

Geographical Information & IT - We map the world



COWI



Geographical Information & IT

We map the world

COWI is one of the ten leading mapping companies in the world and our business unit has extensive international experience in providing services within surveying, mapping, geographical information, 3D city models, IT solutions and land registry.

We deliver high-quality products and services based on significant investments in state-of-the-art technology, including large format digital cameras, LiDAR

systems, a thermal camera system, terrestrial laser scanners and IT services supporting geographical information management.

Our services add value to the customers' projects as well as to COWI's engineering activities in all regions.

Part of a global network

We are involved in projects all over the world. Use this brochure to explore our services and selected projects which we have been involved in during the past years.

Mapping

One of our core competences

Based on aerial photography, COWI carries out mapping projects all over the world.

We have many years of experience in optimising and adapting specifications and data structures to provide digital maps that meet our customers' demands.

COWI's orthophotos are one of our core products which are known for their superior quality and very high resolution.

Internationally, we have produced nationwide orthophotos in several countries including Denmark, England, Serbia, Lithuania and 275,000 km² of Namibia.

Our mapping-related services encompass aerial photography, close range photogrammetry, vector mapping, orthophoto processing, thermal mapping, mobile mapping as well as production of digital terrain models.

Internationally, we maintain our competitive position through our main sourcing partner, COWI India, as well as our other mapping subsidiaries.

Our partners are national mapping agencies, governmental institutions, the EU and private companies throughout the world.

Mapping services

- *Aerial photography*
- *Vector maps*
- *Orthophotos*
- *Oblique photos*
- *Laser scanning (LiDAR)*
- *Digital terrain models*
- *3D city models*
- *Thermal mapping*
- *Mobile mapping*





Technology

It takes leading technology

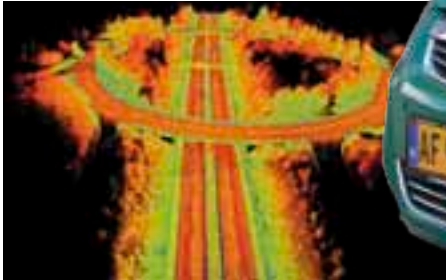
Our products and services are based on leading technology. We combine world class project management with state-of-the-art technology, such as large format digital cameras for airborne surveying, mobile mapping systems for asset management, 3D terrestrial laser scanning for surveying projects and LiDAR systems for collection of large-scale terrain models.

Combined with our specialist knowledge, this makes us one of the ten leading mapping companies in the world.

Mobile mapping

COWI multipurpose technology

The idea behind COWI's new mapping technology is straightforward: a vehicle equipped with a laser scanner and a camera taking pictures and capturing data when moving.



The 3D High Definition (HD) laser scanning and 360° pictures are used for:

- **Road and asset management**

Objects such as man-holes, traffic signs and lights, safety barriers, marker posts and other assets are documented and identified for maintenance purposes.

- **High-speed road and rail HD survey**

Roads and railways are surveyed at speeds of up to 80 km/h with the same accuracy and precision as traditional surveying. Surveying can be done at night time and without closing roads.

- **3D city models**

The laser data is used to add facade details to 3D city models and the high-resolution 360° pictures can be applied as facade textures to create photo-realistic 3D city models.

Surveying

Surveying across the globe

COWI's surveying competencies have been obtained through participation in a wide variety of projects across the world. Our more than 50 surveyors are part of COWI's global network of companies and we provide up-to-date surveying services every day.

We deliver state-of-the-art surveying when needed.

Our technical competencies range from high definition mobile mapping,

terrestrial laser scanning and bathymetry to more traditional surveying.

In major projects, COWI's surveying specialists support all parts of construction projects, including establishment of a geoid, pre-construction surveys, staking out and as built surveys, monitoring surveys as well as site supervision.

One important field of work is infrastructure. We are specialised in and certified to carry out surveying for railroads and highways.

Surveying services

- *HD mobile mapping*
- *Terrestrial laser scanning*
- *Coordinate systems and geoid*
- *Hydrographic surveying/bathymetry*
- *Deformation surveying*
- *Volume calculation*
- *Inspection and site supervision*

Photo: Claire Taylor-Benson.



3D terrestrial laser scanning

New perspectives in 3D surveying

Terrestrial laser scanning is a highly accurate and efficient method of terrestrial 3D surveying allowing even very complicated constructions to be captured in 3D. In a very short time, large data sets can be collected with great accuracy. 3D terrestrial laser scanning offers significant advantages with respect to economy, time and quality within a wide range of engineering activities.

The output from terrestrial laser scanning can replace or supplement traditional surveying. One of the main advantages is that laser scanners collect a vast amount of data. All visible objects are registered during the time of the survey. Therefore, the decision about the objects used for design works by the engineer will be taken at the office after completion of the survey and not prior to the survey.

The results from the survey are geo-referenced and accurate and can be modelled into 3D CAD models for several civil engineering and monitoring purposes.



