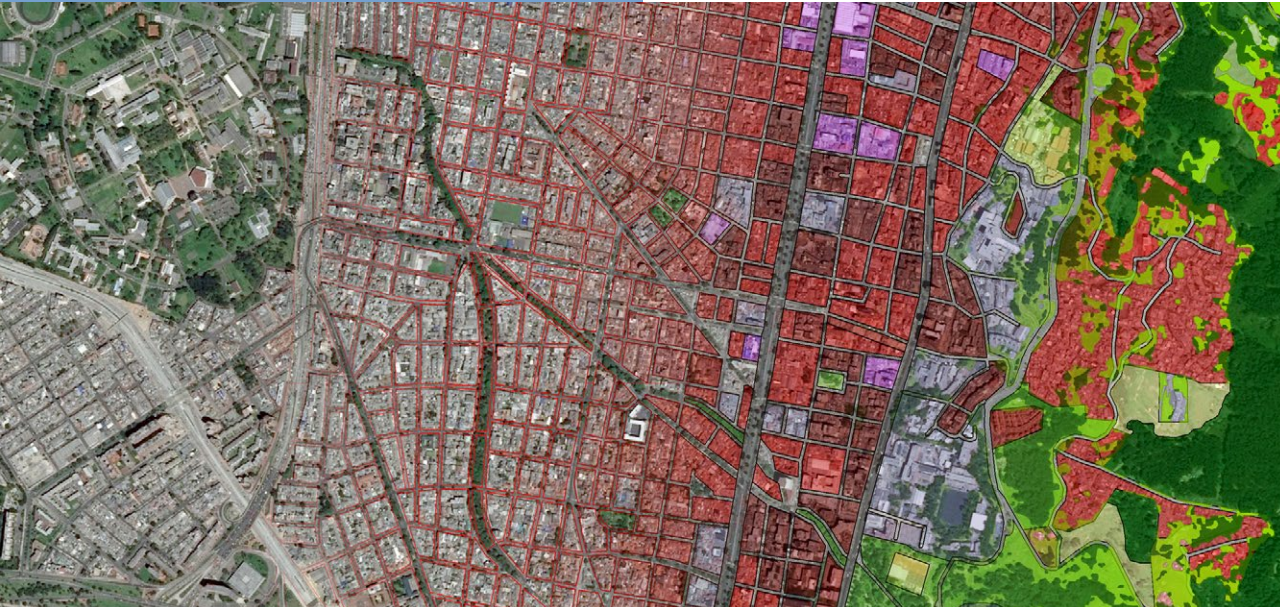


IABG. The Future.



Geospatial Solutions

Geodata turn into solutions

iABG

Geodata Technologies



Remote Sensing

Radar Remote Sensing and
Interferometry

Digital Photogrammetry

Geomatics

Artificial Intelligence and
Neural Networks

Solutions Services

Land Cover & Land Use

Natural Hazards

Urban Analyses

Green Space Cadastre for Municipalities,
Road Cadastres for Municipalities,
Solar Cadastres, Split Wastewater Charge,
3D City Models, Urban Disaster Risk
Management

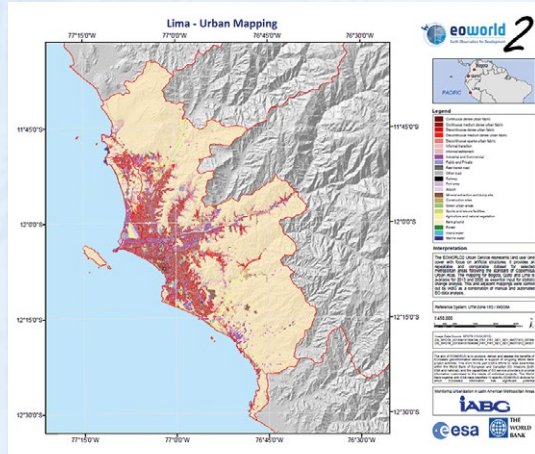
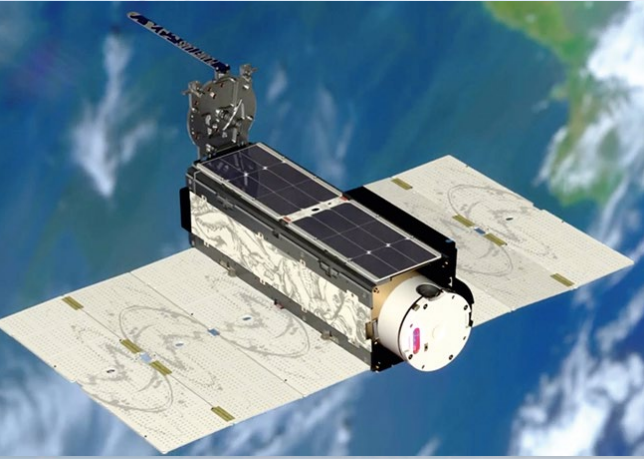
Explosive Ordnance
Exploration for Municipalities

Forest Applications

Hydrological Mapping & Simulation

Monitoring of Railway Infrastructure





Remote Sensing

A view from above

Satellite technology and remote sensing have a decades-long tradition at the IABG. During this time, we not only tested numerous satellites regarding their suitability for space travel in our Space Test Center but also extracted information from images captured by a wide range of sensors.

As such, our geodata experts process image data from optical sensors and radar images, as well as from LiDAR point clouds. Depending on the desired level of detail, images captured by satellites, aircrafts, or drones (RPAS) are used. 70 highly qualified employees use this Earth observation technology to solve a variety of issues that can affect a whole continent or even just a single land parcel. Thereby, the images are not only evaluated visually but are also semi-automatically classified using methods of object-based image analysis (OBIA).

Due to the increasing availability of satellite images with a high spatial and temporal resolution, remote sensing is becoming ever more important for Earth observation.

