User Needs of the Selected Use Cases

Report of the GeoE3 Action

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Table of Contents

1. Introduction

GeoE3 will address two major challenges for Europe: climate change and urbanization. Both require new approaches to be implemented by public bodies and nations. Decisions on these major issues affecting the life of future generations should be based on best possible information. All relevant information sources must be combined into meaningful integrated data sets and made available for users through easy-to-use access points. This is the goal of the Geospatially Enabled Ecosystem that the GeoE3 action is aiming at.

Three different use cases will be used for testing the proposed Geospatially Enabled Ecosystem. While the GeoE3 services and tools are intended to be generic, the use cases will provide an excellent Proof of Concept for the deliverables. The use cases are concerned with solar and other renewable energy sources in the context of the building construction industry, optimised use of electrical cars, and effective land use in the expansion of urban settlements.

The most important user communities have been engaged in order to identify user needs. Based on the collected user needs, the interoperability elements that will be needed in GeoE3 are to be specified – in particular – for data and access APIs. Relevant communities include for example governmental agencies involved in national strategy development on the use of renewable energy and optimized urbanization development, consultants working in the renewable energy market, energy production companies, city and regional planners, and traffic authorities. The parties contacted during the use case development process are listed in the Annex C.

2. Description of the Use cases

In the following, the use cases are introduced using a template, in which the use case is first described in some detail, then its primary actor is mentioned, the pre- and postconditions of the use case defined, the main success scenarios and possible extensions described and, finally, the frequency of the foreseen application of the use case given.

2.1. Use case 1. Solar energy potential and energy efficiency of buildings

The first use case is specifically related to the house construction business. The use case has been divided into two parts: in use case 1A the solar energy potential of an existing building is considered whereas the use case 1B focusses on the optimization of the heating and possible cooling facilities during the building's planning phase.

Use case 1A. Analysing the solar energy potential of a building

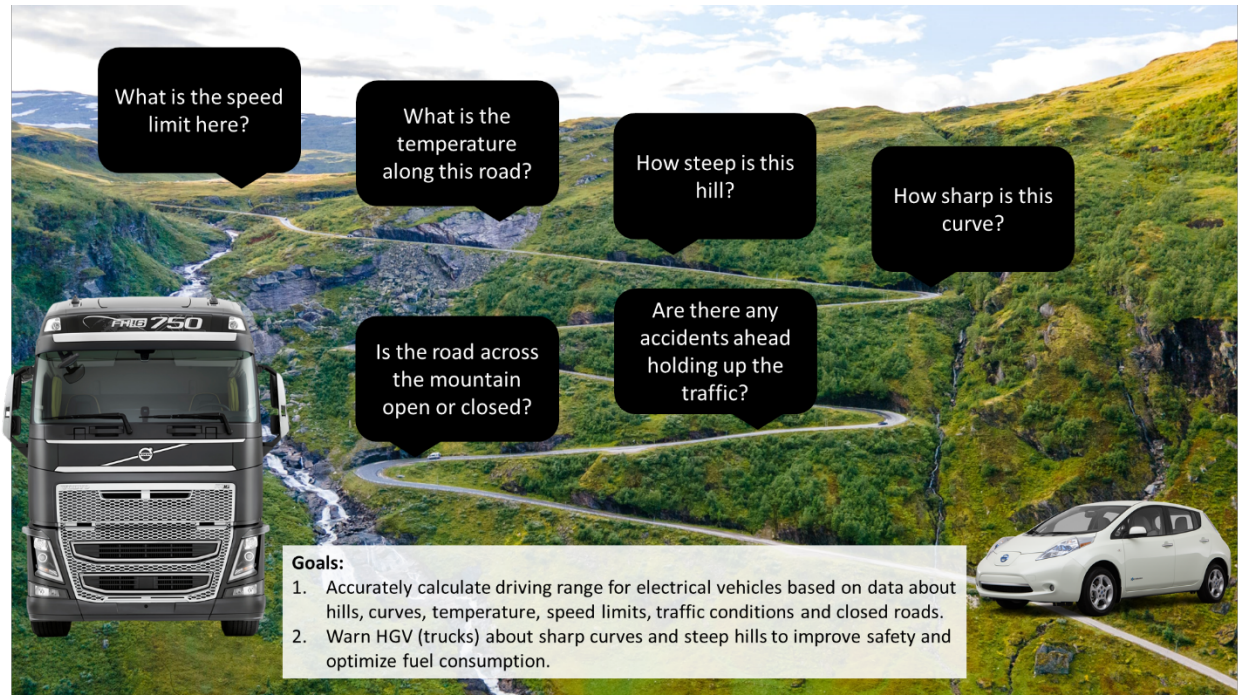
Description:	Solar energy potential of a building is evaluated by calculating, how much solar radiation is available on the roof of the building. In this analysis the following factors will be considered: form of the roof, average sun inclination, possible external shadowing objects (like neighbouring buildings and major trees), and prospects of the future climate conditions. All factors will be evaluated on the exact geographical location of the building. The analysis can be applied in a cross-border manner.
Primary Actor:	Solar Energy Consultant
Preconditions:	The actor has profound understanding of solar energy and all the required software and computing facilities for performing the analysis. The input datasets for the analysis, available from the GeoE3 platform, on an adequate quality and harmonization level, and with permanent feature IDs for integration of external data: - 3D building model with LoD 2 detail - Relevant building attributes - Digital Surface Model (DSM) of the surrounding area - Shadow index coverage - Number of sunshine hours at the nearest observation station Analysis functions that GeoE3 provides to support the user in performing the tasks of the use case.
Postconditions:	Reliable result of the solar energy potential of the building in question. The actor can apply the analysis independently of state borders.
Main Success Scenario:	The actors on the field can expand their businesses internationally. Best possible analysis methods are widely applied as the result of international competition. Optimal number of solar panels are acquired and are installed in best possible locations. The effects of climate change are minimized.
Extensions:	If 3D building models are not available, an approximate analysis can be run on DSM data alone. Considering the permeability and steadiness of the shadowing object in DSM (whether building or forest/tree) would improve the analysis.
Frequency of Use:	Daily

