



# The Swedish Geodata Strategy

2009



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# Introduction

Geodata is a basic information resource in the e-society. It plays an important role in many of society's functions, such as environmental analysis, transport planning and logistics, physical planning, management and control systems for rescue and emergency services as well as navigation and positioning. Geodata is also an important cornerstone for transaction management in public sector authorities and is also an important source of everyday information for the general public. The three years that we have been engaged in formulating the Geodata Strategy have been characterised by excellent co-operation and consensus regarding the measures that need to be carried out. The will and capacity displayed by the different involved parties to participate in future work will be a most critical key to a successful attainment of our goals.

The INSPIRE-directive is an important development stage with regard to both national and international co-operation within the geodata sector. The directive can also be seen as a breakthrough in the development of e-society as it represents a common juridical approach to issues associated with electronic access to and exchange of society's information resources. The national legislation for INSPIRE that is now being put in place will entail that we will have a legal foundation on which to base effective co-operation with regard to the provision of geodata. The legislation will also result in placing sharp demands on those public sector authorities that have been identified as responsible for the provision of information and on Lantmäteriet in its role as coordinator.

Many of these demands have already been taken care of in the Geodata Project in which efforts are now focused on developing the technical infrastructure and a business model. Participants in the project include public sector and local authorities and private sector companies. The enterprise model will, amongst other things, create the pre-requisites for the sharing of data which will take place at both national and international levels. Concerning the technical infrastructure, work with the National Geodata Portal continues.

Although we have taken significant steps forward, several challenges remain ahead of us. Constructive co-operation between the public and private sectors requires that the forms for co-operation are re-viewed and that they are supported by simple and clear financial, organisational and legal pre-conditions. At present the financing that is required to implement INSPIRE is not available. It is necessary that government grants are made available for this purpose if implementation of the directive is to be carried out in accordance with the timetable in the directive.

Gävle March 31, 2009

Stig Jönsson, Chairman of the Geodata Advisory Board  
Director General of Lantmäteriet – the the Swedish mapping, cadastre and land registration authority

# Summary

***In June 2006 the government gave Lantmäteriet, together with the Geodata Advisory Board, and in consultation with other affected public sector authorities and the Swedish Association of Local Authorities and Regions, the task of formulating a national strategy for the integrated provision of information in the geodata sector. The strategy was to be up-dated annually. The first version of the strategy, with the title the Swedish Geodata Strategy, was submitted to the government on March 30th 2007 and a revised version followed on March 28th 2008. A revised version of the Swedish Geodata Strategy for 2009 was to be submitted before March 30th 2009. According to the Annual Appropriations Directions, Lantmäteriet must present a report on how the work with the Swedish Geodata Strategy is progressing by March 30th 2010.***

Activities that have been carried out and are in progress in accordance with the 2008 Geodata Strategy are presented in this document.

The Geodata Advisory Board has expressed its full support for this report as has also Lantmäteriet's board.

The strategy was presented at an open seminar on March 12th 2009. The seminar was a stage in the process of obtaining acceptance for the strategy and replaced the standard, formal procedure of circulating documents for consideration and comments.

## **Key principles and vision**

The aim of the Swedish Geodata Strategy is to encourage increased co-operation within the geodata sector by providing increased and clearer information as well as guidance to producers and users. Key principles for the Geodata Strategy are that it should contribute to the development of Swedish e-governance, support the development of the private sector and facilitate adaptation to new pre-conditions. It should be steered by consumer demands and be based on well-developed co-ordination between the different involved parties. The work is also one stage in the Swedish implementation of the INSPIRE-directive.

The vision for the Swedish Geodata Strategy in a 10-year perspective is that organisations that manage and use geodata in their activities should:

Through the national geodata infrastructure *generate increased benefits for society* based on inter-agency co-operation and at the lowest possible cost.

*Link together information resources in a network* and make them available via uniformly designed services with descriptions of the information content.

*Provide services* to public sector administration, private sector companies and Swedish citizens and satisfy demands at local, regional, national, European and global levels.

## **Influencing factors**

Work with the revision of the Geodata Strategy has, amongst other things, had a number of influencing factors as a starting point. Implementation of the INSPIRE-directive will have a major impact on the creation of a national infrastructure for geodata. Other EC directives and initiatives, such as the directive concerning re-use of public sector information (PSI), the directive concerning assessment and management of flood risks, the proposed framework directive for protection of land, the initiative for the creation of a common information system in the environmental sector (SEIS – Shared Environment Information System) to increase the efficiency of reporting and GMES (Global Monitoring for Environment and Security), will also influence development within the geodata sector

A number of investigations have links with the development of a national infrastructure for geodata, amongst them the Maritime Environment Investigation and the Climate and Vulnerability Investigation. Issues related to security and vulnerability and IT standardisation will also affect development.

There are clear links to the government's action plan for e-governance. The plan emphasises the need for a clearly defined structure for "the softer" parts of the IT infrastructure, which principally concern issues related to a framework of rules, responsibility, co-ordination, standardisation and financing – the same issues that are regulated in INSPIRE and in the framework of the Swedish Geodata Strategy.

The government's action plan also points to implementation of the INSPIRE directive and the infrastructure for the provision of geodata as prioritised issues.

### **Work packages**

To realise the intentions of the strategy, eight work packages have been identified containing strategic goals, direction and prioritised activities:

1. Co-operation in networks as the basis for the infrastructure
2. Information structure
3. Technical infrastructure
4. National metadata catalogue
5. Geodetic reference systems
6. Research, development and education
7. Legal framework
8. Financial- and price models.

Most of these work packages are included in a common project – the Geodata Project. By 2010, the project must have created a business model and a technical infrastructure for the provision of geodata and services to Swedish society and Europe. The technical and activity-related implementation of the INSPIRE-directive takes place within the project.

An action plan for implementation of the INSPIRE-directive has been prepared. The timetable is regularly updated and can be viewed at [www.geodata.se](http://www.geodata.se). The conclusions in the action plan are reflected in most of the work packages together with the prioritised activities within the respective package.

### ***Co-operation in networks as basis for the infrastructure***

The national geodata infrastructure comprises a well-developed co-operation between public sector authorities, local authorities and private sector, based on voluntary agreements. Future work will be oriented towards developing co-operation between independent organisations which, together, have responsibility for the provision of geodata at the national level. Requirements at local, regional, national and international levels will be satisfied.

During 2008 the Geodata Project has made an inventory of needs and identified the starting point for a future business model. Up to June 2009, work will be focused on preparing the base for how co-operation should be regulated – through models for licence agreements, price models, financing models, co-operative agreements for data sharing, a model for managing the Geodata Portal and more. During 2009 working meetings and seminars will be arranged with public sector authorities, local authorities and the private sector to promote further co-operation and gain acceptance for the models that are developed. Thereafter work will be concentrated on building up the necessary management infrastructure and making agreements between the involved parties.

### ***The information structure***

The exchange of information in a national infrastructure for geodata should be built on a homogeneous framework with uniform descriptions of information and services.

The Geodata Advisory Board and the Swedish Standards Institute (SIS) project area for geographic information, Stanli, have reached an agreement concerning standardisation within the framework of a Swedish Geodata Strategy. Work will be concentrated on carrying out the action plan that has been formulated within the framework of the agreement.

During 2008, SIS/Stanli published a report which identifies the geodata and services that should be included in the national infrastructure and contains a definition of the term geodata. The report is based on the results of a questionnaire and interviews with involved authorities.

Future Position X (FPX), the University of Gävle and Lantmäteriet have, together, established a test environment. Within this work, quality-assured methods have been developed for testing specification, datasets and services.

Future work involving further development of the test environment will include evaluating in detail how this resource can be used for certification.

Planned work within the work package – information structure – includes ensuring that the standardisation methods that are used satisfy the requirements of a national infrastructure for geodata and that the demands that are placed on datasets are described.

### ***Technical infrastructure and metadata***

The long-term goal for the technical infrastructure is that it should be based on a service-oriented infrastructure and built on communication interfaces where services and applications work together via standardised messages.

During 2008 the first version of the Geodata Portal was put into use. Services and data will successively be made available. Later the portal will be accessible for a wider group of users. The portal contains WMS services and metadata published by a wide range of geodata producers.

Development work that is planned to be carried out during the coming year includes adaptation of the Geodata Portal in accordance with the requirements of the INSPIRE directive. In mid-May version 1.0 of the Geodata Portal will be launched after which it will be possible for producers to link metadata, geodata and services via the portal. This version will also contain necessary authorization and security solutions, tools for monitoring traffic via the portal as well as improved functionality for searching.

In connection with the development of the Geodata Portal a proposal for a Swedish profile for the metadata standard, SS-ISO 19115, has been prepared. In addition,

an application which makes it possible for respective authorities to create metadata has also been developed. This will mean that it will be possible for authorities to create metadata in a uniform way from both a national and European perspective.

A prioritised area of activity is continuation of the exchange of experience within service-orientation (SOA) and the development of guidelines that describe practical working methods for service-orientation.

### ***Geodetic reference systems***

A homogeneous reference system facilitates the production, processing and use of geodata; it also makes compilation of data from different sources easier. For these reasons, a rapid transition to SWEREF 99 and RH 2000 should take place in Sweden. So far, the transition to SWEREF 99 has taken place in approximately 100 local authorities and preparations are underway for a change to the new reference system in 130 more. During 2009, 10 public sector authorities plan to adopt SWEREF 99 as their reference system.

Lantmäteriet has started work on a new 10-year programme for geodetic activities in Sweden called Geodesi 2010. In addition, an initiative has been taken to create a national arena for handling strategic geodetic issues – Geodesiforum.

### ***Research development and education***

An action programme for research, development and education in the geodata sector has been prepared. In the programme the focus is on describing needs in the three sectors relative to the work packages which have been given priority in the Geodata Strategy. The following strategic goals have been identified:

- The creation of a better national overview and co-operation.
- A clarification of where the responsibility for research in the geodata sector lies.
- Provide better co-ordinated information concerning the availability of funds for R&D which supports the Geodata Strategy.
- The development of better international co-operation.
- The establishment of a testing environment
- The stimulation of development in the private sector.
- Meet the demands for competence where it is clearly required.

### ***Legal framework***

The aim is that the legal framework should be easy to understand concerning the terms and conditions that regulate exchange and use of geodata. It should reflect a balance between the need to protect important national interests (security, vulnerability and integrity) and user requirements concerning easy access to geodata. The legal framework should make possible a service-

based exchange of data and an efficient handling of information.

An important starting point for continued work in this work package is to determine the extent of the legislative reforms that may possibly be needed to achieve the strategic goals. An investigation should be initiated with the aim of making an in-depth evaluation of the implications of common issues. Amongst other topics, the investigation should focus on the definition of tangible requirements and means for the use of geodata containing personal data.

In December 2008 the government proposed that the INSPIRE directive should be implemented in Swedish legislation through a law and an ordinance. The proposal entails that the present law (2005:181) on environmental information held by certain organisations would cease to apply and would be replaced by a new environmental information law. The new rules are expected to come into force during the autumn of 2009. The continued work will be concentrated on following up that the new rules that are proposed as a consequence of the INSPIRE- and PSI- directives are, as far as possible, drawn up based on a long-term perspective. In its role as co-ordinator, and in consultation with involved authorities, Lantmäteriet should be empowered to issue instructions concerning the responsibilities that information providing authorities have for providing information, developing information management services and metadata.

### ***Financing and price models***

Work with financing models, price models and models for cost-benefit analysis is part of the responsibility of the Geodata Project. This work began during the spring of 2008 and the intention is that a concept—a business model—in which the models for financing and pricing are important components, will be presented in June 2009.

Initially there will be common price and financing models for the geodata that is handled via the portal. At a later date there will be other channels for providing geodata with supplier-specific pricing principles. An important task will therefore be to harmonise the different principles as far as possible in order to simplify matters for both suppliers and clients.

### ***Timetable***

A timetable for INSPIRE and the Geodata Project can be found in chapter 6.

### ***Consequences***

The main consequences of the implementation of the Geodata Strategy will be:

- That the requirements in the INSPIRE directive can be realised.
- That continued establishment of closer co-operation between the public and private sectors will be encouraged. The possibility to

create value-added geodata will be improved, which will stimulate development.

- Demands for increased allocation of resources for R&D and competence development within the geodata sector.
- That implementation of the strategy will require changes to the current sets of rules that apply in the geodata sector.
- That issues concerning security, vulnerability and personal integrity will be given greater prominent.
- That the strategy will contribute to the development of efficient e-governance.
- That the strategy may have an influence on roles and the di- vision of responsibility between public sector authorities.
- That Lantmäteriet's role as a coordinator for the provision of geodata is confirmed.
- That the strategy provides the pre-conditions for improved insight by the general public and an increased democratic influence.
- That, on the long-term, the strategy will result in decreased costs for the provision of geodata to society.
- That there will be an increased use of geodata at all levels in society.
- That there may be a need for re-allocation of resources between different organisations and areas of responsibility and, certainly, between different fields of activity.
- That the provision of geodata will have a clear user focus.

During 2008 the government gave Lantmäteriet, in consultation with the Swedish Environmental Protection Agency, the task of analysing and evaluating the consequences of the implementation of the INSPIRE directive.

A report was submitted to the government in November the same year. The report contains a presentation of the national economic consequences of the benefits (= positive national economic consequences) and costs (=negative national economic consequences) that would follow from the implementation of INSPIRE. In the consequence analysis, benefits are compared with costs in a cost-benefit analysis. The analysis is completed with an assessment of how these benefits and costs will affect different involved parties.

The continuation of the work will be focused on making better cost estimates, evaluating costs and benefits for the private sector and for organisations that do not have responsibility for providing information as well as for local authorities. In addition, the impact on society as a whole will be described and evaluated.

### Follow-up

An account of how work with the Swedish Geodata Strategy is progressing will be submitted to the government before March 31st 2010. This report will contain a follow-up of the activities that have been carried out and those that are in progress. The follow-up should be co-ordinated with the national monitoring and reporting as required by the INSPIRE-directive. In accordance with INSPIRE every member state shall supervise the development and utilisation of its infrastructure for geodata. The first report must be submitted before May 15th 2010.

# 1. The task

***In June 2006, the government gave Lantmäteriet, together with the Geodata Advisory Board and in consultation with other affected public sector authorities and the Swedish Association of Local Authorities and Regions, the task of formulating a national strategic plan for the integrated provision of information within the geodata sector. In the government's directives it was stated that the plan should be revised annually.***

The first version of the plan, with the title the Swedish Geodata Strategy, was submitted to the government on March 30th 2007; and the first revision a year later on March 28th 2008. The revised version for 2009 was to be submitted to the government by March 31st 2009. In accordance with Lantmäteriet's Annual Appropriations Directions for 2009, Lantmäteriet must report on progress with the continuation of work on the Swedish Geodata Strategy before March 31st 2010.

## **Objectives**

The objectives for the Swedish Geodata Strategy are: to create a national infrastructure for the geodata sector, to contribute to the development of Swedish public administration and to promote close co-operation between the public and private sectors in order to create a favourable environment for the creation of value-added geodata. The Swedish implementation of the INSPIRE-directive forms part of the work with the Swedish infrastructure for geodata.

## **Aim**

The aim of the Geodata Strategy is to provide producers and users of geodata with guidance concerning the development and use of standards and specifications, metadata and metadata services, services for the distribution of information, policies for access and use, research and training and organisation and forms of co-operation.

## **Target groups**

The target groups for the Geodata Strategy are decision-makers and producers and users of geodata.

## **Revision of the Swedish Geodata Strategy**

The revised version of the Geodata Strategy has been prepared together with the government-appointed Geodata Advisory Board. Members of the group include representatives for the Swedish Meteorological and Hydrological Institute (SMHI), the Geological Survey of Sweden (SGU), the Swedish Maritime Administration, representatives for the Swedish Armed Forces, the county councils, the Swedish Environmental Protection Agency, the Swedish Association of Local Authorities and Regions, the local authority of Sundsvall, the Swedish Development Council for Geographic Information (ULI), and the Swedish Road Administration.

The starting point for the revision work has been a number of influencing factors, including the introduction of the INSPIRE-directive, the government's action plan for e-governance, an increased global engagement in climate and environmental issues. Activities that were planned in the Swedish Geodata Strategy 2008, and which have been completed or are on-going, are described in this revision.

The proposals that are presented are based on known and anticipated trends in the world around us, and the focus is on the development of e-governance in the public sector and the establishment of an infrastructure for geodata in which public and local authorities' geodata is the core data. Here there are strong links with developments in the private and business sectors and the market, as well as international development trends. The development of e-services in the future will depend on interplay between public and private initiatives.

