LIFO: Location Interoperability Framework Observatory

2019 COUNTRY FACTSHEET

NORWAY

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1. Introduction

The **Location Interoperability Framework Observatory** (**LIFO**) is a domain-specific observatory relating to location interoperability. It provides a tool **to monitor, assess and report on the state of play of location interoperability in policy and digital public services of EU Member States and other countries implementing** INSPIRE**.**

The LIFO complements the National Interoperability Framework Observatory (NIFO) that monitors, assesses and reports the progress in implementing the **European Interoperability Framework** (EIF). The NIFO collects and shares details across all levels of the EIF relating to important initiatives in the Member States, uncovering best practices, areas needing improvement or where solutions could be developed.

The LIFO analytical model measures, through specific indicators, **the current level of adoption of the recommendations on location interoperability from the** EULF Blueprint[1], covering its five focus areas: *Policy and Strategy Alignment*; *Digital Government Integration*; *Standardisation and Reuse*; *Return on Investment*; *Governance, Partnerships and Capabilities*. The LIFO model is composed of primary indicators, based on information provided by respondents to a questionnaire, and secondary indicators, re-using information from existing sources, for example the INSPIRE monitoring.

The information collected through the observatory can be used to assess the current status, compare countries and plan appropriate measures, including potential partnerships and opportunities for sharing solutions. More in detail:

- it helps achieve the objectives of the EULF, for example: policy coherence, effective use of location information in digital public services, standards-based approaches, attention to data quality, effective partnerships, and increased awareness and skills;

- as a complementary tool for NIFO (and thanks to the alignment between EULF and EIF), LIFO helps monitor how the EIF is implemented in the geospatial domain;

- it provides visibility and access to guidelines and best practices for each country and across countries, for reuse and/or suggestion of similar / connected developments;

- it can be used as a self-assessment tool for public administrations towards their implementation of location interoperability, both internally and cross-border.

The LIFO is coordinated by the European Location Interoperability Solutions for e-Government (ELISE) action in the Interoperability Solutions for European Public Administrations, Businesses and Citizens (ISA[2]) programme.

Appreciation is given to the ELISE 'User Panel' of 10 Member States and other countries (namely, AT, BE, CZ, DK, FR, IT, NO, PT, SI and SK) who validated the model, answered the survey, and provided further information to ensure the results are representative of the national state of play.

The LIFO will be extended to all ISA[2] and INSPIRE implementing countries in 2020 in order to capture the full status of location interoperability across Europe.

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[1] The European Union Location Framework (EULF) is a geospatial domain interoperability framework allied to the EIF. Key EULF guidance is published in the EULF Blueprint.

2. Structure of the document

This factsheet provides an overview of the information collected on location interoperability in Norway in 2019. It contains the following chapters:

- Location Interoperability State of Play: this chapter contains an overview of the implementation of the EULF Blueprint recommendations in the different focus areas. The paragraphs dedicated to each focus area contain graphs displaying the country's scores for the individual indicators and the average scores for each recommendation. In both cases, scores are compared with the average of the monitored countries. Descriptions and evidence are included to support the relevant scores.
  Best Practices: which highlights existing initiatives and applications in different domains demonstrating the benefits of a consistent use and integration of location information and services in digital public services.

Annexes to the document are:

- The method of scoring and normalisation applied to the indicators;
- A glossary of the most relevant terms used in the document;
- The questionnaire with the replies provided for Norway and the corresponding scores.

The 2019 LIFO monitoring information for Norway has been provided by *Kartverket* (Norwegian Mapping Authority), with assistance from other governmental agencies.

3. Location Interoperability State of Play

3.1. Overview

The information collected on location interoperability in Norway indicates a very good alignment with EULF Blueprint recommendations. The country scores higher than the European average across the 10 countries monitored in all focus areas (see Figure 1).

The top scores, as well as the highest positive deviation from the average, are for the focus areas "Policy and Strategy Alignment" and "Return on Investment". The Policy and Strategy Alignment results are mainly driven by the good alignment of location information and digital government strategies and by the extensive use of standards for public sector procurements of location information and/or services in line with the standards applied to broader ICT procurement. The main positive drivers for Return on Investment are the degree of cooperation between the public and the private sector in the development and use of location-based services, and the extensive monitoring of efficiency and effectiveness of those services.

The "Standardisation and Reuse" focus area also shows a positive deviation from the European average, mainly thanks to the well-structured approach to the SDI architecture, while "Digital Government Integration" and "Governance, Partnership and Capabilities" are in line with the European trend.

The value of the overall LIFO index for Norway is 0,65[2]. This compares with a LIFO European average of 0.54.

Figure 1 - Overall EULF Blueprint implementation

The following sections present the results in detail for each focus area.

