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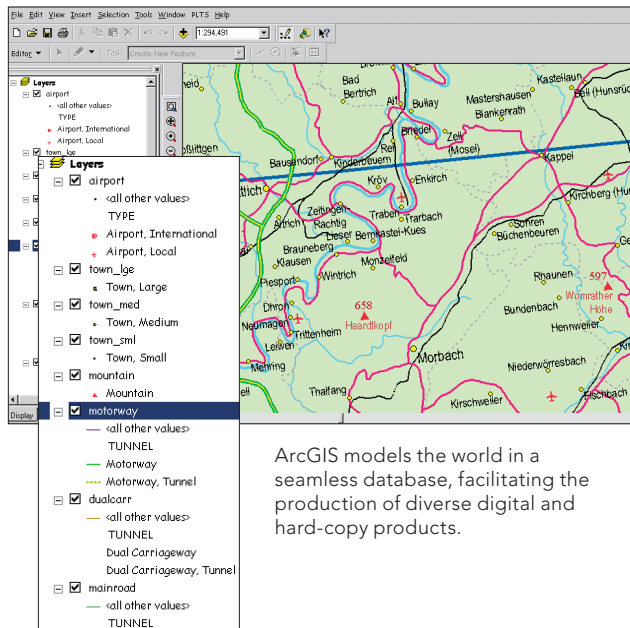
GIS for National Mapping and Charting

Esri® GIS Solutions in Europe

GIS for National Mapping and Charting

Solutions for Land, Sea, and Air

National mapping organisations (NMOs) are under pressure to generate more products and services in less time and with fewer resources. On-demand products, online services, and the continuous production of maps and charts require modern technology and new workflows.



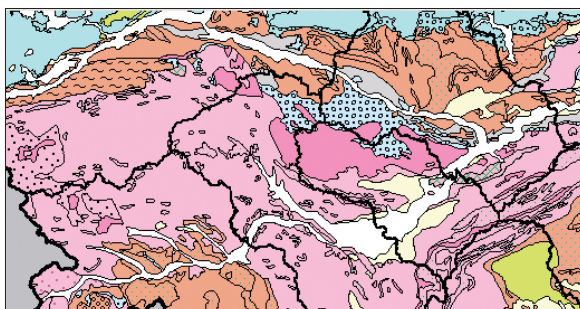
ArcGIS models the world in a seamless database, facilitating the production of diverse digital and hard-copy products.

GIS for National Mapping and Charting

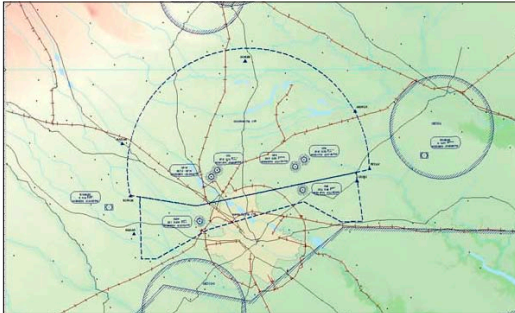
Esri has a history of working with NMOs to find solutions that meet the needs of each country. Software, training, and services are available from a network of distributors and partners across Europe. Esri's ArcGIS® geographic information system (GIS) technology offers powerful, database-driven cartography that is standards based, open, and interoperable. Map and chart products can be produced from large, multipurpose geographic data-bases instead of through the management of disparate datasets for individual products. This improves quality and consistency while driving down production costs.

Esri® ArcGIS provides NMOs with reliable solutions that support scientific decision making for

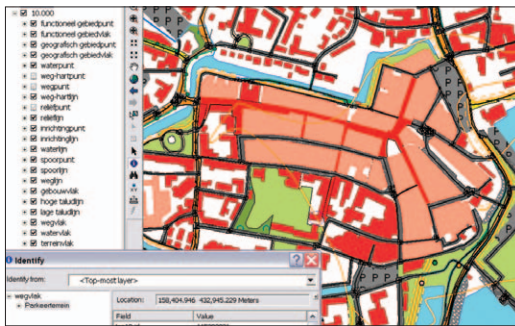
- E-government applications
- Emergency response
- Safety at sea and in the air
- National and regional planning
- Infrastructure management
- Telecommunications
- Climate change initiatives