The timeframe for the action plan for implementation of the INSPIRE-directive is regularly updated and can be followed at [www.geodata.se](http://www.geodata.se). See Appendix 1.

The Geodata Advisory Board has expressed its full support for the revised 2009 version of the Geodata Strategy and it has also been formally approved by Lantmäteriet's Board. The strategy was pre-sented at an open seminar on March 12th 2009. The seminar can be seen as a stage in the process of obtaining acceptance for work with the strategy and as a replacement for the formal process of selected circulation of the document for comments.

To realise the goals set up in the Geodata Strategy, eight work packages have been identified within which work will be focused in the development of a national infrastructure for geodata. Efforts must be made to, for example, create a common information structure, develop the technical infrastructure and make access to information via metadata possible. In addition, efforts must be made to improve the pre-conditions for co-ordination, necessary research and development and changes to the legal framework. A project – the Geodata Project – which is designed to carry out prioritised activities in five of the eight work packages has been started.

Many parties are involved in the Swedish Geodata Strategy. The graphic profile that was developed in 2008 illustrates the common task and creates uniformity in communication.

### **Communication and information**

A comprehensive communication programme was carried out during 2008 in accordance with the programme that was formulated for the strategy and the Geodata Project. The main aim has been to gain acceptance for the Geodata Strategy and the Geodata Project, provide information about Lantmäteriet's role as coordinator and to stimulate interest for the prioritised activities in order to achieve set targets of which the following should be mentioned:

- Personal contacts through members of the Geodata Advisory Board, members of the co-operating organisations and the Geodata Secretariat at Lantmäteriet. A communications plan was prepared for this purpose.
- Regular meetings with the INSPIRE working group to co-ordinate activities and issues related to INSPIRE (the INSPIRE working group is a national group for handling INSPIRE issues and is made up of representatives from Swedish authorities that have responsibility for the provision of information in accordance with the INSPIRE-directive ).
- Lectures and exhibitions at conferences and seminars, with the aim of providing information about the Swedish Geodata Strategy and the activities in connection with its implementation.
- Press releases and articles in technical and trade journals.
- Regularly updated information on the Internet via, amongst other channels, the Geodata Portal [www.geodata.se](http://www.geodata.se) and via e-mails.
- Information about the Swedish Geodata Strategy in brochures in Swedish and English.
- Information folders about INSPIRE and the Geodata Project.

The action plan for implementation of the INSPIRE-directive has regularly been presented and approved by the INSPIRE working group. The working group comprises those agencies which will be most affected by the directive. Comments from the working group have been incorporated into the action plan.

## 2. Influencing factors

***The establishment of an infrastructure for geodata must be carried out in harmony with several external factors which, to a greater or lesser extent, influence different part of the infrastructure and, thereby, also the strategy itself. Appendix 6 contains a description of such, now-known, external factors. This section is a short description of the factors that are judged to have the greatest impact on the work***

*INSPIRE*, which is the directive for the establishment of an infrastructure for geodata in the European Union, came into force on May 15th 2007. The aim of *INSPIRE* is to provide a legal framework for the soft parts of the information infrastructure. The directive contributes to the solution of several problems that are, at present, associated with geodata, such as difficulty in obtaining access to information, varying quality, problems with sharing information between agencies, and more. The directive contains rules which regulate, for example, how technical interoperability can be achieved, that authorities should disseminate geodata in an electronic format via net services, that they should share geodata with other public authorities and certain other organs and that a coordinating body should be created in every member state. The requirements of the directive have been a contributory factor behind the government's decision to give Lantmäteriet responsibility for co-ordinating activities in the geodata sector, the decision to establish a Geodata Advisory Board and the formulation of the Swedish Geodata Strategy. In December 2008, the government presented a proposal for how *INSPIRE* should be implemented in compliance with Swedish legislation in the form of an Act and an ordinance.

The implementation of the directive is an important stage in the development of the national infrastructure for geodata. The directive can also be seen as an important breakthrough in the development of e-society since it entails a common, legal approach to issues concerning access to and the exchange of society's information resources. There are clear links to ***the government's action plan for e-governance*** which was presented in January 2008. The aim of the action plan is to resolve the problems that have prevented a

network-oriented use of IT and thereby slowed down the development of e-governance. The action plan comprises four prioritised areas. Common for all four is that they focus on the need for a clearly defined structure for soft parts of the IT infrastructure which principally concern issues related to rules and regulations, responsibilities, co-ordination, standardisation and financing – the same issues that are regulated in *INSPIRE* and which are handled within the framework of the Geodata Strategy.

In the action plan the government highlights the work that Lantmäteriet is carrying out in the geodata sector, with the support of the Geodata Advisory Board, as an example of on-going work within the information structure. Reference is made to the Geodata Strategy and it is stated that the goal is that the geodata sector shall contribute to the development of Swedish e-governance and promote close co-operation between the public and private sectors in order to create sound and cost-effective pre-requisites for the further processing of geodata. The implementation of the *INSPIRE*-directive has been identified as a prioritised area in the action plan.

***A national framework for interoperability*** has been identified as a prioritised issue in the government's action plan for e-governance. In June 2008, Verva – Swedish Administrative Development Agency – presented a basis for a national framework for interoperability. A national framework should be able to work together with the European framework EIF (European Interoperability Framework).

The proposed framework has been designed for all who have management or planning responsibilities as a means for developing e-governance. The aim of the document is to obtain agreement on a framework which will promote interoperability and re-use of information in public sector authorities in Sweden. The framework should provide guidance and support for planning and decision-making and for harmonising the architectures which, with a higher level of detail, coordinates the further development of e-governance. The framework gives prominence to process orientation as a key for realizing an e-governance that functions seamlessly across organisational divisions. Service orientation is also identified as a means for facilitating the combination of

different types of services in order to create flexible and interoperable solutions where needs arise, and standardisation as an important pre-requisite for achieving interoperability. All of these areas are important in the Geodata Strategy.

The aim of the EC directive on the re-use of public sector information (*the PSI directive*) is to increase growth and competitiveness within the business sector, primarily in the information industry.

An inter-departmental working group has been formed to supervise the Swedish implementation of the directive. The major tasks of the working group are to draw up a government bill containing a proposal for new legislation, necessary amendments to existing laws and regulations, as well as formulating guidelines for how the changes should be handled. The results of the working group should be presented by October 1st 2009. It is considered that the PSI directive will primarily affect the cooperative part of the Geodata Strategy. Agreements concerning the re-use of information must be in accordance with the legislation.

A number of other directives, such as *the proposed framework directive for land protection* and *the directive for the assessment and management of flood risks*, contain proposals which entail requirements for mapping and co-ordination relative to the INSPIRE-directive. The Commission has also taken an initiative to create a common information system that has an environmental focus, *the Shared Information System (SEIS)*. Member states will be able to use SEIS to help satisfy the reporting obligations which are a consequence of EU's policy and decisions in the environmental sector. SEIS requires that infrastructure, that is regulated through INSPIRE, already exists and therefore it is important that the handling of the proposed SEIS bill (which the Commission intends to present during the spring of 2009) is closely followed. SEIS also have links with the EU initiative for *Global Monitoring of Environment and Security (GMES)*. The initiative involves building up a co-ordinated capacity for a more efficient environmental and security-related monitoring. A number of basic services for application areas such as marine, atmosphere, environment, humanitarian support, security and climate will be developed. A starting point for the work with the Swedish Geodata Strategy is the integration of GMES services, as far as possible, with INSPIRE and the Swedish infrastructure for geodata. This will require, amongst other measures, co-ordination of the creation and management of geodata that is of common interest and making GMES services for environmental analysis and risk management accessible via the national Geodata Portal.

Most studies contain proposals which, to some extent, are related to geodata. In the *Marine Environment Inquiry* it is proposed that a national programme for mapping of the marine landscape should be implemented. The programme should be co-ordinated with

INSPIRE concerning the themes hydrography and marine areas. A climate bill, based on *the Climate and Vulnerability Inquiry* will be presented during the spring of 2009. The inquiry includes a proposal for the creation of a terrain elevation database that has a denser grid and higher accuracy than the present base. Other factors that affect development in the geodata sector are *security, vulnerability* and *IT standardisation*. Provision of information in the future will require that a major part of the information available in society is linked and matched and stored together with geodata. The benefits for society will include better basic information for decision-making and more efficient administration. Much of the information generated in society can be seen as open and harmless information but when geodata is linked with other general information in a geographic information system (GIS), a completely new type of information can be generated. This new information, or specific extracts from it, can cause security or vulnerability risks.

The aim of the government's efforts to simplify the set of rules and regulations is to decrease administrative costs for the business sector by at least 25% by 2010 and to generally simplify business activities. The Geodata Strategy contributes to achieving these goals through more efficient administrative processes and better access to information (geodata). At present, both unnecessary time and resources must be given to trying to interpret the complex set of rules and regulations that applies within the authorities that provide information. It can, for example, at times be necessary to contact several authorities to obtain the correct information; and, in addition, several formal requirements may have to be satisfied before the information is released. The Geodata Strategy implies increased co-operation between authorities with the aim of creating uniform routines for accessing and using geodata.

### 3. Geodata in Sweden and internationally

#### ***What is geodata and what does a national infrastructure for geodata imply?***

Geodata is data that describes a phenomenon that has a given geographic location. Geodata in the form of a prognosis or a scenario is just not included in this definition. Geodata is an important subset of the information that is provided to society and is a basic information resource in e-society. Geodata plays an important role in many of society's functions such as forestry planning, environmental analysis, national registration, postal and distribution services, transport planning and logistics, navigation, positioning and in management and control systems for rescue services, the police and total defence. Geodata is an important foundation stone in the systems used by authorities for handling transactions and provides important support for the general public's everyday activities and communication.

The infrastructure for geodata is a collection partly of information and partly of different formal requirements that make the information accessible and usable. To make the information accessible and usable, one requirement is that it must be arranged in identifiable datasets that are provided with standardised metadata i.e. information that describes the datasets. In addition, there must be an IT infrastructure containing data services, a portal and similar to make it possible to search for and retrieve the information. The IT infrastructure is, in turn, dependent on harmonising rules which, amongst other things, defined the legal pre-requisites for being granted access to the information. There must also be a supporting organisational structure that facilitates co-ordination between public sector bodies on both the national and EU levels.

#### ***Why do we need a National Geodata Strategy?***

There is a major need for a national strategy for how the infrastructure for geodata should be developed. Many public sector authorities are represented in the group of agencies that contribute, or can contribute, to the development of a national infrastructure. The need for co-ordination and co-operation is increasing in order to keep abreast of the increase in the dissemination and use of information.

The purpose of the Geodata Strategy is to promote

the use of and increases access to geodata in Swedish society. Implementation of the Geodata Strategy will result in the creation of an infrastructure for the provision of geodata. The goal is that the geodata sector should contribute to the development of Swedish e-governance and promote co-operation and collaboration between the public and private sectors to create sound and cost-efficient pre-conditions for the re-refinement — production of value-added products — of geodata.

#### ***The Swedish Geodata Strategy and INSPIRE***

The National Geodata Strategy is one stage in the Swedish implementation of the INSPIRE-directive. The strategy takes into account the requirements of the directive and is the common platform for Sweden's participation in European co-operation in the geodata sector. The directive contains common rules for exchange, accessibility and use of public sector geodata in Europe. The Swedish Geodata Strategy is aimed at developing increased co-operation within the geodata sector. The goal for both the directive and for the Geodata Strategy is to create a common infrastructure for geodata. The purpose of the infrastructure for INSPIRE is to give the general public better access to information — such as via the Internet — and to make it possible for public sector authorities to share geodata with each other in an efficient way.

#### ***The steering and co-ordination of geodata***

The INSPIRE-directive regulates issues that have been the subject of different enquiries and of increasing prioritising in Sweden during the past 15 years. These are issues that concern areas such as the steering and co-ordination of certain types of basic information such as geodata. These issues also include major parts of the e-governance sector. An important contributory factor, which has resulted in these issues being given increasing attention, is the very rapid development of information technology and the associated increased demand that are placed on government administrations by the information society. The most important demands have been, and are, that public sector activities should be more accessible for the general public and more service-

oriented. To meet these demands it will be necessary to create a modern information infrastructure, which will make it possible to modernise public sector administration by introducing information technology on a wider scale by, for example, creating services that make information available via electronic communication channels such as the Internet. Development in this sector has been far-reaching but has not always given the desired results. It can, however, be stated that development in Sweden in this sector, on the whole, is in line with the relevant requirements of the INSPIRE-directive.

A structured management of geodata is a pre-condition for the development of a common infrastructure for society's e-services. Co-operation between different authorities and other bodies will be of increasing importance in the future in order to avoid duplication of effort and satisfy governments' demands for efficient administration.

#### ***Increased co-operation***

Co-operation within Europe, as well as globally, is increasing and has resulted in clear demands for harmonisation and interoperability of national geodata. The INSPIRE-directive provides a legal foundation for a far-reaching harmonisation of many important data themes. The European Union's Global Monitoring of Environment and Security (GMES) initiative involves the creation of more efficient methods for producing, managing and disseminating information that is needed for environmental and security activities. The Group of Earth Observations (GEO) is another – and closely related – example of an initiative to co-ordinate spatial information and thereby increases the possibilities to handle global environmental issues.

The private and business sectors are also demanding increased harmonisation of geodata across national boundaries as well as easier access to data that is held by public sector bodies. There is a clear need for the development of positioning and navigational services and also an emerging need for services in areas such as the real property market, the mortgage loan market and general planning.

***A clearly defined public responsibility*** in the geodata sector will be an important pre-requisite for, amongst other things, the development of successful business activities within the sector. A starting point for the PSI-directive is clarification of the terms and conditions for the further processing of public sector information for the development of new services.

***Security, vulnerability and personal integrity issues*** will be increasingly difficult to handle as a consequence of technological advances which provide completely new possibilities to access, link and process data from different sources. The present set of rules for managing and using geodata will need to be revised and adapted to future service-based exchange of data.

***The availability of competence*** will be crucial for

how well organisations will succeed in carrying out their duties. In Sweden, applied research and training activities must be carried out to contribute to finding effective solutions to both technical and organisational problems. The demand for qualified manpower will be high, which means that training facilities in this sector must be of high quality and attractive. This applies both to basic training and further education.

### **3.1 Supply, demand and needs**

The availability of geodata is important for many functions in society. The demand for geodata is increasing year by year together with demands for better accessibility, usability, quality and lower charges. Different user demands and wishes steer, to a major extent, the availability of geodata in society. It is also a question of supply and demand, where demand is often greater than supply.

In public sector authorities and local authorities, geodata has become of increasing importance as a means of increasing the efficiency of planning, decision-making and follow-up. This is the case, for example, in the environmental sector, agriculture and forestry activities, transport infrastructure, telephone and energy, total defence, preparedness and security and real property management. The private and business sectors have a need for geodata and services for use in areas such as business development, the transport sector, media and tourism and recreational activities. There is a clear need to promote the use of geodata at all levels of society at the same time as it is important to pay careful attention to security, vulnerability and personal integrity issues. The conditions for exchange and use of geodata must be clear and unambiguous and be aimed at maintaining a balance between the need to protect important interests in society (security, vulnerability, integrity and copyright) and demands from users for ease of access to the information they need.

There is also an increasing use of geodata in the consumer market which is accompanied by demands for increased quality. Examples include uses in navigational equipment for motor vehicles, pleasure craft and outdoor activities, as well as for search services such as eniro.se, hitta.se and google.se.

The efficient provision of geodata and services requires, amongst other things, communication, information, possibilities to influence as well as technical solutions and well-defined interfaces.

There is a steady increase in the development of digital services in areas such as health care and social services, culture, transport and the commercial market. The transport sector has made major advances and uses geodata for a wide range of applications. On the commercial market, positioning services for transport logistics and navigational purposes have become extremely attractive. A number of factors can be identified as particularly important for the development of digital

services including: climate change, the development of the Internet, digitising and globalisation of the market. These are factors that have an influence on the information infrastructure and production and market mechanisms which have an impact on society and the business sector. See the report "Digitala tjänster med geodata – perspektiv och framtidsbedömningar" (Digital services based on geodata – perspective and future assessments.) published by Lantmäteriet's designation 505-2007/1252.

