Towards a Map of Open SDI/INSPIRE
Workshop Report

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Towards a Map of Open SDI/INSPIRE

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Workshop Report

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TU Delft

1. Introduction

1. Introduction: about the workshop

Learning objectives

1. Understand the different components of the Open SDI/INSPIRE concept, i.e. multiple ways of making an SDI/INSPIRE more open
2. Analyse the status of Open SDI/INSPIRE in your own country and in Europe in general
3. Consider examples of best practices of Open SDI/INSPIRE
4. Identify the main challenges in making NSDIs and INSPIRE more open

Background

In the search for the ideal spatial data infrastructure a common ground has been established for the development of open spatial data infrastructures. Starting from confidential, highly restricted data with use limited to particular public sector users, SDIs across Europe have developed towards a wider focus, civil society oriented infrastructure enabling a multitude of users to access, share, use and re-use datasets and services from a wide variety of domains both nationally and internationally. Especially in recent years, several countries and public administrations started to make a shift towards the establishment of an open spatial data infrastructures (SDIs), in which also businesses, citizens and non-governmental actors were considered as key stake-holders of the infrastructure. In this workshop, the concept of Open SDI/INSPIRE was introduced to describe characterize the development and implementation of more open spatial data infrastructures. During the workshop a first prototype of the 'Map of Open SDI in Europe' was presented, showing the results of a first exploration of the openness of NSDI/INSPIRE implementation in Europe.

The 'Map of Open SDI in Europe', a project of the Knowledge Centre Open Data of Delft University of Technology, is developed to provide SDI decision makers, practitioners and researchers with a more comprehensive understanding of the openness of spatial data infrastructures in Europe. The Map covers three key dimensions of Open SDIs: the readiness, the data availability and accessibility, the use of spatial data and the associated benefits. The map provides an overview of the actions and initiatives taken in different Member States to open their SDI to stakeholders outside the public sector. During the workshop, several brainstorm sessions were organized on each of the key dimensions of Open SDIs. The aim of these brainstorm sessions was to collect ideas on how to measure and assess each of the four dimensions and explore good practices that could be added to the Map. The results of the workshops were used to update and improve the Map of Open SDI in Europe, making it a highly relevant and practical tool that shows the status of Open SDIs in Europe and supports decision makers and practitioners in making their own SDI more open

1. Introduction: the Open SDI concept

While spatial data infrastructures (SDIs) already exist for many years, technological, institutional and societal developments have caused them to **shift towards more open SDIs in which also businesses, citizens and other non-governmental actors are considered as key stakeholders of the infrastructure** (Vancauwenberghe and van Loenen, 2018). The development and implementation of an open SDI is not only about opening geographic data, but also about organizing and governing the infrastructure in an open manner, enabling and stimulating the participation of non-government actors. Also other approaches for describing and defining Open SDIs exist: Open SDI can be considered as the application of open government principles to the development and implementation of SDIs, as the emergence of a new generation of spatial data infrastructures and/or as the creation of an open spatial data ecosystem, in which spatial data of different stakeholders (government, business, citizens) are commonly shared and used.

In the past 20 years a broad range of SDI assessment frameworks has been developed and implemented by SDI researchers and practitioners (e.g Crompvoets et al, 2008). While these frameworks address various aspects and components of SDIs, none of them has investigated the openness of SDIs and little is known about the extent to which existing SDIs can be considered as open. Around ten years ago, governments started setting up open data initiatives, and assessment frameworks were developed and applied to support and monitor the implementation of these initiatives. Since the introduction of the Socrata Open Government Data Benchmark in the U.S. in 2010, many other open data assessment frameworks have been developed and implemented, including the well-known Global Open Data Index (OpenKnowledge International, 2017) and the Open Data Barometer (World Wide Web Foundation, 2017). Most of these frameworks have a strong focus on the openness of the data and of the infrastructure, and thus provide a foundation and inspiration for the development of an assessment framework for Open SDIs.

During the workshop, **the Open SDI Assessment Framework was be introduced as an approach for assessing the openness of spatial data infrastructures**. The framework builds further on existing approaches for assessing SDIs and open data, but particularly focuses on the openness of SDIs. To demonstrate the relevance and applicability of the Open SDI Assessment Framework, the framework was used to create of Map of Open SDI in Europe, which shows the level of openness of national SDIs in Europe. During the workshops, the first results of the Map of Open SDI were be presented. Prior to the presentation of the Open SDI Assessment Framework and the results of the Map of Open SDI, three experts from three different countries (Finland, Italy and Spain) presented their view on the Open SDI concept.

