

Annex B (informative) Use cases

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The use cases presented below are based on real applications, investigated by TWG BU but are projected in future, once INSPIRE conformant data is available.

Building data is used in a similar way by different application domains. This is addressed in chapter B1. Domain-specific applications are addressed in following chapters B2, B3

The description of the use case is kept short and focuses on the role of building data; it does not aim to provide exhaustive explanations about the use case.

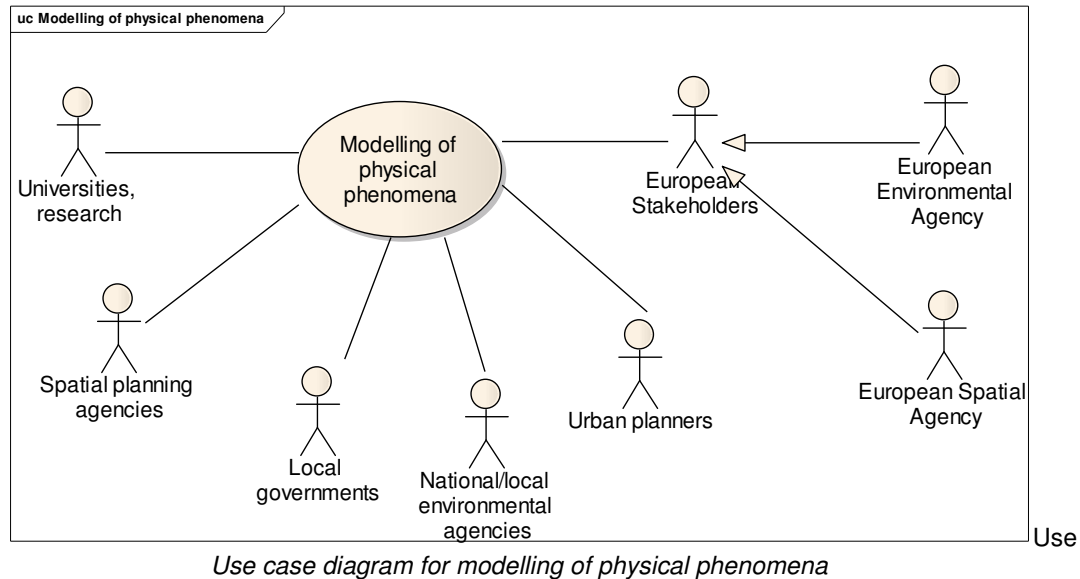
The information required by the use cases and provided from INSPIRE theme BU is highlighted in green. Information provided from other themes is highlighted in orange.

The purpose of this annex is to show the use cases that have been considered by TWG BU. It provides the rationale of the data specifications and guidelines about how INSPIRE conformant data might/should be used.

B.1 Common use of building data

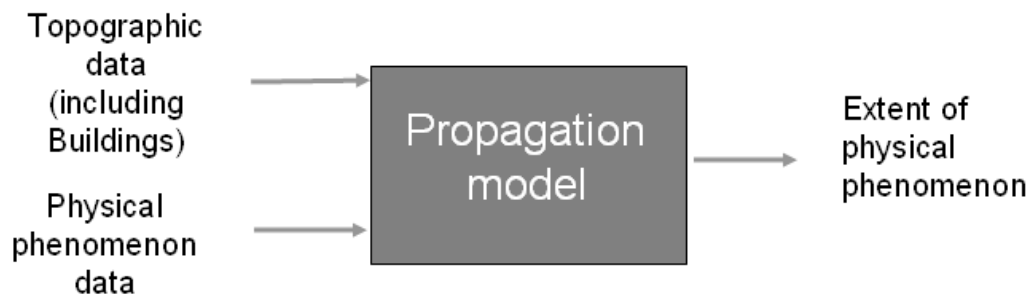
B.1.1 Modelling of physical phenomena

Part 1: UML use case diagram

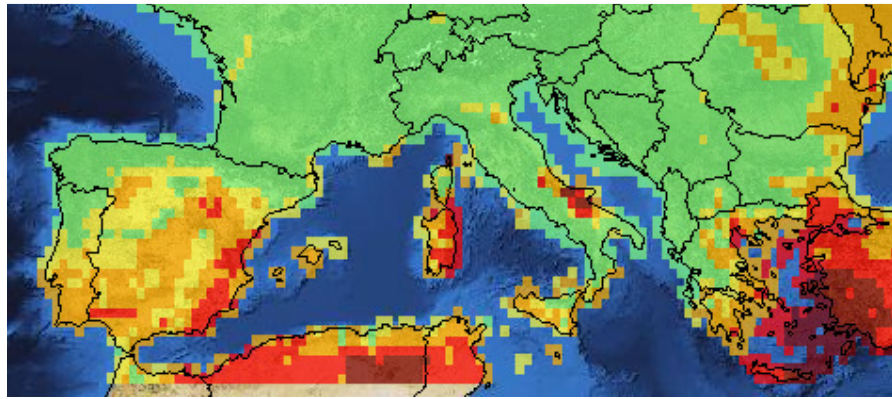


Part 2: Narrative explanation of the use case

Buildings may influence the propagation of physical phenomena, such as air circulation (air pollution, winds), light, water (flood), noise ... Data about buildings will be necessary as input for propagation models.



Principle of propagation model



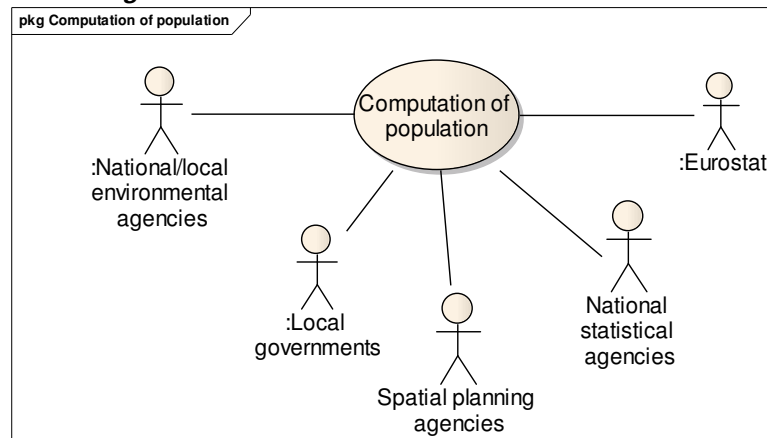
Extract of fire forecast on Europe (EFFIS)

Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Modelling of physical phenomena
Priority	high
Description	The purpose is to estimate the extent of a physical phenomena, taking into account the influence of buildings on the propagation of the phenomena
Pre-condition	Data related to physical phenomena is available (e.g. hydrography for flood, atmospheric conditions for air circulation). Other necessary topographic data is available (e.g. elevation). A propagation model exists, either as an automatic tool or as a well-defined methodology.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE topographic data (mainly themes BU, EL) and themes related to physical phenomena (e.g. MF, AC, TN, HY, ...)
Step 2	Make a 3D model of landscape using elevation data, preferably as DTM and 3D solid geometry of buildings. Environmental barriers (e.g. dam or embankment for flood, tunnels or acoustic fence for noise, protectiveStructure for rock falling) have to be integrated to this model
Step 3	Possibly, enrich the 3D model by information related to the architecture of the building, such as material of roof / structure / façade, height or number of floors below ground ... which may influence the propagation of physical phenomena
Step 4.	The landscape 3D model is supplied as input in the propagation model. The propagation model runs and provides the extend of physical phenomena at a given time
Flow of Events – Alternative Paths	
Step 2 bis.	The 3D model may be computed using the polygon geometry of buildings and their height above ground or number of floor above ground or floor distribution If available, the 3D model may use shape of roof to refine the 3D representation of buildings
Step 3 bis	If not available, the information related to the architecture of building may be roughly assessed from temporal attributes, date of construction and date of renovation . Domain expertise is required.

B.1.2 Computation of population in an area of interest

Part 1: UML use case diagram



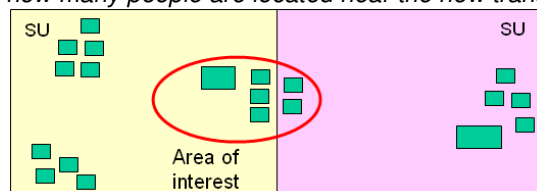
Use case diagram for computation of population

Part 2: Narrative explanation of the use case

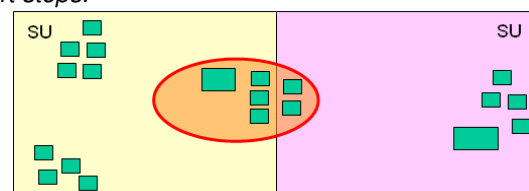
Statistical data, such as number and characteristics of inhabitants, are available on statistic units. However, many applications require getting an assessment of the number of inhabitants, not on statistical units, but in the area of interest of the application.

Typical example is the necessity to assess and report population at day and/or at night located in an area of risk (flood, forest fire, earthquake ...) or of pollution (noise, air pollution).

It is also necessary to assess the number of inhabitants that will benefit from a new public equipment; for instance, when implementing a new line of public transport, it will be of great interest to estimate how many people are located near the new transport stops.



Statistical data on statistical units



Statistical data on area of interest

Principle of computation of population in an area of interest

Part 3: Detailed, structured description of the use case

Assessment of population at night

Use Case Description	
Name	Assessment of population at night
Priority	high
Description	The purpose is to estimate the number of inhabitants during night in an area of interest, for instance an area concerned by noise or air pollution.
Pre-condition	The area of interest is known. Statistical data on population are available on statistical units.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes BU and SU - PD
Step 2	Within the area of interest, using attribute current use , select residential buildings. These are the buildings where most people are located at night.

Use Case Description	
Step 3	<p>Compute the total area of each building dedicated to residential purpose:</p> <ul style="list-style-type: none"> - from polygon geometry, compute ground area - total area = ground area x number of floors x percentage of residential use (if known)
Step 4.	For each statistical unit, compute the total area of all buildings
Step 5	<p>Compute the number of inhabitants in each building</p> <p>Number of inhabitant (building X) = (number of inhabitants (SU)/ total area of all buildings in SU) x total area of the building</p>
Step 6.	Add the number of inhabitants of all buildings located in the area of interest. This number assesses the population at night.
Flow of Events – Alternative Paths	
Step 3 bis.	<p>The total area of each building may be assessed by different ways:</p> <ul style="list-style-type: none"> - the number of floors may be assessed from the height above ground - if available, the official area may be used
Step 3 ter	In case the percentage of current use is unknown, the use case will use total area instead of total area dedicated to residential purpose..
Step 3 quatro.	Instead of the total area of building, the computation may be done using the volume of building. This volume may be supplied by ground area (from polygon geometry) x height above ground
Result	The assessment of population at night is used to implement local management (e.g. schedule rescue services at night) or for reporting (e.g. noise or air pollution)
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes SU, PD, BU
Geographic scope	Area of interest, anywhere in Europe

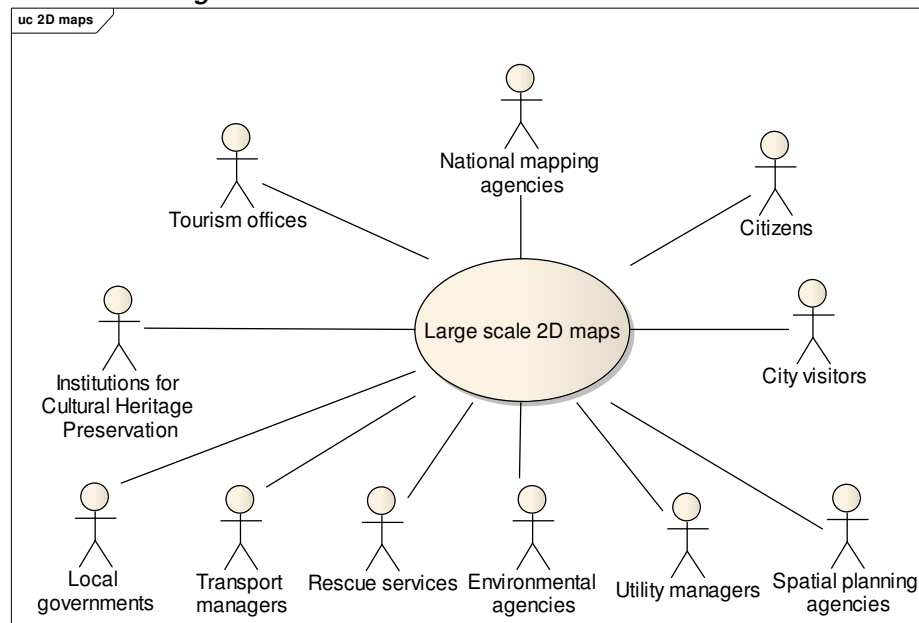
Assessing population at day

Use Case Description	
Name	Assessment of population at day
Priority	high
Description	The purpose is to estimate the number of inhabitants during day in an area of interest.
Pre-condition	The area of interest is known. Statistical data on population are available on statistical units. Some domain expertise is required.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes BU, US and SU - PD
Step 2	<p>Assess population in residential buildings. The method is similar to the method described in B1.2.1 but the number of inhabitants has to be replaced by the number of inhabitants staying at home.</p> <p>It is up to domain expertise to decide which method is better:</p> <ul style="list-style-type: none"> - apply a percentage - restrict the number of inhabitants according to selection criteria (age, type of job, ...) <p>It may also vary according hours in the day.</p>

Use Case Description	
Step 3	Assess population in industrial or buildings. Using attribute current Use , select industrial buildings. Compute total area of industrial buildings (same method as for residential buildings). Apply an average rate of occupation to assess the number of people within industrial buildings.
Step 4.	Assess population in office buildings. Using attribute current Use , select office buildings. Compute total area of office buildings (same method as for residential buildings). Apply an average rate of occupation (e.g. 4 persons / 100 m ²) to assess the number of people within office buildings.
Step 5	Assess population in commercial buildings. Using attribute current Use , select trade buildings. Compute total area of industrial buildings (same method as for residential buildings). Apply an average rate of occupation to assess the number of people within office buildings.
Step 6.	Assess population in public services. This may be done using attribute occupancy of Governmental services in theme US. Using attribute service hours , the information may be refined according day in the week and/or hour in the day.
Flow of Events – Alternative Paths	
Step 3 bis	Download data from theme PF. Information about the activity hosted by the buildings within a PF may enable domain expert to make more detailed assessment of the number of occupants the industrial buildings.
Step 3, 4, 5 bis.	A local or national information system on economic activities exist and may be linked to their location in buildings, using : <ul style="list-style-type: none"> - common address - or the attribute external reference of theme BU The knowledge of activity enable domain expert to make more detailed assessment of the number of occupants in a commercial, industrial or office building.
Result	The assessment of population at night is used to implement local management (e.g. schedule rescue services at day, assess need of public transport) or for reporting (e.g. noise or air pollution).
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes SU, US, PF, PD, BU, AD
Geographic scope	Area of interest, anywhere in Europe

B.1.3 Large scale 2D mapping

Part 1: UML use case diagram



Use case diagram for large scale 2D mapping

Part 2: Narrative explanation of the use case

Mapping of urban areas at large scale is one of the common requirements of most use cases. Large scale maps are necessary or at least very useful for a lot of applications, e.g.

