

JRC TECHNICAL REPORTS

European Union Location Framework Blueprint

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POLICY AND STRATEGY ALIGNMENT	
1.	Connect location information and digital government strategies in all legal and policy instruments
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government
3.	Comply with data protection principles as defined by European and national law when processing location data.
4.	Make effective use of location-based analysis for evidence-based policy making
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement
DIGITAL GOVERNMENT INTEGRATION	
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions
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
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government
STANDARDISATION AND REUSE	
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements
11.	Reuse existing authentic data, data services and relevant technical solutions where possible
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services
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
RETURN ON INVESTMENT	
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities
15.	Communicate the benefits of integrating and using location information in digital public services
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
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES	
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
18.	Partner effectively to ensure the successful development and exploitation of location data infrastructures
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

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Abstract

Location data is fundamental to people and organisations and is used to deliver value in combination with other data about services, contacts or objects (data from the Internet of Things). For public administrations, location intelligence will become mainstream in digital government in 2 to 5 years. This context - growing in ambition - is further challenged by the need for interoperability supporting these services across Europe, the importance of government-authorised geospatial data (core location data) in the legal context of digital government services and the other various potential sources of geospatial data which will emerge from different sectors.

The European Union Location Framework (EULF) project, which was part of the Interoperability Solutions for Public Administrations (ISA) programme took action to tackle these challenges. The EULF vision is to create and promote a coherent European framework of guidance and actions to foster cross-sector and cross-border interoperability and use of location information in digital public services, building on the INSPIRE¹, and resulting in more effective services, savings in time and money, and contributing to increased growth.

The EULF Blueprint is a guidance framework for a wide audience to implement the EULF vision. It is based on an extensive EU survey and consultation with stakeholders and therefore embodies a wide range of views and experience. This updated version (v3.0), which takes on board latest developments and improves usability, has been produced by the European Location Interoperability Solutions for e-Government (ELISE) project, which is part of the ISA² programme. ELISE merges and extends the work of the two geospatial actions under ISA, namely EULF and ARE3NA, drawing together the policy-related work of EULF and the work on reusable INSPIRE solutions from ARE3NA.

The document is aimed at six types of readers: Policy Maker; Digital Public Service Owner, Manager or Implementer; ICT Manager or Developer; Data Manager or Data Scientist; INSPIRE Data Publisher; and Private Sector Product and Service Entrepreneur / Developer. There are 5 focus areas identified in the EULF Vision, presented in **Figure 1** below.

Figure 1: Five focus areas of the EULF



The EULF Blueprint is organised as follows: for each focus area, the 'current state' assessment and 'vision' are outlined. The key points for progressing from the current state to the vision are then expanded into a series of 19 recommendations, each describing 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, and further reading related to the recommendation.

The annexes complement this actionable framework with detailed descriptions of best practices, and guidance for the reader through a role-based discovery of the relevant recommendations.

A series of separate guidance documents complement the Framework and provide more detailed guidelines, methodologies and/or good practices with regard to these topics. The recommendations refer to these guidance documents. While the EULF Blueprint is targeted at decision makers and managers at EU and national levels, the Guidance documents and tools are especially relevant for practitioners.

¹ Directive 2007/2/EC establishing an Infrastructure for Spatial Information in the European Community (INSPIRE): <http://inspire.ec.europa.eu/inspire-directive/2>

Change history

The EU Location Framework Blueprint has evolved through a series of document versions, which have taken on board new developments in the provision and use of location data by public administrations, including relevant policies and the opportunities afforded by new technologies (see Table 1) .

Table 1. EU Location Framework Blueprint Change History

Version	Date	Main changes
1.0	2017	Initial publication
2.0	2018	<p>A new introduction was included to emphasise the strategic importance of location data and its role in digital government transformation,</p> <p>The recommendations, checklists and reference materials were refreshed to include additional content and improve readability.</p> <p>A new recommendation was added on data quality, Additional content was provided on new technical themes, including MESH architectures and APIs. A number of new best practice use cases were added.</p> <p>Some of the recommendations were reworded. The supporting text was simplified and the checklists were made more 'actionable'.</p>
3.0	2019	<p>The main findings were incorporated from an ELISE study on the impact of the General Data Protection Regulation (GDPR), which came into effect in May 2018.</p> <p>There were a number of updates to reflect new developments, e.g. an updated Gartner Hype Cycle, additional considerations on the use of APIs, and some new reference materials.</p> <p>A number of changes were made to improve readability, including creating more structured "how to" checklists for each recommendation. The actions are grouped under sub-headings, which were used to define priority questions for the Location Interoperability Framework Observatory (LIFO) assessment of location interoperability in Member States.</p> <p>The revision mirrors the layout of the online guidance, enabling readers to move easily between the two formats.</p>

Please note, from Version 2 onwards the Blueprint content has also been made available on the Commission's Joinup website. New releases of the document are mirrored in the [online version](#).

Introduction

An ambitious context for EU digital public services

Location data provides a foundation for delivering added value in combination with other data about services*, stakeholders or objects from the Internet of Things (devices, machines, buildings etc.).

*Government to Government (G2G), Government to Business (G2B) and Government to Citizen (G2C)

To enable this, interoperability of location information sits at the core of more effective services, products and communication with stakeholders, and is conditional for an effective use and analysis of location data to deliver efficiency gains.

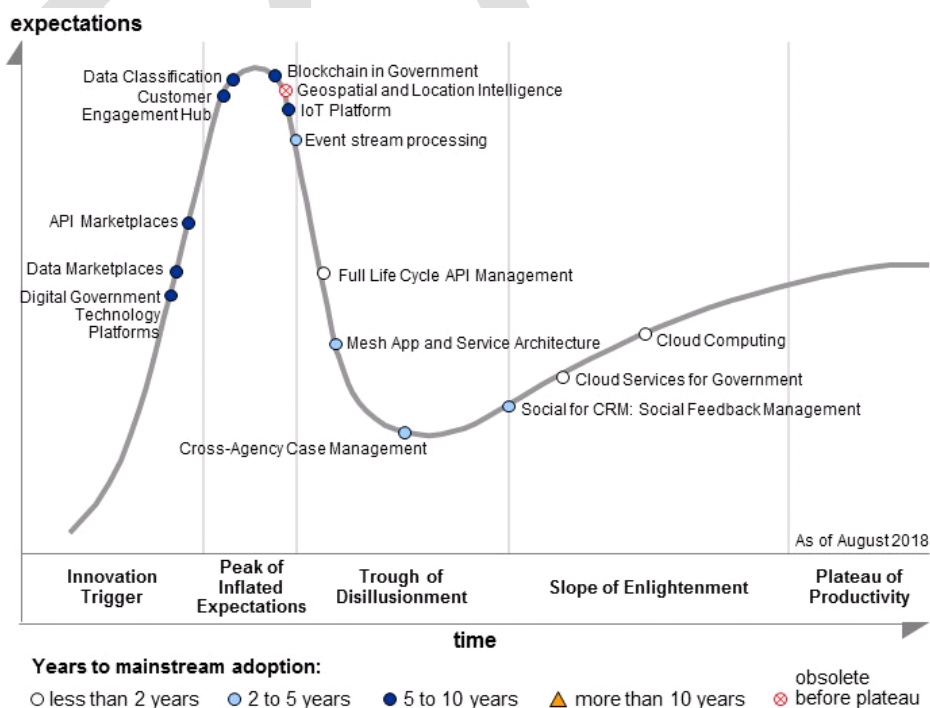
Location intelligence, which makes a combined use of analytics, geospatial information and location-based services, has many use cases in government. Examples are Internet of Things applications that integrate government data (such as demographic data, geological maps or planning/zoning information) into their real-time solutions, including those supporting smart city programmes.

According to Gartner, geospatial and location intelligence (GLI) technologies are just past the peak in terms of interest for digital government, as shown in **Figure 3**.

Figure 2: Relevance of Location Data in combination with other data domains



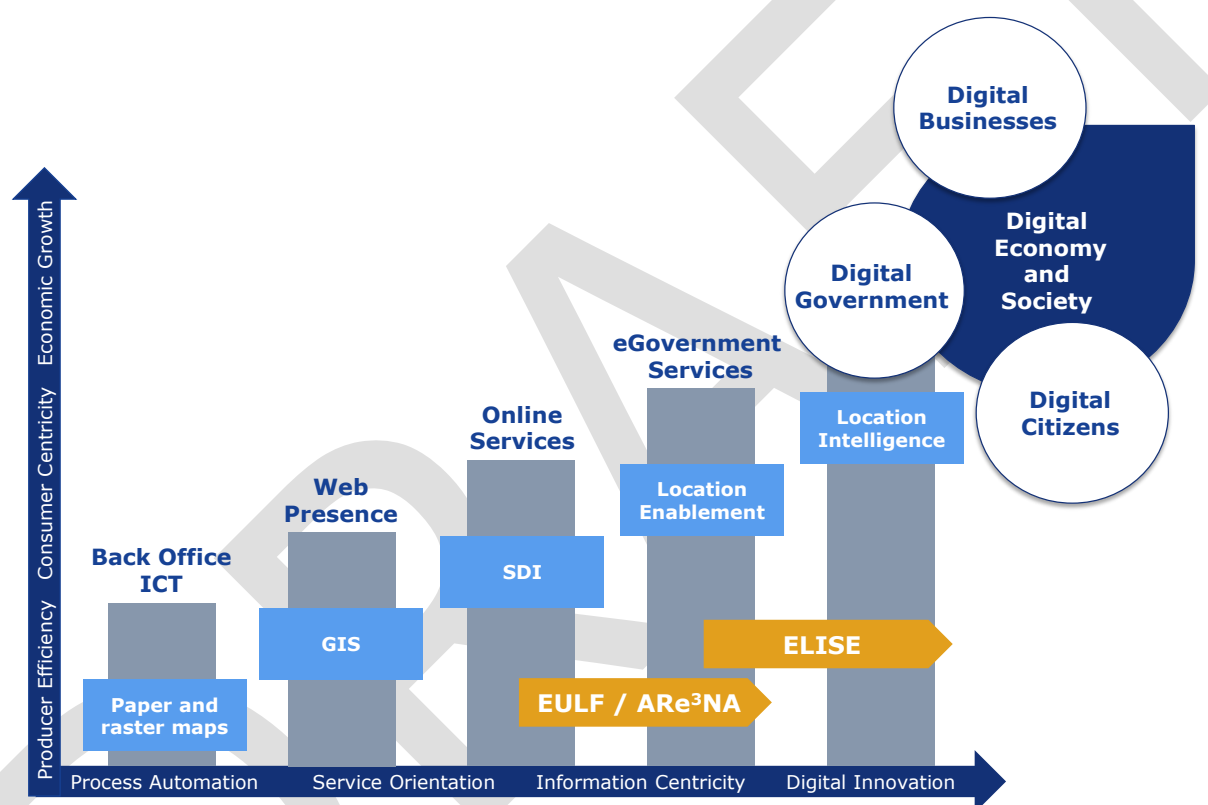
Figure 3: Gartner Hype Cycle for Digital Government 2018: Technologies relevant to EULF Blueprint (Source Gartner Research)



Public administrations increasingly recognise the value of location information to understand policy impacts, interact with citizens and businesses, and manage resources and emergencies. However, the concept of a single GLI solution will disappear. Some vendors will continue to offer GIS specialist tools while others will embed GLI capabilities in broader analytics tools and platforms or application specific technologies (e.g. smart mobility). There is also likely to be a separation between macro location intelligence (e.g. environmental, transport applications) and micro location intelligence (indoor locations, including the home).

An analysis of the evolution of digital government and the use of location information and location based services, as shown in **Figure 4** below, highlights a common maturing trend towards higher information centrality and digital innovation. The most mature models involve comprehensive digital government strategies, promoting innovation and growth through the use of data, and in particular, the use of location intelligence in applications across all aspects of public life.

Figure 4: Evolution of digital government and use location information



This context - growing in ambition - is further challenged by the need for cross-border interoperability supporting these services across Europe, the importance of government-validated geolocation data (core location data) in the legal context of digital public services and the other various potential sources of geospatial data which will emerge from other sectors.

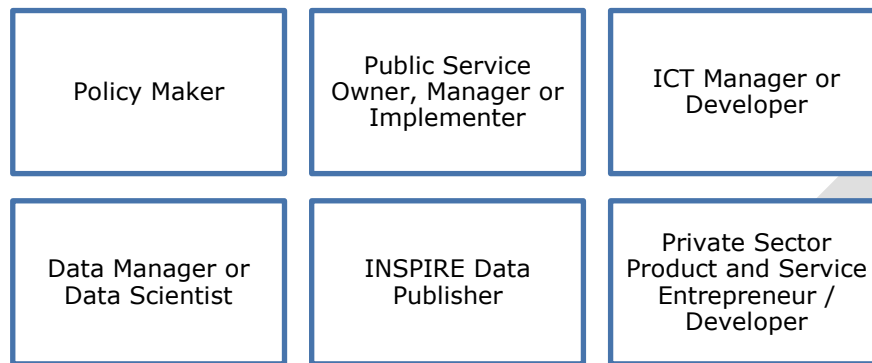
A guidance framework for a wide audience to implement the EULF vision

The EULF vision is that “more effective services, savings in time and money, and increased growth and employment will result from adopting a coherent European framework of guidance and actions to foster cross-sector and cross-border interoperability and use of location information in digital public services, building on INSPIRE”.

The EU Location Framework Blueprint is a key guidance document addressing a wide audience, with elements relevant to specific target groups listed in **Figure 5** below².

² Annex II describes a role-based reading of the recommendations.

Figure 5: Target audiences of the EU Location Guidance Framework



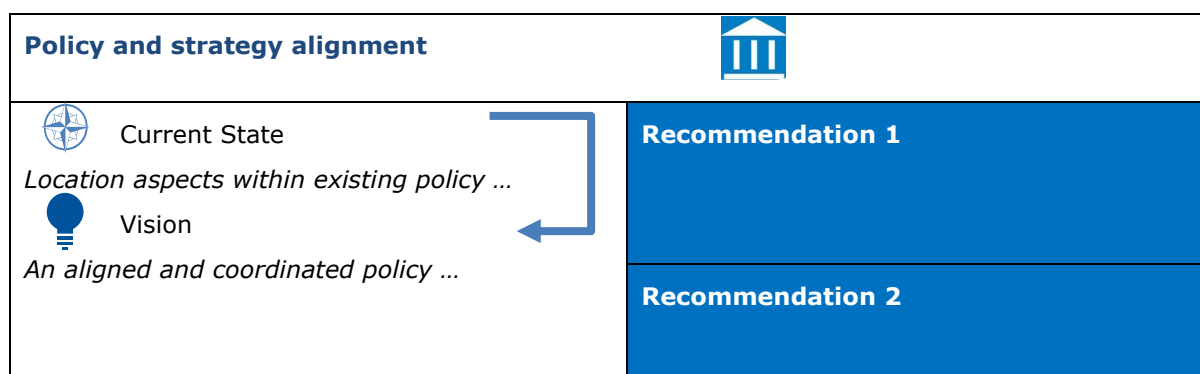
There are 5 focus areas identified in the EULF Vision and presented in **Figure 6** below.

Figure 6: Five focus areas of the EULF



The EU location guidance framework in the Blueprint is organised as follows: for each focus area, a general 'current state' assessment and 'vision' are outlined; the key points for progressing from the current state to the vision are then expanded into a series of recommendations.

The 'current state' and 'vision' are based on surveys and analysis carried out in the EULF project up to 2016. These will evolve over time as new directions emerge and progress is observed across Europe. The Blueprint is updated periodically to reflect these developments.

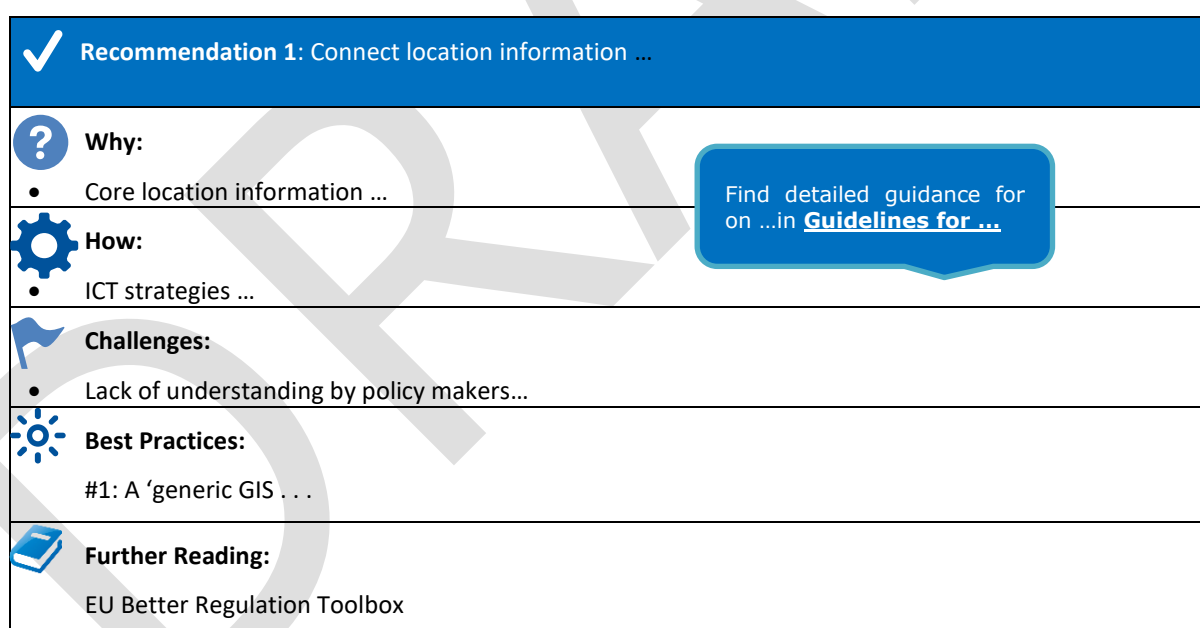


A series of more detailed guidance documents complement the Blueprint framework, providing detailed practical guidance, methodologies and good practices on specific topics, introduced in outline in the Blueprint. The recommendations in the Blueprint refer to these guidance documents.

While the EU Location Framework Blueprint may provide a sufficient level of information for decision makers and managers at EU and national levels, the associated detailed guidance documents and tools may provide relevant answers for practitioners. The set of detailed guidance documents includes Location Privacy Guidelines, Guidelines for Aligning the Use of Location Data in EU Policy, Public Procurement of Geospatial Technologies, Design of Location Enabled e-Government Services, and Architectures and Standards for SDIs and e-Government.

19 recommendations

Figure 7: Structure of a recommendation



The EU Location Framework Blueprint defines a series of recommendations in the five focus areas, the rationale for following the recommendation (why?), a checklist of associated actions (how?), potential problem areas to address in implementing the recommendations (challenges), references to best practices in the topic area, and further reading from contextual documentation to concrete toolboxes.

A guidance box links to the relevant detailed guidance documents. References are also made to relevant EULF best practices. **Figure 7** shows the structure of a recommendation.

There are 5 recommendations for policy and strategy alignment, 4 for digital government integration, 4 for standardisation and reuse, 3 for return on investment and 3 for governance, partnerships and capabilities.

The content is enriched with 2 annexes

Figure 8: Blueprint annexes



Illustrations of best practices are provided to give additional context and while these are listed under each recommendation, they are described in Annex I.

The reader is guided through the relevant recommendations related to the specific roles in Annex II Role-based methodologies.

Policy and Strategy Alignment



Current State

Location aspects within existing policy and strategic frameworks are often addressed in inconsistent and incompatible ways. This can result in less effective policies, and in duplication of effort and unnecessary costs. Data of suitable quality is not always readily accessible. There are some good examples of simple, consistent licensing and access to open data but there is limited alignment across Member States.



Vision

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 strategies and digital government strategies in all legal and policy instruments



Why:

- Core location information (e.g. address data) is relevant to most digital public services and broader location-based information is important in many digital public services (e.g. land registration) and in public sector information provided to citizens and businesses (e.g. location of schools and hospitals)
- Optimising the use of location information helps to deliver innovative, authoritative and comprehensive digital public services
- Silo thinking in policy development can lead to duplication and inefficiency, poor value for money, confusion for stakeholders, and overall reduction in policy effectiveness. The potential impacts are felt by businesses and citizens as well as across the public sector
- A connected strategic approach will help align implementation actions for mutual benefit, contributing to achievement of goals around growth and better services



How:

Location and digital strategy alignment

- Digital government and ICT strategies include a key role for location information and technologies, to deliver better digital public services supported by an overall interoperable ICT framework
- Location information strategies address the requirements of digital public services, supplying data for these digital public services and supporting links between the public sector and society. These strategies consider the broad requirements of digital public services and not just the restricted context for which location information might be collected in the first place.
- Location information strategies are aligned with ICT strategies, in terms of the architectures and technologies used.

