Spatial Data Infrastructures in *Norway*: State of play
Spring 2003

Country report on SDI elaborated in the context of a study commissioned by the EC (EUROSTAT & DG ENV) in the framework of the INSPIRE initiative

August 2003
# Report meta-information

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Executive summary

Norway is on its way towards having an extensive public NSDI known as “Norway Digital”. Many building blocks and issues are being knit together through a co-ordinated national SDI strategy for which however, no formal dedicated legislation exists. Nevertheless a general lack of awareness about NSDI and related policy aspects still prevails, especially at the lower administrative levels.

The NSDI approach in Norway is extensively based on core and agreed standards and specifications (SOSI and ISO). Co-operation on co-financing, and jointly executed projects for establishing, improving and maintaining large scale and environmental digital geographic data are crucial.

Cooperation and coordination are essential features. To this end the Norwegian NSDI is providing for the collection and co-ordination of key elements built around a core of geographic information and services. These elements are policy and guidelines, standards, competence and education, partnership and co-operation and core data.

The NSDI is building upon various national level programmes including eNorge (which is the eGovernment programme), Geovekst (a cooperation programme for establishing digital geographic data) and AREALIS (the environmental programme that aims to make environmental data and land use information available).

The National Mapping Agency is the major executive and coordinating body within the NSDI.

The NSDI is also receiving political support including backing by the Norwegian Parliament\(^1\) which has stated that “Geographic data must be easily accessed and be used efficiently across sectors and management level.”

An additional driving force for the NSDI in Norway, as in a number of other countries, are the e-Government and eEurope programmes which serve to play an active role for encouraging Internet access to information and services, and for promoting the development of strategy documents from the central and/or regional levels.

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\(^1\) It is expected that the state of play country report for Norway will be updated after the Parliaments discussions and conclusions.
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## Abbreviations and acronyms

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>CDS</td>
<td>Catalogue of Data Servers</td>
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<td>CT</td>
<td>Core Thematic Data</td>
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<td>EEA</td>
<td>European Economic Area</td>
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<td>EUROGI</td>
<td>European Umbrella organisation for geographical information</td>
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<tr>
<td>FIR</td>
<td>Further Investigation Required</td>
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<td>FKB</td>
<td>Primary data (FKB data)</td>
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<td>GBL</td>
<td>Association of Enterprises in Geomatics</td>
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<td>GEMET</td>
<td>General multi-lingual Environmental Thesaurus</td>
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<td>GI</td>
<td>Geographical Information</td>
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<td>GINIE</td>
<td>Geographic Information Network in Europe</td>
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<td>GIS</td>
<td>Geographical Information System</td>
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<td>GIT</td>
<td>Geographic Information Technology</td>
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<td>GPS</td>
<td>Global Positioning System</td>
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<td>INSPIRE</td>
<td>INfrastructure for SPatial InfoRmation in Europe</td>
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<td>NGIS</td>
<td>National Geographic InfraStructure (is also National Geographical Information Centre)</td>
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<td>NMA</td>
<td>National Mapping Agency</td>
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<tr>
<td>NORSOK</td>
<td>norsk sokkels konkuranseposisjon or “the competitive standing of the Norwegian offshore sector”</td>
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<td>NS-EN</td>
<td>Norwegian Standards – EuropeaN standards</td>
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<td>NSA</td>
<td>Norwegian Standards Association</td>
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<td>NSDI</td>
<td>National Spatial Data Infrastructures</td>
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<td>NTS</td>
<td>Norwegian Technology Centre</td>
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<td>PPP</td>
<td>Public-Private Partnerships</td>
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<td>PSI</td>
<td>Policy and legislation on access to public sector information</td>
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<td>REF</td>
<td>Reference data</td>
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<tr>
<td>RINGG</td>
<td>reference gruppe for Innforing av Nytt Geodetisk Grunnlag</td>
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<td>SDI</td>
<td>Spatial Data Infrastructures</td>
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<td>SOSI</td>
<td>Norwegian standards</td>
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<td>WFS</td>
<td>WebFeatureService</td>
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<td>WMS</td>
<td>WebMapServer</td>
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1. GENERAL INFORMATION

1.1 Method

This report is summarizing the review of SDI in Norway, and reflects the degree to which the SDI situation is similar to the ideas set out in the INSPIRE position papers\(^2\).

The report is based mainly on the analysis of web sites and other documents readily accessible\(^3\) including:

- http://www.statkart.no
- http://www.statkart.no/geovekst
- http://www.geonorge.no/IPS/geonorge.no/
- http://www.statkart.no/AREALIS/hvaerAREALIS/AREALISenglish.html

and has been completed by integration and consolidation of comments received from representatives of the NSDI initiatives. Those comments were provided in written form.

1.2 The Norwegian SDI-scene

1.2.1 General

Norway is on its way towards having an extensive NSDI known as “Norway Digital.” Many topics and issues are in the process of being knitted together through a co-ordinated NSDI strategy. Nevertheless there is still a general lack of awareness about NSDI and related policy aspects. Presently the Norwegian Mapping Authority (NMA) manages the NSDI in Norway. The NMA is an agency reporting to the Ministry of the Environment.

\[NMA\] May 9, 2003 the Ministry of the Environment presented a policy document to the Parliament. This document states the present policy on Norway Digital as a core fundament to value for Society. This policy is an important part of the Governments general IT-policy. Hydrographic survey and production of electronic charts is Priority 1 to secure safe transport along the Norwegian coast. The Norwegian development, management and distribution of Electronic Charts are internationally acknowledged as a tool to reduce environment disaster along the coasts.

Next focused task is the work with modern land registry, which is being transferred from the courts to the NMA, and core map data. The focus here will be on co-operation and co-financing from many stakeholders, both producers and users, of Geographic

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\(^2\) INSPIRE position papers, final versions: RDM, ETC, DPLI, ASF, IST, IAS (latest version).

\(^3\) Including the analysis of various documents, project references and web sites readily accessible. Most resources were gathered from the Internet. Throughout the report a distinction is made between actual SDI initiatives and GI and GIS based projects. Key elements that should be in place for an SDI to exist are: Status - strategy (or mandate) for SDI to be developed and not a one-off effort; Coordination - who will administer and organise the SDI; Scope - broad based interest and stakeholder involvement; Promoting - awareness, documentation, access; Funding - dedicated resources, a clear plan to pay for it; Partnerships - getting players on-board.
Information. The co-operation is based on agreements and will cover establishment, updating and distribution of core data.

Today the NSDI approach in Norway is based on core and agreed standards and specifications, co-operation on co-financing and jointly executed projects for establishing, improving and maintaining large scale digital geographic data (Geovekst).

