UN-GGIM EUROPE

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INFORMATION MANAGEMENT

UN-GGIM: Europe Work Group on Data Integration

Report on tasks B2.2 and B2.3 "The methods of implementing the prioritised combinations of data: Provide best practice guidance to the interactions between NMCAs/NSIs/Environmental Agencies and other relevant organisations. Review current use of data from multiple sources to identify case studies and best practices relevant for combinations with core data."

Content

1. Executive Summary

This report contributes towards UN-GGIM: Europe's Work Group B on Data Integration. It forms the second output for the work of WGB.2 "Recommendations for methods implementing the prioritised combinations of data".

The aim of this report is to review existing models of engagement and cooperation between European National Mapping and Cadastral Agencies (NMCA's) and National Statistical Institutes (NSI), and to provide a number of outcomes which may provide the basis for closer cooperation and working across the separate national organisations.

European Member States were invited to participate in several forums and were given the opportunity to add their own countries good practice case study to the report. Given that this topic is not only an issue across European organisation, several case studies were also considered from New Zealand, Mexico, and the United States of America. A total of 11 studies were used to collate this report.

The Working Group acknowledged that this sub-theme aligns with the overarching vision for UN-GGIM, as a forum to liaise and coordinate within and between UN Member States and international organisations. Due to the different formats in which the case studies were received, the full case studies have not been included within this report, Annexe A will contain a short summary of the case study. Member States will be requested to formalise the case studies and upload them to the UN-GGIM Knowledge Base[1].

2. Background, acknowledgements, and disclaimers

The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) is the global forum for discussion, promotion, sharing of knowledge and good practice, and setting the global agenda relating to geospatial information. It provides a forum to liaise and coordinate among and between Member States and international organisations.

To align the strategic aims of UN-GGIM, regional committees have been set up to best serve the needs of different regions of the world. The regional committee UN-GGIM: Europe was established on 1 October 2014. Its work plan mainly focuses on two issues: increasing data interoperability and harmonization by proposing core geospatial data and enabling the integration of geospatial data with other information/data (statistical, environmental, etc.) to foster further usage.

Germany chairs Work Group B "Data Integration". It is common understanding that Work Group B envisages a global vision with the focus on Europe for all tasks / deliverables. Strategic and political papers for "evidence based decision making" are needed rather than technical ones.

Following a consultative period, Work Group B set out its first work plan. Work Group B will supply three deliverables for three main tasks 1-3:

[1] http://ggim.un.org/knowledgebase/Knowledgebase.aspx

1. Definition of the priority user needs for combinations of data.
2. Recommendation for methods implementing the prioritised combinations of data.
3. Recommendation about how to manage side-effects induced by data combinations.

WG B decided to distribute the work to three subgroups B1, B2 and B3, one for each task.

This report relates to B.2 the United Kingdom, represented by Ordnance Survey was asked to lead this task. B.2 has been split into three sub-task that deal with key success factors for achieving effective data integration:

1. Review current European Interoperability Frameworks and geospatial and statistical integration projects regarding methods of combinations of data.
2. Provide best practice guidance to the interactions between NMCAs/NSIs/Environmental Agencies and other relevant organisations[2].
3. Review current use of data from multiple sources to identify case studies and best practices relevant for combinations with core data.

A wide range of national mapping, cadastral, and statistical agencies have contributed to the final version of this report. These contributions have been in the form of physical meeting, telephone conference, and email exchanges. At the closure of this report NMCA and NSIs from a wide variety of European Member States as well as representatives from European Commission (Eurostat/JRC) have provided valuable input into the report. A full list of contributors can be found in Annexe B. All the contributors are thanked for their contributions during the project, the full reports of B2 should help contributing organisations to provide case studies and evidence bases to their governments to promote the use of geospatial and statistical information for informed decision making.

Although there is no formal overlap with the objectives and finding of the UN-GGIM Working Group on National Institutional Arrangements (NIA), this report does consider similar topics, the report could be considered by the NIA Working Group as part of its research base.

In providing this report to the UN-GGIM: Europe Executive Committee sub-group B.2 discharges these actions.

3. Introduction

The topic ”Recommendations for methods of implementing the prioritised combinations of data” was initially discussed during the exploratory and initiation phases for the set-up of UN-GGIM: Europe. It was decided that there are, and have been, really good examples of how National Mapping and Cadastral Agencies have collaborated with National Statistical Institutes to provide better, more stream-lined and effective services, data and solutions for both the consumer and governments. Many of these examples can be found in the report from Work Group B.1. on priority user needs. Based on

[2] Whilst Environmental Agencies were in the initial scope for the report, lack of representation on the Working Group meant they have been excluded from the analysis.

the findings of this subgroup the following key drivers for effective data integration have been identified:

- Interoperability of data and data infrastructures.
- Cooperation between data producers and data users.
- Effective data integration methods in a production environment.

This specific work group has been asked to:

- Task B.2.1 – Review current European interoperability frameworks and geospatial, statistical and other thematic data integration projects regarding methods for combinations of data. The findings of this report can be found in the published document entitled *Report on sub-task B2.1 "The methods of implementing the prioritised combinations of data: Review of current European Interoperability Frameworks and geospatial and statistical integration projects regarding methods of combinations of data".*
- Task B.2.2 – Provide best practice guidance to the interaction between NMCAs, NSIs, environmental agencies and other relevant organisations.
- Task B.2.3 – Review current use of data from multiple sources (crowd-sourcing, community sourcing, and regulatory geospatial representations) to identify case studies and best practices relevant for combinations with core data.

During the compilation of the case studies to inform the work of task B.2.2 and B.2.3 it became apparent that there are many overlaps in the documentation and that the case studies often dealt with both aspects. As a result it was decided that this report should focus on presenting good practices from different national and institutional contexts and bring them together into one report. The aim of the report should be to look at some of the underlying reasons why organisations work together within individual countries, but also looks at the benefits that can be realised when working at a regional level.

4. What is 'good practice'?

4.1 Definition of 'good practice'

For this report, the working group has not sought to provide a fixed definition of the term good practice, as we believe that although most contributors will have their own variation of the terminology, they will all follow the same guiding principles. It was for this reason that the working group decided that there was no requirement to redefine the meaning of the term good practice. The only concession we have made to the task set out is to use the terminology "good practice" rather than "best practice" it was commented on that best practice requires the judgment of one example of good practice being better than another. This was felt to be an unnecessary level of bureaucracy and, considering the information from FAO (below), an unnecessary level of detail.

To inform the reader of the report, the definition provided by the Food and Agriculture Organisation of the United Nations (FAO)[3] and used by them as a template to collect and publish good practice case studies can be applied in this context:

> A good practice is not only a practice that is good, but a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it.

The same FAO report sets out criteria for determining whether a practice can be determined "good practice". The practice should be:

- **Effective and successful:**
  A "good practice" has proven its strategic relevance as the most effective way in achieving a specific objective; it has been successfully adopted and has had a positive impact on individuals and/or communities.
- **Environmentally, economically and socially sustainable:**
  A "good practice" meets current needs, in particular the essential needs of the world's poorest, without compromising the ability to address future needs.
- **Gender sensitive:**
  A description of the practice must show how actors, men and women, involved in the process, were able to improve their livelihoods.
- **Technically feasible:**
  Technical feasibility is the basis of a "good practice". It is easy to learn and to implement.
- **Inherently participatory:**
  Participatory approaches are essential as they support a joint sense of ownership of decisions and actions.
- **Replicable and adaptable:**
  A "good practice" should have the potential for replication and should therefore be adaptable to similar objectives in varying situations.
- **Reducing disaster/crisis risks, if applicable:**
  A "good practice" contributes to disaster/crisis risks reduction for resilience.