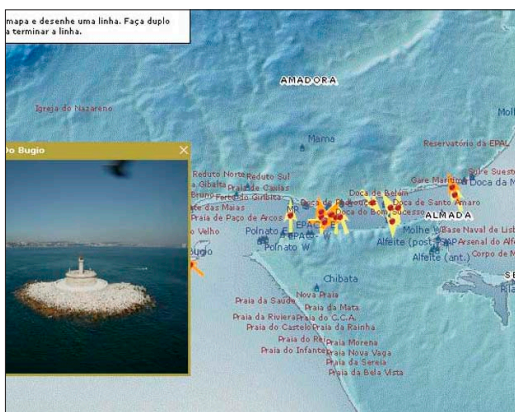
The Digital Atlas of Styria provides many types of map data online including this geology map.



Romanian Civil Aeronautical Authority uses GIS for data management, creating and editing cartographic products, and viewing spatial data.



Netherlands TOP10NL data is topologically structured and richly attributed.



As an aid for navigators, photographs of landmarks along the Portuguese coastline are available from IHPT's public website. This picture shows the lighthouse at the entrance to the Lisbon harbour.

Case Study—Romanian Civil Aeronautical Authority

Romanian Civil Aeronautical Authority (RCAA) regulates all civil aviation activities in the country, including licencing pilots, registering aircraft, and certifying that aircraft and engine designs are safe for use. RCAA uses ArcGIS for data management, mapping and viewing spatial data, and efficiently managing its aeronautical information to produce high-quality charts.

Case Study—Netherlands Kadaster

The Dutch national mapping agency Netherlands Kadaster selected Esri software for the foundation of its production environment for topographic data and maps because of the product's full range of functional and technical capabilities.

The system is used to produce the 1:10,000-scale topographic database (TOP10NL) and has topological structure and attribute intelligence, replacing the previous system with primarily graphic line features. TOP10NL will be used in the development of various GIS applications and for paper map production. Mapping agency customers will receive data suitable for analysis as well as visualisation, with geographic content and structure presented in a rich, standardised way.

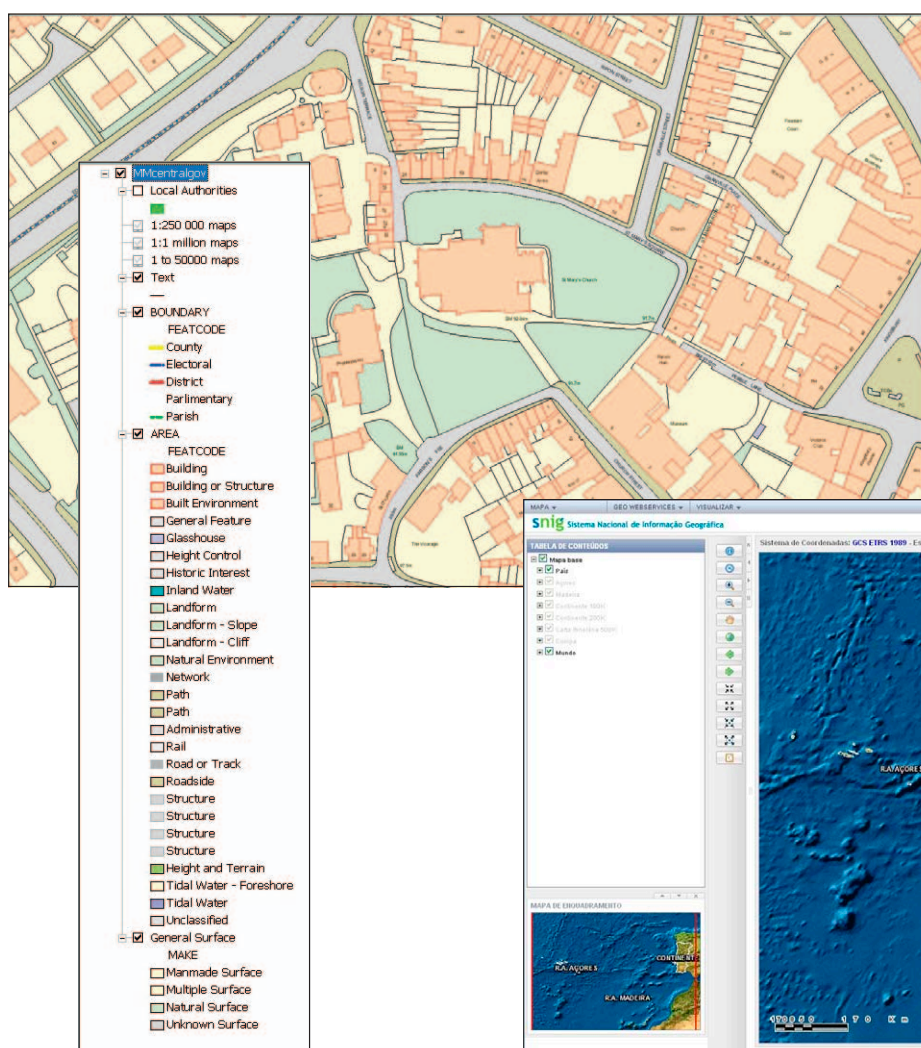
Case Study—Portuguese Instituto Hidrográfico