- ordinary city maps to help any city visitor (tourism, business, conferences, ...) to discover the urban area and to find his/her way to the main places of interest or to a given address
- documents to prepare decision making, showing the issue to be solved in its environment
- communication documents to make people aware of a specific aspect of the urban area (risk area, polluted area, ...)
- working documents to help the operational staff that has to ensure in a way or another the management of the urban area

Of course, these different kinds of mapping have some specificities, according to the purpose of the map; only the part that is (likely) common to all of them is described below.

Note that, in this common use case, urban area should be understood with a wide meaning, as mapping is, of course, also of interest for villages.

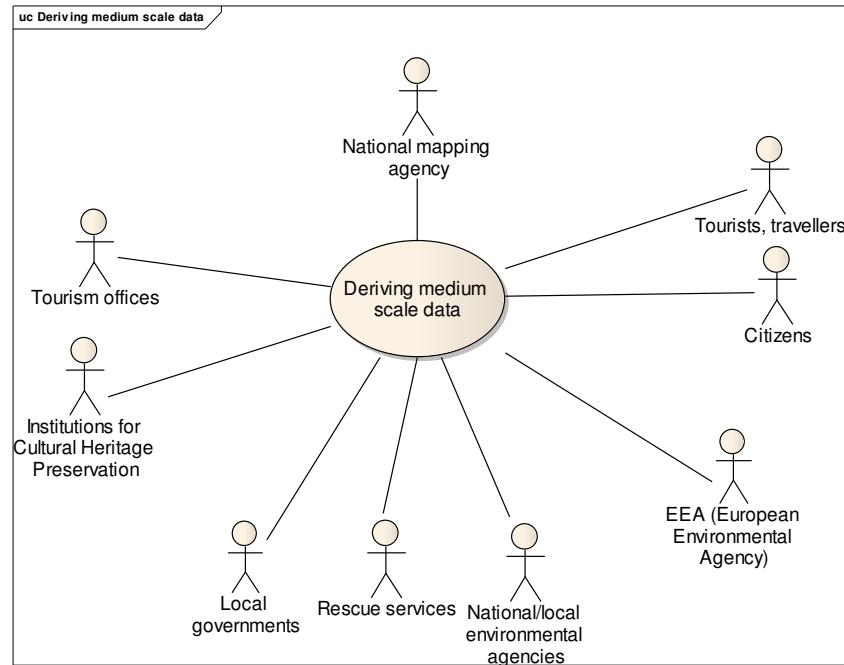
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Large scale 2D mapping
Priority	high
Description	The purpose is to make 2D maps for target users.
Pre-condition	Necessary data is available: <ul style="list-style-type: none">- at least TN, BU, US- and possibly AU, CP, AD, HY, GN
Flow of Events – Basic Path	
Step 1.	Download the INSPIRE themes

Use Case Description	
Step 2	<p>Select the following features and represent them using their geometry:</p> <ul style="list-style-type: none"> - roads by lines - buildings (and possibly building parts) by 2D polygon - constructions by polygons, points or lines - governmental service geometry (as point or surface) - administrative boundaries and administrative units - cadastral parcels by surfaces - address (by points) -
Step 3	<p>Choose relevant portrayal for selected features. For instance, portrayal rules may give different styles according to the value of an attribute, e.g.:</p> <ul style="list-style-type: none"> - for roads, the Form Of Way or the Functional Road Class - for buildings, the building nature - for other constructions, the construction nature - for administrative boundaries, the boundary level - for governmental services, the service Type <p>Buildings with specific interest and constructions together with governmental services are necessary because they are both useful landmarks and potential places of interest.</p>
Step 4.	<p>Place the writings associated with each feature, e.g.</p> <ul style="list-style-type: none"> - road name - label for Cadastral parcels - locator designator for addresses - name for buildings and constructions - name for governmental services
Step 5	Complete the map by giving legend, scale, ...
Step 6.	Make the map available to its target (e.g. as paper map or on Web site)
Result	A city map is available for the targeted users.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes at least TN, BU, US and possibly AU, CP, AD, HY, GN
Geographic scope	Urban areas, everywhere in Europe

B.1.4 Deriving medium scale data

Part 1: UML use case diagram



Use case diagram for deriving medium scale data

Part 2: Narrative explanation of the use case

The general purpose is to analyse the structure of an urbanised area. For instance, to get an overview of the city, it is often necessary to make maps of it, at smaller scales than the scales used for reference data, such as buildings. Typically, whereas it is meaningful to represent buildings at scales most detailed than 1/ 20 000, city maps at less detailed scales, such as 1/ 50 000 and 1/ 100 000 are also needed.

For producing these maps and for enabling spatial analysis at the city scale, it is necessary to derive urban and urbanised areas from source topographic data. This is done by making relevant groupings of buildings (sometimes, also called blocks) and to provide urban areas of homogeneous type; the building blocks are generally defined by gathering buildings that are close to one another and that share some common characteristics. For instance, it will be meaningful to make groups of individual houses and groups of industrial buildings.

The medium scale mapping use case addresses applications such as generalisation of topographic maps and the derivation of land use or land cover maps from most detailed topographic data.

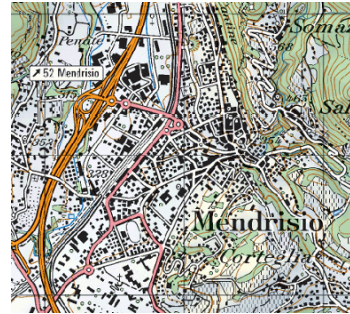
1:10k



1:50k



1:100k



Example: Swiss topo maps

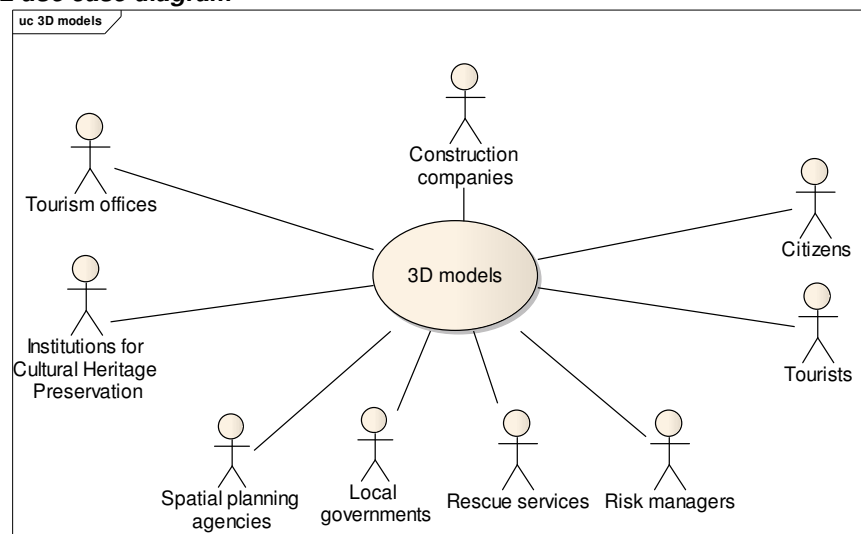
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Medium scale mapping
Priority	high
Description	The purpose is to make medium scale maps in urban areas.
Pre-condition	Topographic data is available. Specifications of the medium scale map are defined.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE topographic themes, mainly BU, US , TN and HY
Step 2	The specification of medium scale map gives the classification of the urban or urbanised areas to be defined (e.g. individual residential areas, industrial areas, ...) and the target scale.
Step 3	Automatic or semi-automatic generalisation rules to transform buildings into different kinds of urban areas are elaborated, based on: <ul style="list-style-type: none"> - the target classification and scale - the content of source data (see step 4) These generalisation rules use mainly <ul style="list-style-type: none"> - the proximity of buildings (e.g. maximum distance from one another, no big roads between them) - common properties (e.g. individual houses, industrial buildings, ...) Other constructions may also have to be grouped to define urbanised areas.
Step 4	The relevant attributes to be used by the generalisation rules are identified , for instance: <ul style="list-style-type: none"> - 2D geometry to make computation of distance from one building to another or to compute buffers around buildings - if available, current use of buildings to make difference between collective/individual residential areas, industrial areas, ... Attributes service type , construction nature and building nature may help to refine the classification From the 2D geometry , the size, orientation, elongation, compactness of the buildings may be computed. The height above ground or number of floors above ground may help to distinguish between individual and collective residential purpose if this information is not available from current use. The geometry and importance of roads, railways, watercourse is necessary to ensure continuous urban areas.

Use Case Description	
Step 5.	The generalisation rules are run on source topographic data. Urban/urbanised areas are known by their geometry and classification.
Flow of Events – Alternative Paths	
Step 1 bis	Download also theme OI
Step 3 bis	The derivation is not done by automatic rules but the urban or urbanised areas are delimited and classified by human beings. Instead of defining generalisation rules, data capture rules are defined based both on the characteristics of buildings, constructions, transport, ... (as in step 4) and of the ortho-image
Step 5 bis	The capture rules are applied on source topographic data and on ortho-image. Urban/urbanised areas are known by their geometry and classification.
Result	A medium scale map with target scale and classification of urban areas is available. It may be part of a LU or LC data set.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, TN, HY (and possibly OI)
Geographic scope	Any urban area in Europe

B.1.5 3D models

Part 1: UML use case diagram



Use case diagram for 3D models

Part 2: Narrative explanation of the use case

3D models are becoming more or more usual for management of territory. They are used mainly for two purposes: construction projects and communication.

3D models are currently used in case of a project for a new public infrastructure. In this case, the 3D model helps to realize how the new infrastructure will be inserted in its environment, it helps deciders to choose between different proposals, it enables good communication with citizens. 3D models are also quite useful to make the studies about heat or noise propagation. Accurate 3D models are required.

There is also a growing trend to deliver building permits to private projects, based on requests including 3D models.

3D models are also a fantastic tool for communication, e.g.

- for making people more conscious of risk (showing a risk zone in a 3D model)
- advertising for a territory, to encourage tourists to visit it or companies to set up their business or just to enable citizens to have better knowledge of their environment.



Project of a new motorway and new neighbourhoods

Part 3: Detailed, structured description of the use case

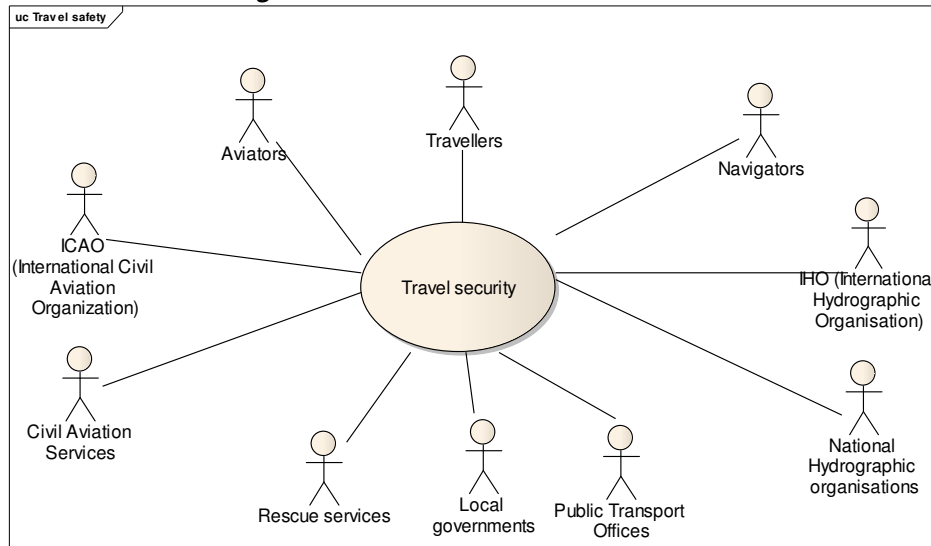
Use Case Description	
Name	Use of 3D models
Priority	medium
Description	A local government uses a 3D model for a construction project for a new infrastructure and for related communication
Pre-condition	
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU with 3D profile
Step 2	If necessary, enrich the 3D profile. Typically, a more detailed description may be required for the noticeable buildings or for the buildings in the area of interest
Step 3	Potential construction companies are invited to present their proposals by showing the new infrastructure plan within the 3D model, showing the 3D geometry of previous buildings.
Step 4.	Technical studies (noise, energy, visibility, vulnerability) are carried out taking into account the position of walls, roof, openings (doors and windows) and the material of roof, material of façade, material of structure...
Step 5	The proposals from construction companies will be shown to deciders and to citizens. Textures close to real-world appearance will help people to get better understanding of the project and to provide relevant feed-back and decisions
Step 6	A proposal is chosen. In case the new infrastructure is itself a building, its own 3D model may be linked through external reference to the PLM (Project Lifecycle Management) documents.
Step 7	The enrichments of 3D model + new infrastructure 3D representation may be published for INSPIRE under the 3D profile.
Flow of Events – Alternative Paths	
Step 1 bis	Download theme BU with 2D profile . Make 3D representation of buildings by extruding the 2D geometry using height above ground or number of floor above ground or better floor distribution . Typical textures might be guessed from material of roof and material of facade .

Use Case Description	
Result	The new infrastructure has been designed and chosen in a way ensuring a good integration in its environment. The enrichments to the 3D model are available to other users.

B.2 Safety

B.2.1 Travel security

Part 1: UML use case diagram



Use case diagram for travel security

Part 2: Narrative explanation of the use case

Building data is necessary to ensure safe travel both for air navigation (where buildings and other constructions are obstacles and so, as dangers for flights) and for marine navigation (where buildings and other constructions may be used as landmarks and so as helps for navigators). More generally, buildings and constructions having a specific physical aspect constitute landmarks and are useful for any kind of travelling.





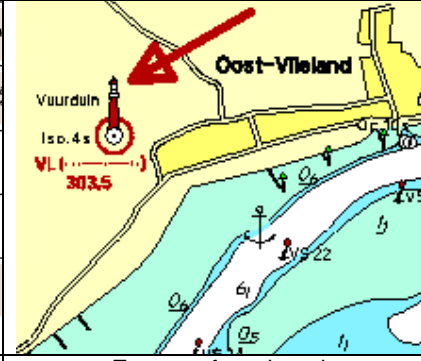













The requirement for data harmonisation coming from marine and air navigation is quite strong and these two communities have adopted international standards:

- annex 15 of ICAO (International Civil Aviation Organization) offers a data model for vertical structures (including buildings) called AIXM (Aeronautical Information eXchange Model).
- the IHO (International Hydrographic Organisation) has its standard S-57 which comprises the specifications of ENC (Electronic Navigation Charts) and a glossary.