Many public sector authorities handle geodata in their daily activities. The investigation "Lägesbild GI Sverige" (Current Situation Concerning Geographic Information for Sweden) concerning the public sector that was carried out by the Swedish Development Council for Geographic Information (ULI) in 2007 showed that there was a wider use of geodata compared with the results of a study carried out in 2003. More organisations used geodata in a wider range of activities. A comparison between the level of use of geodata for different tasks in 2003 and 2007 shows that use for "simple" GIS applications has increased (by "simple" applications is meant search, view data and carry out simple analyses). More than 50% of those who use geodata in their daily activities use it for simple tasks. An incentive to increase the use of geographic information systems and geographic information techniques (GIS/GIT) by public sector authorities would be accessibility — rapid and easy access to data — and quality and supply i.e. that the required data with reliable quality can be retrieved when it is needed. More than 50% of the answers received indicated that the authorities planned to offer several more services based on geodata via the Internet.

That the branch is expanding can be seen from the significant increase in the demand for persons with geodata competence. Of the organisations that participated in the study, 90% stated that they see a need for an increase in the level of competence in the geodata sector during the coming three years.

During February 2008, Swedish Standards Institute (SIS/Stanli) sent out a questionnaire inviting the submission of proposals for setting priorities regarding which geodata and services should be included in the national infrastructure for geodata — see Appendix 2. Most agencies pointed to the need for geodata services in the form of Web Map Services (WMS) and Web Feature Services (WFS). Other requirements that were identified included downloading services, viewing services, mobile services and a number of map services. Most of the authorities specifically pointed out the need for improved elevation and depth data.

## 4. The future supply of geodata

***This section is aimed at clarifying what achievement of the goals in the strategy would mean for the supply of geodata in the future in the form of increases in benefits for society and sustainable development, as the result of a more efficient management of information.***

The provision of geodata in the future will be done as automatically and uniformly as possible. It will be easy to find data and to understand price models related to its use and to make agreements with one or several suppliers. Delivery of data will be via the Internet using Web services. Clients will always be able to access geodata online. Transaction times from order to delivery of less complex requests will be of the order of a few minutes.

The infrastructure for geodata will form a linked collection of data and services which can be accessed via the Internet. In addition to the infrastructure itself, there will be a Geodata Portal ([www.geodata.se](http://www.geodata.se)) through which clients and suppliers can find each other. For most users, the portal will be the visible sign of the infrastructure. The portal will comprise a search function, a map viewing function and a purchasing function (e-commerce).

The geodata and the geodata services will be the responsibility of the supplier such as, a public sector authority, a local authority or a company and they can be accessed via the portal. It will be possible to connect existing data services directly to the user's own application without passing through the portal.

The foundation for a well-functioning infrastructure for the provision of geodata is a technical infrastructure and an enterprise model that function together. A basic requirement for the technical infrastructure is the availability of standards and specifications that support efficient co-operation in the production and management of geodata. A common technical infrastructure also facilitates an increased use of geodata in society. The enterprise model contains procedures for making geodata available, such as agreements, price models and financing solutions. The aim is to promote an efficient exchange of information between agencies and also make it easier for companies to create and provide geodata services.

The infrastructure for geodata is based on co-operation between different organisations, which can be both suppliers of and clients for geodata. The co-operation is based on voluntary forms of agreement and concerns the development of businesslike preconditions and models for how the co-operation should take place. Cost aspects are important. The starting point is, to a considerable extent, to automate the processes for supplying geodata

Increased co-operation between public sector administrations and private sector companies is an important prerequisite for the implementation of the strategy and for the development of the Geodata Portal. It is also important for the development of e-governance.

An important goal for the development of the infrastructure for geodata is to make information more easily accessible and easier to use. The national Geodata Portal will be an access point for gaining access to information from several sources.

### ***Increased benefits for society***

In the future, the national infrastructure for geodata will benefit the activities of public sector administrations, the private sector and the general public. Public sector authorities that co-operate with each other, for example to assist persons in distress in crisis and emergency situations, will be able to quickly obtain reliable geodata and thereby increase the possibility to act quickly. Companies will have better possibilities to develop new products and services, for example for transport planning, supporting decision-making and environmental analysis. The benefits for the general public will include a more efficient public administration, for example via e-services, and the fact that companies can produce new applications such as search services like Eniro.

*Example:* a consultant who is engaged in the pre-planning of a road project in a local authority area. Today, the consultant would have to contact several central and local authorities to obtain information, such as the number of inhabitants who live and work in the area and their transport needs. An infrastructure for geodata – which would be an access point to the information – would make access to the information much easier. Shorter times to find information result in cost savings

for society.

### **More efficient management of information**

In the future, the national infrastructure for geodata will be an integral part of Swedish e-governance. Information will be easy to share, combine and use. Suppliers and clients for geodata will co-operate more closely and exchange common types of information.

*Example:* a transport company that transports hazardous goods must obtain information from central and local authorities about safe and trafficable routes. With standardised geodata which is given in the same reference system it is possible to create a seamless set of information – the efficiency of the handling of information will be increased.

### **Sustainable development**

The need for improved access to geodata is increasing in many administrative areas and branches such as the environment, security, transport and medical care and social services. In the future, geodata that is more easily accessible and of a higher quality will provide the prerequisites for a sustainable development of society. Closer co-operation on local, regional, national and international levels will make it possible for public sector authorities, companies and the general public to obtain the geodata they need. The multinational perspective is particularly important where sustainable development is concerned, such as for counteracting the impact of climatic change, protecting the environment and the transition to a global market.

*Example:* In environmental research into the spread of pollution in water and in the air between different countries, there is a need to obtain and combine information from several different sources. An access point through which information can be searched for and retrieved will increase the possibilities to carry out research across agency and national boundaries countries and long time series. This will make co-operation easier, sustainability will be increased and the results of the research will be more reliable.

## **4.1 Key principles and vision**

To create increased benefits for society through better access to and easier use of geodata there is a need for the creation of a basic structure – an infrastructure for geodata – on a national level. The Geodata Strategy is the plan for how the infrastructure will be built up.

The aim of the Swedish Geodata Strategy is to stimulate increased co-operation in the geodata sector by providing more information about geodata and guidelines for producers and users.

The strategy is intended to provide guidance for all involved parties in Sweden. It is the general plan on which the infrastructure will be based and for Sweden's participation in European and international co-operation in the geodata sector.

Work for the realisation of the objectives of the strategy is based on the following common key principles:

- The strategy should generate benefits for society by providing favourable preconditions for the further processing of geodata and support the development of the Swedish business sector and contribute to strengthening international competitiveness.
- The provision of geodata should contribute to the development of Swedish e-governance and be a model for the development in other information sectors. The provision of geodata should also utilise existing solutions concerning Swedish e-governance.
- The strategy should create flexibility by providing favourable prerequisites for rapid and easy adaptation to the new preconditions, new demands and technical development.
- The strategy should be based on a user perspective which should stimulate the use of geodata on local, regional, national and global levels.
- Co-operation between different parties should be so well developed and carried out in such an efficient way that costs for the use of geodata can be decreased. Networks for co-operation between central and local and the private sector are an important basis for the infrastructure. The co-operation can be based on voluntary agreements and satisfy the needs for local, regional and national applications. The networks should stimulate the development of services that meet the requirements of individual members of the general public as well those of the private and public sectors.
- The strategy is part of the implementation of the INSPIRE-directive in Sweden.

Important keys to success are a common approach and sound forms of co-operation between all involved parties. Reliance, collaboration and co-operation must be developed across administrative boundaries and between all involved parties.

The vision for the Swedish Geodata Strategy in a 10-year perspective is that organisations that manage and use geodata in their daily activities should:

Use geodata to *generate increased benefits for society*, based on co-operation across organisational boundaries, and at the lowest possible cost.

*Co-ordinate information resources in a network* and make them available via uniformly structured services and descriptions of the information.

*Provide services* to public sector administration, companies and the general public and satisfy demands at local, regional, national, European and global levels.

## 5. Work packages

**The achievement of the vision and the strategic goals is based on Sweden's international commitments, including the EC directives INSPIRE and PSI, political decisions, including the government's action plan for e-governance, and on clearly expressed user demands. The work must take into consideration rapid developments in techniques and technology and the fact that demands, obstacles and possibilities can rapidly change.**

Eight work packages have been identified in the Geodata Strategy. These are, without any order of priority:

1. Co-operation in networks as the basis for the infrastructure.
2. Information structure.
3. Technical infrastructure.
4. National metadata catalogue.
5. Geodetic reference systems.
6. Research, development and education.
7. Legal framework.
8. Financing and price models.

These work packages can be seen as puzzle pieces in the Geodata Strategy which piece by piece form the national infrastructure which, in turn, is a puzzle piece in the European infrastructure for geodata (INSPIRE).

### *The Geodata Project*

There are clear links between several of the work packages. Those that have the strongest links have been included in a common project – the Geodata Project.

By 2010 the project will create a business model and technical infrastructure for how geodata and services should be made available for nationally in Swedish and in Europe. The technical and practical implementation of the INSPIRE-directive will be done within the project. The solution will be developed together with other parties who are involved in the provision of geodata.

The targets for the project are to:

- increase the value for clients of the provision of geodata,
- increase co-operation within and between public sector administrations and companies,
- create flexible business processes,
- decrease costs for the provision of geodata,
- increase growth and competitiveness for companies that provide geodata products and services.

The project comprises two parts – *business model* and *technical infrastructure*. The technical infrastructure includes the development of:

- a Geodata Portal,
- a network for making services available,
- search and metadata services.

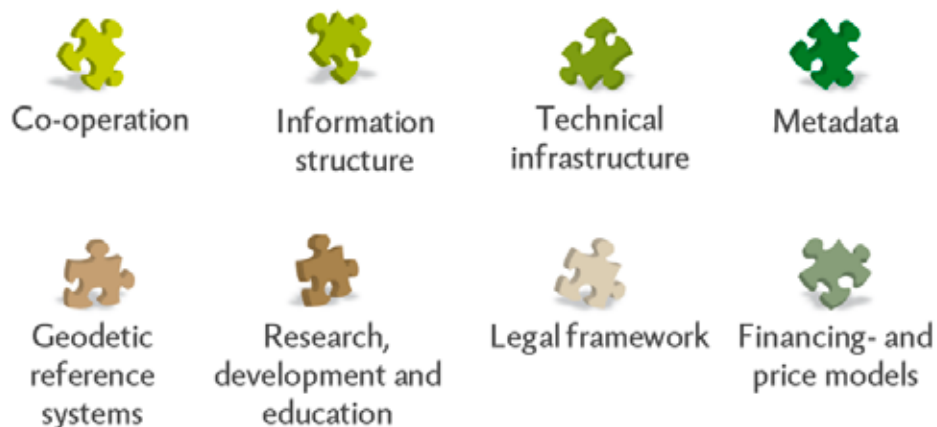


Figure 1: The Swedish Geodata Strategy is made up of 8 work packages

Work on the business model includes co-operation and organisational issues as well as contractual, pricing and financing issues. The basic task for the project is to investigate issues related to the full scope of the provision of geodata. It is also important that the technical infrastructure functions together with the business model. Data, services and metadata from producers should be made available to users without obstacles, at the same time as licences, prices and costs are handled in a flexible and reliable way. The basic idea behind the project is process orientation with focus on user processes.

The project is divided into three main phases. The first phase, which was completed during the autumn of 2008 has, concerning the business model, mainly involved the creation of a clear and common picture of the current situation concerning the provision of geodata and of the demands and needs which should be taken into consideration during the continued development work. The work has also included carrying out cost-benefit analyses and initiating a number of research projects, as well as standardisation activities. Concerning the technical infrastructure, work during the first phase has been concentrated on designing a prototype for the Geodata Portal, formulating a preliminary standard for metadata, designing a tool for the creation of metadata and preparing guidelines for creating and providing metadata and geodata services.

Phase 2, which will be completed during the first half of 2009, will involve designing an architecture for the future business model as well as formulating rules — in the form of co-operation agreements, licence agreements and similar — that are required for the implementation of the model. With regard to the technical infrastructure, work will continue on the development of the first working version of the Geodata Portal. By the middle of May a stable, functioning version, version 1.0, will be available. This will make it possible for producers to smoothly link metadata, geodata and services via the portal. This version will also contain the necessary authorization and security solutions, tools for monitoring traffic via the portal and improved functionality for searching. The work also includes preparing a rule framework and guidelines to steer and facilitate publication and use of metadata and services. By the end of June technical specifications should have been prepared for version 2.0 of the portal, which is planned to be in use by the end of June 2010. These specifications will be based on the business model, experience from testing and international experiences.

Finally, in phase 3, a management organisation will be established, agreements will be signed with involved parties and a functioning operational environment and management organisation for the Geodata Portal will be set up. The completed portal, with a technical solution that functions together with the business model and administrative routines, will be in operation by the end

of June 2010. Information about the Geodata Project will be provided on a regular basis at [www.geodata.se](http://www.geodata.se).

### ***Action plan for implementation of the EC directive INSPIRE***

An action plan for implementation of the INSPIRE-directive is presented in Appendix 1. The plan contains the timetable that should apply in accordance with INSPIRE, the activities that must be carried out in order to achieve the purpose of the directive and who should be responsible for doing so. Prioritised activities according to the action plan (for 2009-2012) are described under the respective work package. The timetable is regularly updated and the latest version can be found at [www.geodata.se](http://www.geodata.se).

An important conclusion is that the timetable for implementation of the directive is rather tight. Relevant net services must have been established and metadata created during 2010 at the latest. The information produced by public sector authorities that is covered by the directive's Appendix 1 must have been adapted or be accessible by the use of transformation services during 2011 at the latest. A problem in this connection is that the involved authorities' work in this sector is dependent on the directive's implementation rules. In order to be able to follow the timetable the authorities will presumably need to begin the work before the implementation rules have been adopted.

In order to be able to take preparatory measures with regard to the respective authorities' obligations, which will follow the implementation of INSPIRE and which are described in the action plan, there is a need for authority-related working plans. These plans should contain a description of the different activities that will be implemented, the latest date for their implementation and where responsibility for the implementation lies in the authority. As some of the dates in the time table for the implementation of INSPIRE are preliminary it is important that the working plans are regularly updated. There is a list of examples of working plans under References.

### ***Roles and players***

In the INSPIRE action plan there are five players, or groups of players who, in different ways, have responsibility for the implementation of the directive. The same group of players is involved in the work with the national infrastructure for geodata.

1. The European Commission — responsible for preparing proposals for the formulation of implementation rules, which will be submitted to a committee containing representatives for the EU's member states. The Commission is also responsible for the creation of a geoportal at the EU level and for the follow-up and monitoring the implementation of the directive.

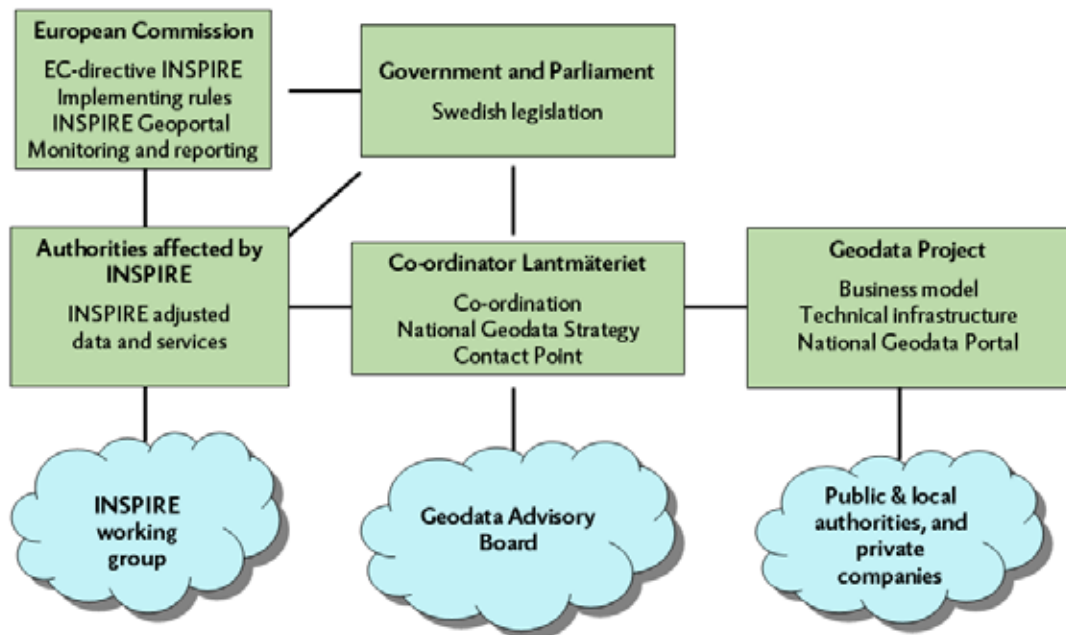


Figure 2: Overview of players.

