European Commission

Mapping Guide v4.7 for a European Urban Atlas

Copernicus
The European Earth Observation Programme

Regional Policy

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MAPPING GUIDE
FOR A EUROPEAN URBAN ATLAS

1. EXECUTIVE SUMMARY

This document contains the product description, mapping guidance and class description for the product "Urban Atlas" from the Copernicus "Urban Atlas" project for the 2006 reference year and the "Urban Atlas" update and extension for the 2012 reference year.

2. SCOPE

This mapping guide guides the service providers in generating an Urban Atlas mapping product. In particular, it provides guidance to achieve:

- Congruent product attributes such as file format, file attributes;
- Common nomenclature;
- Common look and feel of the product;
- Comparable quality of the product.

3. REFERENCE DOCUMENTS

The table below includes the different Reference Documents (RD) related to the Urban Atlas project. A list of abbreviations is provided in Annex 1.

	Name	Issue	Date	Reference
RD[1]	C5-Service Validation Protocol	1.00	14/05/2008	ITD-0421-RP-0003-C5
RD[2]	Call for Tenders No ENTR/08/029 - Specifications	2.00	07/05/2008	Call for Tenders No ENTR/08/029 - Specs
RD[3]	Mapping Guide for a European Urban Atlas	1.02	08/05/2008	ITD-0421-GSELand-TN-01

4. MAPPING GUIDE

4.1. PRODUCT DESCRIPTION

The Urban Atlas service offers a high-resolution land use map of urban areas.

The product described in this mapping guide is adapted to European needs (discussed and agreed with DG Regional and Urban Policy (REGIO)) and contains information that can be derived mainly from Earth Observation (EO) data backed by other reference data, such as Commercial Off-The-Shelf (COTS) or Open Street Map (OSM) navigation data and topographic maps.

FIGURE 1: EXAMPLE OF THE "LOOK & FEEL" OF THE FINAL URBAN ATLAS PRODUCT FOR BRUSSELS

Legend

- 11100: Continuous Urban fabric (S.L. > 80%)
- 11210: Discontinuous Dense Urban Fabric (S.L.: 50% - 80%)
- 11220: Discontinuous Medium Density Urban Fabric (S.L.: 30% - 50%)
- 11230: Discontinuous Low Density Urban Fabric (S.L.: 10% - 30%)
- 11240: Discontinuous very low density urban fabric (S.L. < 10%)
- 11300: Isolated Structures
- 12100: Industrial, commercial, public, military and private units
- 12210: Fast transit roads and associated land
- 12220: Other roads and associated land
- 12230: Railways and associated land
- 12300: Port areas
- 12400: Airports
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- 13300: Construction sites
- 13400: Land without current use
- 14100: Green urban areas
- 14200: Sports and leisure facilities
- 21000: Arable land (annual crops)
- 22000: Permanent crops
- 23000: Pastures
- 24000: Complex and mixed cultivation patterns
- 25000: Orchards
- 31000: Forests
- 32000: Herbaceous vegetation associations
- 33000: Open spaces with little or no vegetations
- 40000: Wetlands
- 50000: Water

4.2. GENERAL GUIDELINES

4.2.1. PRE-PROCESSING AND GEO-CODING OF EO DATA

The EO data provided to the Service Provider should already be pre-processed. In order to reach the 1/10,000 expected scale, EO data should be provided with spatial resolution less than 5 meters. Service Provider should check the geometric quality of the delivered EO Data but no further pre-processing step is expected. The EO data for the Urban Atlas 2012 is the optical VHR2 coverage over EU 2011-2013 (DWH_MG2b_CORE_03) available on Data Ware House (DWH) of the European Space Agency (ESA).

4.2.2. PRE-PROCESSING AND GEOMETRIC ADAPTATION OF NAVIGATION DATA

The EO data are the basis for interpretation. In case of geometrical differences between EO data and navigation data (COTS or OSM), the navigation data has to be corrected in line with the EO data.

The pre-processing and application of the navigation data (COTS or OSM) shall be done according to the methodology defined in Annex 2.

4.2.3. PRE-PROCESSING OF TOPOGRAPHIC MAPS

Topographic maps are used for interpretation of objects. Topographic maps should be used in digital form with precise geo-coding. The usage of printed (analogue) maps is not recommended. In case of geometrical differences between EO data and topographic maps, the erroneous data (either EO-data or topo-maps) needs to be identified using reliable datasets providing spatial reference information. The geometry of the mapping product shall then be congruent with the correct dataset.

4.2.4. CLASSIFICATION AND INTERPRETATION

Application of automatic classification routines, such as segmentation and clustering, may be applied whenever appropriate:
> Automated segmentation and classification to achieve an initial differentiation between basic land cover classes (urban vs. forest vs. water vs. other land cover) is possible following a decision of the service providers;
> As the backbone for the object geometry, the navigation data network (COTS or OSM) is recommended but only with the method defined in the Annex.

Complying with the interpretation rules and data format definitions according to this mapping guide is essential (see below).

4.2.5. APPLICATION OF IMPERVIOUSNESS LAYER

The High Resolution Layer (HRL) Imperviousness (formerly named Fast Track Sealing layer, FTS) is used for classification of the sealing densities of class 1.1 urban fabric for levels 3 and 4.
The assignment of the imperviousness/sealing levels (i.e. classes 1.1.2.1 - 1.1.2.4) shall be carried out using the HRL Imperviousness layer. The Quality Assurance (QA) check will check only if the technical approach agreed with DG REGIO is kept, but will not assess the absolute accuracy of these classes.

4.2.6. ACCURACY ASSESSMENT AND VALIDATION

The methodology for Accuracy Assessment and Validation has to be defined according to RD[1]. The Minimum Overall Accuracy (OA) for level 1 class 1 "Artificial surfaces" must include both omission and commission errors with other classes within the FUA.

4.2.7. DATA FORMAT OF FINAL PRODUCT

ESRI ArcGIS compatible vector format with polygon topology:
- Complete coverage in a single map single layer;
- No overlapping polygons, gaps, duplicates or missing polygon labels or node overshoots;
- Final vectors need to have a smooth appearance (no pixel-shaped polygons are allowed). The smoothing shall be done by the service provider by methods preserving the geometry of objects. It is to ensure that smoothed vectors still comply with the minimum width and minimum mapping units required for objects.

CODE_yyyy
11210*

example provided of the number for UA class 1.1.2.1

CODE	→	Legend code
yyyy	→	Reference year (e.g. 2006 or 2012)

Column data format:

CODE_yyyy: 5 digits in Long Integer format without decimal places (values allowed: 11100 to 92000 (all class codes))

The complete description of the data format is provided in Annex 4.

4.2.8. INTERPRETATION RULES

- The delineation is to be done on the EO data. EO data should be considered as the primary (guiding) data source.
- The interpretation of the object is done using:
  - The EO data, topographic maps, navigation data (COTS or OSM) and other relevant ancillary data;
  - Auxiliary information including local expertise.
- The interpreted area should be interpreted with a minimum 100 m extension (100 m buffer) to ensure accuracy and continuity of polygons. During the post-processing phase, a subset with the spatial extent of the final product will be generated. At the borders of this subset (i.e. the final product), polygons smaller than the MMU may be present.
- In areas where two or more scenes overlap, the most recent data must be used for delineation and interpretation.
- In case of cloud coverage over the most recent scene, the affected part (only this part!) shall be interpreted using a cloudless alternative scene.

- If two or more objects are overlapping at different levels, the top level is mapped continuously, e.g. road bridge over railway is mapped as seen, the railway polygon is broken and the road is mapped as a continuous feature.
- In case of two or more objects overlapping at the same height level, the visually dominant and complete object (in use and shape) is mapped continuously. For example, a road / railway crossing viewed at the same height level: the railway shall be mapped continuously to maintain the network. The road shall be broken.

