

GSGF Europe: Strategy, Governance and Other Non-technical Aspects

GEOSTAT 4

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Summary

Implementation, analysis and use of geospatial information is essential when understanding the development of society nationally and globally. Traditionally, countries have built individual proprietary solutions for data management, analysis and publication of geospatial information and statistics. These solutions have been technology-driven without thinking about cooperation or exchange of information for national needs or across countries.

Exchange of comparable data across sectors and nations has increased, and thus the need for interoperable IT systems. To achieve this, it is essential to focus on strategic and non-technological aspects such as institutional collaboration, capacity and capability development, legislation and policies, innovation and the use of standard frameworks. All these aspects would benefit from established or future Public Private Partnerships (PPP).

The strong and long-lasting impact of the new European data strategy, data spaces and related legislation, Open Data directive and High-Value Datasets are decisive for the evolution of traditional technology-oriented National Spatial Data Infrastructures (NSDIs) towards knowledge creation and cross-domain/cross-border data ecosystems.

Innovation is the application of knowledge and technology to change, and this is imperative, particularly for developing countries, which require a quick and effective transition to modern geospatial information management systems and practices. Innovative methods provide an opportunity for many countries to avoid implementing traditional NSDI approaches, aiming for more agile and lighter technology enablers.

To support competence on how to integrate statistics and geospatial information, the Global Statistical Geospatial Framework (GSGF) and The Integrated Geospatial Information Framework (IGIF) provide guidance on a collaborative approach for stakeholders across sectors at administrative and operational levels to bridge the gap between the statistical and geospatial realms.

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List of Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
ESS	European Statistical System
GIS	Geographic Information System
GSGF	Global Statistical Geospatial Framework
HVD	High-Value Dataset
IGIF	Integrated Geospatial Information Framework
INSPIRE	Infrastructure for Spatial Information in the European Community
ISO	International Organization for Standardization
MS	European Union Member States
NGIA	National Geospatial Information Agency
(N)SDI	(National) Spatial Data Infrastructure
NSI	National Statistical Institute
OGC	Open Geospatial Consortium
PSI	Public Sector Information Directive
PPP	Public Private Partnership
R&D	Research and Development
UN-GGIM	United Nations Committee of Experts on Global Geospatial Information Management

1. Introduction

When implementing a framework, such as The Global Statistical Geospatial Framework (GSGF), there are besides the technical sides to it, several organisational, legal and other non-technical aspects to consider and find a suitable strategy for handling. In a European context, like for other regions; strengthening of institutions and governance, as well as improved communication with stakeholders is decisive when it comes to implementing the concepts around integration of statistics and geospatial information presented in the GSGF. In addition, long-term financial sustainability, capacity and capability development, as well as innovation are all vital for geospatial information management, integration of geospatial information in statistics production and to ensure interoperability of data and statistics within the frames of a national spatial data infrastructure (NSDI).



Figure 1 The GSGF – from "The Global Statistical Geospatial Framework" (Source: UNSC and UN-GGIM, 2019).

The interoperability of geospatial data and services within a NSDI relies on the internationally agreed ISO 19100 family and respective OGC standards and processes, occasionally supported with feasible standards from other international standardisation bodies.

The presumed conditions or aspects mentioned above are to a large extent highlighted by the four cross cutting Key Elements defined in the GSGF (i.e. Standards and Good Practice; National Laws and Policies; Technical Infrastructure; Institutional Collaboration).

This document focuses on the non-technical aspects, that also can be categorised as governance, innovation and policy matters, which lay the foundation for good 'integration-environments' for stakeholders across sectors at both administrative and operational levels.

2. Institutional Collaboration

Nationally and across borders, cooperation, exchange of knowledge and capacity building, as part of concrete actions and projects, are important arenas for sharing knowledge on how to utilise and integrate geospatial information in statistics. From a statistical point of view this is crucial to make consistent and comparable geospatially enabled statistics for Europe, and the ESS partnership.

Participating in and contributing to national and international events of both formal and informal nature, with representatives from statistical and geospatial communities, will help to connect people with valuable skills and knowledge that will embrace the concept of integration of statistics and geospatial information. This is crucial for the work to be done later, on the regional and national levels.