The UN-GGIM Committee of Experts set up a working group in 2012, to look at the *Development of a shared statement of principles on the management of geospatial information*[4]. The working group presented their finalised report to the Committee of Experts in 2014. Contained within the report was the principle:

[3] From: http://www.fao.org/3/a-ap784e.pdf

[4] http://ggim.un.org/UN_GGIM_wg2.html

Standards of service: employ geospatial information management best practices and solution, and pursue excellence in the delivery of geospatial data and services. Appropriate access, fairness and equity are to be accorded to all stakeholders[5].

5. Good practice Case Studies

5.1 Scope of research

The initial research was limited to European Member States who were members of UN-GGIM: Europe, however, it became apparent that there are many examples of good practice happening in other UN-GGIM regions. A selection of these have been made available for this report and are included in the documentation.

It was also discussed and agreed that a lot of good practice and information sharing took place during conferences and events. For instance, several members of the work group took part in, or were represented at the European Forum for Geography and Statistics. During the 2015 conference, there were several papers, and presentations which discussed the topics of linking geospatial, statistical and other sources of information, the authors of these papers were contacted and have provided examples to cover the sub-tasks B.2.3.

There was also a recognition that good practice does not have to be limited to technical peer-to-peer practices, but also includes sharing of practices at a Governmental level, several of the case studies reflect this.

5.2 Good practice case studies received

All members of UN-GGIM: Europe subgroup B.2 were asked to provide case studies demonstrating how national mapping and statistical agencies work together. To support and enhance the case studies from Europe, several case studies have been identified and provided from other UN-GGIM Regions. The table below gives an overview of the case studies received. Each case study is also presented as in summary form later in the Annexes.

B2.2 Examples	B2.3 Examples	Global supporting case studies
Istituto Nacional des Estatística (INE) and Direção-Geral do Território (DGT), Portugal	Slovenia (statistics and mobile data)	INEGI, Mexico
Turkey National GIS TRGIS, Turkey	Germany (Address and statistical reference areas)	Statistics New Zealand, New Zealand

[5] http://ggim.un.org/docs/meetings/GGIM5/E-C20-2015-10%20Statement%20of%20Shared%20Principles%20Report.pdf

Federal Statistical Office (FSO) and Federal Agency for Cartography and Geodesy (BKG), Germany		US Census Bureau, United States of America
Cadastre, Land Registry and Mapping Agency (Kadaster) and Statistics Netherlands (CBS), Netherlands		
Statistics Sweden and Lantmäteriet, Sweden		
Spanish Statistical Office and Spanish General Directorate for Cadastre, Spain		
Office for National Statistics (ONS) and Ordnance Survey (OS), United Kingdom		
Spatial Statistics on Web, Finland		

6 Findings and conclusions

The findings from this project can be linked to four over-arching themes that cover the main advantages for organisations to collaborate and work together. The four themes include:

1. Funding constraints – leading to the need for organizational efficiencies
2. The challenge of open data – exploring of options
3. Conditions for effectively using data
4. The need for authoritative data to be used by a variety of government sources

6.1 Theme 1: Funding constraints– leading to the need for organisational efficiencies.

Across many European Member States, continued pressures by national governments to reduce public sector funding are having a growing impact on both National Mapping and Cadastral Agencies and National Statistical Institutes. This has been particularly noticeable during the widespread government austerity measures that followed the financial crisis of 2008. The need to reduce capital expenditure

has provided an opportunity for NMCAs and NSIs to work together to provide better services to citizens, and governments alike.

As identified in a 2013 Joint Research Centre report on the *Status of INSPIRE in the Balkan Countries*[6], the funding of National Spatial Data Infrastructures (NSDIs) appears to be a great challenge in these countries, which is further complicated by the current economic and financial crisis[7]. Most frequently the financial support is provided by the state budget. Significant contribution is coming from donations and bank loans. The latter mainly comes from the World Bank. Specific projects are financed by donors from EU countries, from Norway, USA and Japan. The external sources are complemented by own incomes, e.g. by charging fees for spatial data and services. Because of the crisis the business models of NMCAs has started to change, which is expressed in increasing self-financing and decreasing budgetary support.

The increasing economic pressure within the Public Sector results in having to provide an improved service, often with reduced levels of staff, based on organisational reforms, and new technology applied. This Public Sector reform has led to the need for greater collaborations between government agencies. In many countries, the National Mapping and Cadastre Agencies (NMCAs) are affected by these reforms, and some are attempting to address these reforms through the increased sharing of data, and promising initiatives on inter-institutional processes optimizing on collecting and dissemination of data[8].

6.1.1 Key messages from the case studies

The development and maintenance of National Spatial Data Infrastructures have allowed counties to identify and start to respond to the diverse and varying needs of government stakeholders. For example, the development of the National Spatial Data Infrastructure in Turkey was started by the Turkish Government in 2004, however it was not until the establishment of the General Directorate of GIS, in 2011, that a national GIS strategy and associated legislative framework was considered. The "Turkey National GIS" (TRGIS) has developed a contextual model based on INSPIRE and ISO/TC211 standards, and has analyzed the requirements at a national level for 15 different Ministries, 86 General Directorate, 88 Departments and 118 Branches. Although not explicitly stated, the process of defining and implement a National SDI has meant the geographical data produced by different institutional stakeholders (and the GI applications used within the decision-making process) has created a structure which avoids information loss. This also reduces the duplication in time and effort required which has the net effect of implementing TRGIS and producing operational efficiencies.

Similar operational efficiencies are discussed in the case studies from Sweden and Great Britain through the Geodata Cooperation Agreement, and the Public Sector Mapping Agreement respectively.

The Swedish Geodata Cooperation Agreement was put in place in 2011, in part to fulfil the INSPIRE data sharing objectives. The Cooperation Agreement covers bodies that have a responsibility for handling information according to the Swedish Act and Ordinance on Spatial Information. As well as

[6] http://inspire.ec.europa.eu/documents/INSPIRE_/JRC86293_2013_Report_NSDI_Balkan.pdf

[7] It may be worth noting that this report does cover a small group of countries, who were already facing financial constraints before the financial crisis of 2008.

[8] https://www.fig.net/resources/proceedings/fig_proceedings/fig2006/papers/ts52/ts52_02_muggenhuber_0766.pdf

handling the organization, steering and coordination responsibilities, the Cooperation Agreement allows parties to offer each other their spatial data for official use for an annual fee. This data sharing agreement is a cost-effective way for the public sector to use high-quality data for a wide variety of tasks. There is also an added benefit that having the data available, under a single public sector agreement, makes it easier to derive private sector benefits as well. On a practical side, a partner signs one agreement (easier licensing conditions) and pays one fee, and gains access to over 400 geodata products from 19 public data providers. The collective negotiations contained within the Swedish Geodata Cooperation Agreement did mean that for some organizations the annual fee for using the data was higher than previously paid, however with access to new sources of information, and high-quality data than previously received it was decided that the data was worth the investment.

