Geodata
SWEDEN BIT BY BIT

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Country Report of Sweden

Swedish Spatial Data Infrastructure and the National Geodata Strategy

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EXECUTIVE SUMMARY

Spatial information is crucial and widely used in the modern society. The information is also produced by many different organisations on national, regional and local level. Efficient production, maintenance and use of the information imply coordinated actions between the different stakeholders. In Sweden a national spatial strategy has been set up and based on the strategy the spatial data infrastructure is gradually developed and implemented. During the last couple of years, Sweden has focused to ensure that international efforts INSPIRE and UN GGIM are recognized nationally and being part of the national spatial data infrastructure.

The Swedish SDI development has a wide support in society. Representatives from a great number of central agencies, municipalities and private enterprises have taken an active part in the work. The Swedish Government has also given an outspoken support.

Constructive cooperation requires that the forms for cooperation are supported by simple and clear financial, organisational and legal preconditions. The benefits from different actions must be made visible.

The INSPIRE Directive implies great demands, but is also a driving force for the national developments.

It is important to have a long-term approach within the frames of the sustainable development goals set by the UN, but at the same time work with step wise actions and show concrete results. In order to enable this, Lantmäteriet has in consultation with the Swedish Geodata Council drawn up a new Swedish geodata strategy for the years 2016-2020.

An overall national strategy and reform agenda makes it clear how geodata can contribute towards process efficiency, towards the environmental work and the 17 sustainable development goals in Agenda 2030, and towards innovation, growth and competiveness in both the digital economy and the physical economy.

The national strategy is based on five challenges for the Swedish society where geodata is expected to contribute to solutions: Innovation and business growth, the digitization of public administration, the streamlining of the urban planning process, the climate adaptation and environmental threats and the Swedish defence and civil contingencies.

Common to all mentioned societal challenges is that the solutions will benefit from open geodata. In Sweden the user financing of public sector geodata is still substantial. This negatively effects data-driven innovation and business growth. It also negatively effects the digitization of public sector administration and the society's ability to act efficiently in businesses where it is important to share an updated and reliable model of the real world.

All challenges will also benefit from having a further developed national harmonization of geodata between national, regional and local level public sector entities. Sweden still deals with a situation where different geodata standards are used in the 290 municipalities. Further to this, both the social planning process and the civil contingencies – including emergency response

activities – will benefit from having more unified basic geodata supporting the coordination of the activities involved.

All challenges would finally benefit from reliable and well known API services with clearly stated service level commitments. Lantmäteriet expects that developments will take a leap step forward when such APIs with high quality authoritative geodata becomes generally available for use in public and private sector applications.

The vision for the development of the future national infrastructure for geodata is formulated as follows:

Sweden has a national infrastructure for geodata that promotes innovation and growth in the business sector, allows digitizing and streamlining of processes within public sector and actively contributes in securing the citizens a good, safe and sustainable living

To make this happen and fully support the Swedish society in solving its societal challenges, the existing, well-working cooperation between the public sector geodata entities in Sweden needs to further develop its ability to cooperate.

This paper provides a summary of the new strategy as well as a brief overview of the organisations working on the spatial data infrastructure (SDI) and its organisation.

1 BRIEF ON THE HISTORY AND INTERNATIONAL CONTEXT

1.1 INSPIRE and EU Spatial Data Infrastructure

The INSPIRE Directive consists of a legal framework for the spatial data infrastructure and the Directive was implemented in Swedish law in 2011. The following requirements can be found by the INSPIRE Directive;

- Member States must develop metadata for data and services covered by the Directive
- Develop network services in order to make data available over the Internet
- Harmonise data and services in order to make these "interoperable"
- Create an access point that makes it possible to find data and services - Authorities within the Member States shall share data between themselves and with institutions at EU-level
- Member States shall establish a structure for coordination of the implementation
- Monitor the implementation and use of their infrastructures and to report on the implementation to the Commission

The following underlying principles exists for the spatial data infrastructure;