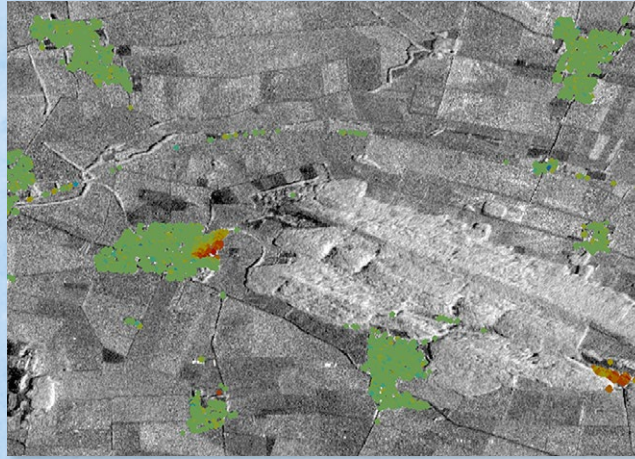
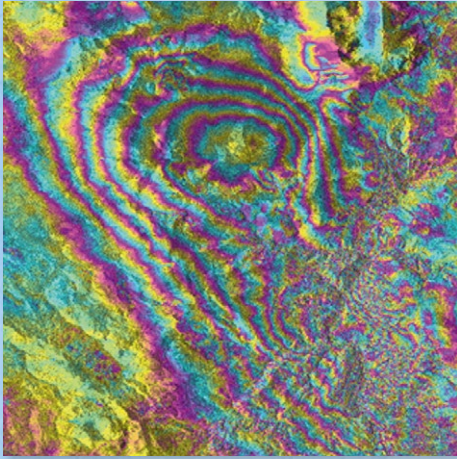
Our expertise, proven within the framework of Copernicus services, makes the IABG a reliable and sought-after partner for European institutions.

Areas of application

- Land cover/land use mapping
- Monitoring of critical infrastructures
- Risk and damage analysis
- Monitoring border security
- Urban development
- E-government

Our services

- Advice on the appropriate procedures
- Procurement of the image material
- Image processing/georeferencing
- Image interpretation/image analysis
- Presentation of the results



Radar Remote Sensing and Interferometry

In radar remote sensing, electromagnetic pulses are emitted from aircraft- or satellite-mounted sensors, which then record and process the radiation backscattered from the earth's surface. In doing so, various frequencies (X-band, C-band or L-band) are used for different application areas. This active process allows for Earth observation at any time of the day and in all weather conditions.

The recorded signals represent a complex combination of backscatter intensity and wave phases. These not only allow conclusions to be drawn about the properties of the earth's surface (roughness, humidity) but also enable the recording of the terrain height. Radar interferometry includes various measuring methods for the comparative analysis of image pairs and time series.

Classic differential SAR interferometry uses recordings of two points in time to detect changes in the height of the earth's surface. With the advanced methods of interferometric stacking, monitoring tasks can also be accomplished by analyzing data of entire time series. After the reduction of interferences, it is possible to identify ground movements in the cm to mm range.

Areas of application

- Land cover / land use mapping
- Soil moisture mapping
- Flood areas
- Risk and damage analysis
- Geotectonic crustal movements
- Natural resource / groundwater extraction
- Subterranean work
- Landslides
- Marine pollution

Our services

- Multitemporal land cover analysis
- Measurement of surface deformations
- Damage detection after environmental events
- Monitoring of ground movements



Digital Photogrammetry

From image to information

Highly accurate, current spatial information (geodata) is the basis of many planning and decision-making processes. Using individually captured or readily available aerial and satellite images, our experts carry out digital photogrammetry (image surveying) using state-of-the-art processing stations as an efficient method of obtaining accurate 2D/3D-data. Project-relevant visible objects and structures are thereby systematically and uniformly captured and stored in a database. The spatial resolution of the used images ranges from a few meters up to 3 cm and can thus be adapted to the requirements of our customers with regard to subject matter and accuracy.

Whenever geodata is used to realistically depict or model our complex world, the photogrammetric approach is the method of choice.

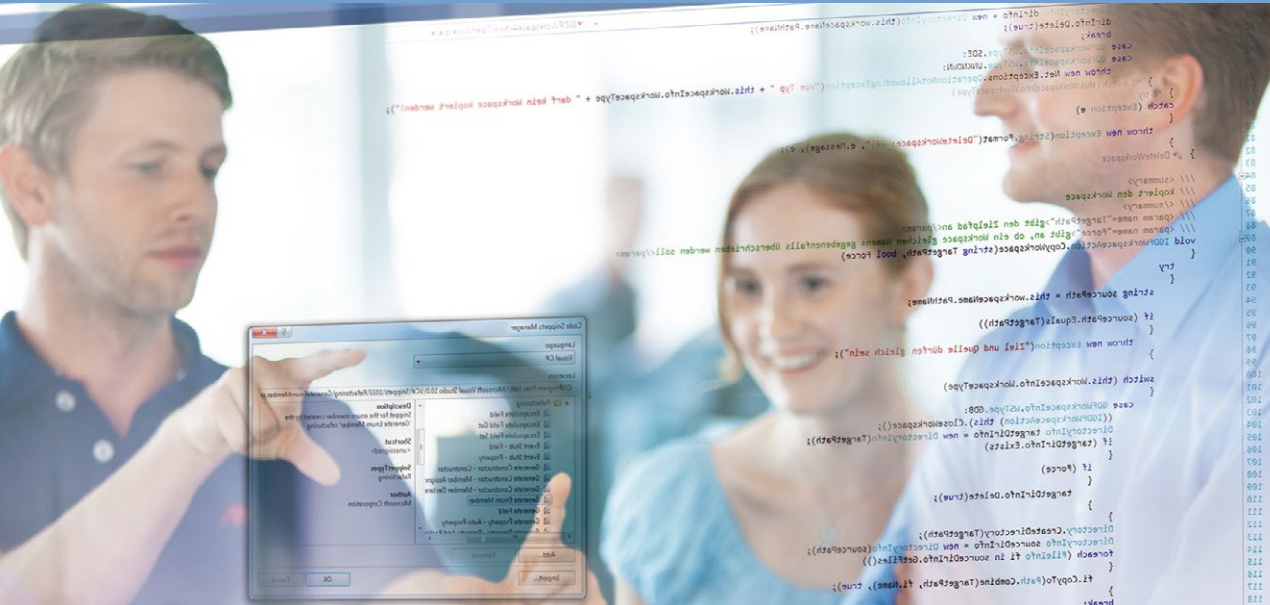
In close cooperation with our customers, we develop tailored solutions and implement them in sophisticated, cost-efficient projects. Our many years of experience and ISO 9001 certified quality management thereby ensure the highest quality standards.

