



Everything happens somewhere

National geospatial strategy towards 2025



Foreword

Geospatial information is information about objects, events and conditions where the position is an integral part of the information. The terms location data, geodata, spatial data or geographic information are often used with almost the same meaning.

Many activities are dependent on access to geospatial information. Navigation at sea, flood and landslide protection, construction and civil engineering activities, and emergency service responses are just a few examples. Ever-increasing amounts of data and the ability to collate this data entail additional areas of application and greater practical value. Often we do not even think about the fact that we are using geospatial information; its use is interwoven in virtually all sectors and at all levels. Systems and data are linked together and become part of a comprehensive decision-making basis.

Norway has an extensive and advanced foundation for access to geospatial information. This is our geospatial data infrastructure. It covers many needs in society and consists of various shared solutions for the management, distribution and use of geospatial information. This infrastructure has been developed to a great extent through the agreement-based administrative cooperation Norway Digital.

With this strategy, the Government will continue to develop this infrastructure. This strategy is based on the fact that “everything happens somewhere”, and it shows the direction of the work ahead. The strategy complements Report no. 27 to the Storting (2015–2016), Digital Agenda for Norway – ICT for Simpler Everyday Life and Increased Productivity. This strategy essentially builds on a draft from the Coordination Group for Geospatial Information and the National Geodata Council. The strategy addresses the sectoral authorities at various administrative levels, data producers, technology providers, innovators and users in all sectors – and the Norwegian Mapping Authority as the national geospatial coordinator. The responsibility for implementing measures in the strategy’s action plan will essentially lie with the public sector in accordance with the Act on an infrastructure for geospatial information (the Spatial Data Act).

Oslo, 1 November 2018

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Vision and primary objective

We are living in a digital era, where we rely on geospatial information every single day. Both professionals and private individuals use geospatial information to visualise physical phenomena and events and increase the value of other information.

Geospatial information is required to meet social challenges, such as climate change, environmental challenges, transport, resource management, emergency planning and urbanisation. Geospatial information is also part of many commercial offerings and is an integral part of the digital services we all use in everyday life.

The creation of value based on geospatial information is significant, but there is still a great unused potential here. The needs and demand change over time. The development of technology will in itself also offer new opportunities and applications. In some areas, new needs arise for data other than what has traditionally been used. In other areas, data with an even higher degree of detail may be required to solve the tasks or realise the services.

Society needs good, up-to-date data in private and public activities, within all the specialist areas and sectors. Data must be available in ways that meet the needs. The data must have known coverage and a quality adapted to the needs of the various actors, so that it can support their specific applications and be part of the relevant decision-making processes.

A large part of the geospatial information is collected by public actors. A lot of information is also created in the private sector on assignments for the public sector, through commercial activity or the behaviour of consumers. The rapid digitalisation of society and a growing demand brings up the question of how the collection, management, distribution and collation of geospatial information should be organised. In some areas, data from the public (crowdsourcing) emerges as an important source of data.

Norway has made substantial investments in geospatial information and technology. In order for Norway to remain a leading nation in this area and realise further gains, cooperation between the various sectors of society must be expanded and reinforced.

The vision for this strategy is:

Norway shall be at the forefront in the use of geospatial information.

The Government will work for

- A national knowledge base of geospatial information that meets important societal needs
- Shared solutions and technology that support effective problem solving and enable new application opportunities in society
- Well-functioning interaction with respect to management, sharing, development and innovation between both public and private actors
- Framework conditions that are predictable and well suited to the challenges of digital society

Maps and location-based information shall act as a guide for the creation of value and better decisions.

National geospatial strategy – part of the digital agenda for Norway

The strategy builds on and complements the Digital Agenda for Norway – ICT for Simpler Everyday Life and Increased Productivity, cf. Report no. 27 to the Storting (2015 – 2016). This white paper presents the Government's primary objectives and main priorities of the ICT policy. Many actors contribute to the geospatial data infrastructure; first and foremost municipalities and central government authorities, as well as research institutions, private and other public enterprises.

Geographic location is one aspect of the information base. Often there will be other aspects that require greater attention. An example here would be the statistics for road traffic accidents. This is information that would in most contexts be considered transport information. The collection, management, analysis and disclosure of such information will first and foremost be the responsibility of the authorities and actors in the transport sector or other actors with tasks related to such accidents. However, every single accident “happens somewhere”. Localised spatial information can therefore be used to support the identification, analysis and understanding of the primary information, and, secondly, to convey this knowledge further. The intention of the national geospatial strategy is to support the various sectors, so that they can see and exploit these opportunities across each individual sector. The national geospatial strategy does not delve into the specific challenges in the individual specialist or sectoral areas. This responsibility lies with the sectoral authority in accordance with the sectoral responsibility of the central government.

The individual enterprises are responsible for their own data, regardless of whether it represents geospatial information or not. At the same time, the users would like to have a consolidated and comprehensive knowledge base, especially so that they can compare data from different sources of information. The responsible agencies must make the information available through shared solutions that make it easier for the users to gain access to the entire knowledge base in an economical and technically sensible manner. Cooperation on shared solutions requires that the ownership of and responsibility for the information is made clear.

Based on the Digital Agenda Report and the needs of the individual sectors, strategies have been prepared for several areas. The Ministry of Transport has prepared a strategy for the disclosure of public data for the transport sector¹, and the Ministry of Culture has prepared a strategy for open cultural data.² Other relevant strategies include the Ministry of Climate and Environment's “ICT Strategy for Environmental Management 2016-2020”³. Environmental data is an example of data that essentially has a direct or indirect reference to a particular location or geographic area.

The Research Council of Norway has developed a strategy for “Innovation in the Public Sector”.⁴ This strategy emphasises the need for more efficient interaction between the knowledge environment and innovation actors.

¹ <https://www.regjeringen.no/no/dokumenter/strategi-for-tilgjengeliggjoring-av-offentlige-data--samferdselssektoren/id2598229/>

² <https://www.regjeringen.no/no/dokumenter/kulturdepartementets-strategi-for-apne-data/id2576038/>

³ <https://www.regjeringen.no/no/dokumenter/retningslinjer-ved-tilgjengeliggjoring-av-offentlige-data/id2536870/>

⁴ https://www.forskningsradet.no/no/Nyheter/Taktskifte_for_innovasjon_i_offentlig_sektor/1254032730694?lang=no

Important development trends

Report no. 30 to the Storting (2002-2003) *Norway Digital* has been the strategic foundation for developments in the geospatial area in recent years. This report has guided the public efforts and priorities regarding the collection, management and disclosure of geospatial information in Norway.

However, a great deal has changed since the report was submitted to the Storting, in terms of the needs, technology and societal challenges. The focus on the needs of the users and actual usage has increased. Digital solutions are increasingly being used. The importance of geospatial information in society has increased significantly as a result of these developments. At the same time, general pressure on the public sector's solution of problems has increased. Requirements for a more efficient flow of data are thus greater now. Access to geospatial information is of critical importance to many enterprises and functions in society.

