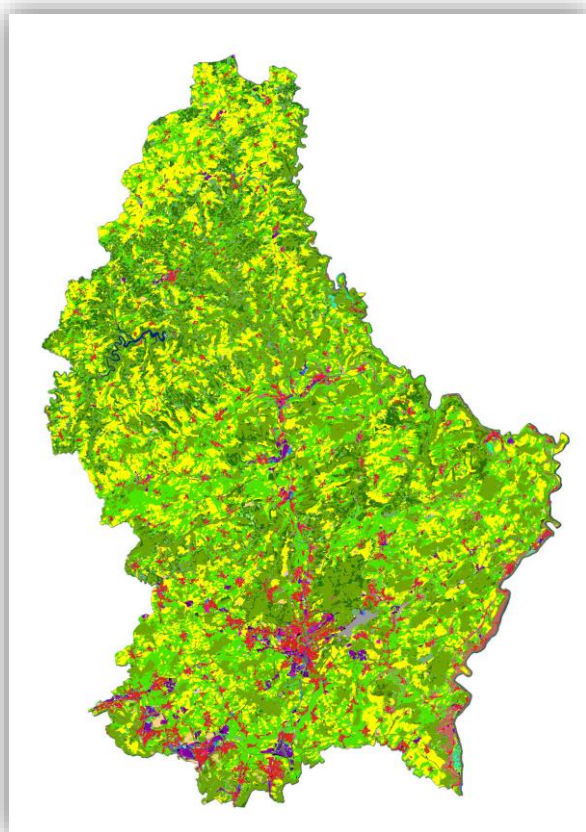


Mapping Guide of Land Use Database of Luxembourg (2007–2021)



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Title:

Mapping Guide of Land Use Database of Luxembourg (2007–2021)

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NOMENCLATURE DESCRIPTION

Detailed description of land use classes (2007, 2015, 2018 and 2021)

PRIMARY LAND USE

The **primary land use** classes have been divided into six main thematic blocks:

- ☐ Settlement
- ☐ Transport
- ☐ Agriculture
- ☐ Forest
- ☐ Natural surfaces
- ☐ Water

S – SETTLEMENT

Settlements are built-up surfaces including buildings and their functionally associated surfaces, such as driveways, gardens and other vegetated areas, storage and manipulation/handling places. Roads for the “inner development” of settlements and traffic lines between settlements are included in the “Transport” class. Therefore, settlement patches smaller than the pre-defined MMU can be found in the final map when resulting from contiguous parcels split by the road network.

S.1 – Settlement & Estate

The delineation of settlements can be derived from the orthophoto or can be based on the ownership information in the cadastral map.

Five settlement types are defined based on their use:

S.1.1 (Class code = 111) – Residential (>50% of the surface dedicated to residential use)

S.1.2 (Class code = 112) – Agricultural facilities (>50% of the surface dedicated to agriculture)

S.1.3 (Class code = 113) – Industry & commerce (>50% of the surface dedicated to industry/commerce/trade); this class includes storage, manipulation/handling places and gas stations) this also includes hotels and resorts

S.1.4 (Class code = 114) – Unused urban areas or industrial brownfields (>50% of the surface includes

open urban spaces without managed vegetation and that are not currently in use (e.g., are occupied by ruderal vegetation), as well as residential and industrial wastelands, whether contaminated or not)

S.1.5 (Class code = 115) – Social, Cultural and Other (>50% of the surface includes cultural and spiritual buildings, health, education, military, administration and public services, indoor sports halls)

A MMU of 100m² applies to individual objects of settlement types.

S.3 – Public facilities

S.3.1 (Class code = 131) – Cemetery (>50% of the surface includes cemeteries)

S.3.2 (Class code = 132) – Public open spaces (>50% of the surface includes a town square)

S.3.3 (Class code = 133) – Park (>50% of the surface includes parks and playgrounds)

S.3.4 (Class code = 134) – Other (>50% of the surface includes other public facilities such as urban areas not used for recreational activities that are covered by significant green vegetation (e.g., green roundabout) and cannot be merged to the road network).

A MMU of 500m² applies.

