Spatial Data Infrastructures in Sweden: State of play Spring 2003

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

August 2003
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Executive summary

The NSDI in Sweden is highly visible and accessible to the broad user community through publicly accessible Internet sites such as MapStore, MapSearch and Property search services. The NSDI web portal is presently hosted by the National Land Survey which can be regarded as the executive coordinating body for the NSDI.

Much of the information contained in the Swedish SDI is developed out of the Land Data Bank System (LDBS), the Land Use Map and the Topographic Map service. As such, the NSDI forms an essential part of the country’s Public Sector Information.

The basic components of the Swedish NSDI are:

- Information - different data sets with specific focus on reference data sets that for the foundation on which other spatial data sets are built. Metadata forms another important part of the information but seems to be less developed;
- Legislative and institutional frameworks;
- Human resources, technical systems and processes;
- Strategies and action plans.

The Swedish approach regarding the capture, storage and use of data and especially geographic data is one where the national, regional and local levels appear to be well interlinked.

In Sweden the NSDI is seen as an agent of change, and a number of drivers are promoting the idea of the NSDI and likewise the NSDI is acting as a driver itself, promoting change in how tasks are done.

The Swedish NSDI strongly incorporates cadastre-based information, and it has been noted that the cadastre has an important role (especially in Scandinavian countries) and that this role is being redefined in a way that brings about change not only in the information systems that use it but also in a way (e.g. via applications and services) that brings about change at an economic and social dimension.

The NSDI is itself bringing about change in the business and government sectors, for example by reducing times to handle transitional spin-off effects.

Additional drivers for the NSDI include the needs of stakeholders such as Municipalities which migrate their Master Plans and their planning processes into GIS environments, as well as the Swedish Environmental Protection Agency which is working together with NLS to build up the components for its own SDI.
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Abbreviations and acronyms

CT  Core Thematic Data
FIR  Further Investigation Required
GI  Geographical Information
GINIE  Geographic Information Network in Europe
GIS  Geographical Information System
GPS  Global Positioning System
GSDI  Global Spatial Data Infrastructure
GSD  Geographical Sweden Data
INSPIRE  INfrastructure for SPatial InfoRmation in Europe
LDBS  Land Database
LIS  Land Information System
MEGI  Metadata for Geographic Information
NAP  National Amsterdam Peil
NLS  National Land Survey
NSDI  National Spatial Data Infrastructures
PSI  Policy and legislation on access to public sector information
REF  Reference data
SDI  Spatial Data Infrastructures
SEK  Swedish Crown
SEPA  Swedish Environmental Protection Agency
SGU  Geological Survey of Sweden
SNRD  Swedish National Road Database
SS  Swedish Standards
SIS  Swedish Standards Institute
UELN  United European Levelling Network
ULI  Utvecklingsradet for landskapsinformation (Swedish Development Council for Land Information)
1 GENERAL INFORMATION

1.1 Method

This report is summarizing the review of SDI in Sweden, and reflects the degree to which the SDI situation is similar to the ideas set out in the INSPIRE position papers1.

The report is based mainly on the analysis of web sites and other documents readily accessible2 including:

- [http://www.lantmateriet.se/index_eng.htm](http://www.lantmateriet.se/index_eng.htm)
- [http://www.svenskamiljonatet.se/cbd/eng/](http://www.svenskamiljonatet.se/cbd/eng/)
- [http://www.sis.se/stanli](http://www.sis.se/stanli)
- [http://www.stadskartan.se/start/](http://www.stadskartan.se/start/)

and has been completed by integration and consolidation of comments received from representatives of the NSDI initiatives. Those comments were provided in written form and offered clarifications and corrections relevant to the report.

1.2 Background of the Swedish NSDI

The Swedish approach regarding the capture, storage and use of data and especially geographic data is one where the national, regional and local levels appear to be well interlinked. Geographic information in Sweden is collected mainly at the national level and the Municipal level, although the 21 Counties are becoming increasingly involved in spatial data collection and use. The 290 Municipalities are the responsible authorities for the large scale mapping as well as the maintenance of key databases through their administrative processes.

Geo-portals that offer this spatial/geographic data and services are pertinentiy available. Today SDI activity at the national level is very complete and up-to-date regarding the combination of data, applications and technology, and the approach to the provision of services. Other SDI activities in the country are either not evident or they have been integrated into the existing NSDI framework.

The information offered by the Swedish NSDI is mainly developed out of the Land Data Bank System (LDBS), the Land Use Map and the Topographic Map, and all are based on the National Geodetic Network. The NSDI forms an essential part of the Country’s

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1 INSPIRE position papers, final versions: RDM, ETC, DPLI, ASF, IST, IAS (latest version).
2 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 stake holder involvement; Promoting - awareness, documentation, access; Funding - dedicated resources, a clear plan to pay for it; Partnerships - getting players on-board.
Public Sector Information, or PSI. Besides the reference GI, the basic components of the Swedish SDI are:

- Metadata;
- Legislative and institutional framework;
- Human resources, technical systems and processes;
- Strategies and action plans, especially for interoperability and information dissemination.

The NSDI is hosted by the National Land Survey (NLS) of Sweden. The NLS is a governmental agency and the first Swedish authority to have a commercial presence on the Internet with the MapStore service. Other Internet-based services and applications available include Property search, SwedeImages and MapSearch.

