



Simulating Urban Atlas

Can OSM be used as a source
for landuse/landcover?

Jerry Clough (SK53)



Landuse mapping in OSM

- Mainly import driven
 - Corine
 - US States (GA, NJ)
- Imports as a base for modification
 - But are they?
- Enhance cartographic rendered outputs
- Are they useful?

Landuse mapping in OSM

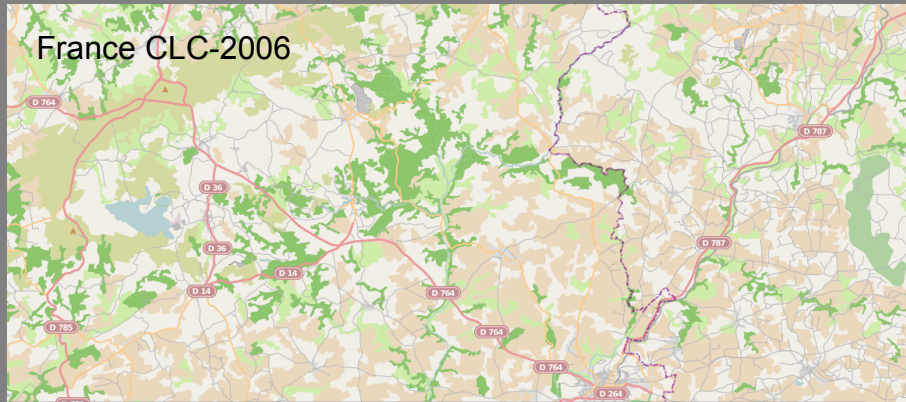
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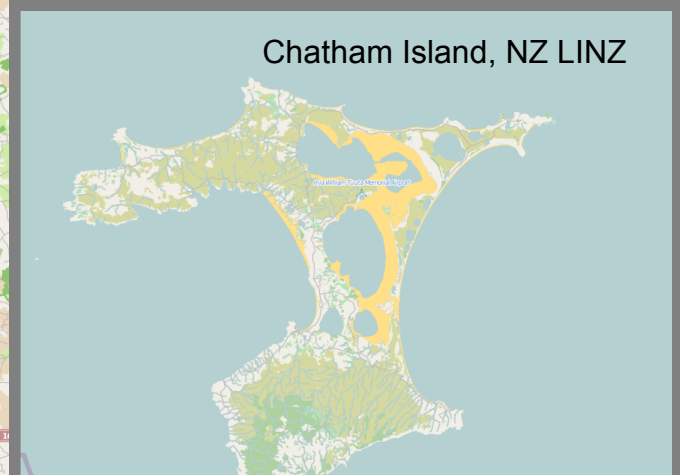
Your **first Node** in OSM, do you remember?
(Thu Dec 11 10:23:20 CET 2008)