S.4 – Sport and leisure

S.4.1 (Class code = 141) – Golf course (>50% of the surface includes golf courses)

S.4.2 (Class code = 142) – Campground (>50% of the surface includes campgrounds)

S.4.3 (Class code = 143 – Other sports facilities (>50% of the surface includes outdoor sports facilities such as equestrian facilities, football fields, tennis courts and swimming pools)

S.4.4 (Class code = 144) – Other recreation facilities (>50% of the surface includes other recreation facilities such as allotment gardens and picnic areas)

A MMU of 500m² applies.

S.5 – Technical infrastructure

S.5.1 (Class code = 151) – Utility (production, disposal facilities) (facilities for the production and provision of water, electricity, gas or heat as well as for the incineration, disposal or recycling of waste material or wastewater)

S.5.2 (Class code = 152) – Mining / Extraction (areas of mining and extraction)

A MMU of 500m² applies.

S.6 (Class code = 160) – Construction site (areas that are characterized as construction sites at the time of the aerial survey, regardless of future use, e.g., street, commercial, housing)

A MMU of 500m² applies.

T – TRANSPORT

This class includes infrastructure related to transport. Transport does NOT include single buildings. Only functionally associated buildings (e.g., service areas, road maintenance depot) are included here.

T.1 – Roads

Transport includes all connecting roads between settlements.

T.1.1 (Class code = 611) – Rural roads (untarred roads)

T.1.2 (Class code = 612) – Main roads (tarred roads)

T.2 (Class code = 620) - Railways

T.3. Air traffic

T.3.1 (Class code = 631) – Commercial

T.3.2 (Class code = 632) – Sports & leisure

T.4. (Class code = 640) – Water transport (harbour and cargo forwarding service)

T.5 (Class code = 650) – Parking lot

A MMU of 100m² applies to T.1.1, T.1.2 and T.5; a MMU of 500m² applies to the other subclasses. Still, patches smaller than 500m² can be found in the final map when resulting from contiguous parcels split by the road network.

A – AGRICULTURE

The classification of agricultural areas is divided into three main land use categories: arable land, grassland and special crops. Similar to “settlements”, which include individual buildings and their surroundings (e.g., urban gardens), individual fields are grouped into agricultural blocks which are delineated by roads, water courses or hedgerows.

A.1 (Class code = 210) – Arable land (this can encompass various land cover classes, such as bare soil (fallow land), herbaceous (crops) and even woody (coppice < 30 years) vegetation. A differentiation by crop type is not foreseen. In Luxembourg, if the number of years of green cover is less than 5, the parcel is considered as arable land.)

A.2 (Class code = 220) – Grassland (contrary to “arable land”, the grassland class is characterised by the lack of bare soil during the year (i.e., no ploughing). Nevertheless, woody vegetation can occur (orchards or surface overgrown by bushes). In Luxembourg, if the number of years of green cover is 6 or more, the parcel is considered as permanent grassland. In the case that the number of years of green cover is 5 and the parcel is used as grassland in the current year, the parcel becomes permanent grassland in that year.)

A.3 – Permanent crops & special cultures

Special cultures include vineyards, fruit trees, orchards and other special crops (e.g., hop):

A.3.1 (Class code = 231) – Vineyard (vineyards with surfaces in flat and hilly terrain, with or without vegetation in between the rows)

A.3.2 (Class code = 232) – Fruits trees (this subclass is characterised by the linear arrangement of the plants)

A.3.3 (Class code = 233) – Orchard (this subclass represents orchards that do not necessarily have a regular pattern of tree distribution)

A.3.4 (Class code = 234) – Other (includes agricultural surfaces not included in the previous sub-types, such as greenhouses and tree plantations (Christmas trees))

A MMU of 500m² applies. Patches smaller than the MMU can be found in the final map when resulting from contiguous parcels split by the road network.

F – FOREST

The thematic block “forest” is mostly composed of the land cover class “woody vegetation”. A “forest” is composed of woody vegetation of surfaces $> 500\text{m}^2$, although also multiple smaller patches can be classified as forest if overall, they achieve a tree cover density of $>10\%$ and a total surface of $>500\text{m}^2$.

Analogue to the class “settlement” and “agriculture”, forest classes are delineated by “connecting” roads and water courses. Therefore, patches of forest classes smaller than 500m^2 can be found in the final map when resulting from contiguous forest parcels split by the road network.