Great Britain has a similar collective agreement, the Public Sector Mapping Agreement (PSMA) is a collective agreement between Ordnance Survey (OS), as GB's national geospatial agency, and the English and Welsh Governments. It differs from the Swedish Geodata Cooperation Agreement in the fact that it is a centrally negotiated agreement, where central government pays OS an agreed annual fee, and all Public Sector organizations in GB, from Central Government Departments to local Town councils, can all access the geospatial data under one PSMA Licence, and free-at-the-point-of-use for those signed up to the agreement. Currently over 4 000 different organizations are using the service to access the OS geospatial data. The PSMA Agreement delivers significant efficiency savings and improvements in public service delivery for the benefit of citizens and businesses, this includes delivering increased value for money by encouraging the effective use of geographic information.

6.1.2 Similarities: What are the areas of similarity between the case studies?

- Collective Agreements provide high-quality data to a wider range of users.
- The development of a SDI allows countries to provide data for a range of uses.
- Decision-making needs a reliable foundation; i.e. authoritative statistics usually needs authoritative geospatial information.

6.2 Theme 2: The challenge of open data – exploring of options.

Amongst the recommendations proposed by UN-GGIM: Europe Work Group B for the combination of geospatial data with statistical data, the group states that the content (geospatial data and services) should be accessible to all stakeholders (authorities).

It has been suggested that open geospatial data will help to achieve efficiency gains between public administrations (for example statistical-geospatial-environmental). Geospatial open data provides the potential for re-use in new products and services; also, having more data openly available has the potential to discover new and innovative solutions and fostering participation of citizens in political and social life and increasing transparency of government.

The European Commission supports Open Data as a part of the Digital Agenda for Europe - a Europe 2020 Initiative. The Commission's work around open data is focusing on generating value through re-use of government data. That is all the information that public bodies produce, collect or pay for. And, the Commission always points out as examples of data for re-use: **geospatial information, statistics**, weather data, and data from publicly funded research projects.

The European Union introduced several legal instruments to stimulate the provision of data. The most prominent instrument is Directive 2003/98/EC on the re-use of public sector information (PSI Directive) and the INSPIRE Directive 2007/2/EC establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) that in its Policy Principle No. 11 of the INSPIRE Data Policy and Legal Issues Position Paper states "The unimpeded flow of data and information between (a) the Commission and Member States, (b) Member States, (c) local authorities and (d) members of the public shall be assured."

Combined with the requirement for an unimpeded flow of data and information, the protection of individuals regarding the processing of personal data and on the free movement of such data is needed. Therefore, a regulation of the European parliament and of the council is an essential step to strengthen citizens´ fundamental rights in the digital age While the Regulation will enter into force on 24 May 2016, it shall apply from 25 May 2018. The Directive enters into force on 5 May 2016 and EU Member States have to transpose it into their national law by 6 May 2018. This single law delivers the fundamental right to data protection whenever personal data is used by criminal law enforcement authorities. It will facilitate cross-border cooperation in the fight against crime and terrorism[9].

Another viewpoint has to be added for the provision of open data and services: the security of networks and information. These topics dealing with cyber threads, data protection or privacy enhancing technologies are considered by the European Union Agency for Network and Information Security (ENISA)[10].

6.2.1 State of play in Europe

In recent years, national governments and NMCAs have made big efforts to offer geospatial information as open data. But there are still several main problems that make it difficult for the agencies to offer their data as **free and open data**[11]:

1. Many NMCAs are supported economically with revenue from their data and services, and the current trend for national governments is to restrict public expenses, which makes it difficult for governments to fund NMCAs to open their data.
2. There are legal barriers that in some cases are preventing data from being published or there are licenses and contracts not enough transparent and very bureaucratic.
3. Data protection legislation needs a common approach.
4. Information and network security have to be considered with a common understanding and feasible pragmatics.

Access methods for open data can vary in form from a website, where you can see data on a map and get information on single features, to standardized map services like Web Mapping Service (WMS) and Web Mapping Tile Service (WMTS) to file download, Web Feature Service (WFS) and atom feeds. Usability in applications can vary a lot according to the access methods.

[9] http://ec.europa.eu/justice/data-protection/reform/index_en.htm

[10] https://www.enisa.europa.eu/

[11] There are a number of definitions of free and open data. For this report, we acknowledge that data may be free-of-charge but with some restrictions, free-at-the-point-of-use, or free for specific users. Open data can also be used in the context of accessible data, i.e., data should be made available in open formats that are easily retrieved and processed by computers – machine readability.

An indication on open data can be found in the Open Knowledge Foundation Network Index for open data. This register collects and reviews open data in important information areas across 122 nations[12].

6.2.2 Key messages from the case studies

There are several success stories as result of open data. The following examples are provided:

In 2012, Public Authorities in **Denmark** opened various registers with core information about individuals, businesses, real properties, buildings, addresses. This information, launched a basic-data initiative called "Good basic data for everyone – a driver for growth and efficiency"[13]. The initiative enables the re-use throughout the public sector and is an important basis for public authorities to perform their tasks properly and efficiently. However, basic data also has great value for the private sector, partly because businesses use this data in their internal processes and, partly, because the information contained in public-sector data can be exploited for entirely new products and solutions, particularly digital ones. In short, Danish Government states that good basic data, which is freely available to the private sector, is a potential driver for innovation, growth and job creation.

In **Spain**, the Spanish cadastre was a pioneer public sector organisation in its facilitation of access and re-use of its PSI for free for both commercial and non-commercial purposes. From 2004 the electronic office of cadastre provides all its data for free use. It has evolved from being a government tax collection and a real estate security service to being a socially valuable tool since this data is used in an increasing number of application and new services **(between them connection with statistic data)**. This approach has led progressively to a huge success in demand, with more than 53 million of visits a year and requests to download the cadastre's PSI.

In **Estonia**, the Estonian open Location-Based Service (LBS) is a system that can instantly pinpoint the location of any GSM mobile phone that's used to make an emergency call. The system has become an invaluable tool for Estonia's rescue workers, who otherwise would have trouble locating victims who call from remote areas. LBS systems also provide the location data for several geospatial information systems (or Geographic Information Systems – GIS's), which provide a visual representation of database information on a map. In the public sector, positioning services are used by police and rescue teams, tourism authorities and the statistics agency**.** They also have a wide variety of commercial applications, such as keeping track of vehicles in a delivery fleet and many others.

In **Portugal**, the Directorate-General for the Territory, the Portuguese NMCA, coordinates an open data platform - iGEO. This platform works complementarily with the National Spatial Data Infrastructure - SNIG. In this portal, it is possible to have access to several geographic data from Portugal using a simple and user-friendly interface. The data are available through Web Map and Web Feature Services. The access to this information is free for the Public Administration and for the Academy.

The given examples do not consider any occurrence of side-effects concerning security, data protection or benefit assessment, nor do they comment on the funding arrangement necessary for open data. Also, they do not address the issue of quantifying the economic value generated through

[12] http://index.okfn.org/

[13] Report from: http://www.eurogeographics.org/sites/default/files/BasicData_UK_web_2012%2010%2008.pdf

re-use of open data (which is the focus of the European Commission's work on open data) in terms of new products and services created by the private sector.

6.3 Theme 3: Conditions for effectively using data.

It has been discussed in other areas of this report that there can be benefits identified by providing better linkages between geospatial and statistical information. However, these benefits can only be realised if there are simple and effective services to show the outputs of the analysis, coupled with data relevance, and knowledge of the tools available to use data effectively.

There is a strong need for merging and linking socio-economic, environmental, health and other types of data on the social and physical environment to a location. From a technical perspective, the linking of socio-economic data, tabular data, to a location or geospatial data can be done in many ways.