A general agreement on the Geovekst program includes the State Road Department, the Board of Electricity Companies, the Norwegian Association of Local Authorities, Norwegian Mapping Authority, the Telecommunication Department and the Ministry of Agriculture. Other services may participate in the program in specific regions. The Norwegian Mapping Authority undertakes the co-ordination role both on national and regional level. The practical execution is organised as individual projects through which digital data is established and administrated in specific, limited geographic areas. The projects are based on an agreed set of standard rules and manuals, which facilitate the exchange and sharing of data across administrative boundaries.

An important initiative in relation to the NSDI is AREALIS. AREALIS is a national initiative to establish a nation-wide Geographical Information System (GIS) making environmental data and land use information available. The program is a unique co-operation where governmental agencies, together with all counties and municipalities, are to specify and make access to a variety of environmental data sets. Information is shared by all parties, and is also distributed for external use. AREALIS data presents the value and interest of different sectors. Such information is essential for land users if we are to move towards sustainable land use. Other important aspects of AREALIS are very focused specifications, a high diversity of topics, a wide range of partners and users, joint management and the use of the National Spatial Database infrastructure (NSDI).

One programme that has supported the development of geographic information via the Internet, is eNorway. The eNorway action plan explicitly addressed geographic information in a limited number of action points, all of which were tasked to the Ministry of Environment:

- Increase of access to local information through binding co-operation agreements with local authorities. Including collaboration being established between local authorities, the state and other users of geodata on a common map database.
- Establishment of a first version of Net portal for national geographic data.
- Development of Net-based learning in the field of Geographic Information Technology (GIT).

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4 This is the e-government initiative as described in the document “eNorway Action Plan 2.0” (http://odin.dep.no/nhd/norsk/enorge/p10001876/024101-220008/index-dok000-b-n-a.html)

5 All tasks were planned for completion in 2001.
- Implement pilot project for co-ordinated administration of geographic information.

<table>
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<th>Some important stakeholders related to SDI activities in Norway:</th>
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<tr>
<td><strong>The Ministry of the Environment:</strong> Policy framework, legal issues, instructions, budget</td>
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<tr>
<td><strong>Norwegian Mapping Authority:</strong> Implementing agency, management, standardisation and co-ordination of NSDI, Norwegian member of EuroGeographics</td>
</tr>
<tr>
<td><strong>GeoForum; (<a href="http://www.geoforum.no">www.geoforum.no</a>):</strong> Norwegian umbrella organisation for GI. It is the Norwegian member of EUROGI</td>
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<td><strong>Geovekst Forum:</strong> See 1.2.2.4 below.</td>
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<td><strong>AREALIS reference group:</strong> See below.</td>
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<td><strong>PRIMAR:</strong></td>
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<td><strong>GBL:</strong> Association of Enterprises in Geomatics</td>
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The Norwegian NSDI has been described as a collection and co-ordination of key elements built around a core of geographic information and services. These elements are

- Policy and guidelines;
- Standards;
- Competence and education;
- Partnership and co-operation;
- Core data

Today the NSDI approach in Norway (NGIS) is based on core and agreed standards and specifications, co-operation on co-financing and jointly executed projects for establishing, improving and maintaining large scale digital geographic data (Geovekst) and an environmental information system AREALIS.

### 1.2.2 GEOVEKST

[AMA] Geovekst is a nation-wide program for co-operation on establishing digital geographic data in Norway. The basic concept is pooling of money and other resources in jointly executed projects for establishing, improving and maintaining large-scale digital geographic data.

The main stakeholders have signed a general agreement. Other services may participate in the program in specific regions.
The Norwegian Mapping Authority undertakes the co-ordination role both on national and regional level. The practical execution is organised as individual projects through which digital data is established and administrated in specific, limited geographic areas. The projects are based on an agreed set of standard rules and manuals, which facilitate the exchange and sharing of data across administrative boundaries.

1.2.2.1 The participants in Geovekst

- **Norwegian Mapping Authority**, working nation-wide. Most of the central functions are located in the main office. In addition there is one office situated in each of the 18 counties in Norway. The County Mapping Offices have traditionally been responsible for large scale topographic mapping, the so called Economic Map Series, in scales 1:5 000 and 1:10 000. They are also the main contact to the municipalities regarding GI related topics and coordination.

- **The Road Department** is also organised with one head office and one office in each county. They need digital data for planning and for making as-built maps when a road construction is completed.

- **The electricity companies** have different owners and ways of being organised throughout the country. Usually you find one electricity board in one specific region. But you can also find areas where one company is responsible for the network, while another company distributes energy to the users. The electricity companies use digital data in their continuous operation, as well as for planning.

- **The Local Authorities** differ a lot in size and capacity. In Norway there are about 434 Local Authorities (municipalities) at the moment. Their area differs from 6 to 9 700 km² and the number of inhabitants varies from 200 to more than 500 000. Their tasks vary widely, and so do the use of digital geographic data. Traditionally they cover urban areas by maps at the scales 1:500, 1:1 000 and 1:2 000.

- **The national Telecommunication Department** is divided into different units/companies, which take care of distinct operations. The unit that is responsible for the network is the one that participates in Geovekst. The Telecommunication Department has designated one person in each region to take care of their local interests in Geovekst.

- **The State Agriculture Administration** is a department under the Chief Administrative Officer of the county. As the name says, they are situated in each county.

1.2.2.2 The national agreement on Geovekst

The Geovekst program is based on a shared responsibility concerning mapping and cost of mapping. The National Agreement commits each main participant to do their best to
take part in all projects. The parties may however consider if they want and have the possibility to take part in the actual projects.

Up to now all parties to the national agreement have taken part in almost all projects. The data production is generally outsourced to private companies. There are two contracts made for each project, one for the participants in the co-operation and one between the co-operation and the private company. These contracts are based on standard contract formulas with the possibility for local adjustment.

1.2.2.3 Private Companies role in Geovekst

The data production is generally put out on tender to private companies. In Norway there are many private companies working in surveying and mapping. They have recently formed the Association of Enterprises in Geomatics (GBL) to join forces in communication with public sector, parliament, ministries and other stakeholders.

1.2.2.4 Geovekst Forum

Geovekst Forum is a national forum with representatives from each of the participants. They meet regularly to discuss questions and problems that come up during the practical work throughout the country. The forum works out guidelines for co-operation amongst all the stakeholders.

Core large-scale datasets are updated and maintained through this process of cooperation (Geovekst forum) among different key players including the government authorities, municipalities, the utilities, the road and railways administrations and the NMA. Within Geovekst (www.statkart.no/geovekst), annual geodata plans to implement projects of common interest are agreed upon. Local projects are hence carried out according to these annual geodata plans. Each partner contributes to the projects with funding and personnel and the resulting databases are accessible to all participants for joint use. For 1998 the total amount used on these projects were NOK 65 millions (nearly 8 million EURO).