F.1 – Forest block

F.1.1 (Class code = 311) – Coniferous ($>75\%$ of the trees are coniferous)

F.1.2 (Class code = 312) – Mixed (composed of broadleaved and coniferous trees comprising both $>25\%$ of the tree canopy)

F.1.3 (Class code = 313) – Deciduous ($>75\%$ of the trees are deciduous)

F.1.4 (Class code = 314) – Young Forest (represents forest regeneration / recolonization or natural succession with the mean vegetation height between 0.5 and 5 meters above the ground surface, such as young plants of broadleaved and coniferous species, with herbaceous vegetation and dispersed solitary adult trees. As soon as the tree type can be recognized change accordingly (311 – 313). If young trees cannot be identified in the plot, then it should be classified into class F.2 – clearing.

F.2 – Clearing & Damaged trees

Area inside the “forest” temporarily without woody vegetation cover. Normally a clearing was wooded before and will be wooded again. Temporarily clearings can contain one or more land cover classes (e.g., bare soil or grassland $< 500\text{m}^2$).

F.2.1 (Class code = 321) – Damaged Forest (includes dead trees, and areas damaged through natural causes, such as storm damages, and burnt areas)

F.2.3 (Class code = 323) – Clear cuts (harvesting) (includes clear cut forest for harvesting purposes; can have bare soil, grass coverage; no replantation or natural tree succession is visible)

F.3 – Forest roads

F.3.1 (Class code = 331) – Forest Roads (includes rural roads that occur within the forest boundaries)

N – NATURAL SURFACES

Natural and semi-natural areas are mostly defined and monitored by specific inventories like the “Biotopkataster” and the “Grünlandkartierung”. The delineation of these sites is a-priori defined by these specific inventories and EO are subsequently used to detect changes within these boundaries.

A MMU of 500m² applies. Patches of natural and semi-natural elements that are smaller than the pre-defined MMU can be found in the final map when resulting from contiguous parcels split by the road network.

N.1 (Class code = 410) – Gravel (> 50% of the surface is covered by land cover class “gravel”)

N.2 (Class code = 420) – Rocks (> 50% of the surface is covered by the land cover class “rocks”)

N.3 (Class code = 430) – Natural grasslands (> 50% of the surface is covered by the land cover class natural grassland that are also in the “Biotopkataster” mapped as natural or dry grasslands. The key characteristic of dry grasslands is that they have low-growing plants, causing the area to be quite open, and soils that are relatively dry and nutrient-poor.

N.4 (Class code = 440) – Heathland (>50% of the surface is covered by open, low growing woody vegetation (e.g., heath))

N.5 (Class code = 450) – Bushes (> 50% of the surface is covered by the land cover class “bushes”. These areas are often found at the outer perimeter of forests, or they represent a succession state from former agricultural use to a forest vegetation, e.g., former vineyards that have been abandoned and left to natural succession)

N.6 (Class code = 460) – Wetland (A wetland is a land area that is saturated with water, either permanently or seasonally. The delineation should be based on specific ancillary data (“Biotopkataster”, CDCA, Ramsar), nonetheless evidence should also be present in the EO data.)

W – WATER

The land use block water includes permanently water covered surfaces, including adjacent, functionally associated areas such as slopes, riparian vegetation and foot paths.

W.1 – Running water

Permanently flowing water. Delineated is the water course itself plus the immediately adjacent water influenced area, e.g., 30-year flood return period.

W.1.1 (Class code = 511) – Natural (water course of natural origin such as a river or creek)

W.1.2 (Class code = 512) – Artificial (man-made water course such as a channel)

A MMU of 500m² applies.

W.2 – Standing water

Spatial information about the distribution of lakes and reservoirs is essential for the effective management of competing uses, such as flood and fire control, drought mitigation, agricultural irrigation, recreation, etc.

W.2.1 (Class code = 521) – Natural (water body of natural origin such as a lake)

W.2.2 (Class code = 522) – Artificial (man-made water body such as a reservoir)

A MMU of 100m² applies.

