UN-GGIM EUROPE

UNITED NATIONS COMMITEE OF EXPERTS ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

Core Data Scope

Working Group A - First Deliverable of Task 1.a

Version 1.2 - 2016-07-27

Version History

Version number	Date	Modified by	Comments
0.1	2016-04-12	Dominique Laurent - François Chirié (France)	Initial draft, for internal review within WG A
1	2016-05-23	Dominique Laurent - (France)	Comments from WG A members (Ignacio Duque, Annie Katsina, Neil Sutherland, Marie Haldorson) integrated Validated by UN-GGIM: Europe Executive Committee on 1st June 2016.
1.1	2016-07-19	François Chirié (France)	Incorporate WGA decision to add theme “governmental services” to the list of core data themes.
1.2	2016-07-27	Dominique Laurent	Updating the document due to the addition of theme “governmental services” : - Adding the rationale for this new theme (clause 4); - Updating some figures in clause 5.

Content

1 Executive Summary

The main purpose of this report of the UN-GGIM: Europe Work Group A (WG A) is to determine the scope of core data by selecting a list of priority Inspire data themes, based on identifying user needs for core data.

To carry out this selection of core data themes, WG A applied a methodology consisting of a bottom-up approach, based on identifying user needs, complemented by a top-down approach.

The bottom-up approach consisted in considering the Sustainable Development Goals (SDGs) decided by Member States in the framework of the United Nations 2030 Agenda for Sustainable Development, and in identifying the SDG targets that require Geospatial Information. For each selected SDG target, WG A identified the use cases to analyse, achieve and monitor the target, and identified the INSPIRE data themes required by these use cases.

Then, for each INSPIRE data theme, WG A made a summary of the use cases requiring data from the theme, and set up a map synthesising these use cases.

The top-down approach consisted in considering several projects around the world that tried to define core (or base, reference, fundamental) data. WG A noticed a substantial agreement between these projects about the most important themes, and used the findings of these earlier studies to help validate the conclusions of the bottom-up process.

WG A applied the following selection process. It discussed about each INSPIRE data theme based on its summary of use cases. Then each country or observer (including Work Group B) ranked the Inspire data themes according to the most required by SDG use cases, either directly or indirectly (i.e. as framework on which other richer, more thematic geospatial and statistical data would rely). The final ranking was the average of all rankings, and an Inspire themes histogram was derived.

WG A chose a break line in this histogram and thereby selected the 14 following INSPIRE themes as core:

- INSPIRE Annex I: Geographical Names; Administrative Units; Addresses; Cadastral Parcels; Transport Networks; Hydrography.
- INSPIRE Annex II: Elevation; Land Cover; Orthoimagery.
- INSPIRE Annex III: Statistical units; Buildings; Area management/restriction/regulation and reporting units; Land use; Governmental services.

The survey of user requirements carried out by WG A showed that SDG targets need geospatial data at different levels of detail and for different users. Selecting core INSPIRE themes was steered by their usefulness for SDG targets, either directly, or indirectly as a framework to derive other data, as background for other data, or to combine other data.

The resulting selection includes mainly reference data themes and a few thematic data themes. The selected core data themes have a European dimension because the selection was based on INSPIRE themes and use cases, and because these use cases include reporting for some European directives.

However, most of the SDG-based user needs investigated by WG A are common with the global level. Therefore, WG A outcomes may be used as input to the UN GGIM: Work Group on Global Fundamental Geospatial Data Themes. As an example, the list of themes selected by the National Institutional Arrangements (NIA) UN-GGIM Work Group shows that WG A core themes are a superset of NIA themes including 5 themes in addition. This enables us to envisage a nesting of national core data, regional core data, and global fundamental data; i.e. national core data would be used to derive European core data, which in turn would be used to derive global fundamental data.

2 Introduction

2.1 Scope and structure of this report

This report is the first deliverable of UN-GGIM: Europe WG A on core data. Its main aim is to determine the scope of core data by selecting a list of priority INSPIRE data themes, based on identifying user needs for core data.

The report is structured as follows:

- The first chapter is the executive summary; it provides an overview on the methodology and results regarding core data themes.
- The second chapter is the introduction; it reminds the general context of the core data initiative, explains the context of core data itself and provides a list of the acronyms used in the document.
- The third chapter is about the methodology; it explains the steps followed by WG A in order to select the core data themes.
- The fourth chapter is about the selected themes; for each theme, it provides the rationale why this theme has been considered as core data.
- The fifth chapter is about the other conclusions; it provides the other main learnings coming from the user requirement survey and from the selection process; it also explains what will be the next steps of WG A work.
- Annexes A, B and C respectively provide the list of the report contributors, the list of the interviewed experts and the list of the SDGs and targets taken into account by WG A.

2.2 Context

The following background of harmonised pan-European data was identified.[1]

Authoritative geospatial data are used to support both the implementation of public policies and the development of downstream services. Moreover, geospatial data are required to be homogenous to enable the implementation of public policies in a coherent and coordinated way among countries and at regional or global level. Likewise, significant opportunities exist if services developed by industry can be exploited without requiring country specific adaptation.

Unfortunately, these requirements are not currently met in Europe as the available geospatial data remain heterogeneous between countries. Although some pan-European harmonised data is compiled from national data, other datasets are commissioned centrally at European level which may duplicate and be inconsistent with the existing data in use at a national level.

Therefore it is desirable to intensify the coordination between countries and the European institutions and global bodies to identify, define, produce and distribute pan-European harmonised geospatial core data.

The INSPIRE Directive has set up the legal and technical framework for harmonisation of the existing data related to the themes in annexes I, II and III. INSPIRE specifications provide common data models that ensure the first step towards interoperability but as most of the features and attributes

[1] Extract from the Report by the Preparatory Committee on the establishment of the UN-GGIM: Europe Regional Committee, European Commission Ref. Ares(2014)1491140 - 09/05/2014.

are “voidable” (i.e. to be supplied if available or derivable at reasonable cost), there will be no guarantee that the INSPIRE data will be homogeneous in its content and level of detail.

This background led the UN-GGIM: Europe Regional Committee to setup in 2014 the Work Group A on Core Data to deal with core data specifications and quality, production issues, funding and data availability.

Core data specification will complement the INSPIRE initiative by defining the priorities on the core content that should be made available, either by harmonisation of existing data when possible or by production of new data when necessary.

2.3 Core data concept

In terms of a concept[2], *core data can be seen as the authoritative, harmonized and homogeneous framework data which both national and international users need to either fulfil their requirements or to geo-reference and locate their own thematic data.*

In the latter case, core data may be used as a framework on which other richer, more detailed, thematic geospatial and statistical data would rely.

UN-GGIM: Europe believes that core data should be produced once for national and regional uses with maximum resolution, and would then be provided to international users if necessary through generalizing and aggregating processes.

On a more practical point of view, scope of core data should be a subset of the INSPIRE themes; this subset should be limited in order to ensure feasibility and the selected themes will be those considered as having the widest use.

2.4 Glossary

2D	2 dimensions
3D	3 dimensions
AD	Address
AF	Agricultural Facilities
AM	Area management/restriction/regulation zones and reporting units
AU	Administrative Units
BU	Buildings
CAP	Common Agricultural Policy
CP	Cadastral Parcels
EEA	European Environment Agency
EF	Environmental Monitoring Facilities

[2] Extract from the UN-GGIM report E/C.20/2015/4 “Determination of global fundamental geospatial data themes” § II.5.

EL	Elevation
EU	European Union
GI	Geographic Information
GN	Geographical Names
GPS	Global Positioning System
HH	Human Health - Safety
HY	Hydrography
LAU	Local Administrative Units
LC	Land Cover
LU	Land Use
NUTS	Nomenclature des Unités Territoriales Statistiques (Nomenclature of Territorial Units for Statistics)
OI	Orthoimagery
PD	Population Distribution
PF	Production Facilities
SDG	Sustainable Development Goal
SU	Statistical Units
TN	Transport Network
UN	United Nations
UN-GGIM	United Nations initiative on Global Geospatial Information Management
US	Utilities –Governmental Services
WG A	(UN-GGIM: Europe) Work Group on Core data
WG B	(UN-GGIM: Europe) Work Group on Data Integration

3 Methodology

3.1 Main principles

3.1.1 SDGs taken as basis for requirements

Core data is the data that is the most widely used, either directly or as a framework. Due to the United Nations context, WG A decided to focus the user requirements survey on the SDG-related requirements. Core data will be the data of main value for the UN Sustainable Development Goals (SDGs).

3.1.2 INSPIRE taken as basis for data themes

WG A acknowledges the importance of the specification works carried out by the European Union for setting up the INSPIRE Directive. For this first WG A deliverable, INSPIRE offers a common nomenclature that has been chosen as input to express the data themes (and when possible, sub-themes, feature types etc.) required by users.

This common terminology is a powerful tool that enables common understanding between all the actors involved in the WG A work.

Due to these two decisions, defining core data scope consists in selecting the INSPIRE themes that are the most widely required by the SDGs.

NOTE: the INSPIRE Directive includes data themes related to environmental policies or to policies having an impact on environment. The result is a pretty comprehensive list of spatial data themes that has been considered by WG A as a quite sufficient list of candidates for core data themes.

3.2 Bottom-up approach

Investigating user requirements were carried out through the following steps.

3.2.1 Selection of SDGs

First, the SDGs or SDG targets that “consume” geospatial information were identified.

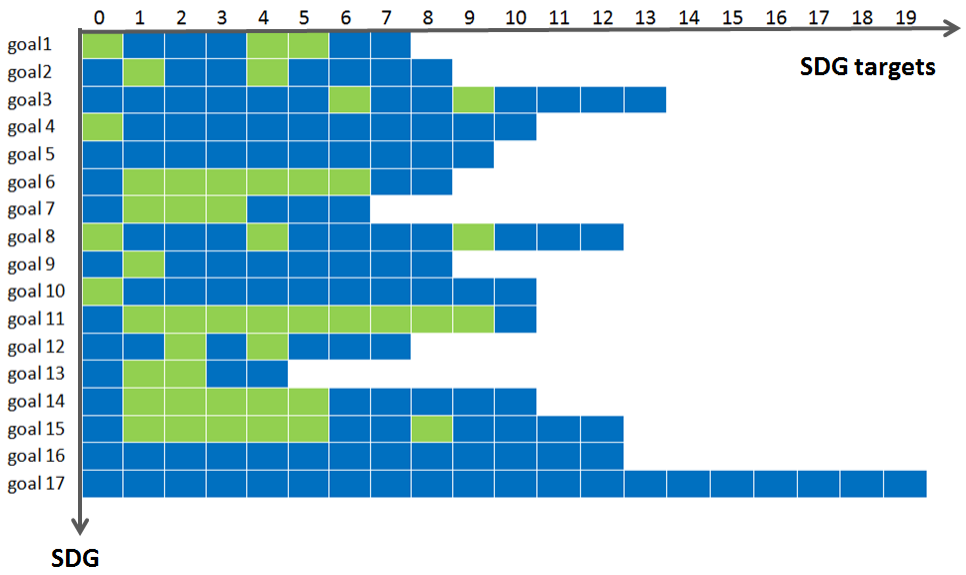

Figure 1: the SDG targets consuming GI

The goals (SDGs) are represented in first column and their related targets in first row.

The “0” value stands for the whole SDG (without considering any specific target).

The targets consuming geographic information are represented in green. The list of the selected goals and targets is available in annex C of this document.

NOTE 1: Regarding the “0” value, two cases may occur:

- The goal consumes geographic information as a whole (e.g. goal 4: Ensure inclusive and equitable quality education for all) and there is no specific target requiring geographic information (typically, no target mentioning accessibility to schools);
- The goal consumes geographic information as a whole (e.g. goal 8: Promote sustained, inclusive and sustainable economic growth that requires in general data about addresses, transport networks, cadastral parcels etc.) and in addition, there are specific targets requiring more specialized geographic information (e.g. 8.4 about sustainable resource efficiency and 8.9 about sustainable tourism).

NOTE 2: a similar study was carried by Eurostat; the results, though not being exactly the same, are quite similar, with focus on goal 6 (water), 11 (sustainable cities) and 15 (ecosystems).

NOTE 3: the targets that are very specific to developing countries have not been selected.

These targets have been allocated to three sub-groups within WG A:

1. Risk, pollution, climate;
2. Natural resources (water, ocean, ecosystems);
3. Economy (agriculture, energy, settlements, poverty, education etc.).

3.2.2 SDG related user requirements

Second, for each selected SDG target, investigation was conducted in order to identify the use cases that are necessary or relevant to analyse, **achieve** and monitor the SDG target.