The Geovekst Forum appoints Working Groups on actual problems. These groups and the Forum work out guidelines, documents, manuals and implements.

The work done in the Forum and the Working Groups constitute an efficient support, which is of vital importance for the execution of the Geovekst projects.

Each county has a co-ordination group with representatives from the local participants. Their mandate is to help the County Mapping Office in co-ordinating and planning in the particular county.

Leading stakeholders and their budget contributions to Geovekst projects include the following:

- Municipalities 34%
- NMA 24%
- Public road administration 14%
- Energy companies 9%
- Telecom company (Telenor) 8%
- Agriculture 8%
- Railways (and other) <3%

1.2.3 AREALIS

AREALIS is a national program initiated by the Ministry of the Environment. Its main objective is to make environmental data and land use information available at national, regional and local level.

With respect to the AREALIS programme and its role in the NSDI, it is relevant to note that the role of the central government includes the setting of objectives for sustainable development and providing the different tools or mechanisms to achieve these objectives. But the reality is that these objectives were not being met because the measures in place proved inappropriate to cope with the problems faced at the local and regional levels. For example, cases of severe land use conflict, irreversible land use change, land allocation and development practices that were not environmentally sound (http://www.statkart.no/AREALIS/hvaerAREALIS/AREALISenglish.html). Thus the AREALIS has been designed with these issues in mind, and as such it is very user-oriented. Key elements include:

- To bring together many sectors and data suppliers and users (central level);
- To encourage regional collaboration in all 18 counties and to include the local 435 municipalities in this collaboration;
- Project funding is from the central level with contributions from the local and regional levels;
- The NMA is coordinating the AREALIS activities;
- Global aim is to stimulate cooperation between the players.

[NMA] One of the important elements in AREALIS is co-operation. Several activities has been carried out to stimulate increased co-operation between sectors, making their efforts known to each other, which in turn often stimulates further co-operation. Today more than 10 Norwegian ministries and 20 of their agencies are involved in AREALIS, either as data suppliers or as potential users of the information accessible through AREALIS. In addition a number of county agencies and municipalities take part.

Based on the national strategy on geographic information and the work in several projects, AREALIS will this year (2003) focus on developing a new GI gateway – The
AREALIS Portal. All major national AREALIS participants will in some way also participate in this development.

The Norwegian Mapping Authority is co-ordinating the project on behalf of the Norwegian Ministry of Environment.

### 1.2.4 NGIS – National Geographical Information Centre

[NGIS] The main objective for NGIS is the development of a modern, efficient technology for storing, managing and distributing geospatial information based upon existing and upcoming standards, and establish this technology as a national infrastructure in co-operation with public and private sector.

The three main components of the infrastructure are

- **A national portal**: geoNorge.no;
- **A metadata service**: The Geospatial Catalogue for Norway; and
- **A standardised access services**.

The content of Norway digital and its relation to thematic data is illustrated in the figure:

![Norway digital diagram](Diagram provided by the NMA.)
2. **Details of the Norwegian NSDI**

**2.1 General Information**

The Norwegian Parliament has stated that “Geographic data must be easily accessed and be used efficiently across sectors and management level.”

[NMA] A key driver for the NSDI is the contribution to value for society. There is a growing interest in having the ability to use GI for tasks that include search, entry, analysis, decision making, communication, presentation, storing, and more specifically in municipal management, land based transportation, water transportation, fisheries, agriculture, forestry, defence, emergency planning, environment and resource management, etc.

**2.2 Component 1: Legal framework and funding**

**2.2.1 Legal framework and organisational issues**

The legal framework for an NSDI is based on a number of different laws and initiatives, not all necessarily directed towards spatial information.

The following legal tools are present in Norway:

- A general legal framework, Public Administration Law. Freedom of Information Act, see 2.2.3 below and Public Administration Act is of particular importance.

- A law on cadastral issues (Delingsloven), and a new law is under preparation. There is also a law on planning and buildings (Plan- og bygningsloven) in which there are regulations on reporting obligations on geographic information for buildings and constructions.

- A proposal in the Parliament for some changes in the law, which will make it an obligation for the municipalities to keep an updated map according to the planning issues mentioned in the law. The government will be obliged to make national map data available to all the municipalities. The municipalities can demand new maps from anyone who proposes an impact assessment, a plan or a construction permit.

- A proposal to the Parliament is a new law on access to environmental information. This is the Norwegian implementation of the Aarhus Convention. The proposal defines environmental information, the obligations on the public authorities and to what extent environmental information is free of charge. A general exception is made for copyright protected material.
2.2.2 Public-private partnerships

The sharing of risks and profits and participation through shareholdings are in principle possible for the NMA. Currently discussions are taking place about the establishment of PPPs, but no large projects have yet been initiated.

Several companies are working with the NMA via collaboration agreements. The Norway Mapping Group, for example, is an alliance of seven major Norwegian companies offering mapping systems and services regarding GI technology that concluded such a collaboration agreement with the NMA.

More specifically, surveying and establishing large-scale databases for the whole country has for more than 10 years been conducted by GEOVEKST. The production is put out on tender to private companies. They have recently formed the Association of Enterprises in Geomatics (GBL) to join forces in communication with public sector, parliament, ministries and other stakeholders.

In the standardisation field there is a broad co-operation between both public and private stakeholders that has lead to a core national standard SOSI that is accepted by all stakeholders in Norway for more than 15 years.

There is public-private partnerships established in the development and test of technology in dissemination of geographic information and web-mapping applications. A development project was carried out in 2001 – 2002 called Geodata on the Web.

2.2.3 Policy and legislation on access to public sector information

Norway has a Freedom of Information Act. This act is giving any member of the public a right to access public files. (Act no. 69 of 19 June 1970 relating to public access to documents in the public administration, as amended by Act no. 47 of 11 June 1982, Act no. 86 of 17 December 1982 and Act no. 7 of 10 January 1997). In 1985 this right was extended to computerised files.

The national plan eNorge 2005 -published in May 2002- includes a strategy to increase access to PSI and exploit electronic content (Strategi for Elektronisk Innhold).

[NMA] The new proposal on implementing the Aarhus Convention will have impact on public access to environment information, see 2.2.1.

2.2.4 Legal protection of GI by intellectual property rights

Norway is a member of the Bern Convention. The Norwegian Copyright Act (Act no. 2 of 12 May 1961 relating to copyright in literary, scientific and artistic works) was last amended by Law no. 52 of 23 June 2000.