OSM Landuse Imports

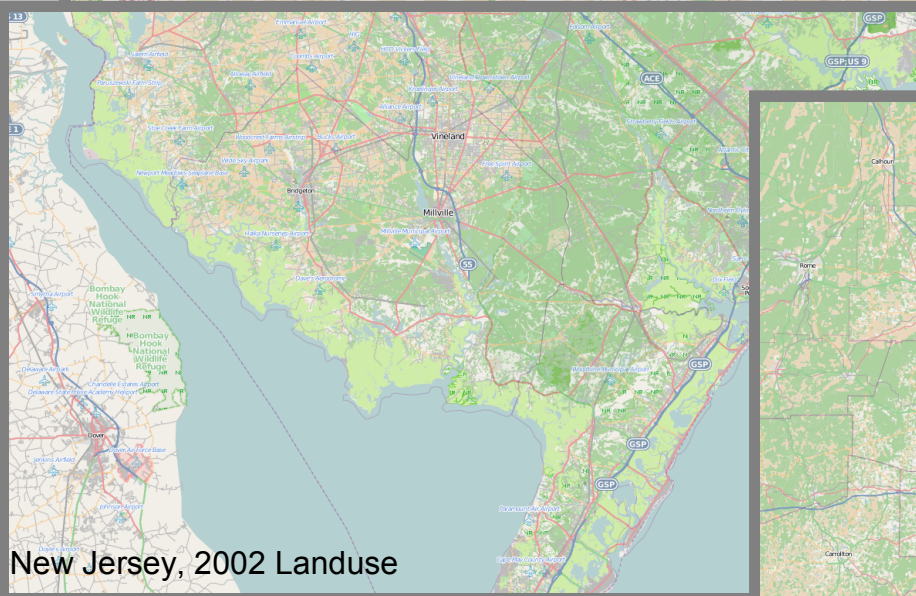
France CLC-2006



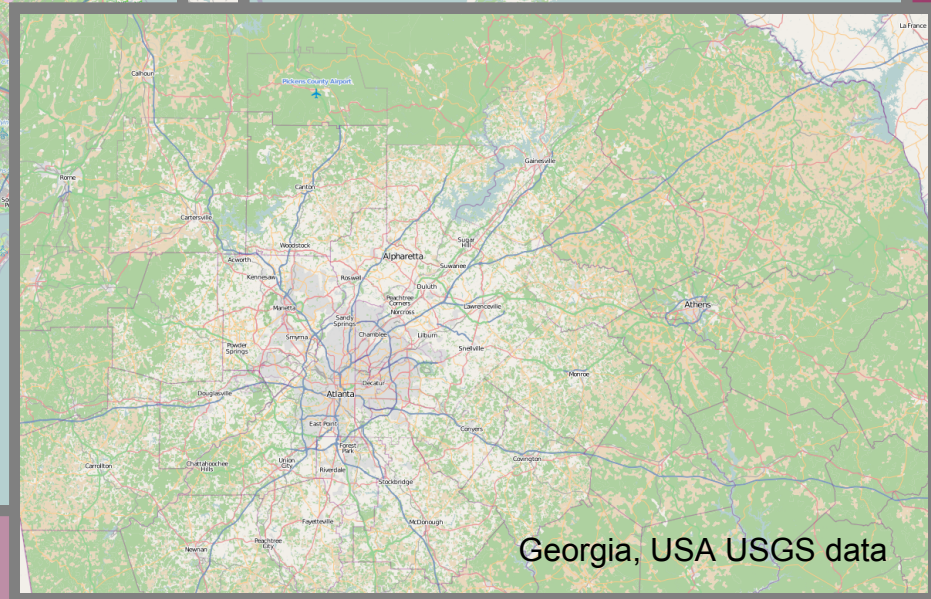
Chatham Island, NZ LINZ

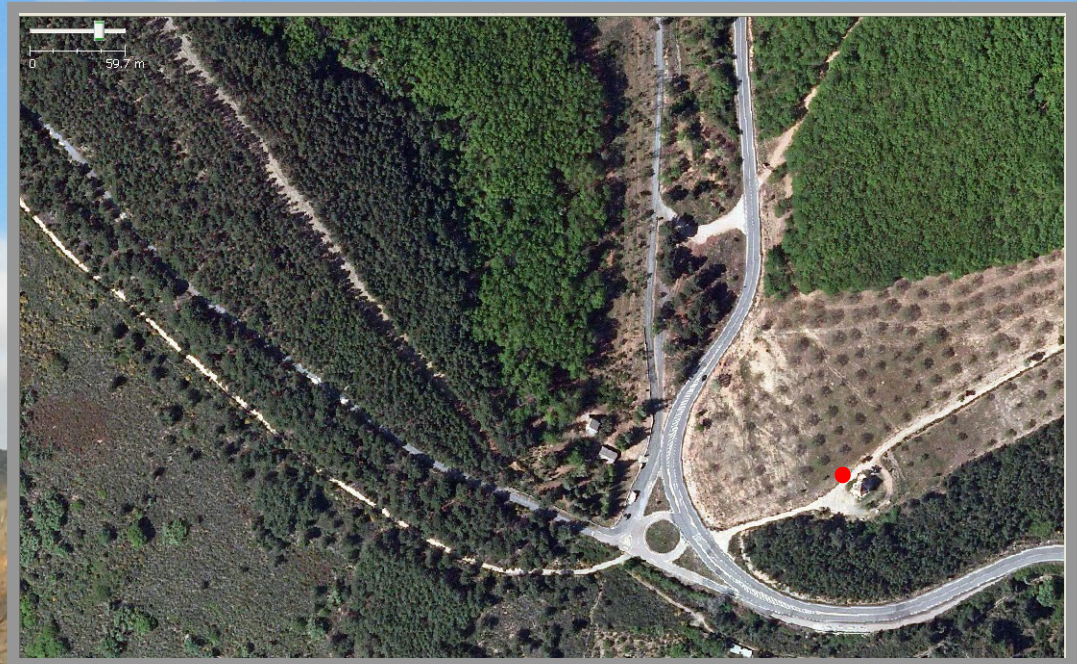
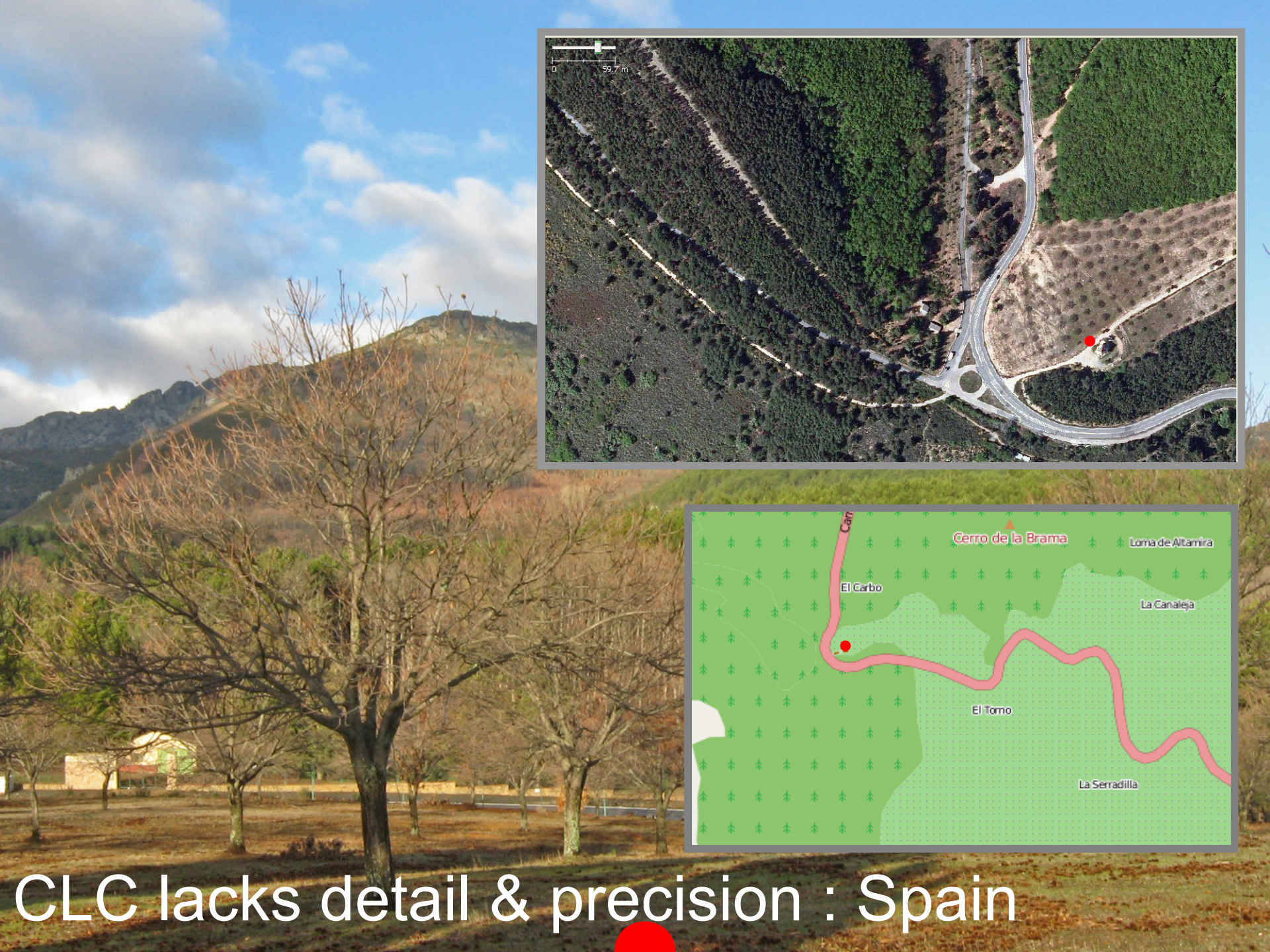