Use case 1B Optimizing the heating/cooling system of a building

Description:	During the architectural design of a building, its heating and cooling facilities are planned, considering the environmental effects (like exposure to sun and wind) on the proposed geographical location of the building.
Primary Actor:	Architect Bureau
Preconditions:	The actor must have the architectural model available in georeferenced form. The input datasets for the analysis, available from the GeoE3 platform, on an adequate quality and harmonization level, and with permanent feature IDs for integration of external data: - 3D building model with LoD 2 detail - Digital Surface Model (DSM) of the surrounding area - Permeability info for the DSM - Shadow index coverage - Average wind conditions - Normal air temperature at the nearest observation station - Monthly mean temperature based on climate scenarios Analysis functions that GeoE3 provides to support the user in performing the tasks of the use case.
Postconditions:	Optimal plan of the heating/cooling facilities for the designed building, considering the environment at the actual building site and the anticipated future effects of the climate change on the location.
Main Success Scenario:	Architectural planning is based on real georeferenced model, where actual environmental factors and localized future climate scenarios can be considered. Significant savings are achieved by optimizing the heating systems of the buildings. Reliable predictions of the necessary cooling facilities can also be made.
Extensions:	By expanding the planning area, an analysis can be made of benefits a centralized heating/cooling facility might provide. The analysis might also be applied so that the exact location of the building in the target area is optimized to minimize the cost related to heating/cooling installations.
Frequency of Use:	Weekly

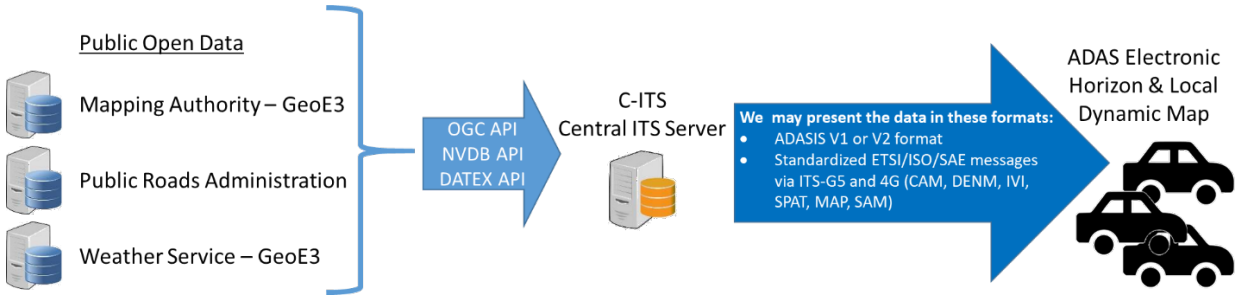
2.2. Use case 2. Co-operative Intelligent Transport Systems (C-ITS) and Advancing map enhanced driver assistance systems leading to automated driving (ADASIS)