Both include information related to theme *Buildings*.

The case of marine navigation is provided more in detail below but the case of air navigation is quite similar.

Hydrographic Organisations have the mission to ensure safety of sea navigation by producing marine charts. These marine charts include navigation aids, bathymetry ... They are provided to navigators either through paper charts or through ENC (Electronic Navigation Chart). The specification of Navigation Electronic Chart has been developed by IHO (International Hydrographic Organisation).

1	 Immeuble  Maison	Exemples d'amers Examples of landmarks	 Imm.  Im.	
2	 IMMEUBLE  CH. D'EAU  HÔTEL  CHÂTEAU D'EAU	Exemples d'amers remarquables Examples of conspicuous landmarks	 Imm. (rem.)  Im. (rem.)  H. (rem.)	
3.1	 	Croquis d'amers (en position) Pictorial symbols (in true position)		
3.2	 	Croquis, vues (hors position) Sketches, Views (out of position)		
4	 (30)	Altitude du sommet d'un édifice, au-dessus du niveau de référence des altitudes Height of top of a structure above plane of reference for heights	 162m	
Standardised symbols for marine charts				Extract of marine chart

Marine charts

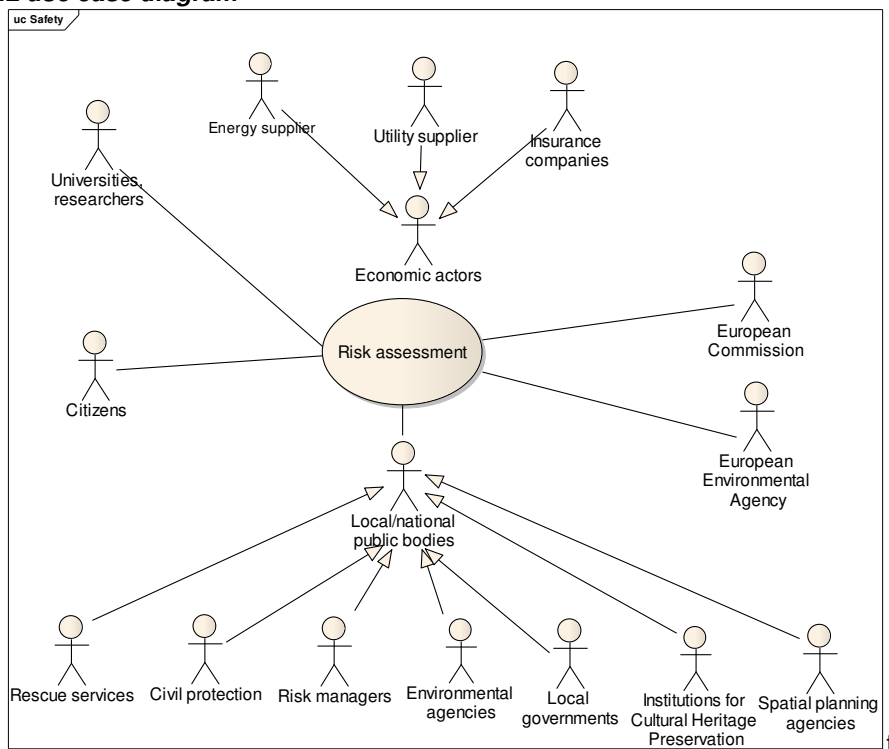
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Updating of Electronic Navigation Charts using INSPIRE building data
Priority	high
Description	The envisaged scenario is that a Hydrographic Organisation uses INSPIRE data as warnings to update Electronic Navigation Charts (ENC)
Pre-condition	Specifications of Electronic Navigation Charts are available.
Flow of Events – Basic Path	
Step 1.	Download the evolutions of INSPIRE data (themes BU, US, TN), using queries based on temporal attributes in the data set <ul style="list-style-type: none"> - beginLifespanVersion (to get new features) - endLifespanVersion (to get old features)
Step 2	Select the new buildings and other constructions that may be of interest for marine navigation (those easy to be recognized). These queries may be done using attributes constructionNature , buildingNature , heightAboveGround The query will provide features such as chimneys , antennas , stadium , towers , churches , mosques , tanks , silos , windmills , wind turbines
Step 3	Select the new governmental services that may be of interest for marine navigation (e.g. hospital , education) by a query on attribute serviceType . Select the features of interest in theme Transport Network (e.g. railwayStation).
Step 4	For the selected features, take in the INSPIRE data sets (if available) the information required by ENC specification: 2D geometry , elevation , heightAboveGround , name
Step 5	For the selected features, provide their classification according to ENC specification: <ul style="list-style-type: none"> - some values may be taken directly from theme BU (buildingNature and constructionNature) - some values come from theme US (serviceType) and have to be reported on theme BU (e.g. by using geometry overlay) - some values may have to be redefined with more details (e.g. monument into column, obelisk ...).
Step 6	For selected features, add missing information according ordinary update procedures (e.g. computation of a symbol)
Step 7	Make comparison between Electronic Navigation Chart and INSPIRE old objects, using 2D geometry . Delete the ENC features corresponding to old INSPIRE features

Use Case Description	
Step 8	The Hydrographic Organisation may then publish updated data under INSPIRE specifications (possibly using the possibility to extend code lists of buildingNature and constructionNature). The enriched data is available for other users.
Flow of Events – Alternative Paths	
Step 4 bis.	The elevation is supplied by theme BU but not in the vertical Reference System used by the marine community. The elevation may be provided in another Vertical Reference System , under condition that the Elevation Reference System is well documented.
Result	The INSPIRE BU and US data have helped Hydrographic Organisation to update Electronic Navigation Charts.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US
Geographic scope	Along sea coastlines

B.2.2 Risk assessment

Part 1: UML use case diagram



Use case diagram for risk assessment

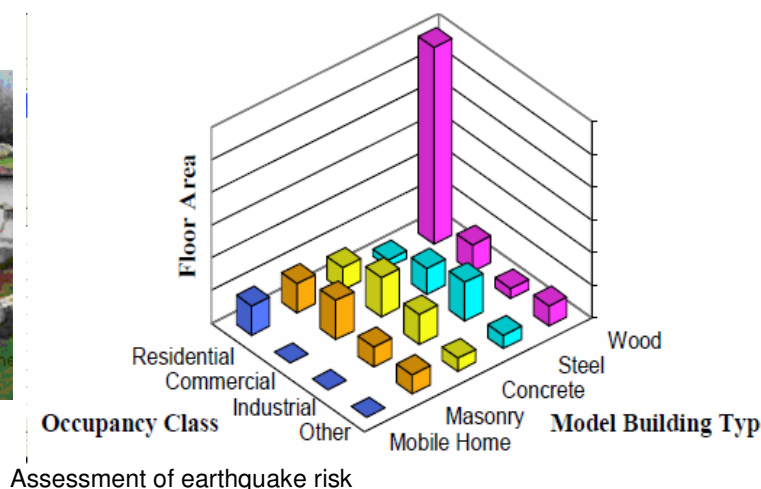
Part 2: Narrative explanation of the use case

There are many sources of potential risk and assessment of the risk impact is the first step necessary to take relevant protection and rescue measures.

- For instance, the EU Floods Directive (2007/60/EC) Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent

and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

- Earthquake is potentially the most significant hazard as it may cause thousands of death. Some parts of Europe are subject to earthquakes.



- In opposite to other continents, Europe is not frequently victim of wind storms. However, this hazard also occurs, as shown by the 1999 wind storm. Moreover, some Member states have over-sea territories which may suffer from frequent wind storms.
- Landslides are various types of gravitational mass movements of the Earth's surface. "Landslides" are a complex-disaster phenomenon triggered by earthquakes, heavy rainfall (typhoons, hurricanes), sustained rainfall, volcanic eruptions and heavy snowmelt, unregulated anthropogenic development, mining, tunnelling and others. Landslides cause many deaths and injuries and great economic loss to society by destroying buildings, roads, life lines and other infrastructures; they also pose irrecoverable damage to our cultural and natural heritage. Large and small landslides occur almost every year in nearly all regions of the world. Large-scale coastal or marine landslides are known to cause tsunami waves that kill many people. Landslides also may occur just due to progress of natural weathering; therefore, they occur almost everywhere in the world. Landslides most commonly impact residents living on and around slopes.
- The European Forest Fire Information System (EFFIS) has been established by the Joint Research Centre (JRC) and the Directorate General for Environment (DG ENV) of the European Commission (EC) to support the services in charge of the protection of forests against fires in the EU and neighbour countries, and also to provide the EC services and the European Parliament with information on forest fires in Europe. EFFIS addresses forest fires in Europe in a comprehensive way, providing EU level assessments from pre-fire to post-fire phases, thus supporting fire prevention, preparedness, fire fighting and post-fire evaluations.

Although risk assessment it is not always a mandatory task with a legal framework, it is a main component in the disaster management cycle. Moreover, the Solvency Directive aims to ensure that insurance and reinsurance companies have enough funding to be able to reimburse the losses due to hazards.

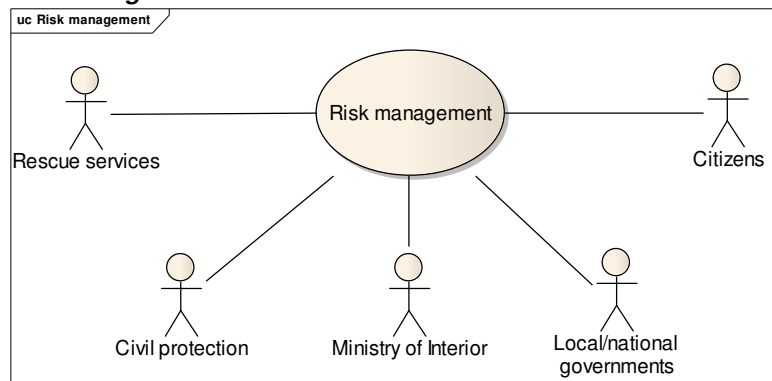
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Assessment of risk
Priority	high
Description	The purpose is to estimate the impact of a potential risk

Use Case Description	
Pre-condition	The hazard zone has been delimited. In case of natural hazards, theme NZ is available.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, US, PF, AF TN, ... Download theme NZ or use delimitation of human risk (e.g. around a SEVESO site)
Step 2	Based on their 2D geometry , select the features (BU, US, TN, ...) located in the hazard area.
Step 3	Assess the general vulnerability of the hazard area. Typically, identify if infrastructures that are essential for the community (such as water / power / telecommunication supply, hospitals, rescue services) are in the hazard area. This may be done using attribute service type of governmental services .
Step 4	In the hazard area, assess the vulnerability of the buildings, e.g. using attributes: <ul style="list-style-type: none"> - material of structure for fire or earthquake - number of floors, floor description (with area of openings) for flood and earthquake - material of façade, material of structure for industrial hazard According to the results, some buildings may be excluded for a given level of risk . In opposite, some buildings may be identified as more vulnerable than the average, generally based on the height above ground or number of floors (e.g. a low building for flood, a high building for most of other risks) or material of structure (e.g. temporary habitat such as mobile homes may be more vulnerable to any risk)
Step 5	In the hazard area, make assessment of the population at night and of the population at day (see common use cases B1.2.1 and B1.2.2)
Step 6	In the hazard area, assess the value of properties. For buildings, this may be done by applying average prices (e.g. by cost/ m ² in a neighbourhood) using the geometry of building and its total area (official area or area derived from geometry x number of floors) The value of furniture can not, a priori, be assessed from INSPIRE data.
Flow of Events – Alternative Paths	
Step 4 bis.	If relevant attributes to assess vulnerability are not available, a rough guess may be done using date of construction and date of renovation . This requires domain expertise.
Step 4 ter	If relevant attributes to assess vulnerability are not available, it may be possible to get them using mechanisms to have access to more detailed information: <ul style="list-style-type: none"> - external reference to other information system - document (e.g. building permits, building code, ...)
Step 6 bis	If available, the official value may be used to refine the assessment of the value of the building property.
Result	The risk is assessed and may be reported, if required by a European Directive (e.g. Flood Directive)
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, PF, AF, TN
Geographic scope	Risk areas in Europe

B.2.3 Risk management

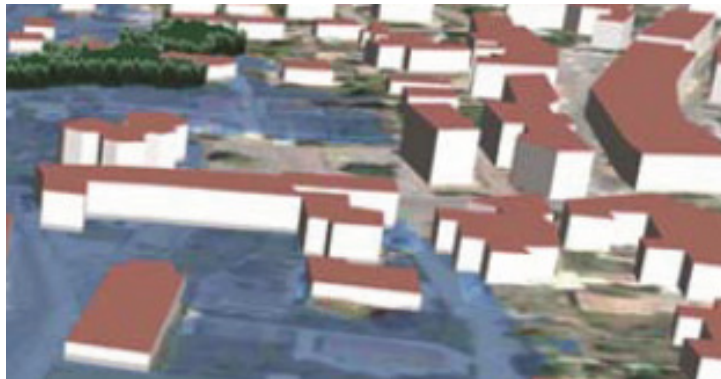
Part 1: UML use case diagram



Use case diagram for risk management

Part 2: Narrative explanation of the use case

National and local governments have the responsibility to ensure safety of citizens. They are in charge of risk management, i.e. of the actions to reduce as much as possible the risk and to organise the rescue of people when the hazard occurs.



Buildings in a flooded area

Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Management of risk
Priority	high
Description	The purpose is to manage the hazard, in order to decrease its consequences.
Pre-condition	The hazard has been (more or less) identified, delimited and assessed
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme NZ, BU, US, PF, AF TN, HY, ...
Step 2	Check if the environmental barriers (e.g. embankments , dam , ...) are adapted to the hazard. If not, improve these environmental barriers or build new ones. Attributes such as height above ground and year of construction will contribute to this checking.