In 2007, the European Union adopted the INSPIRE Directive establishing an Infrastructure for Spatial Information in the European Community. This directive sets out requirements for cooperation and shared solutions for digital services and the sharing of data. The Spatial Data Act implements the INSPIRE Directive into Norwegian law.

The increased digitalisation in many areas of society provides new opportunities for collation, analysis and knowledge production – not to mention sharing, collaboration and interaction between actors. In the private sector, geospatial information provides opportunities for more efficient operation, digital innovation and business development. Software solutions and services based on geospatial information represent a significant export potential for our knowledge-based industries. Global technology and content companies have at the same time become major actors in the field, offering many location-based services to the public.

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) emphasises the importance of a good geospatial knowledge base, in order to achieve sustainable development goals, among other things. The United Nations has established guidelines for how the member states should develop geospatial information, including management solutions and infrastructures. The current strategy agrees essentially with the United Nations initiative in this area.

In the future, geospatial information will interact with new technologies, such as Intelligent Transport Systems (ITS), sensor technologies, big data and learning computers. Technologically, we will be seeing a number of new opportunities for the automation and smart use of geospatial information – and the developments here are rapid. We must at the same time be prepared to meet new challenges, in the area of information security, for example. Automation of work processes based on geospatial information will entail, among other things, stricter data integrity requirements and the availability of both data and functionality. We will become more vulnerable, the more dependent we become on continuous access to data. The geospatial data infrastructure must therefore safeguard important information security requirements.

The user threshold is often high for good utilisation of geospatial information. A special effort must be made to meet the needs of the users for services and provide easy access in an efficient way. Shared solutions and open interfaces that allow third-party suppliers to develop user-friendly services that collect data from the infrastructure are important.

Requirement for electronic access to public geospatial information

The INSPIRE Directive (2007/2/EC) requires that the EU Member States make national geospatial information available electronically. The Directive has been incorporated into the EEA Agreement and also applies to Norway. The directive is a framework directive, in which the more detailed requirements are found in separate implementing directives that have been implemented into Norwegian law in regulations pursuant to the Spatial Data Act (Spatial Data Regulations). This includes, for example, requirements:

- to make geospatial information available electronically with standardised online services for searching, viewing and downloading
- to ensure that geospatial data and related services can interact with other data and services
- to document geospatial data and related services

The Directive is based on the following principles:

- The European infrastructure shall build on the national geospatial data infrastructures of the individual states
- The national infrastructures shall facilitate
 - geospatial data being stored, made available and maintained at the most appropriate administrative level
 - that geospatial data from various sources across Europe can be combined in a uniform manner and shared among many users and areas of application
 - that geospatial data collected at one regulatory level can be made available to authorities at other levels
 - that geospatial data is made available on the basis of conditions that do not unreasonably limit widespread use of such data
- It shall be easy to find geospatial data, assess whether the data is suitable for the intended purpose and ascertain the conditions that apply to use of the data.

Norway already has a digital geospatial data infrastructure. It consists of large amounts of data, collected by many actors from various sectors over a long period of time, and of tools, shared solutions, directory services, agreements and routines that have been established to manage, locate, distribute and use geospatial information efficiently. However, there is still a ways to go before the infrastructure can be said to meet the needs of all the important areas of society.

The amount of digital information in society is growing. Geospatial information is no exception. A number of actors in society are using a great deal of resources to collect, maintain and analyse geospatial information.⁵ Municipal and central government mapping and surveying activities amount to more than NOK 2 billion. The private geomatics industry reported revenues of more than NOK 2.4 billion around the year 2000. Companies that are primarily aimed at special types of mapping, for example, geological and geophysical mapping, were excluded from this number. Members of the trade association for geomatics companies reported revenues of NOK 5.0 billion in 2017, but this number also includes services outside the geomatics area.

⁵ Source: KOSTRA, Proposition no. 1 to the Storting (2017-2018). Report no. 30 to the Storting (2002-2003), geomatikkbedriftene.no, proff.no

Good quality geospatial information is a core part of the knowledge base for many processes in society

This also implies that the use of geospatial information will be part of the solution for handling the societal challenges of our time:

- **Internationalisation.** The Internet, cross-border cooperation and trade contribute to increased globalisation and entail new requirements for adapting the flow of data and cross-border digital services – and this applies to geospatial information as well.
- **The geopolitical situation.** The number of exercises is increasing in Norwegian areas. Both military and civilian national experts must be able to interact during certain events. The utilisation of geospatial information is of key importance here.
- **Emergency planning.** New threats and vulnerabilities arise. The requirements for good emergency planning for serious incidents are increasing, and the ability to handle crisis situations is becoming increasingly important. Updated geospatial information is an important tool for the assessment of threat situations and the ability to act quickly and appropriately.
- **Climate change and other environmental challenges.** Climate change may increasingly cause landslides, flooding and other weather-induced natural disasters. The prerequisites for food production and food safety are gradually changing. Geospatial information is an important element of work with adaptation to climate change and other environmental challenges, including land-use planning by the municipalities.
- **New business activities.** Fisheries, aquaculture, tourism and renewable biological resources are becoming increasingly important to the Norwegian economy. Innovation Norway points to bioeconomics, clean energy, the Blue Economy, creative industries and tourism, health and welfare and smart communities as areas of opportunity for Norwegian restructuring. Geospatial information and knowledge about the properties and value of the resources plays a key role in several of these areas.
- **An efficient public sector.** Public administration ties up a great deal of resources in society. There is a need to perform tasks more efficiently, through digitalisation and more efficient ways of working. The geospatial data infrastructure contributes directly to improving the efficiency of the public sector. The municipal sector is both a producer and user of geospatial information. Shared solutions enable the county authorities, municipalities and central government agencies to take advantage of economies of scale through cooperation. Maintaining and developing a well-functioning infrastructure for the data that is needed will at the same time be costly.
- **Urbanisation.** Public services in the cities of the future will be based on advanced three-dimensional data above and below ground, and sensors and cameras that monitor traffic, energy consumption and other environmental factors. Smart cities are characterised by efficient urban planning, a better knowledge base in the building sector, optimisation of traffic and energy consumption, and more dynamic dimensioning of tenders. Geospatial information is the key to this.
- **Sustainable development goals.** In the autumn of 2015, the UN Member States adopted 17 sustainable development goals towards 2030. The sustainable development goals look at the environment, economics and social development in context. They apply to all countries and are a roadmap for global efforts in the area of sustainable development.

1 Data content

The central government and municipalities collect and manage geospatial information that represents the foundation of our national knowledge base. The information is used in various administrative procedures, but it is also included as part of various public services. Moreover, this information is the basis for the creation of value in trade and industry and benefits us all.