2. Parliament and the government – responsible for the inclusion of the directive in national legislation. By delegation of responsibility to public sector authorities, the government can ensure that the necessary measures are taken. The government has given Lantmäteriet, together with the Geodata Advisory Board and in consultation with other involved public sector authorities and the Swedish Association of Local Authorities and Regions, the task of formulating a National Geodata Strategy.
3. Lantmäteriet – the national geodata co-ordinator. This responsibility includes production issues, collaboration and development, support for the implementation of the directive and for safeguarding Sweden's interests in this sector internationally. This responsibility also extends to updating the Swedish Geodata Strategy. In addition, Lantmäteriet, as the Commission's point of contact in accordance with the directive, has responsibility for reporting on Sweden's behalf to the Commission. The government appointed Geodata Advisory Board supports Lantmäteriet in its role as coordinator. The Geodata Advisory Board participates in the work by initiating, planning, providing information about and seeking acceptance for and following up activities associated with the Geodata Strategy. On the initiative of the Geodata Advisory Board, a working group for INSPIRE issues, made up of representatives from public sector authorities that have responsibility for the provision of information in accordance with INSPIRE, has been formed. The working group has responsibility for co-ordinating activities and issues related to INSPIRE.
4. The Geodata Project – responsible for general development (models for co-operation, agreements, financing and price models) and technical infrastructure for how geodata and services can be made available at national and European levels via a national Geodata Portal ([www.geodata.se](http://www.geodata.se)). Participants in the project include central and local authorities and the private sector.
5. Public sector authorities and organisations – responsible for producing metadata and services. These bodies are also responsible for adapting services (alternatively making transformation possible), datasets and for adapting the technical architecture to satisfy the requirements of the INSPIRE-directive.

### 5.1 Co-operation in networks as the basis for the infrastructure

#### Strategic goal:

Efficient co-operation between independent organisations should be the foundation on which to build the infrastructure. Co-operation should be based on common frameworks and regulated in contracts and agreements.

#### Accomplished activities

Parliament's decision to give Lantmäteriet the role of co-ordinator for production, co-operation and development within the geographic and real property fields

has laid the foundation for the co-ordination within the geodata sector which is now being developed. Since the Swedish Geodata Strategy was presented in 2007, principally the organisations which have representatives in the Geodata Advisory Board, but also several other players, have contributed to the work of achieving the goals that are set in the strategy.

Within the framework of the Geodata Project, Lantmäteriet has signed agreements concerning ways of co-operating with the Swedish Geological Survey, the Swedish Meteorological and Hydrological Institute, the National Maritime Administration, and the Swedish Armed Forces. In addition, letters of intention have been signed with the Swedish Association of Local Authorities and Regions, the forestry company, SCA Skog and a ULL's suppliers section, concerning future co-operation in the implementation of the Geodata Project.

During 2008 the Geodata project has attempted to obtain a clear, general overview of the situation concerning the provision of geodata and, above all, of demands and needs which should be taken into consideration in future development work. This work has been carried out in a number of working groups and the results of their work have been published in the report "*Affärs- och verksamhetsmodeller för Geodataportalen*" (Business and enterprise models for the Geodata Portal).

The report describes client and supplier needs, agreement and licence models, financing and price models and the results of cost-benefit analyses that have been carried out. The report also describes which and how future work will be carried out. The work was begun by creating new forms for the organisation and agreement models based on co-operation between the parties.

During 2008 the Geodata Projects has arranged a number of workshops and other meetings, which have been attended by representatives from both local government authorities and the private sector, with the aim of both mapping needs and demands and starting a dialogue concerning future development work and the role of the two groups in the infrastructure for geodata. The first phase in the Geodata Project has been as much an effort to obtain acceptance and develop channels of communication as a mapping phase.

During the year, the INSPIRE working group has mainly been focused on gaining acceptance for the recommendation for the implementation of the INSPIRE-directive in Swedish legislation and following up and supporting work on the implementation directives.

### Future work

A common business model for the geodata sector will be produced within the Geodata Project. The model will be adapted to facilitate co-operation between the public and private sectors. Work with the model will include the development of a co-operation model which will describe organisation, division of responsibility and

financing. It will also include agreements concerning carrying out the co-operation.

The business model will provide a structured description of how exchange and provision of geodata should be organised. This will include detailed information concerning:

- *What* will be supplied i.e. which metadata, geodata and services will be made available via the Geodata Portal and by other means.
- *How* this data and these services will be supplied i.e. the functions that the portal will have and a description of the processes – from connecting metadata, geodata and services as a data supplier, to searching for information, making agreements and obtaining delivery of data as a client.
- *Which organisations* are involved and what of their respective roles look like (suppliers, clients, other parties, the portal, organisations and more).
- *When* different stages will be carried out (the development stage, testing, launching, management and more).
- *Why* the different stages need to be carried out and which models will be used to create an organisational and financial framework that will contribute to achieving the strategic goals of [www.geodata.se](http://www.geodata.se) in an effective way.

The following special requirements and starting points have been identified for future work by the Geodata Project:

- Security, vulnerability and issues concerning integrity will be handled in consultation with the organisations concerned (the Swedish Security Service, the Swedish Data Inspection Board, the Total Defence Organisation) and the business model and technical infrastructure will be designed to meet these demands.
- The requirements of the INSPIRE and PSI-directives – and the planned future Swedish legislation for implementation of these directives – are mandatory concerning both the business model and the timetable for the continued work. This means, amongst other things that the requirements and intentions of the INSPIRE-directive concerning sharing data and the proposed Swedish legislation concerning voluntarily participation will be met in a suitable way.
- The guidelines for Swedish e-governance should be followed and further developed in consultation with the responsible authorities. As far as possible, the business model and technical infrastructure should be created in accordance with the guidelines.
- The same agreement and licence models

should be used for all geodata – irrespective of whether or not they are included in INSPIRE. There should only be a limited number of agreement and licence models and they should be easy to understand and use by both suppliers and users. To a major extent it should be possible to handle them automatically using suitable tools for digital rights management and be adapted so that different suppliers/users will have differing rights concerning access to and use of information. At present it is not considered to be realistic to include all types in a single model. The goal should be to, as far as possible, create a homogeneous agreement and licence model which could perhaps cover 80% of all agreement situations. The remaining 20% could be handled on an individual basis by the respective suppliers of geodata and geodata services.

- Costs for the provision of data i.e. costs for handling licences and agreements and the supply of data, should be kept as low as possible and reflects the principles which will apply in Swedish legislation for the implementation of INSPIRE. This applies both to data sharing and other types of data supply.
- [www.geodata.se](http://www.geodata.se) is part of the technical infrastructure and a way to strengthen co-operation between public sector authorities, local authorities and the private sector. The principal aim of the portal is to make it easier for users to search for, view and download distributed geodata and also to be the nodal point for Sweden's co-operation in accordance with INSPIRE. It will provide an overview and create order, but the intention is not that the portal should be the only way to exchange data. On the contrary, it is assumed that geodata and geodata services will, to a major extent, also be delivered directly to the users from the suppliers (and directly to their management systems) and that retailers and others who process the data should also have an important future role to play in increasing and broadening the areas of use for geodata.
- The retailer model (for those public sector authorities that use this type of model) will be adapted, based on the possibilities that are opened through the provision of data via [www.geodata.se](http://www.geodata.se) without having a negative impact on functioning solutions that are already available. It also means that geodata will normally be supplied via the portal or as a direct service by the supplier to the user whilst the retailer is responsible for adaptation

and the processing that will increase the value of the data. At the same time, it is important that retailers and other parties are given sufficient incitement to participate in encouraging an increased use of geodata by, amongst other ways, being able to easily make use of the portal for processing of geodata.

The aim is to incorporate all interested parties in the new agreement and licence models. In some cases, however, there may be a need for a successive transition depending on previously reached agreements or other needs. Such a case could be Lantmäteriet's present model for corporation with local authorities.

Current plans are that the foundation for how co-operation should be regulated should be in place by June 2009 – in the form of licence models, price models, finance models, co-operation agreements for data sharing and a model for the management of the Geodata Portal. Thereafter, work will be concentrated on building up the necessary management infrastructure and on reaching agreement with or between involved parties. The intention is to be able to launch a fully operational Geodata Portal, with a well-functioning business model and administered routines, by June 1st 2010. Work with the business model includes the design of a business case, investigating and taking a decision on responsibility issues and preparing descriptions of models for handling relationships with clients, suppliers, other partners and other interested market parties.

#### ***Public sector responsibility for co-ordination***

The government's action plan for e-governance will result in increased demands for co-operation and integration between public sector authorities within the e-governance sector. The INSPIRE-directive places demands on co-operation concerning the exchange of information between public sector authorities, which means that efforts must be made to ensure the active participation of those public sector authorities that are the major providers of information in the geodata sector and those authorities that have an information responsibility in accordance with INSPIRE. Strong engagement at the management level in public sector authorities is necessary to ensure that the necessary competence and financing is made available to carry out the work that is needed in, above all, the Geodata Project and in the common information structure field.

The public sector authorities that will co-operate in the geodata sector and areas that fall within INSPIRE, report to different government departments. Fruitful co-operation between these authorities would be facilitated by a continuous dialogue between the respective departments. More needs to be done to improve the dialogue within the Government Offices regarding these issues.

The Swedish legislation for implementation of the INSPIRE-directive will result in a sound legal foundation

for handling the most important co-operation issues. The directive requires that public sector authorities should co-operate by giving access to each other's geodata. An important issue that must be discussed in this context is the extent to which co-ordination of this co-operation should take place with regard to Sweden's obligation to make information available to other member states, institutions in the Community and other international organisations.

#### **Co-operation with local authorities and regions**

Swedish local authorities and regions are major producers and users of geodata. The business model and the technical infrastructure that will be created in the Geodata Project must be able to function together with local authority and regional solutions. The Swedish Association of Local Authorities and Regions' is represented in the Geodata Project and actively participates in the preparation of different parts of the business model. During the spring of 2009 working meetings will be arranged throughout Sweden to promote further participation and acceptance of the models that are created. All local authorities will be invited to participate in these meetings.

#### **Participation by the private sector**

Private sector companies play an important role in the national provision of geodata and thereby contribute to its increased use in society. The aim of the Geodata Project is to increase the growth and competitiveness of companies that provide geodata products and services. Thus, an important task for the project is to increase understanding of how growth can be stimulated. The private sector is an important partner and can create applications and services based on solutions which will be developed within the framework of the Geodata Project. Representatives from the private sector participate in the Geodata Project's work with the business model. During 2009 working meetings and seminars will be arranged to promote further participation and acceptance of the models that are created.

Private companies should be able to participate in the provision of geodata as partners within the framework for contract-based co-operation. The co-operation model which will be developed in the Geodata Project will define the type of interplay and include rules for co-operation between the public and private sectors. The roles that the market can play in the future are primarily the following:

- Production or value-added products.
- End user.
- Forwarder of demands.
- Sub-contractor/consultant for the development of the infrastructure.
- Active participation in the standardisation work.
- Supplier of geodata.

- By reporting how the data has functioned.
- Active participation in R&D activities.

#### **Active participation in the EU with work in the geodata sector**

In the Commission the work of formulating implementation rules that clearly specify the different requirements of the INSPIRE-directive is in progress. The implementation rules for metadata have already come into force. The INSPIRE implementation committee has taken decisions concerning search and viewing services as well as for monitoring and reporting. Proposals for other implementation rules will be circulated for comments during the period 2009-2011. Decisions concerning the rules will be taken in accordance with the approved timetable in the directive. In order to be able to influence the contents of these rules the Swedish public sector authorities that will be affected by the directive should actively follow and participate in the work of formulating them.

Work in the INSPIRE working group will be focused on the establishment of a common interpretation of the consequences of the recommendations before a decision is taken in the implementation committee.

#### **An action plan for the implementation of the EC directive INSPIRE**

The INSPIRE-directive requires that suitable structures and mechanisms are established at different administrative levels to co-ordinate the activities of producers, suppliers and other participants in the information infrastructure. As was mentioned earlier in this section, a co-operation model for the national infrastructure for geodata will be developed. The model will describe organisation, division of responsibility and financing. Documentation in which the model is described is also an important prerequisite for a smooth implementation of the INSPIRE-directive.

The co-operation model should reflect co-ordination and co-operation perspectives as well as an authority and activity management perspective. Co-ordination and co-operation will require authorities and organisations to act within the framework of applicable legislation. There may, however, be a need to clarify or extend the scope of the current legislation that regulates the activities of public sector authorities and organisations to, for example, clarify the involved parties' role, the division of responsibility and financial responsibilities.

In addition to meeting the requirements of the directive, the co-operation model must also satisfy the implementation rules "Monitoring and Reporting" and "Data sharing" (to be approved during 2009).

#### **Prioritised activities**

- Measures aimed at explaining and communicating information about the targets for the Geodata Strategy. The dialogue should clarify

the benefits of the use of geodata and the possibilities that it offers different involved groups of users.

- A continuous dialogue with the private sector to explain the sector's role in the implementation of the Geodata Strategy. The dialogue should also clarify the possibilities for the market to establish close co-operation during the development process.
- Create the pre-requisites and provide incentives for the local authorities to be involved in the infrastructure for geodata by encouraging their participation in the Geodata Project's reference groups, analysing their needs and considering the extent to which they should be included in the co-operation model.
- Together with the Swedish Association of Local Authorities and Regions, arrange seminars throughout Sweden with the aim of identifying the possible need for other measures concerning what should be done to support the local authorities in their development work for the implementation of the Geodata Strategy.
- Develop a co-operation model for the national infrastructure for geodata. The model should satisfy the requirements of the INSPIRE-directive
- Define responsibility concerning national co-ordination of data exchange with public sector authorities in other member states.
- A model for how activities should be regulated (an architecture) will be created within the Geodata Project. This will entail preparing descriptions of the different types of agreements and guidelines that are needed to establish the required co-operation between data producers and a co-ordinated provision of geodata to users. This will be followed by the formulation of the necessary rules for these activities, such as preparing co-operation agreements, licence agreements and other necessary documentation.

Appendix 1 contains information about other activities that will be required for implementation of the INSPIRE-directive.

## 5.2 Information structure

### *Strategic goal:*

Geodata should satisfy demands concerning usability, interoperability and quality. This requires an information structure built on model-based solutions and a well-defined, logical structure for features, relationships, attributes and terminology.

### **Accomplished activities**

The Geodata Advisory Board and the Swedish Standards Institute's (SIS) project area for geographic information, Stanli, signed a letter of intent concerning standardisation within the framework of a Swedish geodata strategy. The principal aim of this agreement is to clarify respective roles concerning responsibility for standardisation, standards and associated means of assistance and services in connection with the creation of a national infrastructure in the geodata sector. A second aim was to minimise the risk for duplication of effort and competing solutions by establishing co-operation. This co-operation comprises standardisation concerning:

- Development methods
- Technical framework
- Specifications
- Publication/provision
- Information, marketing
- Management
- Support for use (manuals, components, training).

This form of co-operation will mean that SIS/Stanli's concept for organizing and financing the work will be adopted and also that participation in standardisation activities will be open for all interested parties in accordance with SIS/Stanli's standard conditions concerning, for example, financing and personnel. This will ensure that all involved parties will have the possibility to influence decisions that are taken concerning standardisation in the geodata sector.

The Geodata Advisory Board and SIS/Stanli's steering group will have responsibility for ensuring that adequate and suitable resources are made available in the respective organisations for carrying out the work that will be required to develop and maintain a national infrastructure. The Geodata Advisory Board and SIS/Stanli will, together, encourage involved parties to appoint representatives who have a sound knowledge of the respective areas of activity and make efforts to ensure that the specifications that are developed are used.

Within the framework of the co-operation an action plan has been formulated. The plan contains descriptions of prioritised activities and their status. Before work with the respective activities is started it will be described in a case model based on the SIS/Stanli working model.

During 2009 SIS/Stanli published a report based on the results of a questionnaire and interviews with involved authorities. The selection of authorities was based on a previous study in which those authorities that were considered to have a responsibility for the generation and provision of geodata related to INSPIRE's data themes were identified. The report identifies the geodata and services that should be included in the national infrastructure and it contains a definition of the term

geodata. As the interpretation of the concept geodata is of central importance, acceptance for it was sought and obtained by circulating a proposal for comments. Thereafter, the following definition was adopted:

*Geodata* is data that describes a phenomenon that has a given direct or indirect geographic location

Note 1: A geographic location is given directly in a geodetic reference system, or indirectly.