3D terrestrial laser scanning services

- *Topography*
- *Facade measurement*
- *Surveying*
- *Monitoring and civil engineering*
- *City modelling*

3D modelling

The world from another dimension

3D technology is impressive and is used for urban and infrastructure planning and development. Furthermore, 3D is a strong communicative tool that supports the sharing of visions and ideas. COWI produces large-area 3D city models and performs 3D visualisations.

COWI has the experience, know-how and capacity to perform large-area 3D city models of high-quality. We have worked with 3D for many years and have been awarded a number of prestigious 3D projects such as the 3D city models of Doha, Geneva and Monaco.

Photo: République et canton de Genève – hepia HESSO.



3D visualisation and animation

The world from another dimension

A picture can speak more than a thousand words, but sometimes that may not be enough. When presenting complex projects to decision-makers and the public, 3D visualisations and in particular moving images are excellent for communicating the ideas and visions of the project in a short and precise form.

A video is a strong display case

In today's media landscape, easy recognition and a clear message are key ingredients when going public whether it is a project in its early stages or a public hearing.

A specific image of a prominent project feature will often be used again and again by the media to ensure recognition and a video is a strong display case for the project and is easily distributed online.



GIS and IT

Supporting the working procedures

Geographical information systems (GIS) support public and private organisations by enabling them to use the map as an entry point to large data sets.

COWI develops solutions that make the customers' use of geographically based information more efficient.

We have many years of experience working with CAD, GIS systems (ESRI, MapInfo, Bentley, Intergraph) and 3D software solutions.

Our services include data management, consultancy in setting up the IT architecture and related workflows. This includes training of the customers' employees.

Furthermore, we assist in procurement and implementation of data and systems.

Finally, we deliver services within all aspects of management related to geographically based information, including strategies and analyses in relation to the use of GIS.



Easy access to data

webGIS and hosting of datasets

GIS services

- *IT in engineering services*
- *Strategies and action plans*
- *Procurement and implementation of solutions*
- *Integrating 2D/3D geospatial solutions*
- *Software development and customisation*
- *Data management*
- *Data migration*

Easy access to digital map products through a professional WMS solution (Web Map Service) can for many customers be a key factor to getting starting using geographically based information in GIS systems.

In COWI's hosting environment, we offer hosting of large data sets, such as nation-

wide digital orthophotos, oblique photos and height models. In addition, we also host standard software solutions ArcGIS server and MapInfo Stratus.

The advantage is that the costs of data maintenance, operation of server and backup capacity are kept to a minimum for our customers.



Right of Way

Managing property rights in infrastructure projects

COWI is involved in managing real property rights and ensuring right of way, particularly in relation to infrastructure development and utility services.

COWI's approach to these services – especially when they are linked to expropriation – emphasises the importance of establishing and maintaining close con-

tact to land owners and reaching conclusions based on voluntary agreements, to the extent feasible.

We contribute to projects within all disciplines and of different sizes by addressing our worldwide expert knowledge in right of way and land acquisition in the COWI Group.





Airborne Laser Scanning (LiDAR)

A powerful technology for producing digital terrain models

Airborne laser scanning (LiDAR) from aircraft is a powerful and cost-effective technology for the acquisition of highly accurate elevation data of the landscape to produce digital terrain models for infrastructure and development projects.

The digital terrain models describe the elevation of the earth's surface and contain detailed information about the terrain, man-made structures like buildings and

vegetation. These models are useful for analyses covering forest and other valuable resources, as well as flood prevention, road design and line-of-sight.

COWI has worldwide experience in large-scale laser scanning projects. Current projects include nationwide laser scanning of Lithuania, Sweden, Finland and the Netherlands.

Selected projects



Planning and administration of land use in Ghana, 2007-2010

COWI was to develop a cohesive, streamlined and permanent system for planning and administration of land use as part of a long-term programme for physical planning

and cadastral management in Ghana. The project was financed by the Nordic Development Fund.



Orthophoto and height model of Lithuania

COWI has produced orthophotos and a digital elevation model for the National Land Service in cooperation with the Ministry of Agriculture

of Lithuania. COWI's aircraft has carried out aerial photography and laser scanning of a total of 65,300 km² in 2009 and 2010. The nationwide orthophoto was produced in a resolution of 50 cm and will be used for planning, monitoring and administration.



Ibra-Sur LiDAR aerial survey and mapping

COWI mapping has created a highly accurate digital elevation model from LiDAR and orthophoto

based on digital aerial photography. This work was undertaken to support road engineering for the Ministry of Transport & Communications in Oman. The survey covered 130 km along a proposed corridor connecting the cities of Ibra and Sur in the Sultanate. Critical time was saved utilising this fast aerial survey approach.