1. Introduction: the Open SDI concept

At the end of the introductory presentation, the workshop participants were asked to provide their view on and definition of the concept Open SDI. The figure below gives an overview of all definitions provided by the participants (via an online tool).

These answers and definitions provided can be divided into three categories, which also form the starting point for our assessment framework for assessing the openness of European NSDIs:

- **Readiness:** technological and non-technological components allowing also non-government actors to participate in and contribute to the governance and implementation of INSPIRE
- **Data/implementation:** the availability and accessibility of spatial data (and services) to all types of users, including businesses, citizens, research, non-profit organizations, etc.
- **Impact:** the use of spatial data (and services) by non-government users and the benefits realized through this use

2. Experts' presentations

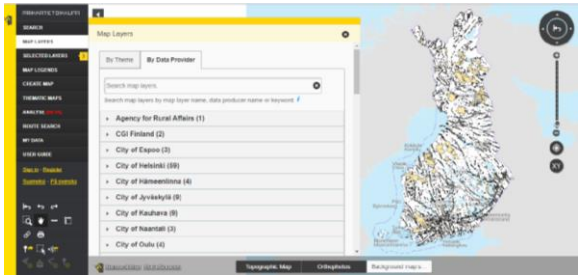
2.1 Openness of the Finish SDI

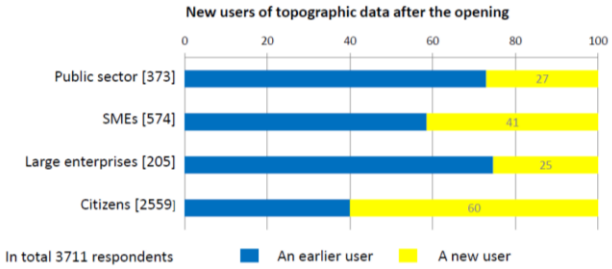
Jaana Mäkelä (Spatineo)

In 2012 the Finnish Government's took a **decision in principle of open public data**, aiming to improve the availability of public data and enhance the reuse. In the budget negotiations the Ministry of Finance required a plan for opening of data from each state organization. The first Open Data Programme ran from May 2013 to June 2015, eliminating various obstacles to the re-use of public data and creating the preconditions for open data within the public administration. The latest government program for open data (2015-2020) especially highlighted the re-use of open data in business.

Among the **pioneers of open data** in Finland are the Finnish Environment Institute, the Finnish Transport Agency and the Finnish Meteorological Institute. The Finnish Environment Institute opened its spatial databases in 2008, which caused an enormous increase in data downloads between 2007 and 2010. Already in 2005, the Finnish Transport Agency opened Digiroad, the road and street information database. The Finnish Meteorological offers software that is used in the production, processing and distribution of weather and environment data as open source code.

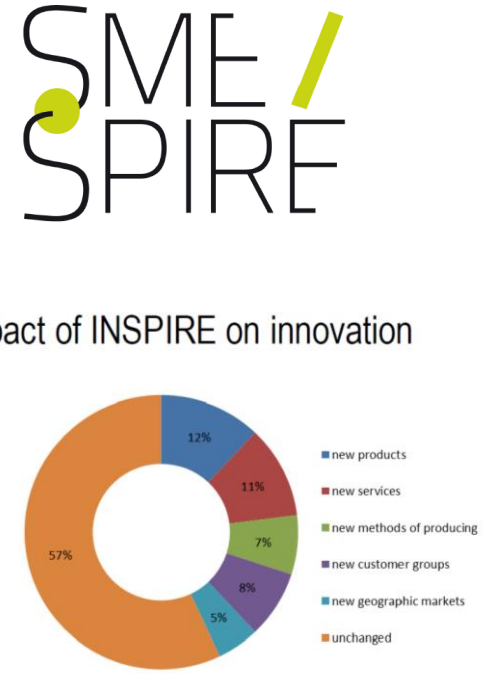
Spatial data is an important element in Finland's open data agenda. While the national geoportal provides access to many open INSPIRE services, open spatial datasets can also be found from the National Open Data Portal. In a recent inventory of INSPIRE data and services as part of the Spatial Data Policy Report to the Parliament, 365 different datasets were identified, of which 229 are open. In 2013, a study was undertaken on the effects of open topographic data in Finland. This study demonstrated that opening of topographic data in Finland has encouraged relatively more new users in SMEs (41%) and among citizens (60 %). Several new and innovative tools based on open spatial data can be seen in Finland. As the cooperative body for companies in GEO-ICT business, the Finnish Location Information Cluster aims to encourage businesses in the geo-information domain.