Although many building blocks were in place, there was not an actual NSDI in place in Sweden until the mid 1990’s. It required putting in place the necessary coordination of organisations, information, systems and technology. Key to this process and specific to the Swedish model was the merging of the Central Board of Real Estate Data and the National Land Survey (old) into the new National Land Survey. A key driver or objective behind this change was to bring a geographical dimension to the Land Data Bank System. (Wiberg)
2 Details of the Swedish NSDI (NLS)

2.1 General Information

Lantmäteriet (www.lantmateriet.se) - the Swedish National Land Survey (NLS) - is a governmental agency (i.e. part of the state and thus not a separate legal person). It is the dominant player in the GI market. The Ministry of Environment is the responsible governmental body for Lantmäteriet. Its role is to support the creation of an efficient and sustainable use of land, water and constructions. Its main activities are real property information (including cadastral surveying and real property registration), land and property information, credit market system, geographic information (the national geodetic system, the basic geographic data etc.), image information and visualisation, surveying and large-scale mapping, consultancy services, software and training, customised databases and maps, atlases and tourist maps. The NLS has the responsibility to co-ordinate the development of an NSDI. In the field of geo-spatial data this task includes inter alia work with standardisation, establishment of metadata services, co-ordination with other producer's production plans (e.g. the municipalities that create and maintain GI databases) and the establishment of new forms for co-operation.

ULI (Utvecklingsradet för landskapsinformation) (www.uli.se) is the Swedish Development Council for Land Information. This non-profit interdisciplinary association of Swedish organisations (220 in January 2003) is working for more efficient use of GI. It aims to be an interest body for users, producers and researchers within the field of land information.

The 21 counties are increasingly involved in spatial data collection and use, but it is the 290 municipalities in Sweden who are responsible for large-scale mapping and the maintenance of key databases through administrative processes. The Swedish Environmental Protection Agency (SEPA) produces and processes a lot of data in areas of its responsibility. Other government agencies, such as the National Road Administration, the Swedish Post and others are involved with and co-operate in data production and/or have responsibilities in different user sectors for spatial information.

2.2 Component 1: Legal framework and funding

2.2.1 Legal framework and organizational issues

No information could be found nor was provided about the possible legal framework which has put responsibility for coordinating the development of an NSDI with the NLS.

2.2.2 Public-private partnerships

There are private companies (e.g. T-kartor, Liber) who are data producers for certain parts of the NSDI and who are service providers for some forms of spatial information. Thus in Sweden private commercial firms are involved in building the NSDI in different
ways. They can be contracted for development works or production works, but also as vendors. Normally, private commercial firms are making "value-added" products out of core data.

### 2.2.3 Policy and legislation on access to public sector information

Further to the Nordic tradition of open access to government files, the citizen’s right of access to government documents is seen as a fundamental aspect of Swedish society. It was first introduced in 1766 by a forerunner to the Freedom of the Press Act (FOI legislation) from 1948 and last amended in 2002. The legislation includes provisions for access to computer files. The Freedom of the Press Act provides for access to documents kept by a public authority (e.g. the parliament, the government, state agencies and municipalities), including electronic documents. All documents drawn up or received by an authority are included. Access to documents is free of charge ("access" mean that the citizen has the right to read and look at the document within the office of the agency which always is free of charge). The citizen also has a right to get a copy of the document or an extract from an "electronic document". The fee for the copy shall respond to the cost for producing the copy (marginal-cost). There is no obligation to make available records for electronic data processing in any form other than printouts. Access can be denied only with reference to a specific clause in legislation demanding secrecy (the Secrecy Act of 1980). In principle, this legislation also covers information held in databases and registers of public authorities. Access to information in data systems and registers are in practice limited to such data that can be extracted and delivered with routine procedures. A selection of information may be requested if retrieval thereof does not require significant effort. For state-agencies the government decides the prices for copies. The purpose of request – commercial interests or not – is not relevant. If information is subject to copyright then whoever has obtained it by citing the Freedom of the press act must respect the rights of the copyrights owner. In general private legal entities controlled by the crown with public tasks are not subject to the access regulations contrary to municipal entities, which are under the access regulations. Government and municipal authorities are currently however organizing their information resources so that they can provide more information electronically. These activities are services directed to the society and the citizen by the agencies and they are formally based on a regulation (Art 4) in the Administrative Procedure Act.

A limited number of larger national databases and public registers are by law authorized to be used for commercial information services (addresses to persons and companies, real estate and land information, vehicle information, etc.). Within the business sector, such information can then be used for value added services. Pricing of the public information is normally based on a cost recovery principle.

### 2.2.4 Legal protection of GI by intellectual property rights

The Crown claims copyright to geographical information produced by and for Lantmäteriet. The Lantmäteriet administers the copyright on behalf of the Crown. The Crown also uses the database protection *sui generis* as supporting protections means on geographical and on real estate registers information in certain cases. The municipalities,
the biggest producer of maps in Sweden, also claim copyright and sui-generic protection to their maps and databases.

The current Swedish Copyright Act dates from 1960 (Law no. 729 of 30 December 1960, as last amended by Law no. 665 of 6 July 2000).

Article 49 of the Copyright Act provides for the protection of catalogues, tables or similar products that contain a large amount of items of information. Article 49 also details the sui generis protection for databases. The protection lasts for ten years after initial publication. The protection exists in addition to copyright.