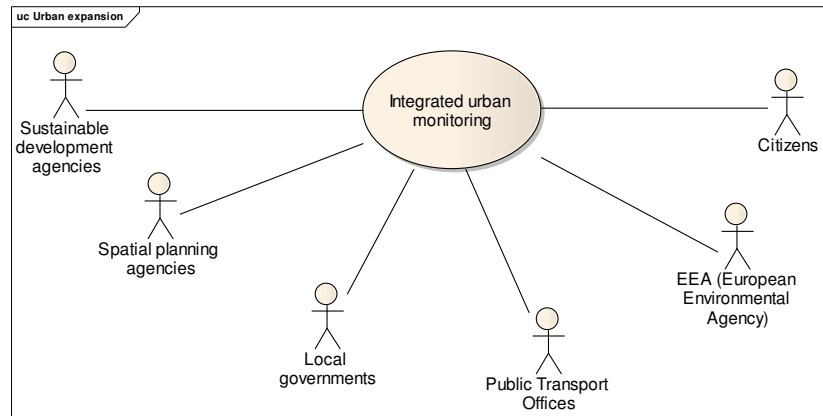
Use Case Description	
Step 3	Make people aware of the hazard by publishing risk maps (see common use case B1.3). A 3D representation, using 3D geometry , may be more efficient to make people conscious of the risk and so, to make them ready to follow the advices for reducing risk and/or how to act in case of emergency.
Step 4	When possible, based on the assessment of vulnerability, encourage people to decrease the vulnerability of their buildings to hazard (e.g. making buildings stronger to resist avalanches or explosions).
Step 5 a	Schedule in advance the rescue operations, e.g. <ul style="list-style-type: none"> - based on the results of assessment of population at day and at night, schedule the number of vehicles necessary in case of evacuation - schedule the possible itineraries from rescue service to potential hazard areas. Identify key infrastructures, such as bridges and tunnels, check how they may be affected by the hazard, using attributes such as height above ground and year of construction.
Step 5 b	Identify the buildings and governmental services that may be resource in case of hazard, e.g.: <ul style="list-style-type: none"> • schools, sport infrastructure for emergency shelters (with attribute service type) • open air spaces to gather people • open air pools in case of fire risk • buildings with flat roof for helicopter landing (attribute roof type) • self-sustainable buildings with installations such as wind turbine or solar panels
Step 5 c	Based on the assessment of vulnerability <ul style="list-style-type: none"> - identify the buildings and governmental services to be rescued first: e.g. informal settlements and mobile homes (from attribute material of structure) are very vulnerable to flood - schedule emergency interventions for the buildings with higher risks (e.g. buildings receiving public, very high buildings). Detailed data related to these very risky buildings may be linked to the INSPIRE data using the external reference or the document attribute.
Step 5 d	Rescue services will need to find the building associated to an address ; detailed 3D geometry (ideally with description of openings , of internal and external installations such as stairs , lifts and with description of building interior for the largest buildings: rooms and/or building units) will be useful for emergency interventions.
Result	The hazard is managed and its consequences are reduced, as much as possible.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes NZ, BU, US, PF, AF, TN
Geographic scope	Everywhere in Europe

NOTE: risk management may apply to natural risks but also to any kind of risks.

B.3 Urban expansion

B.3.1 Integrated urban monitoring

Part 1: UML use case diagram



Use case diagram for integrated urban monitoring, urban atlas and INSPIRE land use

Part 2: Narrative explanation of the use case

Urban areas increasingly use resources from abroad, impacting on areas far away, and thus become more and more dependent on remote areas influencing also their resilience. These factors, as well as demography and lifestyles, change the metabolism regarding intensities, distribution, dependencies and resilience. The purpose is to develop a conceptual framework to capture urban metabolism in Europe, which can adequately describe the functionalities, assess the environmental impacts of urban areas/patterns as well as ongoing urbanisation processes across Europe, show the inter-linkages and mutual impacts among urban areas and between urban and rural areas, and identify the drivers and successful response measures.

The concept of Urban Metabolism goes back to Abel Wolman (1965), who was the first to draw the comparison between an organism and a city. Cities, like organisms, need energy and resources such as fuel, water or food as inputs to sustain life. These 'metabolic inputs' are processed and ultimately released back to the environment as wastes. Hence, the basic rationale behind the urban metabolism concept is that the relationship between the environment and an urban system can be described by systematically recording all flows to and from the environment in physical terms in analogy to economy-wide material flow accounting (Eurostat 2001). In the absence of further information about environmental sources and sinks, this is then usually regarded as an estimate of the pressure environmental pressures generated by urban systems.

Urban Atlas

Part 2: Narrative explanation of the use case

One of the key questions for urban metabolism research is how trends in urban metabolic flows are linked to trends in spatial structure, urban organizations and lifestyles. An approach has been presented whereby urban flow indicators represent the physical metabolism of a city. Four dimensions are being addressed: energy & climate change, water, waste, **land-use**. Land-use data can be taken from the **Urban Atlas project**, where data has already been compiled for larger urban zones with more than 100 000 inhabitants as defined for the urban audit.



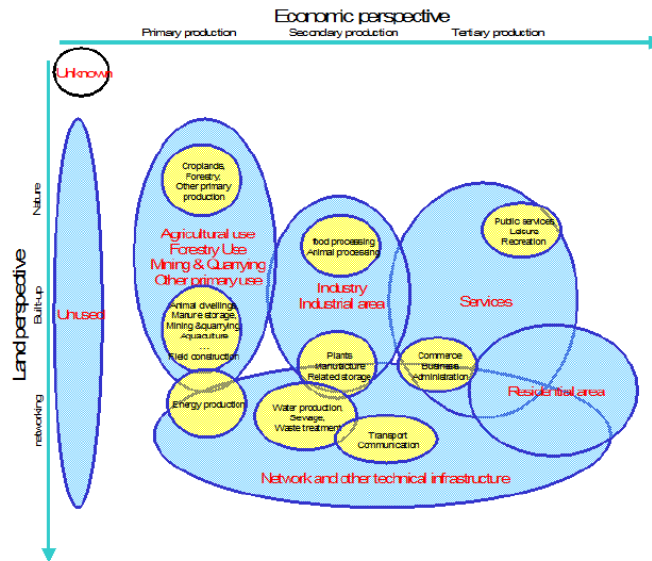
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Extending or updating Urban Atlas
Priority	medium
Description	This use case applies in the case of an update of Urban Atlas or an extension of Urban Atlas to smaller cities is ordered.
Pre-condition	Topographic data (including buildings) and ortho-image are available.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE topographic themes, mainly OI, BU, US, PF, AF, TN and HY
Step 2	This use case is based on the common use case B1.4 Deriving medium scale data in the alternative path of human capture. In this case, buildings are used as auxiliary data for capturing the land use / land cover areas specified by Urban Atlas, main source being ortho-image.
Step 3	Some buildings may be automatically classified into a land use / land cover area, by following the data capture rules specified by Urban Atlas, e.g. : <ul style="list-style-type: none"> • site of industrial activity, energy plants, water treatment plants, sewage plants, farming industries, antennas, ... => industrial, commercial, public, military and private units • schools, universities, hospitals, churches, mosques, temples, chapels, synagogues, penitentiaries, administration buildings, military areas, castles (if not residential) => Public, military and private services not related to the transport system • dams, protectiveStructure, bunkers, city walls, retaining walls (protecting walls) => Civil protection and supply infrastructure • acoustic fence (noise barriers), rest areas => Road and Rail network and associated land • golf courses, amusement parks, sport fields, ... => Sports and leisure facilities
Result	A new version or an extended version of Urban Atlas is available and may be used to report
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, TN, HY (and possibly OI)
Geographic scope	Any urban area in Europe

INSPIRE Land Use

INSPIRE TWG LU has defined a harmonised classification of land use, applicable by all MS in Europe. At short term, many land use data producers will transform existing land use data sets into the INSPIRE model.

At long term, INSPIRE land use map might be carried out directly from other INSPIRE themes, by generalisation. For instance, in urban areas, INSPIRE building data might be used to define some of the possible values of the INSPIRE land use classification.



Principles of INSPIRE land use classification

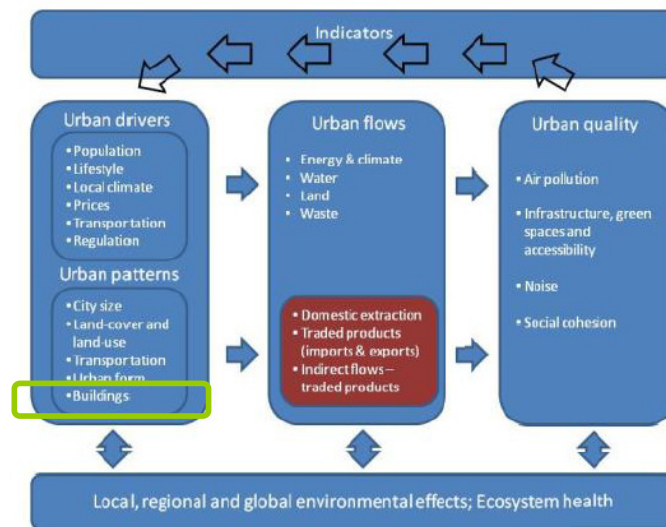
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Producing part of INSPIRE Land Use data
Priority	medium
Description	This use case applies in the case of a urban planner or local government deriving INSPIRE land use data from topographic data
Pre-condition	Topographic data (including buildings) and ortho-image are available.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE topographic themes, mainly OI, BU, US, PF, AF, TN and HY
Step 2	This use case is based on the common use case B1.4 Deriving medium scale data in the alternative path of human capture. The target model is the land use model specified by INSPIRE TWG LU,
Step 3	Buildings having attribute current Use with value industrial may be classified under class B Secondary production: Industrial and manufacturing areas Refinement of LU classification may be done using the attributes from PF
Step 4	Buildings having attribute current Use with value commercesAndServices may be classified under class C Tertiary production: Services Refinement of LU classification may be done using the attribute serviceType from US
Step 5	Buildings having attribute current Use with value residential may be classified under class E Residential areas The sub-classification of residential buildings (individual/collective/for communities), the height or number of floors , the number of dwellings may enable to refine the LU classification: <ul style="list-style-type: none"> - E1 Single house areas - E2 Medium dense residential area - E3 Dense residential area (blocks of flats) - E4 Residential with compatible activity

Use Case Description	
Step 6	Buildings and Other Constructions having attribute conditionOfConstruction with value declined or ruins or demolished may be classified under F1 Abandoned areas
Step 7	Buildings and Other Constructions having attribute conditionOfConstruction with value underConstruction may be classified under F3 Transitional areas
Result	Part of INSPIRE Land use data is available.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, TN, HY (and possibly OI)
Geographic scope	Any urban area in Europe

Urban metabolism

Some of the indicators used to monitor the urban metabolism are related to land use and to buildings



A pragmatic indicator framework for quantifying urban metabolism.

Part 3: Detailed, structured description of the use case

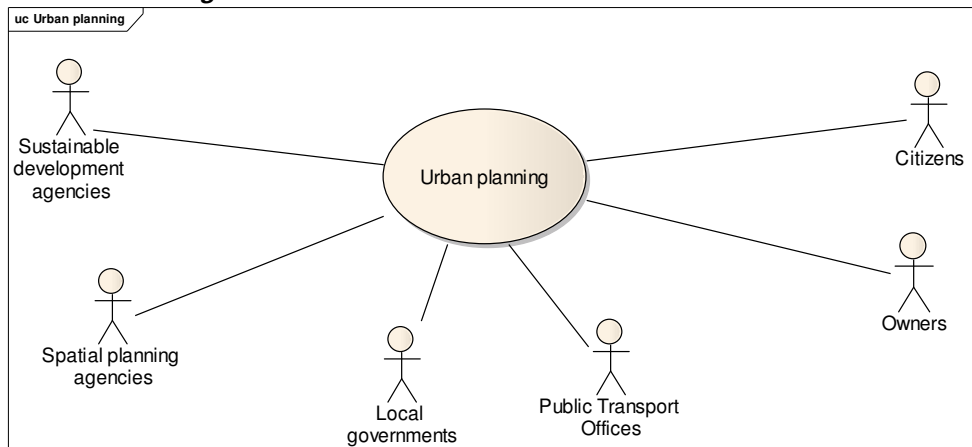
Use Case Description	
Name	Report indicators related to urban metabolism
Priority	high
Description	The purpose is to use building data to report indicators related to urban metabolism
Pre-condition	The indicators of urban metabolism are adopted.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE BU, US, SU, PD themes on the area of interest (a priori, city with more than 100 000 inhabitants)
Step 2	Report about building stocks: count the buildings included in the city.
Step 3	Based on the attribute number of dwellings , summarise the number of dwellings included in the city. Report about it.

Use Case Description	
Step 4	Report about proportion of residents exposed to noise at day, see common use case B1.2.2 (population at day) and the noise use case.
Step 5	Report about proportion of residents exposed to noise at night, see common use case B1.2.1 (population at night) and the noise use case.
Step 6	The report about the proportion of dwellings connected to potable drinking systems may be done, using the external reference to cadastral/official register of buildings where this information may be available in some countries.
Step 7	The report about average area of living accommodation, using: <ul style="list-style-type: none"> the total area of buildings devoted to residential purpose (e.g. area derived from 2D geometry x number of floor x percentage of residential current use) the population of the city
Alternative steps	
Step3 bis	In case the number of dwellings is not available, a rough estimation may be done using attributes current use (with value residential) and numberOfBuildingUnits
Result	The indicators related to urban metabolism that involve building data have been computed and may be supplied to EEA
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, SU, PD
Geographic scope	Currently, cities of more than 100 000 inhabitants (where Urban Atlas is available)

NOTE: urban patterns indicators (complexity, centrality, compactness, porosity) will likely be computed from Urban Atlas data (land use / land cover).

B.3.2 Urban planning

Part 1: UML use case diagram



Use case diagram for urban planning

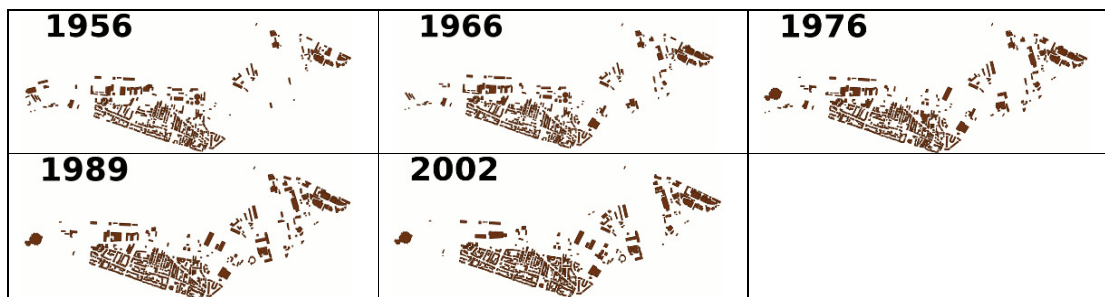
Part 2: Narrative explanation of the use case

In whole world, including Europe, a powerful force is at work: cities are spreading, minimising the time and distances between and in-and-out of the cities. This expansion is occurring in a scattered way throughout Europe's countryside: its name is urban sprawl. Furthermore, it is now rightly regarded as one of the major common challenges facing urban Europe today.