SECONDARY LAND USE

The **secondary land use** classes are as follows:

(Class code = 9) – Energy production (the dual use of land for solar energy production and agriculture (also known as agrivoltaics) or water (also known as floating photovoltaics))

(Class code = 600) – Transport (

(Class code = 650) – Parking lot (parking lots that are within a primary land use and are roughly 20 parking spaces and more)



ILLUSTRATED MAPPING GUIDE

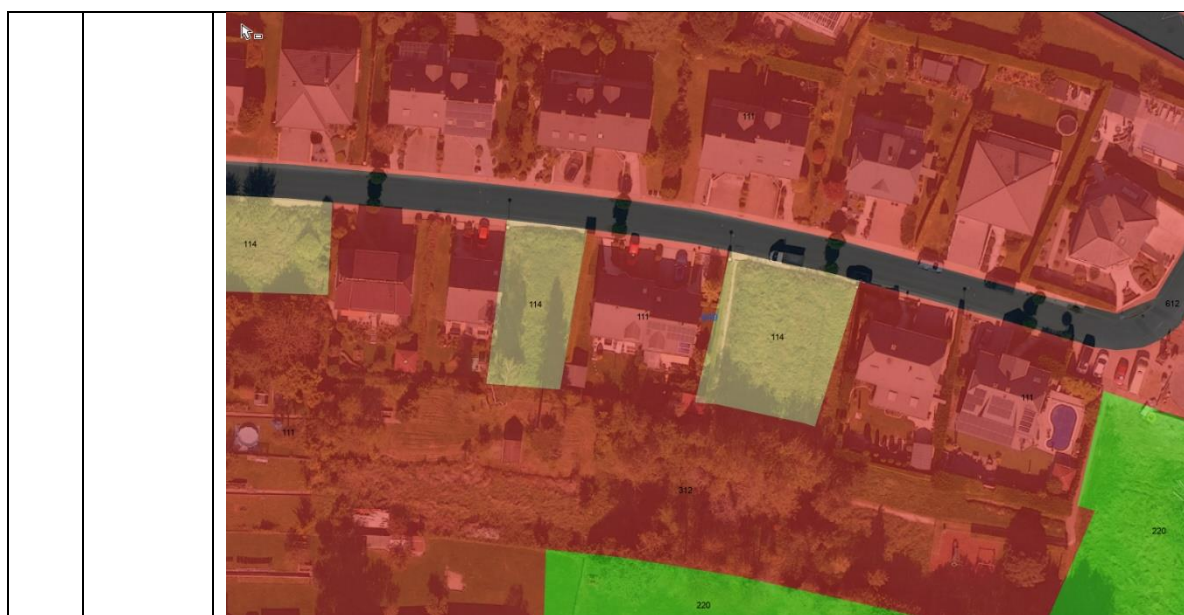
The mapping guide presents some visual examples for each land use class.

PRIMARY LAND USE

SETTLEMENT

Settlement & Estate

1	Text	Buildings with solar panels were not assigned with the secondary land use energy production.
	Image	
2	Text	The area seen in image a can be joined to the settlement, unless it was previously classified as unused urban area (114) as seen in image b, then it remains as it is.
	Image	<p>a</p>  <p>b</p>



111 – Residential

1	Text	Suburban
	Image	

2	Text	Urban
	Image	 An aerial photograph of an urban area. A red line is drawn on the image, outlining a specific area that includes several buildings, a street, and a green space. The area is surrounded by other urban structures and roads.

112 - Agricultural facilities

1	Text	Agricultural facilities
	Image	 An aerial photograph of agricultural facilities. A red line is drawn on the image, outlining a specific area that includes a large barn, a smaller building, and a paved area. The area is surrounded by green fields and a road. The number 4609 is visible on the image.