Under the obligations of the EEA (European Economic Area) Treaty, EEA states (Norway, Iceland and Liechtenstein) must also comply with European legislation in the field of intellectual property, such as the Database Directive 96/9/EC. Norway, like the rest of the Nordic countries, had enacted provisions for the protection of non-original and
comprehensive databases before this Directive was even discussed: in article 43 of the Copyright Act. In 1999 article 43 was somewhat modified to correspond with the Directive. This includes protecting “investments” as well as “large compilations” and prolonging the protection period from 10 to 15 years.

Article 43a of the Copyright Act stipulates that a person who produces a photographic picture shall have the exclusive right to make copies thereof and to make it available to the public. This exclusive right to a photographic picture shall subsist during the lifetime of the photographer and for 15 years after the expiry of the year in which he died, but for not less than 50 years from the expiry of the year in which the picture was produced. This protection is for photographs that are not copyright protected, and therefore particularly interesting for aerial photography.

[NMA] Currently there is a draft White Paper for an amendment of the Copyright Law, concerning implementation of the EU Directive on harmonisation of certain aspects of copyright and related rights in the information society.

2.2.5 Restricted access to GI further to the legal protection of privacy

The Personal Data Registers Act of 2000 (Lov no. 31 om behandling av personopplysninger) was approved on 14 April 2000. It is designed to follow Directive 95/46/EC. It mainly restricts access to spatial information containing detailed information on ownership to properties.

2.2.6 Licensing framework

External access to the NMA databases is regulated through a pricing policy for customers and value-added resellers.

[NMA] The pricing policy has two main categories:

1. Usage rights
2. Marketing rights (including electronic publishing)

   **Usage right**  
   **(no: disposisjonsrett):**  
   Right to use the product for private or internal purposes (no limitations in time). Limited according to number of licenses bought.
   - **Internal use** is when the product is bought by a company/institution. Each legal unit needs a separate usage right.
   - **Private use** is if it is bought by a natural person, and includes use by family and close friends.
   - A customer can acquire limited usage rights, as a subscription (time-limited) or communication licenses (functional limitation).
Licences: Usage rights and communication licenses are priced according to the number of licenses you acquire. Each user needs a license, whether the product is being installed on a network or on a PC.

Marketing rights (no: markedsrett): The right to make the product, or a value-added copy of it, available to the public. This can be distributing usage rights to copies to end users or make the product available in an interactive context like Internet

Interactive marketing rights (i.e. use of interactive networks and services such as Internet services and handheld devices) are separated from the others and given a specially adapted pricing structure.

Re-licensing will only be allowed for special types of customers on certain conditions.

All products based on digital products, shall have a copyright notice referring the NMA as the source data provider.

2.2.7 Funding of SDI and pricing policy

Financing comes from government funds, user payment, and joint ventures with public authorities and public owned organisations. Discussions are also taking place about the establishment of PPPs.

Within the Geovekst forum, each partner contributes to the projects with funding and personnel. For 2002 the total amount used on these projects were NOK 100 million (about 13 million EURO). The resulting databases are accessible to all participants for joint use.

As an example, a government owned company called Norsk Eiendomsinformasjon, which is distributing all information about land registration on behalf of the government, is supposed to have full user payment for its products (www.eiendomsinfo.no)

The Freedom of Information Act only says there is free access to PSI but does not regulate to what extent it can be charged for. In reality, charging for even such basic information as laws and regulations has always been common. It is however under constant discussion to what extent PSI can and should be user paid.

A government White Paper from 1994 ‘Til informasjonens pris’ identified instances in which information could be charged for, namely when free access to information results in irrational use of resources, or when the information could be made available to the private sector for further re-use and distribution. The pricing should mainly be used as a means to secure the most effective use of resources, secondly for cost recovery for the operation, and most definitely not as a general contribution for the financing of the public sector. The pricing should be cost-related with marginal cost as the basis and normal upper limit for the pricing. However, if the information was to be used for commercial purposes within private or public activities, market price could be claimed.
The report has not been discussed within the Government or the Parliament and little effort has been made to start the implementation of the recommended policy in the report.

For GI held within the government institutions, there is therefore no general pricing policy. The Ministry of Finance is in principle in charge of the pricing policy for PSI. The various Ministries have various pricing policies, and there is a need to develop more general pricing models. The guidelines for Norwegian Mapping Authority is that core data shall be partly financed by the end user and some of the production cost is to be paid for by sale income.

Statistics Norway (www.ssb.no) distributes its information largely free of charge or at most at marginal cost. The same is the case for Norwegian Geologic Survey, Directorate of Nature Protection and Norwegian Soil and Forestry Survey. They have a policy not to charge for the information, only for the cost to distribute it. Pricing for cadastral information is based on statutory requirements.

2.3 Component 2: Reference data and core thematic data

2.3.1 Scale and resolution: European, National, Regional, Local, Other

There is a clear policy in favour of continuously updating content from administrative resources and to support information flow from large scale to small scale through aggregation and generalisation that are combined with periodic updates (GINIE).

Thus most all scales are supported from this policy of generalising from larger to smaller scales.

2.3.2 Reference data and core thematic data by resolution or scale range

The NSDI core data at the high resolution are updated and maintained in the Geovekst.

The content of digital geographic information covers a number of data themes, namely: meteorological, geological, traffic – land and sea, planning, environment, statistics and other spatial data.

Reference and core thematic data sets include:

- Geodetic networks, including survey control stations;
- SATREF, a broadcasted GPS correction service with 100% geographic coverage;
- Communication and navigation;
- Small and medium scale topographic data with 100% coverage;
- Elevation;
- Sea bed;
- Hydrographic information;
- Place names;
- Administrative boundaries;(Administrative and statistic areas);
- Real property register that is complete and continuously updated;
- Map coverage of the real property register (in 2002 was 50% completed);
- Building and construction, which are continuously updated with coordinates;
- Addresses, which are continuously updated with coordinates;
- Archaeological and architectural monuments and sites, cultural environments;
- Road data for all public and private roads; continuously updated (accuracy of 1-2 m);
- Land cover and land use.