The second use case combines data from GeoE3 with other public open data to provide new services for the European C-ITS platform (Cooperative Intelligent Transport Systems) as illustrated in this figure:



Description:	This solution will provide 3D geospatial data for electric vehicles with a need to calculate how much power they will use to reach the top of a mountain pass, and how much they can recharge the batteries when they descend the mountain on the other side. It will also be useful as part of the ADAS (Automated Driver Assist System) in heavy goods vehicles (HGV), where the cruise control can take into account upcoming slopes and sharp curves on the road before shifting gear. In addition, we will provide traffic signs and speed limits to the vehicles, collected from the NVDB data bases found in Norway and Finland, as well as traffic alerts from the DATEX2 servers and weather alerts from the meteorological services.
Primary Actor:	Providers of C-ITS and ADASIS services like road operators, fleet management systems, and navigation systems.

Preconditions:	The actors have backend systems that communicate with the vehicles either according to the C-ITS standards or the ADASIS specifications.
Postconditions:	Optimize trip planning to minimize energy/fuel usage, avoid trouble, and reduce travel time.
Main Success Scenario:	Cost savings from reduced energy/fuel usage and reduced travel time outweighs the costs for implementing and maintaining this solution.
Extensions:	Include automatic booking of ferries, booking of charging/fueling stations, and booking of rest stops as part of the trip planning.
Frequency of Use:	Daily



2.3. Use case 3. Cross border & Cross domain Smart City Finland Estonia

The third use case is concerned with the expansion of urban land. The use case has been divided into two parts: in use case 3A the renewable energy potential of a planned development area is considered. The use case 3B deals with the optimization of the efficiency of urban expansion using the United Nations Sustainable Development Goal (SDG) indicator 11.3.1 as the measure.

Use case 3A. Renewable Energy Potential

Description:	Solar and wind energy potential of a planned development is evaluated, based on spatial analysis with a rough 3D construction plan, together with the actual geographic model of the target area.
Primary Actor:	City Planning Department
Preconditions:	The planned development has to be available as rough georeferenced 3D volumes with approximate roof models (LoD 2). The input datasets for the analysis, available from the GeoE3 platform, on an adequate quality and harmonization level, and with permanent feature IDs for integration of external data: - High resolution Digital Elevation Model (DEM) - Digital Surface Model (DSM) - Average wind conditions - Number of sunshine hours at the nearest observation station - Wind speed normal at the nearest observation station Analysis functions that GeoE3 provides to support the user in performing the tasks of the use case.
Postconditions:	New development areas are selected in a more energy-efficient way. Significant savings can be attained for the city, as the need for the provision of centralized energy sources is decreased.
Main Success Scenario:	Energy consumption of the newly developed areas is kept to minimum. With the increased provision of renewable energy sources, the effects of climate change can be restrained.
Extensions:	Availability of a city model of the surrounding areas would improve the analysis. The analysis can also support the planning of centralized energy production facilities and energy distribution networks. The analysis can be extended to cover cross-border target areas.
Frequency of Use:	Yearly

Use case 3B. Analysing the efficiency of expansion of urban land

Description:	The efficiency of an urban expansion plan is evaluated by analysing the compactness of the new development. The measure to be used is the ratio between land consumption and the population growth in the development area (UN SDG indicator 11.3.1). A comparison is made between the 11.3.1 indicator of the area before and after the planned expansion.
Primary Actor:	Regional Council
Preconditions:	Expansion plans have to be available with estimates of land consumption and predicted population capacity. The input datasets for the analysis, available from the GeoE3 platform, on an adequate quality and harmonization level, and with permanent feature IDs for integration of external data: - Building footprints - Existing population data Analysis functions that GeoE3 provides to support the user in performing the tasks of the use case.
Postconditions:	Regional planning is based on reliable facts on the efficiency of the planned developments, compared with the existing situation in the target area.
Main Success Scenario:	Urban area can be expanded in a sustainable way.
Extensions:	More relevant data (like statistics information) can be attached to the existing building features if deemed necessary. The analysis can also be applied for comparison between alternative expansion plans. The 11.3.1 indicator for a given area might also be readily available from the GeoE3 platform. The analysis can be extended to cover cross-border target areas.
Frequency of Use:	Yearly

3. User Need Analysis – approach

3.1. Process

In the process of the GeoE3 use case analysis, the relevant user communities have first been identified. Then the most important actors of the communities were contacted via email. Some video calls were organised and a web form for collecting the user input was developed (see Appendix A). A restricted set of actors from each of the relevant user domains were involved in the use case development.