Strategic engagement

- Location stakeholders are involved in the development of digital government and ICT strategies
- Stakeholders connected with electronic public service provision are involved in the development of location strategies

-
- There is a clear and agreed allocation of tasks and responsibilities between the different parties involved in digital public service, ICT and location information policies

Consistent thematic policies

- Different thematic policies apply a consistent approach to the provision and use of location-related information, for example in their references to standards, use of codes, and reliance on authentic data. The following aspects of policy alignment are considered:
 - Alignment across different policies in the same thematic area
 - Alignment with European (e.g. INSPIRE) and national location policies
 - Alignment with European (e.g. PSI, GDPR) and national data policies (see Recommendation 2 below)
 - Alignment of potential digital public service, e-Government and ICT solutions in a thematic area with European (e.g. ISA², e-Government Action Plan) and national e-Government and ICT policies

Useful tools

- A useful tool for assessing alignment (and other factors) in the development of EU policy is the ICT Assessment Method in the Better Regulation 'Toolbox', which considers firstly whether ICT (including location information and technologies) is important in a particular policy and, secondly, if it is important, examines the potential options in the use of ICT and provides conclusions and recommendations
- ICT assessments may also be undertaken as part of the monitoring and evaluation phase to review the implementation of policies. For EU policies, these take the form of 'evaluations' of particular policies (e.g. INSPIRE) and 'fitness checks' of particular policy domains (e.g. Environment)
- The EU Better Regulation 'Toolbox' provides a series of relevant best practice 'policy' tools, including those mentioned above.



Challenges:

- Lack of understanding by policy makers of the potential role of location information and how the information should be managed. For example, the EULF Marine pilot and the EULF Energy Efficiency of Buildings feasibility study highlighted requests from different directives related to the same location information without defining a common strategy for data sharing and management.
- Complexity in consultation and coordination involving all relevant stakeholders
- Keeping pace with the changing political and policy landscape
- e-Government strategies focus too much on ICT rather than public service needs
- Location information and e-Government strategies involve the private sector to an increasing extent. This presents challenges as well as opportunities that need to be handled consistently, e.g. the conditions for use of private sector data alongside public sector data



Best Practices:

- #1: A digital platform for location data in Flanders
- #4: What's in Your Backyard for farmers
- #6: Digital Exchange platform for spatial plans
- #18: Territorial Information System of Navarre: SITNA



Further Reading:

- [UK Location Strategy](#)
- [UK Government Digital Strategy](#)

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- [UK Digital Strategy](#)
 - [GIDEON: Key geo-information facility for the Netherlands](#)
 - [Country Report of Sweden to UN-GGIM 2015](#)
 - [Finnish National Spatial Data Strategy 2016](#)
 - [EULF References](#)
 - [EU Better regulation Toolbox](#)
 - [ICT Assessment Method](#)
-



Recommendation 2: Make location information policy integral to, and aligned with, wider data policy at all levels of government



Why:

- Location information is key public data and much public policy has a location context
- Location information has particular requirements that need to be considered in formulating wider data policy
- It is important to avoid contradictions between location information policy and broader data policy
- Authentic location data is costly to maintain and this needs to be recognised in wider data policy decision making
- A connected strategic approach will help align implementation actions for mutual benefit
- Public-private partnerships and crowdsourcing of data can support sustainability and reliability goals and ensure real needs are met



How:

Policy reach

- When developing the approach to ensure consistency and alignment between location policy and wider data policy, include key topics such as data sharing, open data, authentic data, data licensing (including reuse), IPR, privacy, data protection and the ethical and professional handling of data
- Ensure that location information is a prominent feature of policies and actions in areas where it can make an important contribution, e.g. open data, authentic data, data licensing and re-use
- Location information plays a significant part of the European data infrastructure envisaged using Cloud services and supporting the goals of the Digital Single Market Strategy

Data governance

- There is a common data governance approach for all public sector data, determining how data are collected, managed, used and made available by public authorities

Stakeholder engagement

- Location information stakeholders are involved in the development of broader data policy and vice versa
 - The role of public-private partnerships and crowdsourced data is determined and applied consistently across all data policy (including location data policy)
 - There is a clear and agreed allocation of tasks and responsibilities between the different parties involved in general data policy and location information policy
-

European alignment

- National location information makes a significant contribution to European data infrastructures, including INSPIRE, Open Data, Earth Observation, NMCA, and thematic data services and vice versa



Challenges:

- Lack of understanding of the specifics of location information by general data policy makers
- Data policy fails to take into account the cost of collecting and making available location data of sufficient quality
- Location policy continues to be seen as “special” and fails to align with wider data policy where it is feasible to do so



Best Practices:

- #3: ‘LoG-IN’ to the local economic knowledge base
- #6: Digital Exchange platform for spatial plans
- #16: Managing the granting of licenses for selling tobacco
- #21: Integrated transport solutions: TRAVELINE
- #23: INSPIRE-compliant marine environment e-reporting



Further Reading:

- [UK Government Licensing framework for Public Sector Information](#)
- [UK Government Service Design Manual – Open Data](#)
- [UK National Information Infrastructure](#)
- [UK Public Data Group](#)
- [UK Location Council Annual Reports](#)
- [Denmark: Good Basic Data For Everyone – A Driver for Growth](#)
- [Planning for Socio Economic Impact – Open data as a policy instrument in the Netherlands and elsewhere](#)
- [INSPIRE Empowers Re-use of Public Sector Information](#)
- [Open Government Data for Citizen engagement in Managing Development](#)
- [Open Data Institute: Guides](#)
- [Data infrastructures supporting the European Digital Single Market Strategy, April 2016](#)
- [A Corporate Information Management Framework for the European Public Sector, Nov 2016](#)



Recommendation 3: Comply with data protection principles as defined by European and national law when processing location data



Why:

- Compliance with data protection and privacy law is mandatory. and failure to comply will attract significant financial penalties, particularly under General Data Protection Regulation (GDPR). There is

a risk that without adequate provisions to protect personal data, there will be a breach of national or European data protection and privacy laws.

- The protection of personal data is a fundamental right. Users of public services expect their rights to be protected and public administrations have an obligation to put in place the necessary protections.
- Failure to protect personal data will erode citizen trust and confidence in the services.
- Without clear and appropriate data protection procedures, there is a risk in not being able to deal adequately with crisis situations such as systematic unlawful use of personal data or major data leakages.
- A governance framework focusing on privacy allows organisations to better implement privacy related principles and respect personal data protection in all processes. Furthermore, according to the General Data Protection Regulation (GDPR), every public administration has to appoint a Data Protection Officer (DPO). The DPO and his team allows for supervision and transparency of (location) data processing, implementation of the data protection strategy, and creation of trust towards data subjects.



How:

Find detailed guidance for public administrations on location privacy in the [EULF Guidelines on Location Privacy](#)

Data protection policy approach

- Set up a governance structure and data management programme for location data protection which includes:
 - Developing a data protection strategy in-line with the organisation's strategy;
 - Creating and implementing data protection policies, standards and guidelines. Policy documents should be created around rights of access requests, data retention cookies, privacy and consent protocols where required;
 - Implementing processes and systems to automate the task of governance compliance;
 - Defining metrics to measure the effectiveness of the data protection programme.
- Appoint a responsible and certified³ person for data protection – Data Protection Officer (DPO) – to supervise the management of personal location data and provide transparency within the organisation and towards data subjects.
- Connect the DPO with the Chief Information Security Officer (CISO) to secure adequately the processing of personal location data: There are security control frameworks such as ISO 27018 for data protection but also more general frameworks such as the ISO 2700x family, ISF Standard of Good Practices, NIST or SANS publications that can help.

Data management approach

- Ensure lawful processing of personal location data and that the processing of personal location data is fair and transparent – individual 'data subjects' should know why their location data is being collected, how it will be used, how this will benefit them, if it will be shared and with whom, and how long it will be retained; data subjects should not be deceived or misled
- Use clear and unambiguous language about what data is being collected, why it is being collected how it will help the user.

³ The EC expressed preference for certificate evidence through Article 42 and 43 of the General Data Protection Regulation. Accredited certifications include e.g. the Certified Information Privacy Professional Europe (CIPP/E) of International Association for Privacy Professionals' International Association for Privacy Professionals (IAPP) or the Certification Programme for Data Protection Officers and Other Data Protection Professionals from the European Institute of Public Administration (EIPA)

-
- Be open about collecting the data including if it is required under legislation.
 - Assess the risks for data subjects when data is exposed and their location data processed. Also, perform periodic privacy risk assessments to guarantee an accurate level of data protection towards the data subjects
 - Minimise the data collected to ensure that only the minimum amount of data is collected that the task requires, and that the data is retained only as long as is needed.
 - Prepare for data subjects' rights of access, rectification, erasure, to be forgotten, data portability, restriction of processing and notification of data breaches (in the latter case to both data subjects and supervisory authorities)
 - Unless required by legislation, ensure anonymisation of personal data before publication (see Annex II of the EULF guidelines on location privacy).
 - Have Data Protection Impact Assessment (DPIA) defined and in place for both future and legacy processes including significant updates/changes to legacy systems.

Location data awareness in data protection community

- Ensure DPOs are aware of the scenarios for use of location data within the organisation and the potential data privacy risks
- Check the website of your national Data Regulator
- Review the EULF Guidelines on GDPR and location data
- Link to the ELISE community on location data and GDPR
- Link into local and European wide bodies that specialise in location data. For example, EUROGI is European wide professional body that brings together industry and individuals involved in location data

Trust measures

- Create trust with data subjects. Be transparent and open with regard to data collection, processing, security, and privacy measures applied:
 - Keep all notices and terms in simple, clear and unambiguous language;
 - Publish a privacy notice that describes how the organisation collects, uses, retains and discloses what personal data is collected, how the data is used, what technical security measures are in place to protect personal data, with whom the data is shared, how a data subject can access or rectify personal data, and contact information of the DPO;
 - Require informed consent from customers and users on the use of their personal data. PLEASE NOTE CONSENT MAY NOT ALWAYS BE NEEDED IF PERSONAL DATA IS REQUIRED TO BE COLLECTED FOR EXAMPLE UNDER LEGISLATION, However, this should be stated clearly, concisely, and in plain and simple language to the data subject;
 - Have a contact point for data subjects where they can direct their enquiries.

Challenges:

- To have a complete 'protection without sharing' approach can result in lost opportunities. As in the commercial world, the release of personal data can benefit users of public services. In the same way that users of internet retail sites may feel they benefit from targeted marketing (others may not of course), there can be similar advantages for users of public services, e.g. to take advantage of energy subsidies they may not otherwise know about. This why transparency, and clear and simple communication are so important. If the data subjects understand and can see the benefit to them, they are more likely to share their location or any other personal data.
 - Introducing personal data protection presents extra considerations and efforts for all projects. Also, the drive towards more 'open government data' and more data sharing between administrations raises more situations where privacy risks need to be considered.
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- Organisation culture can be difficult to change and managing personal data across an organisation under GDPR may require a series of changes that will need to be implemented across organisations.
 - A key tool to protect the data subject, where data is to be shared, is the anonymisation of the data. There are a number of ways of doing this, however, ongoing reviews are needed as new and other data sets become available. The newly available data may invalidate or compromise the anonymisation method used resulting in a requirement re-anonymise.
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Best Practices:

#17: Location-enabled census data in Poland

Please see also https://joinup.ec.europa.eu/sites/default/files/jrc103110_1-dc246-d3.2_eulf_guideline_on_location_privacy_v1.00_final_-_pubsy.pdf for further case studies of Transport for London (Oyster) and EUCARIS (European CAR and driving licence Information System)



Further Reading:

- [European Commission, Data Protection](#)
 - [Regulation \(EU\) 2016/679 of the European Parliament and of the Council of 27 April 2016, General Data Protection Regulation](#)
 - [European Data Protection Board](#)
 - [EDPB, National bodies responsible for data protection](#)
 - [European Union Agency for Fundamental Rights, Handbook on European data protection law \(2018\)](#)
 - [EU Agency for Network Information and Security \(ENISA\): Privacy, Accountability and Trust – Challenges and Opportunities](#)
 - [EU Agency for Network Information and Security \(ENISA\): Privacy and Data Protection by Design – from policy to engineering](#)
 - [EU Agency for Network Information and Security \(ENISA\): Privacy by Design in Big Data](#)
 - [EULF guidelines on location privacy](#)
 - [UK Information Commissioner's Office : Privacy by Design Guidelines](#)
 - [The Location Forum: Location Data Privacy – Guidelines, Assessment & Recommendations](#)
 - [ISO/IEC 27018:2014](#)
 - [ISO/IEC 27001 - Information security management](#)
 - [ISF Standard of Good Practices](#)
 - [NIST](#)
 - [SANS](#)
 - [European Automobile Manufacturers Association: Principles of data protection in relation to connected vehicles and services, September 2015](#)
 - [Information Commissioner's Office \(ICO\) \(November 2012\), Anonymisation: managing data protection risk code of practice](#)
 - [Elliot, Mackey, O'Hara and Tudor, UKAN \(2016\), The Anonymisation Decision-Making Framework](#)
 - [Companies that fail to see privacy as a business priority risk crossing the creepy line, KPMG \(2016\)](#)
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Recommendation 4: Make effective use of location-based analysis for evidence-based policy making



Why:

- Geographic differences, e.g. in relation to property and jobs, should be taken into account in policy formulation and assessing policy instruments. This will help in establishing an overall approach balancing geographic variations or in developing “differential” policy that specifically targets regional differences (e.g. regional development policy).
- Location analytics and map visualisations are valuable instruments to analyse large and localised data sets quickly and in a way that helps recognise hidden patterns, relationships and correlations between phenomena happening in the same place. These patterns may not be readily apparent using generic socioeconomic and statistical analysis.
- Visualisation tools available for location information are an extremely attractive and understandable alternative to lists and tables of figures. They enable policy makers to explain the impact of their interventions to the general public.



How:

Analytical geo-reference data

- Use data for standard geographical areas (e.g. administrative and statistical units, post code areas, national parks) to support statistical and policy analysis
- Take account of the opportunities with INSPIRE for EU-wide analytical comparisons based on harmonised location-related data
- Ensure reference data semantics and standards are consistently applied, to support accurate and comprehensive assessments and help in clear decision making

Location based statistics and visualisation for policy

- Use location-based data and statistics as evidence to inform policy making and monitor or evaluate policy outcomes. This location-based data may come from a variety of sources, such as sensors and mobile devices, or from mapping data/services (for example, geocoding)
- Take account of national / regional / local variations or variations by other geographic characteristics (e.g. urban/rural contexts, risk exposure to atmospheric pollution, noise and flooding in different locations, how a new road through an area can affect communities) to establish a balanced approach in policy formulation
- Use spatio-temporal analysis to highlight changes in policy indicators over time
- Use relevant location-based evidence in ex-ante impact assessments, ongoing reporting of policy implementation, and ex-post policy evaluations of EU and national legislation
- Target scientific research funding towards key policy topics, giving due weight to the value of location-based research
- Use geographical visualisation techniques (e.g. maps, heat maps, visualisations over time) to “communicate the message” and make the policy analysis easy to understand, including evaluating existing data, assessing policy options, and communicating the impact of policies to the generic public
- Have the flexibility to use different techniques in different situations, depending on the audience, to make the communication as impactful as possible

Analytical sources and techniques

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- Consider both ‘hard’ and ‘soft’ evidence in informing policy. ‘Hard’ evidence may come from databases and surveys. ‘Soft’ evidence could come, for example, from interviews, focus groups, social media (e.g. location-based information from mobile phones) and behavioural analysis
 - Combine the technologies for location-based analysis and business intelligence and analytics platforms to support extensive analysis and insight for policy makers, using location-based data as fully as possible
 - Make use of location intelligence algorithms (such as network path analysis, matrix routing, etc.) for spatial analysis and optimised resource allocation based on topological, geometrical and/or geographical properties
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Challenges:

- Policy processes are complex with multiple factors involved and often gaps or inconsistencies in data and information (particularly in ex-ante stages). A holistic understanding is needed, taking account of relevant risk factors. There may be trade-offs to take into account in affected policy areas. These issues are particularly important in relation to environmental policy and related policy areas, e.g. transport, industry, energy, health, industrial and residential development
 - Simplistic extrapolations based on geography and demographics can hide key underlying variables and patterns that result in misjudged decisions
 - Lack of spatial literacy (e.g. the difficulty in reading a map without being guided) and designing communications for specialists rather than the general target audience may hinder the immediacy of the message that policy makers want to pass on.
 - Maps can be used to hide the real connections or make un-related connections. To avoid this, it is very important that the underlying analysis is sound.
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Best Practices:

- #1: A digital platform for location data in Flanders
 - #3: ‘LoG-IN’ to the local economic knowledge base
 - #5: Radiological Emergency Response in Germany
 - #7: National landslide warning system in Italy
 - #8: ‘One solution for all emergency services’ in Poland
 - #9: Digital Accessibility Map for better informed firemen
 - #13: KLIC to prevent damage caused by excavation works
 - #14: Air quality monitoring and reporting in Belgium
 - #15: Information System of Contaminated Sites in Slovakia
 - #18: Territorial Information System of Navarre: SITNA
 - #20: Digital system for building permits in Italy
 - #23: INSPIRE-compliant marine environment e-reporting
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Further Reading:

- [EU Environmental status of marine waters](#)
 - [Making the most of our evidence: a strategy for Defra and its network](#)
 - [Sustainable Development Goals in the Netherlands - Building blocks for environmental policy for 2030](#)
 - [GIS and Evidence-based Policy Making, ed. Stephen Wise, Max Craglia](#)
 - [Do Place Based Policies Matter, Federal Bank of San Francisco](#)
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- [Place Based Policies, Oxford University School for Business Taxation](#)
- [The Case for Evidence Based Policy, Policy Horizons Canada](#)
- [United Kingdom Crime Statistics](#)
- [EULF Marine Pilot, creating a Marine SDI framework for Marine Strategy Framework Directive e-reporting](#)
- [Italian National Landslide Warning System](#)

Recommendation 5: Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement



Why:

- It is important to have a transparent and uniform procurement approach to ensure fully effective competition following procurement best practices
- Suppliers should be given a clear steer on what is needed from them and how they will be evaluated. This will result in more relevant proposals and reduce the risk of delivery failure / change requests.
- Legal requirements (e.g. INSPIRE) need to be followed
- Such an approach avoids additional burdens or unnecessary expenditure in re-inventing the wheel or re-working solutions
- Electronic procurement makes for more effective procurement processes



How:

Find detailed guidance for public administrations on public procurement in the [EULF Guidelines for public procurement of Geospatial Technologies](#)

Procurement process

- Apply the procurement rules specified in the new EU Directives on Public Procurement
 - Directive 2014/23/EU on the award of concession contracts
 - Directive 2014/24/EU on public procurement
 - Directive 2014/25 EU on procurement by entities operating in the water, energy, transport and postal service sectors.
- Use electronic procurement processes and tools for more effective management of the procurement process, including pan-European e-procurement tools, such as e-PRIOR, the European Single Procurement Document (ESPD) Service and e-CERTIS
- Ensure location assets being procured are interoperable and reusable
- Ensure procurement includes relevant geospatial skills as well as data or software solutions
- Include these location-specific requirements in the selection/evaluation criteria

Standards-based references

- Make appropriate references to INSPIRE and other relevant standards (e.g. thematic standards) in procurement documents
- When referring to INSPIRE:

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- Refer to the INSPIRE Directive, its Implementing Rules and Guidelines in a precise way
 - Refer to INSPIRE as a method for data specification development or apply some of the technical specifications of INSPIRE, even if certain activities covered by the Call for Tender do not – strictly speaking – relate to INSPIRE
 - For geoportals or data portals accessing location data, reference may be made to the use of INSPIRE data and services but not to any INSPIRE requirements for geoportals (they do not exist). To say “the geoportal should be compliant with the INSPIRE Directive” does not make sense.
 - Clarify the terminology used in the procurement documents and how these relate to the terminology used in INSPIRE
 - Refer whenever possible to existing architecture documents describing the National/sub-National SDI, INSPIRE or e-Government/public service architecture in which the requested components fit
 - Allow room for flexibility by not only referring to standards and specifications that are already adopted, but also to ongoing work
 - When including conformity requirements:
 - Be clear about which outputs/products of the procurement should/must be conformant/compliant with which specification/standard.
 - Require testing of the outputs/products on conformity/compliance as part of the procurement.
 - When referring to international standards:
 - Be as complete and precise as possible when referring to International standards.
 - If necessary, refer to a series of standards that go together, rather than to individual standards.
 - If necessary, employ INSPIRE/standards specialists in the procurement or follow-on implementation to ensure appropriate standards-based approaches are followed
 - Check the European Catalogue of ICT Standards for Public Procurement
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Challenges:

- Lack of understanding of what is relevant to specify in procurement documents on location standards / INSPIRE
 - Supplier evidence may be lacking in early stages of INSPIRE implementation
 - Specifying that particular standards will be followed doesn't guarantee that they will be followed or that solutions will be functionally or even technically proficient. Parallel functional requirements are needed in procurement. Oversight of solution delivery is needed during implementation to ensure what is promised is what is delivered.
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Further Reading:

- [Ciciriello, C. \(2014\). OpenPEPPOL e-Procurement in Europe. OpenPEPPOL AISBL: Brussels, Belgium](#)
 - [European Commission \(2013\). Guide for the procurement of standards-based ICT-Elements of Good Practice. Commission Staff Working Document. European Commission: Brussels](#)
 - [Janssen, K. \(2009\). The EC legal framework for the availability of public sector spatial data: an examination of the criteria for applying the directive on access to environmental information, the PSI directive and the INSPIRE directive. Elsevier: Amsterdam](#)
 - [Medeiros, R. \(2014\). The New Directive 2014/24/EU on Public Procurement: A First Overview. In L.V. Tavares, R. Medeiros & D. Coelho \(eds.\). The New Directive 2014/24/EU on Public Procurement, pp 29-52. OPET: Lisbon](#)
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- Tavares, L.V. (2014). The New Directive 2014/24/EU on Public Procurement: Policy Issues and Next Steps. In L.V. Tavares, R. Medeiros & D. Coelho (eds.). The New Directive 2014/24/EU on Public Procurement, pp 13-28. OPET: Lisbon
 - Study on best practices for ICT procurement based on standards in order to promote efficiency and reduce lock-in: [Analysis of Survey Results](#), [Final Report](#)
 - [European Union Location Framework Guidelines for Public Procurement of Geospatial Technologies \(2016\)](#), Vandenbroucke, D et al.
 - [European Catalogue of ICT Standards for Public Procurement](#)
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DRAFT

Digital Government Integration



Current State



Location is key to effective public services but location information is not well integrated in digital government processes, resulting in sub-optimal services, incompatible systems and expensive maintenance. Location-related services are often designed and implemented from a provider rather than a user perspective, resulting in services and information that may not be fit for purpose.