- It should be easy to discover which spatial data that is available, and to learn more about it
- Spatial data should be shared between all levels of government
- Spatial data needed for good governance should be available on conditions that are not restricting its extensive use
- Spatial data from different sources should be interoperable and possible to share between users and applications
- Data should be collected once and maintained at the level where this can be done most effectively

1.2 UN-GGIM in Sweden

Sweden has been involved in and given UN-GGIM high priority from the beginning. We have actively participated in the different initiatives, e.g. in the working group regarding the UN Resolution on Global Geodetic Reference Frame. Sweden was also one of the leading countries drafting the work plan for UN-GGIM: Europe. The involvement is also demonstrated as the Director General of Lantmäteriet was nominated as the first chair of UN-GGIM: Europe. The INSPIRE Directive from the European Union creates a common European infrastructure and common rules concerning exchange, sharing, access and use of public spatial data and data services. UN- GGIM: Europe acknowledges this and uses INSPIRE as the base.

1.3 The National Strategy for Geospatial Information

The Swedish SDI has been gradually developed since 2006 when the Swedish Government commissioned Lantmäteriet and the Swedish Geodata Council in 2006 to prepare a strategy for the development of a national SDI. The strategy has been updated a few times to deal with societal developments

and the latest, presented in 2015, describes a clear vision for the future including strategic goals to work towards, but also concrete and measurable targets for the short term actions.

The vision is based on five future challenges in the Swedish society where geodata is expected to contribute to solutions: Innovation and business growth, the digitization of public administration, the streamlining of the urban planning process, the climate adaptation and environmental threats and the Swedish defence and civil contingencies.

Common to all mentioned societal challenges is that the solutions will benefit from open geodata. In Sweden the user financing of public sector geodata is still substantial. This negatively effects data-driven innovation and business growth. It also negatively effects the digitization of public sector administration and the society's ability to act efficiently in businesses where it is important to share an updated and reliable model of the real world.

All challenges will also benefit from having a further developed national harmonization of geodata between national, regional and local level public sector entities. Sweden still deals with a situation where different geodata standards are used in the 290 municipalities. Further to this, both the social planning process and the civil contingencies – including emergency response activities – will benefit from having more unified basic geodata supporting the coordination of the activities involved.

All challenges would finally benefit from reliable and well known API services with clearly stated service level commitments. Lantmäteriet expects that developments will take a leap step forward when such APIs with high quality authoritative geodata becomes generally available for use in public and private sector applications.

To make this happen and fully support the Swedish society in solving its societal challenges, the public sector geodata entities in Sweden needs to further develop its ability to cooperate.

For each goal, an action plan has been developed to ensure that the goals are achieved at the latest 2020.

1.4 Organisation of the Swedish SDI and Data Sharing

The Swedish Government has given Lantmäteriet the role as coordinator of the Swedish SDI, including being the national contact point for the INSPIRE Directive as well as UN-GGIM.

Within the Government, the Ministry of Environment is responsible for the implementation of the INSPIRE Directive. The Swedish legislation implementing the directive is rather detailed and points out which organisations are responsible for each of the data themes covered by the Directive. About 25 organisations have such responsibilities. Lantmäteriet is responsible for some of the data themes, for the coordination of the implementation of the directive as well as the monitoring and reporting of the progress. Representatives from the 25 agencies meet on a regular basis in order to plan and coordinate their work.

An important part of the development and implementation of the Swedish spatial data infrastructure has been to create a model for data sharing between different public organisations to fulfil the INSPIRE Directive. The parties of the data sharing model have signed an agreement which defines rights and responsibilities. The aim is to simplify sharing of data between organisations being responsible for provision of spatial information, facilitate for all kind of public organisations to make use of existing spatial information.

In May 2017 around 290 central agencies, county administrations and local authorities have signed the agreement on data sharing. This means that they have a licence to use relevant geographic information within their organisations and for setting up services on the Internet

1.5 National Web Portal for Geospatial Information

A national web portal has been developed and is accessible at www.geodata.se. The portal works as a node where one can find a large number of datasets being stored and maintained by the responsible organisation for each data theme. Today some 220 WMS-services (some 930 datasets) are directly accessible via the portal and the number is continuously increasing. Any data provider can offer their data via the portal by describing their data in the metadata catalogue and make their services accessible via the portal.