TABLE 2: PRODUCT ACCURACIES

	CORINE Classes [Lev. I, No.]	Levels provided	MMU	Thematic Accuracy	Positional Pixel Accuracy
Urban	1	I - IV	0.25 ha	>= 85%	<+/- 5 m
Rural	2 - 5	I-II	1 ha	>= 80%	<+/- 5 m
Overall Accuracy				>= 80%	

## 4.2.9. MINIMUM MAPPING UNITS

> **Minimum Mapping Unit (MMU): Class 1:**   0.25 ha

Class 2 – 5: 1 ha

Exception of MMU 0.25 / 1 ha: in case of an homogeneous area > MMU, but divided in 2 or more polygons by the road network, each part can be smaller to preserve the land cover information. However, no polygon can be smaller than 500 m² (e.g. a 1 ha forest divided in 4 polygons by the road network has to be mapped) except for polygons at the border of the FUA (>100 m²).

The minimum mapping width (MinMW) between 2 objects for distinct mapping is 10 m.

Exception of minimum width 10 m of a mapping unit: to maintain continuity of linear structures, they can be mapped smaller than 10 m over a distance of up to 50 m (see figure below).
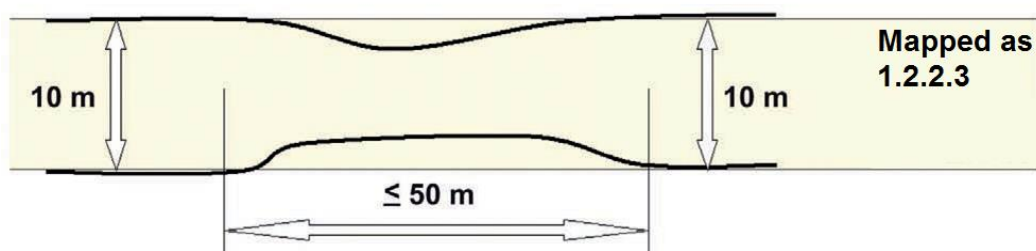
4.2.10. PRIORITY RULES

Priority mapping rules for areas smaller than the MMU:

- Smaller areas are added to the adjacent unit with the next lesser number of the same sub-class.
- Smaller areas are added to the adjacent unit of the same upper class.
- Smaller areas are added to the adjacent unit with the longest common border line, except to railways or roads (exception here: if an object is below the MMU size and completely surrounded by e.g. a road or railway network, it shall be aggregated with that surrounding traffic line).

4.2.11. GOOD PRACTICE FOR DATA DISPLAY FOR DELINEATION

Mapping scale on screen 1: 5 000

4.3. VISUAL EXAMPLES FOR RANDOM DISTRIBUTIONS
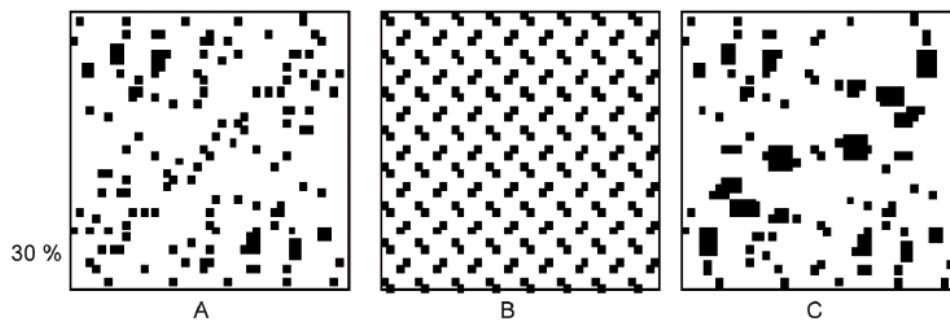
Random distribution of the forest trees coverage (A, C) and regular distribution (B).

1 %

2 %

5 %

10 %

15 %

20 %

25 %

35 %

40 %

50 %

70 %

4.4. LEGEND TABLE
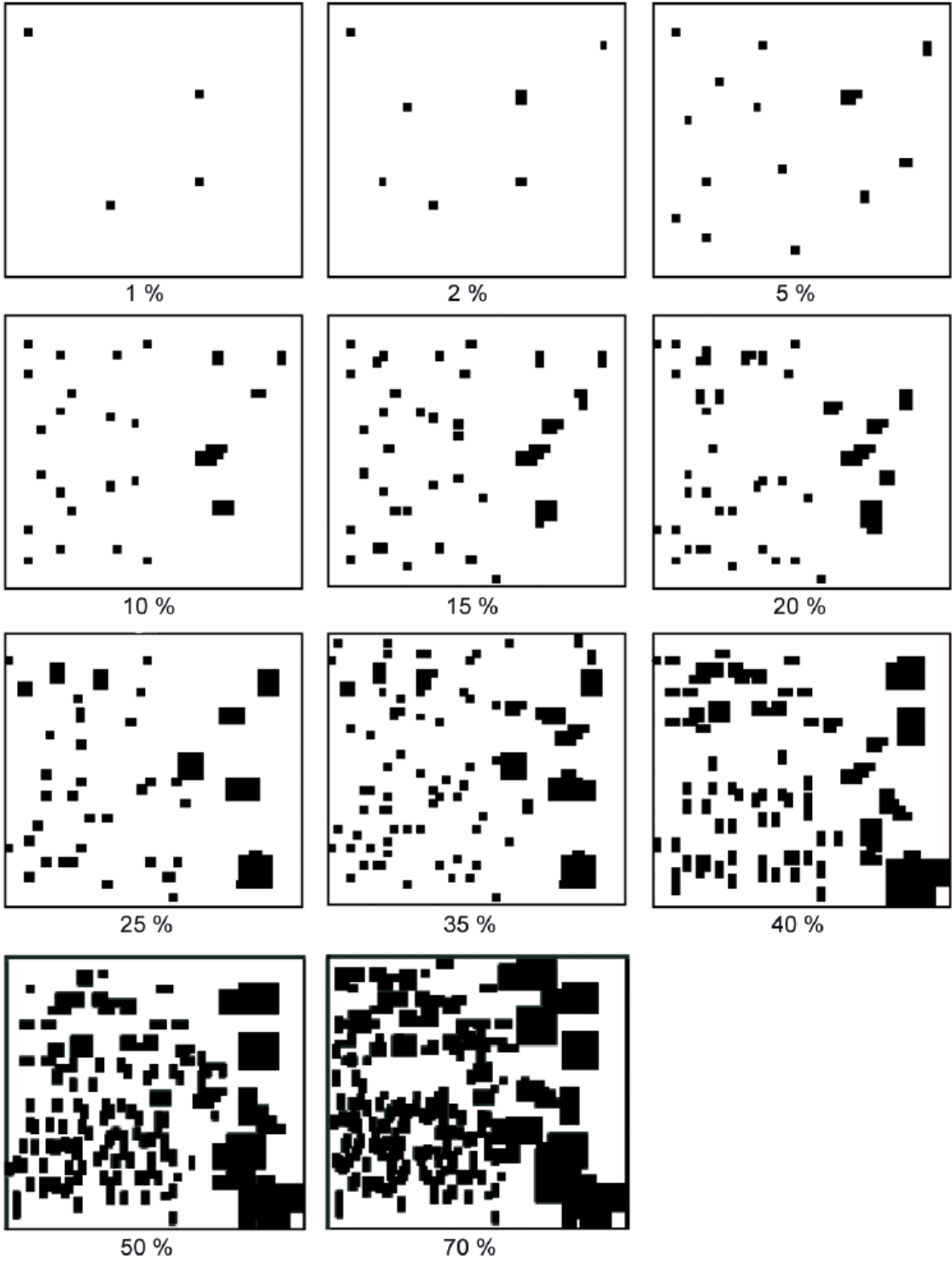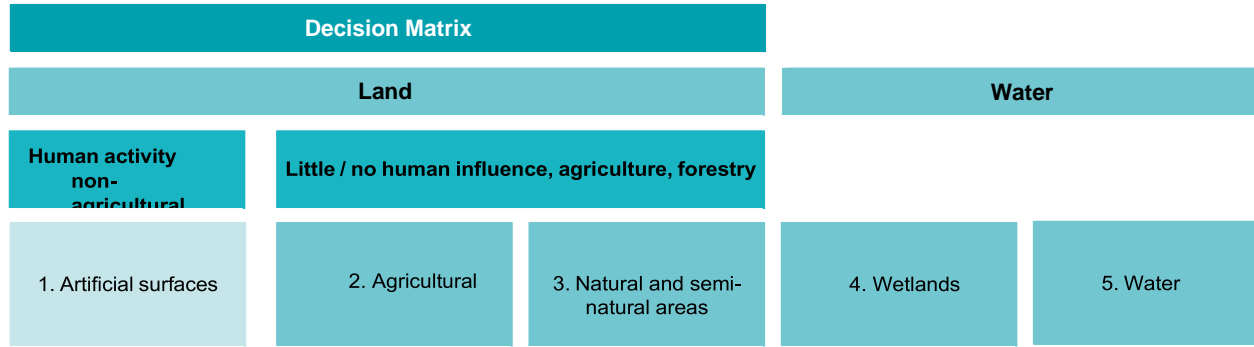
TABLE 3: UA LULC NOMENCLATURE (IN BOLD: CLASSES WITHOUT ANY
FURTHER SUBDIVISION)