3.2. Response from user communities

The response from the user communities was scarce but useful. Very fruitful discussions were held for example with representatives of environmental government agencies, electrical power producing companies and departments dealing with renewable energy production issues in cities. In the discussions, the specific aim was to get feedback on the source data sets required for the analysis and decision-making processes in each user domain. Based on the feedback received, the final proposed lists of necessary data sets and access interfaces are shown in Chapter 4.

4. Proposed Data and API's

4.1. Data from mapping Agencies.

Currently four datasets typically provided by mapping agencies are identified by the users for the selected use cases.

Data set	Resolution	Use case	Remark
Buildings, 3D	LoD2	1,3	
Digital Surface model	1m	1,3	Highest possible resolution
Digital Elevation model	1m	2,3	Highest possible resolution
Road network		2	Network Topology with linear referencing
Cadastral boundaries		3	
Orthophotos		1	
Point Clouds		1	
Land use and Land cover		3	

4.2. Data from other domains.

Currently several datasets provided by agencies in other domains are identified by the users for the selected use cases. There might be more datasets added to the list when users' needs are analysed further.

Data set	Use case	Data provider	Remark
Sunshine hours	1,3	Meteorological institutes	
Wind conditions	1,3	Meteorological institutes	
Normal air temperature	1,2,3	Meteorological institutes	
Mean temperatures	1,3	Meteorological institutes	
Traffic signs, speed limits	2	Road Administration	
Realtime traffic info	2	Road Administration	
Building attributes	3	Several	
Traffic accidents	2	Statistical Centre	
Petrol stations	2		
Population statistics	3	Statistical Centre	
Buildings 3D	1,3	Cities	
Building plans	3	Cities	
Point Clouds	1	Cities	