The focus of the case studies has been on enabling the end-users to link data together. There are growing demands, by end-users, to be able to do this in a simplified way.[14] One of these ways is through the use of a Table Joining Service. A Table Joining Service (TJS) is an online service that links statistical tables to map services. The tabular data can be table services like the SDMX table service from Eurostat or it can be a table uploaded by the users. The geometry can come from existing geospatial information services or map services. The TJS is an Open Geospatial Consortium (OGC) standard.

The TJS has the potential to replace the 'manual' data joining operations in the daily practice of data management for thematic mapping and spatial statistics. Table Joining Services also provides the ability to find a solution for publishing INSPIRE themes that have no geometry on its own, like Human Health and Population Distribution (which are Annexe III themes).

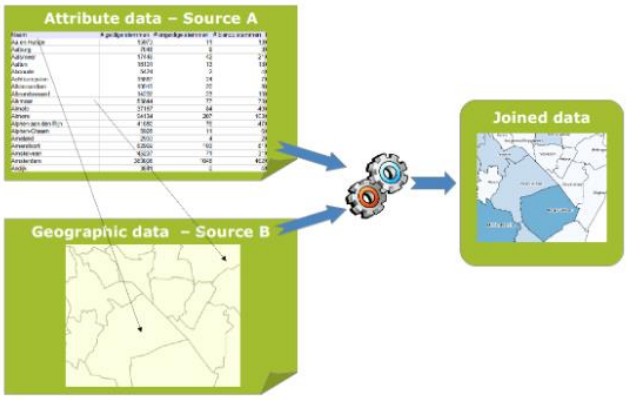

Figure 1: The TJS Concept

6.3.1 The state of play in Europe and case studies received

Statistics Netherlands has recently performed a proof of concept for a Table Joining Service (TJS) together with the Dutch Kadaster, Geonovum (a Dutch company dealing with governmental geospatial information) and PDOK (the Dutch hosting organisation for INSPIRE services). This was done with the

[14] http://www.geonovum.nl/sites/default/files/Report%20Geonovum-Table%20Joining%20Service%20v1.1.pdf

help of a Eurostat Grant. The output from the proof of concept was an impact analysis which can be downloaded and viewed[15].

Whilst the impact analysis does draw together some interesting and valid conclusions, it is clearly stated that a centralised European TJS could be a very cost effective way to realise the INSPIRE goals. Section 6.8 of the impact assessment states:

Officially, all statistical offices of the member states are responsible for the publication of their map service according to INSPIRE. This would mean that 28 statistical offices would create a map service for all their tables that fit the INSPIRE themes for Population and Demography, Human Health, and Energy. This is a very large and costly effort, that can be avoided once a combined European action is undertaken by means of a TJS operating on the Eurostat SDMX web service.

Another example of organisations working together to provide a joint service is the recent cooperation between Statistics Finland and the National Land Survey of Finland. The two organisations undertook a project to look at implementing an open source web application enabling spatial analysis of statistical data.

The aim of the project, called *Spatial Statistics on Web (SSW)*, was to improve the shared use of statistical and map data and to develop tools for utilizing statistical grid data. The project implements spatial analysis based on statistical grid data and geographic information, tools for presenting the analysis results and transferring the data to user's own data processing systems. NLS has developed the map functionalities using the Oskari platform. The online service is being hosted on the Paikkatietoikkuna platform. Paikkatietoikkuna the national geoportal for Finland, and as such is a public and free website that is open to all. It contains geographic information for Finland, and information about geographic information in the rest of the world.

Users can now view and download over 2 000 different map layers from over 50 different organisations in Finland. By working together, Statistics Finland and the National Land Survey of Finland have developed new tools to make statistical analysis based on geospatial information a possibility through the national geoportal.

6.3.2 Similarities: What are the areas of similarity between the case studies?

- Users need a platform that enables the easy merging of statistical and geospatial information.
- Currently all statistical data comes from authoritative sources. There are other ways of collecting statistical data, however unlike with geospatial information, there has been little consideration of the use of Volunteered Information.

6.4 Theme 4: The need for authoritative data to be used by a variety of government sources

UN-GGIM: Europe Work Group B proposed five recommendations for the combination of geospatial data with statistical data to be supported and tackled by UN-GGIM: Europe. Amongst others, the Member States should initiate a process to increase the number of national, authoritative geospatial

[15] https://themes.jrc.ec.europa.eu/file/download/113290

datasets (addresses and others) meeting stakeholders (like statistics) requirements within Member States. This should be incorporated into a geospatial infrastructure maintenance process including its data, services, architectures and business models. The content (data and services) should be accessible to all stakeholders (authorities). The report of the Eurostat task force, on the integration of statistical and geospatial information, states which data are needed from the NSIs and should be used when deciding which data to give priority. Thus, the need for authoritative data to be used has been expressed explicitly by the statistical community and can be expected to be applied for other government sources as well.

6.4.1 Key messages from the case studies

From the case studies provided by several European countries (Germany, Portugal, Slovenia, Spain Sweden, Turkey, United Kingdom, The Netherlands) the following key messages can be summarised:

The need for territorial information is not limited to a greater segmentation, but it extends to the need of having new indicators that result from the integration of geographic and statistical information and that make use of geospatial analysis and modelling (Portugal). At the national level, these challenges call for synergies and greater cooperation between NSI and National Cadastral and Mapping Agencies (NMCA). A medium-term strategy can be developed to express the need to promote a greater interoperability between spatial and statistical data to support statistical production and to promote spatial and statistical integration to produce new statistical indicators. Bi-directional flows should be agreed in order to allow for a better and wider use and dissemination of data.

Challenges to be faced are a lack of detailed descriptions of the underlying criteria associated to different data sources and data analysis procedures as well as of the level of detail and metadata availability provided by both entities. The definition and assessment of the quality of statistical information derived from geospatial information integration and/or geospatial analysis/modelling is crucial. Thus, geospatial and statistical standards should also focus on achieving interoperability regarding quality assurance standards.

Formal agreements between both institutions about official access to the geospatial datasets and geospatial data produced by the public sector are considered to be helpful (Slovenia). Agreements for collaboration, where it is specified that the NMCA provides a copy of all its geospatial and literal information to the NSI are available as well. Sometimes the data is provided as open data (Netherlands), e.g. providing periodical updates of this information or allowing the NSI the access via Internet to the cadastral information system (Spain). The statistical confidentiality and the tax secrecy (general tax law) do not prevent the cooperation.

In some countries, the INSPIRE directive or other initiatives actually don't change anything regarding the access rights but some optimization of the interoperability of the geospatial data and their integration in statistical production are to be expected. Based on the INSPIRE directive, in some countries the municipalities, government agencies and other organizations with official duties offer each other their spatial data for official use to an annual fee (Sweden).

In a nutshell cooperation and data sharing are a cost-effective way for the public sector to use data of high quality for a wide variety of tasks, access to so much new, high quality geospatial information.

A summary of the case studies provided by members of the working group can be viewed in Annex A.

6.4.2 Similarities: What are the areas of similarity between the case studies?

Comparing the case studies the following similarities can be identified:

- Reliability of geospatial information are requested by all stakeholders
- Confidentiality of statistical data has to be observed
- Data of high quality for a wide variety of tasks is needed
- Quality standards have to be met

7 Varying Governance Arrangements

Within the scope of this report to "...provide best practice/guidance to the interactions between NMCA/NSI..." we find that the existence of different type of governance arrangements across Europe is itself an important finding of this report. It is for this reason that we have used this section as an concluding and over-riding theme to help draw this report to conclusion. There is a consistent message contained within the case studies that by working closer together most NMCAs and NSIs, can identify and realise clear benefits. These can be financial, improved quality data, or easier access.