Note 2: Geographic information and geographic data are frequently used as synonyms for geodata.

Note 3: Geodata can be measured, computed, estimated or defined in some other way.

(Geodata in the form of prognoses or scenarios are not included.)

The results of the questionnaire show that the geodata that is needed for the national infrastructure is, to a large extent, the same type of geodata as is prescribed for the INSPIRE-directive (see Appendices I-III). The report recommends that geodata that is linked to the themes in the directive — in Appendix I and Appendix II — should be given priority so that they can be made available in the first stage of the national infrastructure via the Geodata Portal. The services that will be developed in accordance with the INSPIRE-directive generally satisfy the needs of the national infrastructure, but the study shows that there is a need for additional services. The results of the analysis can be found in Appendix 2 of the final report.

During 2008 discussions were started as to whether a new technical committee for terminology (TK 512) should be formed within SIS/Stanli. This would involve the formation of several working groups each with its own area of specialization: updating of existing technical dictionaries, use of SIS/Stanli's terminology database, use of new concepts and more. At present, these comprehensive activities are dormant. For the time being it is suggested that efforts should be concentrated on preparing descriptions of the most central concepts in connection with the national infrastructure. The work should begin with a study to identify the concepts that should be included. The Geodata Project, the INSPIRE working group and SIS/Stanli should be consulted.

The services that will be used to access metadata and geodata are important cornerstones in the national infrastructure and the INSPIRE-directive. There is a need to standardize and increase competence in several areas, such as how to handle and build/adapt net services, what is required of services in an infrastructure for geodata and definition of services in the geodata sector. SIS/Stanli has initiated this work by forming a group that will define the contents and scope of the work.

Standardisation in the geodata sector must be co-ordinated with the on-going work to formulate implementation rules for the INSPIRE-directive. The Commission's thematic working groups will formulate specifications and other implementation rules for the data themes that are covered by Appendix I in the

directive

A decision will be taken concerning the specifications at a meeting of the INSPIRE implementation committee on May 15th 2009, after which the work of formulating specifications for the data themes covered by Appendix II and Appendix III in the directive will be started. A draft of the specifications for all of the themes in Appendix I of the directive was supplied at the end of 2008 for testing and feed-back.

Future Position X (FPX), the University of Gävle and Lantmäteriet have, together, established a test environment. Within the framework of this work, quality-assured methods have been developed for test-ing specification, datasets and services. These methods have been used to test the specification for place names, cadastral parcels, transport networks, hydrography and addresses. The tests were primarily focused on evaluating how data that satisfies national specifications can be transformed to INSPIRE specifications. A technical committee (TK 542 Water systems) within SIS/Stanli has carried out a number of tests of the INSPIRE specifications for hydrography.

As part of an MSc thesis, "SDI requirements for datasets", a project was carried out to produce technical specifications and an evaluation system for geodata datasets in the Swedish infrastructure for geodata. Based on studies of the literature and interviews, a set of technical specifications and two proposals for an evaluation model were presented. At present, there are no documented specifications apart from those that apply for INSPIRE, which should be available in a more detailed form when they have been finally approved, and examples of their use in the national infrastructure are available. In one of the evaluation models the specifications are broken down into sub groups and allocated weights. An evaluation of individual sub-groups can be done but can also be combined to give a common value for the whole dataset. In the second proposed model a small number of core requirements are defined. Additional requirements, in different levels, are then placed as layers above the core requirements. For example, layer 1 – core requirements, layer 2 - satisfy INSPIRE requirements, layer 3 – satisfy requirements for the national infrastructure. In this way it is possible to define in a simplistic way the level to which a dataset belongs. For more information please refer to "*SDI-krav på geodatamängder – Kravbeskrivning och värderingssystem inom den svenska infrastrukturen för geodata*", Lunds Tekniska Högskola.

Together, the models that have been produced in the test environment and the results of the university project could form a basis for certification of the national infrastructure.

The public sector authorities and organisations which primarily will be affected by the INSPIRE-directive are those that have a responsibility for providing the geodata that is included in one or several of the data

themes named in the appendices to the directive. By responsibility for the provision of information is meant the collection, management or dissemination of information. These public sector authorities and organisations are affected because they are specially mentioned in the directive's various rules as being responsible for executing different responsibilities such as disseminating geodata via net services.

The coming ordinance which will regulate implementation of INSPIRE describes information responsibility and identifies which authorities will have responsibility for geodata.

### **Future work**

Standards are an important basis for development and implementation of the infrastructure for geodata. It is, therefore, of interest to make standards, frameworks, guidelines and other documents that are produced in the standardisation of geodata sector easily accessible to a large circle of interested parties via the Geodata Portal. As always, however, this entails maintaining a balance between costs, benefits and type of financing. It is therefore of interest to consider the merits of different alternatives.

The focus of work with the information structure will be on being able to produce and provide required quality-assured information in accordance with agreed models and descriptions so that use of it will be easy and efficient. This presupposes that all involved parties make resources available and actively participate in the work.

The exchange of information in the national infrastructure for geodata should be based on a homogeneous, general framework with uniform descriptions of the information and services. The framework should include rules and methods for model-based concepts and descriptions of information, as well as rules and methods for service-based exchange of information. As far as possible, implementation should be based on international standards and where Swedish standards are available they should be used.

Those public sector authorities that have responsibility for providing information according to the INSPIRE-directive should take a relatively high degree of responsibility for ensuring that resources are made available this work.

The resources and experience that have been built up in the test environment should be used for testing future proposals for specifications (Appendices II and III). The models that have been developed should be used for testing services and for the quality assurance of geodata.

### ***Action plan for implementation of the EC directive INSPIRE***

The INSPIRE-directive contains mandatory requirements in this sector of activity. Those public sector authorities' datasets that are covered by INSPIRE

should be adapted to meet the directive's requirements or, alternatively, be made available with the help of transformation services. This means that public sector authorities must develop the necessary data models and data exchange models. Responsibility for this work must be clarified and be supported by instructions formulated by the authorities and given in their Annual Appropriations Direction.

Execution of the work will be dependent on the requirements of the directive and on the implementation rules concerning data specifications. The first set of implementation rules for Appendix I of the directive will receive approval during 2009. The final set of implementation rules will be approved during 2012.

The timetable for the formulation of the implementation rules varies depending on the appendix involved and on whether it is a question of existing datasets or datasets that are new or have been significantly restructured. For reasons of cost and efficiency, the timetable should apply for both available and new/restructured datasets. Because the timetable is tight, and because the work is dependent on steering documents which, so far, have not been approved, the extent to which it is possible, and suitable, to follow a comment timetable for all datasets should be discussed.

### **Prioritised activities**

- The co-operation with SIS/Stanli should include ensuring that the standardisation methods that are used satisfy the requirements of a national infrastructure for geodata concerning for example, applicability, interoperability and flexibility.
- A description of the demands that should be placed on geodata datasets for use in a national infrastructure for geodata should be prepared. In addition, a method and process for grading how well a geodata set satisfies given requirements should be developed.
- The continued implementation of the activities which form part of the action plan that has been prepared within the framework of the agreement between the Geodata Advisory Board and SIS/Stanli.
- Those public sector authorities that have responsibility for the provision of information in accordance with the coming ordinance for implementation of INSPIRE should be supported by information in connection with the planning of their own implementation of INSPIRE.
- The national resource for testing that has been built up in the special environment for testing standards and implementation rules for INSPIRE should be further expanded. In addition it should be clarified how this re-

- source could possibly be used for certification.
- It should be investigated whether it is possible to apply a tighter timetable for implementation of the INSPIRE-directive in this area of activity.

Several other activities for the implementation of the INSPIRE-directive are described in Appendix 1.

### 5.3 Technical infrastructure

#### *Strategic goal:*

The technical infrastructure should support efficient co-operation in the production and management of geodata and facilitate access to data and services. A national Geodata Portal should be created which will make it easier for users to search for, find, view and download distributed geodata. The Geodata Portal should be the node for Sweden's co-operation in Europe in accordance with the EC directive INSPIRE.

#### **Accomplished activities**

During the past year, Lantmäteriet, the Geological Survey of Sweden, the Swedish Meteorological and Hydrological Institute and the National Maritime Administration have been engaged in establishing co-operation in development activities.

A result of this work is that the first version of a Geodata Portal is now in use. Services and data will successively be made available via the portal. In stages, the portal will be accessible for a larger circle of users. The portal includes WMS services and metadata published by a number of producers.

The National Board of Housing, Building and Planning's project Planeringsportal (The Planning Portal) will develop a Web service to support physical planning, urban and rural development, regional development planning, infrastructural planning and the localisation and granting of permits for buildings and facilities. It will be possible for companies, the local authorities, public sector authorities, organisations and the general public to search for, view and download almost all geographic information that is relevant for development and planning, activities via the portal. This will be possible irrespective of who has responsibility for the information.

The goals for the Planning Portal and the Geodata Portal are broadly similar. Some overlapping is unavoidable, but to minimise duplication of effort it is important that both projects handle common questions in a similar way. During the spring of 2007 the Board of Housing, Building and Planning and the Geodata Advisory Board reached an agreement that, in principle, the national Geodata Portal should be used for searching and providing the geodata and services required by the Planning Portal. In addition, during 2008, the two projects signed an agreement which, in principle, regulates responsibility issues and defines responsibility for different parts

of the work. The agreement also regulates organisation and principles for the co-operation. During 2008 the co-operation has resulted in the Geodata Portal and the Planning Portal sharing the same technical production environment.

#### **Future work**

The long-term goal for the technical infrastructure is that it should be based on a service-oriented architecture and built on communication via interfaces where services and applications work together via standardised messages.

In the proposal for a national framework for interoperability presented by the Swedish Administrative Development Agency (Verva), particular focus is placed on service-oriented architecture (SOA) as the most suitable for developing interoperability in the Swedish public sector administration.

SOA is based on the basic assumption that there are two parties, a service producer and a service consumer. The service producer provides and presents a well-defined activity – whilst the service consumer uses it without knowing or needing to be concerned about how the provider of the service has technically produced it.

The services can contain a high or low level of functionality and can, therefore, be major or minor. Most important is that the services satisfy the requirements of the intended consumer of the service. Services can be a combination of other services, which makes it possible to put together new selections of combined services based on existing published services which can then satisfy the needs of completely new or changed activities.

SOA supports and provides functionality in applications; systems and services, which can be made available for other applications, systems, services and users, in the whole authority /organisation. SOA handles objects/elements in business or authority processes and their basic IT services as standardised components. These can be combined, for example to make possible re-use of services to create new combined services and thereby speed up development projects.

The component services must satisfy the specifications and standards that have been developed by ISO (International Organisation for Standardisation), CEN (European Committee for Standardisation), OGC (Open Geospatial Consortium) and W3C (The World Wide Web Consortium) and also possible national profiles produced by SIS/Stanli.

There is a need for a continual exchange of experience in the SOA field and for guidelines which describe practical working methods and tools for achieving a long-term realisation of service orientation both conceptually and IT-wise. A first stage in this work has been initiated through the description of SOA that has been formulated by the Swedish Armed Forces, see Appendix 5.

**Service Level Agreement - SLA**

A service level agreement (SLA) is a negotiated agreement between two parties in which responsibilities are regulated. Normally, an SLA regulates issues such as services, priorities and warranties where the relevant levels are defined: the level of accessibility, usefulness, performance, use and similar issues. During the year work with the formulation of an SLA between the Geodata Portal and its service suppliers will be started. The agreements will be based on the set of rules and regulations which was adopted within INSPIRE. Initially the focus will be on establishing rules and regulations for how the provided services will be configured with regard to performance, stability in use and interfaces.

**The Geodata Portal**

Development of e-services in the form of portals is being carried out in several projects. The meaning of portal can, however, vary depending on the context. In this context, the portal is the starting point from which to reach data and services i.e. several entry points are combined at the same website. Via the portal it is possible to search for both web pages using a search engine index and for categorized links via a link catalogue. Other associated services — often related to a specific subject or phenomenon — can also be accessed.

The purpose of the Geodata Portal (www.geodata.se) is to create an access point to geodata and associated services. The Portal can be used for searching viewing and downloading information from different sources, which eliminates the need to collect data and services centrally. Data, services and applications should, as far as possible, be decentralised. The most important function of the portal is to provide a good overview of data and services that are available and where they can be found. Part of the contents and functionality will lie in the common portal, whilst other parts will, wholly or partly, lie with the co-operating organisations.

The figure below gives a general overview of the parts which make up the technical architecture that will be developed, and also who has responsibility for them. The architecture is divided into four layers. The Geodata Portal and applications are in the upper layer, which is directly visible for users. Via a service bus (Internet) and a Georights Management layer, which handles rights (prices, agreements, authorisation and more), the user can access the different services which, in turn, make available metadata and geodata. The Georights Management layer is a layer above the services, which means that other portals can also utilise the functionality. The top layer can be any type of portal or application such another authority's web page or an EC portal.

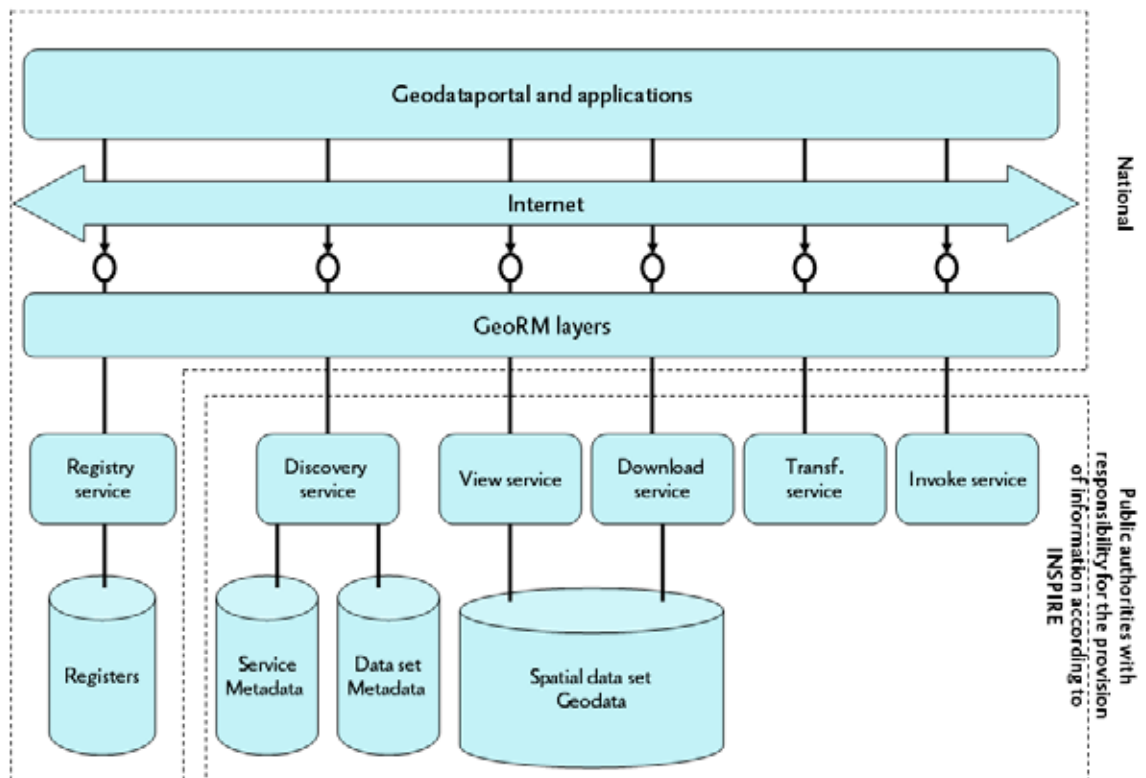


Figure 3: INSPIRE Network Service Architecture overview.

The architecture is being developed on a co-operative basis via the Geodata Project and by the respective public sector authorities. An example is metadata which is created by the respective authorities, whereas it is the Geodata Portal that ensures that it will be made available, by publishing it in the portal. A uniform search service and search application will make it easier for users to find geodata and services.

The aim, since the start of work on the strategy, has been to establish co-operation between the participating organisations via distributed solutions. The figure above is an illustration of the type of co-operation that is aimed at, where services are created and managed by the respective authorities. The services (and the geodata) can be accessed through an inhouse application or via the common Portal.