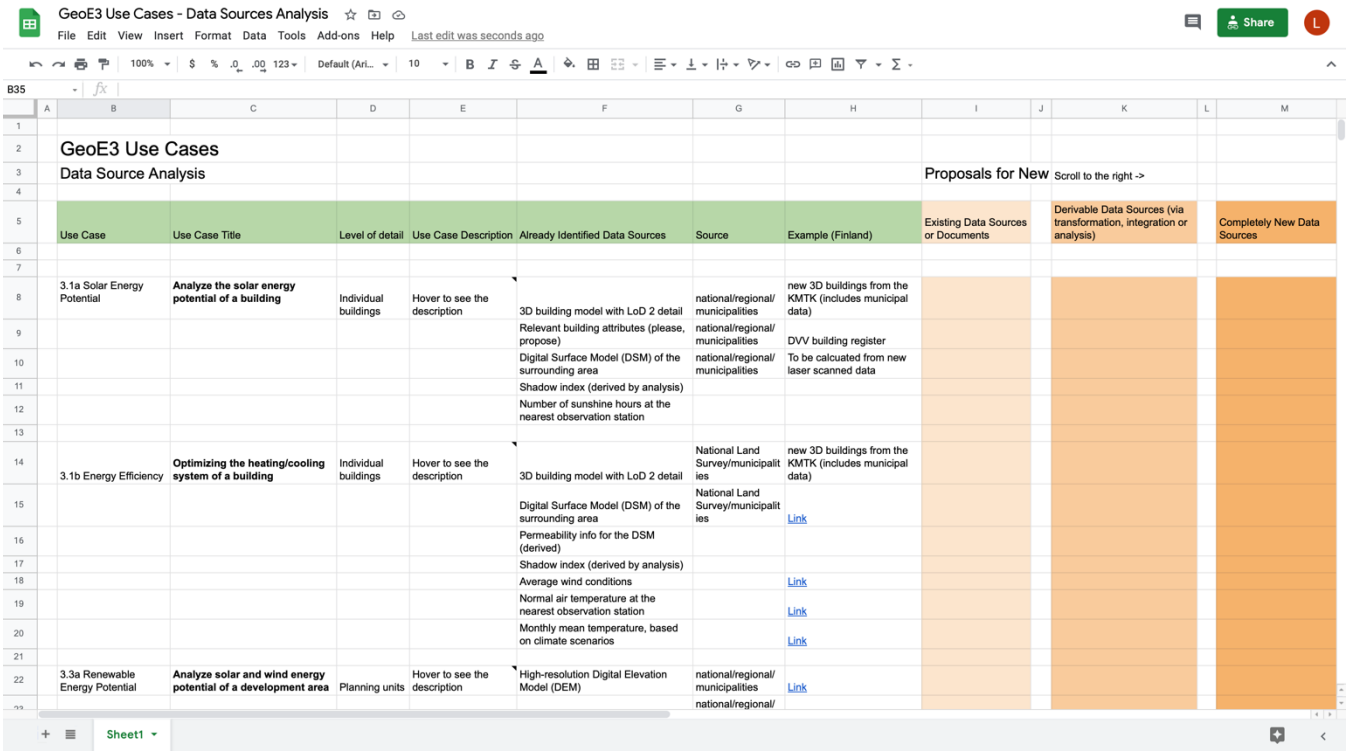
4.3. **Relevant APIs**

Currently eleven API's are identified in either being in use or expected to come in use during the project. Eight are from the geospatial domain, two from the transportation domain and one from the scientific(meteorological) domain.

API	Use case	Main host	Remark
OGC API Features	1,2,3	Mapping agencies	
OGC API Coverages	1,2,3	Mapping agencies	
OGC API Processes	1,2,3	GeoE3 platform	
OGC API Tiles	1,2,3	Mapping agencies / GeoE3 platform	
OGC API Records	1,2,3	GeoE3 platform	
Table Joining Service	1,2,3	GeoE3 platform	
OGC EDR	2	Meteorological institutes	
3D access interface	1,2,3	Mapping agencies / GeoE3 platform	If consensus reached in industry
NVDB	2	Road Administration	
DATEX	2	Road Administration	
OPeNDAP	1,2	Meteorological institutes	Streaming netCDF

5. Appendices

APPENDIX A. USE CASE ANALYSIS QUESTIONNAIRE



GeoE3 Use Cases - Data Sources Analysis

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GeoE3 Use Cases

Data Source Analysis

Proposals for New — Scroll to the right ->

Use Case	Use Case Title	Level of detail	Use Case Description	Already Identified Data Sources	Source	Example (Finland)	Existing Data Sources or Documents	Derivable Data Sources (via transformation, integration or analysis)	Completely New Data Sources
3.1a Solar Energy Potential	**Analyze the solar energy potential of a building**	Individual buildings	Hover to see the description	3D building model with LoD 2 detail	national/regional/ municipalities	new 3D buildings from the KMTK (includes municipal data)			
				Relevant building attributes (please, propose)	national/regional/ municipalities	DVV building register			
				Digital Surface Model (DSM) of the surrounding area	national/regional/ municipalities	To be calcuated from new laser scanned data			
				Shadow index (derived by analysis)					
				Number of sunshine hours at the nearest observation station					
3.1b Energy Efficiency	**Optimizing the heating/cooling system of a building**	Individual buildings	Hover to see the description	3D building model with LoD 2 detail	National Land Survey/municipalities	new 3D buildings from the KMTK (includes municipal data)			
				Digital Surface Model (DSM) of the surrounding area	National Land Survey/municipalities	Link			
				Permeability info for the DSM (derived)					
				Shadow index (derived by analysis)					
				Average wind conditions		Link			
				Normal air temperature at the nearest observation station		Link			
				Monthly mean temperature, based on climate scenarios		Link			
3.3a Renewable Energy Potential	**Analyze solar and wind energy potential of a development area**	Planning units	Hover to see the description	High-resolution Digital Elevation Model (DEM)	national/regional/ municipalities	Link			
					national/regional/				