It is clear from the case studies and associated discussions that there are a wide range of governance arrangements in place which provide the best possible mode of operation for the organisations involved. These range from informal agreements, through to contracts, and regulations. Each of the types of arrangements is explored in more detail below. It is worth pointing out that legislation plays a different role in different countries. Some countries require statutes to enable authorities to do something, others do not.

Legal Statute

In the Netherlands, there is a good working relationship between Kadaster as the NMCA and CBS as the NSI. This relationship is based on a legal statute where Kadaster must deliver its cadastral and geospatial information to CBS for the purposes of statistical research. Apart from the legal statute, Kadaster and CBS have signed an agreement dealing with operational issues like the creation of joint products, exchange of data and quality improvements.

Legislation also exists in Turkey. The "Establishment and Maintenance of National Geographic Information System" was put in place in March 2015. The aim of the legislation is to provide a smooth pathway to the adoption of current European legislation, such as the INSPIRE legislation. This will be achieved through the development of the "Developing Turkey National GIS" project which aims to determine the correct legislative framework and data standards which are needed for the successful implementation of a Spatial Data Infrastructure in Turkey.

Memorandum of Understanding

Memorandum of Understanding (MoU) can be a key agreement that is less formal and restrictive than legislation, which helps both parties to manage mutual expectations and prioritise their needs and level of service, while ensuring consistency of services activities across the organisations involved. They also have the advantage of helping to improve transparency by clarifying the commitments and accountabilities of each of the parties involved.

There is a very good example of a Memorandum of Understanding (MoU) being in place in Portugal between the Directorate-General for Territory (DGT) as the Portuguese NMCA, and Statistics Portugal (INE). The MoU is expected to contribute towards greater territorial segmentation of statistical information and to promote a broader integration of geographical and statistical information in statistical indicators design and purpose. Their MoU is based on four main 'pillars of cooperation' and can be demonstrated in the figure below.

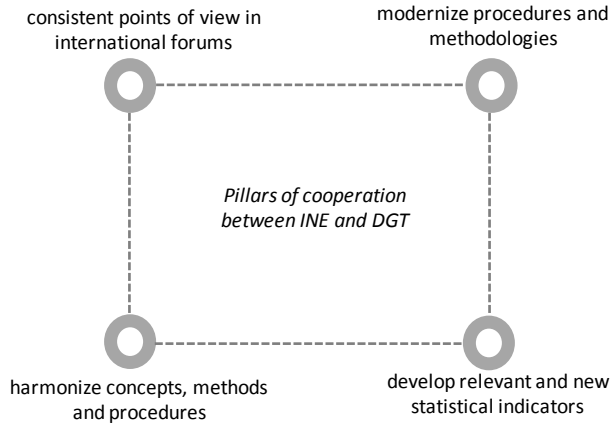

Figure 2 – Four pillars of cooperation between INE and DGT

It is not only Member States who enter Memorandums of Understanding to establish the exchange of information and the provision of services. The European Commission's decision on Eurostat refers specifically to inter-service agreements to be established between Eurostat and other services of the Commission for the planning and programming of activities related on the one hand to European statistics and on the other hand to those that are directly produced by the other Commission services outside the European statistical programme (i.e. so-called 'other statistics').

Collective Agreements

Having formalised collective agreements in place is another common way for organisations to collect, share and disseminate data. The earlier examples of the Swedish Geodata Cooperation Agreement, and the Public Sector Mapping Agreement in the UK are both good examples of this type of arrangement. As stated in the above 'Issue' data sharing is a cost-effective way for the public sector to use high-quality data for a wide variety of tasks. Collective Agreements have an added benefit of being flexible in their composition and it is easier to change the make-up of the agreement than through enacted legislation.

Other collaboration agreements include the Collaboration agreement between the Spanish Statistical Office and the Directorate General for Cadastre. Within the agreement, which was signed in 2012, the two organisations share cadastral information (at no charge) to each other. This includes the sharing of cartographic information. The agreement also states a general duty of cooperation for both parties and reflects the fact that the two organisations have been working together for many years before the collective agreement was put in place. Although the cooperation agreement was difficult to develop, both parties appear satisfied with the current arrangements. The professional relationships, and fluent dialog between experts within the two organisations means that any issues are identified and dealt with in a timely manner.

A number of the case studies, and the discussion forums held during the active phase of the Working Group's research, highlighted that where there was a close working relationship between different organisations, this had often been developed over several years, and through engagement at different levels within the organisations.

It is understood that across Europe, as in other UN-GGIM Regions that there are many ways in which NMCAs and NSIs operate. In some Member States the organisations are very closely linked through legal statute, whilst in others there is very little formal collaboration between the two organisations. The diagram below was developed to represent this concept in principle, and to show how in Europe there are several different ways for institutions to work closer together.

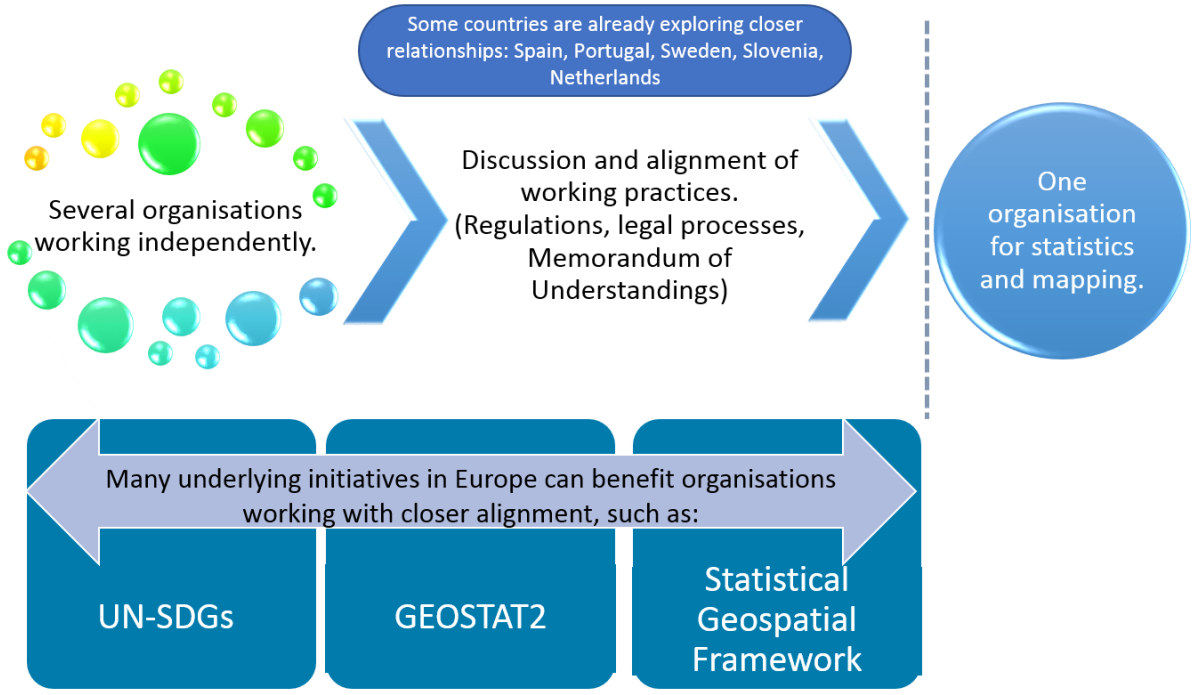

Figure 3: Concept of "Collective Agreements"

UN-GGIM: Europe Work Group B does not advocate that NMCAs and NSIs should merge and become a single organisation. It does, however, reflect and acknowledge that there is a range of different institutional arrangements that affects the way in which organisations operate. Often peer-to-peer working on technical projects, or leaning through relationship building at conferences and peer-learning events provided a background and basis for more detailed senior levels of cooperation.