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 with location intelligence and implement improvement actions



Why:

- As everything happens in a place or space, location information underpins many public services. However, this is not always understood or recognised, and location information is not always used in the most effective and efficient ways.
- Administrative burdens can be reduced and better services delivered with optimal use of location information, accessed via digital channels whenever appropriate
- Such action will help realise the value of location information in digital public services
- Users of digital public services have increasing expectations on the nature and integration of the online experience, based on their exposure to private sector applications.



How:

Find detailed guidance on designing location enabled digital public services with the [Guidelines for Design of Location Enabled e-Government Services](#)

Key events inventory

- Look for events that trigger a series of cascading actions and data exchange across a network of people, businesses and organisations, and things to achieve a singular objective (e.g. change of address)

Find many examples of use cases in the [EULF References Document](#)

- Create an inventory of key digital government processes and services that play a role in such events and determine in which location information plays a significant role

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- Document use cases for such events in a common structured manner as this will increase the possibility of re-use and interoperability, with the associated economic advantages user benefits. Consider using the following classification:

- Policy area
- Location
- Application
- Level – regional/national
- Interfaces – G2C, G2G, G2B
- Business area
- Indoor/outdoor
- Static/Dynamic data

This approach will support organisational interoperability by setting a common description across Member States, a first step towards reuse of practices and then solutions. Use cases can then be documented according to the different possible scenarios related to the roles of different actors: G2G, G2B, G2C and the intermediary role for government to provide the rule engine for the different producers and consumers of data.

Assessing new business models

- Analyse opportunities for improving digital public services and processes in their use or potential use of location information, through internal analysis (e.g. using BPMN), external analysis (e.g. customer insight techniques) or external comparison (e.g. benchmarking, examining best practices in other Member States or other administrations in the same Member State). This can be best achieved by applying the following event-based approach:
 - Step 1: Identify key events in your environment in which location data plays a critical role. Key events are ideally real-life cases which are very recognisable and impact multiple stakeholders e.g. precision emergency response to incidents (e.g. terror attack, boat capsizes, oil spill, flooding, search and rescue, etc.) or natural disaster (e.g. tornado, tsunami, etc.) or human-related incidents (e.g. job losses, human and drug trafficking, etc.) or events impacting the local community (e.g. litter, graffiti, maintenance of street furniture, traffic flows, schools and crèche services).
 - Step 2: Analyse the bilateral data exchanges amongst the different stakeholders involved in the processes of the key event. (Techniques such as BPMN, Use Case Diagrams and Data Modelling can support this step)
 - Step 3: Rethink the processes and data exchanges as if there was an open digital platform available that allows for multidirectional exchange of data.
 - Step 4: Analyse what new (location-) intelligence techniques could be developed on top of such a platform that connect disparate data sources in an open manner. Techniques could be for example: site location optimisation (e.g. police force deployment), location impact simulation (e.g. oil spill), geographic concentration (e.g. terrorism threats), etc.
 - Step 5: Look for new ways of collaboration with all stakeholders who might benefit from this platform and evaluate the impact on their business and operating model as an input to define the new digital services.

Service improvement programme

- Establish improvement programmes in priority areas where location information can be used more effectively in digital public services and processes
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- Determine the most cost-effective business models, from step-changes in the approach (e.g. the introduction of a collaborative 'digital platform' based business model to replace previous bi-lateral arrangements) to more incremental improvements (e.g. revising a single part of the process, relationships with a single actor)
- Look for quick wins to demonstrate progress
- Establish and publicise 'model implementations' to encourage wider take-up of good practice
- Look elsewhere nationally and in other MS to identify good practices that can be re-used
- Introduce methods of continuous assessment, to help in planning and delivery of incremental improvements, identify new factors that need to be considered, and ensure interoperability is maintained over time as location-enabled services and solutions evolve



Challenges:

- Better use of location information is only one aspect of public service improvement
- The significance and benefits of well-managed or applied location information and may not be understood or be clear
- The benefits of investment in other areas may be more cost effective or felt to be more cost effective because they are more clearly understood and defined
- Services cannot always be considered in isolation. There are basic elements involving location information that cut across multiple services, e.g. addresses, buildings information, transport information. However, the links may not be taken into account in planning investments.



Best Practices:

- # 1: A digital platform for location data in Flanders
- #14: Air quality monitoring and reporting in Belgium
- #18: Territorial Information System of Navarre: SITNA
- #21: Integrated transport solutions: TRAVELINE
- #22: Standardised road safety data exchange
- #23: INSPIRE-compliant marine environment e-reporting



Further Reading:

- [Future Proofing e-Government for a Digital Single Market, 2015](#)
- [United Nations e-Government Survey, 2014: Chapter 2 Progress in Service Delivery](#)
- [United Nations e-Government Survey, 2018: Chapter 3.3: Emerging uses of artificial intelligence, social media, space technology applications and geospatial information for e-resilience; Chapter 8 Fast Evolving Technologies in e-Government: Government Platforms, Artificial Intelligence and People](#)
- [E-Government for Better Government, OECD, 2005](#)
- [Location aware solutions for healthcare, Cisco](#)
- EULF process use case, traffic accident monitoring
- [E-Government: Using technology to improve public services and democratic participation, European Parliamentary Research Service, 2015](#)
- [e-Government: The need for effective process management in the public sector](#)
- [EULF Transportation Pilot: a model implementation in the ITS domain, that can be followed by other countries](#)

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- [EULF Energy Pilot, Use Case 1: extending the NL best practice of mapping energy performance certificates](#)
 - [ELISE: Digital Platform for public services, 2018](#)
-



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



Why:

- 'Location' is a key integrating factor for a lot of public sector data
- Although INSPIRE was introduced for environmental policy reasons, it contains data themes that are relevant to other policy areas and related public services (e.g. addresses, cadastral parcels, transport networks, protected sites, buildings).
- It is important to build the INSPIRE 'critical mass' to support both known and unknown uses (optimising the benefits of the SDI)
- INSPIRE publication is a long term consideration involving large numbers of public authorities and individuals. It is essential that the process is organised in a structured and efficient way
- Member state SDIs, with their authoritative data, have evolved with a common INSPIRE-based approach capable of supporting digital services across different sectors and levels of public administration
- INSPIRE supports cross-border harmonisation of data making cross-border public services and data portals easier to establish and operate



How:

Collaboration and sharing

- Consult relevant organisational, national and EU experts and resources in publishing and using INSPIRE data – the EU INSPIRE website is a good starting point (<http://inspire.ec.europa.eu/>)
- Pilot implementation of INSPIRE based solutions in collaboration with other MS to engage in collective learning, and pave the way for EU wide roll out

Implementation programme

- Publish newly created or modified INSPIRE data using INSPIRE services and ensure data is discoverable in thematic, national, and EU catalogues and portals
- Establish an INSPIRE implementation timetable, taking into account priorities for use of the data as well as the legislative timetable
- Make use of INSPIRE data where it exists and contribute to the 'pool' of INSPIRE data where relevant
- Re-use best practice tools to publish and use INSPIRE data, e.g. tools for:
 - Metadata creation and publication
 - Portal implementation
 - Data transformation
 - Visualisation
 - Licence creation
 - Data discovery

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- View and download services

- Use the INSPIRE geoportal to discover and access pan-European INSPIRE data

Holistic approach

- Consider all relevant legislation relating to data sharing, including data protection, when seeking to implement a cross-sector or cross-border location enabled service
- Integrate INSPIRE and non-INSPIRE data in discovery portals to establish a “whole government data” approach
- Consider extensions to INSPIRE if appropriate to the thematic area / services being planned but be aware of the complexities this introduces. Refer to the relevant INSPIRE Thematic Working Group(s) and related communities when considering extensions to INSPIRE in order to exploit and share the extensions with EU and National communities and to support the maintenance of INSPIRE.
- Ensure the INSPIRE data approach goes beyond compliance and considers priority needs of users in different policy areas and in cross-border initiatives, so that INSPIRE data plays a key role in the broader data economy



Challenges:

- Lack of understanding of INSPIRE
 - Perceived complexity of INSPIRE and lack of awareness of the benefits
 - Implementing INSPIRE compliant data and metadata requires an effort that is not always perceived. It means changing the way people usually work with their data, involving potential additional effort in duplication, maintenance, sharing, documentation, training and procurement
 - In either case the ROI is unclear
 - Silo thinking, ignoring benefits of wider data sharing, interoperability and reuse
 - Extending INSPIRE can increase complexity in use and maintenance
 - Poor quality metadata, making data difficult to find and creating problems in deciding on use
 - Poor and variable data quality in relation to the intended use, and inconsistent application of standards. Contributing factors may include:
 - INSPIRE does not require the publication of new data. The intended use of data may require new data;
 - In the early stages of INSPIRE implementation, data does not have to be compliant with the specifications;
 - Data may be lost in transforming to INSPIRE
 - Cross-border differences may be difficult to reconcile due to different interpretations of the INSPIRE specifications
 - Data may be needed before it is mandated in the INSPIRE regulatory roadmap
 - Data may be mandated in the INSPIRE roadmap but is not seen as a priority by users of the data
 - ‘Quick and dirty’ geodata may be more relevant than ‘authoritative’ geodata
 - The focus of INSPIRE has largely been static authoritative geodata but more dynamic, granular and event-driven data may be needed in particular applications
 - It may be difficult to obtain public sector funding for cross-border applications where there are different interpretations of the INSPIRE models, data outside of INSPIRE forms a significant part of the requirement, or beneficiaries are outside the public sector.
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Best Practices:

- #2: IDOS - Cross-border journey planner for citizens
- #4: What's in Your Backyard for farmers
- #6: Digital Exchange platform for spatial plans
- #8: 'One solution for all emergency services' in Poland
- #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
- #12: Enterprise locations in the Euregio Meuse-Rhine
- #13: KLIC to prevent damage caused by excavation works
- #14: Air quality monitoring and reporting in Belgium
- #15: Information System of Contaminated Sites in Slovakia
- #16: Managing the granting of licenses for selling tobacco
- #17: Location-enabled census data in Poland
- #18: Territorial Information System of Navarre: SITNA
- #19: Democratisation of soil data in the UK
- #22: Standardised road safety data exchange
- #23: INSPIRE-compliant marine environment e-reporting



Further Reading:

- [INSPIRE Knowledge Base](#)
 - [INSPIRE Geoportal](#)
 - [INSPIRE Roadmap](#)
 - [INSPIRE in Practice: Implementation Tasks](#)
 - [Considerations in using INSPIRE data](#)
 - [INSPIRE Thematic clusters website](#)
 - [Guidance and tools for implementation of INSPIRE in the UK](#)
 - [GIM International, INSPIRE Boosts Spatial Data Sharing](#)
 - [MSFD Working Group Data, information and Knowledge exchange \(DIKE\)](#)
 - [EULF Marine Pilot website](#)
 - [EULF INSPIRE marine pilot – D1.2. Analysis of requirements that link INSPIRE and MSFD](#)
 - [EULF INSPIRE marine pilot – D2.0. MSFD spatial data requirements mapped to INSPIRE data Models](#)
 - [EULF INSPIRE marine pilot - D4.2. EMODnet and INSPIRE: benefits of closer collaboration and a framework for action](#)
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Recommendation 8: Adopt an open and collaborative methodology to design and improve location-enabled digital public services



Why:

- Having an open and collaborative methodology and communicating it openly to all parties involved increases stakeholders' buy-in and participation since it starts from the needs and requirements of the users.
- Public services are about 'serving' the public (i.e. businesses and citizens) who pay taxes to help in paying for these services. Businesses and citizens should therefore have a say in what these services look like.
- There is an expectation from taxpayers that different parts of government will share information they provide and act in a coordinated and efficient way.
- Asking for feedback at an early stage of development together with frequent releases ensures quick user feedback, incremental improvement, and reduces the risk of building a service that does not meet users' requirements.
- Working groups with experts from public administrations, academia, and the industry can help to build consensus and tackle difficult challenges when developing digital public services.
- Use of business process standards can help formalise the process and analyse the (location) data flows of services and collaboration opportunities, possibly using service chaining and orchestration to facilitate collaboration and implementation of services.
- Evaluating and monitoring digital public services help public administrations improve future releases of the service.
- Allowing or ensuring feedback to the public sector on the improvement of data by the private sector can provide a source of added value of data



How:

Collaborative service development

- Use the three phases for collaborative development of digital public services - design, implement, evaluate and monitor – defined in the European Commission publications: '*Collaborative Production in e-Government*' and '*Analysis of the value of new generation of e-Government services*'.
- (1) Follow these collaborative service design principles:
- Stakeholder engagement by organising workshops, surveys, interviews, focus groups and other forms of collaboration.
 - Ask early feedback by sharing ideas, concepts, source code and any other relevant artefacts as soon as possible so that engaged parties can provide feedback.
 - Release early and frequently to reduce risk in service design. This enhances mutual learning and usually improves quality.
 - Adopt user-centric design principles, based on needs and views of users, for example:
 - Create a service that is simple and intuitive enough that users succeed first time;
 - Give users a single point of contact for the service, rather than passing them around different parts of government;
 - Ask users of digital public services once only for location-related information. For example, users should not be required to resubmit their address data for each service when it has already been registered with government;
 - Requested location information should be relevant and proportionate to the needs of the service and the associated legislation;

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- Location-based digital public services should use the preferred electronic channels of citizens, e.g. mobile channels. They should be optimised for mobile use;
 - Public administrations should respect the legitimate 'location privacy' of citizens and businesses (see recommendation 3) and should not compromise their security through unchecked sharing of location-related information. The approach should aim to increase businesses' and citizens' confidence in the way public administrations are handling their location information;
- Create and communicate the process for collaboration so that stakeholders know how and to what extent their input will be taken into account. As an example, the UK Government Digital Service Manual contains guidance and resources to understand the needs of the consumer of digital public services. The Manual is tailored to different profiles like designers, developers, researchers, analysts, architects, etc. Make use of Working Groups. For example, ISA developed a 'Process and methodology for developing core vocabularies' which includes among others the use of collaborative tools that are publicly available.
 - Adopt governance models and business models for developing added value data which allow or even entice public and private sectors to collaborate
- (2) Ensure that implementation and operation of the service maintains the user and collaborative focus of the design phase:
- Put in place a sustainable multidisciplinary team to design, build and operate the service, led by a service delivery manager
 - Deliver the service by ensuring that collaborators can reuse the service or data in their processes. Service chaining (choreography) and orchestration are key to manage the process flow:
 - Standards such as the Universal Description, Discovery and Integration (UDDI) can facilitate service chaining and orchestration of services. UDDI is a protocol that includes a registry by which organisations can list themselves on-line and allow for third-parties to register and locate web service applications.
 - Electronic Business using eXtensible Markup Language (ebXML) includes XML-based standards sponsored by UN/CEFACT and OASIS and allows reuse of (electronic) business and location information by all collaborators.
 - Test the end-to-end service with all participants and parts of government in an environment identical to the live service, including all common types of browsers and devices. If possible, involve users who have contributed in the design phase. If required, conduct usability testing with other potential users outside the input group to validate the design.
 - Ensure contingency plans are in place for initial service introduction (e.g. peaks in certain processes) and potential service disruption
- (3) Openly measure and evaluate the performance of digital public services:
- Analytics can reveal how digital public services are actually being used and how users respond to variations in service design. Similarly, key performance indicators like usage statistics or service delivery costs can help make better decisions on improving services. For example, Gov.uk Performance makes this information publicly available to promote transparency and accountability.
 - Carry out ongoing user research and usability testing to continuously seek feedback from users to improve the service

External delivery

The above model assumes that public authorities take responsibility for service delivery as well as the ICT associated with the service. The ICT may be produced in-house or with the help of private sector companies. However, it must first be determined whether public authorities should deliver the service, i.e. that the service is part of the public task. There, there are other models that may be adopted, for example:

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- The private sector may be well-placed to offer a particular service or a sufficiently similar service without the need for significant intervention from the public sector (i.e. it is in their commercial interests to offer such as service and their commercial interests coincide with the public interest).
 - Public authorities may collect data through a particular process or service and decide to make the data openly available for external parties to develop their own products and services. In this case, the external parties (e.g. private sector companies) should be engaged openly to inform them and to assess their potential interest in using the data. Actions to tailor the data to external needs may be part of the eventual public sector process. This option is also a contributor to growth objectives (see Recommendation 15).
 - Public authorities may scale back their role in existing service delivery when they can rely on alternative models. For example, the UK Department for Transport operated a national multi-modal journey planning service for several years. The data was subsequently made available as open data so that developers could build their own services. Finally, a public / private partnership called Traveline was developed that operates the service, including publication of open data, on a not-for-profit basis without public funding (see Best Practice 21).
 - Governments may encourage 'civic hacking' to develop new ideas, technologies or methodologies to help solve civic problems and improve the lives of citizens (this is a form of participatory government, often involving the use of public data, that has had some successes).
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Challenges:

- If public administrations do not make an effort to develop and apply open methodologies for collaborative digital public service design they risk developing digital public services that do not meet stakeholders' requirements, especially if stakeholders are not included early in the design process.
 - Difficulty in obtaining the 'voice of the customer' when it comes to public services. Introducing an open collaborative approach gives voice to those wanting to participate and not necessarily those whose needs may be met by a collaborative approach to digital public services.
 - The wishes of citizens and businesses may conflict with government policy needs, which are often about control, rules, taxes etc.
 - There is a risk in overcomplicating the data collection and reporting process under the guise of 'policy compliance'
 - Legacy systems often make repeat requests for data and possibly use different standards and formats, and channels that are difficult to integrate
 - There may be gaps in skills (digital divide) that limit participation and use of digital services. This possibility needs to be managed in the process.
 - Required changes may not be affordable.
 - The time required to develop a service may be so long that, when the service is ready to use, it is obsolete. A faster way to develop services should be adopted.
 - If government relies on the private sector to deliver 'services', there is a risk that the public interest may not be (fully) supported.
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Best Practices:

- # 1: A digital platform for location data in Flanders
 - #15: Information System of Contaminated Sites in Slovakia
 - #17: Location-enabled census data in Poland
 - #19: Democratisation of soil data in the UK
 - #21: Integrated transport solutions: TRAVELINE
 - #22: Standardised road safety data exchange
-



Further Reading:

- [Collaborative Production in eGovernment - SMART 2010-0075, Tech4i2 Ltd, \(2012\)](#)
- [Analysis of the value of new generation of eGovernment services - SMART 2014-0066, \(2015\), European Commission, PwC, Open Evidence, Institute for Baltic Studies](#)
- [UK Government Digital Service Manual](#)
- [Rethinking e-Government Services – User Centred Approaches, OECD](#)
- [Electronic Business using eXtensible Markup Language](#)
- [ISA Programme - process and methodology for developing core vocabularies](#)
- [Taxonomy of Open Government Services](#)
- [Universal Description, Discovery and Integration](#)
- [UK Performance Dashboard](#)
- [Traveline](#)
- [Civic hacking](#)
- [Example of citizens' participation to shape European eGovernment services](#)
- [EULF e-Government Service Design Guidelines](#)



Recommendation 9: Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government



Why:

- Much statistical data has a geospatial component
- The techniques and mechanisms used nationally and in different policy areas for location-based data collection and analysis are not sufficiently well integrated to support pan European or cross-domain analysis and comparisons
- The challenge of the integration of location-based statistical data may hinder the timeliness and extent of analysis that can be undertaken, inhibiting the potential value of the policy evidence base.
- Geospatial information combined with statistics underpins evidence-based policy making and political decisions at all levels in government and helps deliver better services based on informed decisions
- Periodic monitoring of geographically-related indicators over time is a typical requirement for many EU Directives, e.g. the Marine Strategy Framework Directive, being addressed by the EULF Marine Pilot.
- With a common geospatial framework policy makers in public administrations will be able to combine different methods of location-based data collection to inform their policy decisions, including census data, transaction data, social media information etc.



How:

Reference framework

- Member States create and maintain an accurate and up-to-date knowledge base of where their citizens and businesses are located. This will make the collection of census and other statistical data as straightforward as possible.