The municipalities are important contributors to, premise providers for and users of the knowledge base. They establish, develop, partially finance and maintain detailed geospatial data. The municipalities' administrative data capture covers most of the man-made changes to the physical environment. The Norwegian Public Base of Geospatial Data (DOK) is used to make decisions, approve applications, prepare and process plans in accordance with the Planning and Building Act and to develop local communities. Among other things, the municipalities use the data in their work with climate adaptations and to safeguard environmental considerations and conservation interests.

A good geospatial knowledge base is essential for well-functioning cities and local communities. The building industry is a billion kroner industry that can achieve greater predictability, better engineering support and more efficient interaction with the municipalities through integrated use of geospatial information.



Figure 1.1 A surface model showing elevation data based on detailed laser measurements from an aircraft

Illustration photo: Norwegian Mapping Authority, hoydedata.no

Expectations for the data content of the infrastructure are increasing

Central societal processes are becoming increasingly dependent on quality-assured data from many sources – preferably across sectors and administrative levels. The requirements for updating are increasing. In some cases, real-time data updates are required. The users' expectations for the data content and quality are often higher than what the geospatial data

infrastructure can offer. For example, the municipalities point out that they need more detailed and comprehensive data and better documentation of appropriate use than what they currently receive from national agencies in the Norwegian Public Base of Geospatial Data. In areas of society where digital geospatial information is not currently utilised much, there will be new users who request other data and levels of detail, but who will also contribute new data to the infrastructure. These needs and expectations for the data content will place pressure on the infrastructure. There will also be a need for an effort to raise the quality of the data.

Ecological base map

Good geospatial data for the environment is crucial when large and small initiatives are to be planned and realised. In order to succeed, we must have good maps showing where various natural assets are located. The Government is following up the Storting's request to strengthen the efforts to map the natural environment and establish an ecological base map for Norway. The Ministry of Climate and Environment has appointed the Norwegian Environment Agency to lead and coordinate this work, which will take place in close cooperation with the Norwegian Biodiversity Information Centre and the affected authorities.

The ecological base map is not one specific map, but a collection of geospatial data with, among other things, geo-referenced information for the types of natural environments, species and types of landscape. Such geospatial data is available from the environmental management, scientific communities and various sectoral authorities. The sum total of this geospatial data will represent an ecological base map for Norway and provide the basis for knowledge-based management of the Norwegian natural environment.

The selected map layers shall be collated and made easily accessible as spatial services in accordance with the requirements of the Spatial Data Act. A user-friendly and up-to-date viewing solution shall also be created. As part of this effort, work is in progress to establish routines for the flow of data from various authorities and related services for the ecological base map.

The combined efforts must be utilised better

Collecting and managing data is often associated with high costs. This means that as much as possible must be gained from the combined efforts through cooperation. Central government agencies have a self-defined need for specific data within their areas of responsibility and manage their own investments accordingly. The municipalities establish data to exercise their role as a service provider and exerciser of authority, for example in the form of municipal master plans, detailed technical maps and the water grid. There is well-functioning cooperation for the coordinated establishment, management and maintenance of detailed data through cooperative structures such as Geovekst⁶ and the National

⁶ Geovekst is a cooperative effort for the joint financing, establishment and maintenance of basic geospatial information. See the explanation on page 28

Programme⁷ for Aerial Photography. In the area of marine mapping, the Mareano⁸ Programme is a corresponding example. Cooperation is both socio-economically sensible and necessary. In addition, a number of international programmes in the area of environmental and resource monitoring also contribute a large amount of new data. It is expected that international joint initiatives will be of greater importance in the future. Copernicus, Europe's major satellite and sensor-based programme for environmental monitoring, climate and civil protection, provides us with data on land use, vegetation changes, water quality, weather conditions, air quality, pollution and greenhouse gases. This concerns large amounts of data that are now available and must be utilised in a good way, which entails new major requirements for the infrastructure for geospatial information.

Actors outside of the public administration must participate to a greater extent

Colleges, universities, research institutions and national and international R&D programmes create data that will be valuable to decision-making processes and for the creation of value. In general, this information is currently not very accessible for reuse. It must be possible to link the geospatial data infrastructure to research data to a greater degree. Geo-referenced research data could thus become part of our common knowledge base, and the geospatial data infrastructure could support research more efficiently in accordance with the national strategy for the disclosure and sharing of research data⁹. This goes both ways: The geospatial data infrastructure shall be suitable as a source of data for research, and for the archiving and disclosure of geospatial related research data.

Private actors contribute to the production of data through development plans, licence applications, impact assessments, environmental assessments or other statutory interaction with central government agencies or municipalities. This data must also become an integral part of our overall knowledge base to a greater extent.

Private companies also establish databases for various special purposes, which may encompass general maps of roads, topographies, etc. Examples of major global actors who have done this include Google, Apple and the map service Here. These actors do not just use detailed basic maps and aerial images, they also use three-dimensional terrain models and various types of thematic information.

Organisations, the voluntary sector and the general public also contribute to the production of geo-referenced data, through online voluntary work and interaction with the public sector. The infrastructure shall facilitate the utilisation of these contributions in the infrastructure, as well as innovation.

⁷ The National Programme for Aerial Photography started aerial photography in 2006. At present, there are orthophotos with a ground resolution 50 cm or better for the entire country. The objective is to repeat the photography at regular intervals of 5-10 years, depending on the area. The programme is in its second round of circulation now.

⁸ The Mareano Programme represents cross-sectoral cooperation on the mapping of Norwegian sea and fjord areas. The activities here include the mapping of depth, bottom topography and environmental conditions. See the explanation on page 29

⁹ <https://www.regjeringen.no/no/dokumenter/nasjonal-strategi-for-tilgjengeliggjoring-og-delning-av-forskningsdata/id2582412/>

Data content sub-goal

1.1 Priority geospatial data is anchored, funded and established

Some geospatial data forms the foundation for the entire infrastructure. This “core data” must be defined in more detail. The data sets must have a known coverage and be of sufficient quality to meet the intended purpose, be up to date and easily accessible. If necessary, the specific data sets must be formalised in legislation to ensure their availability and create predictability, so that automated decision-making processes can be supported. Some key data – such as property, building and address data from the land register (cadastre) – must be of very high quality, since many societal processes are dependent on this data. It will be important to develop good processes and resources for the planning, prioritisation and coordination of the actors’ data capture, maintenance and improvement of the quality of the priority data sets.

Basic geospatial data and thematic geospatial data

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) points to the following themes as fundamental to society's access to geospatial information:

- reference frame for positioning
- geographical names
- addresses
- administrative and other functional areas
- buildings and settlements
- land parcels and registration of rights
- transport networks
- surface of the Earth (on land and under the sea and water)
- population distribution
- land cover and land use
- geology and soils
- physical infrastructure, including the service and utility infrastructure
- water and watercourses
- orthoimagery

The INSPIRE directive defines additional topics. The expansion here applies first and foremost to environmental information.¹⁰

In accordance with the current principles of Norway Digital, the geospatial data infrastructure consists of both basic geospatial data (seabed, topography, watercourses, geographical names, etc.) and thematic spatial data (resource information, environmental information, geology, existing and planned land use, etc.). The Norwegian Public Base of Geospatial Data currently sets out 140 spatial data themes that are of importance to purposes pursuant to the Planning and Building Act.