Areas of application

- Land cover / land use mapping
- Terrain and surface models
- 3D city models
- Explosive ordnance exploration
- Solar registry
- Municipal cadastre
- E-government
- Natural hazards analysis

Our services

- Advice on the appropriate procedures
- Procurement of the imagery
- Image processing / georeferencing
- Photogrammetric evaluation
- Further processing in Geographical Information Systems (GIS)



Geoinformatics

The increasing usage of geoinformation systems in industry and administration results in the growing of new needs and demands with regard to the basic digital data required. The challenge for service providers is to introduce and comply with standards in the customer data.

The wide-reaching expertise of our engineers ensures the necessary knowledge required for the various customer-specific demands in the GIS sector. The development team of our Geodata Service consults and supports our customers competently in all methodical and technical matters in geoinformatics and software development. We have a cutting-edge hardware and software and develop tailored solutions for our customers: from small project teams to complete offices and authorities.

Our services

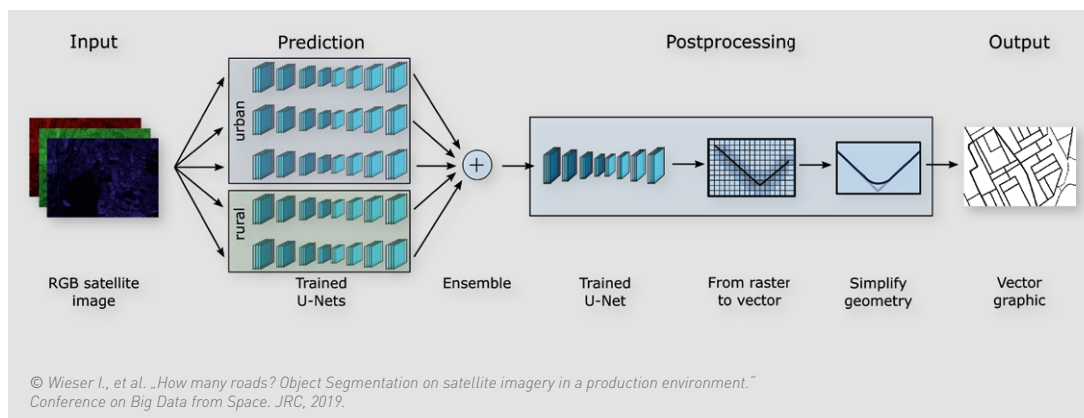
- GIS application
- Development in the GIS sector (tools, applications)
- GIS consulting and training

Areas of application

- Updating services (cadastres, green spaces, land coverage)
- Planning services (solar potential, site determination, radio network planning, population density)
- Simulation (flooding, erosion risks) Split wastewater fee (production of legally binding fee notifications)



Artificial Intelligence and Neural Networks

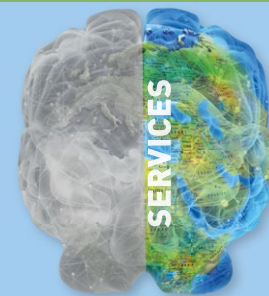


Copernicus, the European Union’s Earth observation programme, and the commercial PlanetScope data together provide extensive and steadily growing data archives. Using them for earth observation requires appropriate analysis methods and sets new requirements for algorithms and computing capacity.

Deep learning, a subdomain of artificial intelligence, has proven to be an adequate concept for analyzing large volumes of data (big data). These data archives permit neural networks to learn and at the same time form the basis for extensive analyses and efficient monitoring. A particular highlight: The system can be adapted very easily to all sorts of different geographical conditions.

IABG Services

- Identification of road and housing infrastructure
- Classification and monitoring of land cover changes
- Monitoring of single objects such as ships, vehicles or aircrafts
- Activity based intelligence to understand the “Patterns-of Live” for security-relevant zones such as airports, borders, ports
- Early crisis warning through spatial and temporal correlation across multiple data sets



Land Cover and Land Use

Multi-temporal evaluations and analyses

Capturing and taking inventory of the land surface are crucial for various planning, monitoring, and modeling purposes. IABG has longstanding expertise in the evaluation and analysis of multi-spectral, multi-sensorial, and multi-temporal landcover data.

Our services are characterized by highest-quality standards, and comprise national nomenclatures (ATKIS®, LBM-DE, cadastre), European standards (Corine Land Cover), and international mapping provisions (DFDD, FAO, LCCS).

We support our forestry clients in forest inventory by providing remote sensing and situational analyses and GIS-technical data handling.

Our services

- Land use mapping
- Land use classification using optical radar satellites
- Change analyses
- Data migration
- Storm damages assessment
- Biomass determination





Natural Hazards

Global climate change and its ramifications

Global climate change and its ramifications are posing new challenges for today's society: Rising sea levels, earthquakes, or extreme weather events like heavy rainfall or storms are increasingly common. Consequences like flooding, coastal erosion, landslides, or tsunamis oftentimes claim a large number of human lives and cause substantial economic damage.

