

THE NORWEGIAN SPATIAL DATA INFRASTRUCTURE "NORWAY DIGITAL"

NORVEŠKA PROSTORSKA PODATKOVNA INFRASTRUKTURA "NORWAY DIGITAL"

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ABSTRACT

This paper describes the Norwegian Spatial Data Infrastructure "Norway Digital" including the national geodetic network related to both European and Norwegian administrative and legal frameworks. Norway Digital is developed and implemented based on user demands, e-Government objectives, Parliament white paper and INSPIRE directive. Norway Digital is a broad co-operation based on a core framework, national and international standards and the need for distribution services.

KEY WORDS

eGovernment, INSPIRE, NSDI, EUREF89, GIS

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POVZETEK

Članek opisuje norveško prostorsko podatkovno infrastrukturo "Norway Digital", ki vključuje nacionalno geodetsko mrežo v povezavi tako z evropskim kot z norveškim administrativnim in pravnim okvirjem. Norway Digital je razvit in izdelan na podlagi potreb uporabnikov, ciljev e-Uprave, bele knjige parlamenta in direktive INSPIRE. Norway Digital predstavlja široko sodelovanje, ki temelji na osnovnem okvirju, nacionalnih in mednarodnih standardin in na potrebah za distribucijske dejavnosti.

KLJUČNE BESEDE

eUprava, INSPIRE, NSDI, EUREF89, GIS

1. eNORWAY 2009

The Norwegian Government has set up an objective to make everyday life simpler for the citizens and secure their future welfare. ICT (Information Communication Technology), used in the appropriate way, is a contribution to achieve these goals. ICT is a natural part of everyday life for most people. The Norwegian government wants to support a knowledge society where everyone can participate and where the potential for the use of information and communication technology is optimised. The needs of the citizens and private businesses shall be the driving force for the development of the eNorway services. **eNorway 2009** is about how the government wants to use and realise the opportunities. ICT shall support the development of public authorities to be a safe and efficient distributor of services and resources.

Some of the goals from eNorway 2009 relevant for GI (Geographic Information) society:

- eServices for everyone including those who do not have internet access by 2007,
- 80% of public web sites shall fulfil the quality criteria of **Norway.no** for availability by 2007

- all relevant interactive public services for the citizens shall be available through the citizens portal My Page by 2009,
- all agreements for reuse of public data shall be assessed for adaptation to the PSI (Public Sector Information) directive by 2007,
- government authorities within the geodata field and most of the municipalities shall be part of Norway Digital and have an update system for their own data,
- there will be modern electronic charts available for the whole Norwegian coastal water by 2008,
- complete non-sensitive communication between public authorities shall be done electronically,
- all public institutions shall use electronically supported administrative systems and electronic archives,
- all public institutions shall use eID and eSignature for all relevant services,
- all new ICT systems in public sector shall be based upon open source standards by 2009.

The Ministry of Environment, in co-operation with other ministries, municipalities and Norwegian Mapping and Cadastre Authority, is given the responsibility for the priority tasks in eNorway 2009 relevant for the Geographic Information Society.

2. NORWAY DIGITAL

Norway Digital is a national program for co-operation on establishment, maintenance and distribution of digital geographic information. The major concept is building a national geospatial infrastructure to support eGovernment. The co-operation is based on a Parliamentary White Paper on the National Spatial Data Infrastructure presented by the Norwegian government and accepted by the Parliament on 18 June 2003. Norway Digital is a broad cooperation with more than 600 partners and more than 100 operational web map services, geoportal and other services. Thus, Norway Digital is an existing implementation of the infrastructure described by the European INSPIRE directive. The major concept is building a national geospatial infrastructure to support eGovernment. The aim is to enhance the availability and use of quality geographic information among a broad range of users, primarily in the public sector.

Through Norway Digital all public producers, authorities and main national users of geographic information (maps, geodata and property data) are establishing a co-ordinated and user-friendly distribution service. This service will make all standardised geodata available through a core portal. The data are free of charge for internal use for all the participants in the program and the service is be available on commercial basis and as a free of charge view service for the citizens.