Sheet1

APPENDIX B. EXAMPLES OF AVAILABLE DATA SETS FROM THE MAPPING AGENCIES

Finland

Dataset Name	Dataset Type	Description
Pääkaupunkiseudun aurinkosähköpotentiaali	Solar energy potential	Solar energy potential dataset of Helsinki region
Auringon säteilyenergian määrä katoilla pääkaupunkiseudulla	Solar energy potential	Amount of solar energy in building roofs of Helsinki region
Helsingin 3D-kaupunkimallit	3D building model LoD2	Helsinki city 3D buildings
Kuopion 3D-rakennusmalli	3D building model LoD2	Kuopio city 3D buildings
Espoon 3D-kaupunkimalli	3D building model LoD2	Espoo city 3D buildings
Oulun 3D-kaupunkimalli	3D building model LoD2	Oulu city 3D buildings
	3D building model LoD2	Other 3D building datasets from Finnish cities are available and upcoming but not listed here. Production of national coverage 3D LoD2 buildings dataset begins in 2021
Kansallisen maastotietokannan rakennukset	Relevant building attributes and footprints	National topographic database's Buildings theme
Korkeusmalli 2m	Digital elevation model (DEM)	Digital elevation model 2m
Rinnevarjostus	Shadow index coverage	Hillshade
Auringon säteilyhavainnot	Number of sunshine hours at the nearest observation station	Solar radiation observations
Tuuliatlas 250m	Average wind conditions	Wind atlas 250m

Säähavaintojen kuukausiarvot	Normal air temperature at the nearest observation station	Monthly statistics of weather observations
Ilmastonmuutosskenaariot	Monthly mean temperature based on climate scenarios	Climate change scenarios
Tilastokeskuksen aineistot	Existing population data	Statistics Finland's datasets

Spain

Dataset Name	Dataset Type	Description
Buildings	3D building model	3D building models are provided in a KML file to be loaded into Google Earth or other software that supports KML. This data is obtained from the cadastral information of the number of plants in each part of the buildings (BuildingPart), each multiplying by a height factor. (See attached presentation)
Buildings	Relevant building attributes	The data for cadastral constructs has been transformed entirely into the INSPIRE 2D extended BU (http://inspire.ec.europa.eu/schemas/) model as the following 3 objects: Building, BuildingPart, OtherConstructions. We provide : geometry of the construction footprintNumber of plants above and below ground (BuildingPart), conservation status, date of construction, dateof register in the data-base, dominant use, constructed area, inspire identifier, cadastral reference, cadastral parcel where is the construction , address, etc. And as "document"a scaled graphic representation of each of the floor of each of the buildings More information: http://www.catastro.minhap.es/webinspire/index_eng.html http://www.catastro.minhap.es/webinspire/documentos/Conjuntos%20de%20datos_en.pdf
Información alfanumérica (formato CAT)	Relevant building attributes	The CAT format is the official format of exchange of cadastral data in Spain, reflecting all the cadastral information of the real estate (excep data protected: owner and value). . Through this format you can obtain relevant information from the buildings, buildings parts, units, other premisses, crops, etc...since each of them is identified in the real estate with its physical description: surface, antiquity, typology, use etc.....

Buildings	Building footprints	The geometry of the INSPIRE model building obtained from the SDGC data is defined as a multi-recinct representing the enveloping line of all constructions with volumetry above ground of each cadastral parcel, excluding overhangs and terraces or balconies; and therefore the footprint of the building is represented.
Digital Surface Model (DSM) (5 metres)	Digital Surface Model (DSM)	Digital Surface Model (DSM) with a grid of 5 m. The DSM has been obtained through rasterization of LiDAR (3D point clouds). First of all the LiDAR file was clasified in soil (class 2), vegetation (class 3, 4 and 5) and buildings (class 6). After that, In the process of rasterization, each cell in the .asc file take the value of the point with higher altitude among all the 3D points within that cell. Data from Ceuta, Melilla and Gibraltar are not available since there is no LiDAR data in these areas. ASCII Format. Geodetic Reference System ETRS89 (Canary Islands REGCAN95, compatible with ETRS89) and UTM proyection.
Digital Surface Model Normalized (DSMn)	Digital Surface Model Normalized (DSMn)	Digital Surface Model Normalized with the building class corresponding to the first coverage. Grid 2,5 meters. The DSM has been obtained by interpolating the height of the 3D point clouds of the LIDAR file classified as "buildings" taking the DTM as level 0. With the exception of Andorra, Ceuta, Melilla, Alboran Island (183-2, 1110-3, 1111-3, 1078B) . ASCII matrix file format ESRI (asc). Reference geodetic system ETRS89 (in the Canary Islands REGCAN95, compatible with ETRS89) and UTM projection. Available at the download centre (ASCII format) and via the WCS download service (various formats).
Digital Terrain Model of Spain (5, 25 and 200 metres)	Digital Terrain Model (DTM)	Digital terrain models with a grid of 5 m, 25 m and 200 m. The DTM has been obtained by interpolating the 3D point clouds of the LIDAR file, with the exception of Andorra, Ceuta, Melilla, Alboran Island and Gibraltar (183-2, 1110-3, 1111-3, 1078B, 1078-2) obtained by automatic stereotyping of photogrammetrical flights in the National Plan for Orthoimagery (PNOA). ASCII matrix file format ESRI (asc). Reference geodetic system ETRS89 (in the Canary Islands REGCAN95, compatible with ETRS89) and UTM projection. Available at the download centre (ASCII format) and via the WCS download service (various formats).
LiDAR map of Spain (2,5 metres)	Digital Surface Model (DSM) of LiDAR	Digital Surface Model (DSM) has three layers. Two layers come from the rasterisation of the building and vegetation classes among all the points of the LiDAR file .las; and the third layer is the hydrography of the Geographical Reference Information. By applying a suitable colour for each layer, the final product is visualised. ECW file format. ETRS89 reference geodetic system (in the Canary Islands REGCAN95, compatible with ETRS89) and EPSG projection: 3857 throughout the national territory