The results of this investigation are documented in a graphical way, as shown in the example of the following figure, and are available at: http://un-ggim-europe.org/content/wg-a-core-data

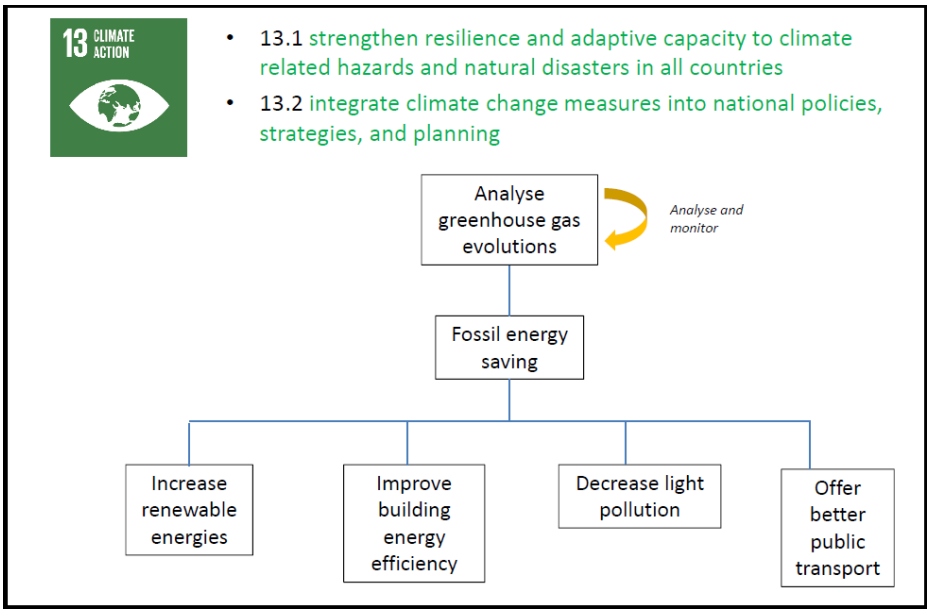

Figure 2: use cases for climate change SDG

Then, for each use case, WG A investigated the required data: data was identified using the INSPIRE nomenclature, per theme and when possible per more detailed characteristics (e.g. sub-theme, specific feature types); rationale explaining why the data is required was provided together with a reference, when available.

To conduct this investigation, various sources were used, mainly the use cases described in the INSPIRE specifications. However, as INSPIRE only deals with policies having impact on environment and not on whole sustainable development with its environmental, social and economic aspects and as, in addition, the use case description in INSPIRE data specifications has heterogeneous quality, this input had to be completed by other sources: bibliography (including the use cases identified by UN-GGIM: Europe WG B), a set of interviews of sustainable development experts and of course the expertise of WG A members. The list of interviews is provided in annex B of this document.

Due to these various inputs, the use case survey is considered as representative enough but does not claim to be exhaustive.

These two steps required taking into account all the stages of sustainable development policies and the data they require; not only the stage consisting in analysing sustainable development issues, but also the more operational stages consisting in treating or mitigating sustainable development issues, and the stages consisting in making decisions and monitoring them.

The results of this work are documented in an Excel table, as shown in the following figure and are available at: http://un-ggim-europe.org/content/wg-a-core-data

Use Case	Target or sub-target	Phase	Theme	Sub-theme	Specification	Importance	Scale	Justification	Reference
Find relevant place for new antennas	1.4 11.1	Operational	LU		residential area business area ...	Necessary		To assess requirements for mobile phones	Use cases "find better location for new antennas" and "prove the necessity of a new antenna" in DS BU
			SU-PD			Necessary			
			BU			Necessary		Buildings may disturb propagation of phone waves	
			US	Telecom network		Critical		To locate existing antennas	
			EL			Critical		To simulate "visibility maps" from the antennas	

Figure 3: data required by the specific SDG related use cases

NOTE: the use cases that are common to most targets (e.g. make 2D background map) have been factorised in a "Common use cases" sheet. It may occur that a theme is not directly used by a SDG target but has ancillary use (e.g. the theme is used as source data in the capture of another theme); this has been also taken into account in the "Common use cases" sheet.

Action	Target or sub-target	Phase	Theme	Sub-theme	Specification	Importance	Scale	Justification	Reference
The theme is not directly used by SDG but has ancillary use (e.g.the theme is used as source data in the capture of another theme)	Not applicable	Source data or ancillary use	EL		on land	Critical		EL is absolutely required to carry out OI EL is required for locating Drainage Basins (HY) and may help to capture HY data in general	DS EL - use case B1.2 Orthoimagery production Interview French Water expert
			AU			Necessary		AU is often first level in the cadastral hierarchy (municipalities as cadastral zoning in theme CP) AU is often the first level in address hierarchy (AdminUnitName is an addresss component)	
			BU			Useful		BU may be used as main or as ancillary source data for LC/LU built-up areas (by aggregation). BU is also useful to carry out census (for PD data). It is candidate theme for point based statistics	DS BU - use case B1.4 (deriving medium scale data) DS BU - use case B6.1 (European census)

Figure 4: ancillary use of data (documented under the common use cases)

3.2.3 State-of-play of user requirements per theme

The last step was to carry out, for each INSPIRE theme, a compilation and aggregation of the use cases requiring this theme. The results have been documented through a map of use cases whose purpose is to give an overview of the theme value for the SDGs.

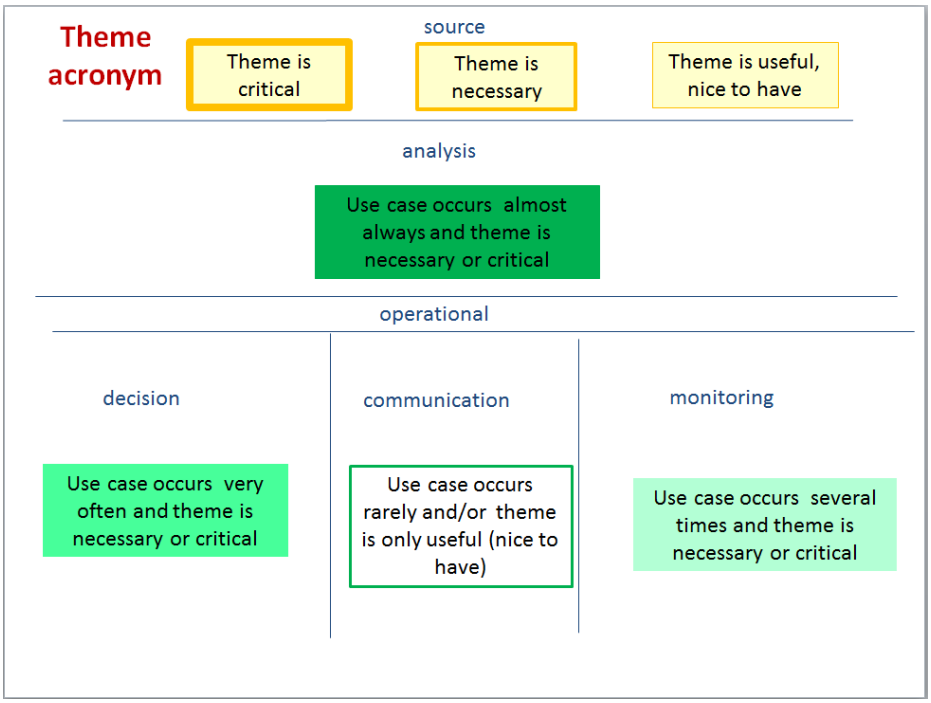

Figure 5: use case map template

The use case maps have been designed in the following way:

- From top to down, the different stages when the data may be required: indirect use (source data), analysis, operational itself subdivided into decision, communication and monitoring;
- Colour coding was applied: yellow for the indirect use and green for direct use; the colour saturation indicates how the use case is frequent (if it addresses many or few SDG targets) and if the theme is necessary or just 'nice to have'.

The survey has been conducted without any a priori assumptions; all the INSPIRE data themes – both reference and thematic or environmental[3] – have been investigated. However, themes 'Reference Systems' and 'Geographical Grids' were excluded as they do not contain any data and therefore, cannot obviously be part of core data.

The use case maps of the selected core data themes may be found in the chapter 4 of this document. The use case maps of all themes may be found at: http://un-ggim-europe.org/content/wg-a-core-data

In parallel, based on its environmental expertise, EEA conducted an assessment of the potential use of INSPIRE themes for the SDG targets selected by WG A. The results of this EEA survey may be found at: http://un-ggim-europe.org/content/wg-a-core-data

3.3 Top-down approach

To get the best result, the previous approach was combined with the approach consisting in examining past efforts to define core data. The intention of the top-down process was to complement the detailed bottom-up analysis, which was needed in any event to support the work group's conclusions and to set the scene for the next steps.

[3] Cf. "Environmental Thematic User Needs Position paper", INSPIRE Environmental Thematic Coordination Group, 2002-10-02.

The top-down process was based on some simple observations:

- Several projects around the world tried to define core/base/reference/fundamental data;
- There is substantial agreement between these projects about the most important themes.

Therefore the thinking of the top-down process was to use the findings of these earlier studies to help validate the conclusions of the bottom-up process.

The top-down process has been documented in an Excel spreadsheet explaining what the projects were about and compiling the involved data themes. It may be found at: http://un-ggim-europe.org/content/wg-a-core-data

3.4 Decision process

Determining the core data list required a WG A plenary workshop to select the data themes. Therefore during its 13-14 January 2016 workshop, WG A discussed each INSPIRE theme, mainly on the basis of its use cases map.

In this respect it was proposed to carry out an intersection of the data themes required by different SDGs, rather than bringing together all the data themes required by all SDGs. Indeed, the latter would have entailed a too broad and ambitious core data scope (all INSPIRE themes), while the former entailed a 'framework' or 'skeleton' with realistic feasibility. In other words, the use cases that were common to several SDG targets revealed good theme candidates for core data.

Despite the user investigation survey, it looked difficult to reach a consensus as WG A members and observers had different opinions about what should be core data, depending on their background experiences. This was shown by a first round of selection. This is why decision was done using the ranking system.

For instance, the results of the EEA assessment have complemented but also, for some themes, have contradicted the results of the use cases maps, EEA giving more weight to the environmental themes widely used for analysis and monitoring and less to local reference data that is mainly used in policy implementation. These different points of view have contributed to a rich discussion during the decision process.

Before launching the ranking, the selection criteria were clarified, selected themes should:

- Pertain to geospatial data (with mandatory geometric representation);
- Be widely used: it should be the most necessary, most common, priority data required to analyse, monitor and achieve the SDGs, either directly or indirectly;
- Meet requirements common to many countries.

Each country or observer (incl. representatives of WG B) ranked the themes according to the agreed criteria. Finally the final ranking was calculated as average of all individual rankings.

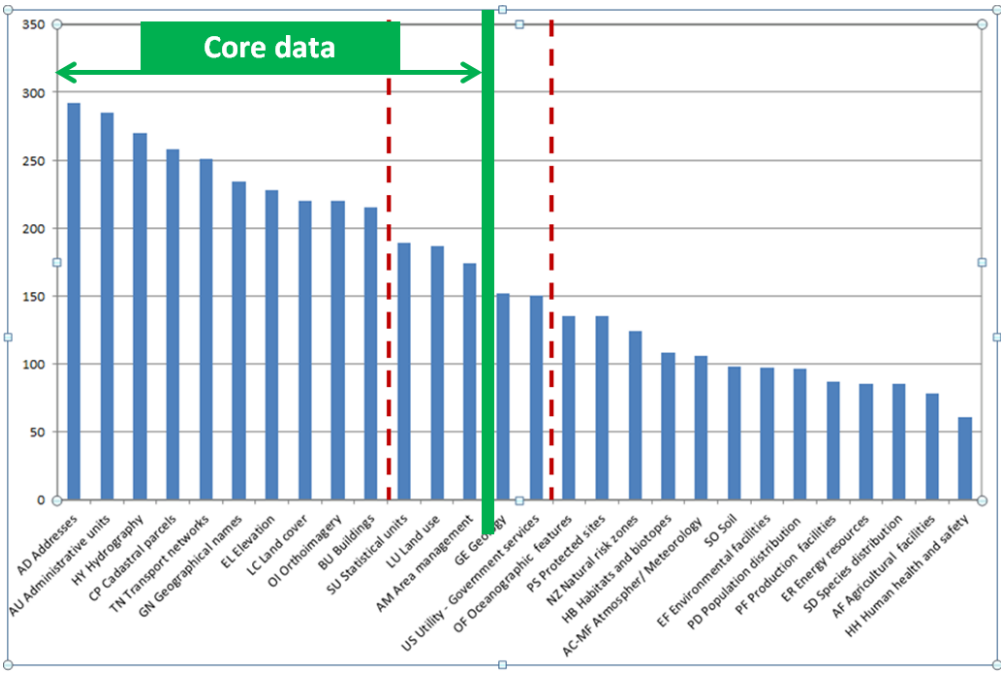

Figure 6: the selected core themes

The selected data themes are the following:

- In annex I : Addresses, Administrative Units, Hydrography, Cadastral Parcels, Transport Networks, Geographical Names;
- In annex II: Elevation, Land Cover, Orthoimagery;
- In annex III: Buildings, Statistical Units, Land Use, Area Management.