There are four classes of primary data or FKB data (FKB-A, FKB-B, FKB-C, FKB-D):
- FKB - A is the highest resolution origin to scale 1:500 – 1:1000,
- FKB – B is resolution origin to scale 1:1000 – 1:2000
- FKB – C is resolution origin to scale 1:2000 – 1:20.000
- FKB – D is resolution origin to scale 1:50.000

Other datasets are also available from NMA include:
- Digital cartographic model;
  - N50 kartdata, useable for scale range 1:30 000 – 1:75 000
  - N250 kartdata version 1997 1:150 000 – 1:300 000
  - N1000 kartdata, useable for scale range 1:750 000 – 1:1 500 000
  - N2000 kartdata, useable for scale range smaller than 1:1 500 000
  - N5000 kartdata, useable for scale range smaller than 1:1 500 000
- Digital Elevation Model (DEM):
  - Digital terrain elevation data 1:150 000 – 1:300 000
  - Digital geographic model (primary datasets)
- Vbase national road database, 1:5 000 – 1:75 000
- Gazetteer
  - National place name register 1:30 000 – 1:75 000
- Scanned maps
  - N50 raster data 1:30 000 – 1:75 000
  - N250 raster data 1:150 000 – 1:300 000
  - N1000 raster data 1:750 000 – 1:1 500 000

The use of grid squares is also very well introduced in Norway, as in the other Nordic countries. It is considered as perhaps one of the most flexible statistical basic geographic data units. Due to the availability of geo-coded register based data, the opportunities for exploring socio-economic geographic data are exceptionally good throughout the Nordic countries. The most frequently used grid size is 1km x 1km.

Geo-coded grid data as used by Statistics Norway, for example, are presented in Universal Transversal Mercator projection, using the WGS84 datum. The maps (e.g. population by 1km x 1km grid) can be ordered from Statistics Norway or directly downloaded from the Internet as PDF.
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<th>Components</th>
<th>Type</th>
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<th>Organisat. responsible</th>
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2.3.3 Geodetic reference systems and projections

The co-ordinate system is UTM (EUREF89) with three zones (32, 33, 35).

EUREF 89 is the datum used in most mapping. The EUREF89 is based on the ellipsoid GR80 and for all practical reasons this is nearly the same as WGS84.

Until 1993 either NGO1948 or ED50 were used as the official geodetic datum in Norway. The decision to change was based on the NMA working group RINGG (reference group for Implementing of New Geodetic Reference) which prepared the strategy document for geodetic referencing in Norway.

The projection generally used for display and mapping is the Universal Transversal Mercator projection. This also applies to the geo-coded grid data as used by Statistics Norway.

To support converting co-ordinates there is a transformation library available and this assists in the storing and providing of transformation programmes such as WSK TRANS, FYKOD, VG-Trans, etc.

2.3.4 Quality of the reference data & core thematic data

Overall the NSDI is being based on users’ needs analysis. Both Geovekst and AREALIS are examples of GI and SDI elements built from this user driven approach.

Updating of much of the data is continuous in nature, for example the Geovekst data are continuously updated for properties, addresses, buildings, roads, railways and other data related to construction.

In Geovekst there are standard contracts, technical manuals and guidelines. The program has developed standard bidding procedures and standard contracts describing both legal and technical matters. These documents are available on Internet, which means that all parties have access to the latest versions. In addition newsletters from the Geovekst Forum are distributed regularly.

Key documentation developed and made available under the Geovekst program are:

- General agreement
- Guidelines for national and local co-operation
- Standard contracts
- Standard for regional geodata production and maintenance
- Standard model for cost sharing
- Manual for production of data in standardised form, including collection, structure, storage and exchange
- Software for data production
- Control procedures, including software, for checking data quality according to fixed specifications including content, accuracy, completeness and data homogeneity, data structure and data delivery

Increasing of standard software for data production and quality control is done in close collaboration with Geovekst, however these activities belong mainly outside the scope of Geovekst. Manuals to be used by contracted private companies are developed in close collaboration with the private sector.

The main objective for Geovekst is mapping in the scales 1:500 to 1:5000. The digital data are however also used for maps in smaller scales.

### 2.3.5 Interoperability

Various GIS software products are used throughout the different organisations and offices involved in GI/GIS projects as well as the NSDI. Examples include:

- ArcGIS
- ArcView
- GIS/Line
- VG-Systemene
- Gemini-systemene
- PS/WinMap
- MapInfo
- Fysak
- SOSI-VIS (Browser of SOSI files free of charge)

[NMA] Data are mostly distributed according to the SOSI standards. Most software dealers in Norway have developed converter between SOSI and their software. There is an ongoing approach towards ISO/OGC standards to secure interoperability of data and products.

Establishing of digital data follows a nation wide standard for content, structure and exchange called SOSI. This common standard is necessary to make it possible to combine data established in different areas. Particularly the parties with data needs across

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ISO standards employed are 19115, 19109, 19118, 19119 for Metadata, Schema and encoding and definition of services, and the OpenGIS specifications governing WMS, WFS, GML and Catalog and registry services.
Community borders require that data are in accordance with standard. The standard operates with different classes relevant to the different levels of mapping. Which class to apply for the individual project, is negotiated by the parties to project. SOSI will be further developed according to ISO/CEN standards.

2.3.6 Language and culture

Metadata and distributed data are available on platforms and systems that support multilingual and multicultural aspects. Most descriptions and accompanying documents are only available in Norwegian. Some new products and services are available in the two variants of Norwegian (Bokmal and Nynorsk), Sami and English.

2.3.7 Data Content

No information has been found nor provided.

2.3.8 Geographical names

In Norway the situation regarding place names is somewhat complicated. Different spellings of a name may be in official use at the same time, and the goal of establishing a single standardised form for each name is still a long way off.

The names are decided according to the Place Names Act of 1990. The main provisions are the following:

- The public body which uses a place name should authorise the spelling;
- Place names which have been determined by law should be used by the other public bodies;
- Written form should be based on the traditional, local pronunciation, while keeping the current spelling rules.

All names recognised by Law must be reported to a central computerised register administered by the NMA. There could be several names on the same object. There is a code in the register for the status of the various names used.

The names in the NSDI are prepared based on the document “Toponymic guidelines for cartography – Norway”.

There are two official forms of written Norwegian, Bokmal (used by 85% of the population) and Nynorsk (used by 15% of the population). In the municipalities, 36% are using Bokmal as the official language, 28% have Nynorsk as the official language, while the remaining 36% of municipalities have made no final decision regarding official language.

Other names will come from Sami, which is also an officially used language in the local administrations, and Kven (Finnish) place names are used in two Norwegian counties (Troms and Finnmark).
2.3.9 Character sets

[NMA] Hydrographic presentation use the international standards specified in S 57.

For Topographic and thematic land mapping there is developed symbol fonts for cartographic presentations. There is some initiatives to compare the national symbols to international standards.

ISO 8859 –1 cover Norwegian language and ISO 8859-10 gives adaptation for Sami language.

ISO 10646 UNICODE is used for new web versions of information products like Norgesglasset.

Requirements for support of Sami languages in data processing.