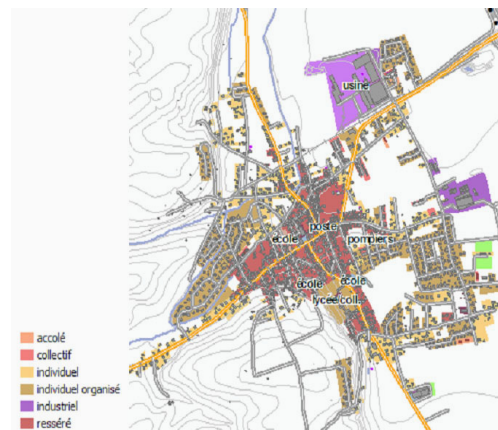
Urban sprawl threatens the very culture of Europe, as it creates environmental, social and economic impacts for both the cities and countryside of Europe. Moreover, it seriously undermines efforts to meet the global challenge of climate change.

For instance, coasts are being urbanised at an accelerating rate, and resident communities are being transformed in order to accommodate these new economies. As a result, our coasts are becoming increasingly intertwined with the hinterland and more dependent on tourism and secondary homes.

The aim of spatial planning is to control and decide the city expansion by making planned land use maps of the city. These land use maps define the rights and restrictions to construct in an area and draw the city of tomorrow.



Urban fabric evolution data (<http://geopensim.ign.fr/>)



Planned Land Use Map

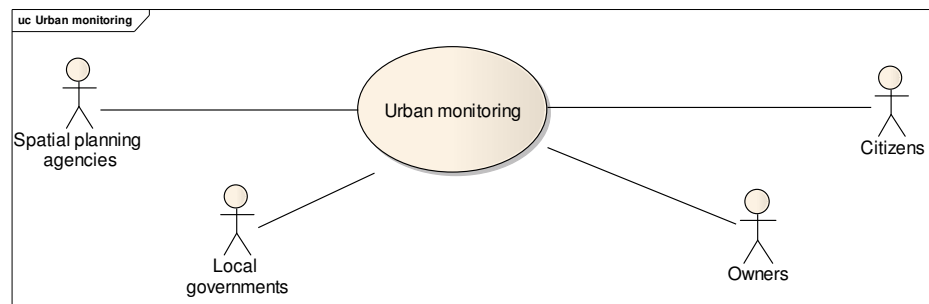
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Spatial planning
Priority	high
Description	The purpose is to make maps of planned land use
Pre-condition	Necessary data is available. A current land use map is useful. A politic agreement on the spatial planning objectives has been achieved.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes, mainly BU, US, TN, PF, AF and CP

Use Case Description	
Step 2	<p>In order to understand how the city evolves, it may be useful to represent the city at different dates.</p> <p>The city at a given date T in the past may be reconstituted using the attributes date of construction (by deleting the buildings constructed after T) and date of demolition (by re-integrating the buildings demolished since T)</p>
Step 3	<p>The buildings and facilities / governmental services that generate public easement are identified, e.g.</p> <ul style="list-style-type: none"> - protected sites, classified monuments, architectural and urban patrimony - lighthouses - oysters facility - powder shops (Defence-Navy) - military airports - military constructions (forts, ...) - tanks (gas, fuel) - cemeteries - stadium (sport installations) - risk installations (e.g. Seveso factories) - radio-electric antennas <p>Most of them may be found using attributes construction nature, buildingNature, service type.</p> <p>Then, the extend of public easements is defined.</p>
Step 4	<p>Local government decide on a planned use map; the land use areas are generally represented on a background map representing cadastral parcels, existing buildings, transport networks.</p> <p>This planned land use map defines the restrictions of construction for the next years, applying to each parcel.</p>
Step 5.	<p>In order to have a better idea of the consequences of the planned land use map, a 3D model may be done:</p> <ul style="list-style-type: none"> - using 3D geometry of existing buildings if available; if not, the volume of buildings may be derived from 2D polygon geometry and height above ground - for buildings under project or under construction, their 3D geometry may be derived in the same way; the height above ground may have to be searched in the building permit (using attribute document or the external reference mechanism) - simulated data are used for the new buildings that are allowed by the new spatial planning map.
Result	A planned land use map is available and may be published for INSPIRE under LU theme
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, PF, AF, TN, CP
Geographic scope	Any urban area in Europe

B.3.3 Urban monitoring

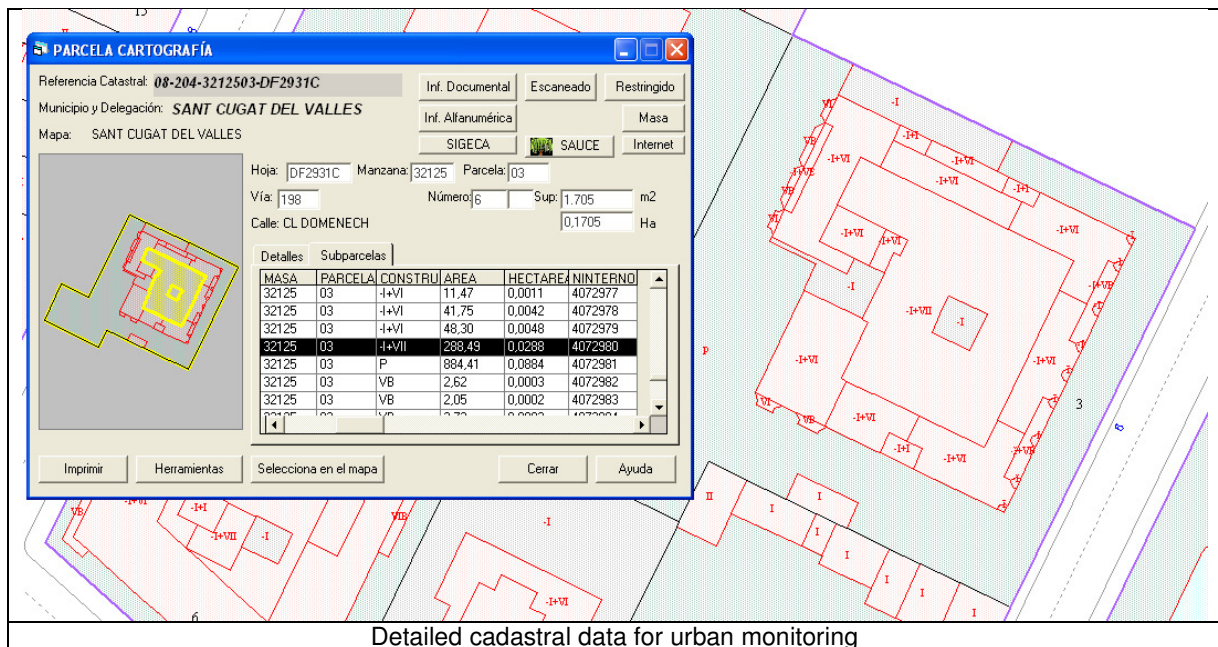
Part 1: UML use case diagram



Use case diagram for urban monitoring

Part 2: Narrative explanation of the use case

The purpose of this use case is to ensure that the rules defined by the spatial planning map and by other regulations are respected.



Detailed cadastral data for urban monitoring

Part 3: Detailed, structured description of the use case

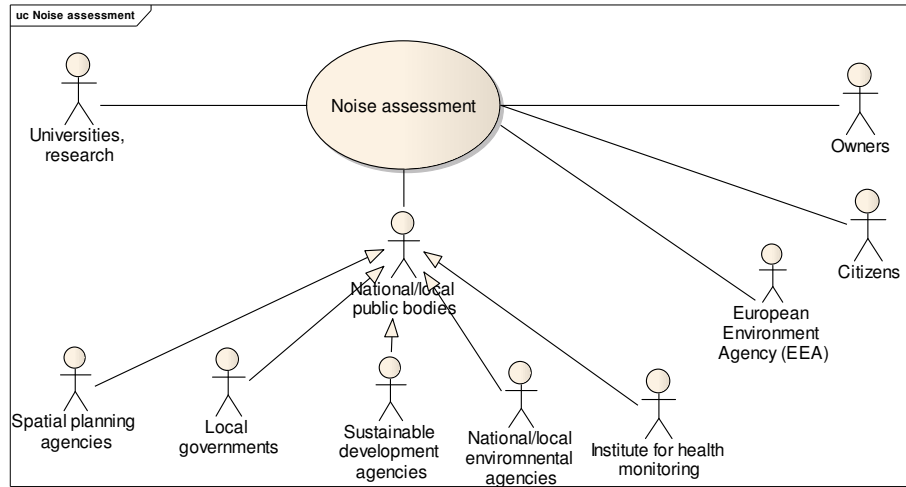
Use Case Description	
Name	Spatial monitoring
Priority	high
Description	The purpose is to check if spatial planning decisions (registered in a planned land use map) and other urbanism regulations are respected.
Pre-condition	Planned land use map and associated regulations are available. A politic agreement on the spatial planning objectives has been achieved.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes, mainly BU, TN and CP

Use Case Description	
Step 2	When a owner asks permission for a new building through the building permit, check if the building permit is conform to planned land use map and other regulations
Step 3	When the building construction is achieved, there may be a checking done by field survey to control if the building in real world is conform to building in the building permit. The reference INSPIRE data may be updated to take into account this new building, ideally with all the attributes of the extended profile that are available from the building permit.
Flow of Events – Alternative Paths	
Step 3 bis.	Once an area is constructed, the INSPIRE building data may be used to carry out more systematic checks, using the attributes: <ul style="list-style-type: none"> - 2D geometry (for deriving its size) - height above ground of the building - material of roof, material of façade - official area (to check if the density indicators were respected) - detailed 2D geometry to measure distance to the road or to the cadastral boundary.
Step 3 ter	Systematic check may be done at city level, several years after the planned land use map was published (date T), by comparing the buildings effectively constructed (selection of building whose construction date is after T) with the areas where buildings were allowed.
Result	The decisions taken for spatial planning are respected.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, TN, CP
Geographic scope	Any urban area in Europe

B.4 Environment

B.4.1 Noise

Part 1: UML use case diagram



Use case diagram for noise assessment

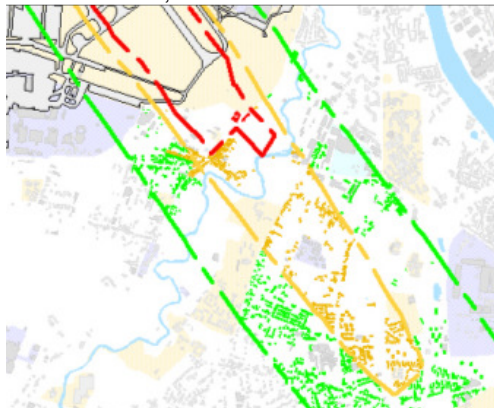
NOTE: this use case diagram applies to B4.1, B4.2 and B4.3.

Part 2: Narrative explanation of the use case

European legislation (Environmental Noise Directive; END) defines obligations to consider the environmental noise and noise sources and appropriate actions to address and manage noise issues within the Member States (MS). The scope of the END Directive (Art.2) defines, that this Directive shall apply to environmental noise to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas.

MS establish competent authorities and bodies for making or approving and collecting noise maps and action plans for agglomerations, major roads, major railways and major airports. These authorities are usually designated at local level and hierarchical level of authorities is usually used to collect data (example: from local level) and report to the EC (example: from national level).

MS have to report to the European Commission certain data related to strategic noise maps, action plans, noise control programmes, computation or measurement methods used to provide noise values, estimation of people exposed to noise values, etc.



Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Assessment and reporting for Noise Directive
Priority	high
Description	The purpose is to assess and report noise indicators, in conformance with Noise Directive.
Pre-condition	Data related to noise source (e.g. air traffic, road traffic) is available
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes, mainly BU, US and TN
Step 2	The noise extend is delimited as explained in common use case B1.1 (Modelling of physical phenomena). Main attributes to be considered are the geometry , the height above ground (that may influence the height at which the noise has to be estimated), the roof type (ideally as 3D geometry), the material or texture of façade (that may enable domain experts to deduce noise insulation).
Step 3	The estimation of dwellings, schools, hospitals exposed to noise is done by selecting the buildings and governmental services located in the noise extend: <ul style="list-style-type: none"> - spatial query based on their 2D geometry - semantic query based on service type (for schools, hospitals) - semantic query based on number of dwellings for buildings
Step 3	The estimation of people exposed to noise is done as explained in common use cases B1.2.1 (population at night) and B1.2.2 (population at day)
Step 4	Number of people in dwellings with special insulation + ventilation / air conditioning may be assessed by searching detailed information about insulation, ventilation in official building register or in building permits (using document or external reference attributes) and/or by attribute installation nature (e.g. airDuct , air conditioning unit).
Step 5 (optional)	The assessment is done with more details, the floors reached by excessive noise are identified (through the height in floor description). Owners of building units in these floors may receive subsidies to improve insulation.
Result	Noise indicators are reported (partly) in conformance to Noise Directive.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, CP
Geographic scope	Areas around airports and main roads.

Note: it is unsure that INSPIRE BU data will be enough to assess the number of people in dwellings with quiet façade

B.4.2 Air quality

Part 2: Narrative explanation of the use case

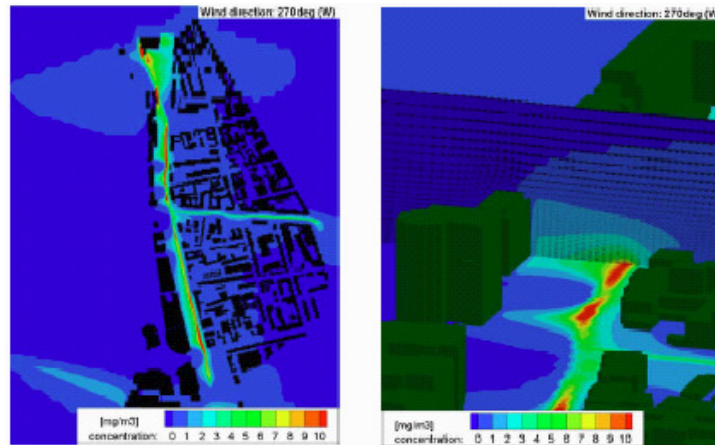
The European legislation (**new Directive 2008/50/EC** of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, Council Directive 96/62/EC - **Air Quality Framework Directive**) require to make yearly reporting (around July – August) about the areas where air

quality is bad (proportion of pollutants higher than the authorized ones) and the populations concerned by this bad air quality

Assessment of air quality may also be useful for urban expansion (e.g. to avoid building a school in a polluted area) or to organise public transport (to reduce the pollution due to car traffic).