The Geodata Portal will be successively developed to offer increased functionality. The portal will also satisfy the requirements for data services laid down in the INSPIRE-directive and its implementation rules. In the first version of the portal, which is now available, priority has been given to search and retrieval functionality for metadata, but it is also possible to search, view and download geodata via WMS services. The demands that are placed on services as described in the INSPIRE implementation rules will steer future development work. In coming versions, the Portal's functionality will also be further developed so that instead of searching for individual sets of geodata it will be possible to search for data based on specific areas of use. A more fully developed portal technique, business model and administrative routines will be in operation in 2010.

On the longer term, the Geodata Portal will be the first choice site for publishing Sweden's geodata. In addition to functionality for searching, viewing and downloading, tools will also be available to support a fully webbased management of geodata and associated services from producer to user. This will represent the realisation of the business model which will be developed within the Geodata Project.

During next year focus will be on the successive development of techniques in and around the Geodata Portal to make it possible to satisfy future requirements in INSPIRE. The aim is to create a portal which functions in both a national and European environment.

The work that has been carried out in phase one of the Geodata Project concerning client and producer requirements and business processes, together with experiences gained during the technical development work, can be used as the basis for the future technical infrastructure for providing geodata. This technical solution, which is more advanced than the solution prescribed in INSPIRE, is expected to be able to be put into use at the beginning of 2010.

Co-operation with the Planning Portal will continue and, hopefully, valuable comments will be received from its users which can be of great benefit for work with the

national portal.

### **Historical data**

It is important, in many connections, not only to be able to access up-to-date geodata but also to be able to go back to the historical root data. In the technical infrastructure it is therefore important to develop methods for efficiently archiving historical data (at the respective supplier's site) and have access to time series via the Geodata Portal. These issues are still, to a certain extent, of a research character.

### **Action plan for implementation of the EC directive INSPIRE**

The INSPIRE-directive contains mandatory requirements concerning technical infrastructure. The involved authorities must develop a number of services so that their information can be accessed via the geportal. These services are:

- Discovery services which make it possible to search for geodata and services.
- View services which include possibilities to view, navigate and zoom
- Download services which make it possible to download geodata
- Transformation services which make it possible to transform coordinates and models.
- Services which make it possible to link up with data services (Invoke services).

This work may require modifications to the technical architecture.

Work within public sector authorities in this area is steered by the INSPIRE implementation rules concerning discovery and view services, download and transformation service (coordinate and model transformation services) and invoke services. Implementation rules for discovery and view services were approved by the INSPIRE implementation committee in December 2008. Rules for the remaining services are planned to be adopted during 2009 and 2010.

In addition to the mandatory implementation rules, recommendations for the respective services and the technical architecture will be available. The recommendations that will be issued in connection with the implementation of the directive will be followed when the Geodata Portal is developed. Deviations from the recommendations are, however, permitted in special cases where national requirements make it necessary

The work of public sector authorities with respect to this part will, in the same way as for the information structure, be clarified in the new Act and ordinance which deal with the implementation of INSPIRE.

### **Prioritised activities**

- Continued development of the Geodata Portal in accordance with the requirements of the INSPIRE-directive. In certain parts

of the work with the Swedish solution the timetable will be more ambitious.

- Quality-assurance and monitoring of the Geodata Portal and a continuation of the inquiry concerning authorisation requirements for use of services in accordance with the guidelines for GeoRM, which are developed within INSPIRE.
- Continued work to make service and data accessible for a wider circle of users and thereby receive additional feedback for use in the further development of the Geodata Portal. During the course of the coming year the intention is to make data and services from twenty or more organisations available via the Geodata Portal.
- Formulation of guidelines and help as support for the development of services.
- Continued work concerning exchange of experience and provision of advice and support to describe practical working methods for the realisation of service orientation (SOA). A working group should be established with the task of producing a common architecture for the geodata sector, based on the study of SOA that was carried out by the Armed Forces, (see Appendix 4) and the common architectural principles for administrations that have been established within the framework of the national work with the Swedish e-governance.

Several activities for the implementation of the INSPIRE-directive within this sector are named in Appendix 1.

#### 5.4 A national metadata catalogue

##### *Strategic goal:*

National metadata for geodata and services shall be available. Metadata shall satisfy the demands of adopted standards.

##### **Accomplished activities**

In connection with the development of the Geodata Portal a proposal for a Swedish profile for the metadata standard, SS-ISO 19115, has been prepared. In simplistic terms, a profile is a customised standard that has a special aim. The profile describes the metadata elements that should be included (mandatory as well as a number of voluntary) in the Swedish Geodata Portal and how these metadata should be described. The profile is based on the requirements that are given in the INSPIRE-directive and the draft set of implementation rules. In addition, a number of metadata elements, which are considered to be important for Swedish purposes, have been added.

During 2008 the Geodata Project has developed an application which makes it possible for respective authorities to create metadata. With the tools — a Swedish profile for metadata, guidelines and an application for creating metadata — it will be possible to build a national metadata catalogue.

To facilitate the implementation of the ISO metadata standard, SIS/ Stanli has translated the English concepts and definitions to Swedish. The results have been published in a technical report (TR 14, *Metadata på svenska*).

##### **Future work**

Now that the Swedish profile has been developed, the pre-conditions have been established for the respective authorities to create meta-data in a uniform way from both a national and European perspective. During the spring of 2009, the Swedish profile will be published as a technical report by SIS/Stanli.

The work will also include the development of tools for validation of metadata and the description of publication routines and guidance.

Routines for the publication of metadata will be further developed.

##### ***An action plan for the implementation of the EC directive INSPIRE***

INSPIRE's mandatory requirements regarding the national metadata catalogue imply that the involved authorities and organisations must create metadata for datasets and services. The implementation rules for metadata came into force in December 2008. The directive requires that metadata for datasets must be produced during 2010 for the data themes in Appendix I and II. For Appendix III the final date is during 2013.

The work that must be carried out by public sector authorities in this part, in the same way as for the Information Infrastructure and Technical Infrastructure fields, is clarified in the new Acts and ordinance which regulate the implementation of INSPIRE.

##### **Prioritised activities**

- The draft of a Swedish profile for metadata (SS-ISO 19115, 19139) should be circulated for comments, adopted and disseminated.
- The formulation of instructions which, on a general level, describe needs, handling and use of the metadata.
- Production of metadata in accordance with the Swedish profile by those public sector authorities that have responsibility for the provision of information.
- Improve search possibilities for available resources (data and services) and the extension.
- Communication activities and training.
- Quality assurance of the application of the Swedish metadata profile.

## 5.5 Geodetic reference systems

### *Strategic goal:*

All bodies that produce, manage, provide and use geodata should utilise the national geodetic reference systems, SWEREF 99 and RH 2000.

### **Accomplished activities**

A homogeneous geodetic reference system facilitates the production, processing and use of geodata and also makes compilation of data from different sources easier. There should, therefore, be a rapid transition to the SWEREF 99 (the Swedish realisation of the European geodetic reference system ETRS 89) and RH 2000 (the Swedish realisation of the European height system EVRS) reference systems. The transition to the new three-dimensional geodetic reference system, SWEREF 99, has so far been completed in approximately 100 local authorities which is an increase of 60 local authorities during last year. Preparations for a transition are in progress in a further 130.

A questionnaire was circulated amongst public sector authorities concerning the implementation of the new reference systems. The replies showed that 10 authorities plan to change to SWEREF 99 during 2009.

### **Future work**

The introduction of SWEREF 99 and RH 2000 will:

- facilitate the use of satellite techniques (primarily GPS and GLONASS) locally by the local authorities and in infrastructural projects, typically road and railway construction.
- minimise the need for transformation between different coordinate and height systems.
- facilitate the use of geodata from different organisations.
- decrease the need for duplicate storage of geodata.
- reduce the risk for incorrect height and positional data in emergency situations.
- reduce (primarily for local authorities) costs for the maintenance of local control networks.

Connection to the height system RH 2000 should be done for:

- precision measurement of heights, for example in connection with planning and documentation of sewerage and other in frastructural facilities.
- applications in which the new national heights model is used.

In the geodesy field there is very close European co-operation within EUREF (the European Terrestrial Reference System). In this co-operation there are stringent rules for how systems similar to SWEREF 99 should be developed. The Swedish SWEREF 99 system follows these rules and has been accepted within Europe as a

national realisation. RH 2000 also follows the equivalent guidelines for height systems that are to be found in EUREF. Within INSPIRE (and also GMES) it is prescribed that data exchange should be in ETRS89 and EVRS. SWEREF and RH 2000 are the Swedish equivalents.

The goal is that approximately 150 local authorities and 10 public sector authorities should have begun to use SWEREF 99 by 2009. By the end of 2010 approximately 250 Swedish local authorities will have adopted the system.

The subject of geodetic reference systems is part of the overall development work that is taking place in the geodesy sector in Sweden. So far, development has benefited from the fact that there have been strategic documents (KP85, Geodesi 90 and Geodesi 2000), which have been generally adopted by all involved parties. These documents contain descriptions of the current situation, visions and general plans which have been helpful in the co-operation that is necessary in this field. The time has now come to begin to formulate Geodesi 2010.

Development in the geodesy field is characterised by international co-operation and the close ties between research, development and every day practical activities. An example is navigation and positioning using satellite-based systems. The international and Nordic co-operation is carried out in relatively fixed forms. At times, national co-operation has lacked these fixed forms but, nevertheless, has functioned in a satisfactory manner thanks to active and enthusiastic individuals within research, public sector authorities, the local authorities and private companies. In connection with the work with Geodesi 2010, on the initiative of Lantmäteriet, a national geodesy forum has been formed in which national stakeholders in the geodesy field will be able to get together to develop both the geodetic infrastructure and further co-operation. Examples of issues that will be handled in the forum include:

- SWEREF 99 and RH 2000 and their temporal sustainability.
- The introduction of SWEREF 99 and RH 2000.
- Training.
- Standardisation.
- Manuals and "best practice".
- Active, permanent GNSS stations and networks similar to SWEPOS.
- Maintenance of our national and local municipal geodetic networks.
- Where necessary, measures to support the local authorities in the transition to SWEREF 99 and RH 2000.

### **Prioritised activities**

- Lantmäteriet has now started work on a new 10-year programme for geodetic activities in Sweden, called *Geodesi 2010*.

- Lantmäteriet has taken the initiative to create a national arena for handling strategic geodetic issues, the *Geodesiforum*.
- Lantmäteriet informs on the importance of a rapid adoption of SWEREF 99 and RH 2000.
- Lantmäteriet provides support to those who decide to adopt the new reference systems.
- Lantmäteriet continue to develop SWEPOS to ensure the availability of SWEREF 99 and RH 2000 data.
- Lantmäteriet, on a regular basis, follows up the introduction of the new reference systems with, for example, the help of regular questionnaires.

## 5.6 Research, development and education

### *Strategic goal:*

Sweden should have a system of co-ordinated research and development activities directed towards supporting the development of the infrastructure for geodata. These activities should be based on the need and possibilities for international co-operation. The provision of competence in the geodata sector, on the long-term, should be ensured through well-adapted basic and higher education and further education.

### Accomplished activities

An action programme for research, development and education in the geodata sector was formulated during 2008. In the action programme emphasis has been placed on describing the need for development and education to support the national efforts that are given priority in the Geodata Strategy. In addition, related R&D and education in geographic information techniques and development of geodata services is presented.

The action plan is divided into the following parts:

- A description of the needs for research, development and education in the geodata sector, with particular emphasis on the work that is needed to realise the goals of the Swedish Geodata Strategy.
- An overview of on-going research, development and education in the geodata sector in Sweden (including type, organisation, financing).
- An international comparison to help identify the prioritising that is done in other countries and what possibilities for co-operation exist.
- An overview of Swedish research in the geodata sector.
- An overview of the support for R&D and education in EU's funds and programmes.
- An analysis of the deficiencies that may exist in Swedish research, development and education in the geodata sector.

- A presentation of proposals – expressed as strategic goals and tangible efforts – to improve the preconditions for R&D and education in the geodata sector.

The principal purpose of the action programme is to encourage the different players – users and producers of geodata, research and development groups, the Research Council and decision-makers – to contribute to improving the preconditions for Swedish research, development and education in the geodata sector. In this way, the preconditions would be created to satisfy the aspirations and demands that are placed on the future provision of geodata, in accordance with the intentions of the Swedish Geodata Strategy.

The Geodata Strategy is based on step by step development. This applies particularly to the action plan for R&D and education as these areas are characterised by the need for a long-term approach and involve many groups. A foundation has been laid in the action programme as it describes both needs and possibilities.

A tangible result of the action programme is the development of an environment for testing data specifications, datasets and services. In its first stages, activities have been focused on evaluating proposed data specifications in accordance with Appendix I in the INSPIRE-directive. The test environment was established as a co-operative project involving FPX, Gävle University and Lantmäteriet and with participation of a number of other parties. Testing activities will be extended to include testing of national standards, the service-based exchange of geodata and net services. In addition, these activities will include studies of the prerequisites for the handling of verification and licensing of data and services.

In addition, education programmes will be developed at a number of universities, within SIS/Stanli and by other parties to support the implementation of the Geodata Strategy.

Within SIS/Stanli, planning of a general training package to satisfy the requirements for training in the national infrastructure is in progress. The technical committee for metadata (TK 489), together with the Geodata Project, is studying the possibility of arranging 3-4 seminars in different parts of Sweden at which to present the meta-data profile and describe how metadata can be created using the editor that has been developed within the Geodata Project.

Through co-operation between SIS/Stanli, the University of Lund and Lantmäteriet a webbased training programme to provide information about INSPIRE, the national infrastructure and standards has been developed. In addition to these training initiatives, discussions concerning the preparation of a programme concerning services have been started.

Lantmäteriet plays an active role in the work of EuroSDR (European Spatial Data Research) which, amongst other activities, develops research programmes

and initiates projects directed towards supporting the development of competence in the infrastructure and geodata sectors.

It should also be mentioned that Lantmäteriet also participates in several EU-financed R&D projects aimed at developing the European infrastructure for geodata. These include ESDIN (European Spatial Data Infrastructure Network), which is a project that includes the development and testing of data specifications and net services in accordance with the INSPIRE-directive, and Euradin in which a common European solution for handling information about addresses is being developed.

The government's research-political bill (2008/09:50) can directly or indirectly have implications for the geodata sector.

### **Future work**

In the action programme, a number strategic goals have been identified which can lead to improving R&D and education activities. These include:

#### ***Create a better national overview and develop better co-operation:***

A strategic goal is to prepare one single listing of R&D and education needs on which to base priorities and stimulate increased co-operation.

#### ***Clarify where the responsibility for research in the geodata sector lays***

A strategic goal is that one or several research councils should be given full responsibility for handling R&D issues within the geodata sector.

#### ***Create a list of all R&D funding for projects which support the Geodata Strategy***

With links to the government's action plan for e governance and this action plan for R&D and education, a programme should be formulated and a full presentation of available funding made. A strategic goal is that joint efforts should be made to begin the research and development work that is needed in order to realise the goals set up in the Geodata Strategy.

#### ***Develop better international co-operation***

Swedish research in the geodata sector has a relatively well-established contact network and a good overview over international research activities, but co-operation in specific programmes and projects is far too limited. A strategic goal is, therefore, to create the pre-conditions for better international co-operation. International co-operation in the development of models and frameworks for infrastructure for geodata is also important. This applies not only to the implementation of INSPIRE but also to the co-operation which is taking place between other parties, such as between defence authorities.

#### ***Establish test environments***

A strategic goal is to develop test environments in which to verify service-based exchange of data in accordance with the Geodata Strategy and that the net services, which are required according to INSPIRE, function in a working environment. The test environments should function as a focal point for producers, users and researchers. The goal also includes making it possible for users within the R&D and education fields to utilise data and services from public sector suppliers of geodata. An example is the development of the Digital Map Library to include increased volumes of data and more services.

#### ***Stimulate development in the private sector***

A strategic goal is to create better pre-conditions for the development of the private sector in the geodata sector through, for example, close co-operation between the universities, public sector administrations and the private sector in so-called public-private partnerships.

#### ***Ensure that the necessary competence is available***

A strategic goal is to satisfy the need for competence by co-ordinated efforts to recruit persons to further education and training as researchers.

