Finnish national spatial data strategy 2016

Position for spatial data

Finnish national spatial data strategy 2016
Position for spatial data

Location: the unifying factor – Finnish national spatial data strategy 2010–2015 was published in autumn 2010. The previous national spatial data strategy for 2005–2010 had been published in 2004.

In recent years, there have been significant changes to the operating environment. The establishment of national data policy in spring 2011 has launched an extensive opening of public data, as a result of which maps and spatial data have become the key fuel for new applications.

Positioning and spatial data continue to be an increasingly inseparable part of everyday mobile device use.

The Act on Information Management Governance in Public Administration (Laki julkisen hallinnon tietohallinnon ohjauksesta 634/2011) which entered into force in autumn 2011, steers public administration organisations to develop the interoperability of information systems. Reference architectures produced under the coordination of the Ministry of Finance, including the reference architecture for spatial data; exemplify the will to ensure interoperability. The reformed administrative processes are evident in electronic services and cost savings.

The implementation of spatial data infrastructure steered by the Inspire directive has reached its first stage in 2013. Spatial data falling within the sphere of regulations has been made available in a shared manner in accordance with international standards. The infrastructure has been created and works now as a point of departure in the development of applications and services.

Through the years, the focus of national spatial data strategy has shifted from the building of supply and infrastructure to the utilisation and use of the data.

The emphasis of the vision is that the use of spatial data makes operations and decision-making more effective, as well as increasing participation opportunities. The proposed measures aim at improving the availability of data and the usability of services.

The opportunities afforded by spatial data are developing continuously and they must be made increasingly well-known. Well-functioning cooperation between administration and companies is the prerequisite for the significant growth in the use of spatial data and cost savings. When successful, cooperation will produce innovative solutions for international markets.

The national spatial data strategy has now been updated. The strategy group felt that there was no need to renew the previous strategy entirely. Previously recorded objectives are still valid. The measures proposed are, this time around, more concrete and they have been broken down into tasks and responsible parties have been named.

Each organisation may find its place in the ecosystem of spatial data. The strategy challenges all parties to check the direction and goals of their own operations and to implement them in their own and shared key projects!

Now is the time to discover and use the opportunities provided by spatial data. Locate the position of spatial data!

April 2014
National Spatial Data Network of Finland and National Council for Geographic Information

Strategy group

Chairperson
Riitta Teiniranta, Finnish Environment Institute

Members
Antti Vertanen, Ministry of Agriculture and Forestry
Juha Vuorimies, Ministry of the Environment
Seppo Öörni, Ministry of Transport and Communications
Sami Heikkilä, Ministry of Defence
Kai Karsma, Ministry of Employment and the Economy
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The secretary of the strategy group was
Olavi Köngäs from Netum Consulting Oy.

Vision

Fluent use of spatial data makes operations and decision-making more effective and produces new and varied services. Easily utilisable and reliable spatial data increases participation opportunities and improves safety and competitiveness.

Objectives and measures

1 Spatial data for public administration and companies is of high quality, easily usable and corresponds to the needs of the user

Measure 1: Improving the availability of spatial data

Background: Measures developing the maintenance of spatial data, its quality and timeliness, as well as those facilitating the utilisation of the data in the development of services will be continued. The quality and timeliness of spatial data will be improved and the utilisation of the data in the development of services will be made easier. The aim is that private parties, such as providers of civic services, also open up their data for others to utilise.

Tasks:
- Opening the data from public and private sector data warehouses
- Expanding free data handovers and increasing the transparency of fee-based public sector services
- Developing general technical solutions supporting the utilisation of data
- Drawing up and publishing general terms and conditions for the use of spatial data.
- Drawing up, publishing and maintaining catalogues and metadata on utilisable data
- The availability of data subject to use restrictions will be improved by increasing the transparency of handover principles and by making pricing of data handovers reasonable.

Operators:
- Providers of spatial data in the public sector and ministries in question
- The Advisory Committee on Information Management in Public Administration JUHTA (Public Administration Recommendations JHS)
- Private providers of spatial data

Measure 2: Improving the usability of spatial data and its combinability with other data

Background: The usability of spatial data infrastructure has to be improved by developing and harmonising spatial data and standards and operating methods pertaining to its use as well as compliance with them. Standardisation and other measures increasing interoperability facilitate combining spatial data with other data. Clear and user-oriented descriptions of spatial data and services will be drawn up. The requirements presented in public procurement related to compliance with standards and other open regulations are important with regard to interoperability and usability.

Tasks:
- Promoting harmonisation: glossaries, code lists, data elements, ontologies, harmonisation of schemas and metadata.
- Publishing service level agreements (SLAs) and using them in web services
- Some of the Public Administration Recommendations (JHS-recommendations) should be confirmed as public administration standards
- Promoting the application of standards in software and services through requirements presented for public procurement.

Operators:
- Providers of spatial data in the public sector
- Public administration standard: National Council for Geographic Information → (JUHTA) → Ministry of Finance
- Public procurement units acquiring spatial data software and services
- Private providers of spatial data

Measure 3: Making the use of crowdsourcing in the collection and maintenance of spatial data more efficient

Background: Authorities and companies enable the participation of the public, organisations and the third sector in the collection and maintenance of spatial data in order to improve the comprehensiveness, quality and timeliness of spatial data. By expanding data collection and adjustment outside proprietary data collection systems, the observation network can be densified significantly which means that it will be possible to get faster information about changes as well as, for example, the traffic, the weather or the environment.