2.2 The smeSpire experience

Giacomo Martirano (Epsilon Italia)



SmeSpire was an FP7 Support Action aiming to turn the challenges of the INSPIRE implementation into business opportunities for the geo-ICT European SMEs. The project ran from May 2012 until the end if April 2014. As part of the project, a study was undertaken of the Geo-ICT sector in Europe. This study was the first study about Geo-ICT private sector at European level, providing an in-depth analysis and comparison between private companies and how they relate to INSPIRE Directive and characterizing obstacles for Geo-ICT companies to enter this market.The study showed that the majority of companies in this sector can be considered as SMEs and demonstrated the impact of the European INSPIRE Directive on the sector. Around 43% of the European geo-ICT companies indicated that INSPIRE had an impact on its turnover and on the products and services provided. One of the main conclusions of the study was that the availability of public sector data was one of the biggest hindrances to development by geo-ICT companies, and SMEs in particular.

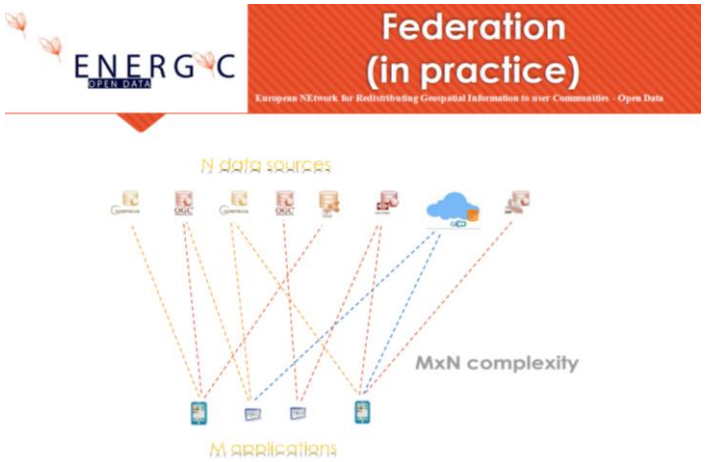
The second part of the presentation introduced **several challenges and open questions** regarding the realization of Open SDIs in Europe. The impact of INSPIRE in realizing a more Open SDI should be further explored. Also new collaborative frameworks for enabling collaboration between public and private actors require further attention and should be investigated. Finally, the presentation also addressed the importance of public procurement as a driver of innovation in both SMEs and public services.

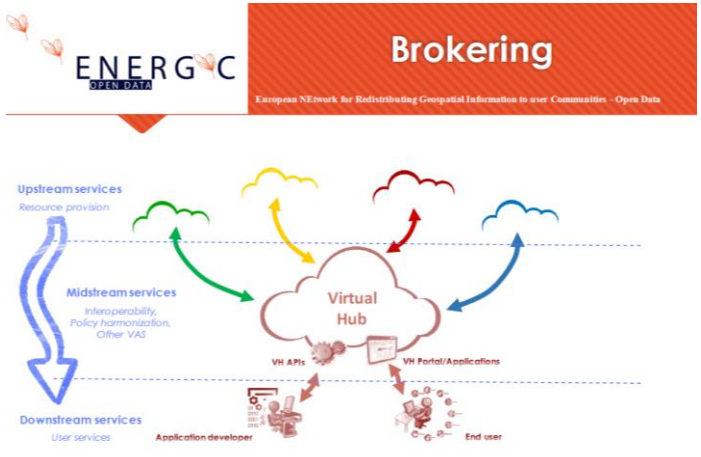
2.3 Virtual Hubs for Facilitating access to Geospatial Open Data in Open SDI

Francisco J. López Pellicer (University of Zaragoza)

Interoperability and usability are two key aspects in determining the re-use of geodata, and many of the technical barriers to re-use are related to these two aspects. Geodata are highly heterogenous, in terms of (meta)data models and formats, coordinate reference systems, data services specifications, quality and reliability and semantics. Complex user interfaces, metadata, data models and encodings strongly affect the usability of geodata.