- Member States have a common geospatial reference framework for statistics to enable timely, accurate and efficient production of location-based statistics. This should be based on geocoded registers of administrative units, addresses, buildings and dwellings and use consistent and persistent identifiers to reference relevant information. The geospatial reference framework for statistics can benefit from INSPIRE which provides a valuable framework for standardising and modelling the SDI, enabling the widest possible collation of harmonised data.
- The geospatial reference framework for statistics forms the basis for the collection of census data, including supporting dynamic census data collection.
- To support the production of statistics and census information, it is important to understand the origin, production process and other aspects of the quality of geospatial data. INSPIRE metadata should be used as the basis for this documentation.

Dynamic data capture

- Member States have mechanisms to enable frequent ('dynamic') collection of statistical information taking account of this 'location' knowledge.
- Opportunities are taken to streamline and improve statistical data collection, taking into account new sources of information, such as sensors, social media, web analytics etc.

Statistical analysis

- Public authorities apply analytical techniques (customer analytics, location intelligence) to help improve public services. For example, Transport for London uses 'big data' analysis of vehicles, vehicle location, traffic information and payment cards to reveal patterns or trends and enable action to be taken.
- The spatio-temporal dimension of statistics is captured in a format that enables it to be used readily in a GIS for geostatistical analysis, with consistent geo-reference data and other consistent coding to enable it to be analysed at different geographic / administrative levels.
- Include relevant private sector data in the statistical information infrastructure
- Ensure the location intelligence infrastructure is continuously kept relevant to growing and evolving needs



Challenges:

- Too much data and not enough information – there is so much data that can be collected and analysed, with risk of hiding or missing the message
- Drawing conclusions based on location may be too simplistic to determine appropriate interventions
- Establishing a common basis for analysis and comparison in multiple geographies and domains is very challenging



Best Practices:

#17: Location-enabled census data in Poland

#24: GeoSTAT projects



Further Reading:

- [“Integration of statistical and geospatial information – a key ESS priority”, Eurostat keynote, at meeting of UN-GGIM expert group on integration of statistical and geospatial information, May 2015](#)

This document highlights a number of significant use cases, for example:

- Ensuring access to emergency hospitals in Europe
- Accessibility to schools in Portugal
- Where establishing new wind power could be worthwhile in Germany

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- Catchment areas of European airports to ensure proper return on investment
 - Access to green infrastructure in Sweden
 - Access to public transport in urban areas in Europe
 - Preventative measures in a crisis situation caused by the climate in Denmark
 - Adaptation to climate change in Europe
 - [New Frontiers for Official Statistics, Eurostat](#)
 - [Geospatial analysis at Eurostat](#)
 - [Sweden: How Geospatial Statistics can Measure Climate Change](#)
 - [Sweden: Benefits from data sharing - increased use of geospatial information in the statistical production process](#)
 - [INSPIRE data specification for statistical units](#)
 - [Transport for London Big Data for a Better Customer Experience](#)
 - [Statistical geography in Australia](#)
 - [Location enabled census in Poland](#)
-

Standardisation and Reuse



Current State

Several standardisation bodies are working on standards in the geospatial field. Also various cross-cutting and thematic standards exist at an international level. These standards can be interpreted and implemented in different ways resulting in incompatible ways of managing and integrating location information. Compliance to existing legislation (notably INSPIRE) helps, but does not guarantee, the creation of harmonised pan-European or cross-border products, including core data sets. Current governance and funding models leave gaps in relation to the interoperability arrangements required for the creation of EU-wide core data.



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.



Why:

- Adopting a common interoperability framework and reference architecture ensures that interoperability is addressed, especially when there is the intention to reuse existing solutions.
- The framework needs to consider interoperability in a holistic manner, taking into account all relevant aspects, i.e. legal, organisational, semantic and technical, as defined by the European Interoperability Framework (EIF) and the associated European Interoperability Reference Architecture (EIRA).
- The framework also needs to be capable of supporting new innovative business models for the delivery of digital public services.
- Service-oriented architecture (SOA) provides flexibility, modularity, scalability, improved information flow and encourages re-usability of services.
- The EIRA implements the four interoperability layers of the EIF and provides further scoping, common terminology and re-usable architecture building blocks to develop service-oriented architectures and services. By using a common terminology, it will be easier for public administrations to integrate location information when developing digital public services. Common terminologies permit minimum level of coordination by providing a set of well-defined architecture building blocks.
- The lack of a common architecture and common terminology on location information can lead to divergent and difficult-to-integrate location information systems.
- INSPIRE provides a common SOA-based architectural approach for cross-sector and cross-border digital government solutions involving location information. The broad-based INSPIRE architecture may need to be complemented by more granular micro services oriented architectural solutions to suit domain-specific needs and enable new business models for digital public services.
- The “EULF Architecture and Standards for SDI and e-Government” report complements the EIF and the EIRA and provides additional information on how they relate to each other and how INSPIRE fits into the overall architectural framework.



How:

Find detailed guidance on architectures and standards for SDIs and e-Government in the [Guidelines on Architectures and Standards for SDIs and e-Government](#)

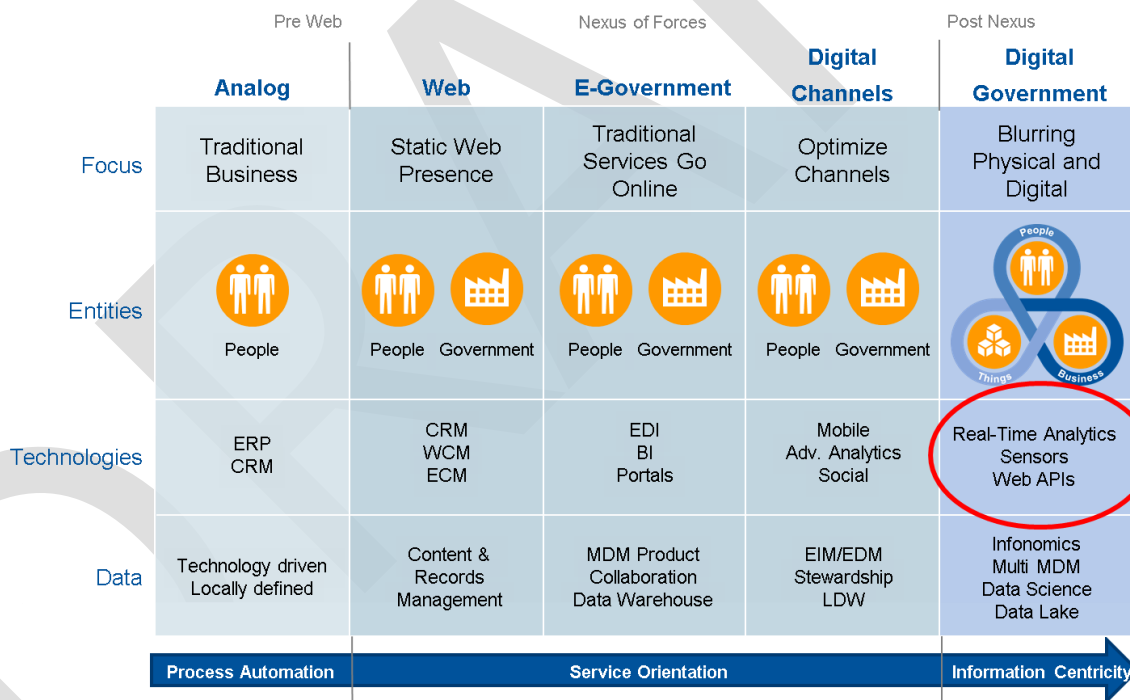
Common architectural approach

- Embed location data architectural approach in broader cross-government ICT and data architecture approach.
- Use an approach based on Service-Oriented Architecture (SOA) for web services such as those specified within INSPIRE. SOA enables a system of building blocks and ensures re-usability, modularity and flexibility of the service.

Use of evolving technologies

- Align with evolving technologies in digital government where they provide new opportunities, as shown in Figure 9. Use of these technologies may require refinements in the architectural approach.

Figure 9: Evolving towards digital government (Source: Gartner Research)



- Consider deploying a Meshed App and Service Architecture (MASA) approach. This is a relatively new application architecture structure with constituent parts (apps, mini services, micro services and mediated Application Programme Interfaces (APIs)) which delivers increased agility and enables application innovations to support Internet of Things (IoT) integration, automated decision making, third-party interoperability and omni-channel business models. A mediated API is a design pattern in which an API is virtualised, managed, protected and enriched by a mediation layer. This layer can enforce policy and inject capabilities into the API interaction for increased agility, usability, performance, security and control. A mediated API allows a service to expose an "inner API" that directly reflects its domain model, and one or more "outer APIs" tailored to support specific client requirements. IoT integration and event stream processing to capture and use the data will become

increasingly important in location-based applications, reflecting the transition from largely static SDI models to increasingly dynamic models, e.g. smart cities, smart grids, intelligent transport systems.

- Organisations adopting SOA, MASA and these transformative architecture patterns can take advantage of transformative business innovations, through the API economy and the promotion of an API marketplace. An API marketplace is an aggregator site in which API providers can publish APIs that provide access to their services, data or applications. Customers use an API marketplace to discover, access, test and purchase access to APIs to use in their own applications. API marketplaces differ from standard API developer portals by aggregating multiple API providers and by providing subscriptions, billing and user management. Essentially, what app stores are for mobile apps, API marketplaces are for APIs.
- Public administrations should consider creating open APIs for core services, to support reuse and evolution as well as business model and application development vendor flexibility.
- Public administrations should consider adopting 'Government as a Platform' (GaaP) approaches to share components, service designs, platforms, data and hosting across public authorities, enabling location data and services to be reused as effectively and widely as possible.
- Use a recognised common modelling language such as Archimate, an open and independent modelling language for enterprise architecture that is supported by different tool vendors.

European alignment

- Although the architecture for digital public services will be based on national standards and frameworks, reference should be made to European frameworks to explore potential synergies and areas for improvement.
- Design the architecture of the digital public service by taking into account the four interoperability layers defined by the European Interoperability Framework (EIF): legal, organisational, semantic, and technical. The EIF also provides underlying architectural principles to consider when designing the service-oriented architecture (SOA). These principles should be applied when defining the architecture of the location-enabled digital public service.
- Use the European Interoperability Reference Architecture (EIRA), a content meta-model and reference architecture focused on interoperability between public administrations. The EIRA expands on the interoperability levels of the EIF. It provides architecture building blocks for each layer together with a common terminology. Furthermore, it uses a SOA-based approach in-line with the EIF.
- Consult the EULF Architecture and Standards for SDI and e-Government document. This document uses the Reference Model for Open and Distributed Processing (RM-ODP) to describe architecture and standards for Spatial Data Infrastructure (SDI) and digital government. It provides information on how digital public services relate to assets from SDIs and INSPIRE.

Note:

- The recommendations above provide examples of architecture approaches and methodologies. Other relevant architecture frameworks and methodologies can be used in combination with the EIF and EIRA such as: TOGAF, DYA, GERAM, Nolan-Norton or Zachman's framework.



Challenges:

- The application may be (largely) standalone and considerations of wider architectural conformity may be an overhead.
 - Different public administrations may have different architectural standards making cross-administration interoperability difficult, particularly in a cross-border context.
 - Integration may be required with legacy systems that were not built using today's architectural principles.
-

- The EIRA and EIC are not yet fully proven and embedded in EU-wide architectural planning for digital government systems.
- Strategic choices may be needed between traditional SOA-based architectural approaches and new architectural styles (e.g. MASA)
- More amenable people and administrations might share their solutions but these might not be the best solutions.



Best Practices:

- #5: Radiological Emergency Response in Germany
- #6: Digital Exchange platform for spatial plans
- #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
- #15: Information System of Contaminated Sites in Slovakia
- #18: Territorial Information System of Navarre: SITNA
- #23: INSPIRE-compliant marine environment e-reporting
- #25: National Geoportal of the Grand-Duchy of Luxembourg (GeoAPI)
- #26: NASA Earthdata Developer Portal



Further Reading:

- [The New European Interoperability Framework](#)
- [European Interoperability Reference Architecture](#)
- [EULF Architectures and Standards for SDI and e-Government](#)
- [INSPIRE Network Services Architecture](#)
- [INSPIRE Data Specifications: Generic Conceptual Model](#)
- [ELISE Digital Government Benchmark API Study, 2018](#)
- [Governments should open APIs to core services](#)
- [UK Government as a Platform approach](#)
- [Archimate modelling language](#); and [Architool](#)
- [Belgium's MAGDA SOA Platform](#)



Recommendation 11: Reuse existing authentic data, data services and relevant technical solutions where possible.



Why:

- Carrying out a re-usability check reduces the risk of isolated ICT development.
- Online catalogues provide lists of re-usable solutions and standards. These catalogues provide access to solutions that have undergone a reusability assessment and that are mature enough to be reused.
- Engaging with communities of interest and re-using solutions from other public administrations can help public administrations share best practices and receive guidance when developing ICT solutions.
- Authentic data registers and common data services can help maximise the potential for reuse of data since they offer common, trusted sources of information.

- Using existing single sources of authentic data, data services and relevant technical solutions reduces the development, maintenance and operating costs of new solutions (in terms of integrating data sources). This helps to focus on more value-adding tasks instead of ‘reinventing the wheel’.
- Using single sources of authentic data improves data quality, assuming these sources are managed properly.
- Using single sources of authentic data increases the potential for interoperability between administrations and for providing a more efficient service to users.
- Persistent identifiers ensure that data resources are more visible and connectable. Furthermore, they promote semantic interoperability.



How:

Check for reusable solutions

- Before developing new ICT systems or digital public services, check whether there are existing solutions that could be reused.
- Use an online catalogue of re-usable technical solutions to find relevant solutions. The European Commission maintains a catalogue of re-usable technical solutions on Joinup. This includes solutions that facilitate geolocation integration and implementation of the INSPIRE Directive. The solutions are centred around communities of interest such as:
 - The Community of Interoperable Solution Repositories (CISR): a community that brings together digital government professionals to disseminate good practices on sharing and re-using ICT solutions. The CISR community can provide an entry point into the Joinup catalogue of solutions.
 - The ARE3NA community holds a list of interoperability solutions in the geospatial and digital government domain in line with the EIF interoperability layers and the tasks associated with the publication and re-use of INSPIRE data and services.
- Reusable solutions in Joinup are mapped to the European Interoperability Reference Architecture (EIRA) using the European Interoperability Cartography (EIC) tool. This mechanism should be used for both finding and sharing solutions. In this way, users can benefit from solutions developed by others as well as contribute to their improvement.

Authentic registers

- Use authentic data registers and data services to ensure that the location information part of the digital public service is trusted and authentic and avoid duplication of data and related management processes (“collect once, use many times”). Authentic data registers and data services are essential building blocks that can include important location datasets and data for various domains. Some examples of data registers providing access to trusted data are:
 - [The INSPIRE registry](#)
 - [Stelsel van basisregistraties \(System of basic registration\)](#)
 - [European Pollutant Release and Transfer Register \(E-PRTR\)](#)

Persistent identifiers

- Use persistent unique identifiers when reusing location data solutions. Using common unique identifiers for the same data (spatial and non-spatial) allows unambiguous references to the same resources over time. They provide a long-lasting globally unique reference to a digital resource, applicable to all uses and potential uses of the data. The European Commission Joint Research Centre (JRC) has developed guidance on governance of persistent identifiers to be used in Spatial Data Infrastructures.
- Persistent unique identifiers can also be used to connect data that were not previously connected and support analysis relating to the connections between the data, e.g. between health and location. These data juxtaposition techniques have their history in studies such as John Snow’s analysis of cholera deaths in London, pointing to drinking water from a particular pump, through to more

formalised relational modelling techniques in use from the 1970s, and more recently linked data and associated technologies that support increasingly open-ended applications.

Data as a Service

- Make use of Data as a Service (DaaS) as design approach or a style of information architecture geared toward transformation of raw data into meaningful data assets for agile/timely data provisioning, and the delivery of these data assets on demand via consistent, prebuilt access, with the aid of standard processing and connectivity protocols. Data as a Service provides ways to share, collect and compose data from a variety of sources in varying formats. DaaS is intended to facilitate repeatable delivery of an established data product and DaaS is generally designed to provide output for targeted context.

Find examples of reusable solutions in the [EULF Descriptions of reusable location information solutions](#)



Challenges:

- Sharing of solutions and associated documentation involves some effort and cost. The rewards of a “sharing culture” are not always appreciated.
- Required data quality may come at a price that is not affordable.
- The existing single authentic data source may not be fit for purpose in relation to a particular new requirement – i.e. it may be too complex, too simplistic, have data gaps etc.
- There may be many legacy systems operating off different isolated data that make the transition to single data sources difficult to justify and manage in a reasonable timeframe.
- Location data is usually combined with other data in digital public services, both multi-purpose data (e.g. citizen data) and thematic data (e.g. energy usage). To get the fullest benefit of a cross-government authentic data strategy requires a clear business case, very strong backing and an intensive delivery programme. Denmark, for example, has been successful with its Basic Data Programme. Such a programme would be more challenging in countries with much larger populations and areas. Governmental structures may also be part of the challenge.



Best Practices:

- #2: IDOS - Cross-border journey planner for citizens
- #3: ‘LoG-IN’ to the local economic knowledge base
- #4: What’s in Your Backyard for farmers
- #6: Digital Exchange platform for spatial plans
- #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
- #14: Air quality monitoring and reporting in Belgium
- #16: Managing the granting of licenses for selling tobacco
- #17: Location-enabled census data in Poland
- #18: Territorial Information System of Navarre: SITNA
- #19: Democratisation of soil data in the UK
- #20: Digital system for building permits in Italy
- #21: Integrated transport solutions: TRAVELINE



Further Reading:

- [European Interoperability Reference Architecture – Catalogue of Solutions](#)
 - [European Interoperability Cartography](#)
 - [CISR Community](#)
 - [ARE3NA community](#)
 - [Governance of Persistent Identifiers to be used in Spatial Data Infrastructures](#)
 - [Persistent identifiers](#)
 - [John Snow's cholera study](#)
 - [Relational data modelling](#)
 - [Linked data](#)
 - [EC Sharing and Reuse Framework](#)
 - [European legislation on reuse of public sector information](#)
-



Recommendation 12: Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services



Why:

- Active participation in GI and digital government communities improves alignment of specifications and helps administrations maintain awareness on technological innovation.
 - Open standards facilitate interoperability and data exchange. They help reduce ICT vendor lock-in and promote fair competition.
 - Standards are used to shape ICT solutions. If existing standards are not applied, ad hoc design decisions may be taken that are relevant to the solution in question but less applicable in the wider context. These ad hoc design decisions may result in long term interoperability issues when integrating with other ecosystems in the future and thus higher costs.
 - The EU INSPIRE Directive sets out binding implementing rules and technical guidelines in a number of specific areas (metadata, data specifications, network services, data and service sharing, and monitoring and reporting). They ensure that spatial data infrastructures of the Member States are cross-border compatible.
 - Catalogues of ICT open standards are centralised online catalogues that contain commonly agreed standards for different domains. They help public administrations identifying standards that, for example, could be included in public procurement.
-



How:

Standards community involvement

- Engage actively in national and international standardisation activities relevant to your Geospatial Information (GI), ICT and digital government communities.

Open standards

- Use open standards – where possible – to reduce the risk of ICT vendor lock-in. There are catalogues of recommended open standards both at national and international level that help identifying existing solutions. Examples include: OGC catalogue service, the Dutch Government Open Standards
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Catalogue and the German SAGA. To know more about interoperability initiatives at Member States level the European Commission developed the National Interoperability Framework Observatory (NIFO) factsheets.

INSPIRE and related standards

- Apply the INSPIRE implementing rules and technical guidelines to put in place an EU-wide, cross-sectoral interoperability framework for location information facilitating its integration in digital government processes and services.
- Expand the application of INSPIRE with other geo-standards elaborated at international level (W3C, OGC, OASIS...) and European level (Copernicus, EIF, CEN TC/287...). This allows linking of the use of geo-standards with relevant general ICT and digital government standards. Examples of geospatially relevant standards that are not covered by INSPIRE are: sensor (observation) services, quality services, and notification, alert and feedback services. Note that, as an evolution of the current INSPIRE standards and to go towards the use of evolving architectures and technologies (e.g. MASA, see Recommendation 10), the OGC has recently published two REST-based standards: the WFS 3.0 download service (which is in a 'Request for Comment' phase⁴) and the SensorThing IoT service⁵.
- Use a standards-based approach in the application of the Linked Data paradigm and its technical specifications, which can enable the integration of geo-spatial and non-geospatial information using URIs and RDF. The application of Linked Data principles and technology supports INSPIRE implementation and can be seen as a complementary approach for exposing INSPIRE assets providing some flexibility. For example, the European Commission has already developed Core Vocabularies in the context of the ISA programme. They are data specifications created in an open process with expert groups and endorsed by ISA Member State representatives. Next to Core Vocabularies there are also metadata schemas such as ADMS-AP, DCAT-AP and GeoDCAT-AP that help to connect related data that wasn't previously linked.
- Integrate the standards-based approach for different thematic sectors to support multi-sector applications. Different sectors have established sometimes different de facto and de jure standards involving location data, e.g. multi-modal transport, construction, energy. An integrated approach is particularly important where the same data (e.g. address, road) is used in different sectors or where applications from different sectors converge (e.g. smart cities).
- Adopt a standards-based approach for Internet of Things (IoT) data, communications and devices – as this will rapidly increase the availability of sensors and tools to share and process big (geospatial) data that becomes relevant for digital government applications.
- Use Business Process Model and Notation (BPMN) to design and describe business processes and Business Process Execution Language (BPEL) to execute the described processes using services. These techniques can be useful to define where spatial data input is needed, processed, and generated in digital government processes.