		Urban Atlas Land Use/Land Cover	Additional Information
UA No.	Code	Nomenclature	
1		Artificial surfaces	
1.1		Urban Fabric	
1.1.1	**11100**	**Continuous urban fabric (S.L. > 80%)**	HRL IMD required
1.1.2		Discontinuous Urban Fabric (S.L. 10% - 80%)	
1.1.2.1	**11210**	**Discontinuous dense urban fabric (S.L. 50% - 80%)**	HRL IMD required
1.1.2.2	**11220**	**Discontinuous medium density urban fabric (S.L. 30% - 50%)**	HRL IMD required
1.1.2.3	**11230**	**Discontinuous low density urban fabric (S.L. 10% - 30%)**	HRL IMD required
1.1.2.4	**11240**	**Discontinuous very low density urban fabric (S.L. < 10%)**	HRL IMD required
1.1.3	**11300**	**Isolated structures**	
1.2		Industrial, commercial, public, military, private and transport units	
1.2.1	**12100**	**Industrial, commercial, public, military and private units**	zoning data / field check recommended
1.2.2		Road and rail network and associated land	COTS or OSM data required
1.2.2.1	**12210**	**Fast transit roads and associated land**	COTS or OSM data required

1.2.2.2	12220	**Other roads and associated land**	COTS or OSM data required
1.2.2.3	12230	**Railways and associated land**	COTS or OSM data required
1.2.3	12300	**Port areas**	zoning data / field check recommended
1.2.4	12400	**Airports**	zoning data / field check recommended
1.3		Mine, dump and construction sites	
1.3.1	13100	**Mineral extraction and dump sites**	
1.3.3	13300	**Construction sites**	
1.3.4	13400	**Land without current use**	
1.4		Artificial non-agricultural vegetated areas	
1.4.1	14100	**Green urban areas**	
1.4.2	14200	**Sports and leisure facilities**	
2		Agricultural areas	1 ha MMU
2.1	21000	**Arable land (annual crops)**	
2.2	22000	**Permanent crops**	
2.3	23000	**Pastures**	
2.4	24000	**Complex and mixed cultivation**	
2.5	25000	**Orchards**	
3		Natural and (semi-)natural areas	1 ha MMU
3.1	31000	**Forests**	
3.2	32000	**Herbaceous vegetation associations**	
3.3	33000	**Open spaces with little or no vegetation**	
4	40000	**Wetlands**	**1 ha MMU**
5	50000	**Water**	**1 ha MMU**
9.1	91000	**No data (Clouds and shadows)**	
9.2	92000	**No data (Missing imagery)**	

Decision Matrix

Land			Water	
Human activity non-agricultural	**Little / no human influence, agriculture, forestry**			
1. Artificial surfaces	2. Agricultural	3. Natural and semi-natural areas	4. Wetlands	5. Water

Ref. data	Additional data req.	
Sat. - image TK OSM data		**1. Artificial Surfaces**

		Urban areas with dominant residential use or inner-city areas with central business district and residential use	Industrial, commercial, public, military and private units or transport units are predominant	Strong human influence on soil surface, buildings not dominant	Leisure and recreation use
		1.1 Urban Fabric	1.2 Industrial, commercial, public, military, private and transport units	1.3 Mine, dump and construction sites	1.4 Artificial non-agricultural vegetated areas

IMD - Sealing	1.1.1 Continuous Urban Fabric	1.1.2 Discontinuous Urban Fabric	1.1.3 Isolated Structures	1.2.1 Industrial, commercial, public, military and private units	1.2.2 Road and rail network and associated land	1.2.3 Port areas	1.2.4 Airports	1.3.1 Mineral extraction and dump sites	1.3.3 Construction sites	1.3.4 Land without current use	1.4.1 Green urban areas	1.4.2 Sports and leisure facilities

IMD - Sealing		1.1.2.1 (IMD 50% - 80%)	1.1.2.2 (IMD 30% - 50%)	1.1.2.3 (IMD 10% - 30%)	1.1.2.4 (IMD 0% - 10%)		1.2.2.1 Fast transit roads and associated land	1.2.2.2 Other roads and associated land	1.2.2.3 Railways and associated land	

4.6. DESCRIPTION OF MAPPING UNITS FOR THE URBAN ATLAS LAND USE/LAND COVER (LULC layer)

1. ARTIFICIAL SURFACES

Surfaces with dominant human influence and without agricultural land use.
These areas include all artificial structures and their associated non-sealed and vegetated surfaces.

Artificial structures are defined as buildings, roads, all constructions of infrastructure and other artificially sealed or paved areas.

Associated non-sealed and vegetated surfaces are areas functionally related to human activities, except agriculture.
Also, the areas where the natural surface is replaced by extraction and / or deposition or designed landscapes (such as urban parks or leisure parks) are mapped in this class.
The land use is dominated by permanently populated areas and / or traffic, exploration, non-agricultural production, sports, recreation and leisure.

1.1. URBAN FABRIC

Built-up areas and their associated land, such as gardens, parks, planted areas and non-surfaced public areas and the infrastructure, if these areas are not suitable to be mapped separately with regard to the minimum mapping unit size.
Basically the classes 1.1.1 and 1.1.2. are distinguished by their degree of soil sealing.
Residential structures and patterns are predominant, but also downtown areas and city centres, including the Central Business Districts (CBD) and areas with partial residential use, are included.
The urban fabric classes (1.1) are distinguished only by their degree of soil sealing not by their type of buildings (single family houses or apartment blocks).
The detailed descriptions of the different classes below are given to the interpreters to support the delineation of mapping objects with homogeneous sealing density (without being required to assign the exact density classes).

Using the navigation data as a skeleton for the urban area, in many cases it is necessary to subdivide the blocks formed by the navigation data due to the different sealing density of the residential areas or different functions of the buildings and their associated land.
After completion of the interpretation, the sealing level information from the IMD sealing layer is integrated into the data.

1.1.1. CONTINUOUS URBAN FABRIC

Special note:

Mapping the 3rd level is done only with the defined application of the IMD sealing layer.

MMU 0.25 ha, MinMW: 10 m

Land Cover:

Average degree of soil sealing: > 80%

Built-up areas and their associated land, if these areas are not suitable to be mapped separately with regard to the minimum mapping unit size.

Buildings, roads and sealed areas cover most of the area; non-linear areas of vegetation and bare soil are exceptional.

Land Use:

Predominant residential use: areas with a high degree of soil sealing, independent of their housing scheme (single family houses or high rise dwellings, city centre or suburb).

Included are downtown areas and city centres, and Central Business Districts (CBD) as long as there is partial residential use.

1.1.2. DISCONTINUOUS URBAN FABRIC

Special note:

Mapping the 4th level of density classes is done only with the defined application of the imperviousness / soil sealing layer.

Land Cover:

Average degree of imperviousness / soil sealing: 0 - 80%

Built-up areas and their associated land (small roads, sealed areas including non-linear areas of vegetation and bare soil), if these areas are not suitable to be mapped separately with regard to the minimum mapping unit size.