In the presentation, a comparison is provided of two alternative technical approaches: **the federation approach and the brokering approach**. In the federation approach, of which INSPIRE is an example, there is a strong mandate for imposing and enforcing the adoption of a common specification. In the brokering approach, no common specification is defined, but specific components (brokers) mediates and harmonizes existing systems. The broker acts as a hub for publishing, discovering and accessing open data.





The final part of the presentation introduced and discussed several insights on open SDI from a technical perspective. Openness requires that domain complexity is hidden, while spatial should not be special to non geo-developers. Elements that can contribute to this include widespread geospatial specifications (e.g. OGC and ISO), lightweight specifications (e.g. OpenSearch), and APIs focused for rapid implementation in JS. It was concluded that legally open data that are not technically usable are closed data in practice.

3. Map of Open SDI

3. Map of Open SDI/INSPIRE

Open SDI Assessment Framework

According to Davies (2013) open data assessments can be divided into **three assessment categories**: (1) readiness assessments, (2) implementation or data assessments, and (3) impact assessments. Readiness assessments analyse whether the conditions in public administrations are appropriate and necessary components are in place for opening open government data. Implementation or Data assessments evaluate whether data actually are available and open. Impact assessments explore to what extent open data initiatives lead to benefits to government, citizens, business and society in general. As an example of an overarching open data assessment, the Open Data Barometer integrates these three types of assessments and assesses the readiness, implementation and impact of open government data initiatives. Since our aim was to assess the different aspects of Open SDIs in a complete and accurate manner, our Open Open SDI Assessment Framework follows the example of the Open Data Barometer and also identifies three key dimensions of Open SDIs: Readiness, Data and Impact.

- The **Readiness dimension** focuses on the development and implementation of the SDI, and assesses the involvement of non-government actors in developing and implementing SDIs. Non-government actors can be involved in both the governance and implementation of the SDI, and various instruments could support or enable this involvement: a national vision or strategy on open geographic data or on opening the SDI, a government-wide open data policy for all geographic data or a governance structure in which also non-government actors are represented. An open SDI also means that non-government actors could add their data to the SDI, making it an infrastructure for sharing all types of geographic data, including government data, business data, citizen data and research data.
- The **Data dimension** deals with the availability and accessibility of geographic data to different types of users including businesses, citizens, non-profit organizations and other users within and outside public administration. The Data dimension adds some other requirements to geographic data, in addition to more traditional requirements such as metadata availability, and accessibility through discovery, view and download services. Users should be able to easily find the data they need, via generic web search services or national data portals. Other important features or characteristics of data in an Open SDI can be derived from the open government data principles and existing open data assessments: geographic data should be publicly available, free of charge and openly licensed.
- The **Impact dimension** focuses on the benefits for businesses, citizens, non-profit organizations and other actors of using geographic data. In order to realize these benefits, also non-government actors should actually use geographic data to make better decisions, improve their existing processes, products and services or create new products or services. Benefits of - using - open geographic data, at least include three main categories of benefits: increased transparency and public participation, economic growth and innovation but also increased government efficiency and effectiveness.

3. Map of Open SDI

Indicators

Application of the Open SDI Assessment Framework resulted in a Map of Open SDI in Europe. It shows the status of open SDIs in different European countries and the differences within Europe with regard to the openness of national SDIs. Data for the first prototype of the Map of Open SDI were collected by students of the MSc Geomatics of Delft University of Technology. Since data had to be collected in a limited time-span of 4 weeks, only a small set of openness indicators were defined. The evaluators were not professionals of the field nor had expert knowledge about the national SDIs. A first set of indicators covering the three dimensions of open SDIs was used to steer the assessment. An overview of the indicators is given in table 1.