The portal is based on open source software and is developed in close cooperation between colleagues from Denmark, Norway, Finland and the Netherlands.

2 SWEDISH SOCIETAL CHALLENGES – GEODATA'S CONTRIBUTION TO SOLUTIONS

2.1 Introduction

Based on a definition of the future societal challenges that Sweden is facing where geodata can contribute to the solutions, five challenges are defined: 1) Innovation and growth, 2) Digitization of public sector administration, 3) Streamlining of the urban planning process, 4) Climate adaptation and environmental threats, 5) Defence and civil contingencies.

The geodata related problems involved in the societal challenges cooked down to four overall goals constituting the strategy: 1) Geodata are open, 2) Geodata are usable, 3) Geodata are accessible, and 4) Cooperation is well developed.

The vision and goals of the new geodata strategy provides a good basis for Lantmäteriet's coordination activities during the period 2016-2020. Lantmäteriet has established annual action plans for implementing the strategy in cooperation between the organizations represented in the Swedish Geodata Council.

The new geodata strategy contributes to the Swedish government's initiative "Digital first" for accelerating the digitization of important public sector processes. This includes Lantmäteriet's assignment as development authority for an efficient digital urban planning process and the Swedish Environmental Protection Agency's assignment as development authority

for smarter environmental information. The new strategy also promotes openness and data-driven innovation for the benefit of both citizens and businesses.

The implementation of the strategy will require cooperation and commitment from both central, regional and local government. The conditions for such cooperation, and for cooperation with the private sector, is essentially based on voluntary participation and voluntary initiatives. The way in which the individual organizations deal with the strategy will therefore also be important for its implementation and for the overall impact within society.

2.2 The Societal Challenges

The starting point is the five important future societal challenges where geodata can contribute to the solutions. When these challenges are described from a citizen perspective, the benefits and consequences of different decisions, choices and prioritizations becomes clearer and easier to understand. This provides a solid foundation for a developed dialogue with the political decision makers regarding necessary changes and developments within the spatial data infrastructure.

2.2.1 Innovation and Growth

The speed of the technological developments will continue to accelerate and the demand for up to date maps and other good quality geodata will grow in line with this. The development of smartphones and mobile Internet has made maps, positioning and location based services available to all. Geodata in 3D is taken for granted. By developing the Internet of Things, we can use geodata and sensors to create smart worlds within many different areas. Through big data and data-driven analysis, large quantities of unstructured data can be combined and visualized with the support of maps and other geodata. The development of artificial intelligence, nanotechnology and biotechnology will bring a number of new applications.

Sweden is a leading IT nation, but not in the absolute frontline when it comes to data-driven innovation based on the re-use of public sector data. Several urgent measures are necessary:

- An overall national strategy and reform agenda for public sector data
- Concrete actions to encourage development and eliminate financial and legal barriers
- Standardization within organizationally fragmented public sector data management
- Improving knowledge among decision makers about the need for digitization.

Several of the problems need to be solved at the highest political level, but this also requires coordinated political decisions at regional and municipal level. In addition to raising awareness of overarching problems, there is also a lot that authorities, municipalities and other public sector organizations can and must do themselves.

In order to encourage data-driven innovation, easy access to standardized data is needed around the clock via appropriate, reliable and up-to-date services. These should also be compatible with open service platforms to promote broad use of geodata. In areas where national data provision is fragmented by different municipal and state data management, the public sector data owners must also cooperate when it comes to standardization and combined national service solutions to overcome the organizational fragmentation.

Access to open data is of great significance in order to encourage innovation among small and medium-sized enterprises. When data is open and available without fees and restrictions on its use, most financial and administrative barriers that limits the use, creative processing and dissemination of data are eliminated. Open data accessible via open services creates good conditions for innovation in connection with e.g. products, visualizations, analyses, data journalism and crowdsourcing. Not to forget the new applications and uses we cannot yet imagine, which will come as the conditions for creative development improves.