#### **Prioritised activities**

As is stated in section Accomplished activities much has been done to achieve the strategic goals that have been set up for R&D and education. However, much work still remains and during the next few years it is proposed to concentrate on the following activities:

- Evaluate the level of interest and the possibilities to establish an R&D forum with the task of creating an improved national overview and co-operation within the R&D and education fields. The forum should include representatives from the universities, public sector administrations and the private sector.
- Act to ensure that one or several research councils are given full responsibility in the geodata sector and that dedicated funds are made available for the research and development work that is required to support the implementation of the Geodata Strategy.
- Develop collaboration with various bodies in Europe by, for example, signing long-term technical collaboration agreements with the EU's research organisation, the Joint Research Centre.
- Continue to develop test environments, for the service-based exchange of data and services in accordance with the model that is described in the Geodata Strategy.
- Continued work on the development of training modules that can support the development of courses for a broader education in the geodata sector.

- Investigate whether any part of the research- political part of the government bill (2008/09:50) can impact on R&D in the geodata sector.

## 5.7 Legal framework

### *Strategic goal:*

The legal framework should be clear and unambiguous concerning terms and conditions for exchange and use of geodata. They should reflect a balance between the needs to protect important national interests (security, vulnerability and integrity) and user demands for ease of access to geodata. The legal framework should also make possible a service-based exchange of data and the efficient management of information.

### Accomplished activities

#### *The government's action plan for e-governance*

In January 2008 the government presented an action plan for modern e-governance. Special focus will, according to the plan, be placed on creating a legal framework for co-operation between public sector authorities and for handling information of common interest. The aim is that there should be a framework which makes possible co-operation between sectors concerning e-governance and an efficient handling of information which will make the information easily accessible and usable whilst, at the same time, taking into consideration integrity and security aspects. Activities that have been given priority during 2008 include clarification of the conditions for the further use of public sector information, in accordance with the directive PSI and implementation of the INSPIRE-directive.

#### *Implementation of the INSPIRE-directive in Swedish legislation—a proposed law*

In December 2008 the government proposed that the INSPIRE-directive should be implemented in Swedish legislation through an Act and an ordinance. The proposal entails that the present Act (2005:181) on environmental information held by certain individual organs will be rescinded and replaced by a new Act on environmental information.

The proposal for a new environmental information Act will contain a number of basic rules and definitions and authorise the government, or the public sector authority appointed by the government to publish the rules. The most applicable rules are proposed in the new environmental information ordinance. It is proposed that Lantmäteriet should have responsibility for coordinating the Swedish infrastructure for geodata. The public sector authorities (and possibly local authorities and private organisation) that will have responsibility for information are identified in chapter 3 in the proposed

environmental information ordinance.

The proposal was sent to public sector and local authorities, and to a number of other organisations, on 22nd December 2008 for consideration and comments and replies should be received before the 16th March 2009. The new rules are expected to come into force during the autumn of 2009.

### Future work

A key issue in the continued work with the legal framework is determination of the scope of the amendments to the legislation that may be required to reach the strategic goal for this work. Inquiries that have been previously carried out and which are still on-going must be taken into consideration. A further prerequisite is that the work is carried out systematically and that the background materials are comprehensive include an identification and analysis of possible problem areas and that the results are validated on a legislative level.

The strategic goal is that the rules should be clear and unambiguous concerning conditions for exchange and use of geodata. They should reflect a balance between the needs to protect important national interests (security, vulnerability and integrity) and user demands for ease of access to geodata. This strategic goal is generally in line with the government's action plan for e-governance. In this connection, it should be pointed out that the goals in the government's action plan presupposed a well-functioning infrastructure for geodata. In many instances, geodata is an absolute pre-requisite if other information is to be assembled and presented.

It may be difficult to achieve these goals because of a conflict with current legal models for public sector activities, particularly in the case concerning activities related to the provision of information, such as that in the geodata sector.

To achieve the goals, public sector authorities with responsibility for information issues must co-operate regarding storage of information and how it is made accessible. This means that a solution must be found regarding for example, common financing, the setting of fees, responsibility for activities, responsibility for personal data and responsibility for confidentiality. The present legislative models for these issues are based on a decentralised approach.

For the development work that is at present being carried out within the geodata and several other fields there are two possible alternative solutions: either to propose rules regulating common and overarching issues in all relevant legislation, or to propose a new legal framework which makes possible a common approach to all common issues. Both solutions will be comprehensive and time-consuming and presuppose a step-by-step approach. The final choice of solution will have a major impact on the complexity of the infrastructure for the provision of information that is now being built up in the digital society.

Characteristic for all infrastructures, both less complex and more advanced, is that they affect the whole of society and are thereby of a long-term character. To make changes to an infrastructure after it has been finalised will be very expensive.

It is difficult to definitely decide in advance which solution should be adopted for geodata, even though preliminary investigations do appear to indicate that the most suitable would be a general geodata law. (In this connection it should be pointed out that the INSPIRE-directive forms a framework for common issues for geodata). It is necessary for the government to clearly state its position regarding issues concerning both e-governance and geodata.

Until a decision is reached, it is important to define and delimit the first steps in the coming — and necessary— legislative development. This includes ensuring that the new, proposed legislation, such as those that are a consequence of the implementation of the directives INSPIRE and PSI, as far as possible reflect a long-term perspective

#### **Action plan for implementation of the EC directive INSPIRE**

As has been mentioned above, the implementation of the INSPIRE-directive is a vital stage in the development of relevant legislation. The starting point for the implementation of the directive in Swedish legislation is the same as for other parts of the geodata sector.

#### **Prioritised activities**

- Define and delimit the first stage in the legislative development in the geodata sector. This should be done against the background of the government's goal in accordance with the action plan for e-governance. (Lobbying of the e-delegation should be started).
- Ensure that the INSPIRE-directive is included in Swedish legislation with a long-term perspective for the information infrastructure.
- Lantmäteriet should, in its role as co-ordinator for INSPIRE, be given the possibility, in consultation with the involved public sector authorities, for issuing instructions concerning the authorities' responsibility for information and for developing information-management services and metadata.
- An inquiry should be initiated with the aim of investigating, in depth, the consequences of the above-named common issues. Amongst other issues, the inquiry should focus on defining specific needs for and the purpose of the use of personal data (This includes identifying who needs the information, why it is needed and how it is intended to be used). A special area in this connection is identifying where there may be a lack of

clarity regarding responsibility for personal data in connection with the authorities' co-operation concerning geodata.

## **5.8 Financing and price models**

### *Strategic goal:*

The financing of geodata should be sustainable on the long-term and provide the pre-conditions for co-operation between the public and private sectors.

Price models should be flexible relative to value, way of use and user category. The models should encourage a wide use geodata and the price level should be as low as possible.

### **Accomplished activities**

Work with the financing models, the price models and models for cost-benefit analysis is part of the Geodata Project. Work on the models began during the spring of 2008 and the intention is to produce a concept for a business model, in which the models for financing and prices are important components, in June 2009.

During 2008 a number of financing and price models, developed by suppliers and producers for the provision of geodata, have been studied. In addition, studies have been carried out concerning special requirements, demands and expectations that exist with regard to future financing and pricing in the geodata sector.

The aim of the study has been to discover which types of financing and price models are most common and, thereafter, to discuss principles for financing and setting prices, as part of feasible, homogeneous, simple and transparent business models in the geodata sector. Costs and revenue from handling geodata and the possible economic impact of the Geodata Portal have been discussed.

During the study, a need was expressed for uniform, simple and transparent price models for handling geodata in the Geodata Portal. These are considered to be of great importance for its success. This presupposes that national guidelines for price models are produced. There have been several proposals that no charges should be made within the framework of co-operation between public sector authorities but that conditions should be set regarding the quality of data. The reverse principle has also been proposed: that fees should always be charged in order to guarantee the quality/ actuality of the supplied products.

During 2008, a cost-benefit analysis was carried out within the Geodata Project, with the support of the so-called PENG model (see [www.peng.se](http://www.peng.se) for more information about the model), with the aim of obtaining a better perception of the size of the costs and the benefits that will be the result of the implementation of the Geodata Strategy. A number of public sector authorities, one local authority and two consultancy firms participated in the study.

The results of the cost-benefit analysis showed that implementation of the Geodata Project will result in several, significant benefits. The pre-requisites exist for the project to be a strategic and judicious investment for society, private organisations and users. There is a more detailed presentation of the analysis in the report *Affärs- och verksamhetsmodeller för Geodataportalen* (Business and Enterprise Models for the Geodata Portal). The main areas in which investments and financing models are needed are:

#### **Implementation of the INSPIRE-directive**

The cost of implementing INSPIRE will initially be borne by the public sector authorities that have a responsibility for providing the datasets that are covered by the directive. The costs will occur during the period 2008 – 2019, depending on the datasets. The costs will be for: the creation of metadata, the transformation or adaptation of data in accordance with the implementation rules, which will apply for the respective data sets, and the creation of the services that are prescribed in the directive.

#### **Co-ordination**

The common, national costs are for management, information, legal support, advisory services and research and development resources and the preparation of manuals to support adaptation to the INSPIRE-directive. There is a need for increased financing for these activities as part of the national co-ordination role.

#### **Development, operation and management of the national Geodata Portal**

There will be common national costs for development and, on the longer term, for the management and the development of the Geodata Portal. Even if the processes in the national Geodata Portal can be automated for clients and suppliers, there will still be a need for manual work. At present, a great deal of time is taken up by client support which is not related to the purchase price or agreement. There will be a need for a client service organisation. The administrative handling of the co-operation agreement, suppliers, partners and others must also be given consideration. Initially, this will give rise to significant costs. Through co-operation with suppliers it should be possible to reduce total costs, particularly on the longer term.

#### **Data structure and data quality**

As a consequence of the INSPIRE-directive and the development of the national provision of geodata, public sector authorities' datasets and services will need to be adapted to satisfy new requirements concerning standards, structures, interfaces and more.

#### **Investments in IT**

By creating a common Geodata Portal and an infrastructure for the provision of geodata nationally the need for investments in information technology will be lower than would be the case if all government agencies and organisations were to make their own investments. Initially, however, investments in information technology will increase since major adaptations will be necessary to satisfy client needs and the demands of the INSPIRE-directive.

#### **Future activities**

The development of a national infrastructure for geodata will require a long-term approach, perseverance and investments. This will be necessary if the geodata sector is to be able to contribute to the development of Swedish e-governance in an efficient manner. Future work should be focused on creating clear pictures of the size of the investments that will be necessary to ensure that the Geodata Project and the Swedish implementation of the INSPIRE-directive is not hampered because of an unclear financing situation.

One of the reasons for carrying out the work in stages is to be able to present, as quickly as possible, tangible results which demonstrate the benefits in the of the work. At the same time, it must be clearly stated that it will take between five and ten years for the benefits to be fully visible. Those organisations which, today, provide the major part of the investments, in most cases, are not those which will feel the greatest benefits of the investments. This situation requires financing solutions which, better than today's, take into account the demands for increased co-ordination and collaboration in the national development work.

#### **Price models for geodata**

Developers and suppliers of geodata have clearly expressed their interest in the development of the Geodata Portal which they consider will benefit both users and themselves. There are expectations that the portal will provide a common entry point to geodata and lead to an increased and broader use both internally and externally. The value of simple, transparent and homogeneous business models is stressed.

Discussions concerning general price models must have the public sector authorities' different financing requirements as a starting point. The aim should be to develop flexible and homogeneous price models which easily can be adapted to satisfy the needs of different suppliers and be acceptable for all involved parties, both suppliers and clients, as well as the market as a whole. A basic principle should be that price models and price levels for similar services are the same, irrespective of who provides them. Otherwise, the way organisations set market prices for their services is, to a large extent, an internal issue although there should be a certain degree of co-ordination between different suppliers.

Initially, there will be common price and financing models for geodata that is handled via the Portal. In the future, there will also be other channels for providing geodata for which supplier-specific pricing principles will apply. An urgent task will therefore be to, as far as possible, harmonise the different principles to make the situation easier for both suppliers and clients.

An important part of the discussions concerning price models is also the issue of principles for payment for digital services involving geodata that can be expected in the future. Ultimately, the choice is between free and pay services. In the discussions on free services tax financing is often mentioned. The arguments that are forwarded in support of tax financing are that the provision of geodata is a public sector commitment that can be expected to generate benefits in the public sector and stimulate a wider use of geodata in society as a whole.

The issue of financing the running and management of the portal must be included in discussions concerning price and financing models. In simplistic terms, there are three possible alternatives: central financing with earmarked State funding; secondly, decentralised financing based on contributions from the organisations that cooperate in running the portal; and thirdly, financing through a combination of State funding and joint contributions. Discussions are still in progress and a number of proposals for possible forms for financing the portal have been made, but they need to be further expanded.

#### ***Action plan for implementation of the EC directive INSPIRE***

Implementation of INSPIRE will imply, amongst other things, that public sector authorities that supply data or services can licence their use and charge fees. Licences and fees must be compatible with the general goal to facilitate use of the data and services by the authorities and therefore kept at as low a level as possible. It should be possible to set fees so that availability and quality of the data and services are ensured.

There are a number of mandatory requirements in the directive concerning the public sector authorities' price models, such as that net services for searching and viewing must be provided free of charge. In order to establish and provide the services that are prescribed in the directive, price models must be developed. A financing model for the national Geodata Portal must be determined in a dialogue with the government.

#### **Prioritised activities**

- Develop price models for geodata.
  - Develop agreement and licensing models for geodata.
  - Develop a financing model for the Geodata Portal.
  - Develop a general business model for the Geodata Portal
- Introduce an automated business process for the Geodata Portal.
  - Continued work with the cost-benefit analysis for delivery and receipt of geodata.

## 6. Development in stages

The establishment of an infrastructure for geodata based on this strategy will present many challenges and there will be a need for development both in the public sector administration and in the private sector. The development of these activities, development of competence and technical development should be done hand-in-hand with the support of an offensive R&D policy.

An important key to success is that development takes place in stages and that the co-operating parties and the Geodata Advisory Board all work towards the same goal and continuously monitor the results of the work that has been carried out. The strategy for the implementation should therefore be to:

- be able to quickly present tangible results that demonstrate the value of the infrastructure.

- continuously monitor measures that have been carried out, learn from experiences and be prepared to revise plans when necessary.
- maintain close contact with users of geodata and geodata services.
- continue to extend co-operation.
- increase the level of participation.

The planned activities are related and are internally dependent within and between the sectors of activity. There are also significant differences concerning the time taken and resources needed between the different activities and it is, therefore, vital that should be steered both functionally and from a time point of view. The division into stages and the timetable shown in the figure below illustrate these relationships and inter-dependence.

Implementing rules	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Metadata Appendix I-II		Implemented									
Metadata Appendix III					Implemented						
Data-sharing (on EU-level)	Consideration	Implemented									
Coordinate transformation services	Consideration		Implemented								
Download services	Consideration		Implemented								
Transformation services		Consideration		Implemented							
Invoke services		Consideration		Implemented							
Interoperability (specifications) Appendix I	Consideration		A					B			
Interoperability (specifications) Appendix II-III			Consideration			A					B
Discovery- and view services		*	**								
Monitoring and reporting											

A = newly collected or extensively restructured data

B = Available data

\* Preliminary timetable for implementation.

Services must follow the requirements of the implementation rules concerning functionality, but do not need to satisfy quality demands. Services do not need to be accessible via the INSPIRE Geoportal.

\*\* Preliminary date for implementation.

Services must follow all parts of the implementation rules and be able to be accessed via the INSPIRE geoportal.

Figure 4: Timetable for the INSPIRE implementation rules.

The Geodata Project	Jan - Nov 2008	Dec 2008 - Jun 2009	Jun 2009 - Jun 2010
Demands-, needs- and cost-benefit analysis			
Version 0.5 of the Geodata Portal	Fas 1		
Designing architecture for the business model			
Version 1.0 of the Geodata Portal: security solution, improved functionality for searching		Fas 2	
Implementation of the business model: agreements			
Version 2.0 of the Geodata Portal: the business model implemented in the Geodata Portal			Fas 3

Figure 5: Timetable for the Geodata Project

## 7. Consequences and follow-up

### 7.1 The cost-benefits of a national infrastructure for geodata

Currently, there are few examples of evaluation of the consequences of the establishment of a national infrastructure for geodata. In a study carried out in 2006 (Addressing the Impacts of Spatial Data Infrastructures, Report of International Workshop on Spatial Data Infrastructures, Cost-Benefit/ Return on Investment, EUR 22294 EN, 1/2006), the European Union's Joint Research Centre (JRC) made an assessment of the socio-economic impacts of an infrastructure for geodata. The report stated that the calculation of costs should include costs for development, operation and maintenance as well as for co-ordination, advisory services and support and amendments to the legislation.