In addition to photographs being able to attract copyright (if original), all photographs are protected by an exclusive right of reproduction according to article 49a of the Copyright Act. This right subsists until 50 years after production.

Following article 9 of the Copyright Act, laws and other regulations, decisions by public authorities, reports by Swedish public authorities and translations of the aforementioned documents are not subject to copyright. The law specifically states that among others maps and drawings that form part of the documents listed in the first paragraph of article 9 are protected by copyright (if, of course, they meet the general criteria set for copyright protection). Although works of public authorities other than those mentioned above may be subject to copyright, there is a general right for everybody to access and get a copy of them in accordance with the regulations in the Freedom of the Press Act (art. 26a). The documents can normally be used freely but there is a number of exceptions. Works that pertain to geographical information: maps, computer programmes, technical models, works which are the result of scientific research and works that are commercially exploited by public authorities may not be freely used (art. 26 § 3).

The 1993 Act on the Protection of Land Information contains provisions that limit the free production and distribution of certain types of GI. The purpose of this legislation is to regulate and control the use and dissemination of GI from national security-reasons. The production of aerial photographs is with the exception of smaller parts of the country free. Building databases with land information, dissemination of aerial photographs, certain maps and land-information in digital form is subject to approval of the authorities for reasons of national security.

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

On 24 October 1998 the Personal Data Act (1998:204) came into force and replaced the out-dated Swedish Data Act from 1973. The Personal Data Act is based on Directive 95/46/EC. Section 33 of the Act was amended in 1999 to implement the EU Directive on the transfer of personal data to a third country. Data protection applies to a large amount of government information, including the SPAR population database, certain types of statistics, certain types of real property information and geographical information (addresses, real estate unit number), vehicle registries and VAT files.


2.2.6 Licencing framework

No information has been found nor was provided.

2.2.7 Funding of SDI and pricing policy

For reference data at NLS the funding partly comes from government funds and partly from the user of the information (cost recovery). For thematic data the situation is similar, although mainly government funded.

The work of ULI is mainly financed by membership fees and by a NLS grant and revenues from conferences and from sale of publications. The member fees vary between type and size of organisation.

With regard to the standardisation work, the framework is financed by different organisations, mainly state authorities, but also some private enterprises. The Swedish Standards Institute (SIS) is co-ordinating this work and sets up the agreements with the contributing organisations. In some cases organisations set up agreements directly with SIS. With regard to the applied standards (e.g. standards on road networks, utility networks, addresses etc.), for each of these standardisation activities, a group of interested bodies are set up and it is up to the participating organisations to finance these specific activities.

For some GI projects Sweden receives financial contributions from the EU.

Rather limited funds have specifically been allocated by the government to establish the NSDI activities. Funds have been raised for fostering standardisation and for development of metadata services. The different governmental authorities have however, spent substantial amounts of money on developing datasets, standardisation, establishment of efficient methods for delivering data etc. According to Wiberg, the annual cost for managing the NSDI is around 30 million EURO.

Sweden has a long tradition of value-added publishing among government agencies, many of them being dependent on extra income. The exploitation is decided case by case and is a non-profit activity. No government agency is allowed to sell information from databases or registers unless specifically allowed to do so by government or parliament. Only a limited number of agencies have such permission which is given on a case-by-case basis.

The possibility exists that a state agency, if they do have the formal grounds for it, acts on the market in competition with other market actors. Lantmäteriet has such a division, called Metria.

Pricing

The framework for public fees is found in several laws. For the government and the state agencies the central regulation is found in the Instrument of Government (constitutional
law), which is a part of the Constitution and in the Ordinance on Fees. For the municipalities, the Municipality law regulates the rights to decide fees.

In general two types of fees can be determined. Fees for a service which the citizen is forced to use are similar to a tax. The power to decide such a fee is constitutionally given to the parliament and the municipal council. The power can be transferred to the government or even to a state agency. The fee shall only cover the cost for the service. Another type is the fee for services which the citizen is free to use. The power to decide on such fees within the state administration is placed on the government, which can transfer this power to an agency. Such a fee should only cover the costs for the service. If a fee should allow a profit, the parliament should decide this.

Lantmäteriet and the Environmental Protection Agency are ruled under traditional conditions for agencies. That means among others, that the pricing of the agency services and products shall give no profit and only mirrors the costs. The general principle is that a state agency is not allowed to decide prices for its product/services unless the parliament or the government has decided that it can do so.

The government has given Lantmäteriet the right to set fees for services from the real property register and set principles for license fees for use of GI. Such a fee shall cover the cost for producing the document, the costs of dissemination plus a contribution for support and maintenance of the system used, which thus constitutes a modified marginal cost principle. The pricing involved is intended to generate no profit, but some users are thought to see it as expensive. Before the new budget year the government prescribes in a special decision after the budget has passed the parliament, what, how, etc, the agency shall fulfil their objectives. In the decision, the government gives instructions and power to the agency for decisions on the fees. Since 1995 Lantmäteriet shall calculate its fees on information from the Real Property Register and for geographical information with the modified marginal cost principle described above. The fee for products, which contain the said data, shall cover the cost for dissemination but also a contribution from the user, which shall be used for maintenance and support of the technical milieu in which the information is processed and distributed from. The principles for pricing rest on a statement made by the Parliament. Following those principles government decides for each year to what extent the users of the basic geographic and land information shall contribute to the costs for maintaining the databases. In 1998 the users’ maximum-contribution was 100 million SEK, which is approximately 20 percent of the annual costs for the production and maintenance of the basic datasets. The users also have to pay for the actual costs for delivering the information.
2.3 Component 2: Reference data and core thematic data

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

The data in the NSDI includes what is termed core reference and thematic data. Digital data at the national level is in most cases provided at the scale of 1:10 000 and stored in the national land-use and topographic database. Generalised products are available.