2.2.2 Digitisation of Public Sector Administration

The development of the Internet and web-based services is largely driven by social media. This increasingly involves interactivity and cooperation in which users contributes with various kinds of content. The trend of increased interactivity should also serve as a model for the development of public sector processes and services.

To improve interactivity and transparency the public sector interaction with citizens and businesses must be digitized. Digitization is also essential to improve efficiency within public administration and to help citizens fulfil their obligations and exercise their rights.

The Swedish Government's initiative "Digital first" is in principle derived from EU eGovernment Action Plan 2016-2020 and has a clear focus on the development of digital public sector services within society, taking the needs of businesses and citizens as its starting point. This development also improves the opportunities for private sector players to contribute towards social development through attractive services that can interact with the processes within public administration. Everything is done in the best interests of citizens.

The technology for digitizing public sector processes already exists, but the pace in which the practical developments proceeds is rather slow. The problem is partly linked to deficiencies in the provision of information within these processes, but there are also financial, legal, semantic, organizational and cultural barriers to development.

In this societal development of great importance for citizens, businesses and authorities, it is absolutely essential with an efficient geodata supply. Up-to-date core geodata must be easily available via simple, reliable around the clock services. Effective machine interfaces with geodata are crucial to establish digital, automated processes. Thanks to API:s, the geodata supply can be easily integrated into the business systems, bringing great rationalization benefits since the users' can reduce their investments in

parallel databases with geodata and manual updating procedures. When developing effective digital flows and processes, concepts such as manual handling and manual processing must be phased out wherever possible.

Access to open and easy-to-use geodata via machine readable services is also important for the exchange of data between local authorities and central government and for the public sector processes to be able to provide benefits for businesses, associations and citizens. Developments within e-government are largely about democracy, transparency and citizen influence, and about being able to share various kinds of information freely with businesses, associations and citizens. If the core maps and core geodata used in the digitized social processes are not open due to financial or outdated legal restrictions, there is a great risk that the solutions will be limited or will become unnecessarily complicated.

2.2.3 Streamlining of the Urban Planning Process

Statistics Sweden's forecast from May 2015 suggested that the population of Sweden will grow by just over 1.1 million during the ten years up until 2025. The Swedish National Board of Housing, Building and Planning indicates that more than 75,000 homes need to be built annually between 2015 and 2020. Housing construction will not reach the levels needed to satisfy population growth within the foreseeable future. Despite this and the fact that housing construction in Sweden rose by almost 70% in the last five years, there will still be a shortage of housing for the foreseeable future in many of Sweden's larger centres of population.

One of the biggest problems is that some of the information in the process is still analogue. Digitising the urban planning process within state and municipalities will lead to more effective interaction between authorities, citizens and businesses. The need for up-to-date, easy-to-use geodata in 2D and 3D will then become critical in order to make interaction with authorities, project planners/builders and citizens more effective.

There are also some fundamental problems associated with a split-up process in which everyone doesn't have the same information and where some information also is lost. All in all, this results in quality deficiencies, costly administration and lengthy process times. The planning and construction process – which includes overview and detailed planning, road and railway planning, project management, property registration, land registration and dealing with planning permission – therefore needs to be developed in several different areas.

Both the Lantmäteriet state assignment "Digital first - for establishing an efficient urban planning process", and the state innovation program "Smart Built Environment" assume that there is a huge potential in a more efficient urban planning process. Although the assignment includes many different issues to develop in cooperation, Lantmäteriet expects that an improved geodata supply may be one of the key success factors for a more efficient process.

As a large number of different players are involved in the process, there is a need for securing that all involved are provided with uniform maps and

geodata throughout the entire process. It is also important that maps and other geodata are easily accessible via API services.

The need for transparency in the planning and construction process also requires good opportunities for accessing and disseminating various geodata within society. It is therefore important that the user financing is discontinued and replaced with other funding so that core geodata from e.g. Lantmäteriet and the municipalities becomes open data, available free of charge and without restrictions on its use.