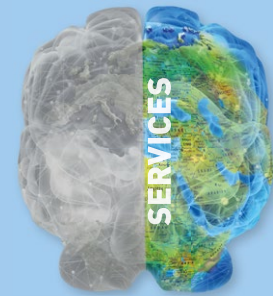
Using remote sensing methods, and imagery, radar, and laser data acquired by satellites, airplanes, or RPAS, IABG generates the geodata necessary for analyzing the resilience of rural and urban areas.

In the topic of „Disaster Risk Reduction (DRR)“, potential risk areas are identified, and the efficacy of structural and planning measures are verified using a modeling approach.

These analyses provide important information regarding a region's vulnerability, to be able to implement targeted measures and to improve the sustainable protection against natural disasters.

Our services

- Construction of high resolution terrain models
- Land use mapping
- Soil sealing assessment
- Determining retention surfaces
- Flood mapping
- Flood simulation
- Determining potential landslide areas
- Monitoring ground motion using radar interferometry
- Monitoring coastal erosion
- Aiding the implementation of the EU flood directive
- Population density



Urban Analyses

Risk management and monitoring in urban areas

The first decade of the 21st century marked the first time that more than 50% of the world's population resided in cities, which led to a soaring increase in the areal as well as vertical expansion of urban areas. The process of increasing urbanization is accompanied by increasing climatic change.

Frequent flooding or marked heat waves, partly accompanied by extreme droughts, are affecting an increasing number of people. In future, planners and administrations face the challenge of making urban spaces resistant towards climatic change, and cities and conglomerate cities increasingly need to be developed into "Resilient Cities".

IABG supports this process through targeted analyses of city structure, based on high resolution remote sensing data. In the context of crisis management, weaknesses like extensive soil sealing, poor distribution of green areas and waterbodies, or areas threatened by flooding and heavy rainfall events are identified.

Our services

- Construction of high-precision terrain models
- Classification according to the European Urban Atlas Classification or other international standards
- Acquisition of single buildings for cadastral applications
- Simulation of flooding scenarios for the designation of threatened areas
- 3D building and city models with derivation of population density
- Retrospective multi-temporal analysis of urban development and future growth scenarios
- Monitoring of critical infrastructure



Urban Analyses • Green Space Cadastre

Tree cadastre – cemetery cadastre – playground cadastre

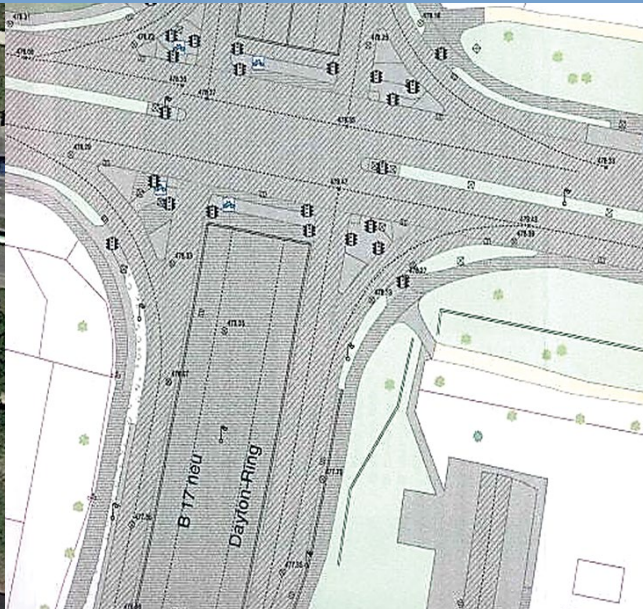
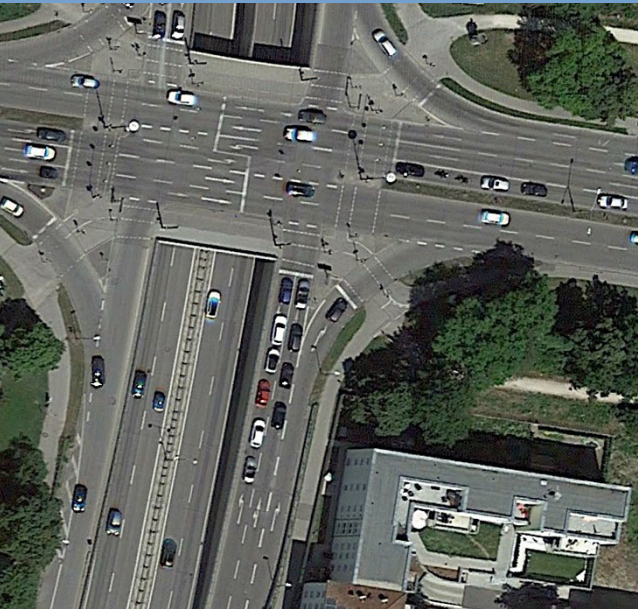
Urban green spaces in parks, tree-lined avenues, school sport facilities, are valuable elements of a well-rounded and high-quality city or municipality image. Digital green space cadastres enable the efficient management and maintenance of green space facilities, parks, playgrounds, and cemeteries, as well as center strip and roadside greenery. They support the operations of personnel and machinery and are used for the planning and fulfillment of the statutory traffic safety requirements.

Objects such as single trees, lawns, shrubs, bushes, and many more are precisely recorded using current aerial images of a suitable resolution and are organized in a database together with the necessary describing data and corresponding orthophotos. The tree cadastre provides the basis for the further attribution of the trees with regard to tree species, maintenance measures, checks.

Additional elements such as buildings, park benches, playground equipment, paths, access roads, and fountains complete the data inventory.