The Norway Digital cooperation is based on mutually binding agreements where the participants are committed to a dual solution entailing joint financing of reference data and obligation to supply their own thematic data. Norway Digital establishes a joint arena for coordination and development that will promote further users within the public administration, as well as businesses

and industry being able to benefit from spatial information. The Norway Digital cooperation will be an active tool in the further development of electronic interaction within the public sector, coordinated with the eNorge plan and the development of the ICT policy. In short, it will contribute to a more modern, user-friendly and efficient public sector.

All institutions participating in Norway Digital bring their own data into the infrastructure, making them available to the other partners. The spatial data are divided in two main categories, reference data and thematic data. From 2008 planning data will also be included. Reference data include the geodetic network, topographical data, hydrography, roads and other infrastructure, land use, buildings and cadastral information, elevation and bathymetry, orthophoto. Thematic data include a broad range of information produced by national institutions and municipalities at the local level. The themes cover aspects such as demography, risks and risk management, protected sites, biodiversity and nature values, pollution, fisheries, geology, mineral resources, agricultural and forest resources, cultural heritage and outdoor recreation facilities.

An important element of Norway Digital is core standards. Large efforts have been made in working out specifications of several different data sets. The specifications have been developed based on the principles of the national de facto standard for geographic information (called SOSI). The future development now is to adapt to the ISO (International Standardisation Organisation) and CEN (European Standardisation Organisation) standards and to the INSPIRE directive. Norway Digital is coordinated by the NMCA (Norwegian Mapping and Cadastre Authority).

The current policy for the SDI (Spatial Data Infrastructure) development is based on three main components:

- a geodata portal,
- a geographic information metadata service,
- a range of access services.

3 GEOPORTAL – WWW.GEONORGE.NO

The main objective for the portal is to make spatial data and environmental data available and ready for use to local and regional planners, officials and politicians. The needs for environmental decision making and planning will have priority. The portals shall also in general serve the government, private sector and citizens with environmental GI on the Internet.

The Geoportal architecture is based on national components and on WMS (Web Map Services), WFS (Web Feature Services). It includes both regional and local components and is used to build national (www.geonorge.no) and regional portal as well as local portals. Also some organisation/thematic specific portals are based on the same architecture. The development addresses all and any potential application fields for geospatial information. It has a big variety of content, a rich set of functionality references and thematic data and services. Much is now in daily, fully operational use, such as the national portal, WMS services from a large amount of agencies with national coverage, Web services and portals from local authorities. A new extension including

more support of eCitizens has been designed since 2006.

The standardisation work includes:

- National framework with mandatory architecture and overview of standards involved,
- Content standards – long range of ISO 191XX,
- Metadata – dataset and services, ISO, OGC (Open GIS Consortium), UDDI,
- Services – OGC, ISO, OASIS (web services).

The geoportals and gateway focus on four main topics:

- GI catalogue/metadata service,
- Web mapping, web map server clients,
- downloading functionality,
- information, specification, standardisation.

Download functionality, access points. Many users in spatial planning, in the environment and risk management fields will need the thematic data sets for use on their own GIS applications. The portals will be access points making spatial data-sets available through a set of download functions. They will be distributed solutions where the data will be provided directly from various own servers of agencies. The geoportals will offer the download functionality as service to other data suppliers. In this context it is a challenge to handle the differences regarding copyright and pricing policies. Today this ranges from full cost recovery and strict licensing regimes to general free access and use. Several metadata catalogues are now running and more than 210,000 datasets with reference data and more than 50,000 datasets with thematic data are accessible. On average there are about 300,000 downloads every day through the **Geonorge.no** portal.