New Jersey, 2002 Landuse

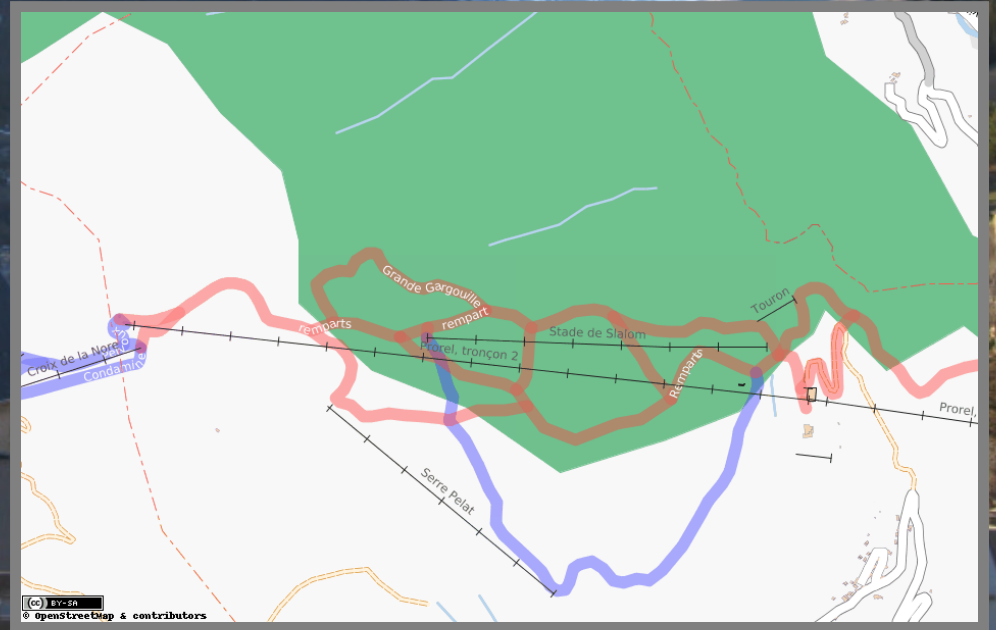


Georgia, USA USGS data





CLC lacks detail & precision : Spain



CLC lacks detail & precision : France



Use-cases for land-use

- Environmental
 - Hydrology
 - Pollution
 - Ecological
 - Sustainable resources
- Planning
 - NIMBY toolkit