2	Text	Alone standing reservoirs are classified as 112 as they are used for agricultural purposes.
	Image	

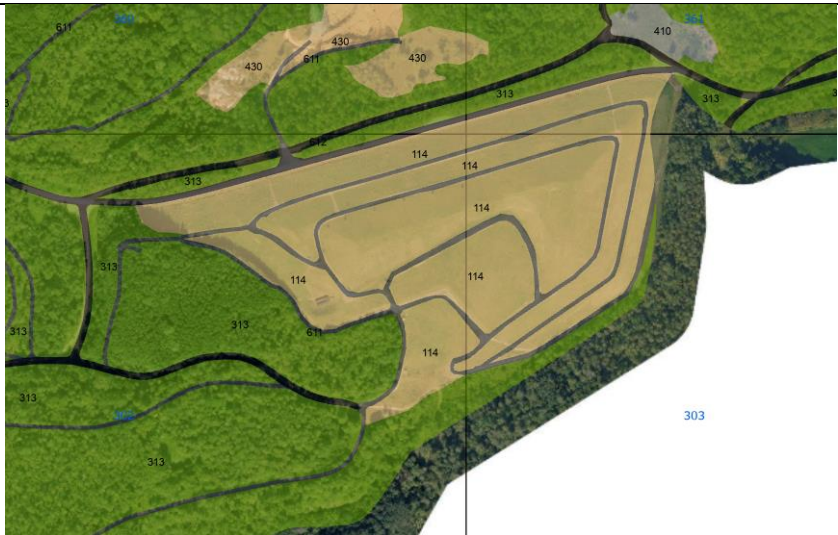
113 - Industry & commerce

1	Text	Storage facilities
	Image	

2	Text	A sawmill with surrounding wood	
	Image		
3	Text	Wood storage with a permanently sealed surface with and without attached buildings.	
	Image		

114 - Unused urban areas or industrial brownfields

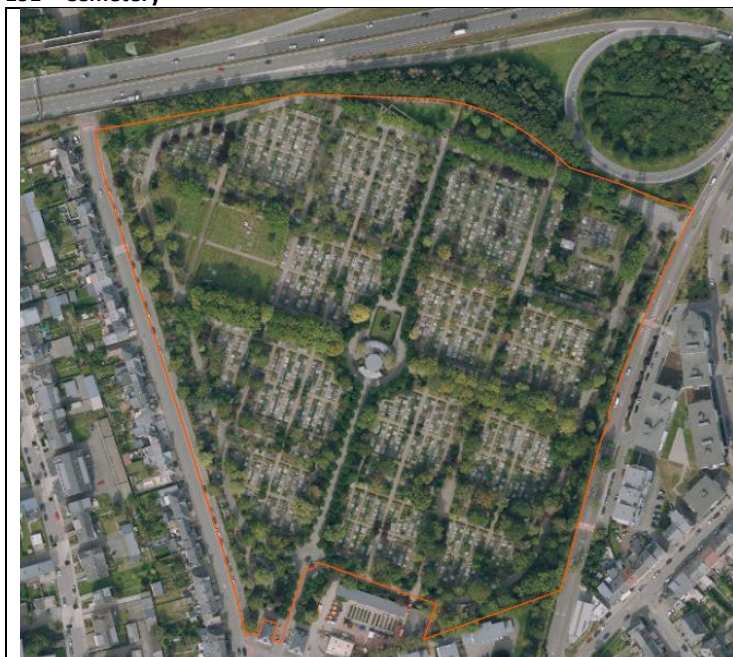
1	Text	Previously built-up area which is now a brownfield	
	Image	 	

2	Text	Old mining area covered by green vegetation, not in use. The original state of the landscape has been altered and now looks different this is a brownfield.
	Image	 An aerial photograph of a brownfield area. The landscape is a mix of green vegetation and brown, bare soil patches. Several numbers are overlaid on the map: 313, 430, 611, 114, 410, and 303. The brown patches are irregularly shaped and scattered throughout the green areas.