This type of land cover can be distinguished from continuous urban fabric by a larger fraction of non-sealed and / or vegetated surfaces: gardens, parks, planted areas and non-surfaced public areas.

Land Use:

Predominant residential usage. Contains more than 20% non-sealed areas, independent of their housing scheme (single family houses or high-rise dwellings, city centre or suburb).

The non-sealed areas might be private gardens or common green areas.

Not included are:
Farms with large buildings (agro-industrial production), → class 1.2.1;
Nurseries with dominant areas of greenhouses (no or only small fields) → class 1.2.1;
Allotment gardens → class 1.4.2.
Holiday villages ("Club Med") → class 1.4.2.

1.1.2.1. DISCONTINUOUS DENSE URBAN FABRIC

MMU 0.25 ha, MinMW: 10 m

Average degree of soil sealing: > 50 - 80%
Residential buildings, roads and other artificially surfaced areas.

1.1.2.2. DISCONTINUOUS MEDIUM DENSITY URBAN FABRIC

MMU 0.25 ha, MinMW: 10 m

Average degree of soil sealing: > 30 - 50%
Residential buildings, roads and other artificially surfaced areas. The vegetated areas are predominant, but the land is not dedicated to forestry or agriculture.

1.1.2.3. DISCONTINUOUS LOW DENSITY URBAN FABRIC

MMU 0.25 ha, MinMW: 10 m

Average degree of soil sealing: 10 - 30%
Residential buildings, roads and other artificially surfaced areas. The vegetated areas are predominant, but the land is not dedicated to forestry or agriculture.

1.1.2.4. DISCONTINUOUS VERY LOW DENSITY URBAN FABRIC

MMU 0.25 ha, MinMW: 10 m

Average degree of soil sealing: <10 %
Residential buildings, roads and other artificially surfaced areas. The vegetated areas are predominant, but the land is not dedicated to forestry or agriculture. Example: exclusive residential areas with large gardens.

1.1.3. ISOLATED STRUCTURES

MMU 0.25 ha, Maximum Mapping Unit 2 ha, MinMW: 10 m

Isolated artificially structures with a **residential component**, such as (small) individual farm houses and related buildings.
The mapping unit will never be surrounded by any urban class other than transportation network.
The mapping unit is no larger than 2 ha. It must not contain more than 4 houses, otherwise it should be included in class 1.1.2.
Exception: border blocks / polygons in housing developments (they may be adjacent to roads and non-urban classes).

1.2. INDUSTRIAL, COMMERCIAL, PUBLIC, MILITARY, PRIVATE AND TRANSPORT UNITS

At least 30% of the ground is covered by artificial surfaces. More than 50% of those artificial surfaces are occupied by buildings and / or artificial structures with non-residential use, i.e. industrial, commercial or transport related uses are dominant.

1.2.1. INDUSTRIAL, COMMERCIAL, PUBLIC, MILITARY AND PRIVATE UNITS

MMU 0.25 ha, MinMW: 10 m

Land cover:
Artificial structures (e.g. buildings) or artificial surfaces (e.g. concrete, asphalt, tar, macadam, tarmac or otherwise stabilised surface, e.g. compacted soil, devoid of vegetation), occupy most of the surface. Included are associated areas, such as roads, sealed areas and vegetated areas, if these areas are not suitable to be mapped separately with regard to the MMU size.

Land use:
Industrial, commercial, public, military or private units. The administrative boundaries of the production or service unit are mapped, including associated features larger than the MMU (e.g. sports areas or transport structures).

Also included are:
> Bare soil and/or grassland potentially used for storage of material or as enclosures for livestock.
> Compounds with significant amounts of green or natural areas but with industrial, commercial, military or public use. Example: communication tower, antennas or wind motors and their associated land.

This class contains:

a) Industrial uses and related areas
> Sites of industrial activities, including their related areas;
> Production sites;
> Energy plants: nuclear, solar, hydroelectric, thermal, electric and wind farms;
> Sewage treatment plants;
> Farming industries (farms with large buildings and / or greenhouses, not production fi
> Antennas, even with predominant vegetated areas. The vegetated areas may be predominant, but the land is not dedicated to forestry or agriculture;
> Water treatment plants;
> Sewage plants;
> Seawater desalination plants.

The industrial units can be distinguished from residential built-up areas by the type of buildings, their   access to transport features and the surroundings:
> Buildings with large surface areas (inside, not all rooms need daylight, as in dwelling houses);
> Good access to roads and parking for customers;
> Industrial areas are often outside the historical city centre.

b) Commercial uses, retail parks and related areas
> Surfaces purely occupied by commercial activities, including their related areas (e.g. parking areas even larger than the MMU);
> High-rise office buildings;
> Petrol and service stations within built-up areas.

The commercial units can be distinguished from residential built-up areas by the type of large buildings,   their access to transport features and the surroundings:
> Buildings with large surface areas (inside, not all rooms need daylight, as in dwelling houses);
> Good access to roads and parking for customers;
> Pure commercial areas are often outside the historical city centre.

Not included are:
Petrol stations along fast transit and main roads with access only from these roads. They are mapped together with the road transport system → class 1.2.2.1 or 1.2.2.2.

c) Public, military and private services not related to the transport system
Surfaces purely occupied by general government, public or private administrations including their related areas (access ways, lawns, parking areas).

Included are:

> Schools and universities;

> Hospitals and other health services or buildings;

> Places of worship (churches / cathedrals / religious buildings);

> Archaeological sites and museums;

> Administration buildings, ministries;

> Penitentiaries;

> Military areas including bases and airports;

> Military exercise areas fenced and under current use;

> Castles, etc. not primarily used for residential purposes (building management, gardeners, etc. living there is not residential use in this sense);

> Private storage areas without a residential component, such as compounds of garages.

Not included are:

Public parks → class 1.4.1;

Holiday resorts including their hotels → class 1.4.2;

Sport centres or bathing centres → class 1.4.2;

Cemeteries → class 1.4.1 *(note: for the "UA 2006" LULC production, the cemeteries were classified in class 1.2.1, they are now included in class 1.4.1 in "UA 2006 Revised" and "UA 2012" LCLU)*;

d) Civil protection and supply infrastructure

> Dams, dikes, irrigation and drainage canals and ponds and other technical public infrastructure, to be mapped with the roads, embankments and associated land included;

> Includes also breakwaters, piers and jetties, sea walls and flood defences;

> (Ancient) city walls, other protecting walls, bunkers;

> Avalanche barriers.

Not included are:

Noise barriers → class 1.2.2.;

Water courses (within e.g. diked canals) if the water area is wider than 10 m → class 5;

Reservoirs along natural water courses → class 5.

1.2.2. ROAD AND RAIL NETWORK AND ASSOCIATED LAND

MMU 0.25 ha, MinMW: 6 m (Road) - 10 m (Rail)

Special Note:

The road and railway network (COTS or OSM data) is ingested into the classification database according to the method given in the Annex.

Parts of the navigation data that are obviously not congruent with the corresponding traffic line in the EO data and ancillary map need to be corrected.

Roads which are not contained in the navigation data are mapped by the service provider according to the mapping criteria defined in this mapping guide.

Roads or railways do not necessarily have to form a closed network. Isolated traffic lines are possible, but they are to be mapped with regard to the MMU criterion.

Associated land is mapped with the roads / railways as it is visible in the EO data and topographic maps.

Associated lands are:
> Slopes of embankments or cut sections;
> Areas enclosed by roads or railways, without direct access and without agricultural land use;
> Fenced areas along roads (e.g. as for protection against wild animals);
> Areas enclosed by motorways, exits or service roads with no detectable access;
> Noise barriers (fences, walls, earth walls);
> Rest areas, service stations and parking areas only accessible from the fast transit roads;
> Railway facilities including stations, cargo stations and service areas;
> Foot- or bicycle paths parallel to the traffic line;
> Green strips, alleys (with trees or bushes).