Data related to buildings are used for two purposes:

- as input parameters in the model to compute propagation of traffic pollution; repartition of buildings has an impact how the pollutants are disseminated (open streets) or not (canyon streets)
- as basis to estimate the number of people in each air quality area.



Air quality mapping – Air quality propagation

Part 3: Detailed, structured description of the use case

The air quality use case step by step description is very similar to the noise use case one. See B4.1

B.4.3 Soil

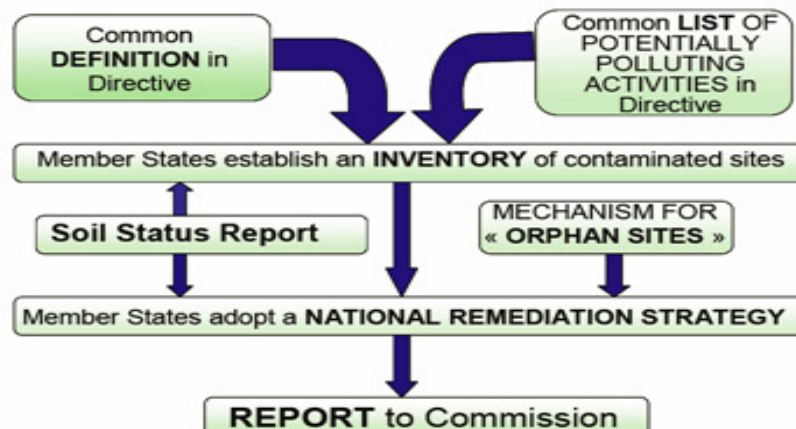
Part 2: Narrative explanation of the use case

Soil is essentially a non-renewable resource and a very dynamic system which performs many functions and delivers services vital to human activities and ecosystems survival. Information available suggests that, over recent decades, there has been a significant increase of soil degradation processes, and there is evidence that they will further increase if no action is taken.

The European Commission has prepared a project of Soil Directive. Among other measures, the proposed Directive includes:

- the establishment of a common framework to protect soil on the basis of the principles of preservation of soil functions, prevention of soil degradation, mitigation of its effects, restoration of degraded soils and integration in other sectoral policies.
- Setting up an inventory of contaminated sites, a mechanism for funding the remediation of orphan sites, a soil status report, and establishing a national strategy for remediation of the contaminated sites identified.

Contamination



ESBN Workshop, Zagreb, September 2006



Soil contamination

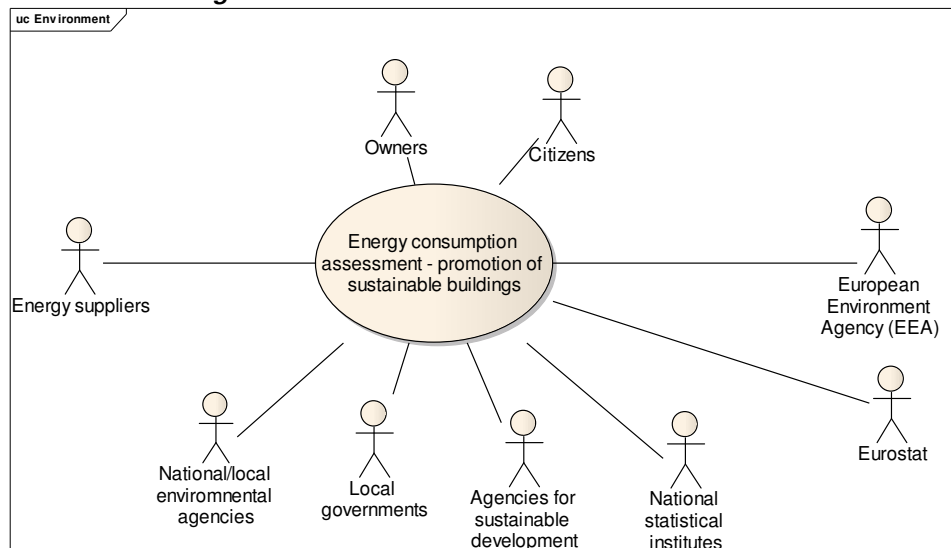
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Assessment and reporting for future Soil Directive
Priority	medium
Description	The purpose is to detect, estimate the extent of the soil pollution and the effect on residents but also to prevent pollution of the groundwater through the polluted soil.
Pre-condition	Data related to noise source (e.g. air traffic, road traffic) is available
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes, mainly BU, PF, AD, SO , CP
Step 2	Maps showing potential contaminated sites are carried out, e.g. in old telephone books, registers etc. to find information about activities and buildings which have had a use that potential produce soil pollution. The polluting activities may be geocoded on a background map, using address of the activity
Step 3	For evaluating the extent of the soil pollution in the ground there is used soil samples, information's about the current and former activities on the site and several other data about the buildings. In addition there is sometimes made a physical inspection of the building to look for cracks etc in the house where vapours can get in.

Use Case Description	
Step 4	<p>Analysis of the possible remediation is done, using following attributes: current use, date of construction, number of floor, roof and wall material, value (in some cases if low valued the building can be demolish to clean the soil more effectively). Height above ground is relevant according to degassing and wind condition. The area may be derived from the 2D geometry of the building or official area may be used. The owner of the building may be found in official register of buildings using the external reference of the Building or BuildingUnit or the association or spatial overlay with cadastral parcels.</p> <p>Information about stairs and chimneys is useful vapours from pollution can be spread through these channels. It may be searched using attribute Document (e.g. sketches of building or building permit)</p> <p>Retired features are necessary to explore which buildings that have been on the site, and what kind of function they had.</p>
Result	Inventory of contaminated soils and report about remediation actions is ready to be reported for the future Soil directive
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, PF, SO, CP, AD
Geographic scope	Everywhere in Europe

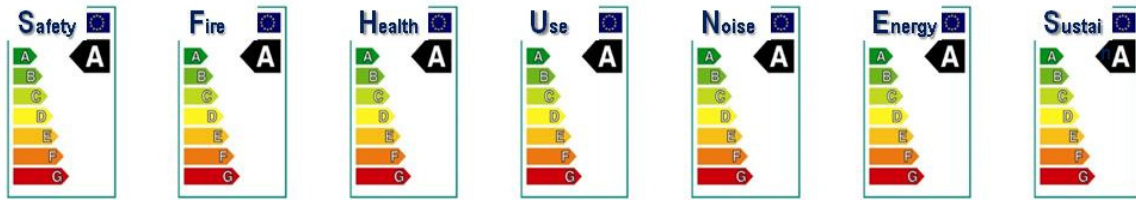
B.4.4 Energy / Sustainable buildings

Part 1: UML use case diagram



Use case diagram for energy / sustainable buildings

JRC has launched a working Group whose aim is to prepare cross-sectoral policies, standards and regulations related to the construction sector in order to promote the sustainability of buildings during their whole life-cycle. The development of a multi-performance labelling of buildings in terms of safety, health, energy efficiency and sustainability is one of the long-term objectives of this Working Group.



Proposed multi-performance labelling of buildings in terms of safety, health, energy efficiency and sustainability ("Building Efficiency Index").

However, currently, only the assessment of energy performance is required by an environmental Directive, the Energy Performance of Building Directive.

Applying the Energy Performance of Building Directive

Part 2: Narrative explanation of the use case

Energy consumption produces emissions of CO₂ and so contributes to the greenhouse effect and to the increase of temperatures.

Over a decade ago, most countries joined an international treaty -- the United Nations Framework Convention on Climate Change (UNFCCC) -- to begin to consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable. More recently, a number of nations approved an addition to the treaty: the Kyoto Protocol, which has more powerful (and legally binding) measures.

At European level, the Energy Performance of Buildings Directive, (EPBD) requires unique building identification for the buildings certificates.

Part 3: Detailed, structured description of the use case

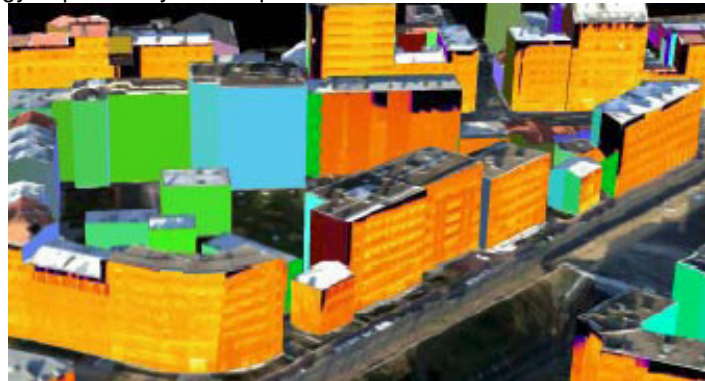
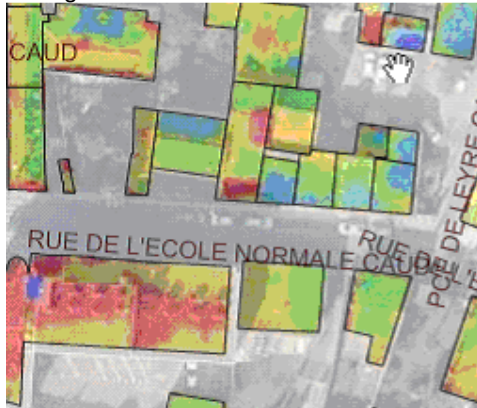
Use Case Description	
Name	Implementing the Energy Performance of Building Directive
Priority	high
Description	The purpose is to implement the Energy Performance of Building Directive. The Energy Performance of buildings has to be calculated only for new buildings or when a building is rent or sold.
Pre-condition	Building data is available
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, US.
Step 2	Identify the buildings that are under the scope of the Energy Performance of Building Directive, using attributes: <ul style="list-style-type: none"> - 2D geometry or official area to get the size of the building (< 50 m² : no requirement, > 1000 m² : higher requirements) - classification of the building (i.e. current use and service type) for possible exclusions (religious buildings, agricultural buildings, industrial sites, workshops)
Step 3	Prepare the evaluation methodology. The calculation method should take into account thermal insulation, heating and air-conditioning installations, application of renewable energy sources, design of the building and temporal aspects (distinction between existing and new buildings, age of building). Number of floors has also influence. This kind of information may be more or less found in INSPIRE data, using for instance date of construction , external reference to official building register or to building permit. It has generally to be completed by field survey.

Use Case Description	
Step 4	The evaluation of energy performance of building is performed when a building is sold or rent. The owner or the tenant of the building may be found in official register of buildings using the external reference of the Building or Building Unit or the association or spatial overlay with cadastral parcels .
Step 5	The result of this evaluation may be captured to updated INSPIRE data, under attribute energyPerformance
Result	The Energy Performance of Building Directive has been applied; information about energy performance is available for environmental studies.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, PF, SO, CP, AD
Geographic scope	Everywhere in Europe

Promoting reduction of CO₂ emissions

Part 2: Narrative explanation of the use case

Moreover, some Member States or local governments are willing to have more pro-active policy and to encourage citizens to improve heating efficiency of their buildings (by better isolation). Better insulation not only reduces the emissions of greenhouse gases but also contributes in long-term to money saving for inhabitants and to reduce the energy dependency of European countries.



Infra-red images showing loss of energy by roof or by façade.

Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Promoting the reduction of CO2 emissions by buildings
Priority	high
Description	The purpose is to assess the energy demand of buildings and/or to detect the houses with heat losses and to encourage owners to make insulation works.
Pre-condition	Data related to buildings is available. Domain expertise is required.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU

Use Case Description	
Step 2	<p>Assess the energy demand of buildings. Ideally, this should be done using LoD4 representation of buildings with geometric description of building units and detailed information with attributes material of roof, material of façade, heating source, heating system (or by searching information about heating in cadastral register by the external reference) and with feature type installations (air conditioning unit, solar panel, wind turbine).</p> <p>The assessment may be done in a rough way, by using 2D geometry, height above ground or number of floors and by deriving the above information about quality of construction and heating from year of construction and year of renovation.</p>
Step 2	<p>Identify the buildings with significant heat losses. This may be done using different methodologies:</p> <p>Deriving it from the assessment of energy demand (step2)</p> <p>using infra-red images to show heat losses by roof (aerial images) or by façade (images taken from a vehicle in the street)</p>
Step 3	<p>Prepare representations of the results. This may generally be done using the common use case B1.3 (Large scale mapping). Note that to represent the results of infra-red roof images, the 2D geometry (polygon) of buildings is required, preferably captured by roof edge. To represent the results façade of infra-red images, the 3D geometry of buildings is required.</p>
Step 5	<p>To make inhabitants aware of the results, the resulting map or 3D model may be published on a Web site or an extract may be sent to the owner. The owner of the building may be found in official register of buildings using the external reference of the Building or BuildingUnit or the association or spatial overlay with cadastral parcels.</p>
Step 5	<p>Local or national governments may envisage financial incitation (e.g. tax reduction) to promote insulation. The cost of this measure may be estimated, based on the previous results</p>
Step 6	<p>Local or national governments are also building owners. In order to show exemplarity, they may be willing to make insulation works in their own patrimony.</p> <p>Analysis of more detailed data (such as 3D geometry with shape of roofs and openings, images of buildings under document attribute) will help them to make first identification of the insulation works to be done.</p>
Result	<p>Building owners are aware of the heat losses and so, may be encouraged to reduce them by insulation works.</p>
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU
Geographic scope	Everywhere in Europe

Sun exposure

Part 2: Narrative explanation of the use case

The aim is to detect buildings on which solar panels may be installed, in order to promote use of renewable energies and to ensure better sustainability of the building. The expected result is maps showing these buildings with good sun exposure. An indicator about sun exposure (number of sunny hours by day) has to be computed.