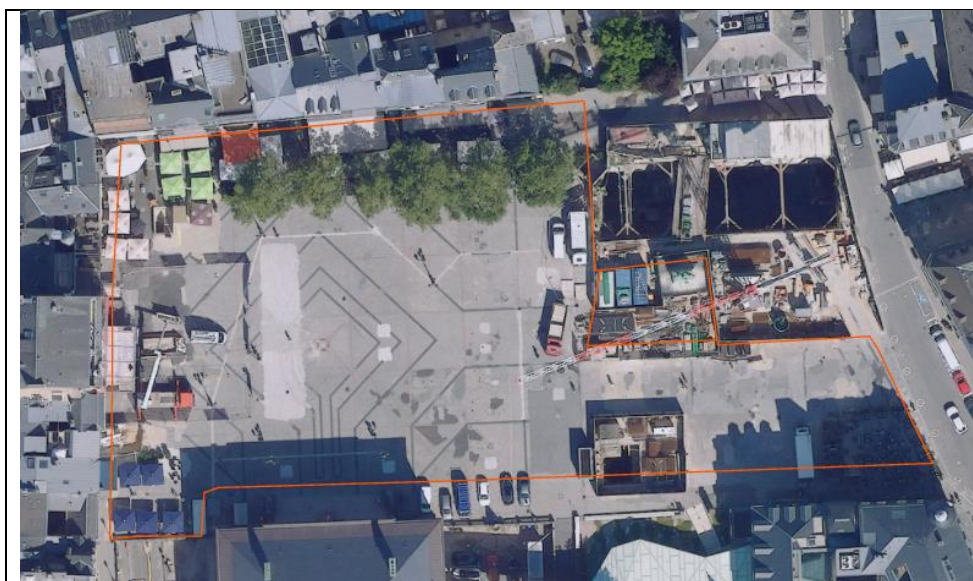
115 - Social, Cultural and Other





Public facilities
131 – Cemetery




132 - Public open spaces



133 – Park & public green

1	Text	Playground
	Image	
2	Text	Park
	Image	

134 – Other (urban areas not used for recreational activities e.g., green roundabout)

1	Text	Grassland along the road which is not natural nor used for agriculture rather as erosion control.	
	Image		

Sport and leisure

141 - Golf course



142 – Campground



143 - Other sports facilities (outdoor sport facilities)

1	Text	Equestrian facilities	
	Image	An aerial photograph of equestrian facilities. It shows two large, rectangular, light-colored sandy areas, likely riding arenas or paddocks, separated by a narrow strip of grass. To the right of the arenas is a paved area with several parked cars and a white building. The entire facility is surrounded by green grass and some trees. A label '4433' is visible in the center of the right-hand arena.	

	Text	Outdoor sports grounds
	Image	

144 – Other recreation facilities (allotment gardens and picnic areas)



Technical infrastructure

151 - Utility (production, disposal facilities)


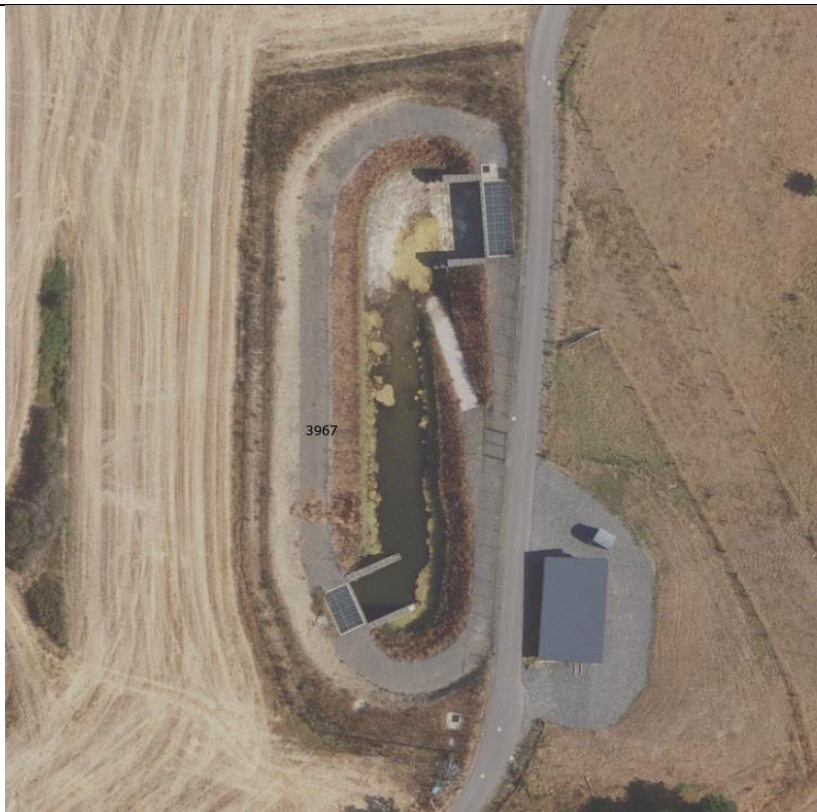
1	Text	The area around the wind turbine is not to be used as the blades need to be exchanged in the future. Thus, the area around the turbine is also used for wind energy.	
	Image		
2	Text	Basin that cleans surface water	
	Image		
3	Text	Retention basin	