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[2] For the description of calculation method of the LIFO index and the other indicators and indexes see Annex 1: LIFO 2019 Scoring methodology

3.2. Policy and Strategy Alignment

Vision There is an aligned and coordinated policy and strategic approach across Europe for the use of location information that enables more efficient and effective integration of cross-sector and cross-border location-based applications, reducing costs and increasing social and economic benefit. Public sector location policies promote accessibility and interoperability. There are simple and consistent approaches to licensing, progressive open data policies that balance the needs of data users and suppliers, and authentic registers in which 'location' has a prominent role.	
Recommendation 1	Connect location information and digital government strategies in all legal and policy instruments
Recommendation 2	Make location information policy integral to, and aligned with, wider data policy at all levels of government
Recommendation 3	Comply with data protection principles as defined by European and national law when processing location data
Recommendation 4	Make effective use of location-based analysis for evidence-based policy making
Recommendation 5	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement

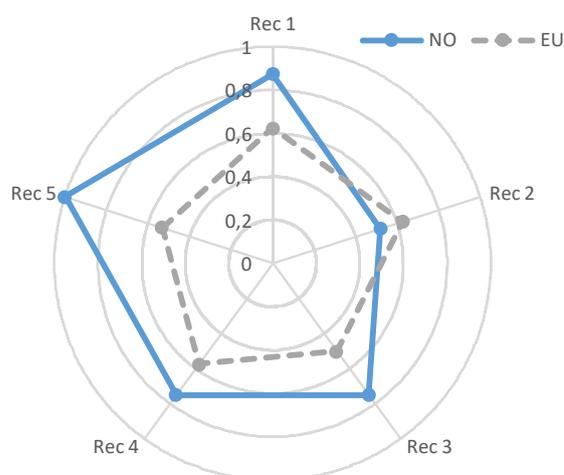*Table 1 - Focus Area "Policy and Strategy Alignment" - vision and recommendations*

Figure 2 – Policy and Strategy Alignment – scores by recommendation

The "Policy and Strategy Alignment" focus area index for Belgium is 0.78, significantly above the European average of 0.57. The location information strategy in Norway, defined in the document "*Everything happens somewhere - National geospatial strategy towards 2025*"[3], builds on and complements the Digital Agenda for Norway (*ICT for Simpler Everyday Life and Increased Productivity*)[4] and its follow-up strategy, i.e. *Public sector digitization strategy 2019-2025*[5].

As such, location information and digital government strategies in Norway are aligned in many key elements (Recommendation 1).

The location information strategy is cross-sectoral. It takes both a holistic perspective and supports sectoral goals for the digitisation of the public administration. Additionally, general cross-sector legislation mandates the use in digital government of authoritative location datasets and services.

With reference to Recommendation 2, most location data is available free of charge under an open licence without restrictions or under a national data licensing framework.

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3 https://www.regjeringen.no/en/dokumenter/national-geospatial-strategy-towards-2025/id2617560/?ch=1
4 https://www.regjeringen.no/contentassets/07b212c03fee4d0a94234b101c5b8ef0/en-gb/pdfs/digital_agenda_for_norway_in_brief.pdf
5 https://www.regjeringen.no/contentassets/db9bf2bf10594ab88a470db40da0d10f/no/pdfs/digitaliseringsstrategi_for_offentlig_sektor.pdf
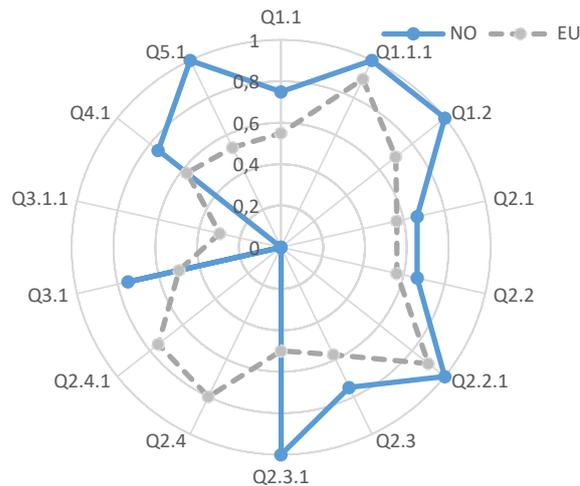
Figure 3 – Policy and Strategy Alignment – scores by indicator

There is a national licence for public data, the Norwegian Public Data Licence (NLOD 2.0)[6], that entitles users to freely copy, use and make available public sector information, provided that they name the contributors and fulfil the terms described in the licence. The licence is without spatial restrictions and has a specific focus on location which requires reporting in all maps the name of the relevant data sources.

Furthermore, a wide range of location core reference datasets are available for general use, although they are not harmonised across international boundaries/across borders. One example is the public map basis (DOK - Det offentlige kartgrunnlaget)[7], which is public geographical data organised for municipal planning and construction work. The purpose of the public map basis is to ensure knowledge-based and effective planning and case management.

The use of these datasets, and related services, available in Norway's National Spatial Data Infrastructure, is regulated by a specific document[8] that defines the general terms for cooperation in the Infrastructure. However, there are no national guidelines on the publication of public sector Information.

Regarding data protection, which is covered under Recommendation 3, custodians of public sector location data in Norway are mainly prepared for GDPR, including awareness of potential location data privacy issues and processes in place to comply with the rights of data subjects. No specific complaints, legal cases or fines related to location data privacy involving public administrations are known to date.

With reference to the use of location information for policy making (Recommendation 4), location-based evidence and analysis are used to help in developing relevant policies and monitoring outcomes in most relevant policy topics. For instance, location-based analysis is used for identifying areas exposed to flooding at a national level[9]. Similarly, location data on snow avalanches, landslides and floods are mapped and used for planning, civil protection and emergency response[10].

Recommendation 5, on procurement of location data and services, shows the Norwegian government has set out public sector targets and standards for e-procurement, in alignment with broader European initiatives. The legislation, passed in 2012, requires that Norwegian public sector entities must use digital mechanisms for all procurement activities, such as the European Single Procurement Document (ESPD)[11]. In this context, public sector procurements of location information and/or services make reference to standards-based architecture documents describing where and how the procured components must fit.