On the national level close cooperation between NSIs and NGIAs, or other organisations with similar responsibilities, is necessary to ensure use of common, updated geodata with acceptable quality as elaborated in Principle 1 in the GSGF. It must be recognised at a strategic level, both in the geospatial and statistical domains, what kind of benefits the integration generates (both to data and to customers/users of statistics). This requires commitment and recognition of opportunities for cooperation at the higher management and strategic level. However, the integration, in GSGF context, means real cooperation between the geospatial and statistical domains. Statistics Institutes, as well as all other information producers, use the same sources of geospatial data and the same geospatial services. This leads to more efficient use of resources and better integration of data produced by different organisations and private sector. To build Public Private Partnership (PPP) seems to be beneficial for efficient and sustainable solutions.

Communication with stakeholders at all levels is key for improvement and is needed to promote the benefits of data integration and securing data interoperability. Eventually, stakeholders will gain a better understanding on both governance and policy issues, as well as a common basic understanding of technical and semantical matters related to the use of geospatial information.

Evolving towards a broad portfolio of geospatially enabled official statistics will extend the decision basis and contribute to informed decision making.

3. Capacity and capability development

Evolving towards a broad portfolio of geospatially enabled official statistics will be demanding. The need for building in-house capability on methods and tools will vary between organisations depending on ambitions and demands for statistics. Establishing competence will often, for good reasons, start in a small specialist environment, but the concept of integration of statistics and geospatial information should be communicated throughout the organisation and with collaborating organisations. Within NSIs, systematic collaboration between architects, methodologists and statistical production units in the design of statistical production processes, is of utmost importance.

Giving priority to awareness raising and capability development on integration of statistics and geospatial information is only possible if it is expressed as part of the strategy in organisations within the statistical and geospatial realms. Once part of the strategy, it must also be adequately reflected in budgets for the time it takes to have a mature system for geospatially enabled official statistics in place.

Other elements in the strategy may include organisational changes and new ways of managing statistics production. Increased use of geospatial information in the statistical production process should be supported by bringing GIS experts and production teams together.

4. Legislation and Policies

It is important to be aware of legislative, professional and social infrastructures that can both enable and constrain activities related to use of geospatial information in the statistical and geospatial realms. This can include international and national data protection, privacy, and confidentiality legislation, ethics and social licence requirements, as well as open data policies and data access agreements.

The EU Member States (MS) must comply with the INSPIRE directive which is required to be fully integrated in the MS within 2021. The EFTA-countries follow suite but within a different timeframe. A new European Data Strategy, along with an initiative to create common sectoral European data spaces, is being adopted. The goal is to create a single digital market to e.g., improve health care, create safer transport, promote innovative products and services, improve sustainability and reduce costs of public services (European Commission, 2021(1)).

A key legislative instrument to drive the change is the new Open Data directive (revised Public Sector Information or PSI directive) that aims at securing extensive open access to public and private sector data, while keeping companies and individuals who generate the data in control (European Commission, 2021(2)). The directive will be implemented by a new act specifying High-Value Datasets (HVDs) that MS will need to make available free of charge, in machine-readable format via APIs and/or bulk download (data.europa.eu, 2021). Geospatial and statistical data reside in the very core of HVDs.

How the INSPIRE and Open Data directives are and will be formally implemented in legislation and policies differs from country to country. Some countries have established specific acts for geospatial data, other countries have geospatial data legislation as part of a larger body of legislation. See examples in the Annex.

In addition to legislation, several countries have established national strategies for use of geospatial data. These strategies focus on further development of NSDIs and show the direction of the work ahead. Important topics include e.g.:

- National databases of geospatial information that meet a broad range of needs.
- Sharing of solutions and technology to support effective problem solving and enable new application opportunities.
- Interaction in terms of management, sharing, development and innovation between both public and private actors in geospatial information application.
- Framework conditions that are predictable and suited to the challenges in a digital society.
- Geospatial information shall act as a guide for the creation of value and better decisions.
- Special concerns about data confidentiality since the number of features necessary to uniquely identify a statistical unit decreases with the size of the mesh within which information is released.

5. National spatial data infrastructures and associated systems

SDIs can be defined as frameworks consisting of geospatial data and services for finding, accessing, disseminating and using the data, together with related legislation, policies, institutional arrangements and human capabilities. The primary focus in the European context has been on technological solutions for discovering, sharing and use of interoperable geospatial information (European Commission – JRC, 2021). The INSPIRE directive has provided the regulatory basis whereas national policies have helped to gradually open public sector geospatial data for free use in many countries.