Larger scale data also exists at the local level, but this has not been harmonized for national purposes.

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

The Geographical Sweden Data (GSD) offers access to maps in different scales. The following is an overview of the product descriptions available on-line. Visitors view the description information (presented in PDF format) and can order the product (either vector or raster maps) from the specified contact person. (http://www.lantmateriet.se/cms/level2index.asp?produktgrupp=104A)

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<tr>
<td>1:50 000</td>
<td>Topographic map + general description; Place names</td>
</tr>
<tr>
<td>1:100 000</td>
<td>Road Map + general description</td>
</tr>
<tr>
<td>1:250 000</td>
<td>General map + general description; General road networks;</td>
</tr>
<tr>
<td></td>
<td>General administrative boundaries</td>
</tr>
<tr>
<td>Other</td>
<td>Maps of Sweden; 1:1 000 000 Generalised versions of Sweden including administrative boundaries 1:5 – 1:20 mil. Terrain Elevation database + general description Contours at 5m, 10m, and 25m vertical intervals Digital orthophotos MapBalticSeaRegion (MapBSR) Land Cover Data</td>
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The principle sources of reference data in the Swedish NSDI (NLS) are elaborated as: (Wiberg, ETemii):

- The geodetic reference system (ETRS89 adjustment) is well established and used. Permanent GPS beacons provided differential GPS service. The system is adjusted to the common European and Global Reference System;
- **Administration units** are well established in the Real Property Register and in the system with basic geographic information. From here it is possible to generate most kinds of administrative units out of the system;

- **Property rights units** provide the strongest part in the NSDI when taken together with the Real Property Register and the Cadastral Index Map;

- **Addresses** (held by the post office and municipalities) are handled in a way that all known requirements of the NSDI can be satisfied;

- Selected **topographic themes** include elevation models established for the entire country, transportation networks which are well established with the Swedish National Road Database (SNRD); Hydrography is established in the system for basic geographic information, and is planned for further expansion and elaboration of the data set; Orthoimagry is well established and the Orthophotos cover the whole country (being updated each year for 25% of the Country surface area).

The LDBS is comprised of the Real Property Register together with the Land Register. On its own, the LDBS is “text only” information but in combination with the cadastral index map the database becomes geographically referenced.

The current version of the Real Property Register was introduced to Sweden in 2000 gives the following detailed information (Wiberg):

1. **Real Property:**
   - Property unit
   - Joint property unit
   - Coordinates
   - Plans, regulations and rights
   - Precincts
   - Joint facility
   - Cadastral index map

2. **Land Register:**
   - Title
   - Leasehold

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3 Each **property unit** in Sweden is described with the following information: Administrative area where the property unit is located; Address; Location on the cadastral index map; Centroid coordinates from the property unit and the buildings on it; Area of the real property unit, and tax assessment values; Name, address and civic registration number of the owner; Date for purchase, changes and price information; Building plans and regulations affecting the unit. (ETeMII, also Wiberg).
2.3.3 Geodetic reference systems and projections

SWEREF 99 is a Swedish realization of ETRS 89. SWEREF 99 coincides with WGS 84[G873]. Coordinates can be transformed from SWEREF 99 to the Swedish coordinate datum RT 90 via a seven parameter transformation formula: http://www.lantmateriet.se/cms/level2index.asp?produktgrupp=104C

The ellipsoid used with SWEREF 99 is GRS 80.

The national mapping coordinate datum is RT90. It is a local geodetic datum. The Swedish national map series are based on a Transverse Mercator (Gauss-Kruger) grid of this datum, and is denoted: RT 90 2.5 gon V 0:-15

Older maps are based on RT 38 which differs from RT 90 with 0-5 metres.

The ellipsoid used with RT 90 is Bessel 1841
The processing of GPS data is performed according to EUREF guidelines and based on observations made on permanent reference stations in Sweden (SWEPOS), Denmark, Finland (FinRef), and Norway (SATREF).

The national height system in Sweden is RH 70, the National Height System 1970. The system is connected to the NAP (National Amsterdam Peil) via UELN 55 (United European Levelling Network 1955).

Projection zones: for larger scale maps >1:10 000, there are 6 different zones of Transvers Mercator projections used in Sweden. Six are used to reduce the map projection errors. The boundaries of the projection zones are adjusted to follow administrative borders if possible.

The SWEN 01L is the national geoid model provided by the NLS and replaces the previous SWEN98L model. SWEN01L is based on a Nordic geoid model called NKG 96, which is in turn based on the global geoid model EGM98.

### 2.3.4 Quality of the reference data & core thematic data

It is recognized that the most essential objective for the NSDI is to deliver information that can fulfill the demands from users in the whole society. An evaluation of SDI users and their use of the information is carried out in an annual survey. The results of the survey are used as the base for programs and for improving activities.