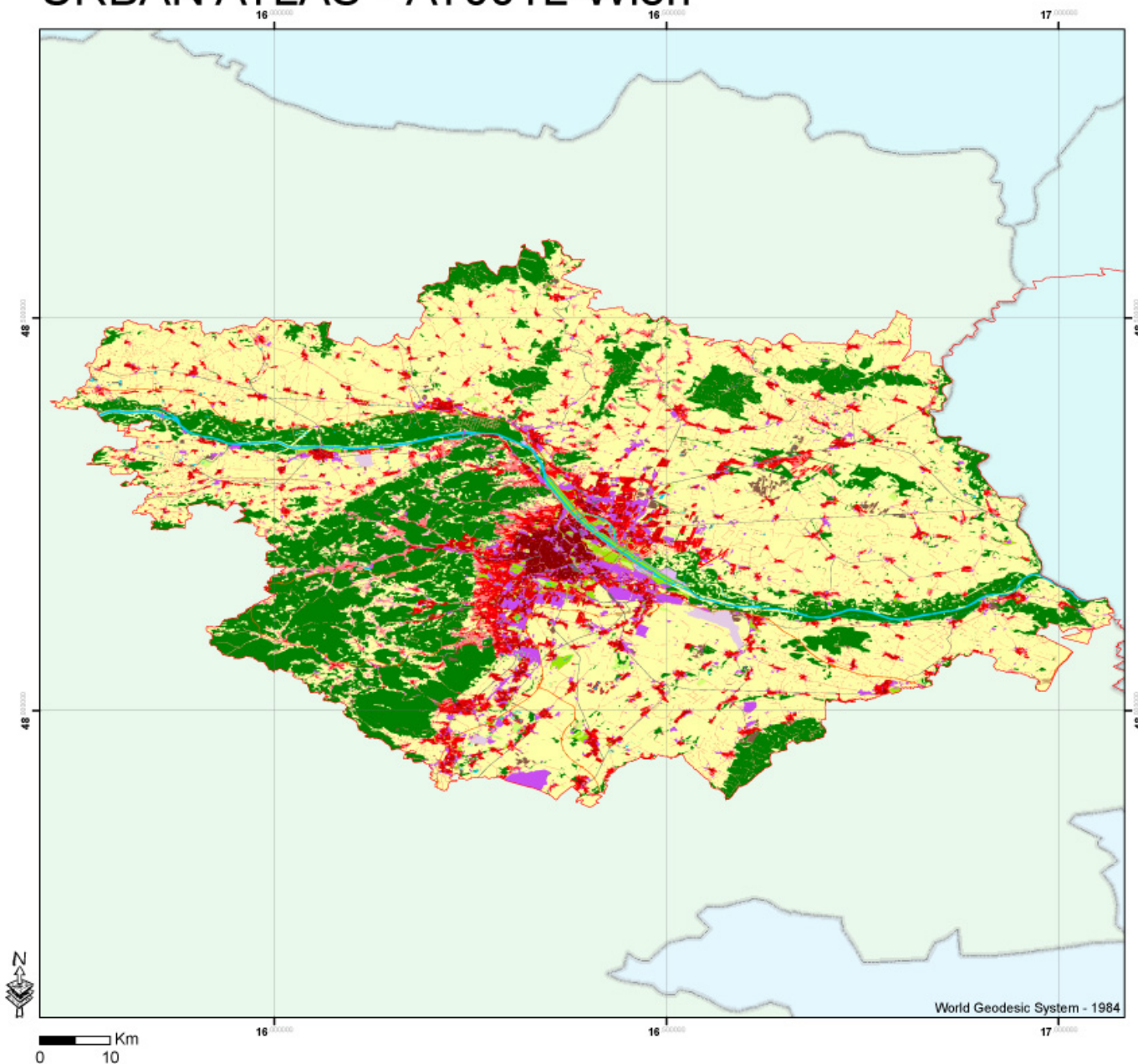
Urban Atlas

- 300+ EU cities population >100k
 - 119 in April 2010
 - 228 in Sept. 2010
- Baseline date 2006-7
- Used 2.5 m imagery
- 5-6 year refresh cycle
- Minimum Map Unit (MMU) 0.25 ha urban / 1 ha rural

<http://sia.eionet.europa.eu/Land Monitoring Core Service/Urban Atlas>



URBAN ATLAS - AT001L-Wien



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
- 13100: Mineral extraction and dump sites
- 13300: Construction sites
- 13400: Land without current use
- 14100: Green urban areas
- 14200: Sports and leisure facilities
- 20000: Agricultural, semi-natural and wetland areas
- 30000: Forest
- 50000: Water

déc 03, 2009



Opportunity

- Urban Atlas
 - Scale (~1:10k) ++ cf. with OSM
 - Discrete areas
 - Urban focus
 - Detail (small MMU size)
- Good chance to examine land-use mapping in OSM
 - Objective comparison to external data
 - Produce equivalent outputs
 - Learn more about :
 - Accuracy/Applicability/Currency/Consistency



UA to OSM Category Mapping 1

UA Code	UA Description	OSM Tags	Comments
11100 11110 11120 11130 11140	Urban Fabric Continuous /Discontinuous Urban Fabric	landuse=residential	There are no widely used sub-classes, certainly none which correspond with the density grouping of UA. See detailed discussion below.
11300	Isolated Dwellings	landuse=farmyard	Other isolated houses would need to be identified computationally.
12100	Industrial and Commercial land	landuse=retail landuse=commercial landuse=industrial amenity=university amenity=hospital,amenity=school	For campus sites (education and health) it is assumed that green spaces (parks, sports pitches, woodland, water, etc) are handled by their respective tags.
12210	Fast transit roads	highway=motorway, motorway_link	Motorways buffered 30 m
12220	Other roads	highway=trunk, trunk_link, primary, primary_link highway=secondary, secondary_link highway=tertiary, tertiary_link highway=unclassified, residential, pedestrian	Primary and Trunk buffered 20 m Secondary roads buffered to 10 m Tertiary roads buffered to 10m other roads buffered to 7.5m