European 'INSPIRE-like' SDIs are, however, considered to gradually fall behind and to represent too rigid public sector provider-centric frameworks, which cannot meet contemporary user needs, particularly outside the domain of geospatial professionals. The Open Data directive and specifications for European data spaces and High Value Datasets could mend some of the shortcomings, at least partially.

One of the main challenges for the evolution of SDIs over the next 5 to 10 years is incorporating and integrating new emerging spatial and non-geospatial data sources from public agencies, citizens and private industry with as open access as possible, following international standards. This will ensure that interoperability matters are considered. In addition, data needs to flow unharnessed in various domain-specific ecosystems nationally and cross-border. Semantic intelligence is also needed, for converting information into knowledge.

However, the first and most imperative task at hand is to find ways of securing a good understanding of the impact of an open data-driven society. Only then can leaders commit and act to invest in prerequisites for freely flowing integrated geospatial information; in terms of streamlined regulations, aligned policies and improved capacity building.

6. Innovation

Traditionally, the significance of innovation has been undervalued by public sector agencies. The Integrated Geospatial Information Framework (IGIF) prepared by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) in collaboration with the World Bank (UN-GGIM, 2021(1)), denotes innovation as its central strategic element for improving management of geospatial information.

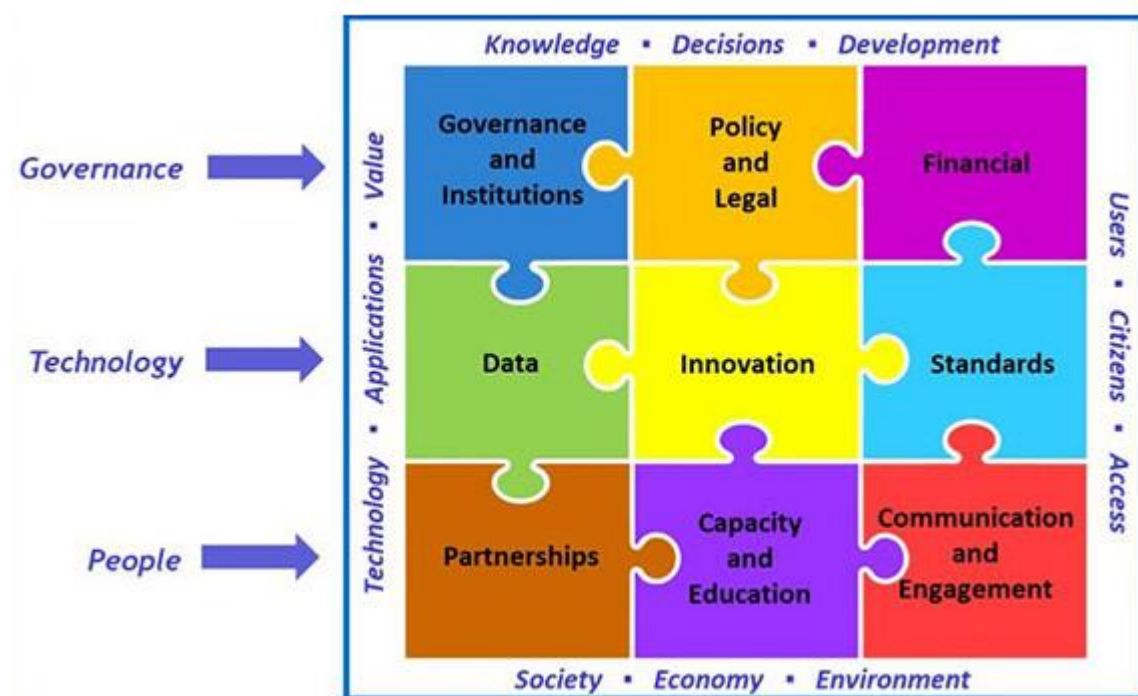


Figure 2. The Integrated Geospatial Information Framework, IGIF (Source: UN-GGIM, 2021(1)).

As stated in the IGIF, “innovation is the application of knowledge and technology to change, or create more effective processes, products and ideas that deliver additional value.” This is imperative, particularly for developing countries, which require a quick and effective transition to modern geospatial information management systems and practices. In a global perspective, innovative methods provide an opportunity for many countries to avoid implementing traditional NSDI approaches, common in European countries, and rather aim for more agile and lighter technology enablers.