NOTE 1: the criteria related to geospatial data explains the weak rank of theme 'Population Distribution', though its use is widespread. There has been general agreement within WG A that geometric component of statistics (namely theme 'Statistical Units') was to be dealt with by WG A whereas integration of statistical data (e.g. 'Population Distribution' or 'Human Health and Safety') was to be dealt by WG B.

NOTE 2: the themes SR (Sea Regions), BR (Biogeographical Regions) and MR (Mineral Resources) were not ranked as there was a consensus to exclude them from core data.

This initial proposal was presented to various stakeholders, including the European Commission; Main feed-back was the wish from Eurostat and the Joint Research Centre to have "governmental services" (from theme US) included into core data. This proposal has been accepted by WG A [workshop on 07-08/06/2016].

4 Selected Core Data Themes

This chapter presents the core data themes selected by WG A, with the rationale for choice. They are presented according to the INSPIRE order.

NOTE: theme 'Land Use' plays a very different role according to the fact it addresses *existing land use* (role close to the 'Land Cover' one) or *planned land use* (role similar to the 'Area Management' one). Therefore, to avoid useless duplication of rationale, 'Land Use' theme has been described, according to its roles, under themes 'Land Cover' and 'Area Management'.

4.1 Annex I

4.1.1 Theme 'Geographical Names'

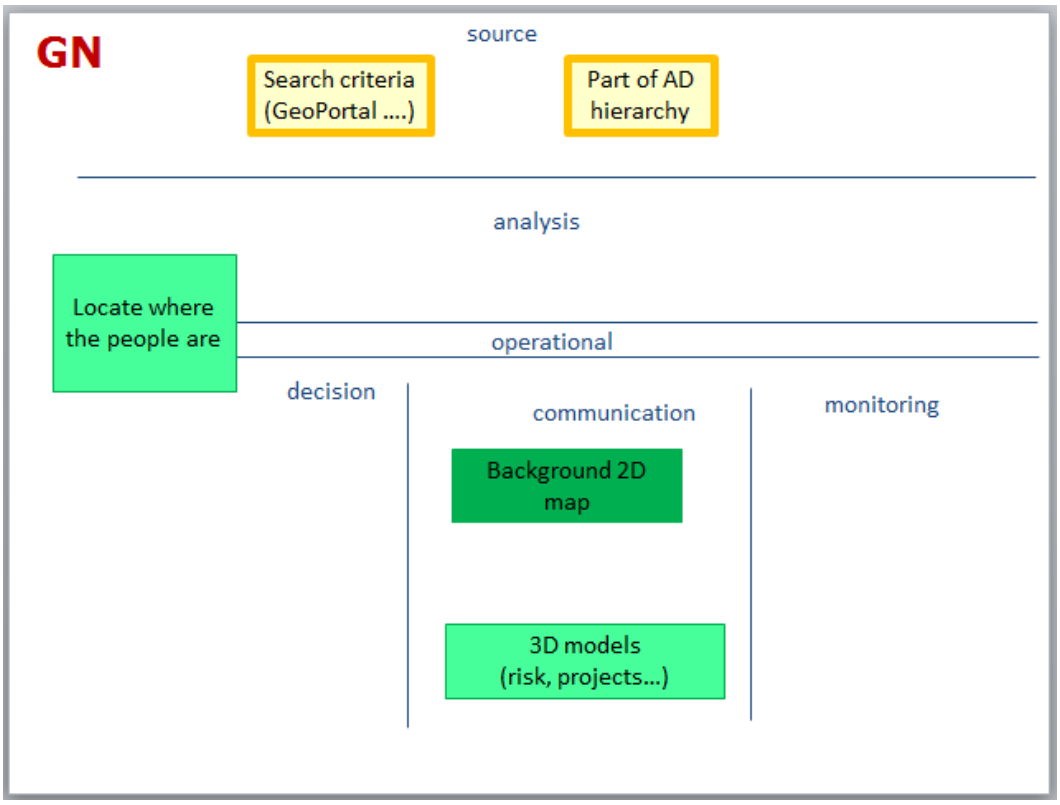

Figure 7: map of use cases for theme GN

Theme 'Geographical Names' includes populated areas, i.e. settlements, cities, etc., that cannot be found as such in any other INSPIRE theme. This data about populated areas is of key interest for many use cases: as framework, populated area names are very often address components; this characteristic makes them quite useful for the geocoding process, e.g. to find the direct location of an accident or disaster. Whereas theme 'Address' enables detailed location on large scale maps, theme 'Geographical Names' has the same role but rather on medium scale maps. In the analysis phase or for more operational purposes, such as raw locating where the people are (e.g. to ensure them accessibility to services or to assess the human pressure on environment or to coarsely assess the impact of a risk or pollution), the populated areas are also quite useful.

However, theme 'Geographical Names' also includes all types of named places. Therefore, the associated data may be used as search criteria in gazetteer services, GeoPortals, GeoCatalogues etc. and is totally necessary for communication purposes: no one would understand a map without

geographical names; this states for any kind of graphical representation (background 2D maps, ortho-images, 3D models). Theme 'Geographical Names' is part of the basic geographic equipment of a country.

In summary, this theme is key data for many medium or small scale related applications.

4.1.2 Theme 'Administrative Units'

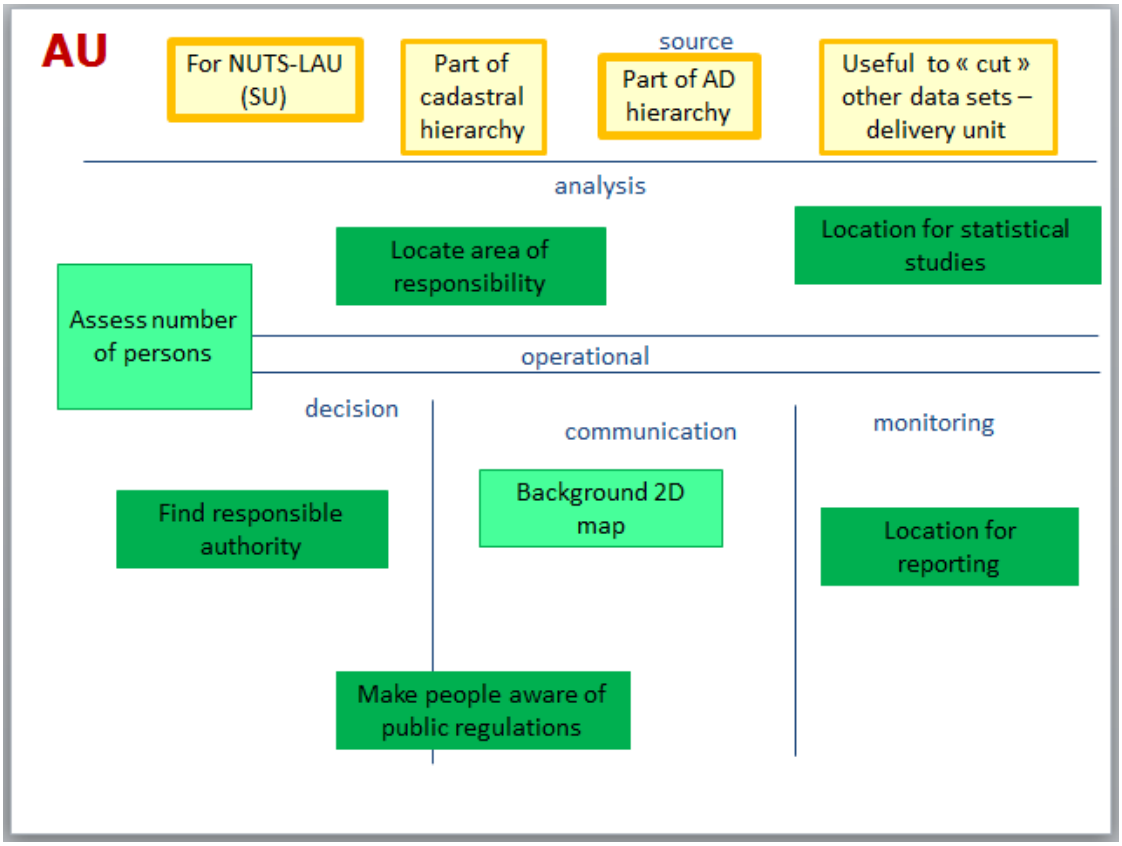

Figure 8: map of use cases for theme AU

Theme 'Administrative Units' has three main roles:

- It represents the territory of responsibility of a competent authority; in the analysis phase, any government has to know the geographic extend for its expected actions; in the operational phase, it may be necessary to find the responsible authority to manage a located event such as a disaster. Administrative units are often used for money allocation.
- It is part of the basic geographic equipment of a country. Administrative units are widely used in the management of geographic information, for instance to "cut" other data sets as delivery units are often based on the country administrative division or as search criteria in gazetteer services, GeoPortals, GeoCatalogues etc. At national level, municipalities are generally used to build the cadastral system (in INSPIRE terminology, they are often 'CadastralZoning') and administrative units are also basis for the address system (in INSPIRE terminology, they are 'AddressComponent'). At European level, the NUTS/LAU are derived from the national administrative units. In addition, administrative units are widely used as background data, either in classical topographic maps or to display regulated areas.
- Administrative units are often used as statistical units and therefore enable the combination of geographic information with all kinds of statistical data (population distribution, socio-economic

data, health statistics …). Consequently, administrative units are widely used in the analysis and in the reporting phases, e.g. for SDG related studies or for European Directives monitoring.

4.1.3 Theme 'Addresses'

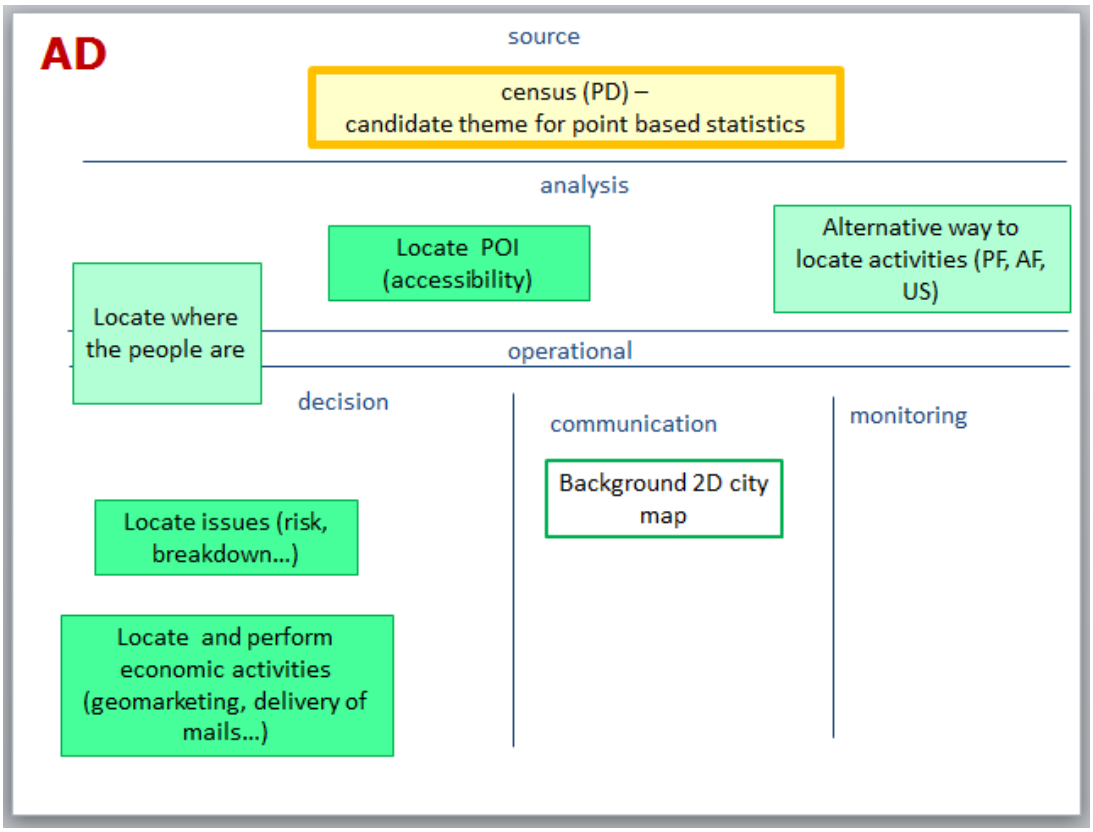

Figure 9: map of use cases for theme AD

The most obvious use of 'Addresses' theme is related to the physical delivery of mail, such as letters and parcels; it has to be highlighted that the physical delivery of parcels is a growing sector due to the expansion of e-commerce on Internet.