The ministers and the president of the Sami Parliament in Finland, Norway and Sweden agree that the document adopted by the Sami Parliamentary Council entitled "Requirements for support of Sami languages in IT" constitutes a basic document where the issue of support for Sami languages in data processing is concerned. National standardisation projects in this area should be conducted in consultation with the Sami Parliaments.

2.4 Component 3: Metadata for reference data and core thematic data

2.4.1 Availability

[NMA] Metadata are produced and managed for a very significant part of the mentioned reference and core thematic data.

The Norwegian standard SOSI requires some metadata elements, like geographic extent, coordinate reference system, quality (positional accuracy and lineage), owner, etc. This kind of metadata is available for most data in the Norwegian Infrastructure. However, there is a considerable effort going on to complement these with metadata elements required for a catalogue services according to IS 19115.

2.4.2 Metadata catalogues availability + standard

NGIS (www.statkart.no/ngis) is normally referred to as the National Geographic InfraStructure. In fact it is the technological tool for data management and the distribution of GI of the Norwegian Mapping Authority. One of its key elements is a metadata catalogue.

2.4.3 Dublin core metadata standards for GI-discovery

Currently not applicable.
2.4.4 Metadata implementation

SOSI provides the standardised format and Norwegian feature catalogue, metadata and data exchange, and it is widely used.

[NMA] The Norwegian metadata standard is a profile of ISO 19115, now being updated to reflect IS 19115, is just finalised (2003). The Norwegian metadata standard is just a translation of parts of the international standard, not a subset of metadata elements, and is 100% conformant to IS 19115.

Update procedures will depend on the dataset being considered. Some such as land cover are not frequently updated while others such as property are continuously updated.

2.5 Component 4: Access services to reference data, core thematic data and their metadata

The main geoportal in Norway is GeoNorge.no. The data is documented based on the national standard SOSI. The databases and information are presented to the visitor via searchable maps and a clearinghouse for metadata. There are a number of new initiatives underway to implement the ISO 19100 family of standards. (GINIE, Ostensen)

Standards used throughout Norway come from the SOSI, and are implemented 100% by both public and private users. There is virtually no proprietary data in Norway. ISO standards are planned to eventually replace the SOSI, beginning with metadata and other data documents and access. OGC specifications are selected for specific geo-spatial services (WFS, WMS).

The catalogue service Geodatakatalogen for Norge is now in its second version and is fully compliant with ISO 19115 Metadata standard. The catalogue is fully searchable and can be developed to be a node in a clearing house concept.

On-line access will be secured at three levels using OGC specifications (GINIE):

- WebMapServer (WMS ISO19128) serves layers in image format;
- WebFeatureService (WFS) serves geospatial objects in GML/XML formats;
- NGIS api is a functional interface for distributed cross-organisational data management based on ISO 19109, 19107, 19108, etc.

Via Internet connections the public user has access to a “user specific database”. Information and data may include the users own data and also data on the economy, demography, geodata, addresses, etc. The data can be processed and maps created. The user receives the maps via electronic distribution.

Most on-line access is available in Norwegian only. Translations into English are available in some places.
2.5.1 On-line access service for metadata about reference & core thematic data

See 2.5

2.5.2 On-line access service for reference data & core thematic data

See 2.5

2.5.3 Inter-linkages of on-line access services for metadata and reference data resp. core thematic data

See 2.5

2.5.4 OpenSource software

[NMA] Norway is supporting the concept of model based approach (MDA) for geographic information, and is participating in projects like ACE-GIS (Adaptable and Composable E-commerce and Geographic Information Services).

The goal of the MDA is to provide the basic concepts for doing platform-independent architecture modelling and provide the means for transforming these models to platform-specific models or implementation code. The MDA will have impact on how we think about different model abstraction levels. It will also influence the tool support for the model-driven way of thinking.

More information is available on http://www.modelbased.net/umt, where software based upon the OpenSource is available for downloading.

2.5.5 Availability of web mapping service(s) and of a WebMap server interface

2.5.5.1 Geographic Information in eNorge/eNorway

One programme that has supported the development of geographic information via the Internet, is eNorway\(^7\). The eNorway action plan explicitly addressed geographic information in a limited number of action points, all of which were tasked to the Ministry of Environment\(^8\):

- Increase of access to local information through binding co-operation agreements with local authorities. Includes collaboration being established between local authorities, the government and other users of geodata on a common map database.
- Establishment of a first version of Net portal for national geographic data.

---

\(^7\) This is the e-government initiative as described in the document “eNorway Action Plan 2.0” (http://odin.dep.no/nhd/norsk/enorge/p10001876/024101-220008/index-dok000-b-n-a.html)

\(^8\) All tasks were planned for completion in 2001.
- Development of Net-based learning in the field of Geographic Information Technology (GIT). (Some E-learning already implemented on the standards-section (SOSI))

- Implement pilot project for co-ordinated administration of geographic information.

Public sector information and services on the Internet (http://english.norge.no/) are provided as part of the overall e-Government service established by the Government of Norway in order to provide easy access to public sector information and services on the web supplied by public bodies at state, county and municipal level.

The Internet service www.norge.no presents, for example, each commune and county with an assessment and a graded evaluation of the availability of PSI, contact information, web pages and interactive Web mapping.

**Overview map (example for Oslo):**
Detailed map (example for Oslo):

The portal GeoNORGE is a nation wide gateway for geographic information. The gateway is established and run by GeoForum and Statens Kartverk (Norwegian Mapping Authority) together. Here interested institutions and individuals can apply to get and give updated information on geomatics. The gateway is a shortcut to information about official institutions and private companies and their products and services.
Other interactive Web mapping applications by the NMA: Norgesglasset and Visveg.

2.5.6 Availability of catalogue services to regulate access
No information has been found.

2.5.7 Availability of catalogue services that perform payment operations
No information has been found.

2.5.8 Availability of catalogue services to extract and send data to a user application
No information has been found.

2.5.9 SDI user applications
No information has been found.

2.5.10 Availability of geo-processing services
No information has been found.

2.6 Component 5: Standards

[NMA] The Ministry of the Environment has given NMA the responsibility for standards and guidelines within Geomatics (mapping, surveying, positioning and Geographic...
Information). Since 1990 NMA has accomplished a comprehensive program to establish a series of national branch standards. NMA has as a strategy to go in for international standardization and take international standards into use when they are available.