Tasks:
- When planning data collection, the utilisation opportunities of crowdsourcing are assessed
- Providers of spatial data enable the collection of pointer and observation data and making changes to spatial data sets and organise the management, processing and distribution of pointer and observation data
- Spatial data providers promote the utilisation of data collected with sensor networks over administrative boundaries

Operators:
- Providers of spatial data

Measure 4: Taking into account the temporal dimension in the management of spatial data

Background: Changes occurring over time, such as changes in administrative boundaries, are interesting in various analytical situations related to spatial data. Archiving, which ensures the long-term availability and ease of use of spatial data sets and recording of the temporal dimension, needs to be planned and guidelines provided.

Tasks:
- The planning of management and archiving solutions for spatial data sets and drawing up of related guidelines
- Planning and implementation of solutions for archived spatial data in spatial data warehouses
- Digitalisation of historical spatial data sets and the arrangement of discovery services for the data
- Development and implementation of spatial data object life cycle thinking
- Inclusion of temporal dimension in the data sets as object level metadata

Operators:
- JUHTA (JHS department)
- National Archives of Finland
- National Land Survey of Finland/Finnish Geospatial Research Institute
- Inspire parties with regard to their own data
- Providers of spatial data

2 The use of spatial data helps to make operations more efficient and to improve services

Measure 5: Improving the usability of spatial data services

Background: The use of spatial data services has expanded extremely fast. International services have achieved a leading position in consumer and, to a certain degree, corporate markets. In services provided by the authorities, the data content is of high quality and is up to date, but implementation and ease of use are not on a competitive level.

Tasks:
- The user orientation and usability of spatial data services is emphasised when planning and providing services
- Web service interfaces will be implemented on spatial data services, which make them easy to integrate into other applications
- The availability and usability of the services will be ensured by investing in systems and production

Operators:
- Providers of spatial data services
- Public procurement units acquiring spatial data services

Measure 6: Promoting the use of spatial data in decision-making

Background: Analysing data is an important tool in preparing decision-making in the public and private sectors. Utilisation of spatial data must be rendered a natural part of preparation and decision-making processes. Easily usable data sets, guidelines and support are needed for utilisation. Thematic management and opening of data increases public participation and influencing opportunities as early as the preparation stage of social actions.

Tasks:
- Spatial data services offer easy to use tools for analysing and visualising data for decision-makers and individuals preparing decisions for them
- A clear and reliable basic data set, which enables various analyses is offered at spatial data services
- Basic analyses on interesting themes are produced regularly
- Spatial data is made increasingly visible in the Findicator service of the Prime Minister's Office
- The utilisation competence of spatial data will be developed, for example, with guides, examples and a case index

Operators:
- Providers of spatial data services in the public sector
- Findicator service of the Prime Minister's Office
- National Land Survey of Finland/Finnish Geospatial Research Institute

Measure 7: Utilising spatial data more extensively in the development of public services

Background: Spatial data combined with other information supports the development of basic services and the improvement of their productivity. For example, changes are planned in healthcare and, for example, more attention should be paid to the prevention of illnesses

Tasks:
- Finding out about the utilisation opportunities of spatial data in various administrative sectors
- In healthcare, for example,
  - Utilisation of spatial data in the organisation of services, travel management, etc.
  - Enriching analysis of factors affecting health by combining spatial data to population and health information

Operators:
- Ministries
- National Council for Geographic Information
- National Institute for Health and Welfare (THL) , the Social Insurance Institution of Finland – Kela, universities
- Municipalities

Measure 8: Communicating about the utilisation opportunities of spatial data

Background: Information about opening of spatial data and new services (for example, Paikkatietoikkuna) has not spread far enough. Measures to increase awareness among, for example, decision-makers and preparing parties are required to increase knowledge, service use and impact.

Tasks:
- A communications plan about spatial data services is drawn up
- General communications, for example, about the release and improvement of services
- Participation in the Open Data Programme
- Developing and promoting the case index

Operators:
- National Spatial Data Network
- National Council for Geographic Information
- National Land Survey of Finland/Finnish Geospatial Research Institute

3 Well-functioning cooperation expands the provision, maintenance and utilisation of spatial data while making them more efficient and creating preconditions forresearch and innovation activities

Measure 9: Improving the cooperation between spatial data providers and launching a development programme to internationalise the service range and operations of spatial data sector companies

Background: The cooperation between the public and private sector in the sphere of spatial data is focused in technical issues. There is a need to increase links and cooperation also at the level of development with the special objective to internationalise the commercial activities within the spatial data sector. Finnish spatial data service companies are typically small and operate primarily in the domestic market. Increasing the size of the companies from their current size requires internationalisation. The internalisation of operations requires the internal development of companies as well as cooperation between companies. The public sector can support the internationalisation of the spatial data sector in other ways than just through corporate financers. In order to develop the operations of companies, the companies have founded a cooperation group, FLIC Finnish Location Information Cluster, under the Federation of Finnish Technology Industries.

Tasks:
- Increasing dialogue between public sector spatial data operators and service companies in the field
- Launching a development programme for internationalisation of the service range and operations of the companies that will be supported by public sector financiers.

Operators:
- National Council for Geographic Information
- National Spatial Data Network
- Ministries
- FLIC
- Finpro

Measure 10: Using open source code principles in spatial data sector system development projects

Background: Open source code is used as much as possible in the development projects in the public sector's spatial data sector, regardless of whether the technical platform is open or commercial. The development work undertaken in the projects is published, which enables the further use of investments in companies and developer communities. Reciprocally, the public operators receive project outcomes for their own use. This is also based on the more general aim of promoting the use of open source code in public administration systems. A good example of open code implementation is the Oskari platform of the National Land Survey.