However, the power of Address data lays in its geocoding capacity: a lot of information is linked with an indirect location, typically an address. A geocoded Address database will enable the transformation from this indirect location to a direct one (a set of coordinates), making possible for instance to locate the information on any background map. For instance, by geocoding a register of inhabitants, a user may find where the people are, which is a common requirement to analyse many SDG related issues; by geocoding registers of farms, industries or public services, a user may locate agricultural facilities, production facilities or public services [in a way, the theme 'Addresses' is alternative data to the INSPIRE themes 'Agricultural Facilities' (AF), 'Production Facilities' (PF) and partly 'Governmental Services' (US)]; by geocoding a business registry, a user may locate Points of Interest, such as hotels, restaurants, retail shops, attraction parks, monuments etc., that may be useful for studies about accessibility to basic services or about tourism; by geocoding files of customers or prospects, an enterprise can carry out geomarketing; by geocoding the address provided by a call, a rescue service may locate the place of accident and a utility manager may locate place of breakdown; this will enable both to provide the best and quickest possible answer to the crisis situation.

Addresses are also involved in most e-government processes. The economic value of address data is recognised as quite significant.

Theme 'Addresses' is one of the candidate themes for the point-based statistics, recommended by UN-GGIM: Europe WG B and by the statistical community in general (cf. GEOSTAT-2 project). The UN-GGIM Expert Group on Integration of Statistical and Geospatial Information has proposed a Global Statistical Geospatial Framework where addresses are considered as one important link in the process of geospatially enabling statistical data[4]. The framework consists of five principles, where principle 1 says "Use of fundamental geospatial infrastructure and geocoding" and principle 2 says "Geocoded unit record data in a data management environment". The geospatial infrastructure should ideally be provided by the NMCA for the geocoding of unit record data (statistical data) to take place within the NSI (National Statistical Institutes).

4.1.4 Theme 'Cadastral Parcels'

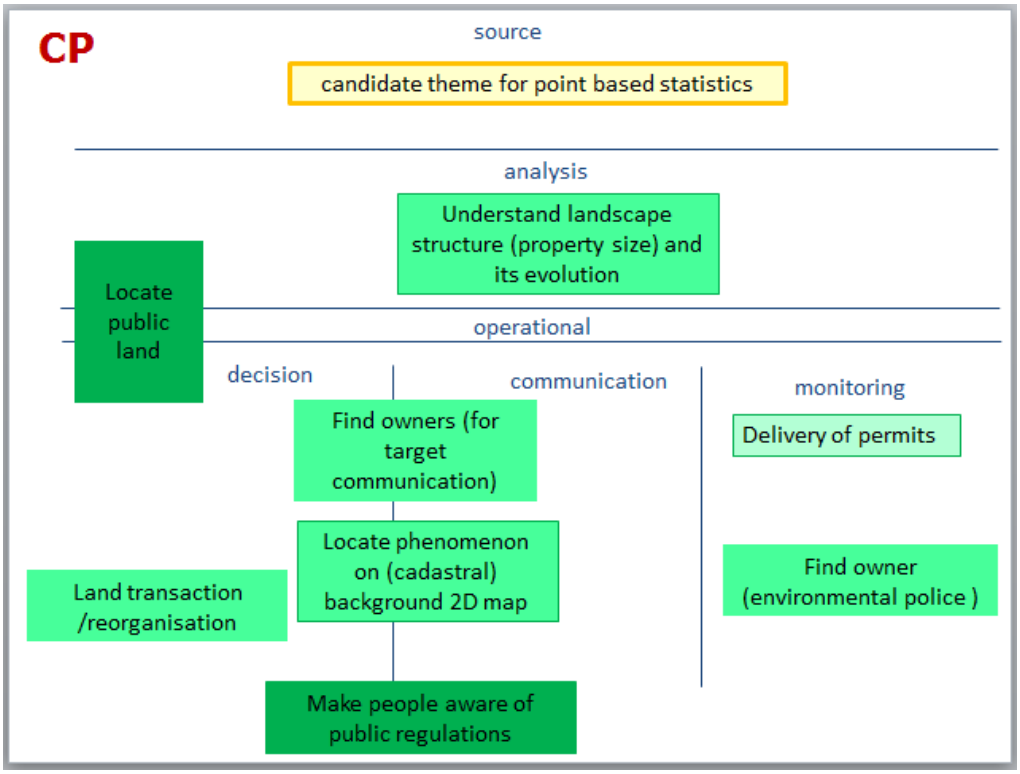

Figure 10: map of use cases for theme CP

The theme 'Cadastral Parcels' is the geographic part of a wider information system and process: land registration. As such, cadastral and land registration system plays a major social and economic role, by providing security of land ownership and of land transactions and so by enabling investments (e.g. land being used as security for a mortgage); it is in general quite necessary to achieve the economy-related SDGs.

The data related to theme 'Cadastral Parcels' is of wide use in all the phases of policy making. By enabling the link with the parcel owner, the theme makes it possible to know if the land is public or private: this is key information for deciders as the means of action may be quite different according to the land ownership status. It also makes it possible for any government to manage its public land

[4] http://www.efgs.info/information-base/production-model/global/

(e.g. by acquiring new parcels for a project), to organise land consolidation to improve agriculture, to find owners for targeted communication (e.g. to encourage them to do some SDG related actions, such as better isolation of buildings located on the parcel in order to save energy and to make the buildings less vulnerable to risk), to check if a permit claimant is the parcel owner or to find the owner of a polluting parcel etc.

The 'Cadastral Parcel' data also helps to understand the landscape, e.g. by analysing the size and distribution of land property. It is quite useful also in the Common Agriculture Policy context as cadastral parcels may be used to define the eligible area to subventions. A background cadastral map is necessary to prepare land planning and also to display regulated areas and so, to make every one aware of the public restrictions that apply on a property.

Last, 'Cadastral Parcels' is one of the candidate themes for the point-based statistics, recommended by UN-GGIM: Europe WG B and by the statistical community in general (GEOSTAT-2 project and the Global Statistical Geospatial Framework).

NOTE: national regulations aiming to protect personal data may restrict the provision of the link between the cadastral parcel and its owner(s).

4.1.5 Theme 'Transport Network'

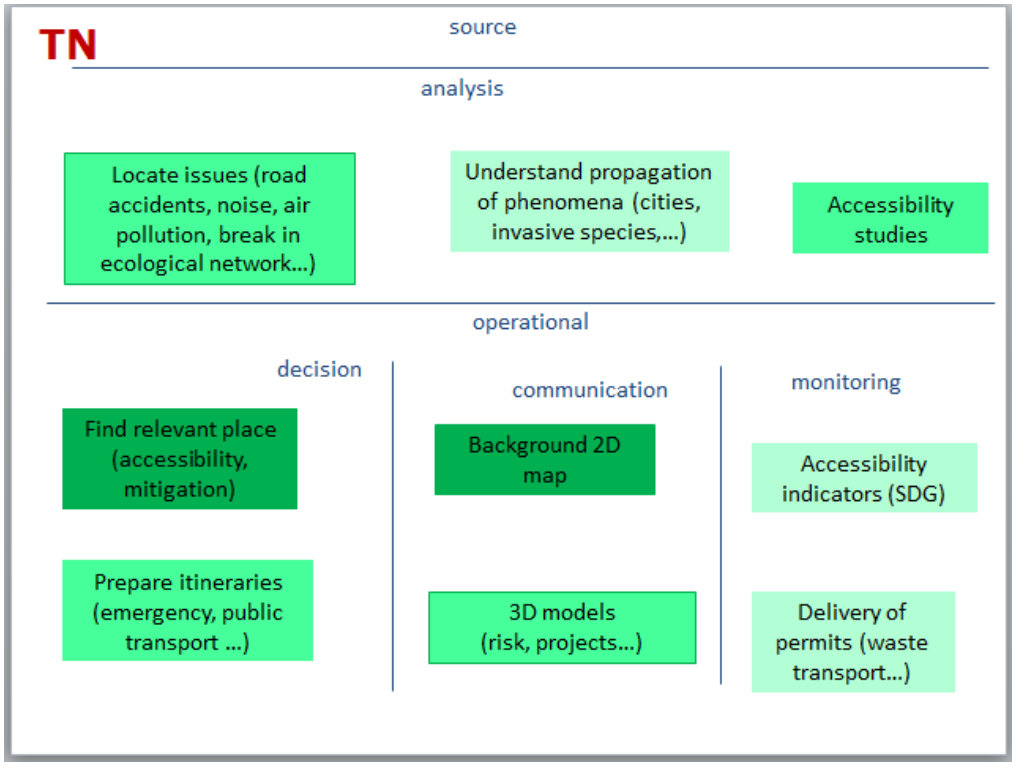

Figure 11: map of use cases for theme TN

Transport elements, such as roads, railways, airports are key features in the landscape and are therefore necessary for communication purposes, e.g. on 2D topographic or road maps or in 3D models.

On the positive side, transport is necessary to human activities as it is condition of accessibility to working places, to schools, to hospitals, to retail trade or to any other place of interest. In the analysis phase, transport data enables studies about accessibility to basic services and helps to

understand and to forecast the spreading of cities. In the operational phase, transport data is necessary to decide on relevant location of a new infrastructure, e.g. to ensure connectivity of a new road to the existing network or to ensure accessibility of a new building or other construction. It is also required for journey planning, to prepare itineraries for rescue operations in case of a crisis or for a new line of public transport or for deciding where dangerous materials may circulate with the minimum of risk. In daily life, transport data are also widely used by economic actors, by tourists, by everyone to find a relevant itinerary to an unknown place.

On the negative side, transport network is source of accidents, of noise, of air pollution; it contributes to the spreading of invasive species; it also contributes to soil sealing and so to floods; it is cutting ecological corridors and causing damages to the fauna. Transport itself is often using non-renewable energies and contributing to climate warning. Consequently, transport data is required in the analysis phase of all this phenomena but also, at operational level, to decide on mitigation actions (building acoustic fences to decrease noise pollution, building bridges or tunnels for wild animals, improving the road conditions to avoid accidents etc.).

4.1.6 Theme 'Hydrography'

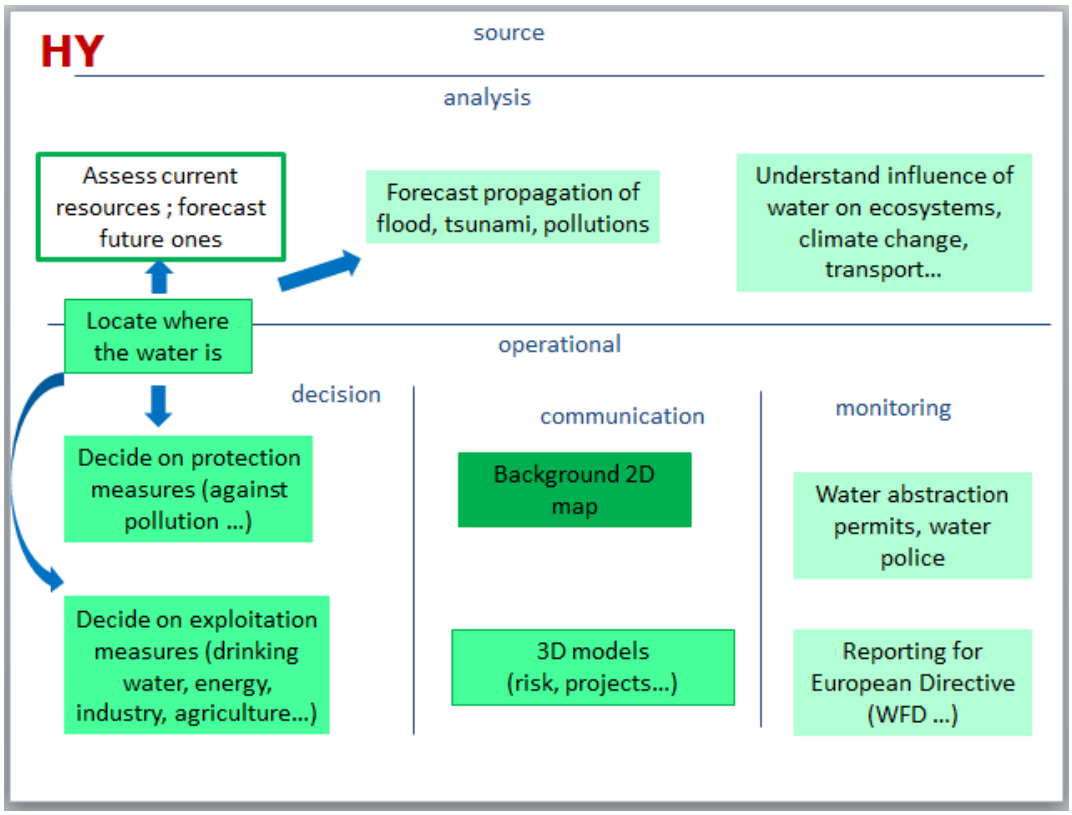

Figure 12: map of use cases for theme HY

Theme 'Hydrography' deals with inland water that is a precious natural resource that unfortunately becomes increasingly scarcer and so, fresh water has to be carefully protected and managed in order to fill its various uses. However, water is also a source of risk by propagating floods or pollution.