The marine spatial data infrastructure (SDI) developed by Portuguese Instituto Hidrográfico (IHPT) provides information to decision makers and information products for environmental protection activities, research and development, private industry, military activities, and public information.

IHPT is the naval organisation responsible for producing official nautical paper and electronic charts as well as conducting studies and research in marine-related disciplines such as physical oceanography, hydrography, marine geology, chemical oceanography, and navigation safety. IHPT maintains an SDI called IDAMAR (an acronym in Portuguese for SDI for the marine environment). The SDI supports maritime safety; police investigations; navy activities; and many areas of public, commercial, and environmental protection service. IDAMAR is based on Esri ArcGIS.

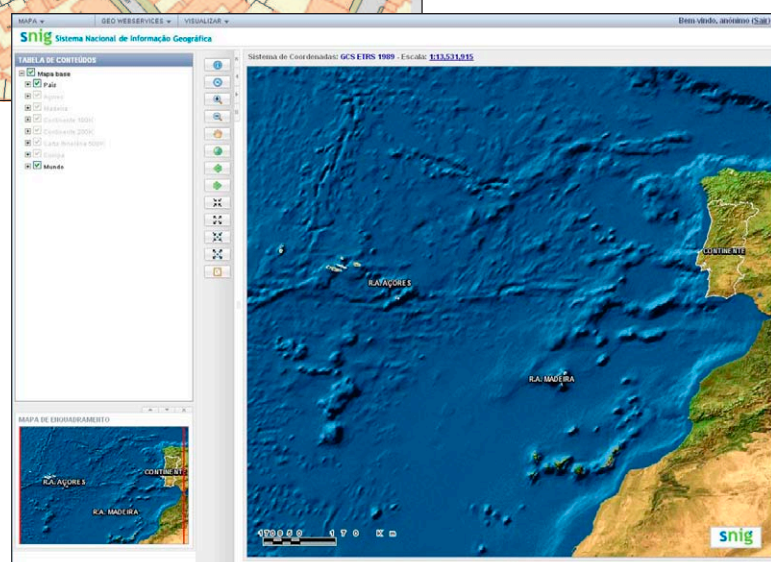
GIS for National Mapping Workflow

NMOs throughout the world, including national, regional, and transnational, use the ArcGIS system to produce a variety of mapping and charting products. These range from very large to very small scales and vary in media from traditional paper to web services and raster and intelligent vector datasets, enabling NMOs to produce a wide variety of products and services.



Ordnance Survey, Britain's national mapping agency, is responsible for creating and updating the master map of the entire country. Ordnance Survey provides maps at various scales, including this example of a large-scale map.