4 NORWAY DIGITAL AND MUNICIPAL INITIATIVES

Municipalities in Norway have decided on a core strategy for ICT, called **eKommune 2009**. This includes strategies for surveying and spatial data, cross border cooperation, infrastructure and standardisation, integration and interoperability, ICT in local democracy and participants for the citizens. The strategy states that maps and spatial information are important both in society planning as well as for value adding services directed to the industry and the citizens. Access to spatial data is essential for local government and for the development of quality services. In this strategy participation of the citizens and their influence is highlighted. By facilitating participation in the political decisions of municipalities through electronic channels enabling dialogue between the citizens, the municipality and the politicians, the political arena is broadened and the possibilities for the citizens to have real influence is increased. This will lead to better knowledge about the needs and the challenges that concern the citizens.

In Norway, many of the local municipalities are relatively small and have limited financial and human resources. After **Arealis** and **GeoVEKST** with a broad collaboration most of the local municipalities today participate in Norway Digital. The local communities struggle to meet the GI challenge (and other challenges). Especially as the number of GI data sets grows due to demands

from central government in the field of environmental and area management and spatial planning. To meet the challenge a formalised co-operation between neighbouring municipalities about core GI portals has been established. The collaboration often has defined two main activities. One activity is to join forces in first time data capture/storage, maintenance and distribution of various spatial data sets. The second activity is to develop and run a common web-mapping application. Some major benefits achieved from such collaboration are:

- GI catalogue/metadata service,
- shared cost through establishing a common IT/GIS infrastructure and
- access to GI expertise by employing a project manager with long GIS experience.

Further work will be focused on further data capturing and technical development towards implementing the OGC Web Map Server specification. In this work the project will be supported by technical expertise from the central Arealis organization.

Municipal experiences and opportunities. In the municipalities there are new possibilities, with WMS as important condition, for better access to data and better participation in municipal processes. A good example is Baerum municipality who has participated actively in the geoPortal project. Baerum municipality has long experience with internet distribution of geographic information both to the public and for internal use. Baerum is a municipality active within development and use of new solution within ICT and GIT(Geographic Information Technology), they have interested and demanding users within the municipality, a liberal attitude to the spreading of information, although they sometimes notice conflict between the objective of free information flow and the demand for income from the same information. The chief surveyor in Baerum summarises the basic improvement with WMS as increased information access, information directly from the source, always updated information (or at least dated) and independency of system and organisation.

In a municipal context this means better preparation for decisions, core information basis and a more efficient distribution system compared to the traditional print and copy process today. WMS allows better information exchange within the organisation and with the citizens in hearings and makes it easier to make regional (intermunicipal) map solutions – flexible for different demands. And in the end he summarises that it is really fun.

For even more success there is a need to get good ordering and payment solutions and electronic self service of data. During preparations it is for a start important to know what contribution can come from others and to get good demonstrations of the possibilities by best practice. Information in local and regional media is important to get a broad involvement both from the staff and from the citizens. It is crucial to invest in competence and good guidance. It is also important to test the possibilities and the limits within the organisation and to choose a solution that is most suitable for your municipality if you should have in house services or buy services at a web-hotel.

4.1 Cooperation on establishing a common IT/GIS infrastructure including the geodetic network

GEOVEKST was set up in mid 1990's for joint financing of large scale reference data. It was set up with a Letter of Intent for the national parties, and agreements between local parties for each project. The national parties are: National Road Administration, Norwegian Electricity Industry Association (EBL), The Norwegian Association of Local and Regional Authorities (KS), Telenor Networks AS and Ministry of Agriculture. The Geovekst co-operation as a national coordination arena with corresponding co-ordination forums in the counties are examples of a specific, professional co-operative arena. The Geovekst co-operation is responsible for the establishment, operation, maintenance and accessibility of the most detailed reference data (the data are called FKB, which is short for Joint Mapping Database) and orthophotos for all but seven municipalities in the country. Through the co-operation approximately 60% of the country's area is covered by FKB data and orthophotos. The participants in the co-operation are holders of rights to the data that are provided through the co-operation. FKB data and FKB products, including orthophotos, are made available to the Norway Digital participants. The densification of the new geodetic network was established through Geovekst co-operation.