2.2.4 Climate Adaptation and Environmental Threats

The challenges of climate and environment are large and cross border. The Swedish environmental quality objectives (http://www.sverigesmiljomal.se) and several of the sustainable development goals included in the UN's Agenda 2030 focus on the climate and the environment. These establish a high level of ambition for environment work, in which open, easily accessible geographic information, but also real property information, is an important prerequisite for both implementation and monitoring.

Despite the climate policy targets set up at the 2015 UN Climate Change Conference in Paris, changes will continue in terms of temperature, precipitation and extreme events such as storms, torrential rain and fires. This will have long-term effects on natural conditions, on land-based industries and on urban planning, infrastructure and emergency response, in which climate and environmental factors must be factored in. In the near future, taking a changed climate into account will be a natural part of the planning and construction processes. The rising sea levels along our coastline are already an important factor in today's planning work.

Since most of the effects of climate change and environmental threats have a geographic component, core geodata is of central importance. Geodata is needed to demonstrate and explain complex courses of events based on often large and complex quantities of data produced by research. Geodata is also needed for analysis, impact assessments and planning measures for climate adaptation, and as basis for the presentation and communication of different types of climate and environmental information. Within the latter, open data, maps and internationally harmonized geodata for land and sea areas are also highly significant.

Environment-related geodata also increases the opportunities for citizens to obtain information and get an overview of the environmental conditions in different areas, and to participate in the social debate on environmental issues. One important such source is the Swedish Environmental Protection Agency's Environmental Data Portal, which makes a large quantity of environment-related geodata about nature and the environment available such as environmental monitoring, land conservation and the results of inventorying and geographical analyses. It also contains links to services for displaying and downloading this data.

A large number of other national and regional agencies are contributing with data and indicators relating to environmental geodata. For example green structures in larger centres of population are investigated every five years

by Statistics Sweden, as well as estimations of the number of people that have access to green areas within a particular distance from their homes.

One challenge yet to be addressed is the lack of bathymetric data of good quality and high resolution for the shallow areas within the Swedish coastal zone. In Sweden more than 50% of the population lives and strives within 10 km from the coastline. It is also in these areas where the climate effects are expected to have a great impact, because of the rising sea level and that the rivers meets the sea in these areas which can cause even greater problems. Access to bathymetric data with good quality and high resolution is necessary in order to be able to analyse, make detailed plans and take relevant measures to reduce the effects of climate change. Therefore, one of the actions in the geodata strategy is to create a proposal for a National Coastal Zone Mapping program, to be presented to the Swedish Government.

The Swedish Meteorological and Hydrological Institute (SMHI), in cooperation with several other Swedish authorities, has established a National Knowledge Centre for Climate Change Adaptation. The portal run by the centre collects and shares the latest news on climate change adaptation, internationally and in Sweden as well as links to useful tools and databases.

2.2.5 Defence and Civil Contingencies

The security policy situation in Northern Europe has gradually deteriorated in recent years. The threats to our security are cross-border and cross-sectoral in nature, and are more changeable than before. The boundaries between preparations for war and actual conflict are also increasingly being erased through hybrid warfare. The development of ICT challenges many traditional ideas about the scope, players and logic involved in security policy.

Defence and civil contingencies involves protection against war, accidents and disasters, and aims to defend important social values. Ultimately, this is about Sweden's integrity and sovereignty. Following many years of easing tensions and efforts in crisis areas elsewhere in the world, the ability and capacity of Sweden's national defence now needs to be reviewed.

As external threats against Sweden grow and have become increasingly complex, we have also gained a better insight in recent years into the need to strengthen our ability to protect life and property in the event of major civil crises. This includes all levels of society, and involves different players within both the private and the public sectors.

Good quality, up-to-date, uniform maps and geodata are important and necessary requirements for military defence and civil contingencies, both in order to prevent accidents and crises and in order to deal with events and actions.

The supply of maps and other geodata vary significantly between different players, from state authorities, emergency response actors to private players.