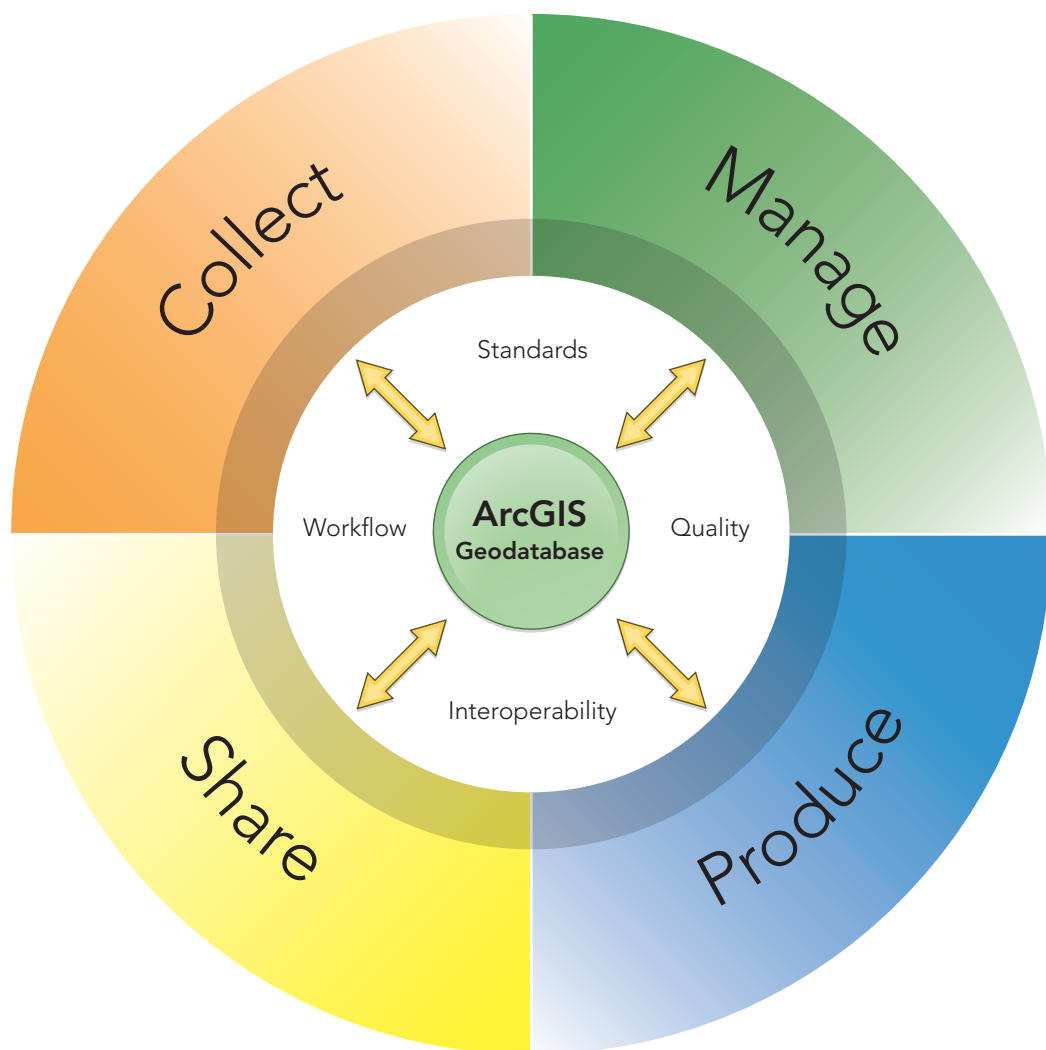
Crown Copyright 2011



Portugal's national SDI provides an Internet map service with GIS data and functionality for public use.

Esri facilitates a database-centric workflow for NMOs. A geodatabase, which stores text and spatial attributes together, acts as the hub to coordinate activities to collect, manage, produce and share map data. Changes can be made at any step in the process, as opposed to following traditional linear workflows. This approach increases return on investment, improves data integrity, and decreases risk.

A GIS-based approach supports the complete production workflow implemented by NMOs. Tools targeted specifically at the management of such production workflows are provided by the software. These tools improve user productivity and simplify the management tasks of assigning work, tracking status, and reporting. This enables NMOs to provide data that is interoperable and compliant with international standards.