The standards series are released (yearly the last four years) at a CD-ROM, "Standarder Geografisk informasjon". The standards cover a wide range of topics:

- Avtale for geodataarbeider (Contract for Geodata works)
- Fastmerkenummerering og fastmerkeregister (Numbering and register for Survey control stations)
- Grafisk utforming av kart i M 1:500 – 1:20000 (Graphical symbols/ Map symbols at Maps in the scales 1:500 – 1:20000)
- Grunnlagsnett (Fundamental Networks)
- Integrasjon av sak/gis/gab-systemer i lokal forvaltning (Geolok) (Integration of systems in Local administration)
- Kontroll av geodata (Control of geodata)
- Kontroll og kalibrering av elektrooptiske avstandsåmåler (Control and calibration of Electro-optical distance meters)
- Koordinatbasert referansesystem (Coordinate-based Reference systems)
- Kvalitetssikring av oppmåling, kartverk og geodata ("Geodatastandarden") (Quality Assurance of Surveying, mapping and geodata)
- Ledningskart (Facility Maps)
- Norges offisielle høydesystem og referansenivåer (Norways official Vertical control system and Vertical datum)
- Ordbok for kart og oppmåling (Dictionary for Mapping and surveying)
- Plassering og beliggenhetskontroll (Control of Position and "As built")
- Satellittbasert posisjonsbestemmelse (Satellite-based positioning)
- SOSI Et standardformat for digitale geodata (SOSI A Standard Format for Digital geodata)
- Stedfesting av eiendoms- og råderettsgrenser (Positional Referencing of Property- and Easement Boundaries)
- Stedfesting av natur- og samfunnsgeografisk informasjon (Positional referencing of Information about nature and society)
Symboler og forkortelser i norske sjøkart (Symbols and abbreviations used on Norwegian Charts)

Symbolfonter for friluftsliv og sport (Symbol fonts for outdoor life and sports)

VA-ledningskartverk (Facility maps, Water and Sewerage)

The Norwegians claims that no format in the world is so well known and widely used within a country as SOSI is in Norway.

As a spin-off of the heavy engagement in standards works Norway is at the head of the international standards work carried out by ISO. Norway has the chair and secretariat of ISO /TC 211 Geographic Information/ Geomatics, has one of four chairs of the working groups, and 5 of 21 project team leaders engaged by the TC.

Together with the standards comes supporting software for quality assurance and visualisation of data in the SOSI format, and TrueType fonts with symbols. Terminology is taken care of by the database "Termer for geografisk informasjon" (http://decentius.hit.uib.no/kartverket/search.html (Username: gjest, password: gjest))

The CD "Standarder Geografisk informasjon" also contains guidelines from the Ministry of the Environment:

- Digitale planer etter plan- og bygningsloven (Digital plans according to the law of Planning and building)
- Kartgrunnlag for plan-og byggesaksbehandlingen (Maps for the handling of Planning and building cases)
- Kommunplanens arealdel (The area part of the Municipality plans)
- Reguleringsplan. Bebyggelsesplan. (Regulation and settlement plans)

Further information can be obtained at http://www.statkart.no under "Standardisering" (Norwegian only).

There is a clearly expressed strategy within our national geographic infrastructure to converge the national standards to be conformant to international standards. The Norwegian metadata standard (part of SOSI) is just a translation of parts of the international standard, not a subset of metadata elements, and will in short time be 100% conformant to the just published IS 19115.

Other standards in the process of being employed is (some of these are not yet finalized)

- ISO 19101 - Reference model
- ISO/TS 19103 - Conceptual schema language
- ISO 19104 - Terminology
- ISO 19106 - Profiles
- ISO 19107 - Spatial schema
- ISO 19108 - Temporal schema
- ISO 19109 - Rules for application schema
- ISO 19110 - Feature cataloguing methodology
- ISO 19111 - Spatial referencing by coordinates
- ISO 19113 - Quality principles
- ISO 19114 - Quality evaluation procedures
- ISO 19115 - Metadata
- ISO 19118 - Encoding
- ISO 19119 - Services
- ISO 19127 - Geodetic codes and parameters
- ISO 19128 / OGC-WMS - Web Map Server Interface and gridded data
- ISO 19131 - Data product specification

The Norwegian Feature Catalogue (SOSI part 2) covers 44 application domains:

- Survey Control Stations
- Terrain
- Coast and sea (S57)
- Inland sea, rivers
- Fishery
- Oil
- Land property
- Land restrictions / easements
- Administrativ and statistic areas
- Land types
- Agricultural Property Register
- Land inventory
- Soil-data
- Introduction - geology
- Mineral resources
- Bedrock geology
- Surficial deposits
- Geochemical mapping
- Geophysical mapping
- Geological conservation areas
- Cave mapping (speleologi)
- Reindeer management
- Natural resources, wildlife, etc
- Other land use
- Buildings
- Other building constructions
- Archaeological and architectural monuments and sites and cultural environments
- Road data
- Road situation
- Railway
- General transport
- Adresses
- Airport
- Utility
- Location names
There is work ongoing to model these application domains in UML according to ISO 191xx standards. As a fundament for this work, a document has been established, called "Modeling in UML - Static structure diagram". This document embeds the principles of ISO/TS 19103 - Conceptual schema language and ISO 19109 - Rules for application schema, also including practical examples from the GI field and finally guidelines for how to enable exporting models by XMI. All information about SOSI is available at http://www.statkart.no/standard/sosi/html/welcome.htm.

2.7 Component 6: Thematic environmental data

With respect to the environmental thematic data component of the NSDI, AREALIS, coordinated by the NMA, is important.

AREALIS aims to structure the collaboration amongst the players and to facilitate the flow of data and information. AREALIS includes land cover data, environmental data, planning information, and other data. It is the environmental side of the NSDI.

The aim of the AREALIS is to achieve better area and resource planning by bringing together the environmental/natural resource data, basic geographic information, property data, positioning data and existing area plans and environmental preservation measures.

2.7.1 Application of the legal framework and funding principles (for reference & core thematic data) to thematic environmental data

The AREALIS programme was originally a pilot project funded by the Ministry of Environment with contributions from other national Ministries and regional and local planning bodies. Regarding how the funding continues now that the project has moved into a long-term operational component of the NSDI, the following can be noted:

- Most environmental data will be free of charge except distribution costs;
Reference data will be subject to ordinary costs;
Formal agreements will be used to co-ordinate data sharing.

2.7.2 Application of reference data & core thematic data characteristics to thematic environmental data

The Norwegian standards (SOSI) are being applied for the definitions of features and attributes in the AREALIS.

The thematic information in AREALIS includes more than 150 datasets organised into 12 main topics or themes. The themes are based on local and regional users needs.