There are financial, legal and knowledge-related obstacles affecting the ability to make effective use of good quality geodata.

Data sharing is prevented by restrictions in license agreements and collaboration hindered by lack of uniformity of maps and geodata. Open geodata would represent a significant step towards making high quality geodata available to a wide range of players within civil contingencies and emergency response.

In order to create the best possible conditions for saving lives and property in the event of accidents and emergencies, all players should have access to uniform maps and positioning data, in order to ensure a shared overview before, during and after an event. Just as in the urban planning process, there are many players involved and there is a real need for measures to ensure that all those involved have access to the same updated information.

3 SHORT ON THE NATIONAL GEODATA STRATEGY FOR SWEDEN 2016-2020

3.1 Vision

The vision for the development of the future national infrastructure for geodata is formulated as follows:

Sweden has a national infrastructure for geodata that promotes innovation and growth in the business sector, allows digitizing and streamlining of processes within public sector and actively contributes in securing the citizens a good, safe and sustainable living.

Sweden has a well-functioning national infrastructure for geodata. This means that it is easy to search for and find geodata and services. Geodata from different sources can be accessed via services, and can easily be combined. State authorities, municipalities and other geodata producers have worked together to make geodata simple to use. This infrastructure is an important national asset for development, and its geodata is freely available to the whole of society. Geodata is created, administered and made available by the public and private sectors within shared frameworks, thus contributing towards openness, availability and compatibility.

An overall national strategy and reform agenda makes it clear how geodata can contribute towards process efficiency, towards the environmental work and the 17 sustainable development goals in Agenda 2030, and towards innovation, growth and competitiveness in both the digital economy and the physical economy.

Knowledge about the opportunities offered by digitization and the benefits of open data is well established among politicians and decision-makers. Significant economic and legal barriers are removed through regulations and reforms. The fragmentation of public sector data sources has been reduced through a combination of standardization work and the establishing of national services for the dissemination of data from national, regional and local level.

Core geodata is national, open, up to date, standardized, of the required quality, easily accessible and efficiently used. National and local government

have clearly stated infrastructure assignments that give the public sector processes and the business community access to the best possible data.

In this vision of the future Swedish society, the public sector processes are characterized by transparency, interactivity and good cooperation between authorities, businesses and citizens. The collaboration around the national infrastructure for geodata;

- promotes innovation and growth within industry
- enables public sector processes to be digitized and streamlined
- contributes to a good, secure and sustainable living environment

The key to success is a long-term approach to the assignment and financing, as well as a continuous, highly effective, cross-sectoral national and regional/local cooperation between public sector geodata producers and key public and private users.

The public sector undertaking for the national geodata supply is long-term, but need to be reviewed regularly to secure that the most requested geodata are made available in society.

Services for access to geodata are known, easily accessible, usable and stable over time, so that users can make long-term investments in their use.

3.2 Goals for the Period 2016-2020

3.2.1 Introduction

In order to encourage development, innovation and entrepreneurship and to achieve increased use of, dissemination of and social benefit from core geodata, new financing models must be introduced for national and local government geodata producers that enables core geodata to be made available as open data.

In order to provide full benefit in society, public sector geodata must be easy to use and easily accessible. Through long term stable machine interfaces, access to geodata can be integrated into different business systems. Through open machine interfaces and appropriate e-services, innovation and enterprise will be made easier.

One important success factor for the continued development within this field is that the strategic cooperation between the state, municipalities and businesses takes place across social sectors and comprises both central, regional and local levels.

Four important overall goals during the period 2016-20 have been identified in order to make sure that geodata can contribute towards the solutions of the defined societal challenges. These overall goals are: 1) Geodata are open, 2) Geodata are usable, 3) Geodata are accessible, and 4) Cooperation is well developed.

The strategy contains tangible goals but to reproduce them here would burden the document. Hence, interested readers can access these goals at https://geodata.se/globalassets/dokumentarkiv/styrning-och-uppfoljning/geodatastrategin/national_geodata_strategy_2016-2020.pdf

3.2.2 Geodata are Open

In order to achieve the maximum benefit to society from public geodata, user financing must be replaced by other forms of funding that facilitates the broad use and dissemination of this data within society. The total amount of

user financed public sector core geodata in Sweden, has been estimated to about SEK 700 million per year.