Our services

- Procurement of aerial images
- Development of mapping keys
- Interpretation of aerial images
- Generation of single tree cadastres
- Mapping of green spaces
- Creation of maps and databases
- Generation of orthophotos



Urban Analyses • Road Cadastres

Traffic areas and their infrastructure are among the most important assets of any municipality. A road cadastre depicts the road network in terms of type, location, and features in a GIS-executable manner, which means that the cadastre can be linked to many other types of geodata. This ensures that every road section is attributed with the necessary specialized information for care and maintenance measures, valuation.

The data is usually acquired by digitally mapping current aerial images of high spatial resolution. In doing so, transport areas are recorded and individually distinguished according to their function and surface type. In addition, road inventory objects such as traffic lights, street lighting, and drains, as well as center strip and roadside greenery are obtained. In a similar manner, the transport areas can also be linearly captured and linked with the desired properties in a node-edge model.

Our services

- Advice on selecting a suitable method
- Procurement of the basic data
- Digitization of the road network
- Generation of a node-edge model
- Attribution of the road network



Urban Analyses • Solar Cadastres

Government funding measures have led to local authorities increasingly publishing a solar cadastre in their portals. This provides neutral information about the suitability of roofs and open spaces for solar thermal energy and photovoltaics. In addition to the solar potential, information about vendors, service providers, funding opportunities can be integrated. The planning of solar parks in open spaces is also supported by this cadastre.

Decisive factors for determining the solar potential of buildings are, on the one hand, global radiation, roof area, roof pitch, and roof orientation, and, on the other hand, the shading caused by other buildings, roofs, and trees, and the relief. Based on this information, the solar potential of the roof and ground surfaces is calculated using current aerial images. For a more detailed assessment of the potential, dormers and interference objects such as chimneys, roof lights, and aerials can be recorded and included in the modeling process.

The level of accuracy desired by our clients determines the choice of modeling method.

Our services

- Advice on the appropriate procedures
- Procurement of the basic data
- Site and building extraction
- Modeling
- Determination of the solar potential
- Integration into a city portal

Anhörungshogen
Grundstücksabflussbeiwert

plantling
Stadtwerke
Simon-Cohen-Straße 1
54447 Pfaffing

Flurstücksdaten:
Gemarkung: Parkstein
Lage: Parkstein-Deufels-64
Flurstückskennung: 6933-3/5
Eigentümer: Fabian, Stephan
Gesamtfäche: 9585 m²

Legende:
 Dachfläche (bitum.) 782 m²
 Versiegelte (bitum.) 271 m²
 Unversiegelt

Die Richtigkeit der Angaben wird bestätigt:
 Ort/Datum: _____
 Unterschrift: _____
 Telefon Nr.: _____
 E-Mail: _____

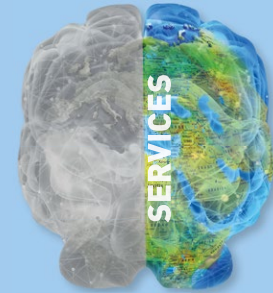
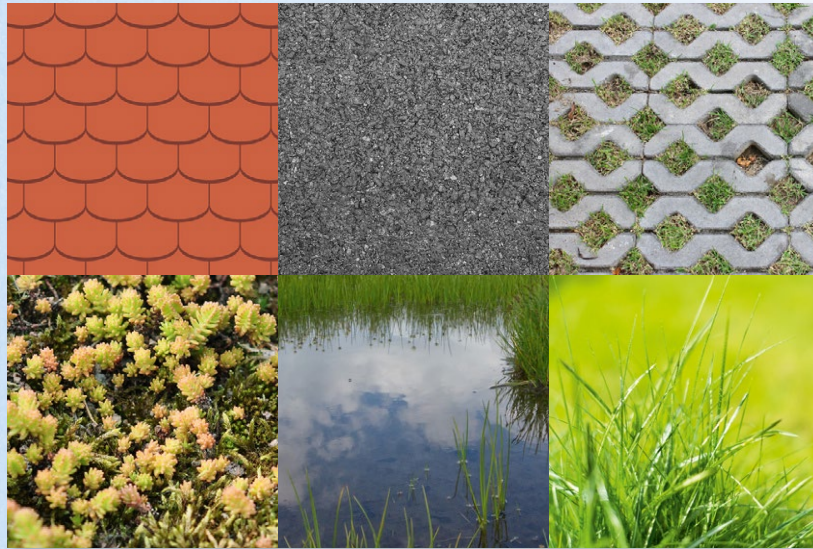
Sie Anwesenquartiere der
Stadtwerke Pfaffing:
 Herr Michael Schredde
 +49 (0) 921 9161632
 michael.schredde@stadtwerke-pfaffing.de

Lageplan: Maßstab 1:800
Dahingrundlage: GÜBfug vom Juli 2013

Expansionsgrenzen bei Bedarf hier einzeichnen.
(Flächen in Pink und in der Tabelle sind eindeutig kennzeichnen)

Nach der Auswertung der bebauten und befestigten Flächen auf Ihrem Flurstück ergibt sich ein mittlerer Grundstücksabflussbeiwert von 0,17. Als Ergebnis wird eine reduzierte Grundsteuerfläche von 1438 m² zur Berechnung der Niederschlagswassergebühr für Ihr Grundstück herangezogen.
 → Informationen zur Berechnung der Werte entnehmen Sie bitte dem Hinweisblatt

ANKÜNDIGUNGSZEITUNG 9212 3/0 5488 01



Urban Analyses • Introduction of the Split Wastewater Charge

Based on highest court rulings, many cities and municipalities are obliged to separate their wastewater charges according to the share of wastewater and rainwater, respectively. Over the past thirteen years, the IABG has accompanied 43 cities and municipalities in southern Germany on their way to introducing split wastewater charges.