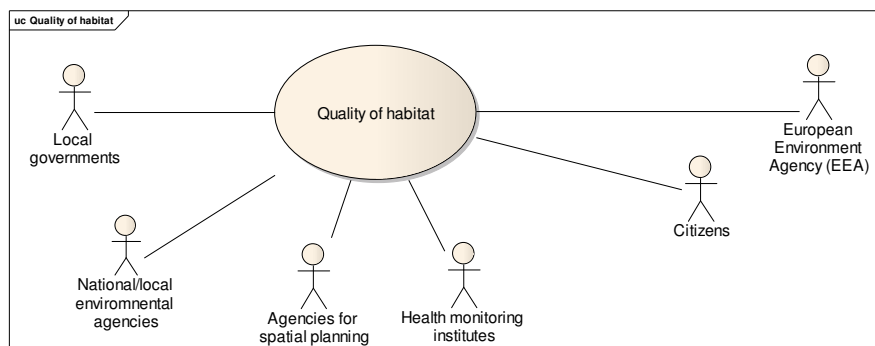
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Sun exposure
Priority	high

Use Case Description	
Description	The purpose is to identify the buildings that are relevant for installation of solar panels on their roof.
Pre-condition	Building and elevation data available.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, EL, possibly OI
Step 2	Compute the propagation of sun. This may be done as explained under common use case B1.1 modelling of physical phenomena. Ideally, should be done with 3D geometry with shape of roof . However, rough assessment may be done using 2D geometry and height above ground . This computation gives the buildings with good sun exposure.
Step 3	Refine the analysis to identify the roofs that may receive solar panels: <ul style="list-style-type: none"> - Using the attribute material of roof and/or roof shape, exclude the buildings that are not appropriate (e.g. covered by thatch) - Owners are generally reluctant to set solar panels if the building has a roof terrace. An investigation may be done using images of roof (as document) or high-resolution ortho-image
Step 4	An electricity company may want to prospect building owners to propose them installation of solar panel. This may be done by field prospecting. A working map has to be prepared to help the prospector to find the relevant buildings, as described in common use case B1.3 Large scale mapping.
Result	The buildings that may receive solar panels are known.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, EL, possibly OI
Geographic scope	Sunny areas in Europe

B.4.5 Quality of habitat

Part 1: UML use case diagram



Use case diagram for quality of habitat

Part 2: Narrative explanation of the use case

The general purpose is to carry out studies about habitat (e.g. social habitat, unhealthy habitat, urbanism documents) and to make deciders (municipality level) aware of the evolution of their territory. The deciders may then decide of relevant actions, such as launching projects of social habitat or buying public land for potential new projects.



Simulation of project, buildings that are going to be demolished are shown in blue

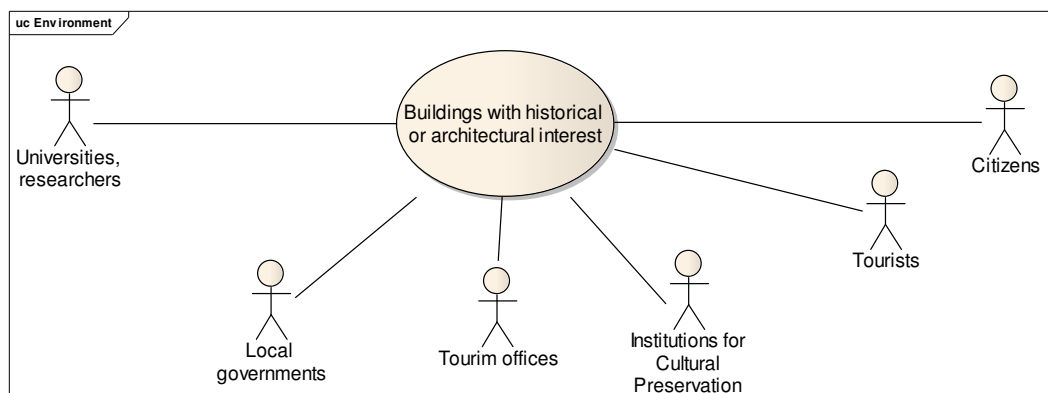
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Quality of habitat
Priority	medium
Description	The purpose is to assess the quality of habitat in order to take relevant decisions to improve it
Pre-condition	Political will to improve quality habitat is required.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes BU, US, CP, TN
Step 1	An atlas of built-up area is carried out (see common use case Deriving medium scale data). The atlas helps to identify the density of buildings (e.g. number of dwellings per cadastral parcel) and to see the possibilities of evolution. The official trend is to increase the density in order to reduce ecological costs of transport and land take.
Step 3	An atlas of public services is carried out, based mainly on the geometry, service type and capacity of governmental services . The aim is to increase the accessibility; people should find all they need near their home in order to reduce the economic and ecologic cost of transport.
Step 4	An atlas of commercial activities is carried out, for instance by geocoding an activity file on buildings, using a common address . Accessibility to commerce is a criteria of life quality.
Step 4	An atlas of social habitat is prepared; 2D geometry of buildings is used as background data to locate programmes of social habitat
Step 5	Monitoring of co-ownership properties is done. If a property has significant vacant flats, quick turn-over of owners and big rate of rent, it means that this habitat programme was not successful. This information may be found in the official building register by the external reference . The local government should not reiterate this type of building programme and may also take measures such as subsidies for work in buildings, buying unused dwellings and/or common parts ... in order to improve the situation of the unsuccessful co-ownership property.

Use Case Description	
Step 6	<p>An atlas of precarious/bad condition habitat is carried out. Information about precarious buildings (mobile homes, caravan sites, shelters, ..) is useful.</p> <p>These kind of habitat may also be assessed by using both data about income of population and data related to the building (date of construction, date of renovation, number of dwellings, 2D geometry + number of floors + current use to derive the habitable area). For instance, the number of occupants by dwelling is a good indicator.</p> <p>Presence of comfort elements (toilet, heating, kitchen, water supply) may be found in official cadastral register, using the external reference.</p>
Step 7	<p>An analysis of healthy/unhealthy habitat is conducted, e.g. influence of heat waves, noise, air pollution, radon, risk of lead poisoning.</p> <p>Attributes date of construction, material of roof / façade /structure, heightBelowGround or numberOfFloorsBelowGround (for radon), 3D geometry with openings (for noise and heat propagation) are necessary to conduct this type of analysis.</p>
Step 8	<p>Some buildings are considered as totally inappropriate for habitat; local government decides to demolish them in order to construct more adapted dwellings and/or services.</p> <p>The 3D geometry of building is used for 3D models that enable deciders and citizens to realize the impact of the project.</p>
Result	Local governments have a clear idea about the quality of habitat and may take relevant decisions.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, TN, CP
Geographic scope	Everywhere in Europe

B.4.6 Buildings with historical or architectural interest

Part 1: UML use case diagram



Use case diagram for buildings with historical or architectural interest

Part 2: Narrative explanation of the use case

Europe countries have had a long history and beneficiate of a rich architectural patrimony. The aim of this use case is to share and increase the knowledge about buildings with historical and architectural interest and to make valorisation of this patrimony through communication actions.



Mont Saint-Michel (France)

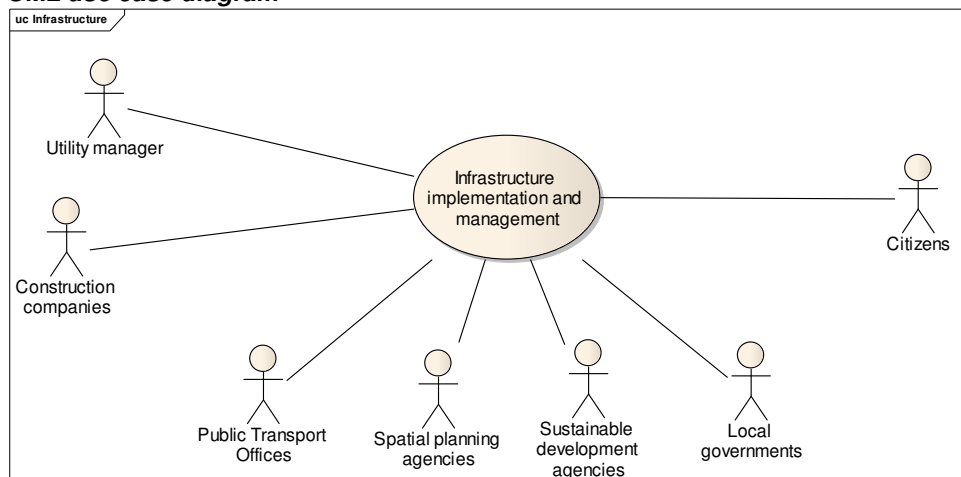
Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Buildings with architectural or historical interest.
Priority	medium
Description	The purpose is to share and increase the knowledge about buildings with historical and architectural interest and to make valorisation of this patrimony.
Pre-condition	Building data is available
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, US, TN, CP, PF
Step 2 - Scenario 1	<p>Decision to collect the work of various researchers in history and archaeology is taken. Moreover, the results of these researches will be located, using INSPIRE data as background.</p> <p>2D geometry of buildings is used to locate the historical/architectural buildings</p> <ul style="list-style-type: none"> In case of buildings that still exist, the INSPIRE 2D geometry may be used as it is In case of buildings that no longer exist, their geometry may be located using relative distance to current BU, TN, It may be represented by a polygon or roughly by a point
Step 2 - Scenario 2	<p>A more ambitious decision is taken: to make inventory of all buildings with historic or architectural interest.</p> <p>INSPIRE data may be used to prepare the field survey by identifying the areas to be investigated (for instance, it is unlikely that a new suburb area with cheap houses looking like one another deserves to be visited).</p> <p>This first selection may be done using attributes such as year of construction, condition of construction (ruins), official value, construction nature (monument), building nature (church, chapel, castle), service type (hospital, governmental service, university, ...).</p> <p>INSPIRE data is used to make work maps for the field survey, as described in the common use case B1.3 large scale mapping.</p>
Step 3	<p>The work of researchers or the results of the inventory is structured according to the INSPIRE application schema, using mainly the temporal attributes (condition of construction, date of construction, date of renovation, date of demolition), the possibility to attach documents to a building.</p> <p>The classification of buildings may be done by extending attributes construction nature and building nature or by adding other attributes.</p> <p>The result of this work may be published on a Web site and contributes to enrich the knowledge of the city history.</p>

Use Case Description	
Step 4	<p>Once the patrimony has been identified, other actions may be conducted to make valorisation of the territory. For instance:</p> <ul style="list-style-type: none"> - Maps of the city at different dates may be produced. - The results may be shown on current cadastral plan (interest for the owners of the parcel) - Walking tours may be organised - Protection measures of the patrimony may be taken <p>It may also be a motivation for ordering the production of the detailed 3D geometry of these buildings, in order to enrich the web site or brochures of the city.</p>
Result	The knowledge about buildings with architectural or historical interest has increased and may be shared by everyone
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, PF, TN, CP
Geographic scope	Everywhere in Europe

B.5 Infrastructures

Part 1: UML use case diagram



Use case diagram for Infrastructure implementation and management

B.5.1 Location of a new service/activity

Part 2: Narrative explanation of the use case

Example 1: find better location for new antennas

The purpose is to find, for potential new antennas, the buildings reached by this antenna and then, to estimate the percentage of buildings covered /reached by this antenna.

Several potential locations for the antenna have been identified. For each of this position, a simulation is done, by making "visibility maps" from the antennas (see common use case B1.1 modelling of physical phenomena). The location that is "visible" by the higher percentage of buildings will be considered as the best one.

Example 2: prove the necessity of a new antenna.

A telecommunication company is initiating a project related to implementation of new antennas for mobile phone. The influence area of an antenna depends of the landscape, for two reasons:

- buildings may disturb propagation of phone waves
- more antennas are needed in urban areas to be able to deal with more calls

For instance, in rural areas, the antenna impact varies from 2 km to 35 km. In urban areas, the antenna impact may be smaller than 500 m.

As there are doubts about influence of phone antennas on health, the telecommunication company has to give rationale for implementation of a new antenna and must prove that there are requirements to get permission from local governments.

So, the telecommunication company need to determine the characteristics of the area around the new antenna. For instance, the need for mobile phone is bigger in large business areas than in residential areas. The density of buildings is also a significant criteria. There is socio-economic data on statistical units but building data is required for more accurate spatial location of this information (see common use case B1.2.2 Computation of population at day).

Example 3: Location of new bus stops

There is obvious need for organizing and scheduling of public transport. A main goal of the application is to create / change / delete bus stops and bus stations and to connect the different stops and stations so that they reach a maximum number of people (in city centres, near points of interest ...) in the shortest possible time. Another purpose is to provide up-to-date information about the routes and stops to all the employees and citizens.

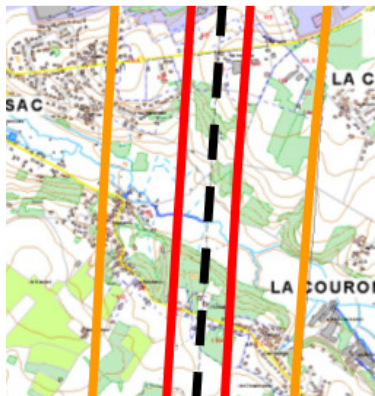
Several scenarios are envisaged for the location of a new bus stop; the area served by the bus stop is delimited (e.g. less than 300 m or less than 5 or 10 minutes walking). Then, the application computes the population that may beneficiate of this new bus stop (see common use case B1.2 about computation of population at day and at night).

Example 4 : Location of new highway (or high speed train)

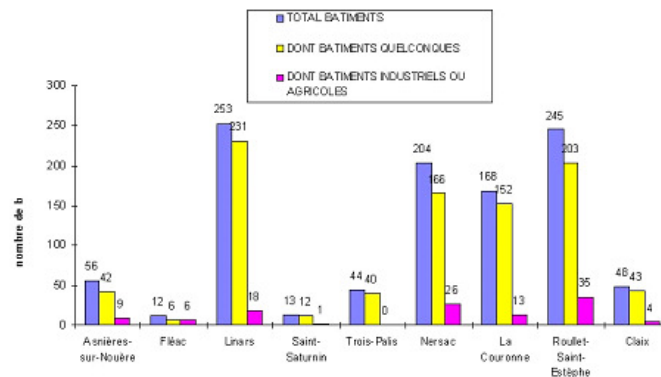
Location of new highway is a complex process in which several steps are required. The purpose is double:

- serve transport needs as much as possible
- disturb local population as few as possible

The first step is to define the rough areas where the highway should be located.



Rough area(s) where the highway should be located



Number of buildings and inhabitants 1 km around the highway

Studies to find better location of a new highway

Then, there is then a need to assess the impact of the project (to identify which buildings are concerned by the project). Visibility / intervisibility maps may be created for this project, e.g. to ensure that a nice site is visible from the highway / the train or to identify the least visible areas along the transport network).

Noise maps may be simulated to show the impact of the new highway or railway.



Current status



With anti-noise wall



With tunnel

Simulation of anti-noise infrastructure impact

3D representation to make 3D model simulating the new project are useful to communicate with the inhabitants impacted by the project.

Example 5: Location of a new wind farm

An electricity company is looking for new sites to set up wind turbines. In first phase, geographic data is required to identify potential sites. Then, the study is completed by field survey.

Data related to buildings are required because wind turbines must be far enough from buildings

Use Case Description	
Name	Location of a new wind farm
Priority	high
Description	The purpose is to identify the potential location of new wind farms.
Pre-condition	
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme AC, MF, BU, EL, TN, PS, CP
Step 2	Compute the areas that receive enough wind (see common use case B1.1 modelling of physical phenomena)
Step 3	A wind farm must be at least at 500 m from a residential building. Using attribute current use , select residential buildings. Create an exclusion zone by making a buffer of 500 m around the 2D geometry of these buildings.
Step 4	Using attributes construction nature and specific interest, select the specific buildings or constructions that generate easements for wind turbines (castles, churches , radars, television towers, antennas, pylons, transformers, airports , SEVESO sites). More generally, the buildings that have an interest for landscape generate more constraints than ordinary buildings. These buildings are those having historical or architectural interest, some are under official classification / protection but not all (for instance, traditional, well-preserved village
Step 5	Make visibility maps around the specific buildings that generate more constraints; for these specific buildings, a detailed 3D geometry with location of openings enables more detailed results. The areas where the wind farm is visible from these specific buildings must be excluded.