In the analysis phase, locations of surface waters and river networks are keys to understand water flows and assets, to predict different kinds of floods and water pollutions. Data about Hydrography is also required for various environmental studies, e.g. to understand ecosystems (such as wetlands) or to forecast the climate change and its impacts. In addition, the hydrography will also influence

transport system as watercourses may be both obstacles to road or rail transport and means of transport, if they are navigable.

In the operational phase, the Hydrography data will be used to decide on the protection and on the exploitation measures. For instance, strips along watercourses will become protected areas where it will be forbidden to spread pesticides; the presence of a river will imply specific protection when depolluting a contaminated area; the various water users have to manage the resource, at drainage basin level; choosing relevant location of a new water treatment plant or of water monitoring sensors can be done only with knowledge of hydrographic data… All these decisions have to be applied and monitored and Hydrography data is also quite useful for delivering water abstraction permits, for reporting to European directives, such as the Water Framework Directive, or for future SDG indicators.

As other topographic data, Hydrography is also required for communication purposes in 2D maps and in 3D models.

4.2 Annex II

4.2.1 Theme 'Elevation'

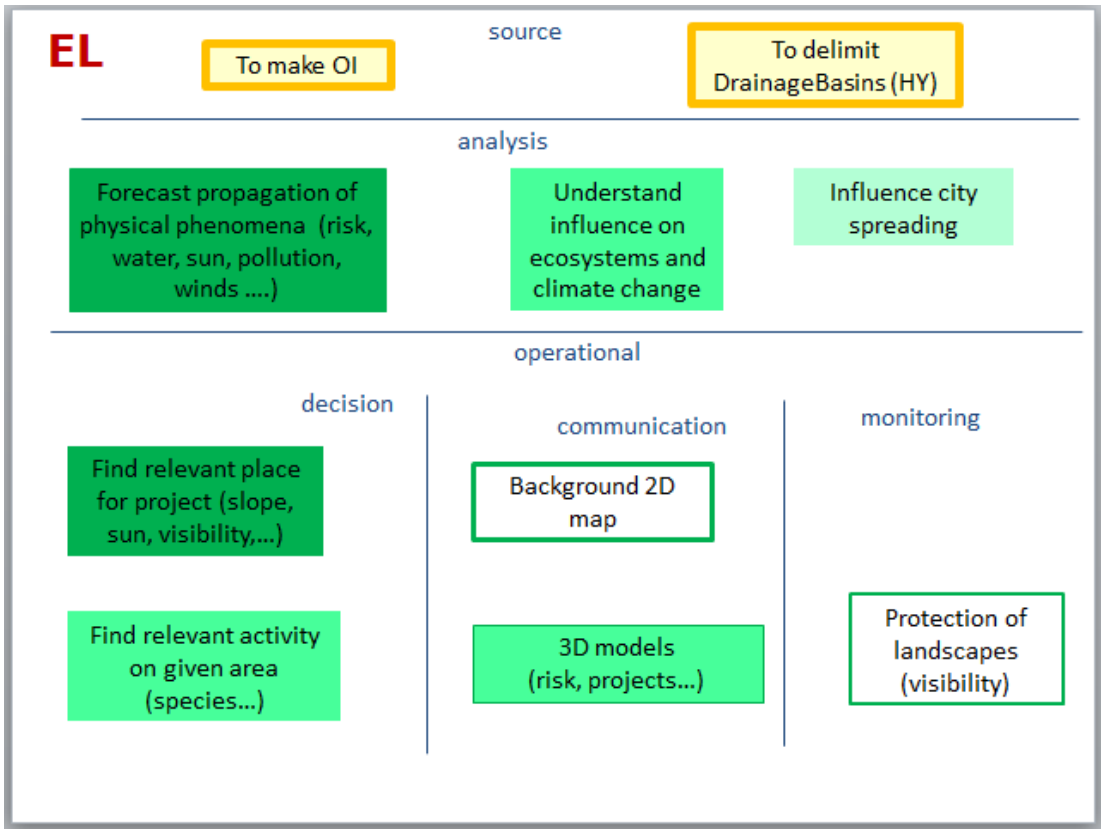

Figure 13: map of use cases for theme EL

Theme 'Elevation' is part of the basic geographic equipment of a country as it is necessary for the production of orthoimages (themselves of wide use) and to delimit Drainage Basins in theme 'Hydrography'. It is also useful for the coastline delimitation. Regarding cartography, elevation data improves 2D maps, by contour lines or by shading but its key use is for 3D models; these 3D models

are themselves of wide use, for instance, to communicate about risk zones (to make people more aware), about a new construction project, for valorisation of a territory etc.

Elevation strongly influences key physical phenomena, namely water, air and light propagation. The water flows from high to low so elevation data is required to forecast flood propagation but also to locate best place for new water pipes. Valleys and mountains facilitate or impede the air propagation so elevation data will be necessary to assess propagation of wind, of fire, of air pollution etc. and to find relevant place for wind turbines. The light may also be stopped by the terrain relief so elevation data is required to compute visibility or inter-visibility maps or to assess the sun potential of an area; it may also help to decide what are the relevant species (agriculture, forestry) for a given area, taking into account the sun exposure and other parameters. From Elevation data, slope data may be derived; slope is a key information to decide on any new infrastructure as a terrain with a strong slope is generally not suitable for construction; consequently elevation helps to understand how a city may spread and therefore is quite necessary for spatial planning.

Elevation also influences natural phenomena and ecosystems; obviously, elevation data is required to delimit mountainous ecosystems; meteorological conditions vary quite a lot according to the elevation, therefore impacting flora and fauna; the climate change has different impacts on an area, according to its altitude.

4.2.2 Theme 'Land Cover' – existing Land Use

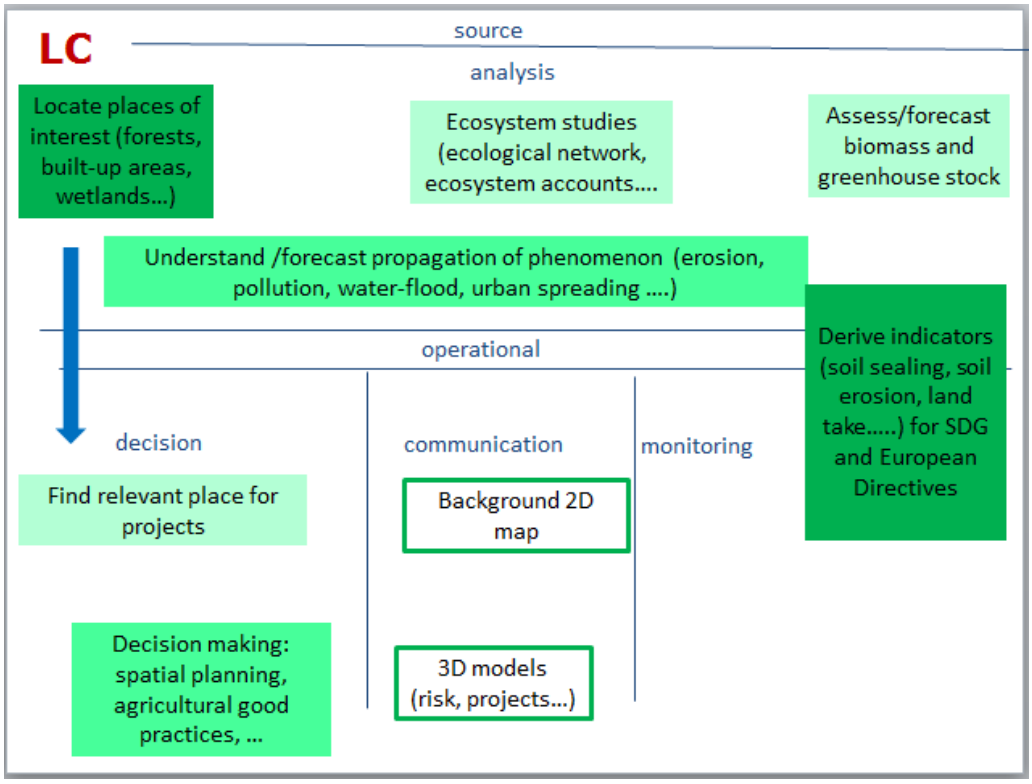

Figure 14: map of use cases for theme LC

Existing Land Use plays more or less a similar role as the theme 'Land Cover' and therefore is described under this theme, to avoid duplication of rationale.

However, 'Land Cover' addresses the biological and physical cover of Earth surface whereas the existing land use addresses the activities performed on this same Earth surface.

The simplest use of land cover is to locate places of interest, such as forests, wetlands, built-up areas etc. especially at medium and small scales. This enables to find a first assessment of relevant place for a new construction project, e.g. to delimit the coarse area where to build a new road.

Land cover data and its evolutions may be used to understand and forecast propagation of various natural or human phenomena. For example, the degree of soil sealing helps to predict the evolution of a flood flow over time; the nature of land cover is necessary to identify the areas prone to erosion or to predict how a pollution will propagate; the evolution of built-up areas and arable land will inform deciders and citizens about the land take issue.

Land cover and, even more, existing land use are key aspects for the assessment of human footprint, they enable location of human activities and to evaluate their pressure on environment and natural resources, such as land or water.

Some types of land cover are likely to have a bigger role in the evolution of biodiversity (e.g. permanent grasslands, ponds and wetlands). Land cover is strongly required to understand ecosystems, it is strongly linked with habitats and biotopes and with species distribution. This knowledge is necessary to take relevant decisions: which agricultural land to be protected from urbanisation when preparing a new spatial plan? Which agricultural practices to be recommended? Etc.

From land cover, it is possible to derive other data, such as ecological networks or ecosystem accounts that may be used in operational phase, for instance to assess the environmental impact of a project; it is also possible to derive various indicators that are quite useful for the reporting to some European Directives and may be in future for SDG indicators.

In addition, existing Land Use data enables to locate human activities, to assess their pressure on environment and on natural resources and therefore to find right balance between different uses of same natural resource.

4.2.3 Theme 'Orthoimagery'

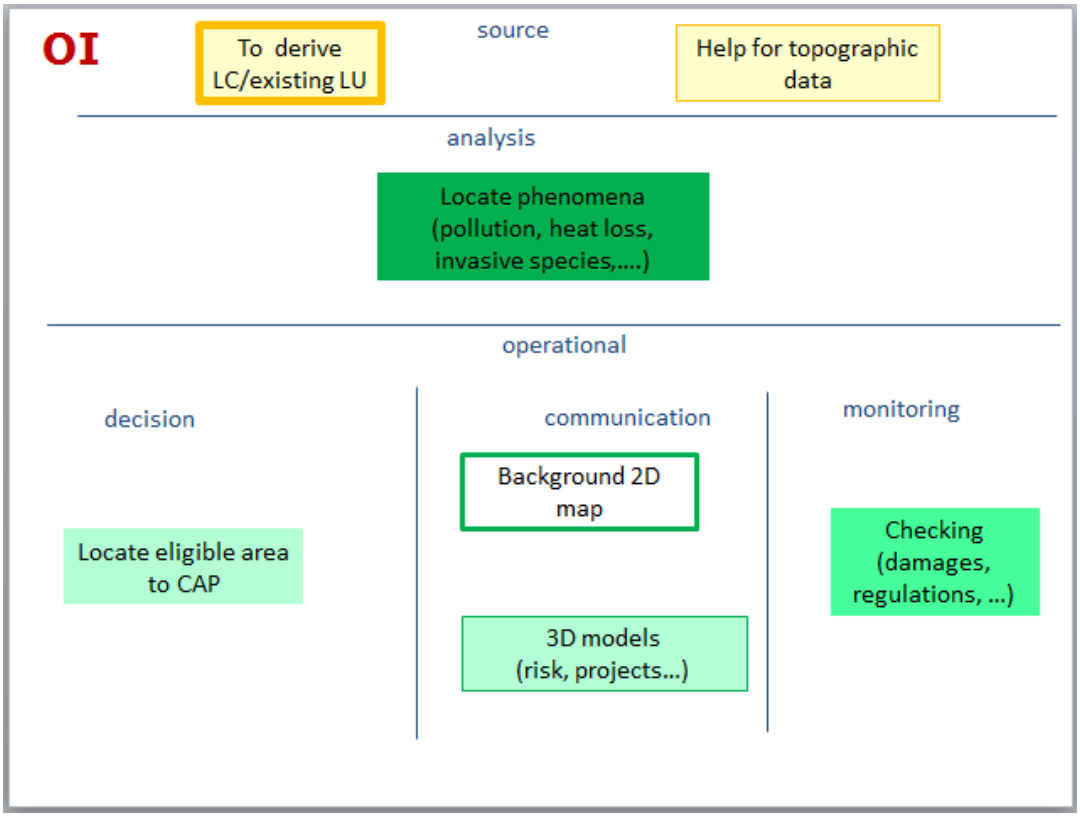

Figure 15: map of use cases for theme OI

Theme 'Orthoimagery' is part of the basic geographic equipment of a country; orthoimages are widely used as main source data to derive land cover or existing land use data; they may also be used to plot main topographical assets either in the production or in maintenance process: map updating and change detection are important uses of orthoimages (for instance, orthoimages are often used to detect missing buildings in topographic databases).