Spatial Data Infrastructure

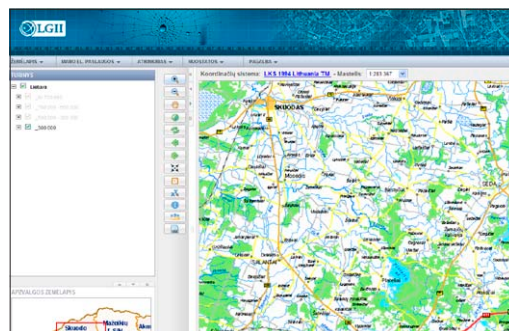
Digital datasets provide the framework or reference data that underpins a nation's SDI. Esri software users, such as Ordnance Survey in Great Britain, have built sophisticated mapping applications. Because mapping organisations must acquire data from a variety of sources and align it to national and regional requirements, they gain from the use of Esri's interoperable GIS software that collects, manages, produces, and shares all common geographic data types. GIS is used locally to bring different departments together into an efficient mapping organisation and nationally to promote a country's SDI.

NMOs play a key role in building and disseminating the core data for an SDI while also minimising data redundancy. Often, they work with other organisations to develop GIS-based small- and large-scale data products and services that will provide the foundation for national and regional SDIs.

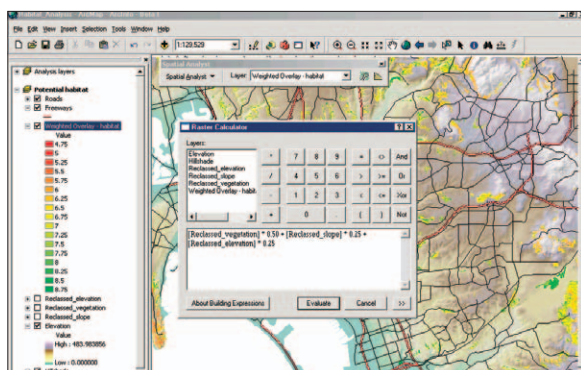
In addition to the ongoing economic pressures to share data, there are increasing numbers of centrally mandated requirements for sharing, such as the Infrastructure for Spatial Information in Europe (INSPIRE) directive. Esri cooperates with international GIS and information technology standards organisations to facilitate the creation of SDIs and the sharing of data. Esri software is based on key interoperability and web computing concepts and is used by tens of thousands of organisations that rely on GIS and information technology interoperability.

Case Study—Lithuanian Geographic Information Infrastructure

The Lithuanian Geographic Information Infrastructure (LGII) ensures the interoperability of and access to datasets from government institutions and state-owned enterprises. The national geoportal (geoportal.lt) also provides access to methodological documents such as business models, data specifications and standards, and relevant legal acts.



The ArcGIS Data Interoperability extension reads more than 75 data formats.



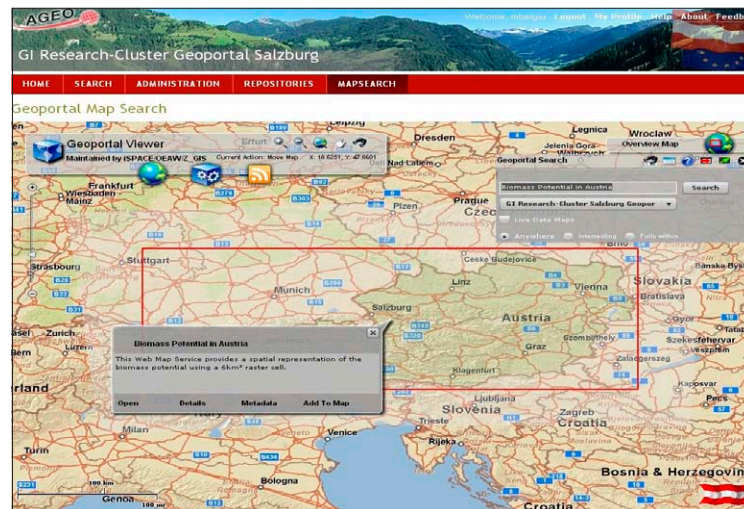
Croatia provides access to countrywide data through Esri technology.