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[6] https://data.norge.no/nlod/no/2.0

[7] https://register.geonorge.no/register/det-offentlige-kartgrunnlaget/dekning

[8] https://www.geonorge.no/globalassets/geonorge2/avtaler-og-bilag-norge-digitalt/generelle-vilkar.pdf

[9] https://kartkatalog.geonorge.no/metadata/flom-aktsomhetsomr%C3%A5der-wms/834179b8-d189-4bc0-b00f-533ffe80faed

[10] https://kartkatalog.geonorge.no/metadata/skredfaresoner-wms/551ebd8b-d5e8-4304-a030-505b03dd8773

[11] https://www.anskaffelser.no/avtaler-og-regelverk/lov-og-forskrifter

3.3. Digital Government Integration

Vision	
Location is well integrated in digital government processing supporting G2G, G2B and G2C interactions, through location related services across government. Users do not have to supply the same mandatory information multiple times. There is visibility of common coordinating and support structures, expert groups and technologies, a strong user voice in the design, evaluation and improvement of location-based services, and good evidence of take-up of services.	
Recommendation 6	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions
Recommendation 7	Use INSPIRE and SDI models, data and services for delivering cross-sector and cross-border digital public services to citizens, businesses, government and other parties
Recommendation 8	Adopt an open and collaborative methodology to design and improve location-enabled digital public services
Recommendation 9	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government

Table 2 - Focus Area "Digital Government Integration" - vision and recommendations

The "Digital Government Integration" focus area index for Norway is 0.59, slightly higher than the European average of 0.54. Under this focus area, the highest alignment with EULF Blueprint is reported for Recommendation 7.
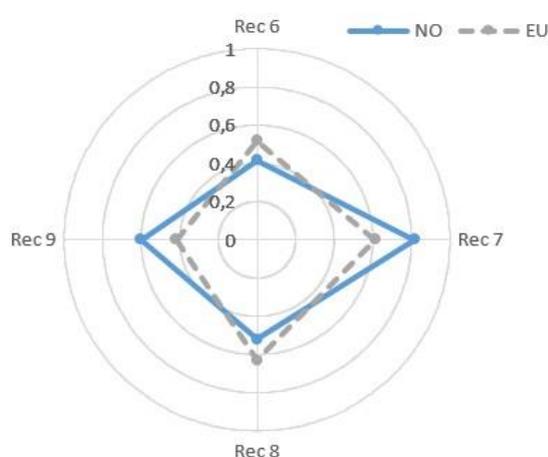

Figure 4 - Digital Government Integration – scores by recommendation

Location data is used in most cases of digital public services under various domains, such as environment, marine, transport, energy, property / land administration, local / regional planning, culture, education, tax policy, farming, utilities, disaster management and defence.

The public sector SDI is used very extensively by the private sector and other organisations (e.g. NGOs) for delivery of new and innovative applications, products and services.

Public sector location datasets are harmonised according to INSPIRE data specifications for use in cross-border public services. The country is involved in the delivery of cross-sector digital public services using INSPIRE for harmonisation of data applications. An example is the EULF transportation pilot[12] and cases for the common representation of the borders between Norway and Sweden, where a series of connection points were established (mainly for lakes, rivers and some man-made constructions like buildings)[13].

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[12] See Best Practice NO1

[13] This digital map is available via app for mobile and tablet at https://kartverket.no/Kart/Hele-Norge-rett-i-lomma/.
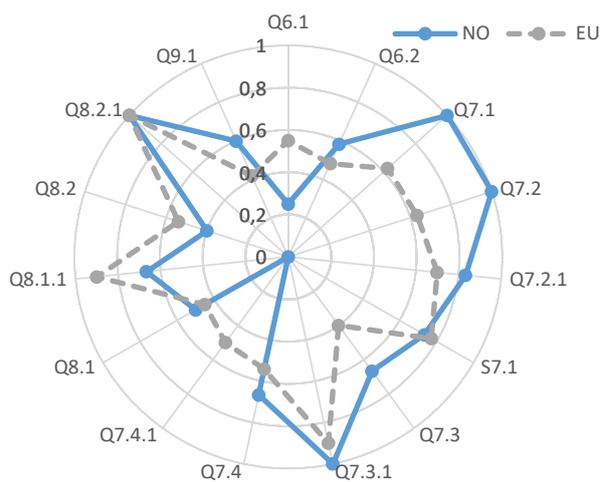
Figure 5 - Digital Government Integration - scores by indicator

It must be noted that Norway, as with all EFTA countries, is not subject to the obligation of regular reporting on the implementation of INSPIRE Directive, unlike EU Member States that are assessed and rated according to their reports submitted every three years.

Nonetheless, Norway does elect to provide INSPIRE monitoring information. The INSPIRE country fiche for 2019[14] registers a complete or almost complete implementation for the identification and description of spatial datasets and in the provision of services for the identified datasets. Nevertheless, there are significant areas for improvement for the implementation of the key obligation on dataset interoperability.

Recommendation 9 also has relatively high alignment with the EULF Blueprint. Various actions are implemented in Norway for the integration of location and statistical information, namely:

- an accurate and up-to-date knowledge base of where citizens and businesses are located;
- a common geospatial reference framework for statistics to enable timely, accurate and efficient production of location-based statistics;
- collection of census data based on the location reference framework for statistics;
- location-based statistics updated dynamically to give an up-to-date snapshot to aid decision-making;
- capture of the spatio-temporal dimension of statistics in a format that enables it to be used readily in a GIS for geostatistical analysis;
- contribution to European projects aiming at establishing a data and production infrastructure for location-based statistics (e.g. GEOSTAT).