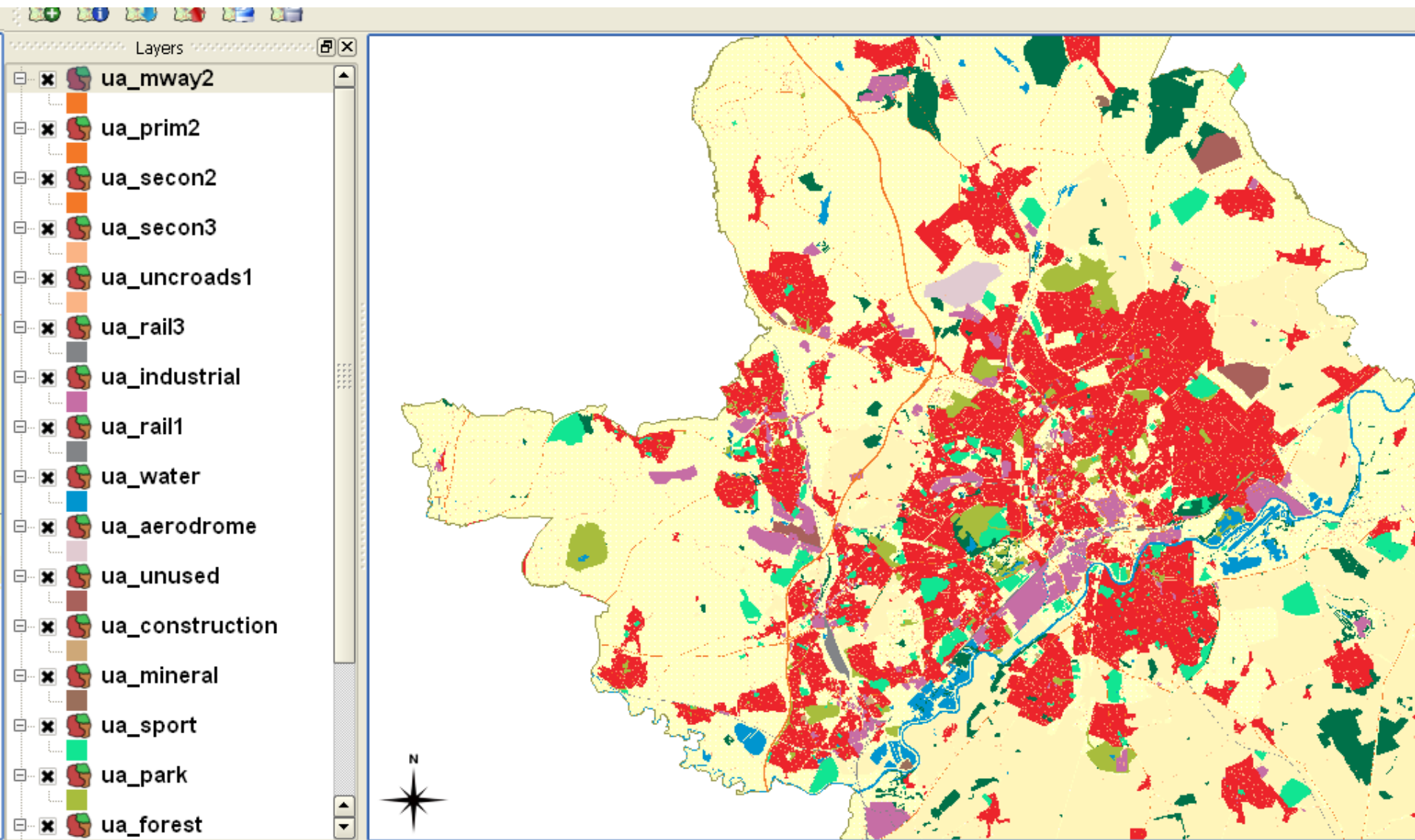
UA to OSM Category Mapping 2

UA Code	UA Description	OSM Tags	Comments
12230	Railways	landuse=railway railway=rail, preserved	Trams were not included even though one runs in a railway corridor. Rail buffered to 10m
12300	Port		Not included in this study.
12400	Airfields	aeroway=aerodrome	
13100	Quarries and Landfill	landuse=quarry landuse=landfill	
13300	Construction	landuse=construction	
13400	Unused Land	landuse=greenfield landuse=brownfield	

UA to OSM Category Mapping 3

UA Code	UA Description	OSM Tags	Comments
14100	Parks, Urban Green Space	amenity=graveyard landuse=cemetery leisure=park leisure=village_green	
14200	Sports Areas	landuse=allotments landuse=recreation_ground leisure=golf_course leisure=pitch leisure=stadium	
20000	Agricultural Land	landuse=farm landuse=farmland landuse=pasture landuse=orchard landuse=vineyard leisure=nature_reserve natural=scrub,natural=heath natural=wetland natural=rock,natural=scree	Additional OSM tags are also valid for this code (e.g., natural=glacier)
30000	Woods & Forest	natural=wood landuse=forest	
50000	Water	landuse=reservoir waterway=riverbank natural=water	