The above concept can be seen in the diagram below, which was put forward by the representative from The Netherlands.

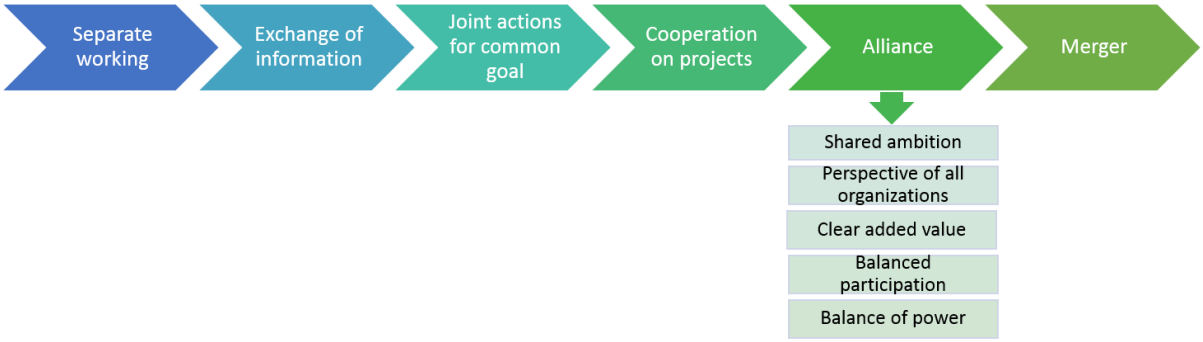

Figure 4: showing the developing relationship for collaborative working

8 Recommendations

Recommendation 1

There are several examples where institutions have built formal working relationships. These have been developed for a variety of reasons as discussed above, and provide mutual benefits for the organisations involved. Cooperation between institutions should rely on (formal) agreements, but the agreements themselves are no guarantee for a good, flexible and solid cooperation. UN-GGIM: Europe Work Group B therefore recommends that **where organisations are not currently working on cooperative projects, or in alliance for strategic development, the step-by-step approach is considered and adopted.**

Recommendation 2

It is apparent that Volunteered Geospatial Information is not as widely used for statistical purposes as geospatial purposes. Typically, NMCAs use VGI as alerts to improve the maintenance of their data, but they check the validity of these alerts the ensure data reliability. It is suggested that **NSIs could explore the options for the use of Volunteered Geographic Information (VGI) in official statistics in order to complement authoritative geospatial information.** This, although specific to one sector, has the potential to turn into a Member State led project with funding from European sources.

Recommendation 3

UN-GGIM: Europe Member States recognise the benefits that the UN-GGIM Knowledge Base provides as a forum and repository for good practice and information sharing. The case studies that have been prepared as background information for this report provide valuable insight into the good practice which is prevalent across Europe. **UN-GGIM: Europe Member States should ensure that these case studies are uploaded to the Knowledge Base.**

Annexe A – Case Studies

Summary of the information provided for Slovenia

Integration of statistical and geospatial information throughout the entire statistical production process has been a common practise in Slovenia since the 1970s. SURS together with GURS launched a project of establishing the Register of Spatial Units in the early 1980's that gradually became the official spatial reference for official statistics. The project was completed in 1995, when the graphical module of the Register was finished. The graphical module contains the geometries of over 40 official territorial divisions, including coordinates of the buildings with an address. Since 1996, the Register has been managed by GURS and is being updated daily. According to the agreement between the institutions, SURS is entitled to disseminate the statistical data merged with geospatial data from the Register to the users as free open data as for instance we do in the STAGE application: http://gis.stat.si/en/

Although not really necessary, there is a formal agreement between both institutions that gives SURS official access to the geospatial datasets. Not really necessary means in Slovenia that the geospatial data produced by the public sector anyhow have to be shared among public institutions for free and after 2018 will have to be available to the general public as open free data. SURS mostly obtains the geospatial datasets from various institutions periodically or when needed whereas for the administrative units and addresses SURS has a direct access to the GURS's database (Register of Spatial Units). The drawback of these rather early established systems is that various statistical databases are not centrally linked to the Register of spatial units but every production environment has different solution also depending on the software used. So with the up rise of new statistical domains the individual data records may get their geo-attributes through different applications which is not really optimal.

Otherwise, any methodological change to the Register of Spatial units has first to be discussed with SURS. Also geospatial data produced by other institutions (not the Mapping agency) that are maintained as registers or evidences have to consider the requirements of SURS.

Crowd-sourced data are not included in official datasets although they are used widely during the floods when people are encouraged to send the photos of the flooded areas that are later orthorectified and merged with official maps so that the water level can be determined more accurately.

The INSPIRE or other initiatives actually don't change anything in Slovenia regarding the access rights but as mentioned above we expect some optimisations of the interoperability of the geospatial data and their integration in statistical production.

Summary of the information provided for Turkey – The National GIS Infrastructure

Turkey started e-government actions to build Turkey's National Spatial Data Infrastructure titled as "Turkey National GIS" (TUCBS or TRGIS in English) in 2004. TRGIS actions aim to enable effective use and sharing of geographic data on digital communication network by developing standards, policies, and technologies. Consecutive actions determined current situation and general vision. However,

requirements could not be determined on production, management, and sharing of geographic data. The General Directorate of GIS in Turkey was established in 2011. Projects were triggered to define geo-data standards and to build legal and administrative structure of National GIS. Hereby, national GIS strategy and the legislation framework were determined to manage geographic information. General administrative structure was designed for the National GIS committee and working groups. National GIS portal with its metadata standard is being built to share geographic information. As a result of analysing existing geo-data, data requirements and international standards; Data Specifications were designed for 10 reference geo-data themes in Turkey. These standards are being tested to use in GIS projects corporately.

However, there is a lack of coordination between the public institutions that produce and use geo-data. In addition, there are technical difficulties, a lack of data standards and specific policies governing GIS projects. These factors contribute to the inefficient collection of data, impact on the quality of the data, and impede the sharing of data and the management of the GIS projects.

In Turkey, geographical data produced by different institutional stakeholders and the geographic information system applications, decision-making process by contributing to the creation of a structure to avoid information loss in terms of time and effort required. Interoperability of geographic data, expressed as the effective use and sharing of geographical data, which provides various administrative levels, policies, standards and technologies, identification and effective management of electronic communications networks and geoportal that provide Turkey's National Spatial Data Infrastructure (TRGIS - SDI) is aimed to build.

TRGIS actions like National SDI initiatives around the World were carried out in Turkey since 2004. TKGM had responsibilities to manage TRGIS actions until 2011. In almost all actions, current situation was analyzed and vision, mission, and working steps were determined to build TRGIS. Expectations were indicated about legal, standard, and technical infrastructure of TRGIS initiatives. But no concrete steps had been taken. Since 2011, General Directorate of GIS with its legal force gets a significant role to build and implement TRGIS.