Case Study—Croatia

The Republic of Croatia uses an online geoportal to simplify access to country-wide geographic data. The geoportal is an essential component of the country's Organised Land Project, which streamlines and regulates the real property registration of land in the republic. The average time for processing changes to land titles has dropped from 400 days to 37 days.

Case Study—Austria

The Austrian Umbrella Organisation for Geographic Information (AGEO) represents the interests of the geographic information community at both the national and international levels. Esri technology allows the country to make geographic resources discoverable while also conforming to INSPIRE directives.

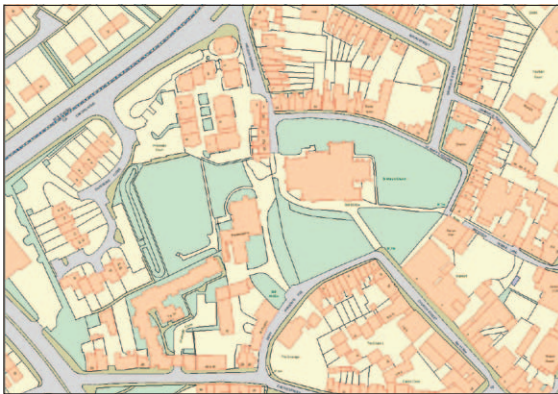


AGEO's web mapping services are available for anyone to access, including results of studies such as this biomass potential study.

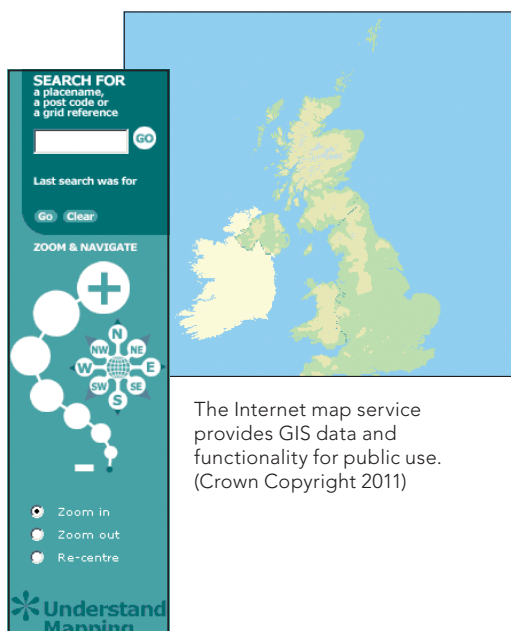
Collect

Centrally Compile Multiple Data Types

Workflows begin with collecting data from a variety of sources including capturing vector data, survey information, map documents, remotely sensed data and other imagery, and GPS points. Compiling this data efficiently requires the ability to integrate multiple data sources in an enterprise GIS in an automated, repeatable fashion, such as through an extraction/transformation/loading process.



Ordnance Survey MasterMap contains more than 400 million features. (Crown Copyright 2011)



The Internet map service provides GIS data and functionality for public use. (Crown Copyright 2011)

Case Study—Ordnance Survey, Great Britain

Ordnance Survey (OS) is Great Britain's national mapping agency. It is responsible for creating and updating the highly detailed and seamless OS MasterMap® of the entire land base, which underpins the Digital National Framework (DNF) of Britain. An independent survey has indicated that Ordnance Survey data enables approximately £100 billion per year of economic activity throughout both the public and private sectors. Ordnance Survey produces and markets a wide range of digital data, online services, and paper maps for business, government, leisure, and educational use. It has a worldwide reputation for the quality, completeness, currency, and accuracy of its data and maps. Ordnance Survey remains at the forefront of mapping advances in the United Kingdom and has an ongoing enterprise license agreement with Esri to facilitate the corporate deployment of GIS technology throughout the organisation. Esri's ArcGIS Server is the technology platform for the services provided by the network of Ordnance Survey Mapping and Data Centres. OS Sitemap® is a web-based, tailored, large-scale mapping product service derived from OS MasterMap data that offers architects, planners, engineers, and estate managers the most up-to-date geographic information available, online and on demand. Esri is also providing the underlying software for a new field editing system, which is based on ArcGIS technology, to be deployed on tablet computers. This system will be used by Ordnance Survey's 300-plus field survey staff, which has responsibility for maintaining the core data repository from which the OS MasterMap product is published—a 400-giga-byte dataset that contains more than 400 million features, of which more than 5,000 are updated each day.