EUREF89. The establishment of a new national geodetic network was given priority in Part 3 of the Norwegian National Mapping Plan. This Plan was officially promulgated in Government White Paper Number 1984:4 under the sub-heading "Geodesy". Completing this task therefore became one of the objectives assigned to the Geodetic Institute, a division of the Norwegian Mapping Authority, "Statens kartverk". However, in view of the dramatic changes taking place in satellite geodesy during the 1980's, it was difficult to select the best time to address this task.

A provisional datum to be used by the offshore industry had meanwhile already been established early in 1989. This datum was called "WGS84*SEA" and was based on observations in the North Sea - Fennoscandia region using the TRANSIT Doppler Satellite System, the predecessor of GPS (Global Positioning System). WGS84*SEA became quite widely used for land purposes, even though it had been designed primarily to serve offshore needs.

In 1989, the Geodetic Institute participated in a major GPS campaign observing at 93 European stations, including seven in Norway. Each of these stations was already, or has since been, connected to the national First Order Triangulation Network. Meanwhile, at the EUREF Commission meetings in 1991 and 1992, it was recommended that the EUREF89 Reference System should be used as the European geodetic datum in the same way as North American Datum 1983 (NAD83) had become accepted in North America.

The National Mapping Authority subsequently decided to establish EUREF89 as an official national geodetic datum from 1 January 1993. The objective then was that this datum would replace both of the existing datums, NGO1948 that had been used for technical and large scale mapping series, and ED50 that had been used for topographic and geographical mapping.

Practical positioning in the Norwegian area will in the future be relative to the "Stamnett", where the station coordinates are computed in the geodetic datum EUREF89. These coordinates will

now remain unchanged for the foreseeable future. This also means that coordinates which are computed for future Stamnett stations will also remain unchanged. The final adjustment of the New Norwegian National Geodetic Network was carried out in May 1997. In total, the Stamnett thus consisted of 930 stations, distributed nation-wide, with well defined coordinates in EUREF89. As Norway covers 324.000 sq. km, this means an average of 19 km between the Stamnett stations.

This work is organised as a Geodata co-operation (Geovekst) between the main users under the leadership of NMCA. The final step of establishing a new reference frame is to densify the Stamnett according to the user requirements. The resulting network is called Landsnett and consists of 11,000 points with a density from one station per 10-25 sq. km in densely populated areas to less than one station per 100 sq. km in other areas. The financial principle is based on cooperation between NMCA, PRA (Public Road Authority) and the municipalities. The progress of the project has been given priority according to rural areas where the infrastructure activities are highest. This work has been ongoing from 1997 and will be completed in 2008

4.2 Environment management and spatial planning

As mentioned above, from 2008 partial plan data will also be a part of Norway Digital and good interaction with planners, citizens, politicians and the data producers is an important issue in Norway. Arealis was a national project initiated by the Norwegian Ministry of the Environment in 1997. The main objective of the project was to make environmental data and land use information available at national, regional and local level and especially for planning and natural resource management. The project focused on co-operation, standardisation and extensive information activities to achieve the objective. From the very beginning the Arealis project chose the Internet as a strategic information channel. Arealis was a program focusing on the environment management and on making sure that there was a sustainable approach in the spatial planning and that relevant information was made available for the planners, politicians and the public. Arealis is now integrated in the Norway Digital program.

Several successful web-mapping applications focusing on GI for environment and area planning have been launched on national, regional as well as local levels. Further development gives an opportunity for better access and participation from the citizens in planning processes. The needs for environmental decision making and planning will have priority. Project including 3D visualisation is also tested for planners and citizens to determine consequences of various construction proposals like landscape analysis, risk assessment, tourist information, etc.