Needs-based approach

- In all of the above considerations regarding standards, ensure the implementation applies the standards in the simplest possible way to reduce complexity and cost, whilst maintaining the aims of interoperability and re-usability.



Challenges:

- The standards world moves slowly and is continually evolving. This means that sometimes it lags behind or is not yet ready in the context of a particular new application. Standards evolve with the evolution in technology. Legacy systems are built on legacy technologies and standards. This sometimes means that it is difficult to justify and make “one more major upgrade” or to integrate new and legacy systems.

⁴ <https://www.opengeospatial.org/pressroom/pressreleases/2830>

⁵ <http://www.opengeospatial.org/standards/sensorthings>

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- Standards are often a “middle ground” agreed by specialists over a number of years. Hence they might not always be a perfect fit for a particular new application.
 - System and data integration require common standards such as those promoted by INSPIRE. With so many public authorities and countries involved, there is an immense implementation challenge to achieve harmonisation. However, the steps are being taken to make this happen in a coordinated way, underpinned by the legislation.
 - The return on investment for linked data depends on a degree of harmonisation which is difficult to achieve, with a multiplicity of data, different data and quality standards, and in many cases, a lack of legislative and policy support.
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Best Practices:

- #1: A digital platform for location data in Flanders
- #2: IDOS - Cross-border journey planner for citizens
- #3: ‘LoG-IN’ to the local economic knowledge base
- #4: What’s in Your Backyard for farmers
- #5: Radiological Emergency Response in Germany
- #9: Digital Accessibility Map for better informed firemen
- #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
- #12: Enterprise locations in the Euregio Meuse-Rhine
- #13: KLIC to prevent damage caused by excavation works
- #15: Information System of Contaminated Sites in Slovakia
- #16: Managing the granting of licenses for selling tobacco
- #18: Territorial Information System of Navarre: SITNA
- #19: Democratisation of soil data in the UK
- #22: Standardised road safety data exchange
- #23: INSPIRE-compliant marine environment e-reporting



Further Reading:

- [INSPIRE](#)
 - [NIFO factsheets](#)
 - [Core Location Vocabulary](#)
 - [ADMS-AP](#)
 - [DCAT-AP](#)
 - [GeoDCAT-AP](#)
 - [Framework of standards for the Dutch SDI](#)
 - [The Dutch Government Open Standards Catalogue](#)
 - [France: e-Government interoperability standards, including geospatial standards](#)
 - [ISA² Programme](#)
 - [EULF Use Case on Traffic Accident Monitoring](#), applying BPMN as a means of assessing where improvements can be made to processes and services in the use of location data
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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



Why:

- Recent research indicates that poor data quality is costing organisations an average of €8.4 million per annum and this is likely to worsen as information environments become increasingly complex.
- Improved data quality is a primary source of value for many IT-enabled business initiatives. On the other hand, research shows that 40% of the anticipated value of all business initiatives is never achieved (source: [Measuring the Business value of Data Quality, Gartner 2011](#)). Poor data quality in both the planning and execution phases of these initiatives is a primary cause. Poor data quality also affects operational efficiency, risk mitigation and agility by compromising the decisions made in each of these areas.
- INSPIRE is creating a data infrastructure where we can anticipate reuse of the data. Public administrations are publishing open data. The same data is reused in many circumstances and, unlike other resources, the value of this data increases rather than decreases with use. Consequently, there is a need for a balanced approach to managing data quality and metadata across different EU Member States to support effective reuse.
- Managing data quality with a common approach/framework will enable a seamless exchange of data between different public service providers reusing this data. This can be done when administrations share their data through a common service for example.
- Managing data quality with a common approach will also enable the exchange of data between data providers. These can define “fitness for purpose” quality levels which include frequency of updates, produce data of a specific level of quality/detail with the adequate level of resources and define appropriate licensing. Data providers can also contribute to and enhance each other’s data, thus sharing resources.
- Data quality has the potential to improve labour productivity by as much as a 20% (source: [Measuring the Business value of Data Quality, Gartner 2011](#)).
- As more business processes become digitalised, data quality becomes the limiting factor for overall process quality.



How:

Fit for purpose data quality design approach

- Determine what is meant by and what is needed in terms of data quality. The dimensions of data quality include timeliness, accuracy, completeness, integrity, consistency, compliance to specifications / standards / legislation, well-described etc.
- Achieving perfect data quality on all data quality dimensions (typically ranging from three to six but sometimes up to several hundred) is impossible to achieve at reasonable cost for most organisations. Therefore it becomes essential to instead clearly define what is meant by “fit for purpose” data quality. By initiating an ex-post evaluation of existing data quality issues against data quality best-practice guidance, an organisation can define what “good enough” data quality means and develop and apply a framework for analysis. This framework will enable common data quality language, better communication of issues, and less confusion and better positioning of governance.
- Establish a clear line of sight between the impact of data and data quality improvement. This can be best achieved by:
 - Identifying the application systems and external services that produce data to support business activities and policy making.
 - Measuring conformance of data to quality parameters set out in the data policy on an agreed frequency.

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- Assessing the current business value in terms of the existing data quality level, and engaging with relevant stakeholders to assess the value of improving specific data quality items.
 - Use data profiling techniques early and often to assess data quality and present profiling results in a way that appropriate issues can be acted upon, identifying outliers, anomalies, cross-referencing errors, gaps etc. A useful approach is to design and implement data quality dashboards for critical information such as authentic data and to embed this as a business-as-usual IT process.
 - Establish a data quality standard which also addresses multilingualism to ensure consistency and appropriateness in the way key enterprise data is applied and reported across the National and European Data Infrastructures
 - Data quality standards are linked to data standards; ensure completeness and adequacy of the metadata, this will support reusability.

Common metadata approach

- Implement an agreed metadata standard across the public sector, which is based on or is consistent with the INSPIRE approach.
- When using common metadata standards, agree among the different stakeholders on the meaning of each metadata field, this ensures semantic interoperability of data.

Combining authoritative and non-authoritative data

- Combine authoritative and non-authoritative data for enhancing public services but define a framework or use cases where this is allowed, so as not to create legal uncertainty or infringement in public service delivery.
- Identify authoritative data and non-authoritative data using the quality framework, standardise the referencing of this authoritative/non-authoritative data for example with a specific metadata field in a common standard.
- Allow the combined publication of authoritative data and non-authoritative data on common platforms so as to favour market places driving innovation in public services.

Data quality governance

- Make data quality a recurring agenda item at the information governance steering group meetings to ensure the data quality improvement roadmap is aligned with the information governance vision and strategy.
 - Establish data quality responsibilities as part of the information steward role.
 - Establish a cross-unit or cross-organisation special interest group for data quality, led by the Information Management team or equivalent body.
 - Establish a data quality review as a release management "stage gate" review process.
 - Communicate the benefits of better data quality regularly to departments by benchmarking improvements with other similar organisations or creating a regular data quality bulletin and highlighting what could be achieved with better data quality management.
 - Leverage external/industry peer groups by inviting them to present at special interest group meetings.
 - Encourage feedback from users to report problems and help improve data quality. This process can be incorporated in licensing agreements.
 - Use artificial intelligence (AI) and machine learning techniques to make suggestions for improving data quality.
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Challenges:

- Chief data officers (CDOs) and information management leaders continue to struggle with getting data quality onto their digital business agendas. This is often due to an overemphasis on enabling technology rather than a focus on organisational culture, people and processes.
- Few organisations attempt to use a consistent, common language for understanding business data quality. Instead, they maintain divergent and often conflicting definitions of the same logical data.
- Information leaders struggle to make data quality improvements beyond the level of a project and do not embed them at the programme level as part of their digital business information culture.
- Required data quality may come at a price that is not affordable.
- Drawing together data from multiple sources for analysis increases the possibility that effort will be needed to transform data to a form where it can be used.



Best Practices:

#27: Quality Assurance Framework of the European Statistical System (ESS)

#28: INSPIRE – Data Quality and Data Specifications

#29: ISO Standard for Geographic Information – Data Quality (ISO-19157:2015)



Further Reading:

- [INSPIRE Knowledge Base – Data Quality Training](#)
 - [Statistics Canada – Data Quality Toolkit](#)
 - [Measuring the Business Value of Data Quality, Gartner 2011](#)
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Return on Investment



Current State



There are inefficiencies in collection, publication and use of location information and growth opportunities with increased availability of re-usable data. There is insufficient understanding of the usefulness and value of location information. Infrastructure investments, such as INSPIRE or SDIs, are difficult to justify and there is limited evidence of actual benefits in the public sector. However, some specific examples do spell out the value of investment in key datasets or particular applications. Funding models are not always clear, particularly where many parties contribute to and derive benefit from the infrastructure. Only some procurement refers to INSPIRE and, when it does, it is not always clear what this means.



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 location-based services



Why:

- Understanding the extent, use and value of location enabled digital public services enables the value of the investment to be determined and also helps target further investments
- Comparisons with other MS can help in identifying opportunities for re-use and collaboration



How:

Agreed list of services for benchmarking

- Define a list of 'basic services' to identify what can be expected to be implemented and measure / benchmark location-enabled digital government development against this list. Use a 'basic services' list which addresses all basic digital public services, with a balanced contribution of those involving location information.
- Align the list of digital public services with those used by other countries to support both national and international performance benchmarking

Regular performance monitoring

- Apply a regular monitoring approach that looks at both "upstream" and "downstream" aspects of location-enabled digital public services, considering:
 - The available components (technological and non-technological) for enabling the availability and access to location data and services
 - The e-services and processes that have integrated location data and web services

- The use (take-up) of these location-enabled e-services by public administrations, businesses and citizens
- The financial and non-financial benefits of using location data and services
- Use the indicators that are included in the INSPIRE monitoring and reporting obligations, e.g.:
 - Existence, accessibility and conformance of data, metadata and network services
 - Use and benefits of data and network services

Impact-based improvement

- In identifying and monitoring the benefits of location information, it is important to focus on the benefits of the use and especially the integration of location data and services in (digital government) processes of public administrations, as this is where the benefits are most visible and tangible. The identification of the benefits of integrating location information in processes can be done at different levels. Benefits can be measured: 1) of one single location-enabled service that is provided in the process (in comparison with a traditional service) to support a G2C, G2B and/or G2G interactions, 2) of the entire location-enabled processes (in comparison with the traditional processes), or 3) of several processes within a policy action or policy domain. Moreover, it is important to look, not only at the benefits for government, but also to take into account the benefits for citizens, businesses and other parties and even broader socio-economic benefits.
- Use the regular monitoring of “upstream” (i.e. production and dissemination) and “downstream” (i.e. use) aspects of location data and services to obtain a good understanding of return on investment across the public sector.
- Use the information to fund improvements in particular location data or services and to prioritise investment across the governmental portfolio.
- Use a common maturity assessment method across EU Member States and benchmark the performance measurement with other MS to understand the relative degree of maturity and identify where good models may be found for future service improvements.



Challenges:

- Tendency of monitoring and benchmarking in the context of digital government to focus on the main upstream activities of the value chain (readiness and availability), while the downstream elements (use and impact) are neglected because of the difficulty of finding this information
- Indicators can sometimes be difficult to measure, with information provided too vague, general or abstract. Involve professional investment analysts to validate indicators



Further Reading:

- [European Commission e-Government Benchmark Framework 2012-15](#)
- [United Nations e-Government Survey 2016](#)
- [INSPIRE Knowledge Base: Monitoring and Reporting](#)



Recommendation 15: Communicate the benefits of integrating and using location information in digital public services



Why:

- Clear metrics provide powerful messages
- Strategic ‘infrastructure’ investments often require a different type of analysis to more straightforward ‘project’ investments.

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- Communication of benefits supports investment and demonstrates to tax payers that public administrations are spending their money to good effect
 - A business case investment approach based on evidence complements the evidence-based policy approach. No longer is government about backing 'political' measures without the necessary evidence.
 - User stories and examples of benefits are simpler to understand and more meaningful to most people than detailing the process followed, parties involved or technology used
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How:

Strategic investment approach

- Use 'strategic' investment approaches, such as macro-economic analysis to assess overall market impacts, including impact on GDP of effective approaches to geospatial information management.
- Apply localised result analysis, such as the impact on air quality, noise, congestion.

Project based evidence

- Prepare 'project' business cases taking into account the potential benefits of an integrated approach to the use of location information in digital public services, using this information to inform investment decisions for particular services.
- In all impact assessments / business cases, it is essential to state the assumptions underlying both costs and benefits. If these are stated, future outcomes can be compared against them and adjustments made where relevant.
- Collect evidence on how the integration of location data and services can help public administrations improve their processes and achieve benefits. Measure benefits of particular investments to validate projected outcomes and make the case for further / continued funding.

Communications approach

- Use real life case studies and user stories to highlight benefits in a way that is understandable
 - Ensure the communication addresses the understanding and motivations of the target audience, e.g. whether they are policy or technically focused
 - Communicate benefits using factsheets, web-based documentation, videos etc.
 - Run digital government 'communication' events involving citizens and businesses
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Challenges:

- Tendency for monitoring and benchmarking in the context of digital public services to focus on the main upstream activities of the value chain (readiness and availability), while the downstream elements (use and impact) are neglected because of the difficulty of finding this information.
 - Indicators can sometimes be difficult to measure, with information provided too vague, general or abstract. Involve professional investment analysts to validate indicators.
 - Impacts of new services or service improvements can be difficult to predict. This is why ongoing monitoring and targeting of improvements is needed. An interactive approach to service delivery and improvement (see recommendation 8) can also be beneficial.
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Best Practices:

#22: Standardised road safety data exchange



Further Reading:

- Relevant benefits studies:
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- [Putting the US Geospatial Services Industry on the Map, Boston Consulting Group 2012](#)
 - [The Value of Geospatial Information to Local Public Service Delivery in England and Wales, 2010](#)
 - [The Value of Spatial Information to the Australian and New Zealand Economies, ACIL Tasman 2008/09](#)
 - [What is the Economic Impact of Geo Services? - a report prepared by Oxera for Google, 2013](#)
 - [Assessing Social Benefits in Sweden](#)
 - [INSPIRE Benefits: Guide for Data Publishers, UK 2014](#)
 - [Costs and Benefits of Implementing the INSPIRE Directive Workshop, 2012](#)
 - [Estimating Benefits of Spatial Data Infrastructures: A Case Study on e-Cadastres, 2012](#)
 - [Finnish INSPIRE benefits study](#)
 - [INSPIRE in Danish e-Government, 2012](#)
 - [The Economics of Public Sector Information, Pollock 2009](#)
 - [Review of Recent Studies on PSI Re-use and Related Developments, Vickery 2011](#)
 - [OECD Working Paper on "Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives"](#)
 - [The Value of Danish Address Data, 2010](#)
 - [The financial benefits of open basic data in Denmark](#)
 - Typical benefits for government and best practice examples are as follows (see Annex III for best practices):
 - Cost and time savings (Netherlands, redesign of spatial planning process – EULF Best Practice 6)
 - Simplification of processes (Italy, building permit process simplification – EULF Best Practice 20)
 - More effective policy making (Belgium, Germany and UK, better informed economic policy through local business knowledge base – EULF Best Practice 3)
 - Increased collaboration and coordination (Germany, Netherlands and Belgium, Euregio Meuse-Rhine business locator – EULF Best Practice 12)
 - Improved quality of processes (Poland, census data collection and management – EULF Best Practice 17)
 - Typical benefits for citizens and businesses and best practice examples are as follows (see Annex III for best practices):
 - Cost and time savings (Netherlands, cables and pipelines database – EULF Best Practice 13)
 - Better service delivery (Poland, improved emergency response – ELF Best Practice 8)
 - Delivery of new services (Belgium, Germany and UK, provision of up-to-date and accurate information on local businesses – EULF Best Practice 3)
 - Public transparency (Belgium, air quality information – EULF Best Practice 14)
 - Public participation (Netherlands, consultation in spatial planning – EULF Best Practice 6)
 - Examples of wider socio-economic benefits are as follows:
 - Creation of new companies (Flanders, generic GIS for e-Government – EULF Best Practice 1)
 - Business relocation and growth (Germany, Netherlands and Belgium, Euregio Meuse-Rhine business locator – EULF Best Practice 12)
 - Value added business services (Czech Republic, Base Register of Territorial Identification, Addresses and Real Estates (EULF Best Practice 11)
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- Improved emergency response (Italy, landslide warning system – EULF Best Practice 7)
 - Flood risk awareness raising (Germany, zoning system for floods, backwater and heavy rains – EULF Best Practice 10)
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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



Why:

- These actions help improve the sharing and reuse of location data to help build the data economy,
- Public sector data is a valuable asset on which added value products and services can be built
- Governments are increasingly open to sharing their data but there are still too many restrictions in discovering the right data and accessing this data easily
- There are inconsistent models in data licensing across European public administrations
- There are proven studies in the contribution of government open data to growth, with geographic datasets being cited as some of the more important data



How:

Core reference data

- Take a strategic approach to funding public sector location reference data (i.e. data that acts as a spatial reference to other data) alongside the funding of other important public sector authentic datasets, e.g. citizens, businesses, property ownership, including consideration of innovative funding models, to promote the widest possible benefit from such investment.

Data policy enablers

- Actively promote the availability of location data and web services to companies, research institutions, citizens and other interested parties
 - Make the process of searching, finding and accessing these data and web services as easy as possible, through for example:
 - Creating data portals merging location data and non-location data, so data needs can be satisfied in one search;
 - Creating an API marketplace as a facilitator for reuse of location data by non-governmental actors;
 - Using standardised metadata for describing location and non-location data;
 - Consider broad potential uses of the data beyond the primary users, when describing the data resource and specifying metadata;
 - Complementing general search facilities with “specialist” search, e.g. thematic portals, extended metadata, to cater for more specialist needs;
 - Simplified and consistent data licensing using standard government-wide terms and conditions for re-use of data and services, both spatial and non-spatial, based on generally recognised approaches, e.g. Creative Commons;
 - Clearly defined licensing for access to data that has been derived from third party sources (often a sticking point in access to thematic location data which is linked to authentic reference location data);
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- 'Open data by default' or 'maximised access to open data' if not the default, with access to public sector data free at point of use and without any reuse restrictions or conditions;
 - Free 'evaluation licences' for public sector data that is ultimately chargeable;
 - 'Freemium' licensing models to distinguish between free and non-free access to datasets, giving free access to, for example, lower resolution datasets, and chargeable access to higher resolution datasets.

Support to innovation and growth

- Public administrations actively support private, non-profit and academic actors in the development of new products and e-services through, for example:
 - Establishing 'innovation labs' or 'innovation hubs' to foster new business developments using public sector data
 - Promoting open data policy in government and brokering access to this data through hackathons, open challenges to government
 - Incorporating non-government actors in the governance framework for public sector data, so that their demands and views are heard
 - Setting up testbeds, as a tool to provide different types of user access to services, tools and applications that still are under development. Testbeds make it possible to experiment with new technologies and to test and validate these new technologies in a 'safe and controlled' environment. An important benefit of testbeds to private companies is that they make it possible to take into account these new technologies in developing their own products and services
 - Setting up pilot projects, in which different stakeholders (public organisations, companies, researchers, etc.) collaborate in exploring, developing, testing and implementing new technological developments. The goal of such projects is to share existing knowledge, ideas and experiences on new technological developments, to stimulate people to further experiment with these new developments and to determine an integrated approach.
 - Providing companies and other non-governmental actors the opportunity to add their data and services to the public sector (spatial) data infrastructure, where they are compliant and relevant, providing a wider audience for their products and services.
 - Taking into account the needs and requirements of businesses, research institutions and other (potential) users in the further development and implementation of INSPIRE/SDI. This means also non-governmental actors and organisations are invited to participate in user requirements analyses and in defining and describing use cases.
 - Demonstrating best practice examples of how private companies, citizens, academic institutions and other users make use of INSPIRE/SDI data and services to provide new or improved products and services. This can be linked to an award competition focusing on the best practices.
 - Providing training in the skills needed to exploit public sector location data, use it in developing digital government solutions, and in creating new commercial products and services.
 - Public administrations take specific action to facilitate companies from other countries wishing to establish operations or do business in their country, for example by:
 - Non-restrictive tender qualifications
 - Working with other countries on shared information sources for new businesses (see EULF Best Practice 12)
 - Reducing red-tape in registration of new businesses
 - An inclusive approach on promotion of innovation
 - Supporting the appointment of multi-national consortia on government funded projects to obtain the right skills
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- Supporting multiple languages where appropriate in relevant documentation and services.
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Challenges:

- Businesses or citizens may not be aware of the possibilities that access to government location data may offer or have the capabilities to exploit the improved availability of this data. In accessing data, potential users may firstly have difficulties in finding the appropriate catalogue. Secondly, when they do find the catalogue, it may be difficult for them to find the right dataset for their needs, even though it appears in the catalogue. This is because data publishers may fail to provide good search parameters for their data or the catalogues may not have good quality search algorithms.
- Access to 'high value' location datasets, capable of supporting the broadest opportunities, may be more limited than access to other datasets.
- Access to public location data may be subject to 'unavoidable' restrictions, e.g. existing commercial arrangements with suppliers, personal privacy concerns associated with the data.
- Although the benefits of high value open government data may be recognised, the cost of making such data available free of charge whilst maintaining data quality may be restrictive.
- Providing open access to high value government data may compromise the commercial position of certain players in the market.
- Free data still needs to be funded. If funding levels drop due to reduction or removal of income from licensing of data or data services, then quality may be compromised as a result.
- Different countries may have significant investments in different data standards, making harmonisation difficult to justify, even with the impetus of INSPIRE
- Sharing technology and data doesn't necessarily create business value and growth. There needs to be relevant business and commercial acumen and innovation to build the new data businesses of the future.
- The broadest capabilities come from existing players in the market who can afford to pay for their data.
- Product cycles are increasingly short and governments are too slow moving to match this pace of change.
- Governments may want to develop data services that are more appropriately placed in the private sector.
- The wider business environment, including wider government policy, may inhibit business growth, regardless of actions taken to provide access to data. This includes, for example, the tax regime, availability of capital, employment policy, policies on establishment of businesses from other countries etc.