Under recommendation 6, there is no regular process for identifying opportunities and implementing improvements to key digital public services in their use of location information, however, limited steps are taken on a case by case basis. Despite this area of growth under this recommendation, there are interesting examples of key digital public services using location information in an innovative way (i.e. location information is used as a contribution, e.g. to integrate processes, location-based analytics, AI algorithms):

- *Gårdskart på nett*: a system for assigning financial support for agricultural businesses, where location is a key element[15];
- *Digital plandialog*: a service that collects and presents information about planned land use and documents for planning purpose[16].

There are also several examples of key digital public services using location information in a comprehensive way (i.e. so that use of location information is an important feature in the design and delivery of the service):

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[14] The country fiche highlights the progress of the country in the various areas of INSPIRE implementation and presents an outlook of planned actions for further improvement of the INSPIRE implementation. The country fiche includes information acquired through the triannual INSPIRE implementation report.

[15] https://gardskart.nibio.no/search

[16] https://www.regjeringen.no/no/tema/plan-bygg-og-eiendom/plan--og-bygningsloven/plan/veiledning-om-planlegging/plankartsiden/plandialog/id2471435/

- *SeEiendo:* which provides citizen access to land register information. Searches of property information are possible by road name, address or farm and utility number[17];
- *Fix errors in Map*: an application allowing citizens to propose updates to spatial data[18];
- *Species observations*: enables citizens to register observations for new species in the national register[19].

With reference to Recommendation 8, an open and collaborative methodology to design and improve location enabled digital public services is applied in several cases at sub-national level through consultations, user groups, feedback requests and iterative development. Furthermore, public authorities make their location data openly available for external parties, including private sector, NGOs and citizens, to develop their own products and services. Citizens in particular, are further involved in specific actions, such as making corrections directly on maps, identification of hiking paths by the Norwegian Trekking Association, registration of landslides[20] or registration of natural species.

Some examples of the collaboration with citizens and private sector are:

- *Geointegration*: a framework consisting of interfaces to the land register and planning register. It has been developed as a standard, consensus-based process, with funding on certain costs provided by the private sector for design, development and testing;
- *Geosyncronization*: a service that ensures that local copies are synchronised with national databases. Similar to the above service, it has been developed through a consensus process, and intervention of the private sector for funding;
- *Fellestjenester BYGG*: an innovative platform for controlling and submission of building permits[21].

3.4   Standardisation and Reuse

Vision	
Core data has been defined and a funding model has been agreed for its ongoing maintenance and availability. Consistent use of geospatial and location-based standards and technologies, enabling interoperability and reuse, and integration with broader ICT standards and technologies, including the standards and solutions promoted by the ISA2 programme. Use of these standards in all areas related to the publication and use of location information in digital public services, including metadata, discovery, view, exchange, visualisation etc.	
Recommendation 10	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements
Recommendation 11	Reuse existing authentic data, data services and relevant technical solutions where possible
Recommendation 12	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services
Recommendation 13	Manage location data quality by linking it to policy and organisational objectives, assigning accountability to business and operational users and applying a "fit for purpose" approach

Table 3 - Focus area Standardisation and Reuse - vision and recommendations

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[17] https://seeiendom.kartverket.no/
[18] https://www.retteikartet.no
[19] https://www.artsobservasjoner.no/
[20] https://www.skredregistrering.no/
[21] See Best Practice NO2

The "Standardisation and Reuse" focus area index for Norway is 0.62, compared with a European average of 0.54.

A strength in this focus area is the adoption of a common architecture to develop digital government solutions (Recommendation 10). The location data architectural approach in Norway fits within a broader national ICT architectural framework based on the EIF / EIRA.

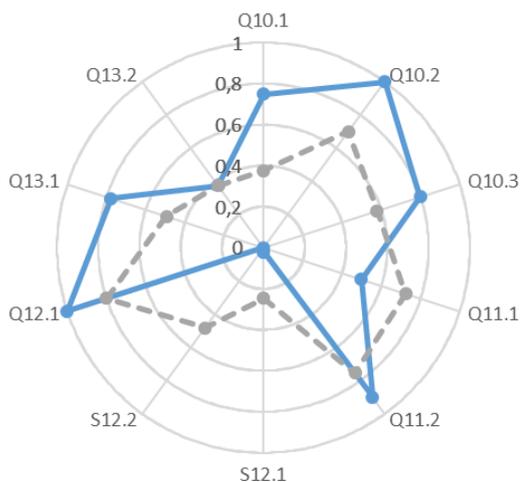*Figure 6 - Standardisation and Reuse – scores by recommendation*

A clear approach is in place for monitoring, testing and upscaling of new technological developments, in collaboration with different stakeholders.

Furthermore, APIs are available for all high value location datasets[22] as part of a national strategy. For instance, APIs are available for addresses[23] and cultural heritage[24]. Guidelines on geospatial APIs and services are also provided[25].

In terms of reuse of solutions and authentic registers (Recommendation 11):

- reuse of national generic ICT solutions is made in the SDI;
- several registers of location information are implemented, namely: addresses, geographical names, administrative units, cadastral parcels, buildings, hydrography, transport networks, code lists, data UML models, portrayal information (SLD) and GML schemas.

Based on INSPIRE monitoring, a very low number of datasets are in conformity with Regulation (EU) No 1089/2010 and no network services are in conformity with Regulation (EC) No 976/2009 (Recommendation 12). This should be however seen in light of the different, longer implementation deadlines applicable to EFTA countries.