Digital Planning dialogue. Digital Planning dialogue is a joint project between twelve Vestfold municipalities, Vestfold County Municipality, the County Governor of Vestfold, Vestfold University College and the Norwegian Mapping and Cadastre Authority. The project aims at integrating existing municipal geographic information system with other relevant applications and data sources to improve current planning processes and increase citizen influence on municipal planning. The background was necessary for a better overview in the planning process so that the citizens, architects, property owners and politicians can be updated more easily and achieve

status in the planning process. The project will pick up profits and synergies from earlier programmes in the municipalities and at national level, e.g. from the development of broadband services, common Internet/intranet portals, common projects on Geodata, common Web based GIS, common handling and filing system and, of course, will build on the Norway Digital programme. This project is supported economically by the Norwegian Research Council / HÖYKOM and has developed pilots for two of the cities.

Some expected outputs of the project:

- more efficient executive work,
- faster processes in case handling of plans and building applications,
- better action data,
- strengthened information services,
- transparency in the planning process (e-democracy),
- increased contact and more predictable processes for land owners and other businesses,
- increased citizen influence on municipal planning,
- increased accessibility of information from municipal planning,
- realise gains from ICT investments,
- Web-based handling and filing system,
- cooperation on Geodata ,
- Web-based GIS tools,
- participation in nationally important development work.

Risk management. In Norway municipalities are responsible for spatial planning and building permits. As part of the municipal spatial master plan it is now a demand that the municipality should carry out risk and vulnerability mapping and analyses. Such maps and analyses may also be required at a more detailed level before building permits can be given. It is a municipal task to make sure that spatial planning and building permits are elaborated in such way to guarantee that they will not represent danger for people, environment and material values. It is a demand to have an overview of the risk and vulnerability in the municipality. Some guidelines have been made to assist the municipalities in this work: «GIS in risk management and spatial planning». These guidelines give good examples on how to use spatial data and GIS tools in these fields.

Through a good planning process the municipality makes sure that new building areas have secure location. It is important that risk information is easily available when handling building permits, so we do not locate new buildings in slide exposed areas, and that flood possibilities are taken into consideration. Many of the risk related GI data can be used for preparedness and risk management by risk management organisation, fire corps, social security management, etc. Some checklists have been made for municipalities, listing the most typical risk and vulnerability problems that could be present in a municipality. For all R&V items there is also an overview of relevant acts, directives and rules that put up demands for security precaution in the spatial planning, such as rules for water management, noise descriptions, slide and other exposed areas, demands for

security zones around industry areas. A municipality could also put out its own objectives for security in the planning, e.g. for traffic safety.

An example of using spatial information and internet for emergency situations is the SmartRap system. It is a pilot program developed by the National Food Security Agency, the National Mapping and Cadastre Authority, and private companies Gecko and NorKart. The main objectives are to design and build distributed systems for use in case of emergency, such as natural or manmade disasters. The system is designed so all information is collected in real time by different Web Services and Geospatial Services directly from official databases. The system shall have the capability to produce notification lists with names and addresses inside a defined buffer zone and send warnings by SMS and voice mail directly to the people, companies or farmers inside this buffer (notification zone). The distributed systems for use in case of emergency consist of three different modules that communicate with each other and with several web services in real time.

5. CONCLUSIONS

These and more not mentioned examples demonstrate the need of spatial information as a tool in many of the day to day tasks. It is a clear need for a core framework in each country and also for authorities at local level to achieve the benefits of these tools for society. The INSPIRE directive is one part of such a framework and we find the same development all over the world. It is important that the infrastructure for spatial information is at the same time serving the eGovernment strategies. To achieve this there is a need:

- for commitment across sectors and authorities on a common strategic direction,
- that corporate data and information are easily accessible and usable across agencies and by external users in the private sector and the local community,
- for responsibility for efficient management and updates of the information by each relevant authority,
- to avoid duplication of data and development effort to minimise the costs of development and support of NSDIs,
- for core development and advisory forums to establish guidelines, standards, integration, logistics and user support,
- to involve and accept the private sector in adapting standards, interfaces and participating in developing and managing of relevant LIS/GIS supporting both data owners and data users,
- for the architecture to incorporate standard Intranet and Internet Web access mechanisms so that secure data access can be provided directly to the application, distributed spatial object, application server and metadata/query interface layers.

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