1.2.2.1. FAST TRANSIT ROADS AND ASSOCIATED LAND

MMU 0.25 ha, MinMW: 6 m

Roads defined as "motorways" in the navigation data, including motorway rest, service areas, tolls, parking areas, only accessible from the motorways.

Areas surrounded by highway or railway junctions have to be included in the corresponding network.

Motorways that are not included in the navigation data are to be mapped by the service provider.

1.2.2.2. OTHER ROADS AND ASSOCIATED LAND

MMU 0.25 ha, MinMW: 10 m

Roads, crossings, intersections and parking areas, including roundabouts and sealed areas with "road surface".

1.2.2.3. RAILWAYS AND ASSOCIATED LAND

MMU 0.25 ha, MinMW: 10 m

Railway facilities including stations, cargo stations and service areas.

1.2.3. PORT AREAS

MMU 0.25 ha, MinMW: 10 m

Special Note:

Ancillary data is recommended for identifying the administrative boundary of the port area. The delineation itself is to be done on the EO data:
> Detailed city / tourist maps or
> Field check (on site visit) or
> Local zoning data

Administrative area of inland harbours and sea ports.
Infrastructure of port areas, including quays, dockyards, transport and storage areas and associated areas.

Not included are:
Marinas → class 1.4.2.

1.2.4. AIRPORTS

MMU 0.25 ha, MinMW: 10 m

Special Note:

Ancillary data is recommended for identifying the administrative boundary of the airport area. The delineation itself is to be done on the EO data:
> Detailed city / tourist maps or
> Field check (on site visit) or
> Local zoning data

Administrative area of airports, mostly fenced.
Included are all airport installations: runways, buildings and associated land.
Military airports are also included (included in class 1.2.1. for UA2006).

Not included are:
Aerodromes without sealed runway → class 1.4.2.

1.3. MINE, DUMP AND CONSTRUCTION SITES

1.3.1. MINERAL EXTRACTION AND DUMP SITES

MMU 0.25 ha, MinMW: 10 m

Special Note:

Ancillary data is recommended for identifying the administrative boundary.
The delineation itself is to be done on the EO data:
> Detailed city / tourist maps or
> Field check (on site visit) or
> Local zoning data

Included are:
> Open pit extraction sites (sand, quarries) including water surface, if < MMU, open-cast mines, **inland salinas**, oil and gas fields;
> Their protecting dikes and / or vegetation belts and associated land such as service areas, storage depots;
> Public, industrial or mine dump sites, raw or liquid wastes, legal or illegal, their protecting dikes and / or vegetation belts and associated land such as service areas.

Not included are:
Water bodies > MMU → class 5;
Exploited peat bogs → class 4 (only for UA2012);
Coastal salinas → class 4 (only for UA2012);
Re-cultivated areas (mapped according to their actual land cover) → class 2 or 3;
River bed extraction → class 4 for wetlands or 3.3 for rocks (only for UA2012);
Decanting basins of biological water treatment plants → class 1.2.1.

1.3.3. CONSTRUCTION SITES

MMU 0.25 ha, MinMW: 10 m

Spaces under construction or development, soil or bedrock excavations for construction purposes or other earthworks visible in the image.
Clear evidence of actual construction needs to be identifiable in the data, such as actual excavations and machinery on site, or ongoing construction of any stage, etc.
In case of doubt → class 1.3.4.

1.3.4. LAND WITHOUT CURRENT USE

MMU 0.25 ha, MinMW: 10 m

Areas in the vicinity of artificial surfaces still waiting to be used or re-used. The area is obviously in a transitional position, "waiting to be used".
Waste land, removed former industry areas, ("brown fields") gaps in between new construction areas or leftover land in the urban context ("green fields").
No actual agricultural or recreational use.
No construction is visible, without maintenance, but no undisturbed fully natural or semi-natural vegetation (secondary ruderal vegetation).
Also areas where the street network is already finished, but actual erection of buildings is still not visible.

Not included are:
"Leftover areas", areas too small / narrow for any construction with regard to the MMU size → map to the appropriate neighbour class as associated land.

1.4. ARTIFICIAL NON-AGRICULTURAL VEGETATED AREAS

Vegetation planted and regularly worked by humans; strongly human-influenced. Sporting facilities as functional units independent of being non-sealed, sealed or built-up.

1.4.1. GREEN URBAN AREAS

MMU 0.25 ha, MinMW: 10 m

Public green areas for predominantly recreational use such as gardens, zoos, parks, castle parks and cemeteries (cemeteries were included in class 1.2.1 for UA2006). Suburban natural areas that have become and are managed as urban parks.
Forests or green areas extending from the surroundings into urban areas are mapped as green urban areas when at least two sides are bordered by urban areas and structures, and traces of recreational use are visible.

Not included are:
Private gardens within housing areas → class 1.1;
Buildings within parks, such as castles or museums → class 1.2.1;
Patches of natural vegetation or agricultural areas enclosed by built-up areas without being managed as green urban areas → class 1.

1.4.2. SPORTS AND LEISURE FACILITIES

MMU 0.25 ha, MinMW: 10 m

All sports and leisure facilities including associated land, whether public or commercially managed: e.g. Theresienwiese (Munich), public arenas for any kind of sports including associated green areas, parking places, etc.:

- Golf courses;
- Sports fields (also outside the settlement area);
- Camp grounds;
- Leisure parks;
- Riding grounds;
- Racecourses;
- Amusement parks;
- Swimming resorts etc.;
- Holiday villages ("Club Med");
- Allotment gardens[1];
- Glider or sports airports, aerodromes without sealed runway;
- Marinas.

Not included are:
Private gardens within housing areas → class 1.1;
Motor racing courses within industrial zone used for test purposes → class 1.2.1;
Caravan parking used for commercial activities → class 1.2.1;
Soccer fields, etc. within e.g. military bases or within university campuses → class 1.2.1;

2. AGRICULTURAL + SEMI-NATURAL + WETLAND AREAS

Classes 2.1 to 2.5 are grouped together in Class 2 in UA2006.

MMU 1 ha

2.1. ARABLE LAND
- Fields under rotation system. Can be non-irrigated or permanently irrigated. Also includes rice fields;
- Fields laid in fallow are included.

2.2. PERMANENT CROPS
- Fruit orchards, scattered fruit trees with pasture;
- Vineyards and their nurseries;

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1. Allotment gardens are complexes of a few up to hundreds of land parcels assigned to residential people. Most of the parcels contain individual cultivation areas with fruits or vegetables, as well as a shed for tools and shelter.

- Roses;
- Olive groves;
- Berries and hop plantations.

2.3. PASTURES

- Pasture and meadow under agricultural use, grazed or mechanically harvested.
- Wooded meadows

2.4. COMPLEX AND MIXED CULTIVATION PATTERNS

- Annual crops associated with permanent crops;
- Complex cultivation patterns;
- Land principally occupied by agriculture, with significant areas of natural vegetation;
- Agro-forestry areas.

2.5. ORCHARDS

- Orchards at the fringe of the urban classes or in the rural classes if > 1 ha.

3. NATURAL AND SEMI-NATURAL AREAS

Class 3.1 are included into class 3 and classes 3.2 and 3.3 are included into class 2 in UA2006.

MMU I ha

3.1. FORESTS
- Broad leaved forest, coniferous forest and mixed forest;
- Transitional woodland and shrub (clear cut, new plantations and regeneration, or damage forest);
- With ground coverage of tree canopy > 30%, tree height > 5 m, including bushes and shrubs at the fringe of the forest;
- Included are plantations such as *Populus* plantations, Christmas tree plantations;
- Forest regeneration / re-colonisation: clear cuts, new forest plantations.