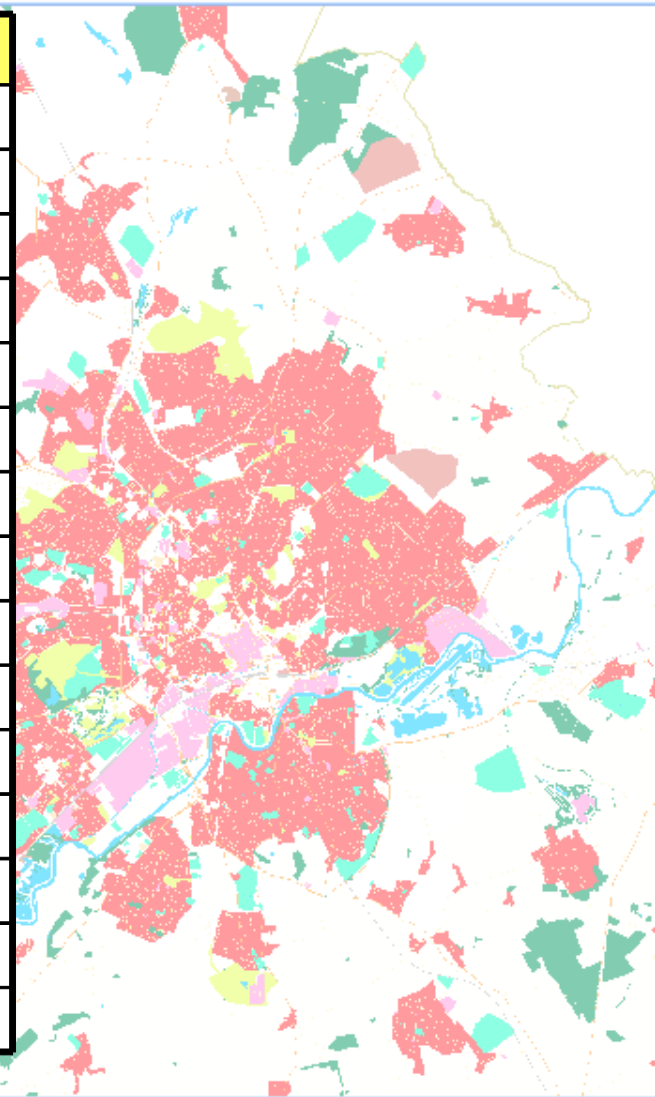
Painter's Algorithm in QGIS



Painter's Algorithm in QGIS

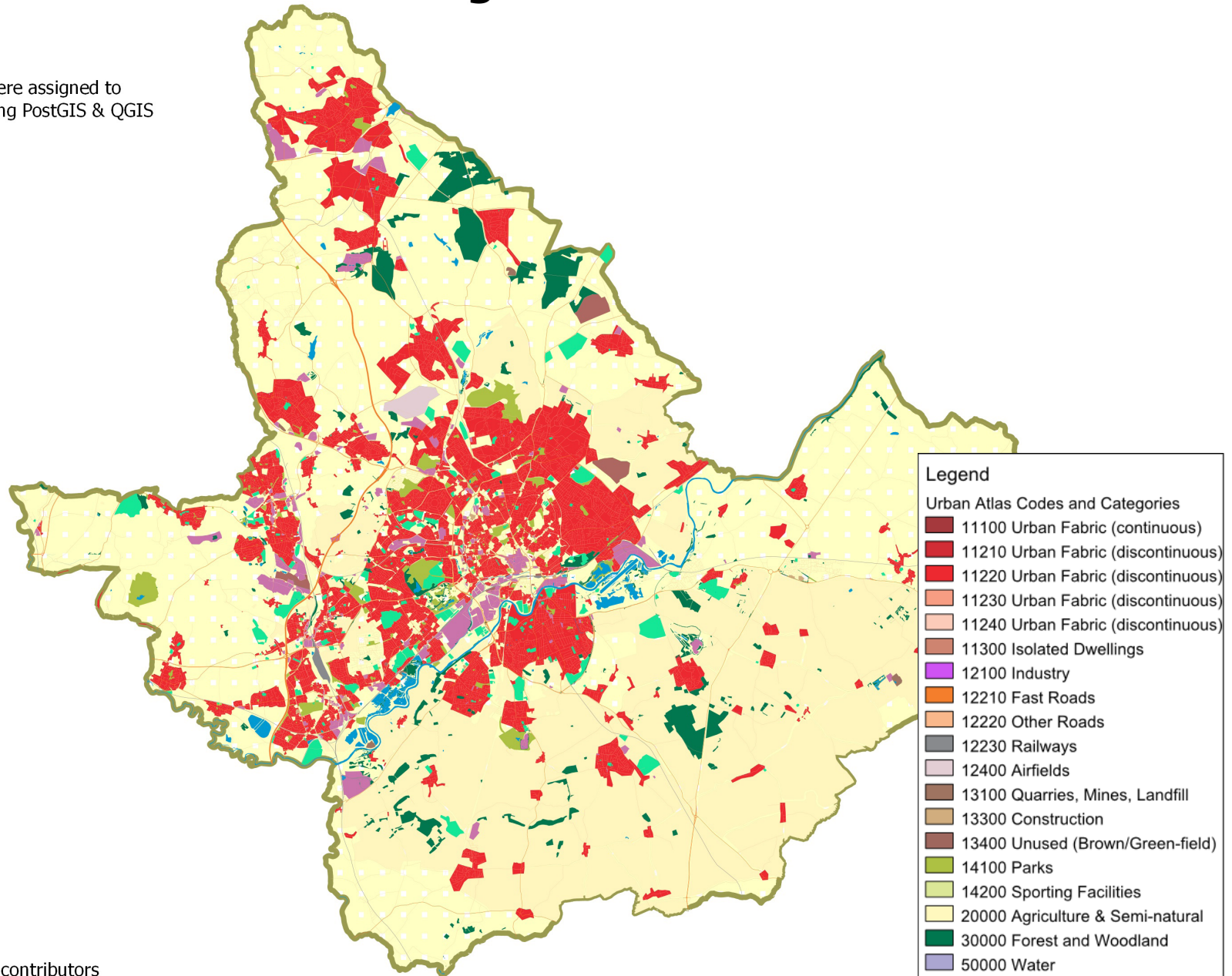


Code	Layer
12210	1
12220	2
12230	3
50000	4
12400	5
13400	6
13300	7
13100	8
14200	9
30000	10
14100	11
12100	12
11300	13
11100,112x0	14
20000	15