	Image		
4	Text	Part of river management	
	Image		
5	Text	High-voltage plant	



	Image	
6	Text	Gas supply
	Image	
7	Text	Wastewater treatment plant

	Image	
8	Text	Satellite ground stations
	Image	
9	Text	Recycling facility

	Image		
10	Text	Biogas facility	
	Image		

152 - Mining / Extraction



160 – Construction site

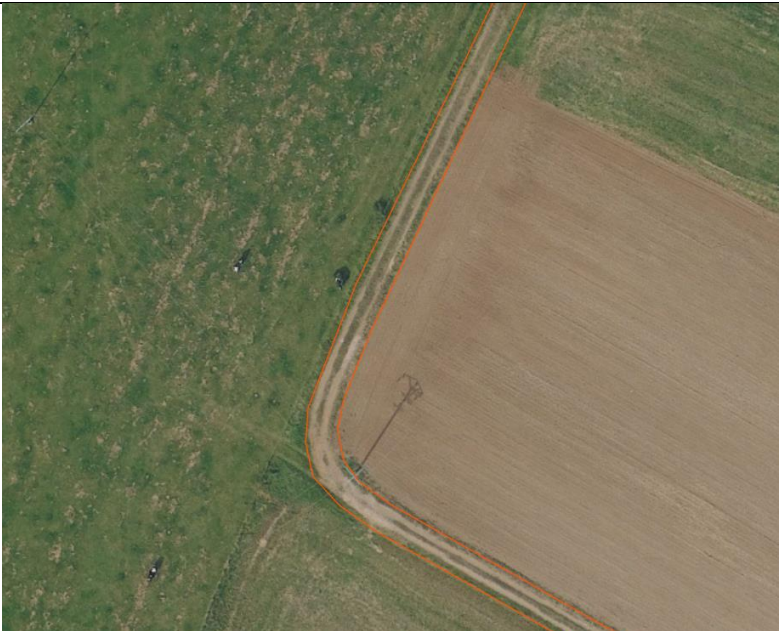


TRANSPORT

Roads

611 - Rural Roads

Text	Untarred roads
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Image		
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612 – Main roads

Text	Tarred roads	
Image		

620 – Railways

1	Text	Tramway
---	------	---------

	Image	
2		Regional rail
		

Air Traffic **631 – Commercial**

Text	Airport
------	---------




632 – Sports & leisure



640 - Water transport

1	Text	Harbour
---	------	---------

	Image		
2	Text	Cargo forwarding service	
	Image		

650 – Parking lot



AGRICULTURE

210 - Arable land

1	Text	Managed grasslands within an urban area fall under arable land	
	Image		
2	Text	Clear sign of growing crops	

	Image	
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220 – Grassland

1	Text	Horse farms are also considered as grasslands even though they do not fall under the “Grünland” layer
	Image	
2	Text	The primary land use in this example is grassland (livestock within the parcel) and the secondary use energy production.

	Image	
3	Text	Clear signs of livestock tracks are indicators that the parcel is used as a grassland.
	Image	

Permanent crops & special cultures
231 – Vineyard



232 – Fruit tree



233 – Orchard



234 – Other (e.g. greenhouses and tree plantations)

1	Text	Area which is used for agriculture and for tree plantations
	Image	
2	Text	Permanent greenhouse

	Image	
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FOREST

311 – Coniferous



312 – Mixed



313 – Deciduous



314 – Young Forest



Clearing & Damaged trees

321 – Damaged Forest



323 - Clear cuts (harvesting)



NATURAL SURFACES

410 – Gravel



420 – Rocks



430 – Natural grasslands



440 – Heathland



450 – Bushes



460 – Wetland



WATER
Running water
511 – Natural



512 – Artificial



Standing water

521 - Natural



522 – Artificial



SECONDARY LAND USE

9 – Energy Production




1	Text	Solar panels where primary land use is <i>Grassland 220</i> (according to FLIK)
	Image	
2	Text	Floating photovoltaics where primary land use is <i>Artificial water 522</i>

	Image	
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600 – Transportation

1	Text	Green/ vegetated areas that are completely enclosed by roads at traffic interchanges/intersections
	Image	

650 – Parking lot

1	Text	Parking lots that are mapped as a second land use to conserve the primary land use (in this case <i>Industry and Commerce 113</i>)	
	Image	