Tasks:
- Requiring that open source code principles are followed in procurement
- Publishing software and components implemented with open source code, thus giving companies access to the source codes of software solutions developed for the public sector
- Increasing cooperation between operators in development projects
- Organisation of open source code development cooperation using the development platform for electronic services (JulkICT Labs, Forge).

Operators:
- Spatial data sector operators

Measure 11: Conducting a survey on the social impact of opening spatial data

Background: Various impact objectives serve as motivation for opening up spatial data. With regard to economic considerations, the public sector policies regarding opening of the data start from the assumption that the benefits to the national economy materially outweigh the immediate losses of income to the public sector. In addition to economic impact, the opening of the data is expected to qualitatively enhance the functioning of the society and democracy in many ways. In addition to the surveys recommended, more academic research is needed on the subject.

Tasks:
- Empirical study of the effects to the national economy of opening up some spatial data sets (including Digiroad, Finnish Environment Institute's data sets, National Land Survey's topographic information)
- Conducting a survey on the social impact of opening up spatial data (participation, decision-making, everyday life of companies and the public, etc.)
- Based on the surveys, determining the indicators providing monitoring data and the structures to monitor the impact continuously

Operators:
- National Council for Geographic Information and ministries

4 Good competence creates preconditions to the utilisation of spatial data and development of spatial data infrastructure

Measure 12: Developing the highest level education in spatial data sector

Background:

The need for spatial data experts, as well as competence in spatial data is increasing fast in society both with regard to technical spatial data expertise and its utilisation and analysis. The increasing volume of data, improved availability and cheaper technology enable the utilisation of the data in various monitoring and planning functions. Data linked with a location is an essential part of the knowledge basis. Data analysis and presentation of the outcomes are important skills in the information society's professions requiring high educational level. More emphasis should be put into developing these skills in training for many different fields. The teaching infrastructure of spatial data should be developed, provided with resources, and cooperation with various institutions should be supported. Research resources for the field of spatial data must be ensured, since high quality teaching is always ultimately based on high-quality research. Education in the spatial data sector should be linked more strongly than currently with the teaching of data management, application of information and communication technology and statistics and visualisation in the substance sectors.

Tasks:
- Ensuring sufficient resources for university education in the spatial data sector
- Consolidating the link between information and communications technology and teaching in spatial data
- Inclusion of spatial data in the curricula of various fields of education
- Increasing cooperation between universities, authorities and companies in the teaching of spatial data sector as well as research and development activities
- Increasing the range of extension studies in spatial data sector

Operators:
- Universities
- Polytechnics
- The Ministry of Education and Culture
- National Council for Geographic Information and National Spatial Data Network

Measure 13: Promoting the introduction of spatial data as a part of citizenship skills

Background: Thanks to internet and mobile devices, almost everyone has the opportunity to utilise spatial and location data in their work and leisure time.

Fluency in basic concepts related to spatial data is a skill required by the efficient and safe use of spatial data services.

Tasks:
- Utilisation of spatial data will be included in the curricula of upper secondary education
- Schools and teachers will be guided in using spatial data and materials and tools supporting education will be made available online
- Inclusion of courses on the utilisation of spatial data and navigation in the course selection of folk high schools and adult education institutes

- Increasing the visibility of spatial data in up-coming electronic matriculation examinations
- Developing a spatial data related module as a part of the Computer Driving Licence, as well as the arrangement of suitable course materials and trainer education

Operators:
- Finnish National Board of Education
- National Land Survey of Finland/Finnish Geospatial Research Institute
- TIEKE Finnish Information Society Development Centre

Appendices

1 Location: the unifying factor – Finnish national spatial data strategy 2010 – 2015

The national spatial data strategy 2010 – 2015 was drawn up as a collaboration between the Inspire network and the National Council for Geographic Information, and it was published in October 2010. The main focus of the strategy was on the utilisation of spatial data. It had been preceded by the first national spatial data strategy (for the period 2005 – 2010) drawn up by the National Council for Geographic Information, which had as its aim the implementation of spatial data infrastructure. Before it, more limited spatial data strategies had been drawn up, such as the public mapping strategy of the Ministry of Agriculture and Forestry in 2002 . It has been revised as Maastotietojärjestelmä kovaan käyttöön - kartastostrategia vuosille 2011 – 2020 (Topographic data system for hard use – mapping strategy for 2011 – 2020).

The vision of the national spatial data strategy for 2015 is:

> *Spatial data infrastructure has improved the quality of services and decision-making making public administration, industry and research more efficient and, supported by research and education, it has generated new business and new services for the public.*

The strategy has four objectives divided into 14 aims.

I High-quality and easily accessible spatial data form the basis for service improvements and new services

1. The public sector will endeavour to meet the growing needs of society at large by producing spatial data that are of a high quality, up to date, comprehensive and interoperable.
2. Spatial data will be available at the service interfaces of the processes maintaining the data.
3. The terms and conditions governing the use of spatial data will be clear and harmonised, and the use of spatial data concerning individuals will be well-managed and governed by guidelines
4. The pricing of spatial data will not be an obstacle to its use.