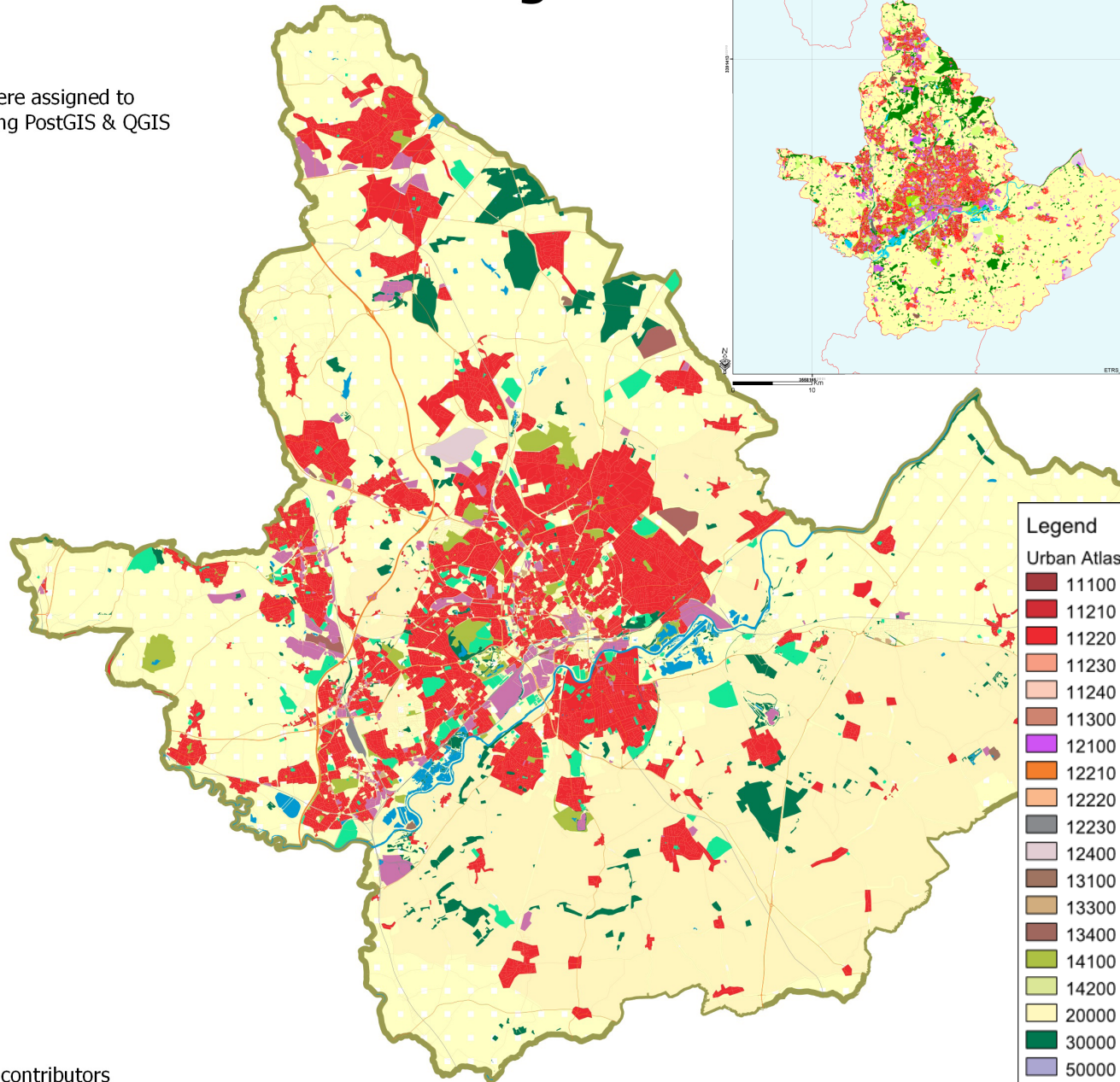
Urban Atlas - UK029L - Nottingham

OpenStreetMap data were assigned to
Urban Atlas classes using PostGIS & QGIS

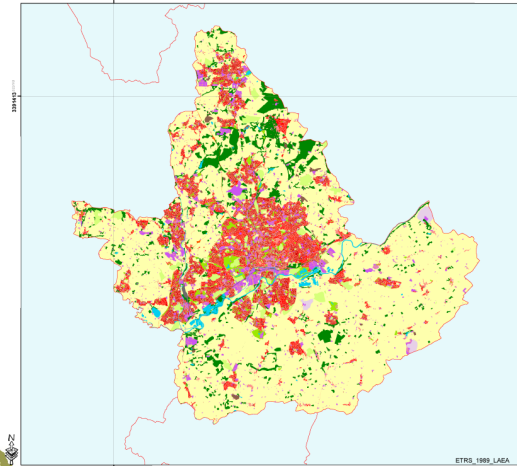


Urban Atlas - UK029L - Nottingham

OpenStreetMap data were assigned to Urban Atlas classes using PostGIS & QGIS



URBAN ATLAS - UK029L-Nottingham



- Legend**
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 - 12100 Industrial, commercial, public, military and private units
 - 12210 Fast roads and associated land
 - 12220 Other roads and associated land
 - 12230 Railways and associated land
 - 12400 Airports
 - 13100 Quarries, mines and dump sites
 - 13300 Construction sites
 - 13400 Land without current use
 - 14100 Parks
 - 14200 Sporting facilities
 - 20000 Agricultural, semi-natural and outdoor areas
 - 30000 Forest and woodland
 - 50000 Water

Apr 20, 2010



Legend

Urban Atlas Codes and Categories

- 11100 Urban Fabric (continuous)
- 11210 Urban Fabric (discontinuous)
- 11220 Urban Fabric (discontinuous)
- 11230 Urban Fabric (discontinuous)
- 11240 Urban Fabric (discontinuous)
- 11300 Isolated Dwellings
- 12100 Industry
- 12210 Fast Roads
- 12220 Other Roads
- 12230 Railways
- 12400 Airfields
- 13100 Quarries, Mines, Landfill
- 13300 Construction
- 13400 Unused (Brown/Green-field)
- 14100 Parks
- 14200 Sporting Facilities
- 20000 Agriculture & Semi-natural
- 30000 Forest and Woodland
- 50000 Water