Manage

Take Charge of Workflows, Data, and Products

Data that is collected must be structured and managed to ensure that it can be used appropriately. This requires organising the data into feature classes, enriching it with attributes and relationships, and implementing metadata to enable accurate use. Multiple datasets and types should be managed centrally to reduce or eliminate data redundancy. The scalable enterprise system architecture centred on the ArcGIS geodatabase produces better quality, manageable workflows, and an authoritative and reliable dataset.

Case Study—BKG, Germany

Within the Federal Republic of Germany, the responsibility of acquisition and provision of topographic reference data and technical geodata mainly belongs to the Länder (states). The German Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie [BKG]) manages and coordinates the country's spatial reference systems and makes topographic reference data available to the federal government and the public.



The BKG GeoDataCenter portal is built on Esri server software and offers Open Geospatial Consortium, Inc®. (OGC®)-compliant web map services.

BKG's products include topographic reference data in digital form as vector and raster data and corresponding maps at different scales as well as geodetic reference networks for planimetry, altimetry, and gravimetry. Since 1989, BKG has been using Esri software products to create its business products such as digital landscape models (vector data) in scales of 1:25,000 (Basis-DLM), 1:250,000 (DLM250), and 1:1,000,000 (DLM1000); digital topographic maps (raster data) in six scales; and digital elevation models and gazetteers.

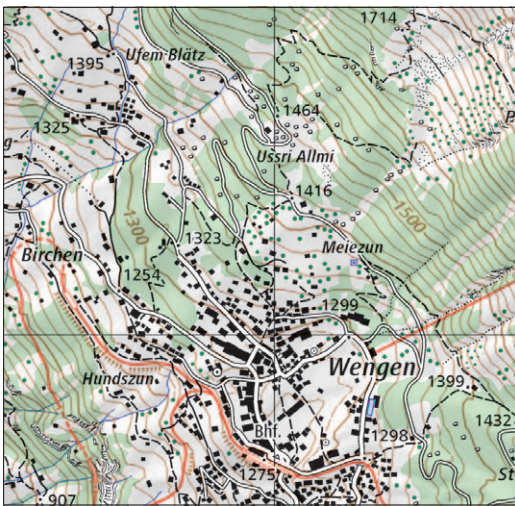
The information technology network is built on Esri's ArcGIS software, which helps BKG reliably and efficiently fulfil its national mapping tasks. Its Internet site has been designed using common Internet programming techniques such as HTML, JavaServer Pages (JSP™), and Java™. BKG operates a metadata system that supports software-based and organisation-wide standards that are essential for effective data sharing. The BKG website also provides an online order and delivery system, online coordinate transformations, a web gazetteer, interactive maps, and downloads of data along with the corresponding internal workflow management processes needed for updating information. The GeoDataCenter of BKG also manages the Internet portal, which offers a broad variety of web services.

BKG offers a continuous and maintainable colour imagery service for all of Germany. The base data (40 cm resolution orthoimagery from the 16 federal state agencies) came as 100,000 tiles with 6 TB of raw data in five different projections. BKG—using ArcGIS—was able to immediately use this data, optimise the data and software system for performance reasons, and offer the service well within the time frame—a real success.

Produce

Maintaining Geographic Excellence

Workflows generally create an end product. High-quality, relevant, up-to-date, and easily accessible maps, data, charts, and web services can be produced in a short time with low production costs. Maps and services can also be hosted through a country's website, as well as through ArcGISSM Online, allowing users throughout the world access to data.