¹⁰ The INSPIRE Directive defines a total of 34 spatial data themes, see the explanation on page 28

1.2 Geospatial information is well-adapted technically and thematically for use

The needs of the users and adaptation for a digital first choice must be key to the development of the national infrastructure. Authoritative and prioritised data shall be structured, documented and offered in accordance with the expectations and user requirements, including international requirements. Data that is included in the national infrastructure, but is not necessarily defined as part of the prioritised “core data”, shall also be adapted for use by the fulfilment of certain requirements (formats, metadata, quality labelling, etc.). Such data may have completely different qualities or coverage. Some data may be adapted to the simple needs of specific user groups, while other data may be used by more groups and subject to greater requirements. The infrastructure shall offer three-dimensional data, dynamic data, historical data and processed information. Broad utilisation of new technologies shall also be facilitated, which can make the utilisation of big data possible, among other things. There shall be a complete overview of geospatial information, including the properties and related services in the map directory www.geonorge.no.

1.3 Geospatial information collected in accordance with public requirements is available in the infrastructure

Significant amounts of geospatial information are collected through publicly funded mapping programmes and research activities at universities, colleges, museums and institutes – and as part of the public development activities, projects and consulting assignments. Through a number of laws, regulations and rules, both private and public actors are required to prepare documentation in the form of geospatial information, in connection with licence applications, spatial planning and building applications, etc. This data represents a potential value to the overall source data. However, to ensure further management and utilisation of the data, the various actors must be aware of the relevant requirements and ensure that the data is made available through the national infrastructure. The infrastructure must be adapted at the same time to this data content.

1.4 Society has appropriate reference frames for positioning

Accurate navigation and positioning services are becoming increasingly important for the utilisation of geospatial information. A necessary prerequisite for this is to have appropriate reference frames for the positioning that enable the users to determine geospatial coordinates (for example, latitude and longitude) with an adequate degree of accuracy and reliability (geodetic reference frame). There is a need for continuous control and updating of this reference frame. The best possible positioning services shall be offered for all applications, based on international guidelines for a sustainable global geodetic reference frame. Increased accuracy requirements require corresponding improvements in the reference frame.

1.5 Infrastructure simplifies reporting for the national, European and global needs

The Norwegian geospatial data infrastructure shall observe the principles that are inherent to work on the geospatial data infrastructure in the EU, including, for example, that data shall

only be collected once, that it shall be stored where it can be the most effective, and that it shall be possible to combine the data seamlessly between different application areas.

Reporting is often fragmented and the opportunities for digital, efficient data capture, adaptation and distribution through sharing on digital platforms are not utilised to any great degree. The national geospatial data infrastructure shall supply various parts of the public sector with relevant data, and it shall also support coordinated and efficient sharing and reporting of Norwegian data for international purposes.

1.6 As a rule, the infrastructure shall be based on open data

The requirements in and pursuant to the Spatial Data Act govern access to data in the geospatial data infrastructure. This applies, for example, to the requirements for documentation and open electronic access. Other laws and regulations also set out requirements for open data, such as the Freedom of Information Act and Environmental Information Act. The Ministry of Local Government and Modernisation's guidelines¹¹ for the disclosure of public data apply to data in the geospatial data infrastructure. This implies essentially that the data is free and freely available for reuse. There are some exceptions, including the most detailed geospatial data (Joint Geospatial Database, "FKB") and precise position data, for example. These are areas where the collection and management of data are particularly costly or where user financing can contribute to better resource allocation. A report on the value of free geospatial and property data from Vista Analyse ("Verdien av gratis kart- og eiendomsdata", 2014) accounts for the social importance of simple and free access to geospatial and property data.

The Ministry of Local Government and Modernisation's aim is for national geospatial and property data to be made available for self-service over the Internet for searching, viewing and downloading, and to be freely available in line with other public information. As a rule, data that is directly associated with retrieval costs shall have a price that covers the cost of distribution. This includes maps and documents on paper, DVD and other physical media. This also applies to retrieval that requires manual processing or other forms of access control. The electronic services shall be adapted to the needs of the general public, trade and industry, and the public administration.

There will still need to be restrictions on access to geospatial and property data for the sake of privacy and national security. Other exceptions may also apply to the need to protect threatened animal species, for example. Changes in the pricing policy will occur incrementally within the current budget limits at any given time.

¹¹ <https://www.regjeringen.no/no/dokumenter/retningslinjer-ved-tilgjengeliggjoring-av-offentlige-data/id2536870/>

Species sightings

The website artsobservasjoner.no is a major voluntary knowledge sharing effort that involves the general public mapping species in Norway. Through this service, volunteer amateurs, consulting firms and the public administration contribute to increasing knowledge of what species exist in Norway and where they are located.

Artsobservasjoner.no is being developed and operated by the Norwegian Biodiversity Information Centre on behalf of the Ministry of Climate and Environment. The system was established in 2008 and now contains over 19 million sightings of species across all the species categories. Data from the solution is used daily in public administration and research, as communicated through the Species Map service.

1.7 Data from the general public is used where appropriate

Online voluntary work and other forms of data collection from the general public represents a potential for supplementary access to data. The infrastructure already has a couple of examples of data from the general public, such as data on trails and paths, but this can be supported better than it is at present. Standards for data capture, quality labelling and modelling must also be in place, so that the public administration can fully benefit from this type of data.

2 Technology and tools

Good tools, methods and a well-functioning technical infrastructure must be in place in order to convert data to information and knowledge for practical use.



Figure 2.1 Geospatial data in your mobile phone

Illustration photo: www.colourbox.com

The infrastructure must be further developed

The use of standards is key to the infrastructure. National standards for geospatial information have long been in widespread use. The national standardisation efforts must be developed in accordance with new societal needs, the development of new technologies and new international standards. Standards, harmonised data formats and concepts, for example, are prerequisites for international cooperation, research and problem solving across sectors and national borders.

Norway is at the forefront in the use of modern data capture methods. Many actors have established efficient production lines for their geospatial information. Good information management will also be a fundamental prerequisite for the geospatial data infrastructure in the future as well. It is also necessary to establish a uniform approach to work with information security. Among other things, there must be good mechanisms for handling classified information in the infrastructure. The Norwegian Mapping Authority as the facilitator and all the data owners and contributors are responsible for ensuring confidentiality, data integrity and the availability of information in the infrastructure.

Integration between infrastructures, data and services is becoming increasingly important

Geospatial information is currently integrated to varying degrees with the available IT solutions. The lack of suitable user applications is one of our challenges. Global actors now offer a growing number of services and information in the “cloud”, which helps increase availability and can lower the user threshold. New user platforms and mobile devices, however, will entail new requirements for standards and user-oriented services in the

infrastructure. Geospatial information from the national infrastructure needs to be better integrated in the work processes and user tools that are used. The infrastructure and shared solutions must interact with commercial software, while the technology is at the same time adapted so that it is independent of the platform. The infrastructure shall facilitate fully digital and efficient processes, as well as service innovation and good utilisation of the knowledge base.