To be able to open up wholly or partly user financed public sector geodata free of charge for broad use in dissemination, innovation and development, alternative financing models for geodata needs to be introduced in central and local government. The scale of the financial problem in Sweden suggests a long-term change process, but for core geodata the need for alternative financing models is time-critical. Examples of such core geodata are basic geographic information like maps, aerial imagery, elevation data, place names, addresses, property boundaries, core statistics, transport information, etc. This data is often fundamental when communicating about other location-specific information and about locational relationships between different phenomena.

When developing the Swedish society, great value is attached to democracy, transparency, citizen influence and the simplification and streamlining of authority processes, for the benefit of citizens, associations and businesses alike. In future Sweden, other important geodata, e.g. in connection with social planning and society development, will therefore also need to be open for everyone to use free of charge and without restrictions on the use and the dissemination.

3.2.3 Geodata are Usable

In order to be effectively usable, geodata should be easy to use, up to date, complete and of a known quality. With a total of 290 municipalities and many governmental agencies that produce geodata, standardization, harmonization and composability are important. We shall ensure that data can be obtained in the forms requested, that there are possibilities to choose between open national and international standards, and that there will not be different versions of basic public geodata.

In situations where more than one party continuously needs to cooperate around maps and location-based information, it is important that all parties involved have access to the same up-to-date information in order to ensure a shared overview. This applies in particular to important functions in society such as emergency response and urban planning. There is currently no common and uniform geodata supply within these areas, and special measures are required to ensure that uniform geodata is made available to all.

3.2.4 Geodata are Accessible

In order to make geodata widely used they must be known and easily available. The transition from human-read data to machine-read data will require completely new ways of working and new workflows within the production, distribution and use of geodata. The workflows of the future

Geodata will use structured semantic data, i.e. machine-readable data. This is an enormous change that requires a focus on system architecture and reference model architecture.

By supplying basic geodata services with machine interfaces (APIs) and professional service undertakings, professional users can integrate these services into their own business systems and simplify the digitization of their processes. E-services with user interfaces facilitate both the dialogue between government and citizens and the sharing of geodata with them. Service development must be user driven, and the services known, clearly described, user-friendly, up to date and available around the clock, with clear service undertakings.

3.2.5 Cooperation is Well Developed

The national geodata strategy 2016-2020 is an important tool for Lantmäteriet in the work with coordinating the Swedish developments in the field of geodata. The strategy forms the foundation for broad national cooperation between different public sector producers and users of geodata. It is important that this cooperation develops in a way that encourages knowledge building, dialogue and practical coordination. Since the production and use of geodata takes place throughout the country, it is important that both sectoral and regional/local driving forces are dealt with in the best way.

APPENDIX Presentation on governmental agencies represented in the Swedish Geodata Council

- Lantmäteriet: http://www.lantmateriet.se/en/
- Linköping Municipality: http://linkoping.se/international/
- County Administrative Board of Värmland: http://www.lansstyrelsen.se/Varmland/En/Pages/default.aspx
- The Swedish Civil Contingencies Agency (MSB): https://www.msb.se/en/?ResetTargetNavigation=true
- The Swedish Environmental Protection Agency: http://www.swedishepa.se/
- The Swedish Maritime Administration: http://www.sjofartsverket.se/en/
- Statistics Sweden (SCB): http://www.scb.se/en/
- The Geological Survey of Sweden (SGU): http://www.sgu.se/en/
- The Swedish Association of Local Authorities and Regions (SKL): https://skl.se/tjanster/englishpages.411.html
- The Swedish University of Agricultural Sciences (SLU): http://www.slu.se/en/
- The Swedish Meteorological and Hydrological Institute (SMHI): https://www.smhi.se/en
- The Swedish Transport Administration: http://www.trafikverket.se/en/startpage/