Orthoimages are also appreciated for communication purposes; orthophotos may replace maps (if some geographical names are added) or complement them as a main background layer; it is also quite common to wrap an orthoimage on a Digital Terrain Model.

They provide a good description of the environment; used by thematic experts, they enable to understand the landscape, to locate and assess various phenomena (crops, health of trees, detection of archaeological remains, invasive species, habitats etc.). Taken at night, they allow detection of light pollution in cities or of heat losses in buildings.

In the operational phase, they are used by farmers and growers of the European Union to declare their agricultural and non-agricultural areas on a yearly basis within the framework of the Common Agricultural Policy.

Satellites enable earth images to be taken very regularly, with high frequency. This makes satellite orthoimages of key interest in monitoring processes, e.g. to assess the damages caused by a disaster before deciding on compensations or to check if the environmental regulations are followed by farmers.

4.3 Annex III

4.3.1 Theme 'Statistical Units'

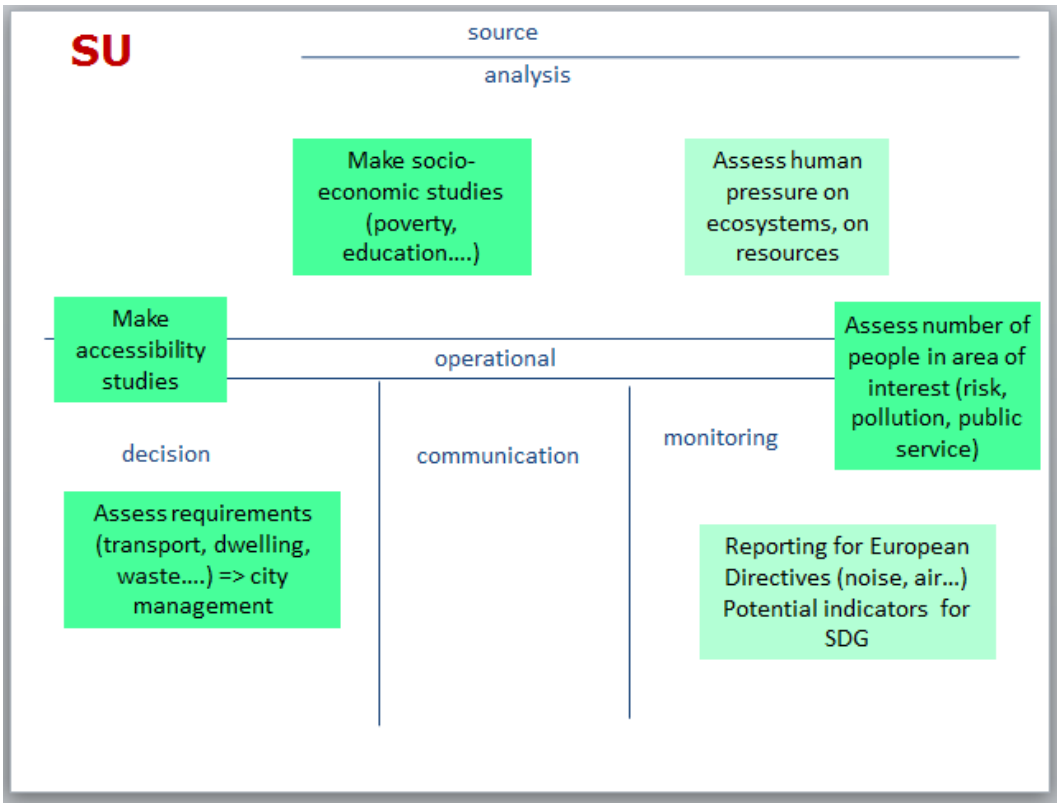

Figure 16: map of use cases for theme SU

'Statistical Units' are the geographic part of a wide range of statistical data. The geography of statistical units is the mandatory bridge that connects the territory and statistical data. Simply combined with basic population information, theme SU provides a location associated with a number of persons and possibly with their characteristics (gender, age, etc.).

Therefore this theme is necessary to assess the number of persons within an area of interest, such as a risk area, a polluted area, the catchment area of a public service and knowing (more or less) the population in any area of interest is key information to make accessibility studies, to assess the population requirements when preparing spatial planning or just when managing a populated area, to report about the number of persons submitted to noise, air pollution, flood risk etc. to the European Commission and it is very likely that it will be also necessary to compute some of the future SDG indicators. It is also quite useful for assessing the human pressure on environment and natural resources.

Statistical Units may also be combined with more specialised statistics, such as socio-economic data or human health data, allowing various analyses about poverty, employment, education, health etc.

In summary, this theme is starting point for almost all studies at medium or small scales, enabling deciders to identify the areas with major issues on a given topic.

As Administrative units, NUTS/LAU may be used for money allocation.

NOTE 1: in agreement with the statistical community, the theme 'Population Distribution' (PD), though of wide use for SDGs, has not been considered as core data because it is not geographic information. Theme PD is statistical information that may be combined with geographic data, generally themes 'Administrative Units' or 'Statistical Units' in order to perform powerful analysis. This aspect has been addressed in the first deliverable of UN-GGIM: Europe WG B on data integration.

NOTE 2: the transfer of population information from Statistical Units to areas of interest may be done, using various models, e.g. by prorata of area or by using built-up areas or buildings to get more accurate estimations.

NOTE 3: According with many initiatives of Eurostat (Geostat 1 and 2 projects, Census regulations) and other professional (European Forum for Geography and Statistics) and academic institutions the European Statistical System is increasingly producing more grid statistics for population, demographic trends and economic activities. This grid statistics could be used as an alternative to classical statistical units or as ancillary data for compute many disaggregation models that fit the information for not conventional zones (risk, pollution or special areas). These detailed and homogeneous units are particularly pertinent when the SDG highlights the importance of the distribution and social and territorial inequalities of any indicator.

4.3.2 Theme 'Buildings'

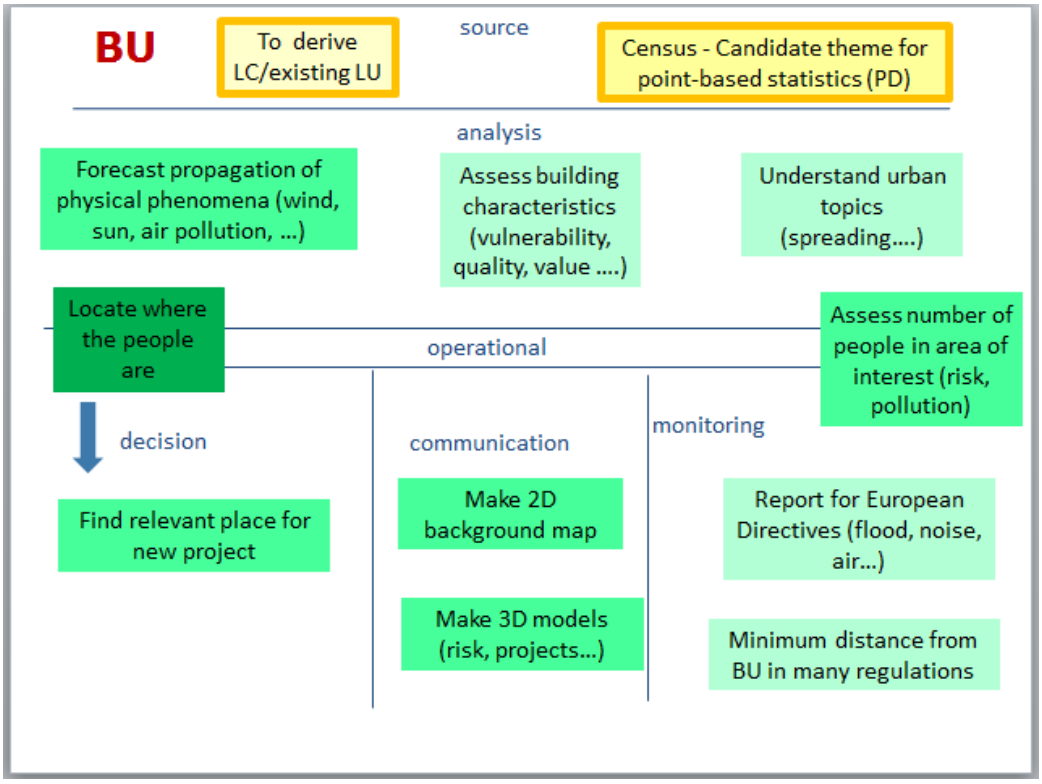

Figure 17: map of use cases for theme BU

Buildings are 3D topographic objects and, as such, may influence the propagation of physical phenomena. Typically, air pollution will not spread in the same way in a street lined with high buildings as in a street lined with small houses. Building data is also quite necessary to make visibility or inter-visibility maps, to understand the urban heat island phenomenon (and so to try to avoid it

when designing new building projects), to forecast how noise will propagate etc. At the same time, the physical phenomena may also impact the building. The most obvious use case is the assessment of the vulnerability of buildings to various kinds of risks (earthquake, fire, flood etc.), according to the physical characteristics of the building. But it is also of significant interest to assess the ability of the building to SDG related improvements, e.g. can the roof host solar panels? Should the building be isolated from noise or from heat losses? Etc. In addition, buildings are valuable economic assets and for some of them, part of historic patrimony; that should be taken into account in risk management.

Regarding communication purposes, buildings are part of most of large scale maps and of 3D models.

However, buildings are, above all, the place where people live, work and spend much of their time. Knowledge about location of buildings may be useful indirectly, as source or ancillary data to derive land use or land cover information enabling various studies at medium scales, e.g. to better understand and forecast city spreading, to assess the requirements for basic services (water, energy, schools etc.), to assess the human pressure on environment etc. Location of buildings is of course quite necessary to carry out the same kind of studies but at most detailed scales. In addition, there are many regulations aiming to protect people that prohibit some activities within a given distance of the buildings where they live. Building data (with height and use) enable transfer of population data from administrative or statistical units to any area of interest. This is key information to assess the number of persons submitted to risk or pollution and to report it for European Directives (noise, flood, air etc.) or in future to compute the SDG indicators. This is also necessary to choose relevant location of new equipment, in order to ensure that it serves the citizens as much as possible (school, hospital, public transport stop etc.) or that it disturbs them as little as possible (waste landfill, water treatment plant etc.).

Building data is also required by the statistical community in order to conduct the census surveys and in future as candidate theme for point-based statistics and a component in the Global Statistical Geospatial Framework.

4.3.3 Theme 'Area Management'

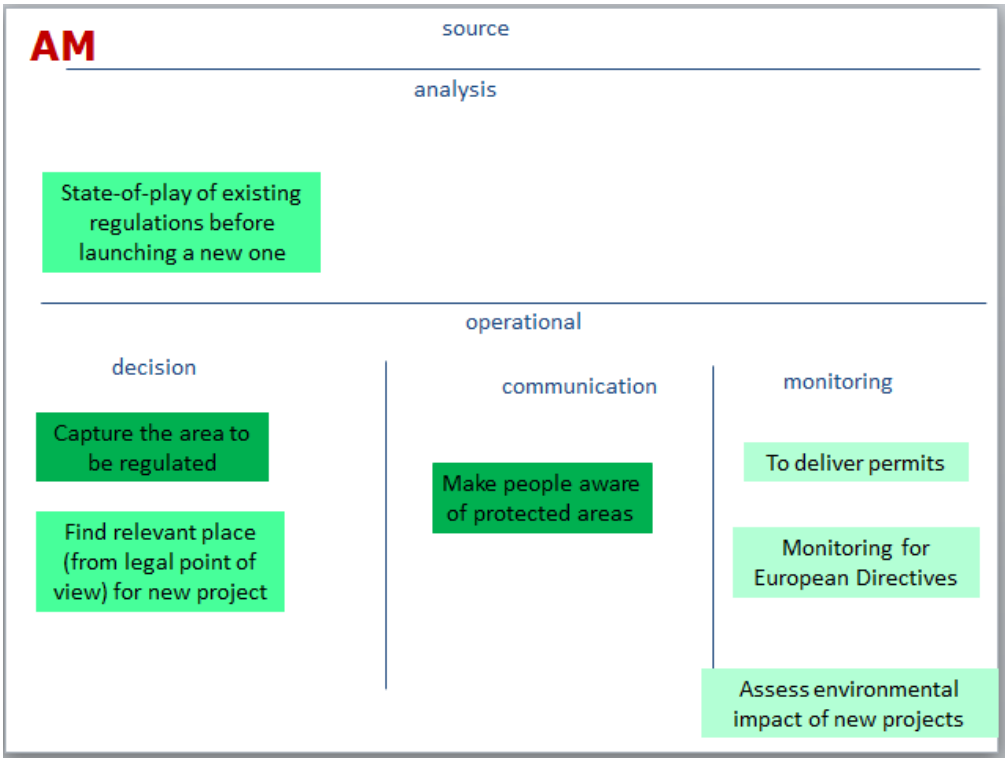

Figure 18: map of use cases for theme AM

In INSPIRE, the exact name of this theme "Area management/restriction/regulation zones and reporting units". For WG A, this theme also includes 'Protected Sites' and planned Land Use that are specific cases of regulated areas.