Figure 7 – Standardisation and Reuse - Scores by indicator

To connect geospatial data and general data, GeoDCAT-AP specification is used.

Another strength in this focus area is in relation to location data quality (Recommendation 13), where several actions are typically implemented to assure that quality in Norway.

In terms of design, these actions include:

- development and application of a framework for analysis of data quality;
- linking data quality standards to data standards;

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22 https://kartkatalog.geonorge.no/?DistributionProtocols=REST-API&organization=Kartverket

23 https://kartkatalog.geonorge.no/metadata/44eeffdc-6069-4000-a49b-2d6bfc59ac61

24 https://kartkatalog.geonorge.no/metadata/1e9b83e3-40e7-43ee-a96a-b9a084edc212

25 https://kartverket.no/en/data/API-er-og-tjenester/

- inclusion of the different dimensions of data quality in the standard, such as timeliness, accuracy, completeness, integrity, consistency, compliance to specifications / standards / legislation;
- inclusion of multilingualism in the data quality standard.

In terms of measurement, actions implemented are:
- measurement of conformance of data to quality parameters set out in the data policy on an agreed frequency;
- ex-post evaluation of existing data quality issues.

The main standards applied to ensure location data quality are:

- ISO Standard 19157 on Data Quality, used as the basis standard for quality;
- Data Quality Vocabulary (DQV) from W3C proposed as an extension to DCAT (Data Catalog vocabulary);
- ISO 25012 Software engineering, on software product quality requirements and Evaluation (SQuaRE) and data quality model.

Some actions are also put in place typically in relation to location data quality governance, namely:

- alignment of the data quality improvement roadmap with the information governance vision and strategy;
- definition of a data quality review process;
- collection of feedback from users to report problems and help improve data quality.

3.4. Return on Investment

Vision	
There is a strategic approach to national and European funding, procurement, and delivery of location information and location-based services to minimise costs and maximise benefits for government, businesses and citizens, recognising best practices, and building on INSPIRE and standardisation tools. The funding and sourcing model for collection and distribution of core location data takes into account user needs from different sectors and the strategic importance of continued supply of data at a suitable quality. Procurement recognises INSPIRE and other standardisation tools in a meaningful way. There are compelling impact assessments and business cases, a rigorous approach to targeting and tracking benefits, and good evidence that benefits are being achieved.	
Recommendation 14	Apply a consistent and systematic approach to monitoring the performance of their location information activities
Recommendation 15	Communicate the benefits of integrating and using location information in digital public services
Recommendation 16	Facilitate the use of public administrations' location data by non-governmental actors to stimulate innovation in products and services and enable job creation and growth

Table 4 - Focus area Return on Investment - vision and recommendations

The "Return on Investment" focus area index for Norway is 0.85, well above the European average of 0.60 and close to the highest of all the countries surveyed in 2019.

Regarding Recommendation 14, the assessment of the efficiency and effectiveness of location-based services is performed through the evaluation of many elements, such as: reusability, risks, availability, responsiveness, reduction in administrative burden, simplification of administrative processes, enhanced business opportunities, user satisfaction, user-

centricity. These assessments are only at the level of each single organisation managing such services rather than as part of a wider national assessment framework.

There is a systematic approach to the communication of availability and benefits of location data and location-enabled digital public services to raise awareness and understanding (Recommendation 15) as shown by the Norway digital newsletters, which are shared by email, and technology workshops[26].
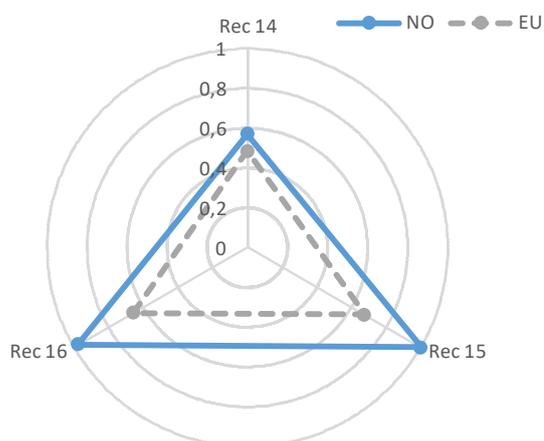

Figure 8 - Return on Investment – scores by recommendation
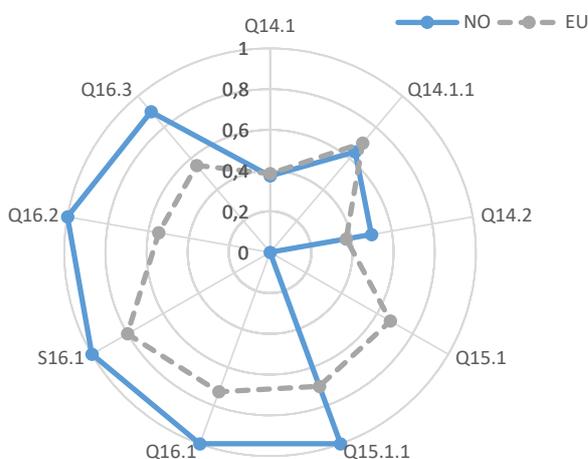

Figure 9 -Return on Investment – scores by indicator

Various measures are implemented to make the process of searching, finding and accessing location data and web services as easy as possible for companies, research institutions, citizens and other interested parties as identified in Recommendation 16:

- a national data portal (Open Data portal) merging location data and non-location data;
- a national discovery geoportal integrating INSPIRE and non-INSPIRE data;
- a geoportal harvested by the European Data Portal;
- thematic portals complementing general search facilities with "specialist" search;
- websites with exposition of data;
- spatial data sets made available on web search engines; and
- metadata APIs[27].