One Internet- and service based project that was recorded as a failure was “SwedeFacts”, which attempted to bring together on-line maps, statistics and real estate data. But the system was an economic failure and was discontinued in 2000. Reasons for the failure include: the wrong products were being offered, thus not meeting the users’ needs; prices were too high, the value of maps had been over estimated; too high costs to develop and maintain and market the system. (SCB, 2000)

During the last years, much effort has been spent on establishing efficient routines for updating (NLS) information directly from the source. For example, the National Road Administration is delivering information on new or changed public roads, the municipalities and delivering information on local streets, the National Environmental Protection Boards is delivering information on national parks.

### 2.3.5 Interoperability

The NSDI is based on cooperation between the different bodies and a commitment to use standards (see section 2.6). Particularly in Sweden where the Municipalities are strong and have an independent status, voluntary cooperation is essential (Wiberg).

User requirements are regularly taken into consideration in many aspects of the NSDI. For example, with the ArcCadastre project the NLS is in partnership with ESRI and Leica for Internet mapping. The first step in this project was the identification of user
requirements, which were formulated in a dialogue between users and developers (NLS, 2001).

2.3.6 Language and culture

Metadata is provided in Swedish and in some cases, but not all, English. Accompanying documents for the data and maps are provided. The extent of detail (e.g. as Data Dictionaries, Exploitation metadata, etc.) has not yet been determined.

2.3.7 Data Content

No information has been found.

2.3.8 Geographical names

The GSD PlaceNames dataset has approximately 450,000 place names. It remains to be determined the number of languages that the names are provided in.

2.4 Metadata for reference data and core thematic data

2.4.1 Availability

The metadata situation for datasets identified via the NSDI is not always complete or up-to-date. Many datasets do have metadata. On-line this is usually metadata of the Exploration or Discovery type. Exploitation metadata was not observed on-line and may be explicitly delivered with orders for data.

2.4.2 Metadata catalogues availability + standard

There are different metadata catalogues available on-line either directly on the NLS pages or on the web sites of key players (e.g. EnviroNet, Clearinghouse for Biological Diversity -CBD- for Sweden, etc.) The standards used are not clear.

Metadata catalogues are also distributed on CD-ROM.

2.4.3 Dublin core metadata standards for GI-discovery

[NLS] EnvironNet, the clearinghouse for data and information on the Swedish environment (http://smn.environ.se/schema), uses Dublin core as metadata standard. This service makes it possible to search information in different geographical areas (counties, municipalities, marine basins etc.).
2.4.4 Metadata implementation

Regarding access to information, Sweden has been developing data documentation. For example the GeoLex service exists for metadata for the Swedish reference database (available via the NLS web site), and is based on national standards (GINIE).

A separate service (MEGI) exists for metadata on thematic data. The MEGI, or metadata for geographic information is a web based service following the standard CEN 12657. The MEGI tends to be out of date in regards to the metadata content.

2.5 Access and other services for reference data, core thematic data and their metadata

2.5.1 On-line access service for reference data metadata & core thematic data

A service called ‘GeoLex’ exists for metadata for Swedish reference data (http://www.geolex.lm.se).

A service for metadata on thematic data ‘Megi’ is also provided by Lantmäteriet (http://www.megi.lm.se). There is today no plan for updating of the service.

There are also discovery services for reference data (e.g. MapSearch) on the Lantmäteriet website.

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

Statistics Sweden is also contributing to the collection of Internet databases freely available for users. The Internet databases have statistical data on the country, county and commune levels. The data can be used in conjunction with the Internet map server “SCB Maps”. (SCB, 2000)

Internet is not the only way that data is disseminated, as access and geoprocessing services for reference and thematic data come mainly through CDROM rather than the Internet.

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

No information has been found.

2.5.4 OpenSource software

No information has been found.
2.5.5 Availability of web mapping service(s) and of a WebMap server interface

Web mapping services are commonly available on many web pages in Sweden.

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

The services allow the user to order on-line maps. In most cases billing will follow with the map delivery – either via the Internet (e-mail) or in the normal post.

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

Customised databases and maps offer a range of products and services via the NSDI (NLS).

The MakeAPoint application is a geocoding service that lets the user get map coordinates for specific objects (e.g. office locations, customers, etc). It is a system in which the client’s own specific data can be integrated with geographic data from the NLS over the Internet. Once the coordinates are assigned the mapping is possible. MakeAPoint lets the user retrieve map coordinates in a logical way. InstantMap is a separate service that lets the user combine standard background maps and other official data with their own data (e.g. customer related data). Both services are available via the NSDI. Other customized services include: Landscape models, MapSupport and Rescue services, MapSupport Taxi, Sverige 1000 Professionell, Tactile maps.

Relatively new Internet solutions available via the NSDI to the general public include (NLS, 2001):

- Property Search for all. In this service there is information about the area, the latest prices and tax assessed values for individual dwellings and the second homes. The system can be queried and the answer will include an overview map of the relevant property unit. The information is taken directly form the Real Property Register. A search on this database costs SEK 30 (about EURO). This site has about 10-12,000 visitors per month.
New version of the Real Property Barometer. The combination of the Real Property Barometer and the Property Search for all is an effective tool for following the developments of the housing market.