II A smoothly functioning division of labour between the private and public sectors and within the public sector will help to put the use of spatial data on a more efficient basis

5. The production of spatial data will be put on a more efficient basis by eliminating overlapping work.
6. Spatial data produced by the public sector will be widely available for use by the markets as well as for research and public administration.
7. Companies will create a large number of innovative solutions based on spatial data for the needs of public administration and other sectors of society.

III The spatial data infrastructure will improve the quality of life and the quality of processes carried out in society at large

8. Spatial data services will support people in their everyday activities and during their leisure time.
9. Spatial data will be widely used in decision making and it will support the participation of citizens.
10. Spatial data will be used for managing a large number of functions essential for society at large.
11. The use of spatial data and spatial data technology will provide a solution for the monitoring and assessment of the state of the environment.

IV Research and training in the spatial data sector will support the use of spatial data and the development of the spatial data infrastructure

12. Increasing training will help deepen spatial data expertise in many sectors.
13. Research using spatial data will grow and expand into new branches of science.
14. Research and development of spatial data services will be at the cutting edge internationally.

The aim of strategy work is a continuous strategy process where, in addition to objectives, aims and implementation, the focus is on analysis of the operating environment and changes in it. The objective set was to revise the strategy every few years.

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[1] *Ministry of Agriculture and Forestry publications 3/2010,*
www.mmm.fi/attachments/mmm/julkaisut/julkaisusarja/newfolder/5tup40qJk/MMM__2010_3.pdf

[2] *Ministry of Agriculture and Forestry publications 10/2004,*
wwwb.mmm.fi/julkaisut/julkaisusarja/MMMjulkaisu2004_10.pdf

[3] *Maps and geographic information – essential elements in a well-functioning society, Public mapping strategy 2001-2010.*
Ministry of Agriculture and Forestry 2001
www.mmm.fi/attachments/mmm/julkaisut/julkaisusarja/5g7uCk1C9/KartastostrategiaMMMjulkaisu2-2002%5B1.pdf

[4] *Ministry of Agriculture and Forestry publications 4/2010,*
www.mmm.fi/fi/index/etusivu/maanmittaus_paikkatiedot/kartoitusjakartat/kartastostrategia.html
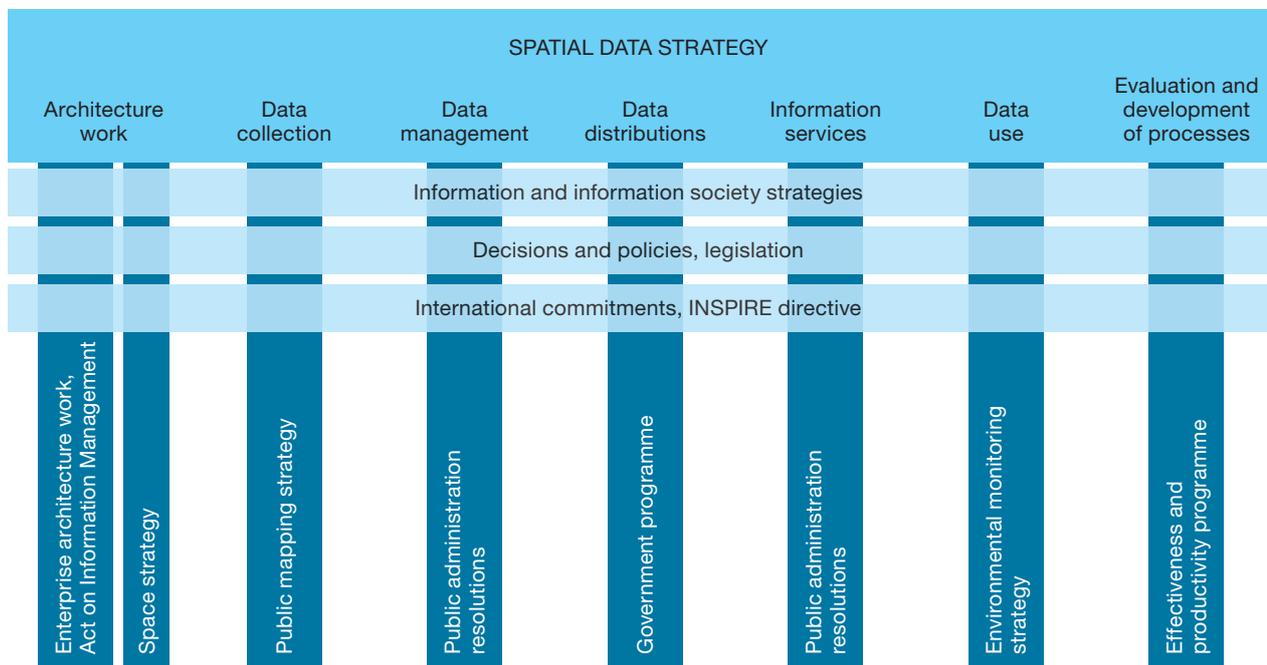
2 Revision process of the national spatial data strategy

In autumn 2012, the steering committee of the national Inspire network proposed to the National Council for Geographic Information that the National Spatial Data Strategy be revised. The project was launched in February 2013 and it is steered by the common strategy group of the network and the council.

The strategy group started the revision by drawing up an estimate about the realisation of the current spatial data strategy (chapter 3.1) and an analysis of the changes in the operating environment (chapter 4).

A discussion about the target of the national spatial data strategy and its links with other strategies and policies was held and the results of the discussion are summarised in the figure below.