Best Practices:

- #1: A digital platform for location data in Flanders
 - #2: IDOS – Cross-border journey planner for citizens
 - #3: 'LoG-IN' to the local economic knowledge base
 - #7: National landslide warning system in Italy
 - #8: 'One solution for all emergency services' in Poland
 - #10: Risk assessment in the Insurance business in Germany
 - #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
 - #12: Enterprise locations in the Euregio Meuse-Rhine
 - #13: KLIC to prevent damage caused by excavation works
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- #16: Managing the granting of licenses for selling tobacco
- #18: Territorial Information System of Navarre: SITNA
- #19: Democratisation of soil data in the UK
- #21: Integrated transport solutions: TRAVELINE
- #22: Standardised road safety data exchange
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Further Reading:

- [European Commission Priorities: Digital Single Market – bringing down barriers to unlock online opportunities](#)
 - [European Commission plan to digitise European Industry, 2016](#)
 - [Denmark Basic Data Programme: Good Basic Data for Everyone – a driver for growth and efficiency](#)
 - [UK: Open Data Institute](#)
 - [UK: National Innovation Plan public consultation](#)
 - Matched funding models: e.g. [Innovate UK](#), [EU PCP and PPI funding](#)
 - [UK: Government Service Design Manual – Open Data](#)
 - [UK: DATA.GOV.UK - Apps](#)
 - [Socio-economic benefits of Danish open address data](#)
 - [GeoAlliance Canada: How can a clear identity for the geomatics sector lead to economic growth?](#)
 - [Australian Government National Innovation and Science Agenda](#)
 - [OECD Study on Public Sector information and Content](#)
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Governance, Partnerships and Capabilities



Current State



Good practices in strategic 'location' governance exist in some Member States, linked with wider governance of e-service delivery. However, there are cases where different interests are not resolved coherently, key stakeholders are left outside the decision process, and network vs central approaches are not well balanced (e.g. in collecting and combining data in a particular domain). Often the partnering model for the exchange of location information is not well defined or understood, and the benefits to stakeholders are not well articulated. Collaboration may exist for specific purposes but wider considerations are not addressed. It is difficult to develop services that cross organisational boundaries, particularly where costs incurred by one organisation have a downstream benefit to others. Knowledge and skills mainly exist with geospatial experts. There is low awareness of the opportunities and issues in using location information outside this community, and few examples of geospatial experts sharing their knowledge convincingly with broader stakeholders.



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



Why:

- The use and integration of location information in public sector processes requires the participation and cooperation of many different actors: not only governments at different levels and/or in different areas, but also private companies, non-profit and academic organisations can contribute to the integration of location information in certain processes, with the aim of providing better services to citizens and other parties.
- Finding a common goal is all about creating a situation in which all parties could benefit. Having a common goal also improves the long-term stability and sustainability of the cooperation.
- Governance needs to be aligned to the types of decisions taken, e.g. strategic, programme, financial, technical.



How:

Stakeholder inclusion

- Recognise the potential contribution of different types of actors, and optimally make use of the competences, knowledge and experiences of different partners.
- The involvement of many different partners requires an approach to create and maintain effective partnerships between these partners.
- Governance needs to take account of the voice of users of the outputs of the location activities, e.g. businesses, citizens, academic bodies, research institutions. This can be done through a number of means, including communications events, consultations, and including “users” in the formal governance arrangements through the establishment of a User Group, Business Forum etc.

Goal orientation

- The key to success is to bring together and unify different parties around a common goal or problem to be solved. In some cases, the basis for cooperation might be a legal obligation or a political decision. Also, the need to provide better or even new services to citizens and other actors might be a good incentive to collaborate.
- Integrating the use of location information effectively in digital public services is a long term continuous process that needs constant attention and occasional renewal.
- INSPIRE and open data policies have been used as drivers for integration. However, the legislative and political obligations of these policies should not be seen as goals in their own right but rather as an opportunity to gain political and financial support to improve service delivery or decision making.
- Once consensus has been established amongst the different actors, a more project management-oriented approach can be followed, determining well-defined goals that will be realised through an agreed sequence of activities. An important instrument within such a project management approach is the instalment of a small but efficient project task force with representatives from the different parties. In many of the EULF Best Practices such a task force or coordination group was established.

Fit-for-purpose governance and decision making

- Over time, public administrations should adopt a flexible approach for governing the relationships and dependencies between different actors, drawing on a combination of different governance mechanisms as appropriate. Initially, more network-oriented forms of governance may be appropriate. When private actors are involved, more market-oriented forms of governance will be appropriate to manage the relationships with them. More hierarchal forms of governance, with agreed roles and responsibilities of different actors may be needed to formalise and guarantee over the long term the commonly agreed principles and decisions.
- The type of governance often depends on how money is approved and flows and whether the governance is operating at the policy level, the programme level or both. If the governance body is managing a budget, decisions will naturally be focused on where and how that money is spent and whether investments are delivering what was intended. Strategic or policy decision making will operate at a different level but should also take account of the implementation feasibility and impact of decisions that have been taken.
- Specialist governance groups may need to be established for particular aspects of the ‘location infrastructure’, either as location-specific groups or as part of wider ICT-related governance. Examples include groups on data standards, data specifications and metadata, groups to manage persistent identifiers, linked data governance etc.
- Establish an independent chair and independent quality assurance for key location governance bodies to ensure interests are balanced and the group performs effectively
- An example of integrated governance of data management is the development of an API programme reaching across both location data and digital public service data communities. In this case, merging governance of digital public service data and geospatial data is needed. This can be complemented

with the use of common platforms catering for both ecosystems (i.e.: merging INSPIRE portals with Open Data Portals). Multichannel citizen engagement, cross-agency digital government and emerging IoT requirements are driving new demands for government data (including geospatial data) and services. A proactive API programme can support these demands and promote innovative delivery of government services. Such a programme includes:

- Reframing the perspective on APIs among IT leadership. Move APIs from the technical domain to the realm of strategic digital government enabler as part of the development of a digital government platform.
 - Implementing a proactive API programme focused on progressively unlocking both the services and data available within current and legacy applications for integrating with internal and external systems.
 - Promoting APIs as a vital digital government asset. Identify opportunities to deliver innovative solutions that utilise internal and external APIs.
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Challenges:

- Securing the necessary time from key relevant stakeholders in the collective governance, balanced with their other responsibilities
 - Covering all interests in the governance arrangements, including balancing 'demand' and 'supply' interests
 - Building governance arrangements based on distributed infrastructures involving many stakeholders entails challenges in overall management and guaranteeing everyone's commitments
 - Maintaining flexibility in the governance arrangements to cope with the changing status of the work programme
 - Keeping the governance fresh and alive, when new ideas and political priorities come to the fore
 - Balancing the long term strategic focus and the short term tactical focus
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Best Practices:

- #9: Digital Accessibility Map for better informed firemen
 - #13: KLIC to prevent damage caused by excavation works
 - #18: Territorial Information System of Navarre: SITNA
 - #20: Digital system for building permits in Italy
 - #21: Integrated transport solutions: TRAVELINE
 - #22: Standardised road safety data exchange
 - #23: INSPIRE-compliant marine environment e-reporting
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Further Reading:

- [Digital Government Factsheets, 2018](#), institutional arrangements for digital government
 - [e-Government Factsheets 10 Years Anniversary Report, 2018](#), governance examples
 - [European Data Portal – Open Data Maturity in Europe](#), national coordination arrangements
 - [INSPIRE Knowledge Base – INSPIRE in your Country](#), coordination and governance arrangements
 - ELISE - The Role of SDI in the Digital Transformation on Public Administration, analysis of governance in different countries
 - [UK Geospatial Commission](#)
 - [The UK Location Programme's approach to benefit realisation and the role of the Location User Group](#)
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- [Open data governance and open governance – interplay or disconnect?, Open Knowledge Foundation](#)
- Examples of common goals that unify different actors:
 - Providing citizens better access to information on contaminated sites (EULF Best Practice 15) or on air quality issues in their region (EULF Best Practice 14)
 - Reducing the time citizens have to wait for a building permit (EULF Best Practice 20)
 - Reducing the risk of accidents during excavations (EULF Best Practice 13)



Recommendation 18: Partner effectively to ensure the successful development and exploitation of spatial data infrastructures.



Why:

- The use and integration of location information in public sector processes requires the participation and cooperation of many different actors: not only public authorities at different levels and/or in different areas, but also private companies, non-profit and academic organisations can contribute to the integration of location information in certain processes, with the aim of providing better services to citizens and other parties.
- Agreements need to be formalised in an appropriate way and by relevant people for any partnership to be successful. Harmonisation of agreements across European borders facilitates collaboration and brings about cost and time savings.
- Even if one party is the central driving force for a location strategy or programme, successful outcomes often depend on multiple parties working together and such an arrangement will stand a better chance of success if these multiple parties have a say in what happens.



How:

Partnering and 'community' approach

- The ground rules of cooperation need to be debated and agreed by the different participants and formalised in an appropriate way, signed by persons of responsibility in the cooperating organisations
- Building and maintaining a spatial data infrastructure requires concerted action and cooperation from a large number of organisations (maybe hundreds of public administrations) over a lengthy period of time (the INSPIRE implementation timetable spans 10 years – 2010 to 2020 – and the intended use of the infrastructure doesn't stop there). Such an activity requires a "community" approach, both at a national level (to engage all the relevant organisations around a common purpose tailored to national needs) and EU-wide (to contribute to specifications, share experiences, collaborate on tools etc.). Such communities may also be relevant at a thematic level (e.g. the marine and transport sectors have active communities) and in relation to particular technologies, e.g. open source software development communities working on tools for data portals, metadata management etc.
- Partnerships can be long term arrangements. The success of the partnership needs to be evaluated from time to time. Changes need to be introduced into the nature of the partnership, the membership, the priorities for action as needs change and to keep the partnership relevant and performing effectively.
- Partnerships can be set up to lobby government on particular (location) data issues, e.g. in order to get open access to public sector data, to lobby for data to be made available in particular ways

Partnership agreements

- Partnership agreements should be established as early as possible in cross government strategic data programmes, joint initiatives to develop location interoperability solutions, or where different public

authorities are involved in the provision of location enabled digital public services. These may include considerations on:

- Purpose
- Scope
- Outputs
- Service Levels
- Intellectual property rights
- Data protection
- Responsibilities
- Funding
- Personnel
- Timetable
- Governance
- Examples of different types of partnership agreements include:
 - Multilateral Collaboration Agreement
 - Bilateral Collaboration Agreement
 - Memorandum of Understanding
 - Implementing Agreement
 - Data Sharing Agreement
- The following types of agreement involve more binding elements that can contribute to the partnership:
 - Legal Partnership Agreements
 - Framework Contracts
 - Service Contracts
 - Pre-commercial procurement for R&D services
 - Service Level Agreements

Public private partnerships

- Develop public private partnerships to bring the best of both worlds in the implementation of digital public service location interoperability solutions and in the delivery of location enabled digital public services. These can be at a strategic level or in relation to specific projects or services. At a strategic level, partnerships may be established with industry bodies (e.g. groups representing the geospatial, surveying and land management, or insurance sectors) or with key industry players. For specific projects or services, the 'partnerships' may be associated with (long term) framework contracts to support public authorities in delivering ICT or digital public services.

Multi-national partnerships

- Develop multi-national partnerships to progress common research interests or promote cross-border opportunities involving location data and services.



Challenges:

- In establishing public private partnerships, public authorities have to be wary of giving unfair competitive advantage to particular industry players
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- Participants may be too focused on their own interests rather than the common good. In this case governments should act as regulators in the interest of the citizens.
 - Lead times for getting agreements can be significant, particularly if many parties are involved. This can create inertia and potentially limit or counterbalance the goodwill engendered in initial discussions amongst the parties
 - Partnerships may reduce their effectiveness over time unless close attention is given to the operation of the partnership and whether it is effective in achieving the commonly agreed goals
 - Successful communities need constant fuelling in order to maintain interest and momentum. There is a risk that without this, they will not succeed.
 - Sufficient funding and resource may not be available to maintain the partnership / community. There is a related risk of dependence on particular sponsors or other individuals who may move on to other things.
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Best Practices:

- #1: A digital platform for location data in Flanders
 - #2: IDOS – Cross-border journey planner for citizens
 - #6: Digital Exchange platform for spatial plans
 - #9: Digital Accessibility Map for better informed firemen
 - #10: Risk assessment in the Insurance business in Germany
 - #12: Enterprise locations in the Euregio Meuse-Rhine
 - #13: KLIC to prevent damage caused by excavation works
 - #14: Air quality monitoring and reporting in Belgium
 - #18: Territorial Information System of Navarre: SITNA
 - #20: Digital system for building permits in Italy
 - #21: Integrated transport solutions: TRAVELINE
 - #22: Standardised road safety data exchange
 - #23: INSPIRE-compliant marine environment e-reporting
-



Further Reading:

- [Designing Comprehensive Partnering Agreements](#), Rotterdam School of Management, Erasmus University
 - [ISA interoperability agreements](#)
 - [INSPIRE Community website](#)
 - [SeaDataNet](#)
 - [MEDIN Marine Environment Data & Information Network](#)
 - [UK Open Government Partnership](#)
 - [Open Knowledge Foundation](#)
 - [GeoNetwork Opensource Community](#)
 - [GEO Alliance Canada](#)
 - [Pan Canadian Geomatics Community Strategy](#)
 - [European Commission ESIF funding partnership agreements](#)
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- [European Commission Joint Research Centre Collaboration Agreements](#)
 - [European Commission Cloud Service Level Agreement Standardisation Guidelines](#)
 - [Pre-commercial Procurement: Driving innovation to ensure sustainable high-quality public services in Europe](#)
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Recommendation 19: Invest in communications and skills to ensure sufficient awareness and capabilities to drive through improvements in the use of location information in digital public services and support growth opportunities



Why:

- Computers and mobile phones are used widely in all walks of life.
- Basic spatial knowledge and understanding of maps is relevant to many everyday situations but is not always retained or kept up to date from geography learning in schools
- Location information is relevant in many policy areas but the opportunities afforded and the best way of exploiting these opportunities are not always well known
- INSPIRE impacts a wide range of people in public authorities across Europe, and requires awareness and skills at different levels and for different purposes
- ICT and data skills frameworks do not always keep up to date with relevant technologies
- There are many ways of learning, and different people learn in different ways, e.g. formal education and training, studying publications, work experience, communicating with peers. These different types of learning all need to be factored in to the overall approach.
- Project teams disband and move on to other things, sometimes outside the organisation. It is therefore essential that knowledge and learning is captured and retained for future use.
- Teams brought together from different organisations and countries can bring a broad perspective of knowledge together to solve particular problems
- Communicating benefits and how they were achieved through worked examples is a powerful way of raising awareness raising and learning



How:

Spatial literacy

- Promote an understanding of geography and spatial literacy in academic and work environments
- Include effective use of geospatial information systems in schools and university curricula
- Include 'spatial' competencies in national ICT and data competency frameworks
- Recognise relevant geospatial and INSPIRE competencies in the terms of reference for procurements involving geospatial technologies

Awareness raising

- Provide awareness training for policy makers to help them understand the value of location-based analysis for evidence-based policy making and the approaches and tools that can be adopted
 - Provide INSPIRE awareness raising and training events for policy makers, (geo) data specialists, and ICT implementers involved in the implementation and use of INSPIRE data
 - Introduce 'digital champions' to promote public sector modernisation through the use of digital technology, and ensure these people are aware of and convey the benefits of geospatial information
-

and technologies. Where an organisation is running a major GI improvement programme, a 'GI champion' may be needed to drive through the changes.

- Promote the benefits of an integrated approach to the use of location information in digital public services and the role of INSPIRE, through communications events, use case factsheets, videos etc. (see also recommendation 14)

Developer and analytical skills

- Run hackathons and competitions to promote innovation in the use of geospatial technologies and take up of more openly available geospatial data. The ISA2 Sharing and Reuse Awards in 2017 and 2018 included several winners from the geospatial sector.
- Reuse existing best practices, tools, and solutions where possible to shortcut implementation, introduce innovation, and reduce the need for specialist skills
- Employ expert quality assurance to avoid mistakes in first time deployment and use of geospatial technologies and data
- Re-use existing geospatial and INSPIRE training resources to support new learning for data specialists and ICT implementers
- Use web-based learning tools to share knowledge and ideas, e.g. wikis, blogs, webinars
- Participate in geospatial community groups to gain / share knowledge and communicate with peers (e.g. INSPIRE community, EUROGI, UK Association for Geographic Information, Trentino Open Data community)
- Install and use location-based apps on mobile phones to see what end-users experience in their daily lives
- Read specialist books and journals to develop knowledge and keep it up to date
- Ensure public sector projects introducing geospatial digital public service solutions document and publish the learning from these projects, and produce relevant training resources to support rollout and take up of solutions

User skills

- Recognise the potential 'digital divide' and 'spatial divide' amongst users of digital public services. Ensure the services are as simple to use as possible, are developed in collaboration with potential users, and have the necessary instructions, training and support for users (see also recommendation 8)

Challenges:

- Training needs to be relevant to the user and timely for the situation, otherwise knowledge and information is not retained
 - Open Knowledge (i.e. knowledge sharing) like Open Data requires commitment and resourcing
 - Policy makers see geospatial information as a technical topic and not a tool for policy related analysis
 - Projects do not allow sufficient time for training and capturing lessons learnt
 - Competency frameworks are too general to focus on geospatial or other specialist topics
 - INSPIRE is seen as too complicated and technical
 - The number of geography graduates and graduates with geospatial training (i.e. in geography or ICT courses) cannot keep pace with requirements
 - Industry is relied upon for training but this concentrates knowledge on the supply side when knowledge is needed at all levels
 - SMEs require business acumen and a supportive business environment as well as technical knowledge and available data to create and run successful (geo) businesses
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Best Practices:

- #3: 'LoG-IN' to the local economic knowledge base
 - #11: Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic
 - #19: Democratisation of soil data in the UK
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Further Reading:

- [Geography in the National Curriculum for Wales](#)
 - [University College London, Centre for Advanced Spatial Analysis](#)
 - [Nottingham Geospatial Institute](#)
 - [Defra Geography Skills Framework](#)
 - [European e-Competence Framework](#)
 - [INSPIRE Forum](#)
 - [European Umbrella Organisation for Geographic Information \(EUROGI\)](#)
 - [UK Association for Geographic Information \(AGI\)](#)
 - [American Geosciences Institute \(AGI\)](#)
 - [Open Source Geospatial Foundation \(OSGeo\)](#)
 - [UN-GGIM Knowledge Base](#)
 - [GeoKnow](#), EU funded project bringing together web-based tools for processing geospatial data
 - [EULF Marine Pilot Training Package](#)
 - [smeSpire Project / Training Platform](#)
 - [Geovation](#), UK promoting and facilitating the use of geospatial data from the Ordnance Survey
 - [UK Open Data Institute Open Data Challenge Series](#)
 - [ESRI training](#)
 - [National Geographic Magazine](#)
 - [GIM International](#)
 - [Geospatial World](#)
 - [Digital champions](#)
 - [Towards the Data Driven Economy \(The Gap in Data and Technology Skills\), IDC](#)
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Conclusion

The EU Location Framework Blueprint outlines 5 focus areas and sets out 19 recommendations in an ambitious context for EU digital public services, whereby location data is sitting at the core of virtually all digital public services. The Blueprint takes into account various maturity levels of public services, e.g.: service orientation, information centricity and digital innovation, and recognises the differences in maturity across Europe.

EU Member States are steadily progressing towards deriving value from location data and have already demonstrated multiple examples of implementation of the recommendations. Furthermore, the Blueprint is anchored in the strategic agenda of and EU public administrations via the “Digital Single Market” (DSM) strategy and the e-Government Action Plan 2016-2020 and in the strategic agendas of Member States via the “Interoperability Solutions for Public Administrations, Businesses and Citizens” (ISA²) programme. It thus reflects current status while guiding towards location intelligence which will support digital innovation in Europe.