Historical Maps offers a large amount of information. It is possible to search through 2,000 old maps and documents: town maps, topographic map series, Economic map series. The maps can be made available via Internet or on CD-Rom. The NLS plans to make progressively more of the archives available through this service. This site has about 20,000 visitors per month.

YourMap service provides customized maps on the Internet. The visitor can choose a map size and center point of their choice (e.g. a house or any point of interest) and then place an order for only the relevant part of the General Map, the Road Map, the Topographic Map and the Cadastral Index Map. The maps are delivered (as images) either by e-mail or as CD-Roms delivered by the post. Monthly visits to the site range from 35,000-45,000 persons.

2.5.10 Availability of geo-processing services

Geo processing services are well supported at the National level.

2.6 Component 5: Standards

Regarding the implementation of standards, the Swedish Standards Institute (SIS) is responsible for the development of national standards and encourages following global trends, namely ISO/TC 211 and CEN/TC 287. SIS vision is to be the most effective organisation for Swedish companies, authorities and organisations, where the knowledge of and the gaining of access to standards are concerned, along with the possibility to influence and take part in the work on national, European and global standards.

The Swedish Standards (SS) series concerning roads, addresses and other layers of GI are well developed. The standards are established for data produced by cooperation between different organizations (GINIE).

Standards in use in the NSDI include:

- GGD-specification – used for mapping and elevation (height) models;
- Swedish Standard SS 63 70 03 – used for postal addresses, road networks, railroads.

2.7 Component 6: Thematic environmental data

[NLS] At national level, the Swedish Environmental Protection Agency (SEPA) has chosen a model with data custodians responsible for storing environmental data with regard to pressure and state. For example, environmental monitoring data is generated in many different places. The fundamental strategy is that data should be stored close to
where it was generated (i.e. close to the producer). As a rule, detailed knowledge of how the values have been calculated and what they stand for is available here. In addition, each individual producer cannot normally maintain rational, uniform service routines concerning the acquisition of results through the ADP (Automatic Data Processing) medium.

To provide better accessibility to data, SEPA has delegated to the data custodians the responsibility for storage and distribution of quality-assured environmental monitoring data (basic data). The purchaser (SEPA and county administrative boards) is guaranteed the copyright for the basic data that is generated by environmental monitoring activities. This is specified in the agreements. A data custodian is to receive and keep data from a specific subject area accessible through the medium of ADP. The data custodian is also responsible for certain feasibility studies and quality-assurance checks and be responsible for the distribution of basic data in accordance with an agreed plan. Through repeated, routine compilations of data from different programmes, poor comparability and regional distortion can be quickly corrected.

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

[NLS] SEPA and the county administrative boards are the copyright owners for the basic data, with regard to pressure and state, produced by the data custodians. When it comes to charging, these data are free for everyone at marginal costs. Data can be ordered by anyone from the data custodians.

Information about threatened species (nesting areas) can be classified as confidential. In cooperation with the Statistics Sweden, especially in regard to presentation of sources for discharges to and pollution load on waters, it is important to be aware of their special rules concerning privacy.

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

No information has been found nor was provided.

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

No information has been found nor was provided.

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

[NLS] Information about the Swedish environmental objectives can be reached at the following Web Portal http://www.miljomal.nu This Portal will in the near future include
information about indicators and their underlying datasets. The indicators will be used as tools in assessing progress towards the objectives.

The SEPA investigates the design and content of a Water Web Portal as one of many activities in implementing the water framework directive. This portal will in a first version include general information (guidance documents etc.) and in a later version metadata and data distribution services.

The SEPA has investigated how information about the use and release of chemical substances can be made available to the public. As a result of this study Sweden has developed a Pollutant Release and Transfer Register (PRTR) containing information on emissions and discharges of chemical substances and groups of chemical substances from large point sources. The Aarhus Convention, adopted in 1998, supports a protocol on Pollutant Release and Emission Registers that was signed at the ministerial meeting in Kiev in May 2003. The Swedish PRTR was released in May 2003 and will in the future be updated with a geographical interface for the public where they can localise major pollutant sources near their home or workplace. The PRTR can be reached from The SEPA’s website, http://www.internat.naturvardsverket.se.

Two Internet applications can statue examples of how environmental data and information about state and pressure can be presented and downloaded on Internet:

- A system for nitrogen (N) and phosphorus (P) gross and net load calculations, retention and source apportionment have been developed and applied for reporting to HELCOM, PLC-4. GIS is part of this model. The data custodian has made the reporting results available on http://www-nrciws.slu.se/TRK/index.html

- Another example shows how data about state can be captured via an Internet application (reporting of bird observations) and then in real time presented.

Reporting application: http://svalan.environ.se/rappsyst/index.htm

Presentation application: http://svalan.environ.se/rappsyst/swedish_daily.asp

Lantmäteriet will at the request of the SEPA help the Agency to build a stable infrastructure for geographic information (the structure of geographic data at servers, applications to facilitate availability to geographic data and the connection between attribute data and the geographic map layers). Main focus in this project is the process of nature conservation (including Natura 2000) together with the County Administrative Boards. The information will also be available to citizens on the Internet. This project (VIC Nature) is in progress.