SPATIAL DATA STRATEGY						
Architecture work	Data collection	Data management	Data distributions	Information services	Data use	Evaluation and development of processes
Information and information society strategies						
Decisions and policies, legislation						
International commitments, INSPIRE directive						
Enterprise architecture work, Act on Information Management / Space strategy	Public mapping strategy	Public administration resolutions	Government programme	Public administration resolutions	Environmental monitoring strategy	Effectiveness and productivity programme

Since it is a question of a national spatial data strategy, it was deemed important that other operators besides those in the spatial data sector were also consulted during the work. For this reason, it was decided that an open web survey would be organised, stakeholder groups heard and strategy discussed in an open seminar.

The open web survey (the results are presented in chapter 3.2) was held in February–March. The Inspire network and the background organisations of the strategy group members were informed about the web survey. The survey received 58 answers.

In April 2013, the strategy group visited the following stakeholder groups to discuss the revision of the spatial data strategy:

- Finnish Innovation Fund Sitra
- Digile Ltd
- Sito Ltd and Karttakeskus Ltd
- Academy of Finland
- Finnish Information Processing Association, FIPA

The meetings discussed themes that according to the opinion of the stakeholder group would need to be highlighted when revising the strategy.

On 17 May 2013, the strategy group organised a seminar at the Expo and Convention Centre Helsinki, where the operating environment analysis and preliminary proposals to revise the strategy were presented. In all, 40 individuals from 28 different organisations participated in the seminar.

The progress of the strategy work was discussed in the National Council for Geographic Information on 13 June 2013.

The strategy group has convened ten times.

3 Estimates about the realisation of the national spatial data strategy

3.1 Estimate of the strategy group

In its meetings on 19 February and 14 March 2013, the strategy group reviewed the objectives and aims of the strategy for 2015 and estimated their realisation. Simultaneously, estimates were made on the need for clarification.

The national spatial data strategy has four objectives divided in 14 aims (see chapter 1).

The strategy group estimated that the aims 6 and 4 related to the opening up of public sector spatial data resources and the pricing data handovers had been realised even better than anticipated when drawing up the strategy. On the other hand, there were great differences between data providers and there are no shared or officially confirmed principles in place. With regard to general terms and conditions (aim 3), working group proposals and open data licence are being prepared for Public Administration Recommendations (JHS). The survey on protection of privacy has not been initiated yet.

The public sector has invested in order to implement Inspire, for example, on the quality, timeliness, comprehensiveness and interoperability of spatial data as well as supply of information through web services (aims 1 and 2).

Measures presented in aim 5 on making spatial data production more efficient and eliminating overlapping work have not been initiated. According to the strategy group's estimate, there is hardly any overlap in public administration and cooperation between authorities functions well. There is overlap in data acquisition of central government and municipalities.

The roles of public and private sectors in the development and provision of solutions based on spatial data services and spatial data (aim 7) have not been discussed in cooperation bodies in the spatial data sector. Development of service supply has not been monitored. The opening up of public sector data has facilitated the development of services and their entry into markets.

Spatial data services offered to the public (aim 8) have been increased by, for example, developing the National Geoportal Paikkatietoikkuna service. The built environment project of the eServices for Housing and Building (SADe) programme will provide municipalities with tools to offer electronic services. The usability of and demand for services have not been monitored.

Aim 9, which is related to the use of spatial data in decision-making and as support for the participation of the public has not been realised. Government does not really use the opportunities to combine spatial data with other information in presenting forecasts and plans or providing grounds for decisions.

Spatial data is increasingly used in managing functions essential for society at large (aim 10). Authorities cooperate extensively, a good example of which is BORIS, the common situation awareness system for Finnish authorities participating in oil spill response (BORIS)[5].

Spatial data and technology are utilised in the monitoring and assessment of the state of the environment (aim 11) but there is still room for development. Modelling tools capable of processing large volumes of data have been developed. There is also need to further develop the communication of results, for example by means of visualisation.

The competence in processing and utilising spatial data (aim 12) has improved through, for example, the increase of location and map services aimed at consumers. Occupational and higher education should provide competences to use spatial data in many different industries and jobs. Data management and information technology education should be added to spatial data expert education. In order to render spatial data competence a civic skill and professional competence, it is essential to educate teachers at all levels.

Aim 13 on growth and spread of research utilising spatial data was seen as important but problematically phrased. As such, the aims have not been achieved. Aim 14 on research is limited to spatial data services and it has not been achieved as such.

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[5] *www.ymparisto.fi/default.asp?contentid=428900&lan=FI*

3.2 Results of the strategy survey

In February–March 2013, the strategy group conducted an open web survey asking for assessments and comments on the realisation of the national spatial data strategy, as well as proposals to review the strategy. The web survey received 58 answers. The survey aimed to reach primarily individuals working in the public sector, which made up over 70% of all respondents, while 15% of the respondents worked in the private sector, mostly in spatial data service companies. The rest of the respondents were researchers etc. Assessments on the impact of the strategy were distributed as follows:

I don't know 14,0 %

Very low 10,5 %

Fairly low 43,9 %

Excellent 3,5 %

Fairly high 28,1 %
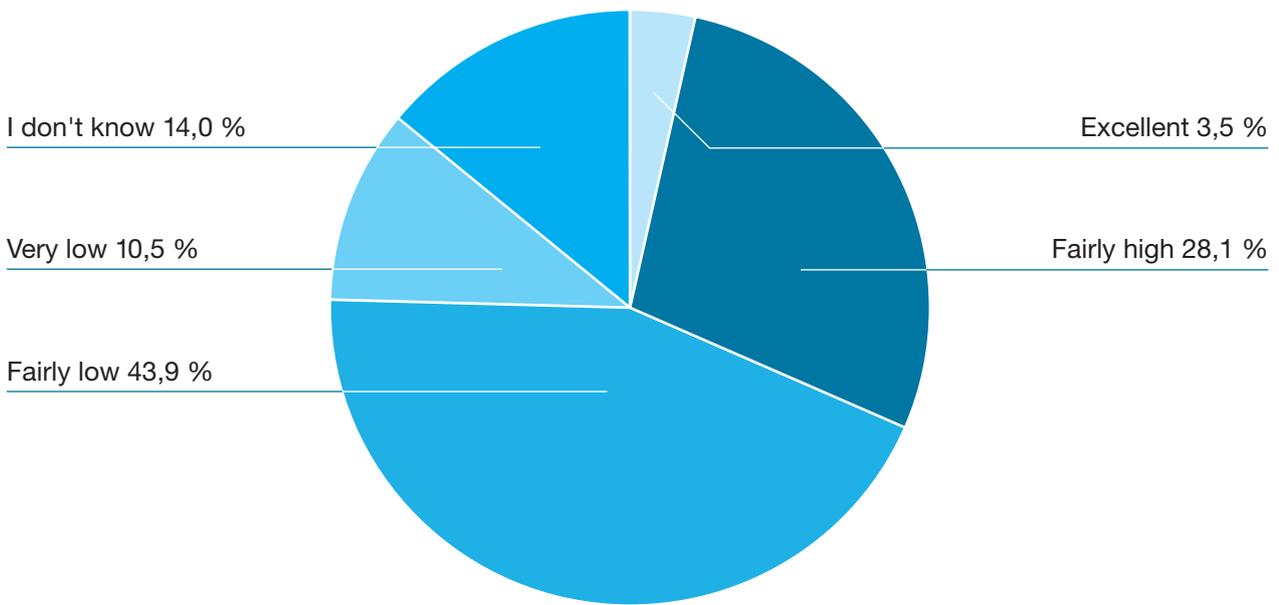
Due to the small number of respondents, differences between respondent groups cannot be reliably compared statistically. Based on the answers, providers of spatial data are more satisfied with the realisation of the strategy than the users or employees of spatial data companies.

The table below shows the distribution of answers to the question *"How well do you think the objectives and aims of the spatial data strategy 2010–2015 have been achieved?"*

	5 (Excellent)	4	3	2	1 (Not at all)
The public sector will endeavour to meet the growing needs of society at large by producing spatial data that are of a high quality, up-to-date comprehensive and interoperable.	7,0 %	**42,1 %**	31,6 %	17,5 %	1,8 %
Spatial data will be available at the service interfaces of the processes maintaining the data.	3,6 %	32,1 %	33,9 %	25,0 %	5,4 %
The terms and conditions governing the use of spatial data will be clear and harmonised, and the use of spatial data concerning individuals will be well-managed and governed by guidelines.	1,8 %	15,8 %	33,3 %	**42,1 %**	7,0 %
The pricing of spatial data will not be an obstacle to its use.	21.1 %	22,8 %	29,8 %	22,8 %	3,5 %
The production of spatial data will be put on a more efficient basis by eliminating overlapping work.	1,8 %	21,4 %	26,8 %	**44,6 %**	5,4 %
Spatial data produced by the public sector will be widely available for use by the markets as well as for research and public administration.	1,8 %	28,1 %	35,1 %	33,3 %	1,8 %
Companies will create a large number of innovative solutions based on spatial data for the needs of public administration and other sectors of society.	1,8 %	7,1 %	42,9 %	**44,6 %**	3,6 %
Spatial data services will support people in their everyday activities and during their leisure time.	5,4 %	**46,4 %**	33,9 %	12,5 %	1,8 %
Spatial data will be widely used in decision making and it will support the participation of citizens.	1,8 %	16,1 %	37,5 %	**37,5 %**	7,1 %
Spatial data will be used for managing a large number of functions essential for society at large.	**10,5 %**	**40,4 %**	33,3 %	10,5 %	5,3 %
The use of spatial data and spatial data technology will provide a solution for the monitoring and assessment of the state of the environment.	**15,8 %**	**49,1 %**	21,1 %	14,0 %	0,0 %
Increasing training will help put spatial data expertise on a more in-depth basis in many sectors.	**8,8 %**	**43,9 %**	29,8 %	12,3 %	5,3 %
Research using spatial data will grow and expand into new branches of science.	**14,0 %**	**43,9 %**	22,8 %	17,5 %	1,8 %
Research and development of spatial data services will be at the cutting edge internationally.	1,8 %	26,8 %	42,9 %	23,2 %	5,4 %

Answers to the question *"How relevant the objectives and aims of the spatial data strategy 2010–2015 are to the new strategy?"* emphasised all aims as still being important.

The survey answers included a great deal of written comments, which the strategy group has taken into account in strategy policies and development proposals related to measures.

4 Analysis of changes to the operating environment

At the beginning of the work, the strategy group assessed the ongoing change trends in the area covered by the spatial data strategy using the PEST method. In it, changes are evaluated from four different perspectives – politics, economy, social development and technology. In addition, change factors related to the environment (E) were assessed.

The changes in the operating environment were linked to eleven development trends.