Innovation is often regarded primarily as technological development. For instance, the UN-GGIM report on “Future Trends in geospatial information management: the five-to ten-year vision” (UN-GGIM, 2021(2)) provides examples of emerging, disruptive technological advances, such as Big Data, Artificial Intelligence (AI), machine and deep learning, robotics cloud computing, the Internet of Things, Digital Twins, Smart Cities etc. These emerging technologies provide novel methods for effective collecting, processing, managing and integrating exponentially growing quantities of multidisciplinary geospatial and other data. These developments need to be monitored and adopted by European NMCAs and NSIs to be able to provide up-to-date information and added value services to a wide range of customers.

From a non-technical viewpoint, national and EU-level policies and legislation can cause serious challenges for the effective use of novel technologies, for instance in terms of strict privacy and security regulations and too rigid and outdated specifications and processes for data acquisition, integration and management. In addition to legislative reform, successful adoption of technological innovations requires holistic support by financial investments, policy interventions and capacity building to deliver adequate improvements for the entire society.

The IGIF Strategic Pathway 5: Innovation (UN-GGIM, 2021(3)) presents a series of innovation-related ideas, concepts and tools, ranging from cutting edge technological advances to policy-related and institutional issues. In many cases, the innovatory can be rather obvious and “low-hanging” rather than radical and disruptive. In the following, three themes are discussed on how to assist the collaborative efforts of NGIAs and NSIs to promote integration of geospatial and statistical data:

- Cross-cutting collaboration throughout the society. Open-minded agile collaboration across and beyond government is needed to fully map and understand user needs, capacities and potential of integrating geospatial and statistical information. This requires low-threshold coaction between public agencies, researchers, businesses and civil society, for instance by establishing a national forum for pinpointing common barriers and deficiencies and promoting improved ways of integration of geospatial and statistical data.

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- Experimental culture and facilities for innovations. An innovation culture within organisations and across governmental domains can be created and nurtured by visionary and empowering leadership embracing new ideas, providing space and time for experimentations and tolerating risks. To facilitate experimentation, decision-makers need to set up innovation programs and local/national hubs as well as provide access to R&D cloud platforms to enable shared, co-located “playgrounds” for studying novel methods of data processing, analysis, visualisation and dissemination. Staff should be granted dedicated time allocations for exploring “freestyle” in collaboration with other communities and users of information.
 - Monitoring and aligning business processes - from intra-institutional silos to inter-institutional data flows and services. NGIAs and NSIs usually plan, implement, monitor and improve their business processes considering their internal organisational setup and customer needs only. However, a major part of (geospatial) data flows, products and services could be streamlined and matched so that NGIAs and NSIs could harmonise and seamlessly share common processes. In practice, this requires reviewing data content, services and processes at different levels by using common enterprise architecture tools and methods. As a result, common data products, services and procedural interfaces can be identified and designed so that any duplication of work and services as well as other inefficiencies, barriers and sources of excessive costs can be uncovered and removed.

Annex

Examples of national practices supporting integration of statistics and geospatial information

Austria

The legal framework for producing georeferenced statistics in Austria is based on the combination of the following laws:

The Federal Statistics Act 2000 (Legal Information System of the Republic of Austria, 2021(1)) regulates that registrars and administrative and statistical data keepers have the duty to co-operate by providing access to the data sources for the creation of statistics. This is particularly important for the register-based census regulated in the Register Census Act (Legal Information System of the Republic of Austria, 2021(2)).

One of these administrative data sources is the Buildings and Dwellings Register (BDR). The contents and structure of the data as well as the access of its use are regulated in the Buildings and Dwellings Register Act (Legal Information System of the Republic of Austria, 2021(3)). This includes the administrative use for the municipalities, Länder (federal subdivisions) and some ministries as well as the statistical use by Statistics Austria.

In practice, this means that any official administrative data set can be used to generate georeferenced statistics if it contains a unique ID which can be linked directly or indirectly to the BDR, which is an administrative data source including a pair of coordinates as spatial reference for the address and building respectively.

To achieve full integration of statistics and geospatial information there should be a legal act that secures that all new regulations on the establishment or amendment of administrative registers include an obligatory link to objects (addresses/buildings) from the BDR.