According to the result of our fieldwork and meetings in Turkey, as understood, public institutions, academicians, and private sectors in GIS industry have deficiencies about Spatial Data Infrastructure vision and using geo-data specifications suitable to ISO/TC211 standards and TRGIS geo-data themes. Uncoordinated bureaucracy and authorization changes constantly hamper the sustainability of TRGIS progress. In this way, beside capacity building activities, TRGIS require process-based approach in the long term instead of product-based approach in short term.

Summary of the information provided for Spain

In Spain NSI and cadastre work very well together.

The Spanish Cadastre is a data bank that includes physical, legal and economic information of 38 million urban properties, 39 million rural parcels and 25 million Cadastral Owners. It include complete cartographic and literal information of the physical, juridical and economical characteristics of cadastral parcels, buildings , addresses, crops etc.

The Spanish Cadastre is principally a fiscal cadastre, whose databases of cadastral values of rural and urban real estate are the basis for the calculation of real estate tax and other local, regional and national taxes.

But this is not its only purpose; it is also a territorial database allowing the visualization of cadastral data as well as the supply of graphic and literal information to users.

Thanks to the Cadastral Virtual office (CVO) it has evolved from being a government tax collection and a real estate security service to being a socially valuable tool since this data is used in an increasing number of application and new services. This approach has led progressively to a huge success in demand, with millions of visits and requests to download the cadastre's data. More than 50 million of visit a year 6 million certificates issued in 2015.

Evolution of the CVO has included implementation of web services to integrate systems applications used by Collaborating Entities, permitting, on-line maintenance of the database, improving the exchange of information.

To protect personal data: it restricts access to the name of owner and the assessed value of the property but administrations and other public entities, after registering, have access to all levels of data, including protected data, but exclusively for the performance of their own competencies.

Cadastre is available 24 x 7, free of charge, for citizens, administrations and collaborating entities and it has a platform for exchange information with customers and collaborators

There are several Services available.

- Interactive services. They are used directly by the user who connects directly with the CVO
- Services application- application (Web). They are invoked directly from other public sector applications, collaborators or companies.
- Update both information systems. Each organization uses its own application that accesses the services of others by Internet
- The Cadastral information is not "being asked for" but is "being directly used.

In 2012, the two institutions signed a formal agreement for collaboration, where it is specified that cadastre will provide a copy of all its cartographic and literal information to the NSI (of course free of charge). Cadastre also provides periodical updates of this information and in addition allows NSI the access via INTERNET to the cadastral information system.

There are a generic duty of cooperation by both parties, and the statistical confidentiality and the tax secrecy (general tax law), do not prevent the relevant organisations from working together, quite the opposite, as they have been working together for many years.

The collaboration has been even bigger beyond this agreement and it has permitted NSI to change its paradigm and to evolve to an interoperability world.

The idea of NSI was to combining the best of the 2 worlds:

- Interoperable access to cadastral data
- Powerful local geostatistical processes

NSI uses cadastral data in all its offices and for all its tasks. Mainly they use cadastral data to geolocated information in all their field works, but they also use other cadastral information in their surveys.

The NSI, combining cadastral and statistics data has created a corporative geodatabase that permits to work with cadastral data in all their workstations. This has been created in several phases and it is kept updated by the WFS that cadastre provide periodically. This updated system is now totally unattended and very agile.

NSI also access via web in any moment to continuously updated cadastral information.

In cadastre, each cadastral parcel and building has an address as attribute and it provides a geo-referenced point for each textual address permitting NSI to link Population Register addresses and dwelling characteristics. Also the NSI can obtain geometry from numerical or textual identifiers.

The cooperation model was difficult to develop but NSI is very happy with the results. In the day to day always there are issues to clarify but the fluent dialog between the experts of both institutions helps a lot. Therefore although the agreement set up a control commission it is not necessary its activity.

Also both organizations collaborate with other institutions, as the National Mapping Institute, to share interoperable information. Always in a free of charge open access defined by the Spanish government and we all participate in the Spanish Spatial Data Infrastructure (IDEE)

Summary of the information provided for the Netherlands

In the Netherlands, a good working relationship exists between Kadaster as the NMCA and CBS as the NSI.

- By Law, Kadaster has to deliver its cadastral and geo-information to CBS for statistical research.
- The delivery of this information is detailed in a formal agreement (covenant).
- In this agreement Kadaster and CBS also describe the joint information products
- Meeting 4 times per year to discuss current agreement and strategy.
- The new agreement will have more strategic components, including cooperation on innovation, quality and communication.
- Examples of existing cooperation are:
    - Joint product called ‘House Price Index’
    - Dashboard on real estate information
    - Table Joining Service (Eurostat grant)
    - INSPIRE production (cooperation with other governmental agencies in the Dutch PDOK platform, www.pdok.nl/en/)
- Future cooperation:
    - Newsroom activities CBS

- Exchange of expertise
- Linked data proposal Eurostat

Summary of the information provided for Portugal

Statistics Portugal and the Directorate-General for Territory (DGT) – the Portuguese NMCA have been working together under a Memorandum of Understanding (MoU) which sets out areas of understanding and cooperation between the two organisations.

It is expected that the MoU will enable greater territorial segmentation of statistical information and to promote a broader integration of geographical and statistical information in statistical indicators design and production. The four main pillars of cooperation from the MoU are:

1. Modernize procedures and methodologies
2. Harmonize concepts, methods and procedures.
3. Develop relevant and new statistical indicators.
4. Consistent points of view in international forums.

The cooperation between INE and DGT includes the exchange of information, corresponding to bi-directional flows that allow for a better and wider use and dissemination of data for users in general. For this purpose, and to make sure that information is disseminated by both entities in a coherent and consistent way, there has been the need to identify, define and harmonize concepts, methods and procedures that guarantee stepping from having information to achieve data and indicators that serve a statistical purpose.

The scope of cooperation also includes the development of specific projects that require the definition and modernization of current procedures and methodologies for the production of statistical and geographical information – for example, the development of land cover and land use statistics under the scope of the LUCAS' project (2015 Eurostat grant). These specific projects are subject of an addendum to the MoU that comprise the identification of representatives from both institutions, the definition and calendarization of results, including a final report of activities.

Summary of the information provided for Germany

In Germany the interaction between the NSI and the NMCA fosters a close cooperative approach. In November 2016, the Federal Statistical Office (FSO) and the Federal Agency for Cartography and Geodesy (BKG) signed a Memorandum of Understanding (MoU) which reaffirms the commitment to cooperation now also on a formal basis.

Basically, the procedures of data integration and dissemination are mostly applied according to legal acts at national and European level as well as standards and guidelines for implementation, of which a selection is mentioned here:

- INSPIRE Directive

- National spatial data infrastructure (GDI-DE)
- Nationwide geoinformation-strategy (NGIS)
- Spatial Data Access Act (GeoZG)
- E-Government Act (EGovG)
- GovData portal

In line with this, the FSO and BKG strengthened their cooperation for providing geospatial statistical data for users based on web service standards that are covering open data standards, as for instance defined by the INSPIRE Directive. In Germany, official statistics predominantly uses the authoritative geospatial data of BKG and the geospatial data services of the Länder of which the Working Committee of the Surveying Authorities of the Länder of the Federal Republic of Germany (AdV) is the responsible body.

Additionally, for official statistics, the German Law on Statistics for Federal Purposes (BStatG) determines basic rules that have to be respected by the statistical offices of the Federation and the Länder within the integration process, visualisation and dissemination of geospatial statistical information. A sub-working group of the statistical offices of the Federation and the Länder develops a concept for an integration process of statistical and geospatial data at work level, in particular guaranteeing statistical confidentiality is of major importance.