The contributory share of the rainwater results from the sealed areas in the land parcels. The degree of ground sealing can be measured or estimated using different methods. Both are based on aerial imagery, which can either be analyzed photogrammetrically for separate land parcels or used to define areas of comparable surface runoff. To involve the citizens in this process, information sheets are automatically generated from the database and sent to the landowners for inspection and approval. The documents returned by the citizens are reviewed and incorporated into the database, which is delivered to our customers for the contribution calculation.

Our services

- Advice on the appropriate procedures
- Public relations work
- Conducting the imaging flight
- Capturing the sealed surfaces
- Creating personalized information sheets
- Organization of citizens' participation
- Dispatch of the information sheets
- Incorporation of citizens' responses



Urban Analyses • 3D City Models

Cities and municipalities are increasingly providing their citizens and administrators with 3D city models. The level of detail ranges from simple block models (LoD 1) to complex building models (LoD 3).

City models serve many purposes:

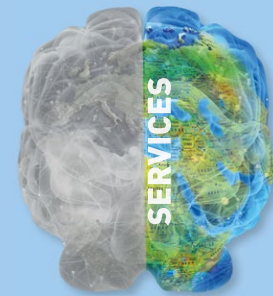
- City and urban development planning
- Noise and pollution forecasts
- Urban climate
- Solar cadastre
- Assessing heat requirements
- Heavy rainfall management
- Applications planning

These models are also used to illustratively present the municipalities in the areas of tourism and marketing.

High-precision building landscapes are modeled by photogrammetric analysis. Simpler city models are produced using the partly automatic Semi-Global-Matching Process, which creates a surface model of the urban area. Both techniques use aerial images that have a resolution of 8 cm to 20 cm.

Our services

- Advice on the appropriate procedures
- Procurement of the basic data
- Site and building extraction
- Modeling



Explosive Ordnance Exploration

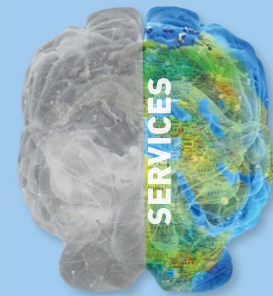
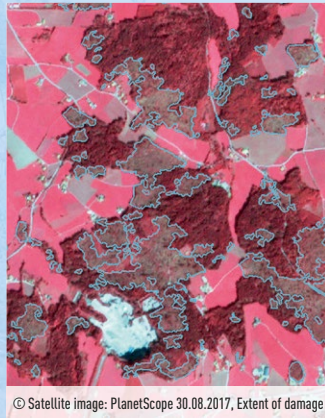
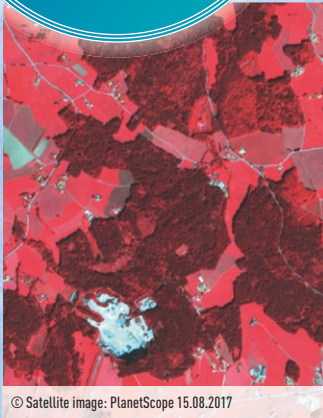
News of bomb discoveries always causes a stir among the population, in a reminder of the dangerous remnants of the Second World War that are still slumbering in the soil of our cities, often-times only to be discovered during earthworks. To minimize the danger to local residents and site personnel, our specialists investigate the local effects of war before groundbreaking.

Since 1991, our experienced aerial image interpreters have been analyzing images that were captured from the air by the allied forces during the war. In doing so, they record former military facilities, ruins, filled pits, bomb craters, and suspected unexploded ordnance sites, which they subsequently document in reports and depict in maps. If abnormalities are detected in the investigation area, technical weapons investigations can be carried out on-site as a further measure.

The IABG is listed as a specialist company of aerial imagery evaluation in the directories of the Bavarian Interior Ministry and the bomb-disposal services Rhineland-Palatinate and is a member of the Güteschutzgemeinschaft Kampfmittelräumung Deutschland e.V.

Our services

- Provision of wartime aerial images
- Evaluation of archives
- Image Interpretation
- Mapping effects of war
- Report Generation
- Recommendations for action
- Historico-genetic evaluation

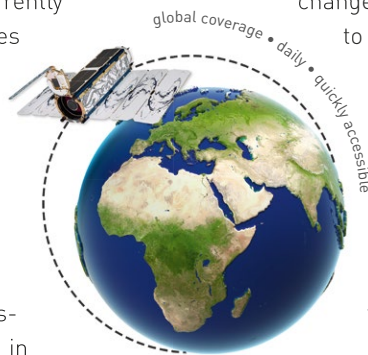


Near Real-Time Monitoring in Agriculture and Forestry with Planet Satellite Constellation – Reference

The increasing extent of natural hazards poses new challenges in the field of earth observation. Planet's constellation of currently more than 190 individual satellites captures one image a day of the entire landmass on earth. Within 24 hours at the latest, the data is made available for further processing in a cloud-based archive.

When thunderstorm Kolle devastated large parts of the forests in Lower Bavaria, Germany, on August 18, 2017, IABG was commissioned by the Bavarian State Institute of Forestry (LWF) to measure the extent of damage caused by the storm. Planet's Dove satellite constellation, which collects daily images with a ground resolution of approx. 3 metres, offered two key benefits:

- Cloud-free post-disaster images were made available incredibly quickly.
- The extremely short time span between pre-disaster and post-disaster images helped rule out the influence of any silvicultural treatments, underlining the informative value of the findings considerably.