Regulation on specific areas is a powerful means to help achieve the SDGs. These regulations may aim to protect a specific area by prohibiting or mandating some activities, to affect the most relevant land use to a given area, to ensure sustainable exploitation of forest or other natural resources, to allocate more funds to less favoured areas etc.

In the analysis phase, before introducing new rules, it is necessary to check that there is no conflict or useless redundancy with existing regulations. Then the location of the regulated area has to be properly captured as spatial data, enabling it to be combined with reference data, such as administrative units or cadastral parcels: to be applied, the regulations must be widely known by citizens and so easy to access and to understand. For instance, protected sites and restricted areas around contaminated sites or air quality management zones must be known by the public in order to lower their exposure to the hazards involved. Knowledge of all public restrictions also brings security for investments and to the land market, ensuring that there are no hidden restrictions.

In the operational phase, governments and other actors have to take into account the existing regulated areas to find relevant locations for a new project, at least to check if this project conforms to the various regulations on land. The protected areas around watercourses may be integrated and taken into account by the GPS of tractors to prevent farmers from spreading pesticides etc.

Regulated areas have also to be known to deliver various kinds of permits (e.g. planned land use for building permits) and to assess the environmental impact of "big" projects. Protected sites are

required for reporting to several European Directives (e.g. Natura 2000) and are involved in some SDG draft indicators. Theme 'Protected Sites' contributes to the depiction of cultural heritage and nature protection sites both in land and water.

4.3.4 Theme 'Governmental Services'

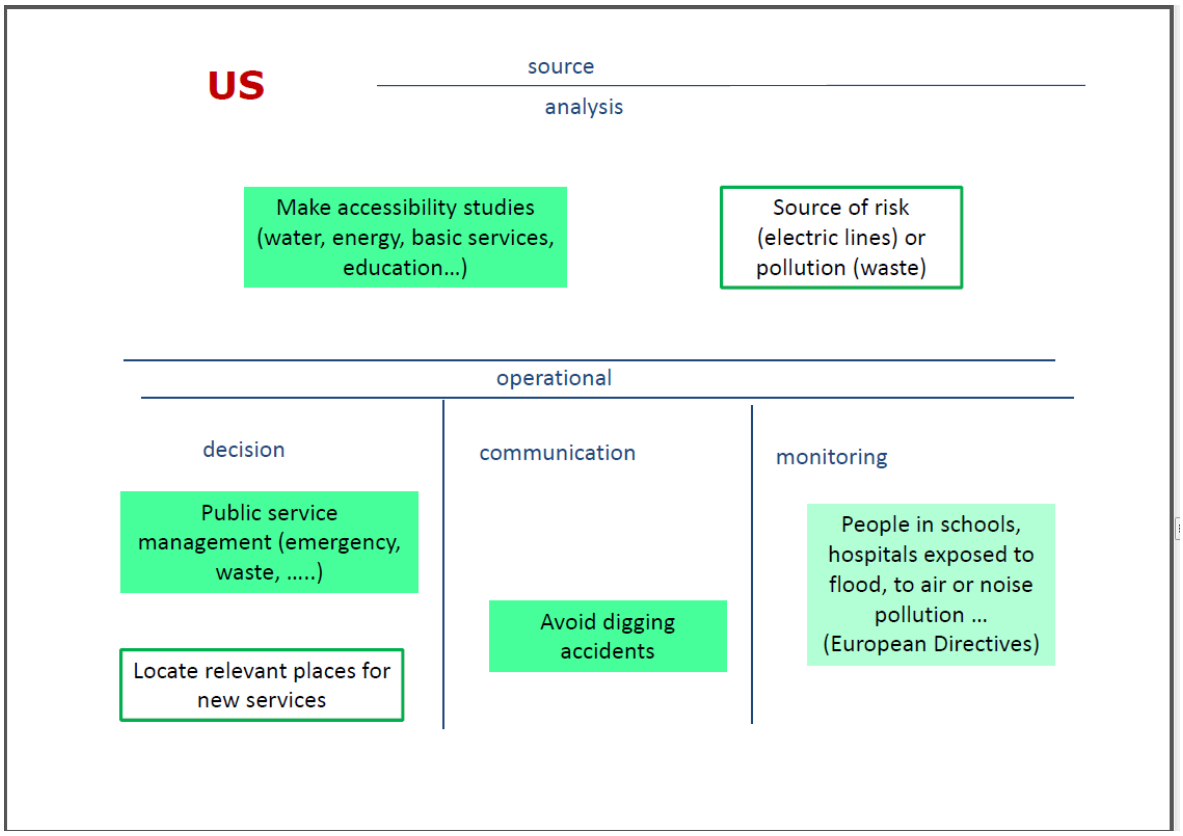

Figure 19: map of use cases for theme US

The INSPIRE theme 'Utility and governmental services' (US) includes three sub-themes: utility networks, administrative and social governmental services and environmental management facilities (i.e. waste management facilities).

Though very useful, the utility network data has been considered by WG A as too detailed to be part of core data, however the sub-theme related to governmental services has been considered as both very necessary for several SDG and quite achievable.

Typically, SDG 3 (good health and well-being) and SG 4 (quality education) will require data about health and education facilities, such as hospitals and schools. Several other SDG targets include access to basic services. This data is required in analysis phase to get the state-of-play of governmental services but also in the operational phase to identify the possible gaps, to decide on best location for a new public service or on the contrary to decide if it is possible to close a public service without decreasing too much the citizen accessibility to basic services.

Education, health and social services are also places where fragile persons (school children, old or ill persons) spend part of their time. Some environmental European Directives ask to report about the number of these fragile persons submitted to various pollutions (e.g. air pollution, noise).

In addition, many governmental services may also be used as landmarks helping travellers to get oriented in a city. More generally, they are places of interest for many stakeholders (citizens, local government, travellers, business persons etc).

5 Other conclusions

5.1 Main findings

5.1.1 Wide use of Geospatial Information

5.1.1.1 Geospatial data for all stages of public policies

Sustainable development policies require taking the right measures to ensure both economic and social development and environmental protection; it is a hard exercise that needs information-based decisions. Data (including geospatial data) is generally assumed as enabling these information-based decisions.

The user survey conducted for this report has confirmed this assumption by showing how much geospatial data is necessary to understand environmental and human phenomena and to conduct various SDG related studies in order to locate places of issues and to identify the relevant measures to be taken. But the scope of using geospatial data is much wider than mere phenomena analysis, as it is absolutely required for policy implementation, e.g. to decide on the best place for a project, to prepare itineraries for emergency rescue or for new public transport, to make citizens aware of regulated areas, to deliver permits according to the various regulations, to manage public land, etc. **Geospatial data is useful not only to identify and display where the issues are located but it is quite helpful also to solve such issues.**

Last, geospatial data is required for monitoring public policies, such as reporting for European Directives or calculating future SDG indicators.

5.1.1.2 Geospatial data for various stakeholders

Though the user requirement survey was mainly targeting governmental actors working for sustainable development, the results have shown that many more stakeholders benefit from geospatial data.

Some basic geospatial data is of daily use by economic actors and even by the person in the street. For instance, cadastral parcels (with related land registration system) ensure safe land market and enable investments whereas transport and addresses data make the moving of persons or goods easier.

In a more elaborated way, geospatial data is input to various tools aiming for instance to model physical phenomena for risk prediction or to simulate future urban spreading according to various spatial planning options or to advise tree species adapted to climate change on a given cadastral parcel or to guide farmers in spreading pesticides only where it is allowed.

The beneficiaries are of course the applications developers (industry, research) but above all, the application users who may be governments, economic actors such as farmers, citizens etc.

In conclusion, unleashing the power of ‘Where’ will really make the world a better place.

5.1.1.3 Levels of Detail of required Geospatial Data

The user requirement survey has shown that geospatial information is required at all levels of detail, typically:

- Geospatial data for policy use → International and strategic level

This is rough (but also specialized) information that is needed for policy issues within the UN, within regional entities such as the EU, and that is needed for national policy developments. The data needed is small scale data covering the area of interest - ideally in a homogeneous way.

- Geospatial data for planning and management → National and management level

In order to obtain a sustainable society and reach the sustainable development goals, there is also a need for data with medium level of detail. Users here are commonly planning different activities at regional and national levels, also based on relevant reference data.

- Geospatial data for local level action → Local and action level

Planned actions have to be implemented and carried out. These can be for example rescue operations, flood mitigation, pollution clean-up actions, sustainable farming and forestry operations, safe sea transport operations etc. These issues and related actions are common to most countries, requiring the same kind of detailed data.

WG A considers that some local data (e.g. for themes AD, BU, CP) is within the scope of core data as such local data address requirements that are common to all countries, even if local data is involved in only few cross-border use cases. In addition, for several themes, the smaller scale data may be derived from the most detailed one, ensuring an effective production system and compliance with the INSPIRE principle “capture once, use many”.

5.1.2 Analysis of selection process and results

5.1.2.1 Difficult choice

Selecting core data themes implies to exclude the other ones, which has been a hard decision. The main selection criterion is extensive use for SDG requirements but, in practice, there is not a clear barrier between themes with “extensive use” and themes with “limited use”. The selection carried out by WG A is based both on a rigorous methodology (relying on the user requirement survey) but also on the human decisions taken by the WG A members and observers.

The resulting selection is a reasonable one but not an incontestable one. We should recognise that (slightly) different selections might have been envisaged and also considered as reasonable.

In particular, Eurostat and Joint Research Centre have expressed disappointment that theme ‘Governmental Services’ (in theme US) is not included in core data. This suggestion for addition has been considered and agreed later during WG A meeting on 07-08/06/2016.

5.1.2.2 Direct use versus indirect use

Core data has been selected according to its wide use for SDGs, either directly, or indirectly as a framework.

The indirect use may take various forms, the most common ones being:

- Data is used as background providing meaningful context to more thematic data;
- Data is used as main source or as ancillary data to derive or to facilitate the production of other data;

- Data is used to transform an indirect location into a direct one by geocoding process[5];
- Data enables the combination with other data, typically by semantic joining.

The resulting selection includes both topographic and administrative description of the territory, as shown by following illustration.

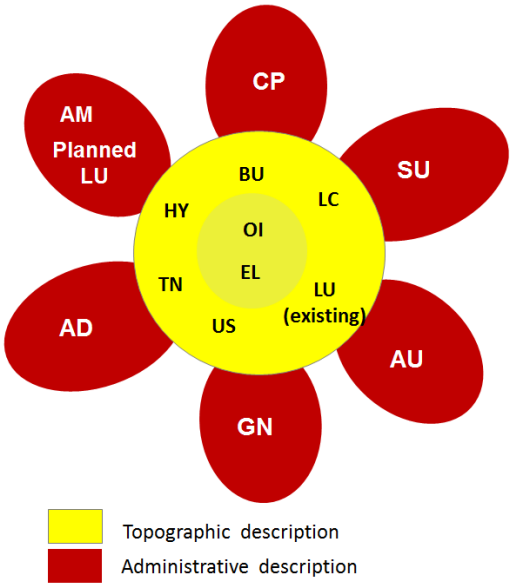

Figure 20: selected themes address topographic and administrative description of territory

Most of the selected themes are widely used as background.

The “administrative” themes offer wonderful “hooks” allowing combination with other data:

- Themes ‘Administrative Units’ and ‘Statistical Units’ enable combination with lots of statistical data; this topic has been dealt with by WG B;
- Themes ‘Administrative Units’, ‘Geographical Names’ and above all ‘Addresses’ enable the geocoding process;
- Theme ‘Cadastral Parcels’ enables linking with land registration data, such as rights, owners, valuation etc.
- Theme ‘Area Management’ enables linking with regulations.