Traditionally, statistical information is predominantly illustrated on hierarchal administrative units, as for instance, the geographical classification “NUTS - Nomenclature of Units for Territorial Statistics”. Besides this, due to legal changes of the BStatG the statistical offices of the Federation and the Länder are nowadays allowed to also present statistical information for small scaled areas based on grid-based mapping. A geocoding service provided by the AdV and BKG is used for the geocoding as well as in-house developments and subject specific concepts by the statistical offices of the Federation and the Länder, e.g. for the population census and the register of agricultural holding.

In an international perspective, for supporting the development of a uniform procedure for geocoding of statistical trade data and registers, there are working level exchanges between and within a number of international forums, including Eurostat / GISCO, UN-GGIM: Europe, UN-GGIM and UN EG ISGI.

Summary of the information provided for Sweden

The Swedish SDI is based on a number of important corner-stones, such as the National Geodata Strategy, the Geodata Cooperation, the standardisation work and the technical solution with a national Geodata portal and the links to the European INSPIRE Geoportal. The Geodata Cooperation fulfils the INSPIRE data sharing objectives and a special Geodata Cooperation Agreement was put in place in Sweden 2011.

The agreement is the foundation for a sustainable cooperation within the infrastructure for spatial information and is managed by the National Mapping and Cadastre Authority, Lantmäteriet. Parties in the cooperation are authorities with an information responsibility according to the Swedish Act and Ordinance on Spatial Information, based on the INSPIRE directive, and municipalities, government agencies and other organizations with official duties.

The Geodata Cooperation Agreement includes how to handle organization, steering, coordination and responsibilities as well as technical prerequisites, forms of supply and terms of use of spatial data. The parties in the Geodata Cooperation offer each other their spatial data for official use to an annual fee. Available geodata are presented and described in a Product Catalogue. Municipalities, government agencies and other organisations which conduct official duties can also join the Geodata Cooperation, and thereby get access to all geodata in the Product Catalogue, for official use.

The contents of the Product Catalogue will change over time, with the aim to include as much spatial information as possible from all authorities in the cooperation. The INSPIRE regulation gives a minimum requirement, but in order to fulfil also the goals in the National Geodata Strategy the cooperation has a broader scope: by making as much spatial information as possible available the benefits from sharing information will increase within the public sector.

Data sharing is a cost-effective way for the public sector to use data of high quality for a wide variety of tasks. By making spatial data available as services on the web it is also easier for the private sector to benefit from this infrastructure, as it gives easier access with known conditions and licenses. Statistics Sweden signed the agreement 1 January 2011 and has since then shared spatial information with the other parties."

Some practical information: a partner signs One Agreement, a partner pays One annual fee (Municipalities 10.000 € - 100.000 €, Public Authorities 5.000 € - 650.000 €). Gives access to > 400 geodata products from 19 public data providers.

The agreement is based on the data sharing principles of INSPIRE, Lantmäteriet negotiated with all the geospatial data providers according to INSPIRE to sign the agreement during 2010 – mainly to get them to accept the proposed annual fee and the business model.

Summary of the information provided for the United Kingdom

Ordnance Survey is Britain's mapping agency, responsible for creating and updating the definitive mapping and geographic information database of England, Scotland and Wales. Its core business is focused on the collection, creation, maintenance, management and supply of geographic information to meet the needs of all aspects of national infrastructure requirements. This data is relied upon by government, business and individuals.

There are two contractual arrangements between Ordnance Survey, as Britain's National Mapping Agency and Government's. In England and Wales, the Public Sector Mapping Agreement's licence lets public sector organisations access and share OS digital mapping. A similar agreement is in place in Scotland, the One Scotland Mapping Agreement is a collective agreement in place to enable the access to, and sharing of, public sector organisations in Scotland.

Together these agreements allow access to and re-use of Ordnance Survey data. The aims of the Agreements were to ensure that delivery of value is aligned to strategic public sector policy and operational objectives, by giving public sector organisations in Great Britain access to OS's high quality digital map products. The key aims of the Agreements were affordability, driving government efficiencies and increasing productivity.

Benefits of the two agreements include:

- Savings on administration cost and processes.
- Access to high quality OS digital mapping products**.**
- Able to share data with other organisations that belong to the PSMA or OSMA**.**
- Share data with contractors.
- Access to the PSMA or OSMA membership community.
- Support from a dedicated helpdesk**.**

International – Mexico

Mexico presented a paper at the Conference of European Statisticians in April 2016. The paper was entitled "Mexico's expertise on geospatial information services based on official statistics[16]", and showed how the development of the disciplines of both geospatial information and statistics, in constant interaction provides value to statistics' producers and final users including policy makers.

The National Institute of Statistics and Geography of Mexico (INEGI) is a single organization in charge of the production of statistical and geographical information. Since 1983, Mexico hosts the areas of statistics and geography in the same national institution, thus allowing the development of both disciplines in constant interaction, as well as valuable feedback and benefits between the producers of official statistics and the final users of integrated data. Thanks to the close integration of geospatial data and statistics users are better informed and may, thus, be capable of developing better public policies as well as taking faster and more accurate decisions, for example in disaster risk management situations.

International – New Zealand

New Zealand presented a paper titled "New Zealand's progress towards linking data 'to' and 'by' location, to unleash the power of data to change lives[17]", this paper was also presented to the Conference of European Statisticians in April 2016.

Statistics New Zealand's vision is to unleash the power of data to change lives. Linking socio-economic data 'to' a location, and integrating statistical and geospatial 'by' location is a key enabler for increasing the value of the data. By value they mean the ability for people, businesses, and government to make better decisions. There is also significant opportunity for the public sector to deliver better services through smarter targeting of limited resources. Gains from data innovation are estimated to be worth billions of New Zealand dollars. An integrated, location-enabled data ecosystem will enable new insights, new analysis and new statistics.

Statistics New Zealand have been building the geospatial infrastructure and capability for being location enabled. New Zealand has a wealth of information on people and businesses but is has been difficult to integrate. Location is a universal key to link and unlock the value of data and to improve statistical business processes. Work is progressing with the elements of Statistical Spatial Framework

[16] https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/CES_23_ENG_G1604704.pdf

[17] https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/CES_33-Geospatial_seminar_New_Zealand.pdf

for the integration of statistical and geospatial information aligned to the international developments led by the United Nations.

International – United States of America

At the Conference of European Statisticians, the US Census Bureau presented a paper called "A common international conceptual framework for geospatial and statistical data acquisition, data management, and data use: goals and barriers[18]".

The paper outlined how Statistical agencies have many of the same goals and barriers in sharing geospatially enabled data and developing best practices. The challenges span data collection, management and use. Issues of data acquisition include proposed common standards and frameworks, basic units of collection, alignment of geographic entities, and temporal cycles of data collection and updates. Methodologies of geospatial integration, coordination of geospatially enabled data, considerations of national and international legislation and policy, and assurances of confidentiality and privacy are the critical concerns of data management. Data use for geospatial analysis and area definitions (e.g., urban/rural) aligns with national and international trends in geographical and statistical modelling (e.g., smart cities). In addition, the international geospatial community continues to search for common ground on the issues of data integration between nations. This paper discussed the impact of these issues on developing a common international conceptual framework for geospatial and statistical data acquisition, management, and use.

[18] https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2016/mtg/ECE_CES_2016_24-1602220E.pdf

Annexe B – List of Contributors

Full list of members of UN-GGIM: Europe Work Group B "Data Integration".

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