Nationwide laser scanning of Sweden (LiDAR)

In 2009, Lantmäteriet (the Swedish mapping, cadastral and land registration authority) appointed Blom to

deliver LiDAR data for creation of a new national elevation model in Sweden. This project, unique by its size, is realised through close cooperation between Blom and COWI. The data collection is estimated to stretch over a 4-year period, starting in the summer of 2009.



Copenhagen Metro

COWI has been the main consultant to Metroselskabet for the management of areas and rights since the start of the Copenhagen Metro project. COWI's function is to calculate the expropriated material and to

undertake agreements with municipalities and other authorities. COWI will assist Metroselskabet with the survey of new property lines and registration of easements when the construction work has been completed.



Mapping of Namibia

A mapping project in northern Namibia literally took COWI to new heights with aerial photos being taken from an altitude of nearly 9,000 m in order to beat the

weather. Racing against the coming wet season, COWI's airborne photographers had less than two months to map an area of 275,000 km² and keep an EU aid project on track. The mapping project was a necessary part of the Namibian Government's Rural Poverty Reduction Programme, which was funded by the EU. The programme aimed to develop the outlying regions of the country through a wide variety of activities, for example by establishing better infrastructure and by creating cadastral and land registration databases. As a base for such activities, accurate and updated maps were essential.



Laser scanning of the Netherlands (LiDAR)

In January 2011, COWI A/S and Eurosense won a project to produce a very detailed and accurate height model of the Netherlands. The data capture is made with the newest technology in laser scanning

(LiDAR) by aircraft. The customer is the Dutch institution, Rijkswaterstaat, which is the national agency that provides "dry feet", clean and sufficient water and a quick and safe flow of traffic. Given the characteristic geography of the Netherlands, a great part of the country being below 0 level, an updated and accurate height model is of essential importance for many planning projects within infrastructure, environment and physical planning.



Environmental system to Fehmarnbelt

COWI's GIS department has developed an Environmental Data Information System (EDIS) to support the Environmental Impact Assessment project for a fixed link across Fehmarnbelt. The client, Femern A/S, and other project consultants

will use the system to access the geographical data needed for their analysis and design. In addition, the client will use the system to manage and visualise all environmental data collected during the project period.



3D model of Monaco

COWI was awarded the project to generate a 3D city model of Monaco at a very high level-of-detail, including facade details for the whole project area of 8 km². For COWI's semi-automatic 3D model-

ling, new aerial images with a resolution of 4,5 cm were used. This high resolution allowed COWI to model details on the roofs and the facades.



The gravity field of Nepal measured from aircraft

COWI and DTU Space are making accurate gravity measurements of Nepal. The measurements, which will be completed in 2011, will probably change the height of the highest mountain in the world,

Mount Everest. In December 2010, the gravity field of Nepal was mapped by one of COWI's aircraft from an altitude of up to nine kilometres. This was performed with a gravity instrument – a so-called gravimeter. Nepal is one of the last places where gravity measurements have not been made until now due to impassable areas until a new technology for measuring gravity from aircraft was developed 10-15 years ago. The project was performed by COWI and DTU Space, both providing equipment and operators and developing the fundamental knowhow, in close cooperation with the Survey Department, Ministry of Land Reform in Nepal, and assisted by the Danish embassy in Kathmandu.



The Danish system for administration and mapping of soil pollution

The Danish Parliament has passed a new law requiring the mapping of soil pollution in order to prevent and reduce the impact of soil pollu-

tion on the ground water, human health and the environment. COWI was given the assignment to develop "a national register of soil pollution", and manage the system for the Danish regions that perform the administration of soil pollution in Denmark. The register provides access to information on soil pollution for the state and local government officials, professionals and citizens.



3D city model of the Canton of Geneva, Switzerland

In July 2008, COWI was awarded to generate a detailed 3D city model of the whole canton of Geneva and to deliver the data for their GIS. This major 3D project

includes approx. 76,000 buildings on about 245 km². COWI will use the existing aerial images taken by a Vexcel camera as well as the official building footprints from a cadastral survey. The 3D city model will be derived using photogrammetry and strong in-house developed 3D capturing and editing software tools.



Qatar National Aerial Mapping

The Qatar National Aerial Mapping project from 2008 was a joint project between COWI Mapping and Space Imaging Middle East (SIME). COWI was responsible for the aerial data acquisition, meas-

urement of ground control points and the 3D city model. Within the project the existing 2D vector map and DTM were updated with aerial images acquired in a new flight mission. A new orthophoto map product was produced to provide a complete and updated national dataset for Qatar. Furthermore, oblique aerial images of urban areas were acquired and a textured 3D model was generated for various applications.

About COWI

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The COWI Group having its headquarters in Denmark and a total staff of more than 6,000 people worldwide, has provided independent multidisciplinary consulting services to public and private clients throughout the world for the past 80 years. The core business of the COWI Group is within the field of our three service lines ranging from classical engineering through environmental science to modern economic analyses.

The COWI Group has 34 branch offices and affiliated offices in Europe, the Middle East, Africa, Asia and North America.

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