Rural Topographic Map (Copyright swisstopo)



Urban Topographic Map (Copyright swisstopo)

Case Study—swisstopo

The Swiss Federal Office of Topography (swisstopo) in Wabern, near Bern, is responsible for the creation and updating of the nationwide geodesic network, geologic mapping, and topographic databases for Switzerland. swisstopo publishes the well-established and world-renowned topographic map series in the scales of 1:25,000 up to 1:1,000,000 using new Esri-based processes and workflows. The master topographic landscape model (TLM) is the foundation for the vector data as well as all the digital cartographic models (DCM). swisstopo created TOPGIS, the central production environment for the TLM. This completely integrates photogrammetry and ArcGIS, allowing a wealth of products to be created from the 3D landscape model.

Updated information from the TLM gets translated into the DCMs, and both are stored within Esri's geodatabase. Using this approach has significantly reduced the time between capturing aerial imagery, which is the basis for the TLM, and the publication of geodata and subsequent map products.

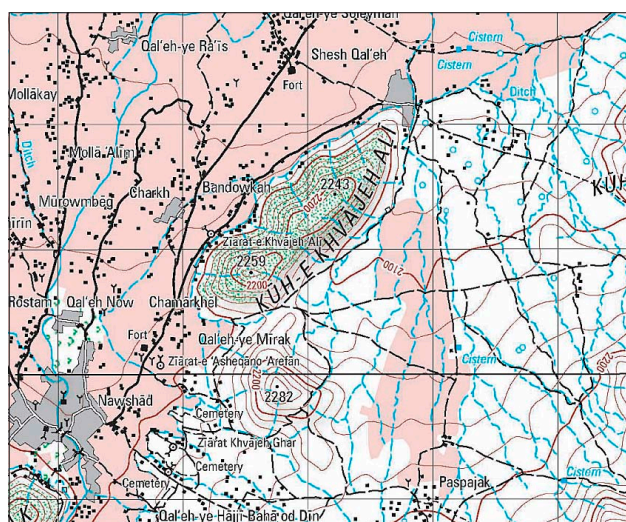
Just like the TLM, the DCM is provided seamlessly for the entire country, but the data is also enhanced cartographically. Map products are derived from the DCMs. swisstopo produces a whole suite of DCMs—each of them corresponding with one of the many map scales created—and derives printed products like the Swiss National Maps series, the popular hiking maps, and digital products like SwissMap.

To simplify the work of the cartographers, the links between the features of the TLM and DCM are maintained. This is of special importance when changes in the real world happen, since it increases the efficiency for subsequent updates. This enables swisstopo to maintain the world-renowned quality of its cartographic end products, which is of the utmost importance.

Maximise the Value of Your Data

Case Study—Geografická služba ACR

The cartographic tools in ArcGIS help GeoS create the correct symbology on the generated map. Rule matching for each single feature is based on properly defined attribute combinations. This database-driven approach to symbolisation provides many advantages—the digital landscape model and the digital cartographic model can coexist in one dataset, and geometry edits of cartographic representations do not change the original feature geometry. Quick symbology matching based on attribute combinations is achieved through a user-defined Python® script to convert the landscape model into the cartographic model.



User-defined tools for processing other data sources have been established for assembling and successfully applying spot height generation. Digital Terrain Elevation Data (DTED) was implemented to create contour lines as well as shaded relief. This helps improve terrain portrayal and map readability.

For more information, [visit esri.com/maps](https://esri.com/maps).



About Esri

Since 1969, Esri has been helping organisations map and model our world. Esri's GIS software tools and methodologies enable these organisations to effectively analyse and manage their geographic information and make better decisions. They are supported by our experienced and knowledgeable staff and extensive network of business partners and international distributors.

A full-service GIS company, Esri supports the implementation of GIS technology on desktops, servers, online services, and mobile devices. These GIS solutions are flexible, customisable, and easy to use.

Our Focus

Esri software is used by hundreds of thousands of organisations that apply GIS to solve problems and make our world a better place to live. We pay close attention to our users to ensure they have the best tools possible to accomplish their missions. A comprehensive suite of training options offered worldwide helps our users fully leverage their GIS applications.

Esri is a socially conscious business, actively supporting organisations involved in education, conservation, sustainable development, and humanitarian affairs.

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