Based on these points above, we conclude that the Blueprint is designed to be as inclusive as possible. It also caters for a very large target audience, thus highlighting that all actors in the public sector have a role to play for achieving digital innovation. This inclusiveness is further demonstrated by the different focus areas that are used in the document to structure the recommendations: policy and strategy alignment, digital government integration, standardisation and reuse, return on investment, and governance, partnerships and capabilities.

While the Blueprint’s main benefit is bringing all these actors together and making them walk along a common path with actionable recommendations to implement, it also needs to be adopted by as many of these actors as possible to achieve the highest impact possible. Many of these recommendations have been already implemented in Member States, and the best practices are an illustration of how this has been done. An observatory will be implemented at the EU level to monitor regularly and illustrate the actual implementation of the EULF Blueprint.

The widespread adoption of this coherent European framework of guidance and actions will foster cross-sector and cross-border interoperability. It will enable the use of location data in digital public services, building on INSPIRE, and will result in more effective services, savings in time and money, and increased growth and employment.

List of abbreviations and definitions

Abbreviations

ADMS-AP	Asset Description Metadata Schema Application Profile
AGI	American Geosciences Institute
API	Application Programming Interface
ARE3NA	Reusable INSPIRE Reference Platform
BfS	German Federal Office for Radiation Protection
BPEL	Business Process Execution Language
BPMN	Business Process Model Notation
BI	Business Intelligence
CEN	Comité Européen de Normalisation - European Committee for Standardisation
CEN/TC 287	CEN Technical Committee 'Geographic Information'
CISR	Community of Interoperable Solution Repositories
CNR	Italian National Research Council
CNR-IRPI	Institute for Geo-Hydrological Protection of the Italian National Research Council
CRM	Customer relationship management
DaaS	Data as a Service
DCAT-AP	Data Catalogue vocabulary (DCAT) Application Profile for data portals
DG	Directorate-General
DIKE	MSFD Working Group for Data, Information and Knowledge Exchange
DPO	Data Protection Officer
DURP	Dutch Digital Exchange of Spatial Processes
DYA	Dynamic Enterprise Architecture
ebXML	Electronic Business using eXtensible Markup Language
EC	European Commission
e-CERTIS	A mapping tool used to identify and compare certificates requested in public procurement procedures across the EU
EIC	European Interoperability Cartography
EIF	European Interoperability Framework
EIRA	European Interoperability Reference Architecture
EIS	European Interoperability Strategy
ELF	European Location Framework
ELISE	European Location Interoperability Solutions for E-government
EMODNet	European Marine Observations and Data Network
e-PRIOR	The European e-Procurement Platform

E-PRTR	European Pollutant Release and Transfer Register
ECM	Enterprise Content Management
EDI	Electronic Data Interchange
EDM	Enterprise Data Management
EIM	Enterprise Information Management
ELISE	European Location Interoperability Solutions for e-Government
ERP	Enterprise Resource Planning
ESIF	European Structural and Investment Funds
ESPD	European Single Procedure Document
EU	European Union
EUROGI	European Umbrella Organisation for Geographic Information
EULF	European Union Location Framework
G2B	Government-to-Business
G2C	Government-to-Citizen
G2G	Government-to-Government
GDPR	General Data Protection Regulation
GDV	German Insurance Association
GeGIS	Belgian Generic GIS for e-government
GEO	Group on Earth Observations
GeoDCAT-AP	Data Catalogue vocabulary (DCAT) Application Profile extension for describing geospatial datasets, dataset series, and services
GERAM	Generalised Enterprise Reference Architecture and Methodology
GI	Geographic information or geospatial information
GIS	Geographic information system or geospatial information system
GML	Geography Markup Language
GRM	Geospatial Rights Management
ICT	Information and Communication Technologies
IMIS	German Integrated Measuring and Information System
INSPIRE	Infrastructure for Spatial Information in the European Community
IoT	Internet of Things
IPR	Intellectual Property Rights
IRCE-CELINE	Belgian Interregional Environment Agency
ISA	Interoperability Solutions for European Public Administrations
ISA ²	Interoperability Solutions for Public Administrations, Businesses and Citizens
ISF	Information Security Forum

ISO	International Organisation for Standardisation
ISO/TC 211	International Organisation for Standardisation (ISO) Technical Committee 211 (Geographic Information/Geomatics)
JRC	Joint Research Centre
LDW	Logical Data Warehouse
MASA	Meshed App and Service Architecture
MDM	Master Data Management
MEDIN	Marine Environment Data and Information Network
MS	EU Member States
MSFD	Marine Strategy Framework Directive
NIFO	National Interoperability Framework Observatory
NIST	National Institute for Standards and Technology
OASIS	Organisation for the Advancement of Structured Information Standards
OECD	Organisation for Economic Cooperation and Development
OGC	Open Geospatial Consortium
OMG	Open Management Group
OSGeo	Open Source Geospatial Foundation
PCP	Pre-Commercial Procurement
PIDs	Persistent Identifiers
PPI	Public Procurement of Innovative Solutions
PSI	Public Sector Information
RDF	Resource Description Framework
RM-ODP	Reference Model for Open and Distributed Processing
RUIAN	Czech Base Register of Territorial Identification, Addresses and Real Estates
SAGA	Standards and Architectures for eGovernment Applications
SANS	Escal Institute of Advanced Technologies
SDI	Spatial Data Infrastructure
SITNA	Territorial Information System of Navarre
SME	Small and Medium-sized Enterprises
SOA	Service Oriented Architecture
sTESTA	Secured Trans European Services for Telematics between Administrations
TOGAF	The Open Group Architecture Framework
UDDI	Universal Description, Discovery and Integration
UK-AGI	UK Association for Geographic Information
UML	Unified Modelling Language

UMM	Universal Map Module
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UN-GGIM	United Nations initiative on Global Geospatial Information Management (UN-GGIM)
URI	Uniform Resource Identifier
W3C	World Wide Web Consortium
WCM	Web Content Management
WIYBY	UK What's In Your Backyard App
XML	eXtensible Markup Language

Definitions

Authentic data	Data that provides an accurate representation of reality with quality parameters that are fit for the intended purposes
Authoritative data	Data from officially regarded sources
Application Programming Interface (API)	A set of functions and procedures that allow the creation of applications which access the features or data of an operating system, application, or other service.
Big data	High volume, high velocity (speed at which data is generated) and high variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.
Data as a Service (DaaS)	A design approach that contributes to an information architecture by delivering data on demand via consistent, prebuilt access, with the aid of standard processing and connectivity protocols. Originating data remains local to its storage platform and, following various steps to access, format, evaluate and possibly even contextualize it, is presented as output for use in a subsequent process or delivery endpoint.
Digital government	Government designed and operated to take advantage of information in creating, optimising, and transforming, government services.
Digital platform	A framework that allows a community of partners, providers and users to share and enhance digital processes and capabilities, or to extend them for mutual benefit. This framework allows for combinations of business models, leadership, talent, delivery and IT infrastructure platforms that power digital ecosystems.
EIRA	A structured basis for classifying and organising building blocks relevant to interoperability, which are used in the delivery of digital public services.
Evidence based policy making	The development of public policy which is informed by objective evidence, e.g. through data related to the content of the policy
Government as a Platform (GaaP)	Government as a Platform presents a new way of building digital public services using a collaborative development model by a community of partners, providers and citizens to share and enhance digital public processes and capabilities, or to extend them for the benefit of society.
INSPIRE	Directive 2007/2/EC establishing an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment.

Internet of Things (IoT)	A network of dedicated physical objects (things) that contain embedded technology to sense or interact with their internal state or external environment. The IoT comprises an ecosystem that includes things, communications, applications and data analysis.
Interoperability	The ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems;
Location information	Any piece of information has a direction or indirect reference to a specific location or geographical area, such as an address, a postcode, a building or a census area. Most information from diverse sources can be linked to a location. This term can be interchanged with spatial, geospatial, place and geographic information.
Location information strategy	A strategic approach for managing and maximising the value of location information.
Location intelligence	Location intelligence is the use of analytics to relate geographic and location contexts to business data. Location intelligence is designed to turn data into insight for a variety of business purposes. Location data, coupled with analytics and Business Intelligence software, can enrich information, then help organisations better analyse and visualise it.
Location privacy	The reasonable expectation that an individual cannot be identified without their permission by reference to information regarding their location or objects that may be attributed to them.
Location-enabled services	Services provided by public authorities which depend on effective management or use of location information
Meshed App and Service Architecture (MASA)	A new application architecture structure with constituent parts (apps, mini services, micro services and mediated APIs) which delivers increased agility and enables far-reaching application innovations to support IoT integration, automated decision making, third-party interoperability and omni-channel business models.
Mediated API	A mediated API is a design pattern in which an API is virtualised, managed, protected and enriched by a mediation layer.
Spatial literacy	The ability to use the properties of space to communicate, reason, and solve problems.
Standard	<p>As defined in European legislation (Article 1, paragraph 6, of Directive 98/34/EC), a standard is a technical specification approved by a recognised standardisation body for repeated or continuous application, with which compliance is not compulsory and which is one of the following:</p> <ul style="list-style-type: none"> • international standard: a standard adopted by an international standardisation organisation and made available to the public; • European standard: a standard adopted by a European standardisation body and made available to the public; • national standard: a standard adopted by a national standardisation body and made available to the public.

Annex I: Overview of EULF Best Practices

The EULF Best Practices are 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. An overview and short description of the EULF Best Practices is provided in this section, with references to the recommendations they demonstrate. These Best Practices are described in more detail in Factsheets available on the ISA website.

EULF Best Practice 1	A digital platform for location data in Flanders
Country: Belgium	
Policy domain: Agriculture & Spatial planning	
Process owners: Agency for Information Flanders (AGIV)	
Short description: In 2013 the Flemish government launched GeoPunt. The aim of the Geopunt project is to bridge the gap between shared location data infrastructure and end users. The platform makes available authentic government, INSPIRE and other data through a partnership between Government, Businesses and Citizens. It bridges the gap with end users by enabling the creation of custom-tailored tools for different types of users with different levels of geo-maturity. In essence there are four components that allow tailoring: The Portal, Plugins, MAP APIs and Webservices API.	
Recommendations: Policy and Strategy Alignment (1 ; 4); Digital Government Integration (6 ; 8); Standardisation and Reuse (12); Return on Investment (16); Governance, Partnerships and Capabilities (18)	
Link: Map: http://www.geopunt.be/ Presentation: https://ies-svn.jrc.ec.europa.eu/attachments/download/973/APIs_Flanders.pdf	
EULF Best Practice 2	IDOS – Cross-border journey planner for citizens
Country: Czech Republic	
Policy domain: Transport & mobility	
Process owners: Ministry of Transport, Czech Public Transport Operators, Private sector	
Short description: IDOS is a multimodal public transport planner of the Czech Republic integrating international, national, regional and urban public transport connections including bus, rail and air. Any person can access the service online to obtain information on a planned journey including timetables, links to the reservation systems, information about the connection (e.g. time, distance, transfer time).	
Recommendations: Digital Government Integration (7); Standardisation and Reuse (11 ; 12); Return on Investment (16); Governance, Partnerships and Capabilities (18)	
Link: http://jizdnirady.idnes.cz/	
EULF Factsheet: https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20IDOS.pdf	

EULF Best Practice 3**'LoG-IN to the local economic knowledge base**

Country: Belgium, Germany and the United Kingdom

Policy domain: Local economy, tourism, child care, water management, etc.

Process owners: Intercommunale Leiedal (BE), Landkreis Rotenburg-Wümme (DE), Norfolk County Council (UK)

Short description: The LoG-IN project aimed to turn local authorities into key players in the local economy through the development of a Generic Information Infrastructure. This infrastructure allowed them to manage and publish their - location - data and to build their own web applications. One of the first applications that was built with support of this Generic Information Infrastructure was an online overview of all companies in a certain region.

Recommendations: Policy and Strategy Alignment ([2](#); [4](#)); Standardisation and Reuse ([11](#); [12](#)); Return on Investment ([16](#)); Governance, Partnerships and Capabilities ([19](#))

Link: <https://joinup.ec.europa.eu/community/epractice/case/local-governments-3-countries-sharing-one-gis-infrastructure>, <http://www.smartregions.eu/log-0>

EULF Best Practice 4**What's in Your Backyard for farmers**

Country: United Kingdom

Policy domain: Environment and agriculture

Process owners: Environment Agency

Short description: One of the key applications at the website of the Environment Agency is What's In Your Backyard (or WIYBY for short). The application provides interactive maps for finding information about the environment: e.g. air pollution, coastal erosion, historic landfills, etc.). A particular application was developed for farmers, to inform them about water bodies in their environment that might be affected by agricultural pollutants.

Recommendations: Policy and Strategy Alignment ([1](#)) ; Digital Government Integration ([7](#)); Standardisation and Reuse ([11](#); [12](#))

Link: <http://apps.environment-agency.gov.uk/wiyby/>

EULF Factsheet:

<https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20WIYBY.pdf>

EULF Best Practice 5**Radiological Emergency Response in Germany**

Country: Germany

Policy domain: Emergency management

Process owners: Federal Office for Radiation Protection (BfS), Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Short description: In Germany, the nuclear accident in Chernobyl 1986 prompted the establishment of the 'Integrated Measuring and Information System (IMIS) for the Monitoring of Environmental Radioactivity', operated by the Federal Office for Radiation Protection. In case of emergency, IMIS provides the information necessary to give recommendations and take appropriate countermeasures based on measurements, forecasts and spatial analysis.

Recommendations: Policy and Strategy Alignment (4); Standardisation and Reuse (10; 12)

Link: http://www.bfs.de/EN/topics/ion/accident-management/measuring-network/imis/imis_node.html

EULF Best Practice 6 Digital Exchange platform for spatial plans

Country: The Netherlands

Policy domain: Spatial planning

Process owners: Ministry of Infrastructure and Environment, Kadaster, Dutch Provinces and municipalities, Geonovum

Short description: As part of the initiative 'Digital Exchange of Spatial Processes' (popularly abbreviated as DURP), a digitized environment for spatial planning was created to facilitate the sharing of spatial plans. A portal to make the plans publicly available was established called Ruimtelijkeplannen.nl with the goal to enhance the communication of future plans to professionals and citizens at municipal, provincial, and national levels.

Recommendations: Policy and Strategy Alignment (1; 2); Digital Government Integration (7); Standardisation and Reuse (10; 12); Governance, Partnerships and Capabilities (18)

Link: www.ruimtelijkeplannen.nl

EULF Factsheet:

https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/New%20EULF%20Factsheet%20DURP.pdf

EULF Best Practice 7 National landslide warning system in Italy

Country: Italy

Policy domain: Emergency management

Process owners: CNR Research Institute for Geo-Hydrological Protection (IRPI), Italian Department for Civil Protection

Short description: The Research Institute for Geo-Hydrological Protection (IRPI) of the Italian National Research Council (CNR) started with the development of a national landslide warning system that is used by the Italian Department for Civil Protection. The system daily provides spatially distributed forecasts for the possible occurrence of rainfall-induced landslides in Italy. The main output consists of critical rainfall levels, which are determined from rainfall measurements and rainfall forecasts.

Recommendations: Policy and Strategy Alignment (4); Return on Investment (16)

Link: http://www.protezionecivile.gov.it/jcms/it/allertamento_meteo_idro.wp

EULF Best Practice 8 'One solution for all emergency services' in Poland

Country: Poland

Policy domain: Emergency management

Process owners: Head Office of Geodesy and Cartography, (National) Police, Fire brigades, Emergency services

Short description: The Head Office of Geodesy and Cartography in Poland has developed a geospatial module enhancing the Command Support System of Polish emergency services. This module, the so-called Universal Map Module (UMM), is applicable for all the emergency services and can be integrated in their Command Support Systems in order to deliver “spatial functionality” as a support to their work processes.

Recommendations: Policy and Strategy Alignment (4); Digital Government Integration (7); Governance, Partnerships and Capabilities (16)

Link: <http://www.gugik.gov.pl/>

EULF Best Practice 9 Digital Accessibility Map for better informed firemen

Country: The Netherlands

Policy domain: Emergency management

Process owners: Fire brigades, Ministry Infrastructure and Environment, Municipalities, Kadaster

Short description: In the Netherlands, the Digital Accessibility Map was developed to provide firemen up-to-date navigation description and all relevant information about the emergency location. Linking the digital map with the nation-wide registries for Addresses and Buildings makes this information more reliable and quicker available. Due to the Digital Accessibility Map firemen immediately know everything about each address and building.

Recommendations: Policy and Strategy Alignment (4); Standardisation and Reuse (12); Governance, Partnerships and Capabilities (17; 18)

Link: <http://www.brandweernederland.nl/>

EULF Best Practice 10 Risk assessment in the insurance business in Germany

Country: Germany

Policy domain: Flood management

Process owners: German Insurance Association, Insurance companies, Water resource management authorities

Short description: The German Insurance Association (GDV), an umbrella organisation for private insurers in Germany, has developed a zoning system for floods, backwater and heavy rains, the so-called ZÜRS Geo system. Individual insurance companies can make use of this online risk assessment tool to assess the risk of natural hazards (especially flooding) for any requested area risks and determine a risk-related premium.

Recommendations: Return on Investment ([16](#)); Governance, Partnerships and Capabilities ([18](#))

Link: <http://www.gdv.de/2015/01/kompass-naturgefahren/>

EULF Factsheet:

https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20ZURS_rev.pdf

EULF Best Practice 11 Base Register of Territorial Identification, Addresses and Real Estates in the Czech Republic

Country: Czech Republic

Policy domain: Broad set of policy domains

Process owners: Czech Office for Surveying, Mapping and Cadastre, Czech Statistical Office, Municipalities, Other

Short description: As one of the four Base Registers in the Czech Republic, the Base Register of Territorial Identification, Addresses and Real Estates (RUIAN) provides up-to-date core location data on administrative units, buildings, addresses, streets and public spaces, geographic names and election districts, as open data. In addition, RUIAN contains information on various characteristics of real estates, buildings and addresses.

Recommendations: Digital Government Integration ([7](#)); Standardisation and Reuse ([10](#); [11](#); [12](#)); Return on Investment ([16](#)); Governance, Partnerships and Capabilities ([19](#))

Link: <http://www.cuzk.cz/Uvod/Produkty-a-sluzby/RUIAN/RUIAN.aspx>

EULF Factsheet:

<https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20RUIAN%20-%20CZ.pdf>

EULF Best Practice 12 Enterprise locations in the Euregio Meuse-Rhine

Country: Germany, the Netherlands & Belgium

Policy domain: Economic policy

Process owners: AGIT (DE), Province of Limburg (NL), Enterprise Flanders, POM Limburg, SPI (BE)

Short description: The Locator is a multi-functional system, consisting of four different modules. Each module provides information on one specific topic. Users can find information about the available plots on business parks, about existing companies on these business parks, about the availability of commercial real estate, and information about settlement conditions.

Recommendations: Digital Government Integration (7); Standardisation and Reuse (12); Return on Investment (16); Governance, Partnerships and Capabilities (18)

Link: <http://www.the-locator.eu/>

EULF Factsheet:

https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/New%20EULF%20Factsheet%20LOCATOR.pdf

EULF Best Practice 13

KLIC to prevent damage caused by excavation works

Country: The Netherlands

Policy domain: Utility management, road works

Process owners: Dutch Cadastre, Utility network operators, Excavation community

Short description: In 2010 The Netherlands introduced the digital information system KLIC to optimize the digital information-exchange between excavators and cable and pipe operators. Before starting excavation works, an excavator needs to submit an application request to KLIC. Network operators deliver the digital information about their cables and pipelines through KLIC to the Cadastre, which provides the information from all network operators to the excavator.

Recommendations: Policy and Strategy Alignment (4); Digital Government Integration (7); Standardisation and Reuse (12); Return on Investment (16); Governance, Partnerships and Capabilities (17; 18)

Link: <http://www.kadaster.nl/web/Themas/Registraties/KLIC-WION.htm>

EULF Factsheet:

<https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20KLIC.pdf>

EULF Best Practice 14

Air quality monitoring and reporting in Belgium

Country: Belgium

Policy domain: Environment

Process owners: Belgian Interregional Environment Agency, Flemish Environment Agency, Brussels Environment, Walloon Agency for Air and Climate

Short description: The Belgian Interregional Environment Agency (IRCEL-CELINE) is responsible for reporting on air quality issues to citizens and policy makers and for transmitting national data concerning air quality to the European level and other international organisations. Several INSPIRE-compliant services are used for reporting and exchanging air quality information through e-Reporting but also for informing the public.

Recommendations: Policy and Strategy Alignment (4); Digital Government Integration (6; 7); Standardisation and Reuse (11); Governance, Partnerships and Capabilities (18)

Link: <http://wwwdev.irceline.be/en>

EULF Best Practice 15

Information System of Contaminated Sites in Slovakia

Country: Slovakia

Policy domain: Environmental protection

Process owners: Ministry of Environment, Slovak Environment Agency, Regional Environmental offices, Slovak Environmental Inspectorate

Short description: In Slovakia, an 'Information System of Contaminated Sites' was developed to support and document all processes related to the management of contaminated sites and to provide access to all official information on different measures in the field of contaminated sites. An essential part of the system is the 'Register of Contaminated Sites', which allows searching all information on Contaminated Sites in Slovakia (spatial and non-spatial).