Not included are:
Forests within urban areas and/or subject to high human pressure → class 1.4.1

3.2. HERBACEOUS VEGETATION ASSOCIATION
- Vegetation cover more than 50%, ground coverage of trees with height >5 m: <30%, areas with minor / without artificial or agricultural influence;
- Sclerophyllous vegetation;
- Bushy sclerophyllous vegetation (e.g. maquis, garrigue);
- Abandoned arable land with bushes;
- Woodland degradation: storm, snow, insects or air pollution;

- Areas under power transmission lines inside forest;
- Fire breaks;
- Steep bushy slopes of eroded areas;
- Abandoned vineyards or orchards, arable land and pasture land under natural colonisation;
- Dehesas with bush proliferation indicating no agricultural or farming use for a rather long time;
- Bushy areas along creeks.
- Bushes, shrubs and herbaceous plants, dwarf forest in alpine or coastal regions (Pinus Mugo forests). Height is maximum 3 m in climax stage.
- Natural grassland

3.3. OPEN SPACES WITH LITTLE OR NO VEGETATION

a) Beaches, dunes, sand:
- < 10% vegetation cover;
- Beaches, dunes and sand plains, (coastal or inland location), gravel along rivers;
- Seasonal rivers, if water is characteristic for a shorter part of the year (< 2 months).

b) Bare rocks:
- > 90% of the land surface of bare rocks, (i.e. < 10% vegetation);
- Rocks, gravel fields, landslides;
- Scree (fragments resulting from mechanical and chemical erosion. Weathering rocks forming heaps of coarse debris at the foot of steep slopes), cliffs, rocks.

c) Sparsely vegetated areas:
- Steppes, tundra, badlands, scattered high altitude vegetation. Bare soils inside military training areas. Vegetation cover 10 - 50%.

d) Burnt areas:
- Recently burnt forest or shrubs (but not natural grassland), still mainly black on EO data.

e) Snow and ice:
- Glacier and perpetual snow.

4. WETLANDS

Class 4 is included into Class 2 in UA2006.

a) Inland wetlands:
- Areas flooded or liable to flooding during a large part of the year by fresh, brackish or standing water with specific vegetation coverage made of low shrub, semi-ligneous or herbaceous species;
- Water fringe vegetation, reed beds of lakes, rivers and brooks. Sedge and fen-sedge beds, swamps;
- Peat bogs, with or without peat extracting areas;
- Shallow water areas covered with reed;
- Seasonal rivers, if water course is not visible in the EO data.

b) Coastal wetlands:

- Areas, flooded or liable to flooding during a large part of the year by brackish or saline water, susceptible to flooding by sea water. Often in the process of fi in and gradually being colonised by halophytic plants;
- Specific vegetation coverage made of low shrub, semi-ligneous or herbaceous species;
- Alluvial planes, marshes and intertidal flats
- Salinas (salt production sites by evaporation).

Not included are:
Military exercise areas fenced and under current use → class 1.2.1;
Greenhouses → class 1.2.1;
Inland salinas → class 1.3 1.

5. WATER

MMU I ha

The visible water surface area on the EO data is delineated. EO data should be considered as a primary (guiding) data source.
- Sea;
- Lakes;
- Fish ponds (natural, artificial)
- Rivers, including channelled rivers;
- Canals.

The default source for delineation is the EO data. If no clear delineation is possible using EO data, the other reference datasets may be used for that. Examples are:
- Reservoirs;
- Water courses or ponds with a strongly variable surface level.

All water bodies and water courses visible in the imagery are mapped as long as they exceed an extent of 1 ha.
Water courses are mapped continuously also when water surface is covered by vegetation. If the water is partly obscured, e.g. by vegetation, the delineation shall be oriented to other parts of the water where it is not obscured.
Included are: seasonal rivers, if the water course is visible in the EO data, otherwise → class 2.
Fish ponds with distance < 10 m are mapped together.
The navigation (COTS or OSM) data water layer may be used as a reference for interpretation. However, delineation of water areas must be done using the EO data, as the geometric accuracy of a OSM data water object is too rough for mapping on the scale 1:10 000.

Not included are:
Shallow water areas covered with reed > MMU → class 2 Seasonal rivers, if the water course is not visible in the EO data → class 2

6. *MISCELLANEOUS*

Areas with EO data provision problems shall be classified in separate classes described below.

a) No data (Clouds and shadows)

Areas affected by clouds or shadows on the EO data have to be mapped with ancillary data if the cloud or/and shadow overlays with the "CGC_RG_LAEA" layer (priority areas corresponding to the cities and greater cities according to the EC/OECD definition of cities (2011) provided by DG REGIO). An additional layer called "CGC_CLOUD_CAPI" delineating the areas classified by other data sources (Google Earth or other relevant available data sources) than the VHR2 coverage (DWH_MG2b_CORE_03) will be produced.

Outside these priority areas, class 9.1 (code 91000) will be used for areas covered by clouds and shadows over the satellite images where land use/land cover is not possible to be determined.

b) No data (Missing imagery)

This class 9.2 (code 92000) includes areas without available satellite image or inadequate imagery (e.g. no STL data can be produced as the image acquisition is outside the vegetation period).

4.7. DESCRIPTION OF MAPPING UNITS FOR THE URBAN ATLAS CHANGE LAYER (LULC change layer)

An additional layer shall be produced by the service provider, the Land Use Land Cover (LULC) change layer. This layer is using the VHR ortho-rectified satellite imagery 2006 and 2012 in an image-to-image change detection process, and from which changes as compared to the Urban Atlas LULC 2006 have to be mapped. An intermediary product, the "UA 2006-2012 Combined LULC", combines the LULC information for two periods (e.g. 2006 and 2012). Based on the first LULC layer (e.g. 2006), this layer is produced by delineating polygons where LULC class has changed in the second period (e.g. 2012). Finally, the "LULC change layer" is derived from this combined layer and only includes polygons with Land Use/Land Cover changes between the two periods.

Change detection will be applied with a MMU different from the LULC layer (other exceptions compared to Section 4.2.9). In order to ensure that relevant LULC changes are appropriately captured, the MMU for the LULC change layer (e.g. 2006-2012) are defined as below:
- Urban (class 1) to urban (class 1) = 0.1 ha
- Rural/natural (classes 2-5) to urban classes (class 1) = 0.1 ha
- Rural/natural (classes 2-5) to rural/natural (classes 2-5) = 0.25 ha
- Urban (class 1) to rural/naturals (classes 2-5) = 0.25 ha

Exceptions of this MMU limit can be found on change polygons where road and rail networks (classes 12210, 12220, 12230) are present in one date (e.g. 2006 or 2012) or polygons directly connected to these networks in order to keep consistency of these networks.

4.8. DESCRIPTION OF MAPPING UNITS FOR THE URBAN ATLAS STREET TREE LAYER (STL)

The Street Tree Layer (STL) is a separate layer from the UA2012 LULC Layer produced within the level 1 urban mask for each FUA. It includes contiguous rows or a patches of trees covering 500m² or more and with a minimum width (MinMW) of 10 m over "Artificial surfaces" (nomenclature class 1) inside FUA (i.e. rows of trees along the road network outside urban areas or forest adjacent to urban areas should not be included).

The following specific rules has to be applied:
- Exception to the 10 m MinMW rule: in order to maintain continuity, units smaller than 10 m over a distance of up to 10 m can still be included in STL (see figures below).
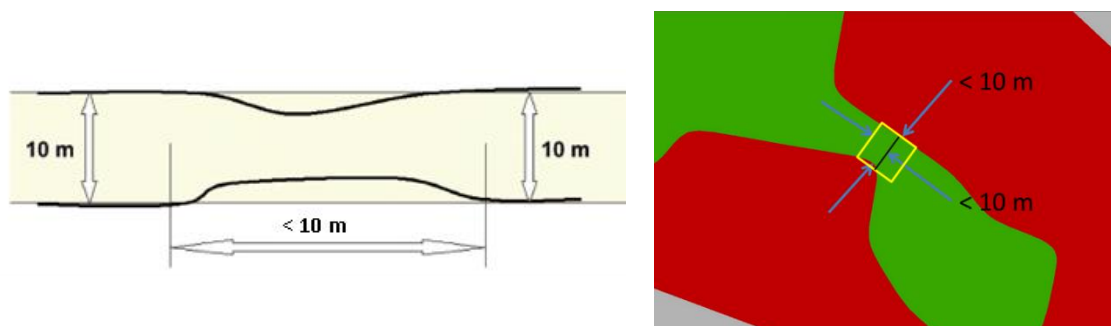
- Border effect: roads network crossing wooded area and connecting cities and villages are fully classified as STL due to trees crown cover.