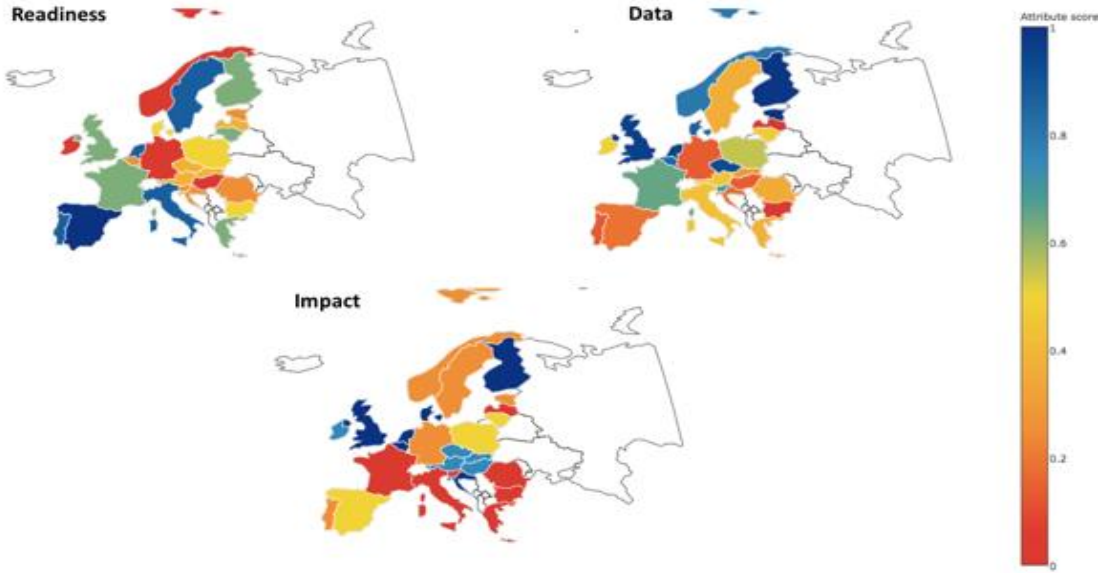
Four openness indicators were defined to measure and assess the readiness of open SDIs. For measuring the availability and accessibility of geographic data, the assessment focused on two high-value geographic datasets: nationwide address data and large-scale topographic data (1:10.000). For both datasets, eight indicators were used to assessed the availability and accessibility. The Impact dimension of Open SDI was assessed through two indicators. For each of these indicators, three levels were distinguished (low, medium, high) for scoring the countries in the assessment.

Dimension	Openness indicator	Description
Readiness	Open vision/strategy	Existence of clear vision and/or strategic document on open geographic data
	Open decision making	Participation of non-government actors in decision making on the SDI
	Open data policy	Existence and implementation of open data policy for all geographic data
	Non-government data	Inclusion of geographic data provided by non-government actors in the SDI
Data *(applied to two datasets)*	Search engine score	Assessment of the easiness to which data could be found back through a web search
	Portals	Publication of the dataset on both the national geoportal and - open - data portal
	Multilangual metadata	Availability of metadata in the national language(s) and in English
	Online available	Data are online available without mandatory registration
	Free of charge	Data are available free of charge, i.e. users don't have to pay for it
	Network services	Accessibility of the data via view and download services
	Open license	Release of the data under an open and international interoperable license
	Level of interoperability	Data published using open standards and open formats
Impact	Use	Number of use cases of non-government actors using open geographic data
	Benefits	Existence of studies showing the benefits of open geographic data

3. Map of Open SDI

Results – Overview of the Map of Open SDI and its three dimensions

The figure below shows the first prototype of the Map of Open SDI in Europe, based on preliminary data as collected by the students, which afterwards were validated by the main researchers. This resulted in a full overview of the 28 EU member states and Norway. It should be noted that the prototype was only used to introduce the rationale and approach behind the Open SDI Assessment Framework, since the process of validating the data was still ongoing and the preliminary data contained some missing and incorrect values. Figure 1 shows how the Open SDI Assessment Framework allows comparing countries with regard to the openness of their SDI.