Recommendations: Policy and Strategy Alignment (4); DigitalGovernment Integration (7; 8); Standardisation and Reuse (10; 12)

Link: <http://envirozataze.enviroportal.sk/mapa>

EULF Best Practice 16

Managing the granting of licenses for selling tobacco

Country: Spain

Policy domain: Economic policy

Process owners: Commissioner of the Tobacco Market, National Geographic Institute

Short description: According to the Spanish law all tobacco points of sale provide themselves of tobacco from one of the three closest official tobacco delivery establishments. For a permit request for a Tobacco Sales Point, the 'AppTobaccoManagement' application determines the spatial location of the 3 tobacconists nearest the sales point. The AppTobaccoManagement is one of the new services that are built upon data and services of CartoCiudad, the seamless cartographic database of Spain.

Recommendations: Policy and Strategy Alignment (2); Digital Government Integration (7); Standardisation and Reuse (11; 12); Return on Investment (16)

Link: <http://www.cmtabacos.es/>

EULF Factsheet:

https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/New%20EULF%20Factsheet%20Tobacco.pdf

EULF Best Practice 17

Location-enabled census data in Poland

Country: Poland

Policy domain: Statistics

Process owners: Central Statistical Office of Poland

Short description: In Poland, the Agricultural Census of 2010 and the Housing Census of 2011 were the first censuses that were completely carried out electronically, without use of paper. Enumerators were equipped with hand-held devices with a mobile application for the execution of the census process. The application contained a map module with orthoimagery and a digital map that assisted the enumerator in locating respondents.

Recommendations: Policy and strategy alignment (3); Digital Government Integration (7; 8; 9); Standardisation and Reuse (11);

Link: <http://geo.stat.gov.pl/>

EULF Factsheet:

<https://joinup.ec.europa.eu/sites/default/files/document/2019-08/New%20EULF%20Factsheet%20CENSUS.pdf>

EULF Best Practice 18

Territorial Information System of Navarre: SITNA

Country: Spain

Policy domain: Many different policy areas

Process owners: Government of Navarre

Short description: The Government of Navarre started with the implementation of a government-wide Territorial Information System of Navarre (SITNA), in order to coordinate and integrate all information from different departments. On top of SITNA, a broad set of applications have been developed in the past years to support different public sector processes and services: the identification of agrarian parcels within the Common Agricultural Policy aid system, information provision on the air quality and air pollution levels in Navarre, etc.

Recommendations: Policy and Strategy Alignment (1.4); Digital Government Integration (6; 7); Standardisation and reuse (10; 11; 12); Return on Investment (16); Governance, Partnerships and Capabilities (17; 18)

Link: <http://sitna.navarra.es/>

EULF Best Practice 19

Democratisation of soil data in the UK

Country: United Kingdom

Policy domain: Soil protection

Process owners: Natural Environment Research Council, British Geological Survey, Centre for Ecology and Hydrology

Short description: Funded by the Natural Environment Research Council, a smartphone application that brings together soil property data and information from a broad range of research centres and data providers was developed by the British Geological Survey in partnership with the Centre for Ecology and Hydrology. Users of

the 'mySoil' application can view soil maps of the UK and EU that provide regional information on soil depth, texture, pH, temperature and organic-matter content, and on vegetation habitats.

Recommendations: Digital Government Integration (7; 8); Standardisation and reuse (11; 12); Return on Investment (16); Governance, Partnerships and Capabilities (19)

Link: <http://bgs.ac.uk/mySoil/>

EULF Factsheet:

https://joinup.ec.europa.eu/sites/default/files/ckeditor_files/files/New%20EULF%20Factsheet%20UK%20Soil%20data.pdf

EULF Best Practice 20 Digital system for building permits in Italy

Country: Italy

Policy domain: Spatial planning

Process owners: Piedmont Region, Piedmont provinces, Piedmont municipalities

Short description: With the aim of streamlining administrative procedures related to building permits, different public authorities in the Piedmont region in Italy started with the development of MUDE Piedmont, a unified digital system for building permits. The aim of MUDE was to standardize the application forms for building permit requests and of the municipal procedures for managing these requests throughout the region.

Recommendations: Policy and Strategy Alignment (4); Standardisation and Reuse (11); Governance, Partnerships and Capabilities (17; 18)

Link: <http://www.mude.piemonte.it/cms/>

EULF Best Practice 21 Integrated transport solutions: TRAVELINE

Country: United Kingdom

Policy domain: Transportation

Process owners: Traveline Information Limited (TIL)

Short description: TRAVELINE is an all Great Britain multi-modal travel planning service, which uses route timetables and real time departures for journey planning; an Open Data provider.

It is structured as a private not for profit company among local authority, government, transport operator and passenger group partners. The purpose of TRAVELINE is to promote public transport passenger growth and enable the delivery of high quality mobility information across a mix of channels in a way that represents best value to stakeholders. It has no government or public funding.

Recommendations: Policy and Strategy Alignment (2); Digital Government Integration (6,8); Standardisation and Reuse (11); Return on Investment (16); Governance, Partnerships and Capabilities (17, 18)

Link: www.traveline.info

EULF Best Practice 22

Standardised road safety data exchange

Country: Norway, Sweden

Policy domain: Intelligent Transport Systems

Process owners: JRC, ERTICO, Norwegian and Swedish Road Authorities, Norwegian and Swedish Road Authorities, TomTom, HERE

Short description: The EULF Transportation Pilot aims to improve the flow of up-to-date road safety data between road authorities and private sector map providers in different countries, supporting the aims of the Intelligent Transport Systems Directive and drawing on INSPIRE. It is a collaborative initiative involving the European Commission-Joint Research Centre from its European Union Location Framework (EULF) project, ERTICO's Transport Network ITS Spatial Data Deployment Platform (TN-ITS), including national road authorities and commercial map providers, and the European Location Framework (ELF) project, including national mapping agencies. Its aim is to promote the use of INSPIRE (European Directive setting the Infrastructure for Spatial Information in Europe) within the transport domain, by focusing on the electronic exchange of data among public road authorities and private sector ITS map providers, at a cross-border level, based on authoritative and seamless data compliant with INSPIRE.

Recommendations: Digital Government Integration (6; 7; 8); Standardisation and Reuse (11; 12); Return on Investment (15; 16); Governance, Partnerships and Capabilities (17; 18)

Link: https://joinup.ec.europa.eu/community/eulf/og_page/eulf-transportation-pilot

EULF Best Practice 23

INSPIRE-compliant marine environment e-reporting

Country: Denmark, Netherlands, Germany

Policy domain: Marine environment

Process owners: JRC, EEA, Danish, Dutch and German Marine Agencies

Short description: The aim of the INSPIRE marine pilot is to help improve the understanding of INSPIRE in the management of Marine Strategy Framework Directive (MSFD)-related spatial information, and to provide guidance and tools that facilitate the mentioned obligations. The activity is funded by the ISA programme as part of the EULF Action, by DG ENV, and by JRC. The EEA, NL, DE, and DK are partners in the first phase project and are contributing in-kind. The pilot takes a few datasets needed to underpin the MSFD reporting, and works out complete examples of INSPIRE-based data management. In the first phase of the pilot this is done for data holdings in NL, DE, and DK. In the second phase the guidelines, tools and expertise are promoted in other countries participating in MSFD Working Group Data Information and Knowledge Exchange (DIKE).

Recommendations: Policy and Strategy Alignment (2; 4); Digital Government Integration (6; 7); Standardisation and Reuse (10; 12); Governance, Partnerships and Capabilities (17; 18)

Link: https://joinup.ec.europa.eu/community/eulf/og_page/eulf-marine-pilot

EULF Best Practice 24

GeoSTAT Projects

Country: Various EU Member States

Policy domain: Cross-Policy Supporting Statistics

Process owners: EUROSTAT and National Statistical Institutions (NSIs)

Short description: The GEOSTAT initiative was taken jointly by Eurostat and the National Statistical Institutes to establish a data and production infrastructure for geospatial statistics. This infrastructure is to be defined and designed through a series of GEOSTAT projects.

The infrastructure will become an integral part of the European Statistical System's (ESS's) existing statistical data infrastructure. The idea is to incorporate the production of geospatial statistics into the various phases of the Generic Statistical Business Process Model (GSBPM), which provides the framework for the production of official statistics. The European Spatial Data Infrastructure (INSPIRE) will be another key element in geo-enabling statistical production.

GEOSTAT's main goal is to support NSIs in setting up their data, methods, and production systems to achieve a fully geocoded 2021 census. All census output should be aggregated from geocoded point-based information, providing sufficient flexibility to publish statistics for any type of territorial classification, including grids.

Recommendations: Digital Government Integration (9);

Link: <http://ec.europa.eu/eurostat/web/gisco/gisco-activities/integrating-statistics-geospatial-information/geostat-initiative>

<http://www.efgs.info/information-base/case-study/analyses/>

EULF Best Practice 25

National Geoportal of the Grand-Duchy of Luxembourg (GeoAPI)

Country: Luxembourg

Policy domain: Supporting many different

Process owners: EUROSTAT and National Statistical Institutions (NSIs)

Short description: geoportal.lu is Luxembourg's national official geoportal, a governmental platform to collect, describe, show and deliver geospatial data and related products. It has been built by Administration du Cadastre et de la Topographie, Luxembourg's national cadastre and mapping authority. The GeoAPI, one of its foundational pillars, is a web delivered service platform delivering both data and functionality, enabling geographical information to be viewed on a map. Just as with the geoportail.lu web service, the GeoAPI enables the integration in external web pages of the geoportail functionality. Although the options for data processing are limited compared with "real" office GIS software, some targeted queries and analyses are possible. A web GIS makes access to geographical information truly independent of platform, installation and location.

Recommendations: Standardisation and Reuse (10);

Link: <https://www.geoportail.lu/en/>

EULF Best Practice 26

NASA Earthdata Developer Portal

Country: United States

Policy domain: Supporting many different

Process owners: NASA

Short description: The newly released Earthdata Developer Portal is for application developers who wish to build applications that search, access, and browse NASA's Earth science data by leveraging the Earth Observing System Data and Information System (EOSDIS) enterprise tools and services. The Earthdata Developer Portal provides centralized and uniform access to public Application Programming Interfaces (APIs) and other documentation.

Recommendations: Standardisation and Reuse ([10](#));

Link: <https://developer.earthdata.nasa.gov/>
<https://api.nasa.gov/>

EULF Best Practice 27

Quality Assurance Framework of the European Statistical System

Country: Pan-European

Policy domain: Supporting many different

Process owners: EUROSTAT

Short description: The Quality Assurance Framework of the European Statistical System (ESS QAF) is a supporting document aimed at assisting the implementation of the European Statistics Code of Practice (CoP). It identifies possible activities, methods and tools that can provide guidance and evidence for the implementation of the indicators of the CoP. A first version of the ESS QAF covering principles 4 and 7 to 15 of the CoP was published in August 2011. Following a revision of the CoP adopted by the European Statistical System Committee (ESSC) on 28th September 2011, the ESS QAF was updated and approved by the Working Group Quality of Statistics in November 2012.

The current version (V1.2) emanates from work carried out in 2013-2015 by the ESS Task Force Peer Review who, in order to develop a complete and coherent self-assessment questionnaire, developed a set of methods and procedures to assess compliance for Principles 5 and 6 of the CoP.

Recommendations: Standardisation and Reuse ([13](#));

Link: <http://ec.europa.eu/eurostat/documents/64157/4392716/ESS-QAF-V1-2final.pdf/bbf5970c-1adf-46c8-afc3-58ce177a0646>
<http://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-32-11-955>

EULF Best Practice 28

INSPIRE – Data Quality and Data Specifications

Country: EU and Member States

Policy domain: Environmental

Process owners: European Commission

Short description: This report describes how data quality (DQ) was addressed during the development of the INSPIRE implementing rules and technical guidelines. This development process, which started in 2005 with the drafting of the conceptual framework, continued with the interoperability specification development for Annex I data themes in 2008-2010, and was finished with the definition of specifications for Annex II and III in 2013.

Recommendations: Standardisation and Reuse ([13](#));

Link:

<http://inspire.ec.europa.eu/documents/data-quality-inspire-balancing-legal-obligations-technical-aspects>

<http://inspire.ec.europa.eu/Technical-Guidelines/Data-Specifications/2892>

EULF Best Practice 29

ISO Standard for Geographic Information – Data Quality (ISO-19157:2015)

Country: International

Policy domain: Supporting many different policy domains

Process owners: International Organization for Standardization

Short description: ISO 19157:2013 establishes the principles for describing the quality of geographic data. It:

- defines components for describing data quality;
- specifies components and content structure of a register for data quality measures;
- describes general procedures for evaluating the quality of geographic data;
- establishes principles for reporting data quality.

ISO 19157:2013 also defines a set of data quality measures for use in evaluating and reporting data quality. It is applicable to data producers providing quality information to describe and assess how well a data set conforms to its product specification and to data users attempting to determine whether or not specific geographic data are of sufficient quality for their particular application.

ISO 19157:2013 does not attempt to define minimum acceptable levels of quality for geographic data.

Recommendations: Standardisation and Reuse ([13](#));

Link: <https://www.iso.org/standard/32575.html>

Annex II: Role-based methodologies

This annex shows role-based methodologies for the main intended users of the document, i.e. policy makers, digital public service owners, managers and implementers, ICT managers and developers, data managers/scientists, INSPIRE data publishers, and private sector entrepreneurs / developers. These methodologies indicate the relevant recommendations that should be considered in undertaking the typical tasks for each of these roles.

Policy Maker					
RECOMMENDATIONS		TASKS			
		Preparation	Adoption	Implementation	Application
POLICY AND STRATEGY ALIGNMENT					
1.	Connect location information and digital government strategies in all legal and policy instruments	X	X		X
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government	X	X		X
3.	Comply with data protection principles as defined by European and national law when processing location data.	X	X		X
4.	Make effective use of location-based analysis for evidence-based policy making	X		X	X
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement			X	
DIGITAL GOVERNMENT INTEGRATION					
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions	X			X
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				
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services				
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government	X			X

STANDARDISATION AND REUSE					
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements				
11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X		X	
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services				
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	X	X	X	X
RETURN ON INVESTMENT					
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities				X
15.	Communicate the benefits of integrating and using location information in digital public services				X
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	X			
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES					
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	X		X	X
18.	Partner effectively to ensure the successful development and exploitation of location data infrastructures				
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				X

Digital Public Service Owner, Manager and Implementer						
RECOMMENDATIONS		TASKS				
		Plan	Design	Develop and test	Introduce and operate	Review and improve
POLICY AND STRATEGY ALIGNMENT						
1.	Connect location information and digital government strategies in all legal and policy instruments					
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government					
3.	Comply with data protection principles as defined by European and national law when processing location data.					
4.	Make effective use of location-based analysis for evidence-based policy making					
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement	X				
DIGITAL GOVERNMENT INTEGRATION						
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions	X	X	X	X	X
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	X	X	X	X	X
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services	X	X	X	x	X
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government	X	X	X	X	X
STANDARDISATION AND REUSE						
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements	X	X			

11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X	X	X	X	
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services		X	X		
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	X	X	X	X	X
RETURN ON INVESTMENT						
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities					X
15.	Communicate the benefits of integrating and using location information in digital public services					
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				X	X
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES						
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	X				X
18.	Partner effectively to ensure the successful development and exploitation of location data infrastructures	X	X	X	X	X
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	X			X	

ICT Manager and Developer						
RECOMMENDATIONS		TASKS				
		Plan	Design	Develop and test	Release, operate and maintain	Review and improve
POLICY AND STRATEGY ALIGNMENT						
1.	Connect location information and digital government strategies in all legal and policy instruments					
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government					
3.	Comply with data protection principles as defined by European and national law when processing location data.					
4.	Make effective use of location-based analysis for evidence-based policy making					
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement	X				
DIGITAL GOVERNMENT INTEGRATION						
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions		X	X	X	X
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	X	X	X	X	X
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services	X	X	X	X	X
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government	X	X	X	X	X
STANDARDISATION AND REUSE						
10.	Adopt a common architecture to develop digital government	X	X			X

	solutions, facilitating the integration of geospatial requirements					
11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X	X	X	X	X
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services		X	X		
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	X	X	X	X	X
RETURN ON INVESTMENT						
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities					X
15.	Communicate the benefits of integrating and using location information in digital public services					
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				X	X
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES						
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	X				X
18.	Partner effectively to ensure the successful development and exploitation of location data infrastructures	X	X	X	X	X
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	X				

Data Manager/Data Scientist								
RECOMMENDATIONS	TASKS							
	Data policy and governance	Data specification and modelling	Data acquisition and quality	Data documentation, organisation and control	Data access, sharing and dissemination	Data warehousing and analytics	Data archiving	
POLICY AND STRATEGY ALIGNMENT								
1.	Connect location information and digital government strategies in all legal and policy instruments	X						
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government	X	X					
3.	Comply with data protection principles as defined by European and national law when processing location data.	X	X	X	X	X	X	X
4.	Make effective use of location-based analysis for evidence-based policy making	X	X			X	X	
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement	X	X	X				
DIGITAL GOVERNMENT INTEGRATION								
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions	X				X	X	
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	X	X	X		X	X	
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services	X	X	X		X		
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and	X	X			X	X	

	at different levels of government							
STANDARDISATION AND REUSE								
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements	X	X		X		X	
11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X		X	X	X	X	
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services	X	X		X	X	X	
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	X	X	X	X	X	X	X
RETURN ON INVESTMENT								
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities	X						
15.	Communicate the benefits of integrating and using location information in digital public services	X				X		
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	X				X		
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES								
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	X	X	X	X	X	X	
18.	Partner effectively to ensure the successful development	X						

	and exploitation of location data infrastructures							
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	X				X	X	

INSPIRE Data Publisher								
RECOMMENDATIONS		TASKS						
		Plan for INSPIRE	Identify spatial data sets	Create and maintain reusable spatial data sets	Provide discovery, view and transformation services	Monitor and report on INSPIRE	Support use of spatial datasets	
POLICY AND STRATEGY ALIGNMENT								
1.	Connect location information and digital government strategies in all legal and policy instruments	X				X		
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government	X	X	X		X	X	
3.	Comply with data protection principles as defined by European and national law when processing location data.	X		X				
4.	Make effective use of location-based analysis for evidence-based policy making	X	X	X	X		X	
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement	X		X	X		X	
DIGITAL GOVERNMENT INTEGRATION								
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions	X	X				X	
7.	Use INSPIRE and SDI models, data and services for delivering cross-sector and cross-border digital public services to citizens.	X	X	X	X	X	X	

	businesses, government and other parties						
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services	X					X
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government	X	X	X	X		X
STANDARDISATION AND REUSE							
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements	X			X	X	
11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X	X	X	X	X	
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services	X	X	X	X	X	
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		X	X	X	X	
RETURN ON INVESTMENT							
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities	X					X
15.	Communicate the benefits of integrating and using location information in digital public services	X					X
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	X					X
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES							
17.	Introduce an integrated governance of location information processes at all levels of government, bringing together different governmental and non-	X					X

	governmental actors around a common goal						
18.	Partner effectively to ensure the successful development and exploitation of location data infrastructures	X	X				X
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	X					X

Private Sector Product and Service Entrepreneur

RECOMMENDATIONS		TASKS					
		Insight and definition	Proto-typing and development	Testing and evaluation	Marketing and sales	Deployment	Maintenance and support
POLICY AND STRATEGY ALIGNMENT							
1.	Connect location information and digital government strategies in all legal and policy instruments						
2.	Make location information policy integral to, and aligned with, wider data policy at all levels of government	X	X				
3.	Comply with data protection principles as defined by European and national law when processing location data.						
4.	Make effective use of location-based analysis for evidence-based policy making				X	X	X
5.	Use a standards-based approach in the procurement of location data and related services in line with broader ICT standards-based procurement		X				
DIGITAL GOVERNMENT INTEGRATION							
6.	Identify where digital government services and processes can be modernised and simplified through the application of location-enabled services and implement improvement actions				X		
7.	Use INSPIRE and SDI models, data and services for delivering cross-sector and cross-border digital public services to citizens.	X	X				X

	businesses, government and other parties						
8.	Adopt an open and collaborative methodology to design and improve location-enabled digital public services	X	X	X	X	X	X
9.	Adopt an integrated location-based approach in the collection and analysis of statistics on different topics and at different levels of government	X			X		
STANDARDISATION AND REUSE							
10.	Adopt a common architecture to develop digital government solutions, facilitating the integration of geospatial requirements	X	X		X		
11.	Reuse existing authentic data, data services and relevant technical solutions where possible	X	X		X		
12.	Apply relevant standards to develop a comprehensive approach for spatial data modelling, sharing, and exchange to facilitate integration in digital public services	X	X		X		
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	X	X	X		X	X
RETURN ON INVESTMENT							
14.	Apply a consistent and systematic approach to monitoring the performance of their location information activities						
15.	Communicate the benefits of integrating and using location information in digital public services						
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	X	X	X	X	X	X
GOVERNANCE, PARTNERSHIPS AND CAPABILITIES							
17.	Introduce an integrated governance of location information processes at all levels of government, bringing together different governmental and non-	X			X		

	governmental actors around a common goal						
18.	Effective partnering is key to the successful development and exploitation of location data infrastructures	X			X		
19.	Invest in communications and skills to ensure sufficient awareness and capabilities to drive through improvements in the use of location information in digital public services and support growth opportunities	X					

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