- Application of an urban mask analysis to exclude roads and railways networks connecting cities and villages to resolves border effect. Urban Mask analysis needs to define a tolerance fixed to 50 m that well differentiate urban and interurban networks. Large railways infrastructures may be excluded from the mask.
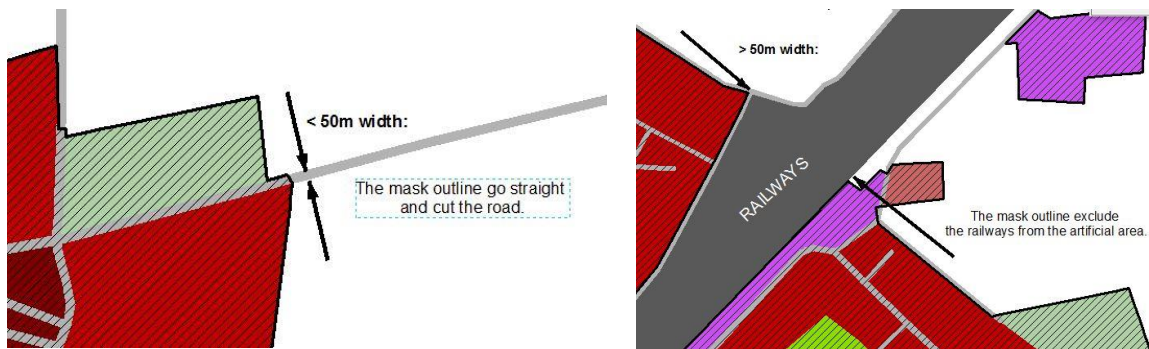
STL patches do not cover roads (codes 12210 and 12220) or railways (code 12230) connecting cities, that are outside the urban mask.

- MMU rule (>500 m²) is only applied to STL polygons (code 1): i.e. holes within a STL polygon can be smaller than 500 m².
- The STL layer is a continuous layer with trees (STL = 1), no-tree (STL = 0) or No data (STL= 91000 or 92000, see point 6. "Miscellaneous" in Section 4.6).

5. ANNEX

5.1. LIST OF ABBREVIATIONS

CBD	Central Business Districts
CORINE	COoRdination of INformation on the Environment
COTS	Commercial Off-The-Shelf
DG REGIO	European Commission Directorate-General for Regional and Urban Policy
EC	European Commission
EEA	European Environment Agency
EO	Earth Observation
FTS	Fast Track Sealing layer
FUA	Functional Urban Areas
HRL	High Resolution Layer
IMD	IMperviousness Degree
INSPIRE	INfrastructure for SPatial InfoRmation in Europe
LULC	Land Use / Land Cover
MinMW	Minimum Mapping Width
MMU	Minimum Mapping Unit
OA	Overall Accuracy
OECD	Organisation for Economic Co-operation and Development
OSM	Open Street Map
QA	Quality Assurance
RD	Reference Document
SL	Sealing Layer
STL	Street Tree Layer
UA	Urban Atlas
VHR	Very High Resolution

5.2. PRE-PROCESSING AND GEOMETRIC ADAPTATION OF NAVIGATION DATA

The navigation data (COTS or OSM) by default comes with a certain categorisation of its street network. Two basic categories are important within the context of the Urban Atlas. The first category gives information about the Functional Road Class (FRC) / Type of each road, the second one gives information about the importance of each road within the city traffic network (Net2Class).

The navigation data currently used shows the following categories for FRC/type and Net2Class:

FRC (COTS)	Type (OSM)	Full name
0	motorway	Motorway, Freeway or other Major Road
1	trunk	Major Road less important than a Motorway
2	trunk_link	Other Major Road
3	primary	Secondary Road
4	secondary	Local Connecting Road
5	secondary_link	Local Road of high importance
6	tertiary	Local Road
7	residential, service, unclassified	Local Road of minor importance
8	track, path, steps, cycleway	Other Road

Net2Class	Importance Level
0	First class (Highest)
1	Second class
2	Third class
3	Fourth class
4	Fifth class
5	Sixth class
6	Seventh class (Lowest)

USAGE OF NAVIGATION DATA FOR THE URBAN ATLAS

The navigation data (COTS or OSM) will be used to generate the street and railroad network of the mapping product. This network will serve as a "backbone" and is decisive for the look and feel of the final product.

The data is delivered in line vector format by the data provider. These lines need to be widened so that the traffic line network of the final product covers the transport areas in the EO data.

For that purpose a usage and buffering strategy was developed to implement the navigation data into the product.

The integration of the traffic network shall be done in advance of all other visual or (semi) automatic delineation and labelling of objects.

The goal of the traffic line implementation process is to ingest a traffic line network into the mapping product that covers all traffic lines wider than 10 m (including their associated land – see traffic line description: class 1.2.2) and – on the other hand – is COTS-efficient to integrate.

To achieve that goal the following strategy was developed:
- The railway network is delineated individually if it exceeds a minimum width of 10 m including its associated land.
- The most important roads (FRC classes 0, 1) will be delineated individually.
- The majority of the roads (FRC classes 2 to 5) will be ingested by buffering the line vectors. The buffered roads will have an overall width of at least 10 m. The buffering width for each FRC class will be adapted to the local conditions of each individual city to resemble the overall characteristics of the local traffic network.
- Certain roads (FRC class 6 and above) will be mapped if available (by buffering) or left out according to the decision of the service provider. This is to preserve a common look and feel of the mapping products of different cities.

The following table gives an overview of the treatment of the road network:

FRC	Net2Class			
	1	2	3	4
0	Manual			
1	Manual			
2	Estimated buffer width	Estimated buffer width	Estimated buffer width	Estimated buffer width
3	Estimated buffer width	Estimated buffer width	Estimated buffer width	Estimated buffer width
4	Estimated buffer width	Estimated buffer width	Estimated buffer width	Estimated buffer width
5	Estimated buffer width	Estimated buffer width	Estimated buffer width	Estimated buffer width
6 and above	Mapping decided on city by city basis			

The general procedure for the road buffering is as follows:

PRE-PROCESSING
- Identification of the different combinations for fields Net2Class and FRC.
- Decision whether to include FRC=6 or not based on visual inspection.
- Sampling of a number of streets (up to service provider) for each combination.
- Estimation of mean width for each combination.
- The use of VHR imagery (e.g. Google Earth) is recommended. If the city is not available in VHR, a city with similar morphology in the same country may be used along with the EO data for production.

PROCESSING
- Buffering implementation.
- Manual delineation of streets FRC=0 and 1.

POST-PROCESSING
- Manual delineation of streets wider than 10 m that have not been buffered previously (i.e. not present in the street network layer or belonging to combinations not considered for buffering).
- Correction (elimination / edition) of errors due to inaccuracies of the line street network or buffering process.

Post-processing will be implemented according to service provider's production chain.