There is also a need for harmonisation and links between the infrastructures, so that the same data can be used in different computer systems. For users today are confronted with different platforms and shared solutions in related sectors and specialist areas. For example, there is a need for good links between the national geoportal “Geonorge” and the sharing portal “data.norge.no”. There is also a need for integration with the research infrastructure and international infrastructures. As a platform for access to all geospatial information, Geonorge will be a source of innovative applications for the data content. It must be possible to integrate geospatial information with other infrastructures and with commercial software, and to handle new data capture methods and new types of data. The Digitalisation Directive stresses the importance of developing continuous digital service chains in the public administration. This will be an important premise for efforts to ensure an efficient flow of data for geospatial information.

Geointegration

Geospatial information systems do not automatically interact with the municipal administrative processing and archiving systems. The administrative processing and archiving systems are not automatically able to utilise information on geospatial conditions either. The Norwegian Mapping Authority and the Norwegian Association of Local & Regional Authorities (KS) are cooperating on developing and maintaining common standards and principles of this type for interaction between geospatial information systems, other professional systems and administrative processing and archiving systems. This applies in particular to integration with the land register (cadastre) and systems that the municipalities use for building applications and land-use planning. The standards have been developed and tested in broad cooperation between the municipalities, suppliers and central government agencies.

Infrastructure must handle new types of data and technologies

The geospatial data infrastructure must be capable of handling new types of data and larger amounts of data. The use of three-dimensional data (3D) for planning and engineering is increasing – and concepts for three-dimensional engineering, such as computer-aided design (CAD) and Building Information Modelling (BIM) are rapidly evolving. There are also increasing expectations that the infrastructure shall handle dynamic (time series) data. Already today, sensors are used a great deal, for quality assurance and analysis of the data that comes from administrative data capture in the enterprises (so-called change analysis), among other things. Growth in the number of devices connected to the Internet also contributes to dramatic growth in the amount of sensor data. This will streamline the collection of geospatial information, but it will also challenge the systems with regard to their storage and processing capacity. The infrastructure must facilitate broad utilisation of the

new opportunities for decision support that lie in data analysis and big data. It will also be necessary to develop new methods and solutions to take full advantage of sensors and other new sources of data in the infrastructure.

Technology and tools sub-goal

2.1 Geonorge ensures an efficient flow of data between sectors and levels

Enterprises in the public sector exchange and reuse data today, but the flow of data can be streamlined. Geospatial information can be utilised more efficiently than it is today – on different platforms and with different technology carriers. In the future, commercial actors will set out higher requirements for the availability, robustness and functional interfaces of the infrastructure as they integrate public information resources with their business models and become economically dependent on both the availability and quality of the data. Geonorge shall therefore be further developed as a national service-based architecture with standardised and sought-after interfaces. This will ensure an efficient flow of data across the sectors and levels. Search and access solutions shall be offered through good interfaces and opportunities for integrations.

2.2 Shared solutions have been established for the storage and management of geospatial information

Robust and user-friendly shared solutions can contribute to a more coordinated management of data in society. Public data providers must be able to deliver data through electronic services that maintain the expected delivery quality. The users must be able to rely on the services from Geonorge. There is a need to further develop national (central and distributed) solutions for the storage and management of geospatial information, such as solutions that support work with impact assessments, licence applications and other processes that the public sector initiates. Such processes may also involve private actors. The possibility of national cloud solutions for the management, adaptation and sharing of geospatial information shall be considered. Cloud-based management solutions may be able to reduce the need for local solutions and may save costs.

2.3 Infrastructure must be subject to satisfactory information security

The infrastructure shall be subject to a regime that ensures the confidentiality, integrity and availability of information. There shall be clear principles and responsibilities. Data owners have an independent responsibility to safeguard information security for their own data, software systems and services. In the central infrastructure, common mechanisms, components and systems shall be established to manage information security. Risk analyses must be conducted annually for all the systems that share data in the infrastructure. Further information security requirements may be found, for example, in the Norwegian Security Act and the Norwegian Personal Data Act. See in particular Section 15 of the eGovernment Regulations.

2.4 Streamlining data capture to the infrastructure

In many areas, sensors and other new technologies (drones, satellites, etc.) make the collection of data significantly more efficient. Further use of sensor technology provides opportunities for obtaining better data, more knowledge and more efficient data collection compared with traditional mapping methods. For example, data can be collected from the general public through the use of mobile devices. The supplier industry and those who deliver data to the infrastructure shall cooperate on the development of methods and other initiatives that contribute to the increased utilisation of sensor technology for efficient data capture. A development in the direction of more use of sensors will generate a continuous flow of geo-referenced data. This is expected to provide substantial growth of dynamic data in the infrastructure for years to come. This requires, however, that the infrastructure be further developed with better support for this type of data.

Norwegian Meteorological Institute

The Norwegian Meteorological Institute is a world leader in utilising observations from private individuals in weather forecasting. From the spring of 2018, temperature readings from a large number of private stations will be combined with established weather stations to correct forecasts on Yr. Private stations make it possible to observe much larger areas, so that the weather forecasts better represent the major local differences that exist in Norway. A high density of stations is essential in order to offer the general public forecasts adapted to each individual user. The use of private so-called non-conventional observations requires new forms of quality control in order to weed out imprecise measurements. Even with conservative tests, around 70% of the private observations are included in the production of weather forecasts. Conventional and non-conventional observations complete and complement each other. All the data is free and openly available.

2.5 Utilisation of big data technology to acquire greater knowledge

Intelligent links and analysis of large amounts of data will form the basis for new knowledge and more efficient decision-making systems in both the public administration and the private sector. In the future, big data will be able to provide considerably better utilisation of the data contained in the geospatial data infrastructure – preferably combined with other types of data (for example, socio-economic data, social media, international data). How big data can be facilitated in the infrastructure shall be studied in more detail.

2.6 Geospatial data infrastructure manages three-dimensional data

Many application areas require an information basis beyond what can be represented by two dimensions. Two examples here are the planning, engineering and management of underground service lines and the drilling of energy wells. The opportunities for handling three-dimensional data (engineering, terrain profiles, underground data, volumes, etc.) are

rapidly evolving. At present, however, there are no shared solutions for managing the type of information that is included in modern engineering tools, such as Building Information Modelling (BIM) and computer-aided design (CAD). Technology that handles such data in the geospatial infrastructure, from data collection to use, shall be developed and implemented.

2.7 Geospatial data infrastructure is adapted to handle processed data

It must be possible for the infrastructure to increasingly handle processed data, with documentation of the calculation models, algorithms and uncertainty. In some cases, the users will want to calculate old data with new methods, for example, calculations back in time in the area of climate research. Access to this type of data in the infrastructure will also help ensure that algorithms, analysis results and calculations can be reused to a greater extent by various parties. Technology that handles processed data in the infrastructure shall be developed and implemented.