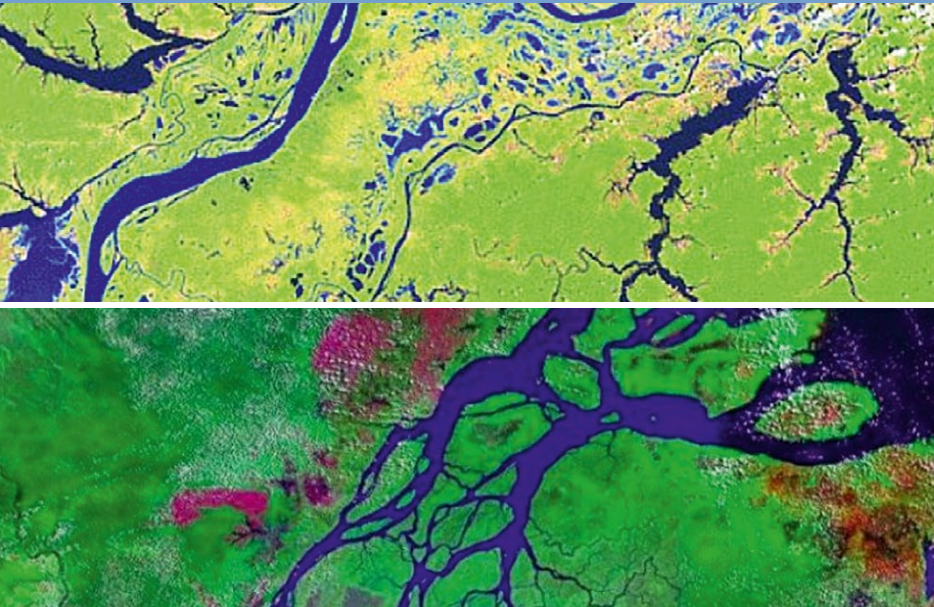


A change detection analysis was performed to automatically determine and visually verify forest changes. Within a few days, IABG was able to deliver important insights that the LWF could leverage immediately for damage investigation purposes and to review aid applications.

In agriculture, Planet data is used for plant vigour analyses, devising crop sequence plans or reviewing financial aid applications (IACS).

Our services

- High-frequency pre-disaster and post-disaster satellite images (with resolutions ranging from 0.8 to 5 metres) from the Planet satellite constellation
- Change detection analysis
- Partially automated monitoring
- Calculation of custom indexes
- Visual verification
- Provision of valid data for reviewing financial aid applications

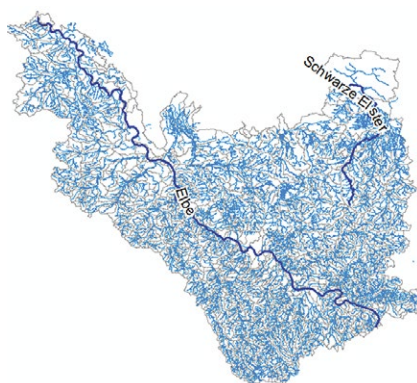


Hydrological Mapping and Simulation

Hydrology is an essential aspect of landscape assessments both from an ecological and an economic perspective. Detailed knowledge of existing surface water is required for any business or activity related to water resource management such as water supply, hydroelectric power generation, flood management or recreational uses of public water.

The climate change and ensuing changes in precipitation patterns, in particular, make it absolutely necessary to have comprehensive knowledge of the water infrastructure in order to manage the water supply in arid regions and plan measures and controls for river and flash floods.

IABG has already created hydrological maps for more than 600,000 kilometres of river systems of different orders across an area of more than 2 million square kilometres. Classic hydrological maps and simulations, flood maps or maps identifying flood retention areas are generated at scales ranging from 1:100,000 to 1:1,000, based on satellite images and high-resolution aerial photographs.

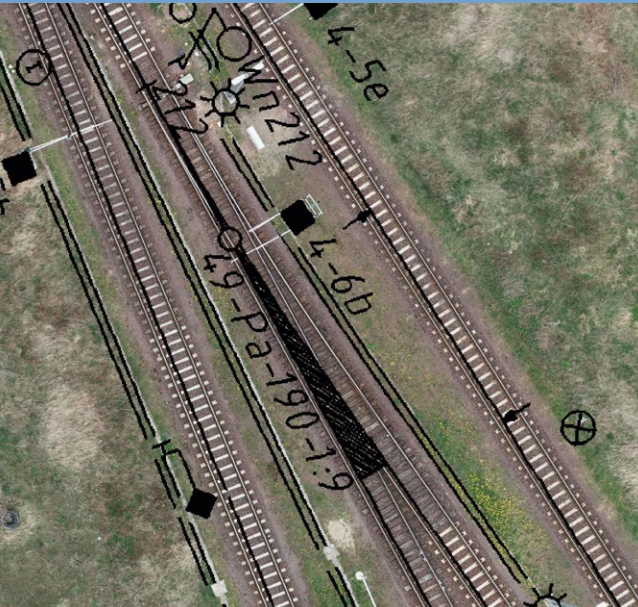


Flood simulations, which require a comprehensive and detailed compilation of all hydrologically relevant factors, are becoming increasingly important for planning and for the insurance industry. And IABG has established itself as an indispensable planning partner.

Services:

- Hydrological mapping of river systems of different orders
- Recording of surface waters such as lakes, retention basins and retention areas
- Recording of irrigation systems
- Flood and flood damage mapping
- Flood simulations to identify potential flood areas





Survey and Monitoring of Railway Infrastructure

Services

Remote sensing and photogrammetry

- Processing of satellite and aerial imagery
- Generation of high resolution terrain and surface models
- Production of orthophotos
- Interferometric Synthetic Aperture Radar

Mapping

- Vector data acquisition
- Automated image analysis
- Topographic mapping
- Land-use mapping
- Emergency mapping and risk evaluation