Some topographic themes are required to derive or to facilitate the production of other data (e.g. elevation for orthoimagery; orthoimagery for land cover). It is also possible to attach other thematic or business data to themes ‘Transport Network’ (or ‘Hydrography’) by linear referencing.

At a coarse overview, the topographic themes have been selected mainly because of their direct use for SDGs and the “administrative” themes mainly because of their indirect use, due to their ability to be combined with other data and so, to widen the interest of geospatial information.

[5] Cf. the concept of ”spatial reference framework” in the ”Report from the task force on the integration of statistical and geospatial information”, Eurostat 20/02/2015.

5.1.2.3 Reference data versus thematic data

During its initial discussions, WG A had to cope with defining core data and the following question arose: is core data synonymous with reference data? In other words, should core data be restricted to reference data or might it include also thematic data?

The methodology chosen by WG A has clearly excluded the first option by investigating all INSPIRE themes against user requirements, either core or thematic themes.

At the end of the decision process, it appears that selected core themes are mainly classical core reference data themes and include only a few thematic data themes, considered as particularly important (namely, 'Land Cover', 'Land Use' and 'Area Management').

NOTE 1: the classification into core reference and thematic or environmental data is taken from the INSPIRE Position Paper about Environmental Thematic User Needs (Ibidem).

NOTE 2: WG A has not found any document supplying clear definitions of reference and thematic data. From some points of view, it might be considered that themes 'Land Cover', 'Land Use' and 'Area Management' are also reference data.

Nevertheless, the work conducted by WG A has also shown that some thematic or environmental data is of significant use, for instance geology (mainly hydrogeology for underground waters), oceanography, meteorology, habitats and biotope etc.

5.1.2.4 What about excluded themes?

The WG A selection is a relatively well-balanced one that gives priority to the reference data themes being used directly, at the various stages of sustainable development policies (analysis, implementation, monitoring) and indirectly, as framework.

The themes that are not part of the WG A selection remain obviously under the scope of INSPIRE, therefore the Member States of the European Union shall provide the necessary efforts to make them more accessible and more interoperable.

WG A has chosen to have a reasonable ambition by selecting, as core data, 13 themes from the 34 of INSPIRE. UN-GGIM is a young initiative; what to do about the non-selected themes is an issue to be considered in the longer term. Some non-selected themes, such as meteorology or oceanography, may also be better harmonised through other international standardisation bodies.

5.2 European dimension versus global dimension of core data

The European dimension of WG A work is threefold:

- Use of the INSPIRE terminology, mainly the naming and definitions of INSPIRE themes: this well-defined vocabulary provides a wonderful common understanding to the writers and readers of this deliverable!
- User requirements: the European context has also been taken into account for the user requirement survey: the few SDG targets that are very specific to developing countries have not been considered; many of the use cases come from the INSPIRE data specifications, including the reporting for European Directives or policies (Common Agricultural Policy, Flood Directive, Noise Directive, Air Quality Directive, Energy Performance of Building Directive, Population and Housing Census Directive, Habitats Directive, Birds Directive etc.).

- Ambition in theme selection: feasibility has been taken into account when selecting core themes; Data available in Europe being already relatively rich, up to thirteen themes have been selected.

What has been carried out by WG A may serve as input for the work to define the global fundamental themes:

- Though the INSPIRE legislation applies only within the European Union, the INSPIRE terminology might be used by the whole world if there is no better agreed standard;
- The identified use cases and user requirements are mainly based on SDGs so many of them might be the same at global level;
- As there may be less data available at global level (at least in developing countries) than at European level, the ambition might be higher for European core data themes than for global fundamental themes. For instance, the UN-GGIM WG on National Institutional Arrangements selected nine land themes that are a subset of the WG A selection.

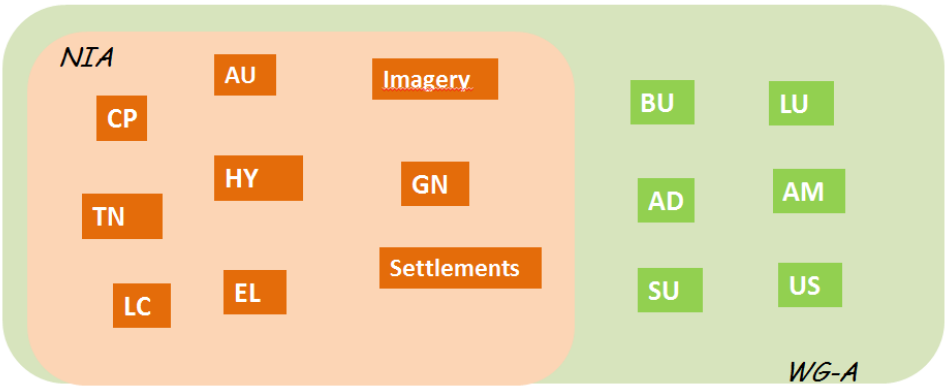

Figure 21: NIA selection as subset of WG A one (in INSPIRE, settlements are part of Geographical Names [GN])

This enables us to envisage a nesting between national core data, regional core data, and global fundamental data i.e. national core data would be used to derive European core data, which in turn would be used to derive global fundamental data.

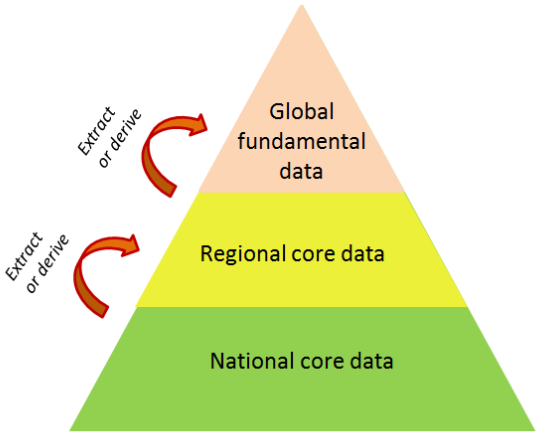

Figure 22: core data at various levels

5.3 Next stages

Definition of core data scope is the first step of the WG A work plan. The next stage will be to elaborate the technical specifications of the selected themes.

The envisaged methodology will use the INSPIRE specifications as starting point and will consist both in selecting core content within an INSPIRE theme (e.g. by identifying the core features and attributes) and in making core data more homogeneous across Europe (e.g. by mandating well-defined levels of detail through quality criteria).

Integration of INSPIRE in the methodology will facilitate later implementation of core data within the INSPIRE infrastructure and within the European Location Framework (ELF) platform.

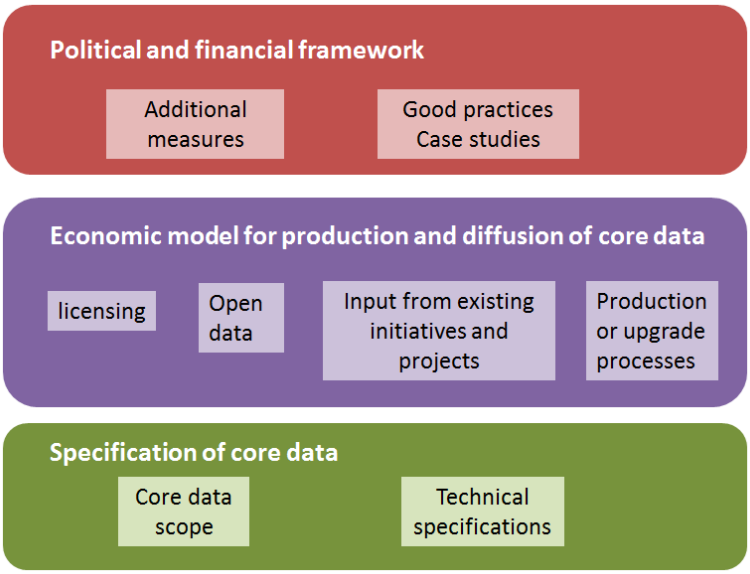

Figure 23: WG A work plan

6 Annex A: List of contributors

6.1 Members of the UN-GGIM: Europe Work Group A "Core Data"

6.1.1 European UN Member States

- Austria, represented by Reinhard Gissing reinhard.gissing@bev.gv.at
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6.1.2 Observers

- Joint Research Centre, represented by Vanda Lima vanda.lima@jrc.ec.europa.eu (data specifications) and Francesco Pignatelli francesco.pignatelli@ec.europa.eu (EULF)
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6.2 Other participants in the workshop

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- UN-GGIM:Europe Secretariat, represented by Carol Agius carol.agius@eurogeographics.org

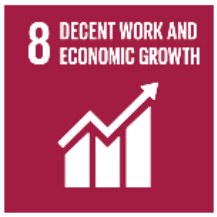
7 Annex B: List of interviews

Person	Organisation	Topic
Dr Peter Seifert	Geological Survey - Austria	Risk
Hans Erik Svart	Nature Agency- Denmark	Invasive species
Ekkehard Petri Nikola Massarelli	Eurostat - Luxembourg	Education
Laurent Pavard	Ministry of Agriculture	Agriculture
Nicolas Paparoditis	Scientific Director – IGN - France	Climate
Joël Mognol Marie-Lise Vautier	Ministry of Sustainable Development-Regional Direction of Environment and Energy.	Environmental impact assessment
Marie-Françoise Slak	Forestry unit – IGN - France	Forest
Jean-Philippe Siblet	National Museum of Natural History - France	Invasive species
Ghislaine Bordes	Ministry of Sustainable Development - France	Public land management – sustainable urbanization
Doris Nicklaus	Ministry of Sustainable Development - France	Resource efficiency
Laurent Delgado	IGN - France	Simulation tools for decision-making
Laurent Coudercy	National Office of Water and water ecosystems - France	Water
Frédéric Brönnimann	IGN - France	Waste management – spatial planning
Dr. Dimitra Founda	National Observatory of Athens- Institute for Environmental Research and Sustainable Development	Climate change
Dr. Christos Giannakopoulos	National Observatory of Athens – Institute for Environmental Research and Sustainable Development	Climate impacts
George Alvanopoulos	Ministry of Environment and Energy-General Directory of Environmental Policy-Directory of Biodiversity, Soil and Waste Management	Biodiversity, ecosystems
Dr. Stella Kyvelou	Panteion University of Social and Political Sciences - Greece	Spatial planning
Nikolaos Mamassis	National Technical University of Athens	Water management
Kamil Rybka	Ministry of Infrastructure and Development	Maritime spatial planning
Francisco J. Goerlich	University of Valencia	Poverty
Antonio Moreno Jiménez	Autonomous University of Madrid	Equality (injustices)
Pablo Fidalgo García	Carlos III University (Madrid, Spain)	Housing - vulnerability
Carolina Guardiola Albert	Instituto Geológico y Minero de España	Water – climate change
Gregorio Pascual Santamaría	Directorate General of Civil Protection and Emergencies, Ministry for Home Affairs - Spain	Risk
Marie Haldorson	Statistics Sweden	Statistics production
Dr. Tom Klingl	Federal Office for the Environment - Switzerland	Sustainable development
Dr Ivan Haigh	National Oceanography Centre - UK	Ocean

8 Annex C: List of the SDGs and SDG targets selected by WG A

This annex lists the SDGs and SDG targets that have been selected by WG A, as consuming geographic information (see figure 1).

SDG	Target	Content
	1	End poverty in all its forms everywhere
	1.4	Ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
	1.5	Build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
	2.1	End hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
	2.4	Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
	3.6	Halve the number of global deaths and injuries from road traffic accidents
	3.9	Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
	4	Ensure inclusive and equitable quality education for all

	6.1	Achieve universal and equitable access to safe and affordable drinking water for all
	6.2	Achieve access to adequate and equitable sanitation and hygiene for all
	6.3	Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
	6.4	Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
	6.5	Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
	6.6	Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
	7.1	Ensure universal access to affordable, reliable and modern energy services
	7.2	Increase substantially the share of renewable energy in the global energy mix
	7.3	Double the global rate of improvement in energy efficiency
	8	Promote sustained, inclusive and sustainable economic growth
	8.4	Improve progressively global resource efficiency in consumption and production
	8.9	Devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products
	9.1	Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
	10	Reduce inequality within and among countries

	11.1	Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
	11.2	Provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
	11.3	Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries
	11.4	Strengthen efforts to protect and safeguard the world's cultural and natural heritage
	11.5	Significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations
	11.6	Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
	11.7	Provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities
	11.a	Support positive economic, social and environmental links between urban, per-urban and rural areas by strengthening national and regional development planning
	11.b	Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters
	12.2	Achieve the sustainable management and efficient use of natural resources
	12.4	Achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment
	13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
	13.2	Integrate climate change measures into national policies, strategies, and planning

	14.1	Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
	14.2	Sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
	14.3	Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
	14.4	effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
	14.5	Conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
	15.1	ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
	15.2	Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
	15.3	Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world
	15.4	Ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development
	15.5	Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
	15.8	Introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species