2.8 Forward-looking standards and user technology shall be developed and implemented

Standards shall contribute to a predictable flow of data and enable integrations and utilisation across technical platforms, sectors and specialist areas. The Digitalisation Directive's instructions regarding architectural principles and standards also apply to the geospatial data infrastructure. Standardisation efforts in national and international standardisation forums shall focus on forward-looking, national and international standards, including efficient utilisation of sensors and other new data capture technologies in the infrastructure. It is also important that the standards and services in the infrastructure facilitate integration with the users' other technology environments. The domain-specific standards of new actors must also be taken into account in this context. Standards shall also enable integration with other types of data.

3 Interaction

Geospatial information will concern more and more actors and must be seen in a broader perspective than in the past. In order to develop content and technology for the benefit of the public sector, trade, industry and society as a whole, there is a need for greater cooperation between all actors than has previously been achieved.



Figure 3.1 Data sharing

Illustration photo: www.colourbox.com

Norway Digital cooperation must meet new needs

Many public enterprises have long-standing experience with cooperation and joint efforts in this area through the Norway Digital cooperation. This has been an agreement-based and well-functioning form of cooperation, across many sectors and with a total of 600 agencies and municipalities involved. In the future, there will be a need to further develop cooperation and open up for broader participation within the public sector, trade and industry and organisations. It is, for example, necessary to better adapt to the needs of the marine and maritime sectors. Moreover, universities, colleges and research institutions should be more active as data providers and contributors to the infrastructure. Data collection and knowledge production are part of this sector's societal mission.

Private sector must participate to a greater extent in the infrastructure

The private sector has been an important contributor to the development of the geospatial area, as data producers, technology providers, service innovators and end users of geospatial information. Many private companies produce their own data and make extensive use of geospatial information in their own activities. Some people refine and increase the value of open public data, or provide services based on this data. Private consulting firms use geospatial information in surveys and analyses. The general public is both a user and producer of data. Contributions by the general public may increase significantly. The private

sector must be regarded to a greater extent as an important contributor to the national infrastructure for geospatial information.

Everything is connected

Geospatial information will become an important matter for far more than just today's public data producers in central government and municipalities. The established cooperative structures cannot automatically adapt to greater demand, new data needs, a more complex actor situation and new technological opportunities. Geospatial information will increasingly be used through integrated and comprehensive digital services – which will say something about where everything is, what it is, what is going on and how things are connected. In the Digitalisation Directive, such connected services are referred to as “service chains”. All the ministries are responsible for evaluating services within their own sector that should be viewed in the context of the services of other enterprises, and whether the services are suitable for the development of service chains. In the future, different specialist models in the geospatial area will be interconnected, not just nationally, but across borders as well – for a total model of reality, both indoors and outdoors. The growing amount of data captured by the general public and internet-connected devices will be utilised across the actors. Such a coherent landscape of data and systems will require closer cooperation between the relevant actors and contributors than is the case today.

Knowledge is needed at all levels

Another prerequisite for good utilisation of the geospatial data infrastructure is knowledge at all levels – knowledge of the opportunities, limitations and challenges. The use of geospatial information is changing in step with the available technology, but the lack of user expertise and the data providers' adaptation for use may be an obstacle to good utilisation of the opportunities. The expertise of data producers, data managers, innovators and users will be challenged. Broad cooperation on a national boost of knowledge in this area is necessary. The education sector should play a more central and long-term role in this context.

Good interaction will be a success factor for this strategy

The actors must cooperate to ensure the implementation of this strategy. Even though the actors still have different roles as data owners, data collectors, distributors and service innovators, it is about having a common knowledge base and the utilisation of this base. Good interaction means that data, services and solutions are reused. For small municipalities and other minor actors, access to shared solutions in the infrastructure will entail economies of scale and provide efficient digital management and use. This will benefit everyone and ensure well-functioning computer systems and services. The ministries must follow up their underlying agencies who are responsible for their own sectoral data.

Interaction sub-goal

3.1 There is good interaction and cooperation across the public sector

Cross-sector cooperation is important and has proven to provide substantial gains in the geospatial area. Many agencies and enterprises have a tradition of cooperation through Geovekst and Norway Digital. There should be good arenas in the future as well, but these arenas must be further developed to formulate and make decisions on measures regarding data content, standards and shared solutions. It is important that this cooperation supports the municipalities' public duties in relation to the citizens and the responsibility for important data in the infrastructure. The municipalities shall be involved in the development of shared solutions in the infrastructure. This cooperation shall also contribute to ensuring robust financing of the prioritised data in the infrastructure. The national geospatial coordinator will be the facilitator and assume special responsibility for the cross-sectoral cooperation structures at the agency level.

3.2 There are appropriate arenas for public-private cooperation

It is imperative that the private sector's contribution to and use of the infrastructure be strengthened. This cooperation revolves around contributions at multiple levels: technical solutions, data deliveries and the development of new user applications and services. The establishment of common arenas for the clarification of responsibilities and coordination of measures between the public and private sectors shall be facilitated.

3.3 Cooperation models are adapted to all the contributors and users

The Norway Digital cooperation should to a greater extent generate broadly established obligations for further development of the geospatial data infrastructure. The model should allow the entry of sectors and smaller agencies who have previously not been involved, so that they can also increase their use and become contributors. The possibilities for differentiated terms and membership in Norway Digital shall be studied. It is also important to have clearly defined responsibilities related to the priority data sets (core data) in the infrastructure. The responsibility for the individual data sets in the Norwegian Public Base of Geospatial Data (DOK) will be clarified in connection with the Ministry's regular approval processes for this base of geospatial data.

Many sectoral laws establish work processes that require the use of geospatial information. Some sectoral laws also require the establishment of specific geospatial information, but without sufficient instructions. When such laws, regulations and rules are revised, requirements for the quality of and responsibility for the data must be specified, so that the data collected can be used efficiently on a broad basis.

3.4 There are active environments and initiatives for innovation and R&D

More innovation and R&D in the geospatial area shall contribute to better utilisation of the realm of possibilities. Public and private actors in the infrastructure must cooperate on this, and include, for example, the Agency for Public Management and eGovernment (Difi) – which performs the role of a promoter of digitalisation work in the public sector – with regard to the development of appropriate innovation arenas. Research communities should also contribute to the development of the infrastructure. There is a need for research and development in the areas of data capture, efficient data management and technologies for the use of data (data analysis, visualisation, etc.). Geospatial innovation and R&D can be facilitated together with the public policy system (Research Council of Norway, Innovation Norway and others). Actors in the public and private sectors must to a greater extent be encouraged to submit joint applications and participate in related national and international research programmes.

3.5 Expertise on geospatial information and the associated solutions is widespread

Knowledge of geospatial information and geospatial methods is important for the realisation of this strategy. Sufficient knowledge and expertise on geospatial information in the educational sector should be facilitated through cross-sectoral cooperation. This will contribute to expertise on the use and development of user solutions based on geospatial information that can promote innovation and the creation of value in society.