5.3. DETAILED PRODUCT SPECIFICATION TABLE

TABLE 1: URBAN ATLAS PRODUCT SPECIFICATION

Product features
Digital thematic map.
Thematic classes based on CORINE LC nomenclature and Copernicus Urban Service Legend.
Input data sources
Earth Observation (EO) data with 2.5 m spatial resolution multispectral or pan-sharpened (multispectral merged with panchromatic) data. Multispectral data includes near-infrared band.
Topographic Maps at a scale of 1: 50 000 or larger.
Navigation data (COTS or OSM) for the road network
Areas of Interest for Urban Atlas (UA) Mapping are determined by DG REGIO.
Soil Sealing / Imperviousness Degree (IMD) based on HRL Imperviousness specifications for degree of sealed soils (IMD 0-100%) for level 3 classes 1.1.1 and 1.1.2 and level 4 classes 1.1.2.1, 1.1.2.2, 1.1.2.3 and 1.1.2.4.
All input data should be described by metadata according to the INSPIRE metadata profile specifications and guidelines.
Ancillary data optional for all classes
Navigation data (COTS or OSM): points of interest, land use, land cover, water areas. Google Earth or other relevant available database (only for interpretation, not for delineation). Local city maps.
Ancillary data required for certain classes
Local zoning data (e.g. cadastral data). Field check (on-site visit). Very high resolution imagery (better than 1 m ground resolution, e.g. aerial photographs).
Geometric resolution (Scale)
1:10 000; MMU = 0.25 ha
Geographic projection / Reference system
ETRS_1989_LAEA (for UA2012)
Positional accuracy
+ / - 5 m

Thematic accuracy (in %)
Minimum Overall Accuracy (OA) for level 1 class 1 "Artificial surfaces: 85%   Minimum OA (all classes): 80%.   Methodology for quality control has to be performed according to RD[1].   The minimum OA for level 1 class 1 "Artificial surfaces" must include both omission and commission errors with other classes within the Functional Urban Areas (FUA).
Update frequency
Every 6 years
Base data topicality
Not specified
Delivery format
Topologically correct GIS files.   Single part features.
Data type
Vector

5.4. PRODUCT TYPES AND FIELDS DESCRIPTIONS

The different types of cartographic products available in the Urban Atlas are described below.

5.4.1. REVISED UA 2006 LULC

This data corresponds to the reviewed version of 305 FUAs produced for the Urban Atlas Land Use/Land Cover for the 2006 reference year.

TABLE 2: UA 2006 LULC REVISED FIELD DESCRIPTION

Field Name	Description	Type	Length	Precision	Scale
COUNTRY	country 2-letter code (e.g. DK)	String	50	0	0
CITIES	FUA Name (e.g. København)	String	254	0	0
FUA_OR_CIT	FUA ID (e.g. DK001L2)	String	254	0	0
CODE2006	2006 LULC code (e.g. 50000)	String	7	0	0
ITEM2006	2006 LULC class (e.g. water)	String	150	0	0
PROD_DATE	Map production year (e.g. 2015)	String	4	0	0
Shape_Length	Length of the polygon (in m)	Double	8	0	0
Shape_Area	Area of the polygon (in m²)	Double	8	0	0

5.4.2. UA 2012 LULC

This data corresponds to the Urban Atlas Land use/Land cover over 697 FUAs for the 2012 reference year.

TABLE 3: UA 2012 LULC FIELD DESCRIPTION

Field Name	Description	Type	Length	Precision	Scale
COUNTRY	country 2-letter code (e.g. DK)	String	50	0	0
CITIES	FUA Name (e.g. København)	String	254	0	0
FUA_OR_CIT	FUA ID (e.g. DK001L2)	String	254	0	0
CODE2012	2012 LULC code (e.g. 50000)	String	7	0	0
ITEM2012	2012 LULC class (e.g. water)	String	150	0	0
PROD_DATE	Map production year (e.g. 2015)	String	4	0	0
IDENT	Unique ID (e.g. 16-DK001L2)	String	30	0	0
Shape_Length	Length of the polygon (in m)	Double	8	0	0
Shape_Area	Area of the polygon (in m²)	Double	8	0	0

5.4.3. UA 2006-2012 COMBINED LULC

This layer corresponds to the Land use/Land cover 2006-2012 (each polygon contains 2006 codification and 2012 codification, if there are no changes, code 2006 = code 2012). It concerns 305 FUAs produced for both the 2006 and 2012 reference years. The MMU is reduced up to 0.1 ha with some exceptions (see Section 4.7 LULC change layer).

TABLE 4: UA 2006-2012 COMBINED LULC FIELD DESCRIPTION

Field Name	Description	Type	Length	Precision	Scale
COUNTRY	country 2-letter code (e.g. DK)	String	50	0	0
CITIES	FUA Name (e.g. København)	String	254	0	0
FUA_OR_CIT	FUA ID (e.g. DK001L2)	String	254	0	0
CODE2006	2006 LULC code (e.g. 50000)	String	7	0	0
ITEM2006	2006 LULC class (e.g. water)	String	150	0	0
CODE2012	2012 LULC code (e.g. 50000)	String	7	0	0
ITEM2012	2012 LULC class (e.g. water)	String	150	0	0
PROD_DATE	Map production year (e.g. 2015)	String	4	0	0
IDENT	Unique ID (e.g. 16-DK001L2)	String	30	0	0
Shape_Length	Length of the polygon (in m)	Double	8	0	0
Shape_Area	Area of the polygon (in m²)	Double	8	0	0

5.4.4. UA 2006-2012 LULC CHANGE MAP

The change 2006-2012 layer is derived from the combined 2006 and 2012 UA data products and corresponds <u>only to the changes of Land use/Land cover</u> between those two dates. It concerns 305 FUAs produced for both the 2006 and 2012 reference years. The MMU is reduced up to 0.1 ha with some exceptions (see Section 4.7 LULC change layer).

TABLE 5: UA 2006-2012 LULC CHANGE FIELD DESCRIPTION

Field Name	Description	Type	Length	Precision	Scale
COUNTRY	country 2-letter code (e.g. DK)	String	50	0	0
CITIES	FUA Name (e.g. København)	String	254	0	0
FUA_OR_CIT	FUA ID (e.g. DK001L2)	String	254	0	0
CODE2006	2006 LULC code (e.g. 50000)	String	7	0	0
ITEM2006	2006 LULC class (e.g. water)	String	150	0	0
CODE2012	2012 LULC code (e.g. 50000)	String	7	0	0
ITEM2012	2012 LULC class (e.g. water)	String	150	0	0
PROD_DATE	Map production year (e.g. 2015)	String	4	0	0
IDENT	Unique ID (e.g. 16-DK001L2)	String	30	0	0
Shape_Length	Length of the polygon (in m)	Double	8	0	0
Shape_Area	Area of the polygon (in m²)	Double	8	0	0

5.4.5. UA STL (STREET TREE LAYER)

This data corresponds to the Urban Atlas - Street Tree Layer (STL) for the 2012 reference year.

TABLE 6: UA STL FIELD DESCRIPTION

Field Name	Description	Type	Length	Precision	Scale
COUNTRY	country 2-letter code (e.g. DK)	String	50	0	0
CITIES	FUA Name (e.g. København)	String	254	0	0
FUA_OR_CIT	FUA ID (e.g. DK001L2)	String	254	0	0
STL	Legend code (0, 1, 91000 or 92000)	Integer	2	0	0
Shape_Length	Length of the polygon (in m)	Double	8	0	0
Shape_Area	Area of the polygon (in m²)	Double	8	0	0

5.5 URBAN ATLAS MAPPING GUIDE - CHANGE RECORDS

Version	Date	Comments and main updates
V1	08/05/2008	Document TD-0421-GSELand-TN-01 from the ESRIN/Contract No. 19407/05/I-LG (GSE Land Information Services)
V2	2011	Urban Atlas 2006 Mapping Guide with European Commission Template
V3	03/04/2016	- Update for the Urban Atlas 2012 component into the former template - Insertion of attribute tables description for Urban Atlas 2006 revised, Urban Atlas 2012, Changes 2006-2012, Urban Atlas 2006-2012 - New unique projection: ETRS_1989_LAEA - Exception of MinMW for the Roads: 6 m
V4.1	03/05/2016	- Urban Atlas 2012 Mapping Guide with European Commission Template - Insertion of Section 4.6: Description of mapping units for the Urban Atlas Street Tree Layer
V4.2	04/05/2016	- Minor corrections
V4.3	24/06/2016	- Insertion of new "no data" classes: 91000 No data (Clouds and shadows) / 92000 No data (Missing imagery)
V4.4	05/07/2016	- Minor corrections
V4.5	27/07/2016	- Insertion of Section 4.7 dedicated on the change layer including the specific MMU for this layer. - Insertion of the Table of Content at the beginning of the document
V4.6	03/08/2016	- Removal of the confusing sentence in section 4.2.9. about Minimum mapping units: "Maximum mapping width (MaxMW) between 2 objects for mapping together 10 m" - MaxMW was also removed from the list of abbreviations
V4.7	28/10/2016	- Insertion of report information and Change records