There are also few evaluations of the benefits of an infrastructure for geodata. In the JRC's assessment of the socio-economic impacts it is stated that following main benefits could be identified:

- Direct benefits of increased efficiency in the form of savings in time and money.
- Indirect benefits of increased efficiency in the form of better integration of data and information technology systems, increased tax revenue, better monitoring and evaluation of activities
- Socio-political benefits, which include:
  - Benefits for the general public, such as better access to information, better insight and greater possibilities to participate and influence.
  - Benefits for administration and management, such as better collaboration on a wider basis between different groups, better political acceptance.
  - Benefits for the private sector, such as more innovations, research that is more focused and of better quality, new business opportunities, and new areas of use and job opportunities.

The assessments presented in the report show a positive correlation between benefits and costs. At the same time, it is pointed out that the major investments are made at the beginning of the period and that the results of them will first be apparent after 10 to 15 years.

In the consequence analysis of implementation of the INSPIRE-directiveS that was carried out under the leadership of the Commission it was pointed out that the direct benefits in efficiency would be tangible in the following tasks:

- Searching for information in connection with environmental impact assessments. Comparable savings can be made in connection with real property value assessments, design and planning of infrastructural developments.
- Environmental monitoring. Comparable savings can be made in, for example, forestry planning.
- Acquisition and planning of nature protection and other nature conservancy tasks.
- A reduction of duplication of effort in connection with data collection.
- Preventive measure at and aftercare in connection with, for example, floods, storms and chemical discharges.
- More efficient EU reporting.

In the Commission's consequence analysis it is stated that the net benefits for environmental issues alone would be of the order of € 1 billion per year within the Union. The value per member state would, on an average, amount to between € 35 and 40 million annually.

The directive contains requirements (for example, in Article 7), for cost-benefit analyses to be carried out in connection with the development of the implementation rules. The method that is cited is called a multi-criteria analysis and implies that alternative solutions should be described and compared with each other in order to assess whether costs for a higher level of ambition, such as how comprehensive a specification for a data theme should be, are matched by increased benefits.

In many countries work is in progress to develop methods for carrying out cost-benefit analyses of the creation of infrastructures for geodata and to develop indicators for comparing how well solutions in different countries function. The JRC has organised special workshops and compiled the results of the attempts that so far have been made. In Sweden, research is required concerning methods for cost-benefit analyses in this

sector, as has been pointed out in the action programme for R&D and education in the geodata sector.

## 7.2 Consequences of the implementation of the Geodata Strategy

Implementation of the Geodata Strategy will, primarily, have the following consequences:

- The introduction in Sweden of an infrastructure for geodata in accordance with this report will contribute to sustainable development of society. The requirements of the INSPIRE-directive can be met. The principal purpose of the directive is to serve as a means for following up and monitoring environmental developments but it has, naturally, also important uses for other activities.
- The implementation of the strategy presupposes close co-operation between involved parties. It also presupposes that these parties actively participate in the work and contribute with resources for its implementation.
- Future steps towards closer co-ordination of public sector and private-sector activities will be promoted. The Geodata Strategy will increase accessibility of geodata and create pre-condition for an increased use of data. Use of the data promotes growth and stimulates the development of the private sector.
- The strategy is based on the use of modern information technology, which will call for research and development and the development of competence.
- Implementation of the strategy will require changes to the present set of rules in the geodata sector.
- Issues concerning security, vulnerability and personal integrity will be given prominence. Security issues must be analysed from a general authority responsibility perspective.
- The strategy contributes to the development of efficient e-governance and is in line with the government's action plan for e-governance.
- The strategy may influence roles and division of responsibility between public sector authorities. In addition, local authorities will be expected to accept an increased responsibility for the provision of information. These changes can occur as the result of informal agreements between public sector authorities and formal agreements with local authorities and companies. This will open up possibilities to provide incentives to encourage as many groups as possible, including small groups, to cooperate.

- The strategy formally confirms and defines Lantmäteriet's role as co-ordinator for the provision of geodata
- The strategy provides the pre-conditions for insight by the general public and increased democratic influence.
- On the long-term, the strategy will result in reduced costs for the national provision of geodata.
- The strategy will lead to an increased use of geodata at all levels of society.
- Implementation of the strategy can result in a need for re-allocation of resources between different organisations and areas of responsibility and, most certainly, between work packages
- The provision of geodata will be given a clear user focus.

## 7.3 Consequences of the implementation of INSPIRE

During 2008 the government gave Lantmäteriet, in consultation with the Swedish Environmental Protection Agency, the task of analysing and evaluating the consequences of the implementation of the INSPIRE-directive.

A report was submitted to the government in November, see Appendix 3. The report contains a presentation of the national economic consequences of the benefits (= positive national economic consequences) and costs (=negative national economic consequences) that would be the result of the implementation of INSPIRE. In the consequence analysis, benefits are compared with costs in a cost-benefit analysis. The analysis is completed with an assessment of how these benefits and costs will affect involved players.

The consequence analysis is mainly based on information from three different sources:

- A so-called PENG analysis, which was carried out by the Geodata Project during September and October 2008.
- A questionnaire that was sent to those public sector authorities that were considered to have responsibility for providing information in accordance with INSPIRE.
- Literature studies which have provided complementary estimations of the benefits for society of INSPIRE based, for example, on international experiences.

Figure 6 is a summary of estimated benefits and costs from a distribution perspective. It should be noted that these are only relatively uncertain estimates, and that the estimations of benefits consistently underestimate the total benefits. There are three reasons for this underestimation:

- 1) Only the proven benefits from the PENG analysis have been taken into account in

Figure 6: Costs and benefits of the proposed plan for INSPIRE, concerning activities and types of involved parties. The figures in the table below have not been rounded off, which means that it is possible to deduce the underlying estimates. It must therefore be emphasized that they should not be understood to be reliable de-spote the impression of precision.

Activity	Total benefit in SEK million during the period 2007- 2020 on current terms (interest=4%) (undiscounted values in brackets)	Comments concerning the certainty of the estimates of benefits	Total costs in SEK million during the period 2007- 2020 on current terms (interest=4%) (undiscounted values in brackets)	Comments concerning the certainty of the estimates of benefits	Other comments
The Geodata Project: suppliers of data	266 (-341)	Refers to "proven" benefits in the PEN G analysis. Thus probably underestimated.	2 000 (2 340)		To avoid duplicated figures the benefits for Lantmäteriet, SGU and the Swedish Road Administration have not been included.
The Geodata Project clients, retailers and data processors	473 (-619)	Refers to "proven" benefits in the PEN G analysis. Thus probably underestimated			To avoid duplicated figures the benefits for Lantmäteriet, SGU and the Swedish Road Administration have not been included.
The Geodata Project: other sectors in society.	449 (-554)	Most probably an underestimate.	0 0		
Consequences for the public authorities that have responsibility for provision of information.	564 (-755)	Probably an underestimate.	230 (-251)	Probably an underestimate.	To avoid duplicated figures the benefits for Lantmäteriet, SGU and the Swedish Road Administration have not been included.
Consequences as a result of Lantmäteriet's responsibility for coordination	Benefit has not been specifically estimated, but is probably included in the above-mentioned estimates.		287 (-359)		
<b>Total</b>	<b>1752</b> <b>(2 317)</b>	<b>Most probably an underestimate</b>	<b>2 517</b> <b>(2 950)</b>	<b>Uncertain estimate.</b>	
Benefits have been systematically underestimated due to: 1) Very restricted use of the results from the PEN G analysis 2) Benefits for organisations do not have responsibility for providing information have not been calculated and 3) many of the identified national benefit factors have not been quantified. This underestimation is not considered to be present on the cost side.					

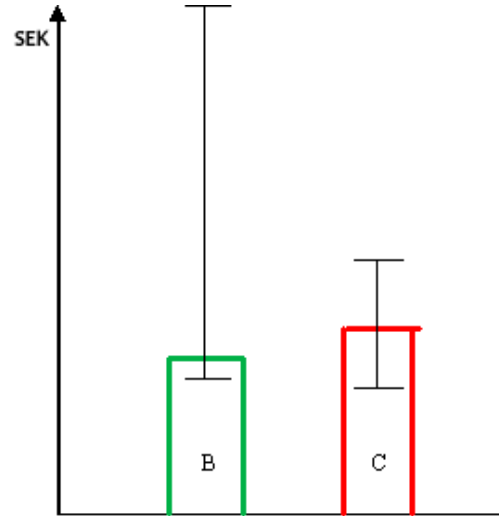
the analysis. It is likely that a proportion of the less certain and the uncertain benefits also happen, but it is uncertain how large this proportion will be.

- 2) The benefits for organisations that do not have responsibility for the provision of information, and which did not participate in the PENG analysis, have not been taken into account. The benefits for these organisations are potentially very large, particularly from the private companies (estimates of costs do not suffer from this problem since it is, above all those authorities that have a responsibility for providing information that have costs as a consequence of the directive and the Geodata Project).
- 3) The benefits for society as a whole that have been estimated in this consequence analysis constitute only a few specific cases for which it has been possible to make financial estimates. There are a number of other potentially large benefits for society in general. Some of them have been identified, such as the impact on democracy, the environment, business and the general benefits that arise as a result of better physical planning. Therefore, it's very likely that there will be major benefits to society in addition to those presented in Appendix 3.

With reference to items 1), 2) and 3) above, it is likely that the accumulated benefits of the implementation in Sweden of the INSPIRE-directive will exceed the total cost. This conclusion cannot, however, be scientifically proved at present, but it does seem probable that more data would provide confirmation. The figure below illustrates in principle the conclusions concerning the estimate of costs for and the benefits of the implementation of INSPIRE in Sweden. As can be seen from the figure, there is a considerable risk of underestimation concerning benefits whereas with regard to costs the risk for incorrect estimates (uncertainty) is both on the plus and minus side.

In the questionnaire that was sent to public sector authorities they were also asked to indicate their need for financing for the period 2007-2020. A total of 13 authorities replied that they had a need for financing which amount to a total of SEK 658 million. To accomplish the implementation of the directive in accordance with Swedish legislation, the government should provide these authorities with the necessary sources.

Figure 7. An illustration of estimated costs and benefits with interval of uncertainty. B= Benefit, C= Cost



#### Prioritised activities:

- a) prepare more accurate cost estimates.
- b) investigate costs and benefits for the business sector, for organisations that do not have responsibility for providing information and for local authorities.
- c) present and make an evaluation of the impacts on society as a whole in more areas such as, the environment and democracy and the potential impact as a result of improved national physical planning.

#### 7.4 Follow-up

In accordance with Annual Appropriations Directions for 2009, Lantmäteriet must submit a description of how work with the Swedish Geodata Strategy is progressing by the 31st of March 2010. An integral part of the report will be a presentation and follow-up of activities that have been carried out and those that are in progress. The follow-up should be co-ordinated with the national supervisory and reporting work in accordance with the INSPIRE-directive. INSPIRE requires every member state to monitor the development and utilisation of its infrastructure for geodata. The first report should be submitted by 15th May 2010. The results of the monitoring should be made available for the Commission and the general public. Monitoring should be carried out with the help of a number of indicators, which are approved and regulated in the implementation rules for the directive.

The indicators will be divided into three groups: Metadata, Datasets and Services and should show whether or not a requirement in the directive has been met. In some cases, they should be given as a share, depending on the size of the total area for the relevant datasets that satisfies the requirements.

In addition to the annual follow-up of the indicators, a report that describes the implementation of INSPIRE

must be submitted to the Commission every third year. The report should include, amongst other items, information concerning co-ordination of the implementation, quality assurance processes, and possible methods for certification, an overview of the involved parties and agreements for data sharing, possible obstacles for data sharing and a cost-benefit analysis.

The most important requirements in the directive that must be satisfied are: that metadata should be produced, that metadata, datasets and services are in accordance with the implementation rules, that services can be carried out at an acceptable speed, that there are no unnecessary obstacles that impede the exchange of datasets between public sector authorities and that there is a suitable structure for co-ordination.

During the autumn of 2008 the GISCentre at the University of Lund carried out a pilot study of how the INSPIRE indicators can be integrated into a framework based on a balanced scorecard. The principal advantage of this type of scorecard is: the possibility to obtain a broad overview of the implementation of the infrastructure, the possibility to compare different indicators with each other and that graphical software is developed for following up the development of indicators on a temporal basis.

The task of the National Geodata Portal is to satisfy a number of defined requirements, some of which are approved in the INSPIRE-directive, others that have been approved on a national level. Within the Geodata Project research is being carried out (partly financed by funds from Vinnova) one of the aims of which is to create instruments and methods for measuring how well the Geodata Portal satisfies the requirements of the INSPIRE-directive and how well it satisfies identified national requirements. The aim is to develop and test methods for making regularly repeated measurements of how well the National Geodata Portal satisfies the defined requirements.

# Concepts and terms

*Some of the concepts and terms that occur in this document are explained below.*

A **business model** describes the business logic in an organisation. It defines the value of the services that the organisation provides to one or several client groups, how it is done and through which channels. The model also describes how the value of a product or service is created in relation to partners, suppliers and the organisation's own human resources. The goal is to create profitability and sustainable revenue as well as to minimise costs.

**Application** In the Geodata Strategy context the term is used for a software program for searching for or using geodata, such as support for an activity or for handling a procedure (case). An application can call a service.

**User** in the context of this report is seen in a wider perspective ranging from an individual member of the general public and public sector authorities to companies in Sweden and Europe as a whole. A user is every individual, organisation, public sector authority or company that has a need for geodata, including producers and developers of different types of value-added products. In some connections, client is a more precise concept than user, for example for persons involved in the production of value-added products based on geodata.

**Geodata** is data that describes a phenomenon including its geographic location.

Note 1: A geographic location is given directly in a geodetic reference system, or indirectly.

Note 2: Geographic information and geographic data are frequently used as synonyms for geodata.

Note 3: Geodata can be measured, computed, estimated or defined in some other way. (Geodata in the form of prognoses or scenarios are not included.)

**Public sector authorities with a responsibility for geodata** – authorities that have a responsibility for providing geodata in accordance with the INSPIRE-directive.

**Interoperability** is the capacity of a system or component to function together with other systems or components without any special measures being necessary.

**Metadata** is information that describes data and services so that search, inventory and use of data and services are possible.

**Co-operation model** describes how a number of organisations inter-act in one or several activities.

**SOA – Service Oriented Architecture** – refers to a distributing function without central steering that are provided by different systems as services. See Appendix 5 for more information.

**Services** Service has different meanings depending on the context. The concept service can be used in a strictly technical context to describe a software program that supports interaction between computers via a network. Services that are well-defined and independent communicate with each other and serve other functions, such as applications, via the Internet. Services can, for example, retrieve, compile and deliver geodata. In general terms, a service can be described the way in which a consumer's needs are set against the supplier's competence to deliver.

**Enterprise model** is a structured definition of an organisation, its internal structure and its relationship with the world outside. The enterprise model is a part of the enterprise's architecture, an over-arching framework for structuring activities and information technology.

# References

The following references are available in Swedish on the Internet, in Swedish, at [www.geodata.se](http://www.geodata.se):

- Report on phase 1: Business and enterprise models for the Geodata Portal.  
(Lantmäteriet´s reg.nr. 505-2008/173)
- Report from a futurological study”Digital services based on geodata – perspective and future assessments”.  
(Lantmäteriet´s reg.nr. 505-2007/1252)
- The Swedish Environmental Protection Agency’s action plan.  
(Naturvårdsverkets Verksprotokoll no. 178-08)  
Lantmäteriet´s reg.nr. 505-2009/376)
- Lantmäteriet’s work plan.  
(Lantmäteriet´s reg.nr. 505-2009/693)
- SDI requirements for spatial datasets – A description of re-quirements and a system for valuation within the Swedish spatial data infrastructure,  
(Kristian Bergstrand, MSc thesis. University of Lund)

This reference is available, in Swedish, at [www.geoforum.se](http://www.geoforum.se):

- Current situation GI Sverige,  
The Swedish Development Council for Geographic Information (ULI), 2007



The Swedish government commissioned Lantmäteriet together with the Geodata Advisory Board to formulate this revised edition of the National Geodata Strategy. The aim of the strategy is to be of guidance for producers and users of geodata.

The objectives with the strategy are: to create a national infrastructure for the geodata sector, to contribute to the development of the Swedish e-governance and to promote close co-operation between the public and private sectors in order to create a favourable environment for the creation of value-added geodata. The Swedish implementation of the INSPIRE-directive forms part of the work with the Swedish infrastructure for geodata.