4 Framework conditions

Development of the geospatial data infrastructure is part of the Government's efforts to digitalise and streamline the public sector.

Public enterprises have a great deal of interest in the infrastructure. In digitalisation work, gains shall be realised from the investments made in the knowledge base. Geospatial information shall be used on a broad basis and across the sectors and administrative levels, and provide efficient decision-making processes and a more knowledge-based management.



Figure 4.1 Property boundaries visualised on mobile phones

Photo: Jan Hausken

The financing of the infrastructure is partly through ordinary appropriations, government charges for acts by public authorities and revenue from the sale of data. In addition, various forms of co-financing by the participants in the infrastructure play a large role, through structures such as Geovekst and Norway Digital, for example. A new elevation data model is a recent example of broad co-financing from a number of sectors. These agreement-based co-financing schemes have been effective due to the fact that they have contributed to the ownership of needs, and that they have distributed the risk among several actors. However, it is a question of whether such measures alone are sufficient as funding mechanisms for critical societal infrastructure. The funding mechanisms that support the strategy and provide security for all the actors must be studied more closely.

The public sector will continue to bear the brunt of the financing of the geospatial data infrastructure. Collecting, maintaining and managing geospatial data is associated with relatively large costs. This is especially true of the most detailed data. At the same time, the demand for such data is increasing as a consequence of the digitalisation of society, among other things. Even though new data capture methods and new technologies streamline data production, we must expect that the cost of data collection, maintenance and management will increase compared to today's levels.

The fact that the geospatial data infrastructure is critical for many societal functions calls of course for assurance of the necessary financing of new data, ongoing operations and maintenance of the data content and related services. This is safeguarded today to a great extent through the budgets of the public sectoral agencies or through a sharing of expenses by the actors who see a common benefit of the investments. From experience, cooperation, sharing expenses and joint investments in data capture and maintenance programmes have proven to safeguard the priorities of key users and provide good utilisation of the actors' combined resources. It is not given that this is a sufficiently predictable structure for the future.

A fundamental problem is that the benefits of high-quality data are often realised by parties other than those who have incurred the expenses. Even though free access to the best data is expected in isolation to be socio-economically beneficial, the actor in question does not necessarily have the economy to pay for all the costs associated with collecting and maintaining data with a high level of detail or quality.

Government's focus on open data

The focus on open public data and reuse is about giving trade and industry, researchers and civil society access to data from the public sector in a way that allows the data to be used in new contexts. There are three main reasons why access to open public data is important to society:

- Streamlining and innovation: When data is shared between enterprises, we obtain better interaction, more rational service development and better public services
- Business development: Trade and industry are given the opportunity to develop new services, products and business models based on access to public information
- An open and democratic society: Access to the basis for making decisions and priorities in the public sector provides a better opportunity for obtaining insight into how decisions are followed up and what the impact of political actions is

In Report no. 27 to the Storting (2015-2016) Digital Agenda for Norway, geospatial and property data has been pointed out as one of five key focus areas for open data.

Achieve more innovation based on open data

A large part of the data in the geospatial infrastructure is currently available through viewing services and application programming interfaces (APIs). Most of the data is free and can freely be reused without restriction, but there are some exceptions, for example, for the most detailed data (Joint Geospatial Database) as accounted for under sub-goal 1.7. Making larger portions of the data content in the infrastructure available free of charge is a goal.

Focusing on open, free data can make it necessary to study alternatives to the current funding model. Any loss of revenue from the detailed data will reduce the scope of funding and may also weaken the co-financing model. This will require adjustments or new sources of funding. The framework conditions must be developed in step with changes in the needs, opportunities and challenges. The Ministry of Local Government and Modernisation will

therefore initiate a study of cooperation models and funding models for a common geospatial data infrastructure.

All actors who base themselves on the geospatial data infrastructure and use the data content as “raw materials” for their own services will be dependent on assurance and a long-term perspective related to data deliveries and their costs. In particular, commercial actors will be dependent on economic predictability. In the geospatial area, licenses that support reuse shall be used. The licences shall provide value adders, innovators and others an opportunity to establish viable business models.

Today, each sector largely makes independent decisions about the need for data, update frequency, data quality, coverage, etc. – within “their own” thematic data. When geospatial information increasingly supports applications and critical societal functions across sectors, the data quality and needs for new data are no longer just a matter for the individual enterprises or sectors. Overviews must be obtained of the available data, data needs and maintenance needs. Thereafter, the principles and possible mechanisms for national prioritisation of the efforts in the area of data maintenance, collection of new data sets and improvement of data quality and the interoperability of existing data sets must be studied.

Terms and expressions

BIM

Building Information Modelling (BIM) is about generation and management of digital building models. BIM is intended to be the core part of a cooperation model between, for example, the client, contractor, electricians, plumbers, maintainers and the public authorities – both during the actual construction process and subsequently throughout the life of the building until its possible demolition and the recycling of materials. There are Building Information Models for each of the various disciplines (building, structural, electrical, HVAC, plumbing, etc.), and these models may also be combined in an interdisciplinary model.

CAD

Computer-aided design, often abbreviated as CAD is design and technical drawing performed using computer-based software and tools. Such programs are used by engineers, architects and other designers in various industries and disciplines, such as in building and civil engineering.

“Det offentlige kartgrunnlaget” (DOK)

The Norwegian Public Base of Geospatial Data (DOK) is defined in Section 2-1 of the Planning and Building Act and the associated Mapping and Planning Regulations, and it represents authoritative geospatial data that has been adapted so that it is a suitable knowledge base for the needs of the Planning and Building Act. The purpose of the public base of geospatial data is to ensure knowledge-based and efficient planning and administrative procedures. It is the Ministry of Local Government and Modernisation that determines what data shall be included in the national data list for the public base of geospatial data (DOK). For more information, see:

<http://www.kartverket.no/geodataarbeid/temadata/det-offentlige-kartgrunnlaget/>

Shared components and shared solutions

Shared components are defined as components of IT solutions that can be co-used or reused in multiple IT solutions. Simply stated, it can be said that shared components are common building blocks for the development of electronic services. In the Digital Agenda, shared solutions are pointed out as important efficiency measures to meet different needs in the public sector. The report to the Storting lists several strategic principles for national shared components, one of which is that the development of shared components should be coordinated.

“Felles kartdatabase (FKB)”

The Joint Geospatial Database (FKB) is a collection of structured data sets that form an important part of the geospatial infrastructure for an area. The data sets in the Joint Geospatial Database typically consist of contour lines (equidistance of 5 metres) and elevation points, coasts, lakes, watercourses, soil, land use, buildings, structural installations and service lines, roads, railways and other forms of transport.

“Geodata”

Spatial data (geodata) is data with a direct or indirect reference to a particular position or geographic area. The terms geospatial information, geo-referenced information, location data and geodata are often used interchangeably.