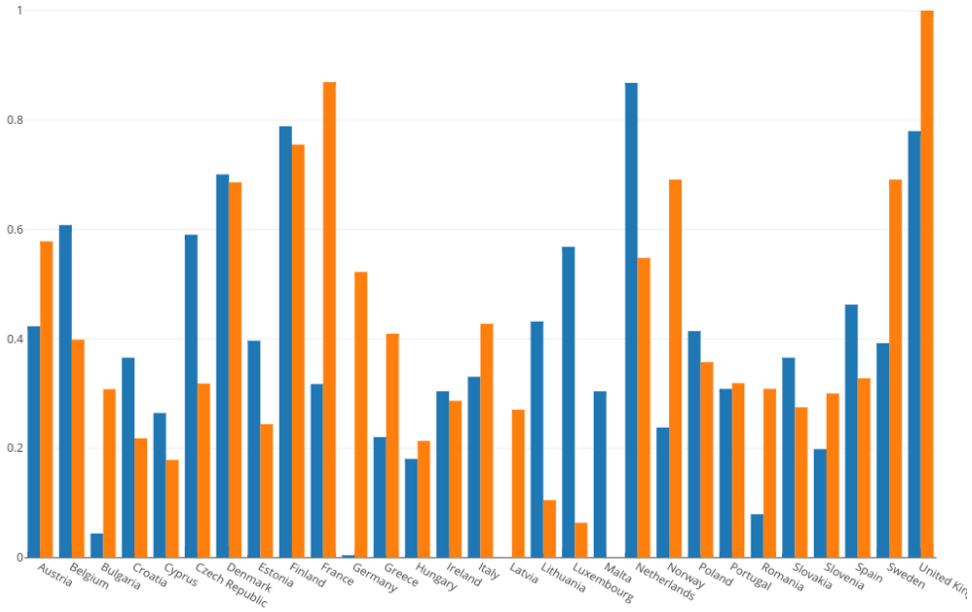


The figure shows three separate maps, representing the Readiness dimension, the Data dimension and the Impact dimension. The maps not only show the differences between countries, but also how the situation within one country can be different for these three dimensions. While in some countries the national SDI can be considered to be open with regard to all three dimensions (e.g. Finland, the Netherlands, the United Kingdom), other countries are especially doing well with regard to one single dimension (e.g. Estonia with its high score on the Data dimension). Since the Open SDI Assessment Framework collects data and assesses all three dimensions, it could also be used for analysing the linkages and relationships between the different dimensions. To what extent does the readiness of an Open SDI affect the availability and accessibility of open geographic data? And will an Open SDI only have an impact once it is fully ready and geographic data are available and accessible to all stakeholder groups? The Open SDI Assessment Framework will help us to find an answer to these key questions.

3. Map of Open SDI

Results – Comparison of results of the Open SDI assessment and Open data assessment

Another application of the Open SDI Assessment Framework is demonstrated in Figure 2, in which the scoring of the Openness of the SDI is compared with the scoring of the status of open data. The 'open SDI' scoring aggregates the scores on all three dimensions (readiness, data and impact). The 'open data' scoring presented in Figure 2 is based on an aggregation of the most recent results of the Global Open Data Index (OpenKnowledge International, 2017), the Open Data Barometer (World Wide Web Foundation, 2017) and the European Data Portal Maturity Assessment (Capgemini Consulting, 2016).



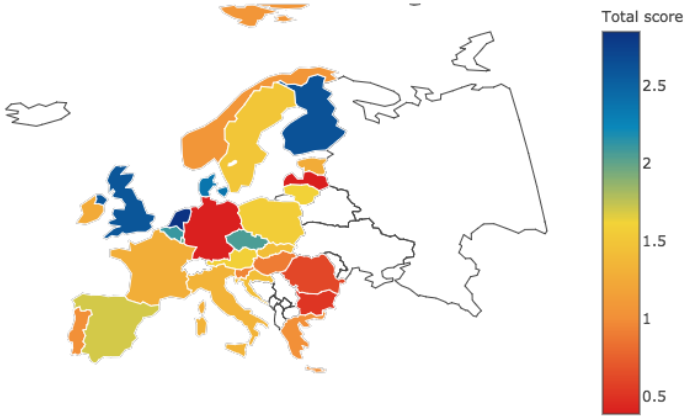
In certain countries both Open SDI and open data appear to be at the same level (e.g. Denmark), in other countries there clearly is a difference in the status of development (e.g., France, the Netherlands). In a similar manner, a comparison could also be made between the status of Open SDI development and the status of SDI development as defined in traditional SDI assessments.