At regional level the county administrative boards have made efforts to establish a SDI built on a common network (an intranet - lst-Net). The aim of the GIS service (lst-GIS) in this network is to make access to common databases and also make data and information available to the public on Internet. One spatial data distribution service is in use today,
http://www.gis.lst.se/lstgis/

The Swedish Surface Water Data Base is managed, maintained and further developed by the Swedish Meteorological and Hydrological Institute (SMHI). The surface water database includes information on watercourses, drainage basins and lakes in Sweden, as well as on the surrounding coastal waters and sea areas. Information and data can be reached via SMHI:s website http://www.smhi.se/en/index.htm.

So-called environmental databases accessible via the NSDI include:

- Geological Survey of Sweden (SGU) holds multiple datasets such as: geo-register, bedrock, the geology for surface deposits, hydrogeology, geophysics, geochemical, mineral supply, and a bedrock database. The SGU web site includes database definitions and description (Discovery information)

- EnvironNet is the clearinghouse for data and information on the Swedish environment. The site has a catalogue of environmental information which contains over 5 000 documents (about 500 of these are in English). Also available from this site are links to the Swedish Clearing House on Biological Diversity, a link to the ELIN databases which are the Swedish Environmental Protection Agency’s library, and also the ArtDatabase of Red List of Swedish species

In Sweden there is a move to introduce an environmental part in the Real Property Register with information on judicial decisions in the environmental courts and restrictions decided by other public bodies and as a result from different inventories. (SLFb, 2001)

The NLS has presented a proposal on how to include environmental information to the cadastre. (NLS, 2001)

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

[NLS] As one of many national efforts in implementing the Water Framework Directive there is an ongoing national standardisation work within a Swedish programme on geographical information standardisation (STANLI). The aim of the project is to develop a standard for Surface water systems (TK 452) by defining e.g. surface water concepts and terminology, geometry and topology. For more information about SIS (Swedish Standards Institute) please visit http://www.sis.se/DesktopFront.aspx Contact person Torbjörn Cederholm, The Swedish standardisation programme in Geographic Information (Stanli) torbjorn.cederholm@sis.se

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 nor provided.
2.8 Use and efficiency of SDI

Discussion about cadastre is relevant to the understanding of the evolution of SDI in Sweden. Public Sector Information (PSI) has been set high on the government’s policy agenda. PSI is seen as a key resource for the development of the Swedish society, and the Swedish Land Information System (LIS) is considered to be an important component in the Swedish Information Infrastructure. The LIS has been fully integrated into other government systems for public information, and is updated on a daily basis from registrations held at the source. (SLF 2001a and SLF 2001b)

The Swedish cadastral system consists of the Land Law, the Real Property Formation Act, the Real Property Register Law and Ordinance, the Measuring Code, the Cadastral Survey Process, and the Real Property Register, which is including the Land Register. The cadastral system and the associated databases are an essential part of the NSDI. (SLF, 2001a)

Organisationally, the Swedish cadastral system is decentralized. There are some 90 local and regional agencies in the country. It is a service oriented agency, and through the Internet anyone can get information about the organization and access to application forms.

The use of the LIS databases and in fact the NSDI has become very wide spread throughout Sweden. The business sector has become very attracted to using the LIS (and thus the NSDI) services. Presently the LIS Internet site is getting upwards of 200,000 visits per month. The LIS is charging fees for different services provided, and the business sector, which is the biggest user, accounts for about 70% of all user fees paid to the LIS.

The NSDI is in effect bringing about change in the business and the government sectors. Benefits from using the LIS have been specified and include: shorter times to handle transactions; spin-off effect in businesses that have developed new more effective systems and processes; new possibilities for more Internet based services as a result of the increased competition in the business sector; more effective processes from the administration (SLF, 2001b).

The use of standards will also bring about change. It is expected that the use of standards in the NSDI, especially ISO/TC 211 compatible, will have a positive impact, and the GI market is expected to continue to expand in Sweden.

Other drivers for Sweden’s push to provide the NSDI include municipal obligations for Master Plans. The planning process requires a large amount of information and thus many municipalities want to use GIS. Most municipalities that have revised their master

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4 The NLS is responsible for the LIS. A new steering document “VVV 2006” presents the vision of the NLS and the strategy and management systems for quality assurance issues.

5 Note: even though the Swedish cadastral organisation has a policy to be widely accessible via the Internet, the organisation actually prefers to have direct contact with the applicants. See ref.: SLF 2001a, page 3.
plans recently have used some form of digital maps. Real property and geographic information is being used in the planning process (NLS, 1997).

Measuring market share is one way to identify or estimate user satisfaction in a service. If the measure is how many actors in the business sector are using the NSDI then in Sweden the following can be noted: almost every bank office and real estate broker has access to the NSDI. Today, the information available via the NSDI is being used in every real property transfer and mortgage (Wiberg).
### 3 Annexes