Geospatial information

Geospatial information is information about objects (water, houses, roads, lighthouses, etc.), events and conditions in which the position (location on earth) is an integral part of the information. The terms geospatial information, geo-referenced information, location data and geodata are often used interchangeably.

Geospatial data infrastructure

Geospatial data infrastructure is society’s foundation for access to geospatial information. It consists of data and metadata (documentation) and electronic services. It also includes legal, administrative, technical and organisational assumptions, including coordinate systems and other reference frames for positioning. In English, the term “Spatial Data Infrastructure” (SDI) or “National Spatial Data Infrastructure” (NSDI) is often used.

Geospatial services

The geospatial data infrastructure builds on the exchange of data based on an ISO-standardised electronic service and application programming interface (API). Examples of this are: WMS (Web Map Service), WFS (Web Feature Service), WCS (Web Coverage Service), CSW (Catalogue Service Web). For more information, see:

<https://www.geonorge.no/Geodataarbeid/Leverer-kartdata/veiledere/>

“Geovekst”

Geovekst is a cooperative effort for the joint financing, establishment and maintenance of basic geospatial information. Geovekst is based on a framework agreement from 1992 between the Norwegian Mapping Authority, Directorate of Public Roads and the former Norwegian Association of Local and Regional Authorities, Norwegian Energy Providers’ Trade Association and the Norwegian Telecommunication Administration. The Ministry of Agriculture acceded to the agreement later that same year. Several other parties have acceded to the cooperation over time. The parties enter into concrete local project agreements based on the framework agreement. This cooperation is coordinated by the Norwegian Mapping Authority with assistance from the Geovekst Forum, where all the key parties participate. The parties are the joint owners of the data established through the cooperation. For more information, see: <http://www.kartverket.no/geodataarbeid/Geovekst/>

INSPIRE

Infrastructure for Spatial Information in Europe (INSPIRE) is a common European geospatial data infrastructure that aims to ensure access to publicly managed geospatial information, which includes the natural environment, transport and settlement, as well as population and environmental conditions, among other things. INSPIRE has been defined by a special EU Directive (2007/2/EC). INSPIRE encompasses the following 34 themes:

- Coordinate reference system
- Geographical grid systems
- Geographical names
- Administrative units
- Addresses
- Cadastral parcels
- Transport networks
- Hydrography
- Protected areas
- Elevation
- Land cover
- Orthoimagery
- Geology
- Statistical units
- Buildings
- Soil
- Land use
- Human health and safety
- Utility and governmental services
- Environmental monitoring facilities
- Production and industrial facilities
- Agricultural and aquaculture facilities
- Population distribution
- Area management/restriction/regulation zones and reporting units
- Natural risk zones
- Atmospheric conditions
- Meteorological geographical features
- Oceanographic geographical features
- Sea regions
- Bio-geographical regions
- Habitats and biotopes
- Species distribution
- Energy resources
- Mineral resources

For more information, see: <http://www.kartverket.no/geodataarbeid/Inspire/>

Internet of Things (IoT)

The Internet of Things is a term that refers to all types of machines and “things” connected to the Internet, which can thus communicate with other machines and “things”. The fact that computers, televisions, parking meters, thermostats, refrigerators, watches and light bulbs are connected to the Internet makes the collection, registration, analysis and presentation of data about them via the Internet possible. This in turn provides the foundation for a host of new services and “smart” applications, ranging from power management, efficient transport

systems and better logistics to better control of one's own health. Experts have predicted that the number of connected devices will reach 100 billion devices by 2020.

ITS – Intelligent Transport Systems

Intelligent Transport Systems and Services (ITS) is a collective term for all types of information and communication technologies used in the transport sector. ITS is a specialist and technology area that is rapidly evolving. ITS provides enormous opportunities for development for all modes of transport, for society as a whole and as a market area for Norwegian trade and industry.

Mareano

Mareano is a programme for mapping depth, seabed conditions, biological diversity, types of natural environments and pollution in the sediments in Norwegian sea areas . The programme aims to answer questions about the physical environment, biological diversity and biological resources in the sea areas. The programme is managed by

the Institute of Marine Research, the Geological Survey of Norway and the Norwegian Mapping Authority, and is funded by the Ministry of Trade, Industry and Fisheries and the Ministry of Climate and Environment through appropriations over the government budget. For more information, see: <http://www.mareano.no/>

National Geodata Council

A national council appointed by the King in Council in 2012. Re-established in 2016, for a term of 4 years. The Council will strengthen cooperation on society's common geospatial data infrastructure. For more information, see:

<https://www.geonorge.no/Geodataarbeid/geografisk-infrastruktur/Norge-digitalt/nasjonalt-geodatarad/>

Norway Digital cooperation

This agreement-based cooperation is a broad cooperation between enterprises responsible for obtaining geo-referenced information or large users of such information. The parties in this cooperation – municipalities, counties and national agencies – are providers of geospatial data and online services. There are common technical and administrative obligations based on the Spatial Data Act and common agreed requirements for the cooperation. Development of the cooperation is anchored in the Spatial Data Act and regulations pursuant thereto. The Government has overall responsibility for Norway Digital, and the general guidelines for the cooperation are established through the government budget.

Coordination Group for Geospatial Information

The Coordination Group for Geospatial Information is the executive body and decision-making authority for the parties in the Norway Digital cooperation. For more information, see:

<https://www.geonorge.no/Geodataarbeid/geografisk-infrastruktur/Norge-digitalt/Samordningsgruppenfor-geografisk-informasjon/>

Big data

A term that refers to handling a volume of data that contains a lot of information, but which is too large, too diverse and too unstructured so that traditional techniques can be used to extract the information. By means of statistical analysis methods, distributed data processing and advanced visualisation techniques, huge amounts of data can be analysed in real time and provide a basis for better decisions and predictions. In meteorology, big data was used early on to analyse weather observations over a long period of time to simulate how many different physical processes interact to form the weather around us.

UN-GGIM

The United Nations Committee of Experts on Global Geospatial Information Management, established under the United Nations Economic and Social Council (ECOSOC), is an initiative for common objectives and initiatives related to geospatial information. The Committee advises on the use and management of geospatial information, including work with the United Nations sustainable development goals. For more information, see:

<http://ggim.un.org/>

Reuse

The disclosure and reuse of public data refers to allowing trade and industry, researchers and civil society to obtain access to and benefit from information in the possession of the public administration. For more information, see:

<https://www.regjeringen.no/no/dokumenter/retningslinjer-ved-tilgjengeliggjoring-av-offentlige-data/id2536870/>

Open data

Open data is structured information that has been made available so that the data can be read and interpreted by both machines and humans. The data must also have an open license so that it can easily be reused by anyone who wants to use it. It does not necessarily have to be free. For more information, see: <http://data.norge.no/document/del-og-skap-verdier-veileder-i-tilgjengeliggj%C3%B8ring-av-offentligedata/hva-er-%C3%A5pne-data>