Use Case Description	
Step 6	The area where it is possible to locate a new wind farm is now known. But it is necessary to get owner agreement. The cadastral parcels located in the favourable area are selected and the owner is found using the national cadastral reference and the negotiation may begin....
Result	The location for a new wind farm is found.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes AC, MF, BU, EL, TN, PS, CP
Geographic scope	Windy areas in Europe

Example 4 : High voltage power line

An electricity company need to set up a new high voltage power line crossing an inhabited area.

Use Case Description	
Name	Location of a new high voltage power line
Priority	high
Description	The purpose is to check that the new line will not be in conflict with existing buildings.
Pre-condition	The potential location of the power line has been defined
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU
Step 2	The power line is above ground. Using the attributes 2D geometry + height (or elevation preferably captured at highest point) or the 3D geometry of buildings and other constructions , check if the scheduled location of power line is fine, i.e. if it respects the minimum distances
Step 3	The power line is underground. Using the attributes 2D geometry (preferably captured as envelope) and height below ground or number of floors below ground , check if the scheduled location of power line is fine, i.e. if it respects the minimum distances
Result	The location for the new high voltage power line has been checked.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU
Geographic scope	Anywhere in Europe

B.5.2 Management of service/activity

Part 2: Narrative explanation of the use case

Example 1: computing population reached by television channels

The national government wants to assess the percentage of population that receive television channels.

Use Case Description	
Name	Computation of population reached by television channels
Priority	medium

Use Case Description	
Description	The purpose is to compute population reached by television channels, using a grid for population
Pre-condition	There is a software taking the population grid as input to check which population was reached or not by television channels.
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, SU, PD
Step 2	Attribute a number of inhabitants for each building (see first steps of common use case B1.2.1 Computation of population at night), using attributes 2D geometry , number of floors and current use (residential) .
Step 3	Select for each building the nearest node of the grid (regular grid of 100m). The result of the query may be stored using the inspireID . If available, use 2D geometry as point to make computation quicker. If not available, the point geometry may be derived from the polygon geometry.
Step 4	Give to each node of the grid the population of the buildings related to this grid node.
Result	The population data is available in the way suitable for the software.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, SU, PD
Geographic scope	Anywhere in Europe

NOTE 1: This example shows the interest of multiple representations of buildings as polygons and as points.

NOTE 2: In a current statistical project of Eurostat, the population has to be related to the cells of a km² grid. The methodology for doing so (transfer of statistical data from existing statistical units to a new kind of statistical units) might be quite similar.

Example 2: managing refuse collection

A public body has to organise the refuse collection in a city. A building in this context will either be a dwelling or premise that requires local authority service delivery in the form of waste collection services.

Use Case Description	
Name	Management of refuse collection
Priority	medium
Description	The purpose is to manage in an efficient way the refuse collection in a city.
Pre-condition	
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, US, PF, TN, AD, ..
Step 2	Using attribute condition of construction , the functional buildings (those deserving refuse collection) are selected.
Step 3	The volume of expected refuse is assessed according to the current use of the building and to its size (official area or area derived from 2D geometry x number of floors)

Use Case Description	
Step 4	Itineraries for refuse collection are prepared, based on the results of previous assessments. The 2D geometry of buildings may be used to prepare working maps (see common use case B1.3 Large scale mapping)
Step 5	When the owner / occupier of the building contact the local authority via the call centre, it is necessary to be able to find the concerned building. This may be done by using the external reference to link geographic data to the information system of owners/occupants
Step 6	Temporal studies are carried out in order to prepare evolutions of the refuse collection, e.g. <ul style="list-style-type: none"> - study of the past by reconstituting the city with attributes date of construction, date of demolition - study in next future by taking into account buildings whose condition of construction is under project or under construction
Result	The refuse collection is managed in an efficient way..
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, US, PF, TN, AD, ..
Geographic scope	Anywhere in Europe

Example 3 : Landing of stratospheric balloons

French Spatial Agency (CNES) is in charge of launching stratospheric balloons over France and other countries. These stratospheric balloons are not inhabited; they are guided either from CNES in Toulouse or from the launch site.

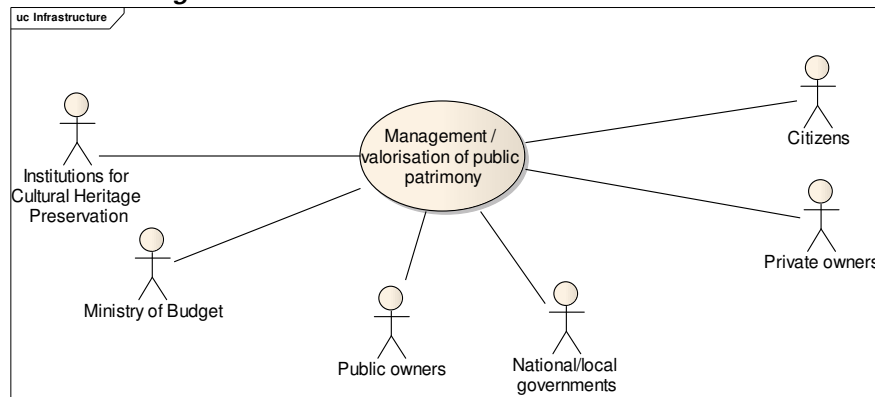
They carry scientific material for studying atmospheric conditions (e.g. winds) or composition. There are lots of demands for example in the context of climate change and of decrease of ozone layer. These studies enable better understanding of current status of atmosphere and some anticipation.

Landing of balloons may be dangerous for the people living in the landing area. There are thresholds which should not be exceeded. The risk depends on the characteristics (mainly weight) of balloon and of landing area. For instance, for the heaviest (and so the most dangerous balloons), the risk factor should not exceed 1 or 2 persons/km². The landing area may be up to several km².

Building data are used to compute this risk factor (see common use case Computation of population at night) and to so to check if the scheduled landing area conforms to the regulation.

B.5.3 Management / valorisation of public patrimony

Part 1: UML use case diagram



Use case diagram for management: valorisation of public patrimony

Part 2: Narrative explanation of the use case

National and local governments as well as other public bodies are generally owners of a significant part of land and of buildings. They obviously need building data for their infrastructure projects but also for daily management.

Part 3: Detailed, structured description of the use case

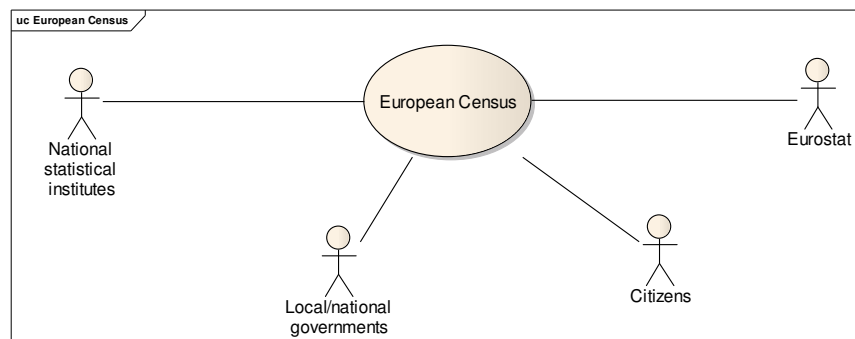
Use Case Description	
Name	Managing Public Property
Priority	medium
Description	The purpose is to manage public property.
Pre-condition	Building data is available
Flow of Events – Basic Path	
Step 1.	Download INSPIRE theme BU, US, CP
Step 2	Decision is taken to constitute a land reserve. The owners who let their buildings abandoned may be good willing to sell their property. Based on attribute condition of construction , select the buildings and construction that are declined or ruins . Based on the national cadastral reference of parcels and/or the external reference of buildings or building units , identify the owner in the cadastral register. The official value may be used to estimate the price the local/national government will propose.
Step 3	A dispute occurs with neighbours of a public building, for instance about adjoining walls. Any document linked to the building may help to understand the issue and to solve it.
Step 4	The public body decides to assess if the buildings devoted to governmental services are well-employed. This may be done for instance by comparing the area of the building (official area or area derived from 2D geometry and number of floors) to the occupancy of the governmental service .

Use Case Description	
	Public body needs to manage its public property (e.g. maintenance activities and costs, concessions of public property and tax payments). This may be done using the INSPIRE application schema for core localised data and to plug the information systems dedicated to management using the external reference to buildings and building units . This will enable the set of stakeholders to share common understanding of the spatial part of the whole information system,
Result	Public property is managed in an efficient way ; results of this management may be communicated in a way understandable by the various stakeholders.
Data source: <Name> [repeat per data source]	
Description	INSPIRE themes BU, PF, SO, CP, AD
Geographic scope	Everywhere in Europe

B.6 Census

B.6.1 European Census

Part 1: UML use case diagram



Use case diagram for European census

Part 2: Narrative explanation of the use case

Each 10 years, the EU Member States have to conduct a census of population and dwellings. There is a set of related documents:

- legislation (the Directive on Population and Housing Censuses)
- technical regulation
- programme (for instance, date for the 2011 census shall be transmitted by 2014 at the latest).

Eurostat is collecting data coming from the Member States (National Institutes of Statistics). In principle, the Member States can decide themselves on the data sources and methodology for their census. Whereas a full enumeration is the ideal for a census, some topics might be covered by means of a sample. For the dwellings, the Member States generally establish a complete frame, i.e. they base the data transmitted to Eurostat on a complete list of buildings/dwellings. Often the censuses in the Member States may use questionnaires to dwelling owner or occupant; it may also use reference data from building registry or other data bases.

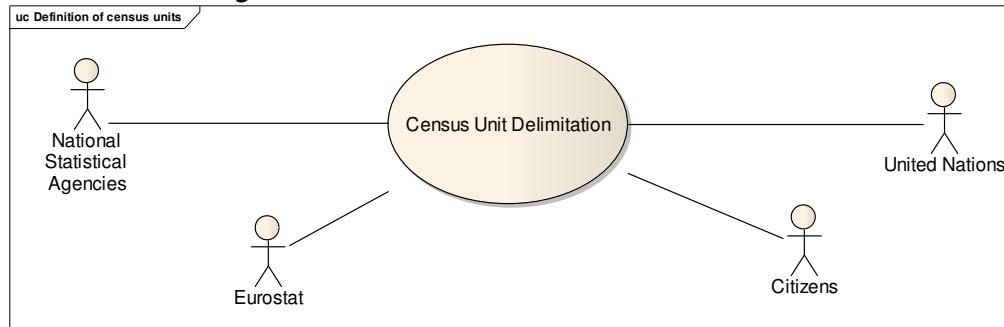
The data related to buildings is also useful for National Institutes to find the dwellings and the inhabitants.

Part 3: Detailed, structured description of the use case

Use Case Description	
Name	Census of population and dwellings
Priority	high
Description	The purpose is to make the census of population and dwellings, according to the European Directives on Population and Housing Censuses
Pre-condition	Location of statistical units is known (INSPIRE theme SU).
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes BU, SU and other data required for large scale mapping.
Step 2	Within the area of interest, using attribute current use , select residential buildings. These are the buildings to be investigated by census agents.
Step 3	Prepare working maps for census agents as described in B1.3. Residential buildings may/should be highlighted.
Step 4.	<p>If available, census agents may use INSPIRE BU data for the census of dwellings:</p> <ul style="list-style-type: none"> - type of building from current use - number of floors from number of floors above ground - period of construction from date of construction - material of building from material of structure, material of walls, material of roofs - state of repair (partly) from condition of construction - water supply, toilet facility, number of rooms, type of heating from the mechanism of external reference to a cadastral or dwelling register where this information may be found.
Step 5	Other necessary data is collected by the census agent, during field survey, through questionnaires filled by the owner or occupant of the buildings.
Step 6.	The collected data is aggregated at SU level.
Flow of Events – Alternative Paths	
Step 4 bis.	<p>The information for census may also be collected from field survey (through the questionnaires)</p> <p>The INSPIRE BU data (if available) may be used for quality control.</p> <p>Possibly, the results of the census are used to update the INSPIRE BU data.</p>
Result	<p>The results of the census are available for theme PD.</p> <p>Possible update of theme BU.</p>
Data source: <Name> <i>[repeat per data source]</i>	
Description	INSPIRE themes SU, BU
Geographic scope	Everywhere in Europe

B.6.2 Census Units

Part 1: UML use case diagram



Use case diagram for Census Units delimitation

Part 2: Narrative explanation of the use case

The purpose is to redefine urban units, according to United Nations recommendations. These rules give general principle: definition of continuous areas of residential buildings. However, the rules are rather flexible and practical implementation may vary according to the country.

For instance, in France, the criteria to be respected are the following:

- Urban area are composed of one or several municipalities with continuous built-up area. Each municipality must have more than half of its population in the urban area.
- The distance between 2 residential buildings must be less than 200 m
- Each urban unit must have more than 2 000 inhabitants
- Bridges, public land (cemeteries, stadium, airports ...) and commercial or industrial buildings are not considered as interruptions in urban areas.

Other countries may have different thresholds for population and/or for maximum distance between 2 buildings.

Part 3: Detailed, structured description of the use case

The step by step description is very similar to the common use case B1.4 deriving medium scale data.

Use Case Description	
Name	Urban units
Priority	high
Description	The purpose is to define continuous urban areas, according to United Nations recommendations.
Pre-condition	
Flow of Events – Basic Path	
Step 1.	Download INSPIRE themes BU, US, TN, AU
Step 2	Define the generalisation rules to derive urban units from themes BU, US, TN, PD, ... For instance, in France, the criteria to be respected are the following: <ul style="list-style-type: none">- Urban area are composed of one or several municipalities with continuous built-up area. Each municipality must have more than half of its population in the urban area.- The distance between 2 residential buildings must be less than 200 m- Each urban unit must have more than 2 000 inhabitants- Bridges, public land (cemeteries, stadium, airports, ...) and commercial or industrial buildings are not considered as interruptions in urban areas.

Use Case Description	
Step 3	Run the generalisation rules on large scale data.
Result	The geometry of the urban units is defined and is available for theme SU
Data source: <Name> <i>[repeat per data source]</i>	
Description	INSPIRE themes BU, US, TN, ..
Geographic scope	Everywhere in Europe