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

<table>
<thead>
<tr>
<th>National NLS</th>
<th>Web address</th>
<th>Organisation mailing address</th>
<th>Over-all contact person: tel./fax/e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="http://www.lantmateriet.se/index_eng.htm">http://www.lantmateriet.se/index_eng.htm</a></td>
<td>Lantmäteriet SE-801 82 Gävle Sweden</td>
<td>Director General Joakim Ollén E-mail: <a href="mailto:joakim.ollen@lm.se">joakim.ollen@lm.se</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Director Lars Jansson, Cadastral Services Devision E-mail: <a href="mailto:lars.jansson@lm.se">lars.jansson@lm.se</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Director Hans-Erik Wiberg, Land and Geographic Information Devison E-mail: <a href="mailto:hans-erik.wiberg@lm.se">hans-erik.wiberg@lm.se</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Director Stig Jönsson, Metria E-mail: <a href="mailto:stig.jonsson@lm.se">stig.jonsson@lm.se</a> Tel.: +46 26 63 30 00 Fax: +46 26 68 75 94</td>
</tr>
<tr>
<td>Contact (National Focal Point) concerning the Clearing-House Mechanism</td>
<td><a href="http://www.svenskamiljonatet.se/cbd/eng/">http://www.svenskamiljonatet.se/cbd/eng/</a></td>
<td>Swedish Environmenta l Protection Agency 106 48 Stockholm</td>
<td>Johan Bodegård <a href="mailto:johan.bodegard@naturvardsverket.se">johan.bodegard@naturvardsverket.se</a> Tel:+46 8 698 1447</td>
</tr>
<tr>
<td>Formas, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning</td>
<td><a href="http://www.formas.se/">http://www.formas.se/</a></td>
<td>Formas Box 1206 Birger Jarls torg 5</td>
<td>tel: 08 775 40 00 fax: 08 775 40 10 <a href="mailto:info@formas.se">info@formas.se</a></td>
</tr>
<tr>
<td>ULI, the Swedish Development Council for Land Information</td>
<td><a href="http://www.uli.se">http://www.uli.se</a></td>
<td>ULI - Swedish Development Council for Land Information SE-801 82 Gävle</td>
<td>President, Lars Lindqvist Secretary General, Patrik Ottoson Information officer, Mia Andersson Tel.: +46 (0)26 61 10 50 Fax :: +46 (0)26 61 32 77 E-mail: <a href="mailto:uli@uli.se">uli@uli.se</a> <a href="http://www.uli.se">http://www.uli.se</a></td>
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<tr>
<td>SIS, Swedish Standards Institute</td>
<td><a href="http://www.sis.se/stanli">http://www.sis.se/stanli</a></td>
<td>SIS, Stanli SE- 118 80 Stockholm</td>
<td>Torbjörn Cederholm Tel. +46 (0)8 555 520 00 e-mail: <a href="mailto:stanli@sis.se">stanli@sis.se</a></td>
</tr>
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### 3.2 List of references for Sweden

Table: list of references used to compile the Country Report

<table>
<thead>
<tr>
<th>Web sites:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lantmäteriet (National Land Survey, NLS)</td>
<td><a href="http://www.lantmateriet.se/">http://www.lantmateriet.se/</a></td>
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<tr>
<td>Stads Kartan</td>
<td><a href="http://www.stadskartan.se/start/">http://www.stadskartan.se/start/</a></td>
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<td>Kartplan 2002</td>
<td><a href="http://www.lm.se/kartplan/">http://www.lm.se/kartplan/</a></td>
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<tr>
<td>GeoLex – web mapping application</td>
<td><a href="http://www.geolex.lm.se/">http://www.geolex.lm.se/</a></td>
</tr>
<tr>
<td>MEGI: Metadata för geografisk information</td>
<td><a href="http://www.megi.lm.se/">http://www.megi.lm.se/</a></td>
</tr>
<tr>
<td>ULI, the Swedish Development Council for Land Information</td>
<td><a href="http://www.uli.se/">http://www.uli.se/</a></td>
</tr>
<tr>
<td>Databases in the Swedish Museum of Natural History</td>
<td><a href="http://www.nrm.se/databas.html.en">http://www.nrm.se/databas.html.en</a></td>
</tr>
<tr>
<td>UN convention on biological diversity (CBD) here is information about CBD, diversity status in Sweden and</td>
<td><a href="http://www.svenskamiljonatet.se/cbd/eng/">http://www.svenskamiljonatet.se/cbd/eng/</a></td>
</tr>
</tbody>
</table>
the activities of Swedish authorities and organizations

<table>
<thead>
<tr>
<th>Environet is a search engine bringing you data and information on the Swedish environment and the environmental work in Swedish governmental agencies, companies and NGOs. All the information is published by the members of the EnviroNet. The EnviroNet hosts the Swedish ClearingHouse of Biological Diversity</th>
<th><a href="http://www.svenskamiljonatet.se/miljonat/english/index.htm">http://www.svenskamiljonatet.se/miljonat/english/index.htm</a></th>
</tr>
</thead>
</table>

| The Geological Survey of Sweden, SGU | http://www.sgu.se/index_e.htm |
| Legal and funding references | http://www.spatial.maine.edu/~onsrud/gsdi/Sweden.html |
| | http://home.online.no/~wkeim/foil.htm |
| | http://www.certh.gr/cordis/t_en/p/se/p_r51_en.asp-adtid=508.htm |
| | http://www.publicsectorinfo.com/summary_results/08a.html |
| | http://www.lantmateriet.se |

**Publications:**

<p>| Clark, Mike (2002). Briefing notes to the INSPIRE DPLI Working Group, Appendix A – EU Member States (brief1.doc). |</p>
<table>
<thead>
<tr>
<th><strong>Other sources:</strong></th>
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<tr>
<td>Written contributions on draft versions of the Country Report as provided by the Swedish National Land Survey and the Swedish Environmental Protection Agency.</td>
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