POLITICAL

REQUIREMENTS OF INCREASING OPEN-NESS

PUBLIC ADMINISTRA-TION STRUCTURAL REFORMS

NATIONAL INTERESTS

THE SIGNIFICANCE OF CITIZENS AND ORGANISATIONS IN DATA COLLECTION INCREASES

ECONOMIC

THE ECONOMIC SITUATION OF PUBLIC ADMINISTRA-TION OPERATORS IS GETTING WEAKER

OPENING OF SPATIAL DATA HAS EXTENSIVE ECONOMIC EFFECTS

TECHNOLOGICAL

NEW TECHNOLOGIES FOR DATA COLLECTION

PRODUCTION METHOD OF ICT FUNCTIONS IS CHANGING

COMPLYING WITH STANDARDS IN IMPLEMENTATION

SOCIAL

THE PUBLIC IS USING SPATIAL DATA MORE THAN BEFORE

THE NEED FOR SPATIAL DATA COMPETENCE INCREASES

4.1 Political change factors

Changes in public administration affect the field of operators

There are significant structural changes about to take place in Finnish public administration, which will affect public spatial data operators. Of these, significant for the spatial data strategy are the central government research institute reform and changes planned in the municipal structure.

The implementation of public administration strategies, such as Public Sector ICT Strategy (JulkICT) affects state spatial data operators directly. The Government is also launching the construction of common national service architecture.

The roles of public and private sector in spatial data production and services are changing due to the policies related to opening up of public data. In issues related to spatial data, there is little cooperation between municipalities on the one hand, and between central government and municipalities on the other. Opening up of data in municipalities tends to be slow and uncertain.

On 5 September 2013, the Government made a resolution on the comprehensive reform of research institutes and research funding. It primarily aims to make research funding more subject to competition. This would mean that the quality of spatial data research is what decides whether or not the research will get funding in the future. On the other hand, competition also means an opportunity to increase funding if you are successful in competition.

Requirements of increasing openness

There is pressure to increase openness of administrative functions and decision-making. The consequences are evident, for example, in policies related to opening up of public data. Decision-making is required to provide more grounds and transparency now that the public and organisations are better equipped with chances to analyse situations themselves. Moreover, for example, the requirements of the Inspire directive increase the openness of administration.

The data management of the public administration has been criticised for committing to provider-specific solutions. In order to increase interoperability of information systems, compliance with standards and to decrease dependence of providers the utilisation of open source code in public administration systems are emphasised.

Taking national interests into account in a global operating environment

In the spatial data sector, companies operating globally have quickly taken hold of consumer markets. It is nationally important to ensure that open competition status is retained and that local operators have the opportunity to develop activities related to spatial data.

Safety and supply security have to be taken into account when making decisions of the collection and maintenance of spatial data as well as those on basic services.

4.2 Economic change factors

The economic situation of public administration operators is weakening

The budget appropriations received by central government spatial data operators is decreasing in real terms and in proportion to the growth of requirements related to information content and services. In addition, the production is affected by government ICT savings targeted at information management expenditure. In human resource allocation, the state expects increased productivity.

Open and free data decreases the income of public administration spatial data operators. This has an adverse effect on quality assurance of the data and the development of services.

Opening of data has significant macro-economic effects

Open data increases economic activity. The use of spatial data and spatial data technology enables the development of new services for companies. The public will benefit from easier access to information. The companies may improve their efficiency and productivity with spatial data.

Open data also enables the utilisation of spatial data for smaller companies and may consequently improve employment. Services based on spatial data are easy to construct so that they may be used in various countries.

It is difficult to estimate the overall economic impact of opening up spatial data. Public administration spatial data operators will see direct decrease of their income. The impact on GDP and tax income will come with delay and cannot be directly shown.

4.3 Social change factors

The public is using spatial data more than before

The use of spatial data and spatial data services available to the public is increasing rapidly as the number of devices connected to the internet and capable of positioning increases. As spatial data is becoming increasingly commonplace, the public proficiency level and requirements towards the quality of services increase. The technology used by consumers is developing rapidly and brings new challenges to official services.

The public have conflicting attitudes to personal data protection. They are willing to give extensive information to various services but simultaneously demand from public administration in particular well-controlled and limited use of the information also with regard to spatial data.

The cognitive equality of the citizens will increase when the costs of data acquisition and processing are lowered. Advertising-funded services that are free to users have provided a basic point of departure according to which online services aimed at the public are free of charge.

The significance of citizens and communities in data collection increases

The role of citizens and communities in the collection of spatial data may be increased by enabling the use of pointer and observation data in the systems of spatial data operators. The citizens have at their disposal numerous connected devices capable of relaying positioning data, which can provide accurately located data. Through the devices in their use, citizens also have a passive role in data collection. The use of communal methods, crowdsourcing, in data collection requires that spatial data providers change and develop their

methods of data collection. Already now, companies utilise information provided actively and passively by consumers.

The citizens provide spatial data services, such as Open Street Map, which may offer an alternative to commercial maps.

The role of the third sector in collecting spatial data will increase. Different organisations may be encouraged to organise data collection in subjects, where there is not enough official capacity.

The need for spatial data competence increases

Combining spatial data with data from various operative systems, management of the temporal dimension and rapid growth of non-structural information require in-depth competence in relationships between data models and flows. In addition to spatial data experts, analysts with an understanding of spatial data analysis are needed. More spatial data perspective is required for information technology education and, on the other hand, more data management is required in the spatial data sector education.

Spatial data needs to be more readily available in social decision-making. This requires utilisation of spatial data in the future, for example in the degree programmes in social sciences and law.