The UK

The Geospatial Commission (GOV.UK, 2021(1)) is an expert committee that sets the UK's geospatial strategy and promotes the best use of geospatial data. It was established in 2018 as an independent, expert committee responsible for setting the UK's geospatial strategy and coordinating public sector geospatial activity. Its aim is to unlock the significant economic, social and environmental opportunities offered by location data and to boost the UK's global geospatial expertise. The Geospatial Commission has a mandate and budget to drive and deliver changes by working in partnership with six core bodies: The British Geological Survey, The Coal Authority, HM Land Registry, Ordnance Survey, UK Hydrographic Office and The Valuation Office Agency.

The mandate for the Geospatial Commission:

- **Provide strategic oversight** of the geospatial ecosystem in the UK, setting geospatial strategy, policy and standards.
- **Hold the budget** for the public sector's largest investment in geospatial data.
- **Make targeted investments** in data projects that accelerate innovation and adoption of geospatial data applications.

The Geospatial Commission has prepared The UK's Geospatial Strategy, 2020 to 2025 (GOV.UK, 2021(2)) called 'Unlocking the power of location'. The strategy published in June 2020, sets a vision that by 2025 the UK will have a coherent national location data framework. The strategy sets out an ambitious programme of activity to achieve the vision, across four key missions:

- **Promoting and safeguarding the use of location data** to provide an evidenced view of the market value of location data, set clear guidelines on data access, privacy, ethics and security, and promote better use of location data.
- **Improving access to better location data** to streamline, test and scale the development of new and existing location data ensuring it is findable, accessible, interoperable, reusable and of high quality.
- **Enhancing skills, capabilities and awareness** to develop more people with the right skills and tools to work with location data - across organisations and sectors - to meet the UK's future needs and support global development.
- **Enabling innovation** to maximise the commercial opportunities for innovation and promote market-wide adoption of high value, emerging location technologies.

The Geospatial Commission has also made a *Best practice guidance and tools for managing geospatial data* in a FAIR (Findable, Accessible, Interoperable and Reusable) way (GOV.UK, 2021(3)).

Norway

The Norwegian Spatial Data Act is a specific *Act on an infrastructure for geographical information* that came into force in 2010 (Government.no, 2021(1)). This Act implements the *European Union INSPIRE Directive* regulating establishment of the Norwegian NSDI.

The *National geospatial strategy* (Government.no, 2021(2)) is built upon the Governmental report called *Everything happens somewhere*. The vision of the strategy is 'Norway shall be at the forefront in the use of geospatial information'. The strategy applies until 2025 and describes how and what the Government will work for.

The Norwegian *National programme for official statistics* (Statistics Norway, 2021) is subject to the Statistics Act and will be operational in the period 2021 – 2023. The programme defines and delimits official statistics and encompasses economic, demographic, social and environmental statistics. Statistics Norway and 11 other public authorities have responsibility for official statistics and the programme defines which of these authorities are responsible for the statistics.

Geonorge is the national website for map data and other location information in Norway (Geonorge, 2021(1)). Users of map data can search for information and access what is available from the Geonorge website or be directed to websites of other data providers.

Geonorge could be seen as the operational part of *Norway Digital* (Geonorge, 2021(2)), a partnership involving public enterprises that are responsible for establishing and managing map data and other location information. Geonorge together with the formalities and agreements of Norway Digital make up the National SDI for Norway.

The Ministry of Local Government and Modernisation has initiated a 3 year-project for modernisation of the Official Cadastre (only in Norwegian). The main goals are:

- To be more user-oriented
- More digital and automated processes
- Better technical and functional user interface
- Facilitate data quality

A User Council is established to ensure that users of the Cadastre are involved in the development. The Council consists of delegates from, among others, Statistics Norway, The Tax Administration, the Courts Administration, the Public Roads Administration, municipalities, geomatics companies and the Forest Administration. The User Council meets several times a year following and supporting the progress of the project.