Many actions are implemented to support private, non-profit and academic actors in the development of new products and e-services:

- "innovation labs" or "innovation hubs";
- promotion of open data policy;
- brokering access to data through hackathons;
- incorporation of non-government actors in the governance framework for public sector data;
- testbeds and pilot projects;
- inclusion of data and services from non-governmental actors in the SDI;
- collection of requirements from businesses, research institutions and other (potential) users for consideration in further development of INSPIRE/SDI;
- collection of best practice examples of how private companies, citizens, academic institutions and other users make use of INSPIRE/SDI data and services;

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[26] https://www.geonorge.no/Geodataarbeid/Norge-digitalt/forumer-og-arbeidsgrupper/Teknologiforum/

[27] Data at in the national geoportal - Geonorge (https://www.geonorge.no/) are harvested by Felles datakatalog (https://fellesdatakatalog.brreg.no/) which has an overview showing which data the various public agencies have registered, how they are connected and what they mean. It is also harvested by the register of open datasets in Norway (http://data.norge.no/), which contains published datasets and open APIs from the Public domain in Norway. Further on, it is harvested by the INSPIRE geoportal and other open data portals in Europe.

- and skills training to exploit the SDI.

This is also supported by the provisions of the digitisation strategy[28] that includes specific focus on data sharing and reuse from public administrations, with the aim of ensuring increased wealth creation for private businesses.[29]

Finally, Norway has a strategic approach to funding public sector location reference data together with the funding other important public sector authentic datasets.

3.5. Governance, Partnerships and Capabilities

Vision
There is high level support for a strategic approach to the funding and availability of location information at Member State and EU level, based on INSPIRE and other tools to achieve interoperability. Effective governance, partnerships, work programmes, responsibilities and capabilities to progress such an approach have been established, taking into account the needs and expectations of stakeholders at Member State and EU level. Governments recognise the importance of 'location' understanding and skills and invest in awareness raising, training and resourcing. Service design takes account of user capabilities. Specialists form communities to share knowledge and develop new ideas related to location information. As a result, there is a sufficient level of understanding and skills to develop, deploy and use effective location-based services.

Recommendation 17	Introduce an integrated governance of location information processes at all levels of government, bringing together different governmental and non-governmental actors around a common goal
Recommendation 18	Partner effectively to ensure the successful development and exploitation of location data infrastructures
Recommendation 19	Invest in communications and skills programmes to ensure sufficient awareness and capabilities to drive through improvements in the use of location information in digital public services and support growth opportunities

Table 5 - Focus area Governance, Partnerships and Capabilities - vision and recommendations

The "Governance, Partnerships and Capabilities" focus area index for Norway is 0.43, compared with the European average of 0.44. Although slightly above the European average, this is the lowest scoring focus area for Norway.

Regarding Recommendation 17)[30], integrated governance of location information processes in Norway include the participation and collaboration in decision making processes, a consortium of relevant communities (location and digital government), domains (thematic), administrative levels (central and local) and sectors (public, private, academic, society).

An integral role in the above process is the played by the Norwegian Mapping Authority, which is responsible for the coordination of location information and SDI.

Formal agreements are in place between public authorities to finance, build and operate a large number of location data services or digital public services using location data (Recommendation 18).

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[28] https://www.regjeringen.no/no/dokumenter/en-digital-offentlig-sektor/id2653874/?ch=1

[29] This finding has been separately reported by the Norwegian Mapping Authority. In this specific case therefore, the information provided by secondary source used in the model (the European Data Portal), has not been retained.

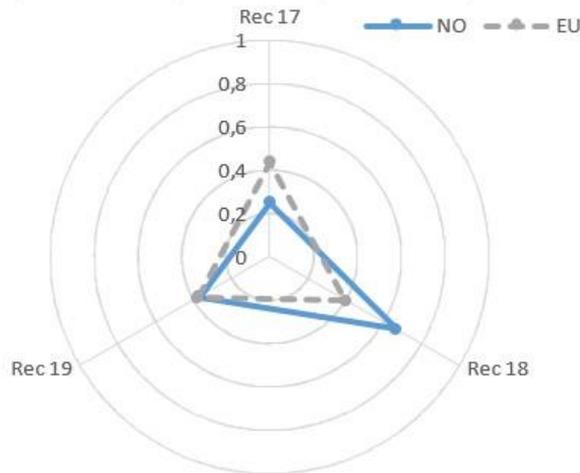[30] See https://lovdata.no/dokument/SF/forskrift/2012-08-08-797

Figure 8 - Governance, Partnerships and Capabilities – scores by recommendation
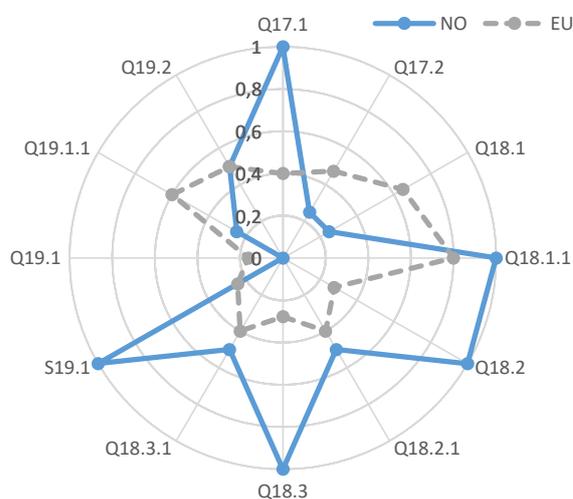

Figure 9 - Governance, Partnerships and Capabilities – scores by recommendations

An example is *Norway digital[31]*, a collaboration between organisations responsible for providing established NSDI information and major users of such information. The participation of each partner is formalised by means of a standard agreement. The parties pay an annual fee to assist with financing basic data sets and agree to share their own data in the infrastructure by adopting a common technical framework and set of standards.