Petrol Stations of Spain	Petrol Stations (kml)	Petrol Stations for terrestrial vehicules an boats.
Spanish Transport Network	Transport Network (Vector)	The Spanish Transport Network is a 3D linear network in accordance with INSPIRE. It includes 5 rtansport nodes: Road Transport Network (including urban roads), Rail Transport Networs, Cable Trasnport Networks, Cable Transport Networks, Water Transport networks and air transport network; as well as its intermodal nodes and associated infraestructures.
Geographical Information of the Population	Existing population data (Vector)	Reference Geographic Information of the Population in Spain. Version 1. It represents the geographical location and the geometric shape of the population entities, including population centres and other no residential areas. Every entity has the number of inhabitants.
Spanish Urban Information System	Urban planning	The Spanish Urban Information System. It includes all the uses of the land and other areas within the urban planning
Land Ocupiation Information System in Spain (SIOSE), 2014	Land Use and Land Cover (.gdb)	SIOSE is the Information System of the Ocupation and Soil in Spain, which is part of the National Plan for the Observation of Territory (PNOT). The objective is to generate a land occupation database for the whole Spain at reference level of 1: 25.000, integrating the information available from the Autonomous Communities and the General State Administration of 2014. More information about the product can be found at www.siose.es

The Netherlands

Dataset Name	Dataset Type	Description
3D Basisvoorziening	3D, buildings and large topography	The 3D Basic Facility is a digital topographic file with three-dimensional objects. The information in the facility is based on topography from the Key Register Large-Scale Topography (BGT), the Key Register Addresses and Buildings (BAG), height generated from aerial photo images and the Current Altitude File Netherlands. The 3D Basic facility can be used at scale levels between 1: 500 and 1: 10,000.
Actueel Hoogtebestand Nederland 1 (AHN1)	Digital Elevation Model (DEM)	The Dutch 1 Actual Highness File (AHN1) are altitude and auxiliary files produced from laser altimetrie in the period 1997-2003. The measured heights (points) are made of 3D point clouds and grids.
Actueel Hoogtebestand Nederland 3 (AHN3)	Digital Terrein/Surface Model (DTM/DSM)	The Acad High Test File Nederland 3 (AHN3) is altitude stocks and auxiliary files made of laser altimetry in the period 2013-2018. 3D points cloud and grids are made of measured heights (points).