Sweden

The Geodata Council (Lantmäteriet, 2021(1)) shall provide advice for matters that apply the Swedish NGIA that has the coordinating role for spatial data in Sweden. Additionally, the Council shall:

- Participate in the work on a national geodata strategy (Lantmäteriet, 2021(2) for the overall information supply within the geodata area
- Address issues of principle and common national interest in the field of spatial data
- Contribute to the development of the national and international infrastructure in the field of spatial data by, for example, supporting the application of standards
- Contribute to increased coordination between relevant authorities in matters of information development and provision of information
- Contribute to the coordination of the infrastructure for exchange and access to geodata

The members of the council are appointed by the government and are Statistics Sweden, The Armed Forces, Swedish Maritime Administration, the NGIA, Swedish Civil Contingencies Agency, Swedish Environmental Protection Agency, Swedish Maritime Administration, Swedish Forest Agency, Swedish Geological Survey, Swedish Geotechnical Institute, Swedish Meteorological and Hydrological Institute, Swedish Transport Administration, The National Board of Housing, Building and Planning and Swedish Space Agency.

The Strategy Goals set for 2021 – 2025 are:

- Geodata are open
- Geodata are usable
- Geodata are available
- A well-developed cooperation

Finland

In 2018, *the Government report on information policy and artificial intelligence* (VM, 2018) was given to the Finnish Parliament. The information policy was devised to promote aspects such as collecting, opening, combining, sharing and storing data, as well as strengthening data protection and information security in a way that respects people's rights and freedoms. The objective of the information policy is to advance and enhance the use and refinement of data for the common good while also identifying and preventing its abuse. The report marks the beginning of a new common policy area in Finland. The information policy applies to the public, private and third sectors alike.

The purpose of the *Finnish Geodata law* and act is to improve the availability and use of spatial data held by public authorities by creating a unified infrastructure for spatial information and making its services generally available.

The report on spatial data policy discusses the types of spatial data needed in society, how their production, management and distribution is developed, and how their use is promoted. The vision of the report is: Finland has the most innovative and secure spatial data ecosystem in the world.

The current *Finnish national spatial data strategy* (2018) focuses on effective utilisation of spatial information. The goals presented in the strategy are e.g.

- Spatial information from public administrations and companies is of high quality, easily accessible, available and meets user needs
- Using spatial information will increase efficiency and improves services
- Effective co-operation expands and enhances the production, maintenance and utilization of spatial information and creates opportunities for research and innovation
- Good competence creates the conditions for the use of spatial data and development of a Spatial Data Infrastructure

The establishment of the *national open data policy* in spring 2011 launched an extensive opening of public data, as a result of which maps and spatial data have become the key fuel for new applications. Furthermore, an *open data* license is being prepared for Public Administration Recommendations (JHS).

GeoForum is a non-profit association that brings together relevant stakeholders. The association develops cooperation between the spatial data industry and organizations using spatial data; between companies, public administrations, educational and research institutions. GeoForum offers stakeholders the opportunity to co-operate and interact in order to utilize and develop expertise throughout Finland. With the help of an active network, the association represents the spatial information sector, increases the understanding of the meaning of spatial information and participates in the preparation of development projects and social decisions.

National Council for Geographic Information is the national coordinating body responsible for monitoring and evaluating the development of the national infrastructure for spatial information and coordinating the implementation of the INSPIRE Directive. National Council for Geographic Information is chaired by Ministry of Agriculture and Forestry of Finland, members are key stakeholders (ministries, agencies and municipality representative), and a secretariat operating under the National Land Survey of Finland.

National network for integration of statistical and geospatial

information was established in early 2021 to respond to identified gaps and suboptimal practices when using geospatial information in statistical production processes. More than 20 government agencies, ministries, research organisations and even private companies are currently involved. The primary long-term goals include improved access to interoperable high-quality information, development of common services for e.g., geocoding and visualisation, a new sub-municipal statistical unit division, and extensive collaboration, communication and capacity sharing with other national networks, such as GeoForum Finland, for pursuing maximal benefits of data integration.

The producers of the statistical ecosystem have together prepared a Development strategy for the statistical ecosystem (Statistics Finland, 2021). The vision, tasks and strategic development objectives for the years 2021 to 2023 have been defined in the strategy. The producers of statistics want to highlight the value and significance of statistics in society, promote the use of data, deepen partnerships and ensure good quality.

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More Information

More examples can be found in the document "Annex 1. Use cases - Final report from the GEOSTAT 2 project" <https://www.efgs.info/wp-content/uploads/2017/03/GEOSTAT2ReportAnnex-1.UseCases.pdf> . See chapter 2 for examples on arrangements for data access, GIS and IT resources in NSIs.