Formal agreements with public authorities in other countries and public private partnerships are in place for a number of services or applications. Two examples are:

- Connection points between Norway and neighbouring countries to enable cross-border spatial data sharing. These have been established for electric lines, roads, railways, rivers and lake boundaries that cross the national border between Norway and Finland[32] and between Norway and Sweden[33];
- Sharing of data for the emergency services on the borders between Norway and Sweden[34].

Norway encourages public private partnerships and there are a few private companies[35] that have co-financed certain themes under the most detailed mapping (FKB)[36] for the country.

With reference to Recommendation 19, training and awareness raising on geospatial skills are undertaken by some organisations as part of a recognised geospatial competency framework or within a public sector ICT or data competency framework. Several initiatives are organised to raise awareness and develop geospatial skills, i.e.:

- a public sector location information / GI champion;
- location information / GI champions in individual organisations where location information plays a significant role;
- spatial literacy awareness raising for non-specialists, e.g. policy makers, legal advisers, project managers;

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[31] See Best Practice NO3
[32] https://kartkatalog.geonorge.no/metadata/738d7288-f990-498b-9136-a8e9b24e9a10
[33] https://kartkatalog.geonorge.no/metadata/04761a69-4b64-4aac-b975-f9e0dcc8526b
[34] See: https://www.kartverket.no/Prosjekter/grensekartsamarbeid-mellom-norge-og-sverige/ and https://www.lantmateriet.se/sv/Om-Lantmateriet/Samverkan-med-andra/internationell-samverkan/datadelning-norge-sverige/
[35] The list of the companies can be found at: https://www.kartverket.no/geodataarbeid/Geovekst/Medlemmer-i-Geovekstforum/
[36] https://kartkatalog.geonorge.no/metadata?text=FKB

- training for specialists, e.g. developers, data analysts;
- special interest group for knowledge sharing within the geospatial community;
- public or cross-government events specialising in location information / GI topics;
- INSPIRE training modules;
- online self-learning tools.

4. Best practices

EULF Best Practice NO1   **Road data exchange in Norway and Sweden**
Policy domain: Intelligent Transport Systems
Process owners: Norwegian Road Authorities and Mapping Agencies
Short description: The EULF Transportation pilot, focused on Norway and Sweden, established an up-to-date flow of road safety data between road authorities and commercial map providers, and provided guidance on linear referencing and exchange standards (the TN-ITS protocol), supporting the aims of the ITS (Intelligent Transport Systems) Directive and drawing on INSPIRE. This work highlighted: (i) the value of timely road safety updates for commercial map providers and users; (ii) the need for public road authorities to make each step in their data processing as timely as possible, to minimise the time taken from making a physical change to disseminating the information about that change; (iii) the need to put in place effective data sharing and collaboration agreements between public and private parties, complementing the tested technical solution (iv) the need to agree on a common location referencing method to facilitate road data exchange (v) the importance of relying on INSPIRE transport network data when national road databases are not available.
Recommendations: Recommendation 7 (Digital Government Integration)
Link: https://joinup.ec.europa.eu/sites/default/files/inline-files/EULF%20Factsheet%20Transportation%20Pilot%20v1%20final.pdf

EULF Best Practice NO2   **Fellestjenester BYGG**
Policy domain: Construction
Process owners: Directorate for Building Quality
Short description: *Fellestjenester BYGG* (Joint Services BYGG) is a toolkit for service providers in the ICT industry who want to develop commercial application solutions for building applications for both professional and public users. With the help of Joint Services BYGG, all digital building applications will come to the municipalities in a common format and appearance regardless of which application system is selected. Joint services BYGG offers automatic control of a building application before submission to the municipality. In addition, digital dissemination of applications and further dialogue between the applicant and the municipality in connection with the processing of the application is ensured.
Recommendations: Recommendation 8 (Digital Government Integration)
Link: https://dibk.no/verktoy-og-veivisere/andre-fagomrader/fellestjenester-bygg/

EULF Best Practice NO3   **Norway digital**
Policy domain: Geospatial
Process owners: Norwegian Mapping Authority
Short description: *Norway digital* is a formal collaboration between organisations that are responsible for providing established NSDI information and / or who are major users of such information. The partners in the collaboration are municipalities, counties and national agencies that are suppliers and users of geographical data and online services. There are common technical and administrative obligations based on the Geodata Act37 and common agreed requirements in the cooperation.
Recommendations: Recommendation 18 (Governance, Partnerships and Capabilities)
Link: https://www.geonorge.no/Geodataarbeid/Norge-digitalt/

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37 https://lovdata.no/dokument/NL/lov/2010-09-03-56

Annex 1: LIFO 2019 Scoring methodology

The LIFO scoring methodology is based on a hierarchy of indicators and indexes.