3. Map of Open SDI

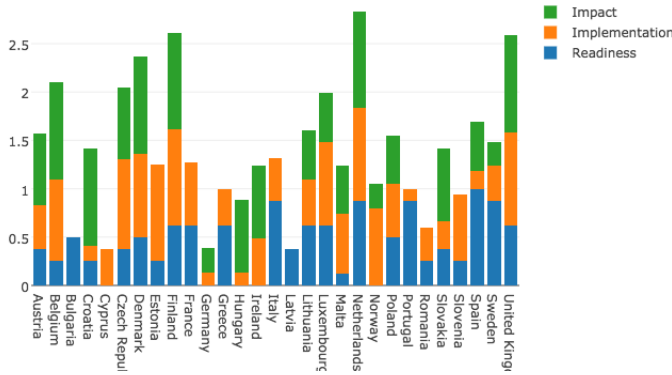
Results – Other aspects of the Map of Open SDI

There are various other applications of the Open SDI Assessment Framework and resulting figures and charts of the Map of Open SDI.

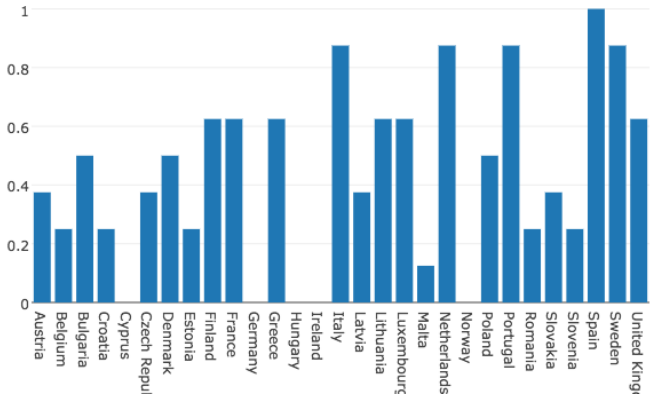
Overall Map of Open SDI



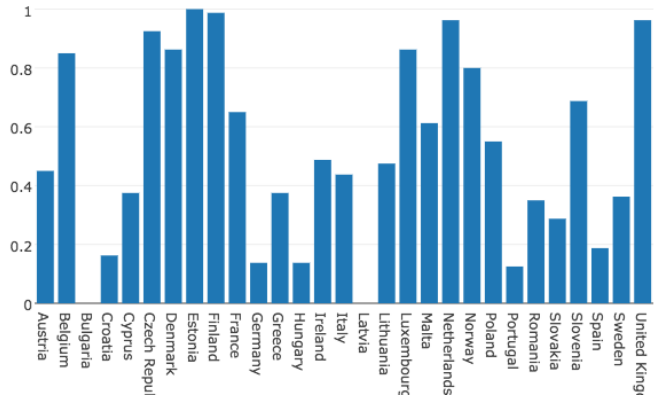
Overall assessment of Open SDI (chart)



Map of Open SDI - Readiness



Map of Open SDI - Data



4. Discussion

4. Discussion

Approach

In the second part of the workshops, several discussion rounds were organised to allow participants to share their view on the Open SDI concept and the way it is assessed in the 'Map of Open SDI' initiative. The discussions were structured around four main topics: Open SDI Readiness, Open SDI Implementation, Open SDI Impact and Open SDI in General. Four each of these topics, a similar set of questions were used for organizing the discussions:

1. **How to measure and analyze?** *What are most important aspects? What are key indicators? What is less relevant?*
2. ***How to collect the information?*** *What is necessary, what is feasible? Which data/information – from other assessments – can be reused?*
3. ***What could/should be next steps?*** *How to ensure – practical – use of results? How to further improve the data and results?*

Results (1)

On Open SDI in general: During the discussion on the framework in general several ideas on how the framework could be improved or extended were raised. Several participants argued that the Open SDI Assessment could also be an interesting tool for measuring changes through time, i.e. past but also ongoing developments towards a more open SDI in a certain country. In addition, the issue of applying weights to the different components and indicators was discussed. In the first prototype of the Map of Open SDI, the three main components were considered to be equally important, and also within each component all indicators had the same importance or weight. Adding weights to the indicators and/or components might be useful to stress the importance of certain indicators or components. It can, for instance, be argued that the Data component of Open SDI is more relevant and important for measuring the openness of an SDI than the Readiness component, which can be expressed by assigning different weights to both components.