3D stereo analyses

- 3D city models
- Cadastral surveying

Geoinformatics

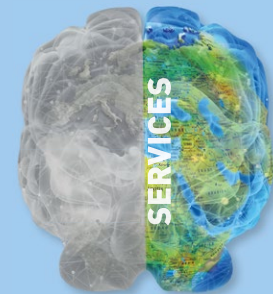
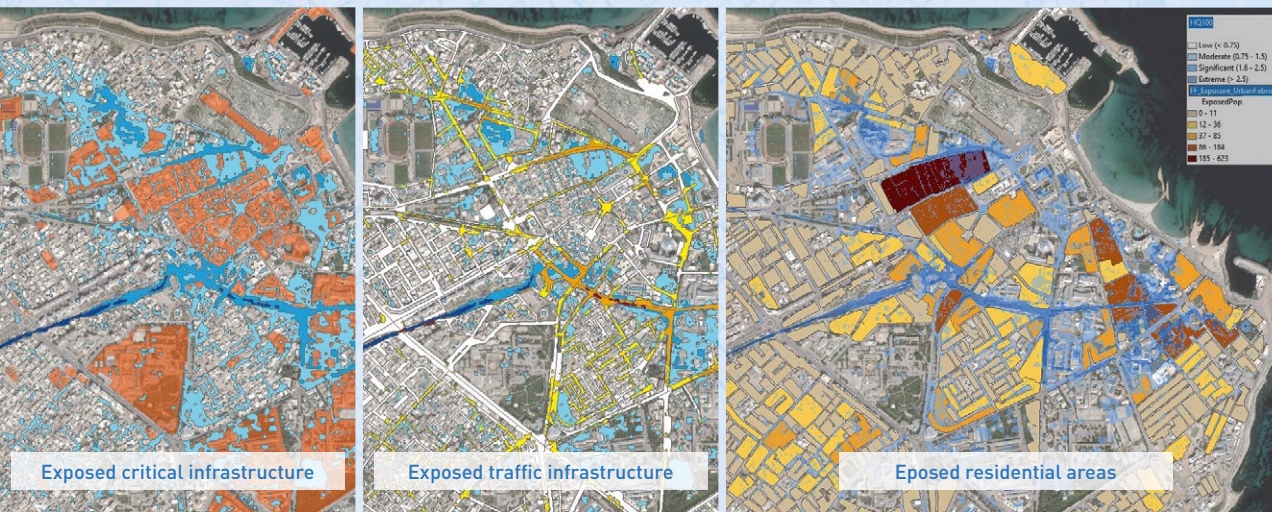
- GIS analysis
- Application development
- Database management
- Quality Assurance of Geodata

Land monitoring

- Ground movement
- Change detection

Projects

- Monitoring of track-geometry after heavy rainfall or landslides
- Semi-automatic acquisition of the railway infrastructure
- Management and quality assurance of infrastructure data
- Mapping and evaluation of forest areas as well as green at and in the railway track
- Ecological management of power lines aisles



Urban Disaster Risk Management

Geodata technology to protect populations

Database Development

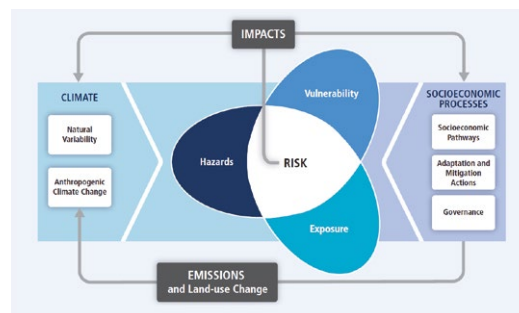
- Evaluation and specification of suitable geospatial data
- Data transfer and aggregation into standardized digital information
- Support of sustainable urban planning processes
- Visualization of project results by an open accessible web viewer to support the decision making process in urban planning
- Development of a standardized and updated geodata base for exposure analysis and mapping

Exposure Analysis

- Retrospective multi-temporal analysis of urban development
- Update of urban maps
- Digital Terrain and Surface Modelling
- Flood mapping
- Simulation of flooding scenarios for the designation of threatened areas in regard of the climate change effects

Vulnerability and Risk Assessment

- Identification of main drivers of vulnerability and risk
- Socioeconomic analysis
- Assessment and mapping of societal vulnerability in urban areas
- Simulation of future urban growth scenarios
- Vulnerability and risk scenarios
- Sustainable planning concepts
- Capacity building and skills training for integrating risk information into urban planning/resilience strategies



© Images: IPCC Report



AUTOMOTIVE

Areas of application

Typical geodata applications include land-use planning, surveying and mapping, flood and disaster control, environmental monitoring, mobile telephony planning, contaminated site management or market research. As a result, consumers increasingly benefit from geodata-based products such as navigation systems and online services, e.g. route planners, Google Earth or Bing Maps 3D. High-resolution geodata is also an important resource for military and border control staff, given the growing number of missions in an extended area of operations.



INFOCOM

IAGB Geodata Factory

At our ultramodern geodata production site in Dresden we have the human and infrastructural resources to handle even extensive geodata projects. At present, we are helping the German Federal Armed Forces evaluate satellite images and the Federal Agency for Cartography and Geodesy update the Digital Landscape Model DLM-DE.



MOBILITY, ENERGY & ENVIRONMENT

About IABG

IABG offers integrated, ground-breaking solutions in the sectors Automotive • InfoCom • Mobility, Energy & Environment • Aeronautics • Space • Defence & Security. We provide independent and competent consulting. We implement with future viability and target orientation. We operate reliably and sustainably. Our success is based on an understanding of market trends and requirements, on our staff's technological excellence and a fair relationship with our customers and business partners.



AERONAUTICS

About IABG Environmental Services

We are a preferred partner for complex projects in the environmental sector, e.g. for the remediation of contaminated sites. Our areas of expertise are environmental engineering and geodata. At the IAGB Geodata Factory we capture and interpret geographical data, for example for surveying flood risk areas, planning mobile telephone networks, designating sites for wind and photovoltaic power plants and for municipal cadastres (e.g. for soil sealing, split wastewater fees).

- Environmental engineering
- Geodata service
- Remediation
- Power management
- Environmental risk assessment
- Renewable energies



SPACE



DEFENCE & SECURITY

For more information please contact:

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