(Action) Indicators: A certain number of actions[38] have been selected in the EULF Blueprint as being representative of the scope of the recommendations to which they belong. For each of these actions, an indicator has been designed to measure how monitored countries are progressing towards the "vision" outlined in the EULF Blueprint. Each indicator is calculated on a specific scale, which best reflects the nature of the action (e.g. if it can be measured over a continuous or a discrete scale, if it is a binary phenomenon i.e. yes/no or similar, etc.). Indicators are then normalised over a scale 0-1, as follows:
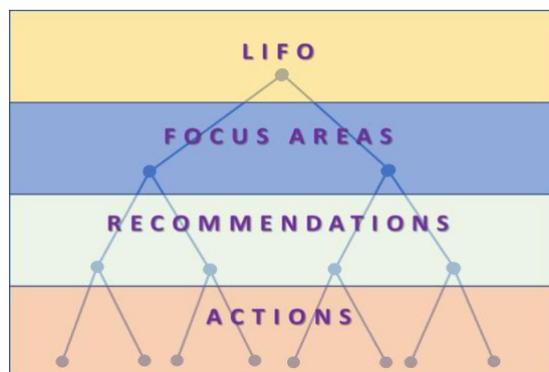

Figure 12 – Hierarchy of indicators and indexes hierarchy

Score attributed to the answer / Maximum Applicable Value: where the Maximum Applicable Value is the upper end of the scale that the non-normalised Value of the indicator can reach.

Note: Optional questions in the LIFO survey capture supplementary information relevant to corresponding mandatory questions about the actions. The mandatory questions (i.e. those marked '*' in the survey) are scored whereas the optional questions are not scored.

(Multi-level) Indexes: Indexes aggregate the Action Indicators at the levels of Recommendations, Focus Areas and LIFO overall, in order to represent the performance of each country at the respective levels. The relationships between (Action) Indicators, Recommendation Indexes, Focus Area Indexes and the overall LIFO Index are described in the table below.

Level	No.	Scoring method
LIFO	1	Average of the 5 Focus area indexes
Focus area	5	Average of scores for all recommendations associated with a focus area
Recommendation	19	Average of normalised scores for all indicators associated with a recommendation[39]
Action	61	Scores calculated using different scoring methods, converted to standard normalised scores in range 0-1.

Table 6 – Relationships between indicators and indexes

Action indicators, Recommendation indexes and Focus Area indexes are thus equally weighted in the calculation of their respective upper level indexes.

Note: *Some questions have a "don't know" response as an option. Respondents are encouraged to provide answers wherever possible. Where a "don't know" response is given, the question has a null score*. This is shown as *zero in the indicator charts* and the question is ignored *in calculating the index scores.*

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[38] Described in the "How" section of each Recommendation
[39] In the event of a failure to respond or an "I don't know" answer, the indicator in question scores zero and it is excluded from the computation of the average score for the above levels.

Annex 2: Glossary

Term	Meaning	Link
European Location Interoperability Solutions for e-Government (ELISE)	The action in the ISA₂ programme responsible for maintaining the EULF Blueprint and coordinating the LIFO.	https://joinup.ec.europa.eu/collection/elise-european-location-interoperability-solutions-e-government/about https://ec.europa.eu/isa2/home_en
European Union Location Framework (EULF)	An EU-wide, cross-sector interoperability framework for the exchange and sharing of location data and services. It consists of a package of recommendations, guidance, methodologies, case studies, training, pilots and collaborative action required by public administrations and stakeholder communities to facilitate the free flow of location data and ensure its effective use in e-government services.	https://joinup.ec.europa.eu/collection/european-union-location-framework-eulf/about
EULF Blueprint	Guidance framework for a wide audience to implement the EULF vision. The EULF Blueprint is updated periodically to embrace new developments in digital government.	https://joinup.ec.europa.eu/collection/european-union-location-framework-eulf/eulf-blueprint
EULF Vision	Vision and framework for 'location-enabled government', based on applying good practice in a number of 'focus areas'. It identifies the objectives, transition strategy and high-level actions needed in each focus area.	https://joinup.ec.europa.eu/sites/default/files/inline-files/ReqNo_JRC94727_lb-na-27125-en-n%20.pdf
Focus area	Best practice domain relevant to the effective use of location information in policy and digital public services. The focus areas identified in the EULF Vision and adapted in the EULF Blueprint are: Policy and Strategy Alignment, Digital Government Integration, Standardisation and Reuse, Return on Investment, Governance, Partnerships and Capabilities.	

Term	Meaning	Link
Indicator	Quantitative measurement of the performance / practice of an organisation or entity. In the context of the LIFO, the indicators evaluate the degree of alignment of the practices implemented by Member States to the EULF Blueprint recommendations. LIFO includes "primary indicators", which are specifically created for the Observatory and are measured through direct questions to LIFO contact points, and "secondary indicators", taken from external sources, following principles of relevance for the scope of LIFO.	
INSPIRE implementing countries	Group of countries that have engaged to implement the INSPIRE directive or parts thereof. It includes: EU Member States, EFTA Members and a group of non-member states.	https://inspire.ec.europa.eu/INSPIRE-in-your-Country
Recommendation	EULF location interoperability best practices in the EULF Blueprint focus areas. Each of the 19 EULF Blueprint recommendations, contains a description of the rationale for following the recommendation and the expected benefits (why?), a checklist of associated actions (how?), potential problem areas to address in implementing the recommendation (challenges), a variety of best practices across Europe where this has been done successfully, links to relevant parts of the EIF, and further reading related to the recommendation.	