Another way of improving the framework and its application is the integration of data from other assessment initiatives. Several existing SDI assessment approaches and tools such as the official INSPIRE Monitoring process (European Commission, 2017) or the Spatineo Monitor (Spatineo, 2017) provide valuable data on the openness of SDIs in Europe. Another suggestion was to integrate the data and results of existing open data assessment initiatives into the Map of Open SDI. Initiatives such as the Global Open Data Index (OpenKnowledge International, 2017) and the Open Data Barometer (World Wide Web Foundation, 2017) assess the availability and accessibility of specific geographic datasets, such as national maps, administrative boundaries, and environmental statistics. Other initiatives, such as the Open Data Impact Map (Open Data for Development Network, 2017), Open Data 500 (OD500 Global Network, 2017) and the European Data Portal, collect open data use cases, which also include use cases of open geographic data. The relevance of these and other existing assessments and how they could be integrated in the Open SDI Assessment should be further explored.

4. Discussion

On Open SDI Readiness: Regarding readiness, the participants uniformly agreed that non-governmental stakeholders are essential for open SDI development. The level of involvement of non-government stakeholders in SDI decision making was considered to be an important indicator of the openness of an SDI. However, it was commented that stakeholders could participate in decision making on the SDI in many different manners. At a more operational level, geographic data users could provide input or interact via the national (geo)portal through data ratings, allowing them to rate the quality of the particular datasets, data requests for governments to publish a dataset that is not available yet and/or feedback systems on the open data operation in general. At a more strategic level, a decision making structure could be put in place in which non-government actors are represented in the central decision making body, in an advisory council, a coordination unit and/or in working groups focused on a particular topic or domain. These examples illustrate that the subject of whom to involve in SDI development and how to do that is not straightforward. The indicator on the involvement of non-government actors in SDI decision making should be further discussed and refined.

On Open SDI Implementation: The Open SDI Implementation discussions focused on the data access and data dissemination. Since the prototype of the Map of Open SDI in Europe only assessed two types of geographic data, i.e. nationwide address data and topographic data 1:10,000, the commonly proposed manner to improve the framework was to include additional datasets. Some datasets suggested by the workshop participants were orthoimagery data, land cover data and elevation data. In addition to new datasets or data categories, new indicators assessing particular properties of the dataset were suggested. Especially the quality of the data was considered to be important, and indicators could be added on the timeliness and actuality of the data or the completeness of the data. In addition, the nationwide criterion of the datasets was questioned. Some federated countries only had the address and topographic data available at the local level (e.g. Germany at the Laender levels). The local datasets are available, some even as open data, but not as a single dataset at the national level. The indicator should take this into account. Another suggestion made by several experts was to not only focus the assessment on particular datasets, but also to assess the portal(s) through which the data are made available. Proposed indicators to do this are the availability of an Application Programming Interface (API), the presence of feedback mechanisms for rating or prioritizing datasets or a general scoring of the easiness to find datasets via a certain portal.

On Open SDI Impact: In the Map of Open SDI in Europe the impact of Open SDIs was assessed using two indicators: the existence of use cases of non-government actors using geographic data and the existence of studies showing the benefits of open geographic data. The workshop participants generally agreed that the Impact dimension of Open SDI was the most difficult to assess. Even national practitioners and experts are still struggling to measure the use of the open geographic data and benefits achieved through open geographic data within their own country. Currently, information on the use and impact of open geographic data are collected through web statistics (e.g. number of visitors and number of downloads), the organization of feedback meetings and events with users and developers and case studies of particular success stories (business cases). While each of these instruments and approaches provide some more insight into the use and benefits of open geographic data, a complete and correct view on and assessment of the impact is still missing. Benefits of open geographic data for the public sector itself are relatively easy to identify and estimate, but measuring the wider socio-economic benefits in a systematic and comparable manner proves to be a challenge. Since approaches to assess and compare the impact of open geographic data across multiple countries still lack, the Map of Open SDI could contribute by collecting information on existing approaches for measuring both the use of open geographic data and studying the benefits of open geographic data.

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