Basisregistratie Adressen en Gebouwen (BAG)	Building footprint, address data	Basic registration addresses and premises (BAG) contain data on premises, residence objects, places of work and berths and their addresses and the appointment of places of residence and public places.
Wijk- en Buurten	Population statistics	The District and Neighborhood Map 2020 file contains the geometry of all municipalities, districts and neighborhoods in the Netherlands with a number of statistical key figures as attribute. The boundaries of districts and neighborhoods are largely based on what the municipalities report to Statistics Netherlands. The municipal boundary comes from the BRK of the Land Registry. The land-water boundary from the Land Use File 2015. A second version will be published in the autumn of 2021.
Landelijk Grondgebruik Nederland (LGN2018)	Land Use	The LGN2018 file is a nationwide grid file with a resolution of 5 meters in which 48 forms of land use have been distinguished. The database distinguishes the most important agricultural crops, a number of nature classes and urban classes. The LGN2018 file has undergone some significant changes compared to LGN7. The geometry and theme on main classes is now fully based on Top10NL (version 2018). Agricultural plots, greenhouses, orchards, fruit nurseries, tree nurseries, sand, heather, forests, water and infrastructure have been taken over from Top10NL. The urban area is defined using the Soil Use File (BBG2015). The agricultural area is filled with (aggregated) crops from BRP2018 supplemented with crop classifications based on satellite images.

Norway

Dataset Name	Dataset Type	Description
FKB-Buildings	Vector 2.5D	FKB-Bygning contains detailed building information. The data includes descriptions of all types of buildings, roof structures, descriptive building lines, and building attachments (for example verandas).

Elveg 2.0	Vector, road network	Elveg 2.0 is a road network data set that includes all driveable roads that are longer than 50 meters, or part of a network, as well as pedestrian and cycle paths and cycle paths represented as road link geometry. Linearly referenced objects are stand-alone objects with linear references to the road link.
Elevation Laser data	Digital elevation Model (DEM)	Laser data available for download through the national portal for Elevation data (www.hoydedata.no) and several APIs
Elevation DTM 1	Digital Terrain Model (DTM) WCS	Elevation - Digital Terrain Model represented as grid with one meter resolution. Delivered according to the OGC Web Coverage specification (WCS)
Elevation DSM 1	Digital Surface Model (DSM) WCS	Elevation - Digital Surface Model represented as grid with one meter resolution. Delivered according to the OGC Web Coverage specification (WCS)
Population on 250 meter grid	Population	Total population on 250 meter grids. The basis for the data is registered population linked to address points in the cadastre and then summed up to grids
Normals (precipitation, temperature, wind and air pressure)	Weather Data	APIs from the Norwegian Meteorological Institute returning precipitation, temperature, wind, sun rise/sunfall etc.

Estonia

Dataset Name	Dataset Type	Description
LOD2 hooned	3D buildings	3D buildings (LOD2), generated from lidar data and ENTD buildings (roofprints). Data is under development. Data will be available as open data, end of 2021. Map application to browse data eill be available april 2021
Eesti topograafia andmekogu - ehitised	Building roofprints	Estonian National Topographic Database buildings: 2.5D shapes (roofprints) and attribute data, collected from aerophotos
Ehitisregister	Buildings: 2D geometry and attributes	Data of buildings' usage, construction materials and legal status

Eesti maakatte kõrgusmudel	DSM - Digital Surface Model	Digital surface model (DSM), generated from 2017-2020 lidar data
Eesti keskkonnaregistri ilmajaamade nimistu	Weather stations	INSPIRE WMS/WFS service
Eesti maapinna kõrgusmudel	DTM - Digital Terrain Model	Digital terrain model (DTM), generated from 2017-2020 lidar data
Rahvastikutiheduse ruutkaart	Population density 1x1km square map. (INSPIRE data model)	INSPIRE WMS/WFS service
Eesti rahvastikutihedus NUTS3 piirkondades	Population density by NUTS 3 areas. (INSPIRE data model)	INSPIRE WMS/WFS service
Aerolaserskaneerimise punktid	Lidar point cloud	Data points from airborne lidar (2017-2020 flights). Not available as service
Ilmajaamade aegread?	Weather stations time series	Not available over API, just web page
Eesti topograafia andmekogu - teed	Road network	Estonian National Topographic Database roads: centerlines with attributes, collected from aerophotos

APPENDIX C. PARTIES CONTACTED DURING THE USE CASE ANALYSIS

Finland

Ministry of Environment, https://ym.fi/en/front-page

MOTIVA – A Sustainable Development Company, https://www.motiva.fi/en

Sun Energia Oy, https://sunenergia.com/en/

City of Helsinki, https://www.hel.fi/helsinki/en

Forum Virium Helsinki, https://forumvirium.fi/en/

Fortum Oyj, https://www.fortum.fi/en

Norway

Here, https://www.here.com/

Mobileye, https://www.mobileye.com/

ITS-Norway, https://its-norway.no/

Norwegian association for electric vehicles, https://elbil.no/#