4.4 Technological change factors

Production method of ICT functions is changing

The development of ICT services has led to a situation where it is becoming increasingly rare that user organisations handle technical platform services themselves. Instead of technology, comprehensive services are acquired for new projects. Instead of proprietary hardware platforms, various cloud services are used in service provision. In spatial data provider organisations, this change will affect, for example, the staff competence requirements and production cost structures.

Device-specificity will decrease in the use of services due to openness required by consumer services and cloud services used in production.

The use of open source code in spatial data applications will increase. It will change the field of operators and business models. For example, GIS tools are available as free open source software.

Cloud services changes costs structures and value chains. Provision of map services as web services through cloud services is extremely cheap compared to previous operating methods, GIS software is available as a cloud service, etc.

New technologies and operating methods for data collection

Technological solutions for collecting spatial data continue to develop rapidly. Methods that have become increasingly commonplace include laser scanning, sensor data, satellite data, remote sensing, unmanned aerial vehicles (UAVs) and mobile devices for collecting and verifying topographic information. The new solutions are cheap to use but their implementation requires investments from spatial data operators as well as development of processes and operating methods.

Diversification and increase of the amount of data (Big Data) present increased challenges to data management. The temporal dimension will introduce 4D alongside current 2D and 3D. Real-time information about the environment is increasingly available through various online monitoring devices. The positioning data of devices in consumer use enrich other monitoring information and enable focused communications and advertising based on location.

Positioning technology will develop when the current GPS and Glonass systems will be joined by EU's Galileo system and the accuracy of satellite systems (collectively known as GNSS) improves. Fixed GPS stations supplementing satellite positioning help to make adjustments at the accuracy of 0.5 metres and traditional height measuring methods can be abandoned.

Producing data collected as open data

The public sector spatial data operators are required to hand over the data they have collected for further utilisation. This requires that the data has been described and provided with necessary metadata. The authorities will also need to implement web and download services.

Complying with standards in implementation

Application of international spatial data standards and compliance with the Public Administration Recommendations (JHS) related to them will gain importance once data is opened and linked with data collected by other parties. The Inspire directive also has a requirement of complying with data models. For public sector operators compliance with standards is mandatory while for companies it is a necessity dictated by the markets.

4.5 Change factors related to the environment

Environmental issues, such as climate change, are part of the mainstream. They are complex, cross-border and

linked with each other. There is increasing demand for spatial data, particularly if it contains the temporal dimension, in the monitoring and forecasting of environmental development.

Environmental consciousness and taking the environment into account are increasing. Environmental problems are more challenging than before and there is a need to react to them. Knowledge based on spatial data is necessary for decision-making related to and affecting the environment.

By combining various spatial data and measuring information, the management of environmental issues will be better founded on knowledge. New, affordable tools will be developed for the calculation and modelling of environmental burden. Massive data resources (Big Data) and tools developed for analysing them will help us to understand the causes and consequences of environmental changes.

4.6 International analyses related to change factors in spatial data sector

Spatial data sector is extremely international and changes in the operating environment are quite similar everywhere. The strategy group utilised, for example, the work of UN experts and the new spatial data strategies of Sweden and the Netherlands.

In January 2013, the UN-GGIM Committee of Experts on Global Geospatial Information Management working under the UN published a report "Future trends in geospatial information management: the five to ten year vision[6] ". The report discusses comprehensively change trends in the operating environment of the spatial data sector and especially their effect on the activities of National Mapping and Cadastral Authorities (NMCAs).

The UN report highlights the following as key change trends:

Trends in technology and data management
- 'Everything happens somewhere' – the new wave of data creation
- Managing a world of data
- Linked data and the 'Internet of Things'
- Cloud computing
- Open source
- Open Standards

Legal and policy developments
- Funding in a changing world
- Open data
- Licensing, pricing and data 'ownership'
- Privacy
- Standards and policies
- Liability and the issue of data assurance
- Disparities between legal and policy frameworks

Skills requirements and training mechanisms
- Maximising the value of geospatial information
- Extracting value from a world of data
- The importance of visualisation skills
- Formal mechanisms for the development of skills
- Education and advocacy
- Investing in research and development

The role of the private and non governmental sectors
- Making mapping accessible to the masses
- The future role of the private sector
- The future role of Volunteered Geographic Information (VGI) and crowdsourced geospatial information

The future role of governments in geospatial data provision and management
- The impact of change
- Coordination and collaboration
- Developing a national geospatial information infrastructure
- Maintaining an accurate, detailed and trusted geospatial information base

In 2012, Sweden published its national spatial data strategy "Sverige bygger en infrastruktur för geodata[7] " ('Sweden is building an infrastructure for geodata'), which was drawn up by the Geodata Advisory Board comprising representation from the state, provinces and municipalities. The strategy is focused on the development of spatial data infrastructure.

The GIDEON programme 2008 – 2012[8] mainly linked with the implementation of the Inspire directive was implemented in the Netherlands and it will be continued with GIDEON 2013 – 2020 programme, the theme of which is "Digital agenda for the human habitat". The programme's aims include utilisation of Inspire information on application areas, which are healthcare, area planning, mobility, energy, construction and water supply.

[6] *http://ggim.un.org/docs/meetings/3rd%20UNCE/UN-GGIM-Future-trends.pdf*

[7] *www.geodata.se/upload/dokument/strategi/geodatastrategi_2012.pdf*

[8] *www.geonovum.nl/images/stories/Voortgangsrapportage%20GIDEON%20december%202008%20versie1_1_def.pdf*

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