- Nature – including geology, biodiversity, conservation of nature, hydrology
- Agriculture and forestry – including suitability for crops, soil erosion susceptibility, etc.
- Cultural heritage – including landscapes, archaeological sites, historical buildings, etc.
- Recreation – such as important areas and tracks
- Landscape classification
- Polluted sites and sources of pollution
- Coastal aspects and fisheries
- Land use plans and other planning elements
- Public safety issues – including crucial issues for built-up areas and other human activities, presenting areas prone to landslides, etc.
- Water supply – ground water quality and availability issues
- Demography
- General topographic map data

2.7.3 Application of metadata issues identified for reference data and core thematic data to thematic environmental data

The feature catalogue will be ISO compliant. The ISO/TC 211 Feature Catalogue methodology will be applied.

The Catalogue of Data Sources (CDS) tools (WinCDS 2001, data cataloguing system as made available from the European Environment Agency) are also used within the Norwegian context. The CDS tools make use of the GEMET (General multi-lingual Environmental Thesaurus, version 2001), which has a core terminology consisting of
more than 5,400 terms and definitions. It is available in 19 languages including Norwegian and all other Nordic languages (exception is Icelandic). GEMET 2001 is made available in different formats.

2.7.4 Application of access services issues identified for reference data and core thematic data to thematic environmental data

AREALIS is in effect the environmental branch of the NSDI, and is available over the Internet.

2.7.5 Application of standards issues identified for reference data and core thematic data to thematic environmental data

SOSI standards are applied.

2.7.6 Application of update procedures issues identified for reference data and core thematic data to thematic environmental data

No information has been found about the update procedures of thematic environmental data.

2.8 Use and efficiency of SDI

In a recent report on the state of the NSDI (Lillethun, 2002), one issue of importance is that local level needs are not being met regarding availability of information, services and procedures.

This is important as there has been a recent shift towards more local management with greater responsibilities in sustainable land use and environmental soundness. This shift has increased the need for local information about national interests, regulations, etc. It is known that useful information exists but very often remains inaccessible – digital information is residing in internal databases and analogue information is stored away in files and drawers, etc.

Also access to information has so far proved difficult to achieve as the players (mainly the public bodies) are diverse and include: municipalities, counties, regional authorities for environment and fishing, the NMA, state county representatives and both national data suppliers and users.

Regarding the impact of the NSDI onto the business sector estimates have been presented for the benefit to business by the use of standards amounting to a total of about 2 200 million NOK\(^9\) (just under 268 million EURO). The benefits realised are due to increased efficiency, better security and better service (Strande).

A number of critical factors and observations have been made regarding the NSDI situation in Norway. These are a set of problem issues facing Norway and provide a

\(^9\) Figures are probably relevant for the year 1999 or 2000.
For the general situation, if an infrastructure does not develop at the speed of the users and the technological changes

- For data capture which is based on administrative routines, if reporting is not functioning or quality checked

- If Quality secure work is not very good, if data is not reliable

- If data is too hard for users to access, if it is not convenient enough

- If integration between the different datasets is poor or not sufficient

- If data does not match the demands from each user

- If data production is not efficient and the costs remain too high

- For data users – if they feel the price of data is too high

One driving force for the NSDI in Norway, as in a number of other countries, are the eGovernment and eEurope programmes which serve to play an active role for encouraging Internet access to information and services, and for promoting the development of strategy documents from the central and/or regional levels. The eNorge initiative is one such example (Ostensen).

The development of the NSDI in Norway has been in accordance with existing IT strategies. The NSDI makes specific reference to the IT Policy of the Association of Municipalities, which states that municipalities and counties ought to take part in the development of national geographic information systems that can contribute to increased value for society. The establishment of such information systems must be based on agreements between municipalities and the national government where there are equal partners and equal rights to use the data (Strande).
### 3. Annexes

#### 3.1 List of SDI addresses / contacts for Norway

<table>
<thead>
<tr>
<th>Table: SDI contact list</th>
<th>Web address</th>
<th>Organisational mailing address</th>
<th>Over-all contact person: tel./fax/e-mail</th>
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<td><strong>National</strong></td>
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<tr>
<td>Norwegian Mapping Authority / Statens kartverk</td>
<td><a href="http://www.statkart.no">www.statkart.no</a></td>
<td>Statens kartverk Service box 15 N-3504 Honefoss Norway</td>
<td>Kari Strande International Director Statens kartverk Tel.: +47 32 11 81 37 Fax: +47 32 11 81 01 (&amp; 84 61) <a href="mailto:Kari.strande@statkart.no">Kari.strande@statkart.no</a></td>
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<tr>
<td>GeoForum</td>
<td><a href="http://www.geoforum.no">www.geoforum.no</a></td>
<td>GeoForum Storgt. 11 N-3510 Hønefoss Norway</td>
<td>Tel.: +47 32 12 31 66 Fax: +47 32 12 06 16 E-mail: <a href="mailto:geoforum@geoforum.no">geoforum@geoforum.no</a></td>
</tr>
<tr>
<td>Statens kartverk Service box 15 N-3504 Honefoss Norway</td>
<td>John Naustdal, Director Land division <a href="mailto:john.naustdal@statkart.no">john.naustdal@statkart.no</a> Tel.: +47 32 11 81 56</td>
<td></td>
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<tr>
<td>Statens kartverk Service box 15 N-3504 Honefoss, Norway</td>
<td>Erik Perstuen, Deputy director Land division <a href="mailto:erik.perstuen@statkart.no">erik.perstuen@statkart.no</a> Tel +47 32 11 84 49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statens kartverk Oslo og Akershus Storgt 33 Postboks 8120 Dep N-0032 Oslo, Norway</td>
<td>Einar Jensen, Technical director Geovekst <a href="mailto:Einar.jensen@statkart.no">Einar.jensen@statkart.no</a> Tel +47 22 99 10 20</td>
<td></td>
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</tr>
<tr>
<td>Statens kartverk Service box 15 N-3504 Honefoss, Norway</td>
<td>Nils Flakstad Technical director maps and map data <a href="mailto:Nils.flakstad@statkart.no">Nils.flakstad@statkart.no</a> +47 32 11 82 58</td>
<td></td>
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<tr>
<td>Statens kartverk Hedmark Vangsøv 73 N-2326 Hamar,</td>
<td>Kåre Kyrkjeeide, Technical director environment (AREALIS) <a href="mailto:kaare.kyrkjeeide@statkart.no">kaare.kyrkjeeide@statkart.no</a></td>
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3.2 List of references for Norway

Table: list of references used to compile the Country Report

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- Geovekst forum (2002a). “Overgang til EUREF89 - trinn for trinn” (Users guide for EUREF89 – step by step). Text is in Norwegian, and was prepared by Lillan Jensen.
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- Masser, Ian (1999) “All shapes and sizes: the first generation of national...
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