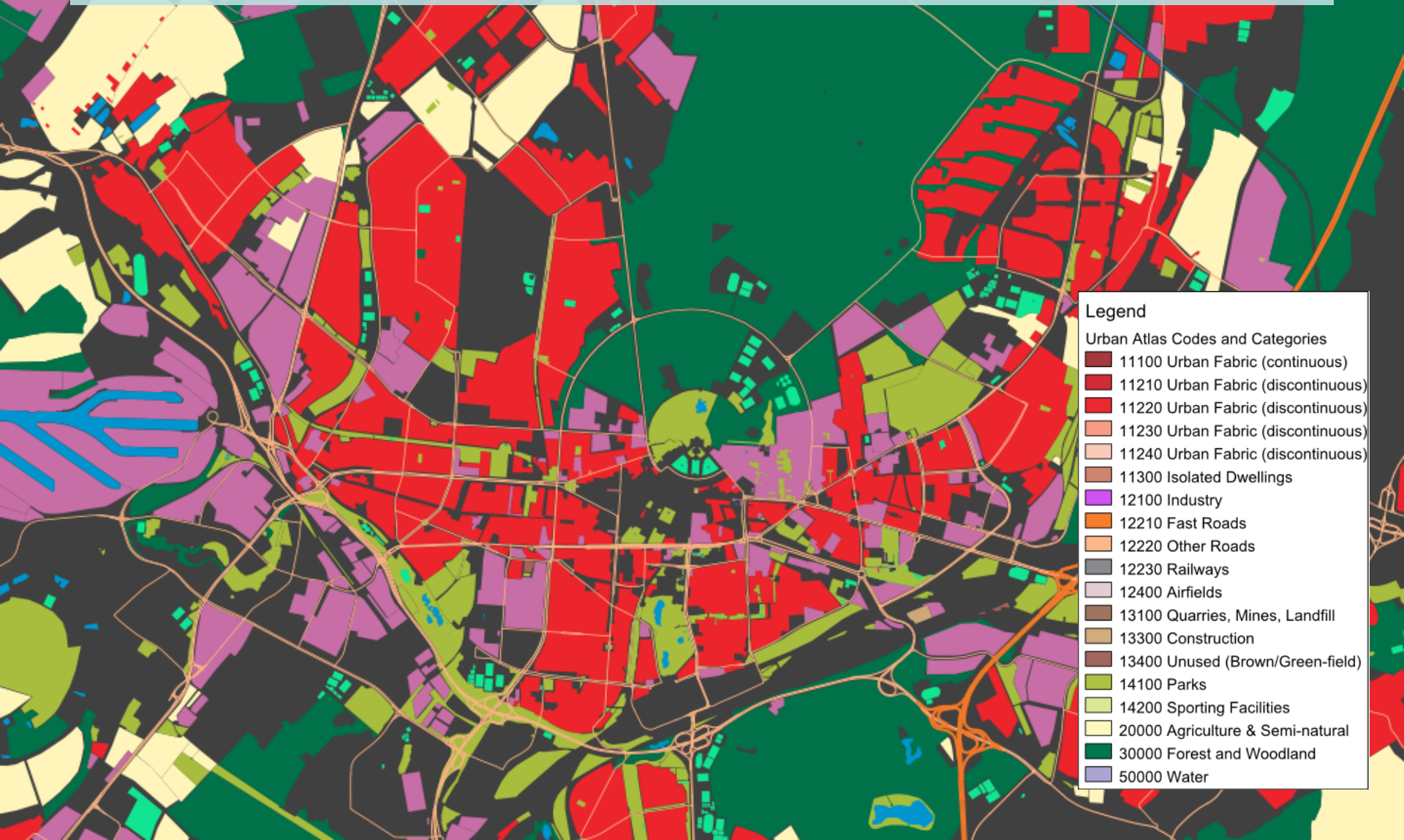
Mapnik Style Rules

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- <Rule>
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- <Datasource>

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  WHEN highway IN ('trunk','trunk_link') THEN 10
  WHEN highway IN ('primary','primary_link') THEN 10
  WHEN highway IN ('secondary','secondary_link') THEN 7.5
  WHEN highway IN ('tertiary','tertiary_link') THEN 7.5
  WHEN
    railway IN ('rail','tram','preserved','narrow_gauge')
    THEN 10
  ELSE 3.75
  END),900913) as way
, highway
, railway
, name
FROM planet_osm_line
WHERE (highway IN
('motorway','motorway_link','trunk','trunk_link','primary','
primary_link','secondary','secondary_link','tertiary','tertiary_link','pedestrian','residential','unclassified'))
OR (railway IN ('rail','tram','preserved','narrow_gauge')) )
AS road_overlay
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Mapnik Output : Karlsruhe OSM





BUT...

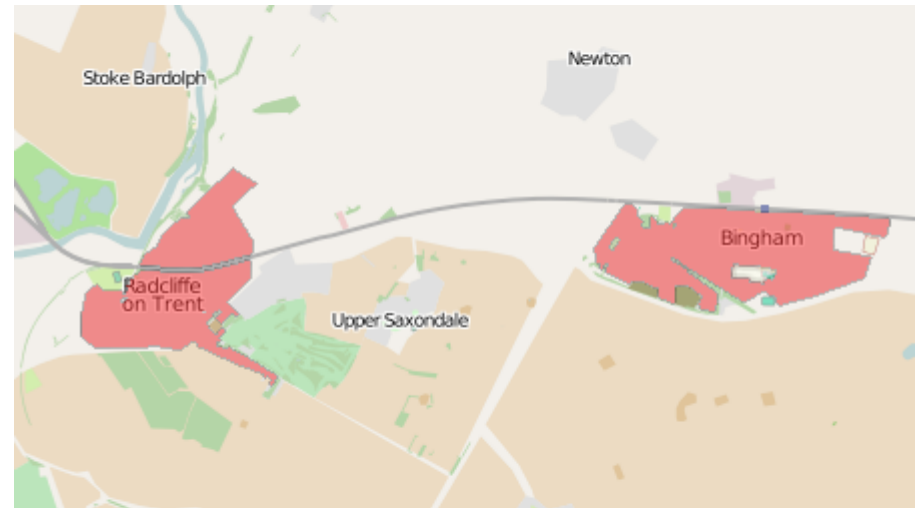
- Raster output only
 - No Shape file output
- Informational not Analytical
- Bad Polygons



PostGIS

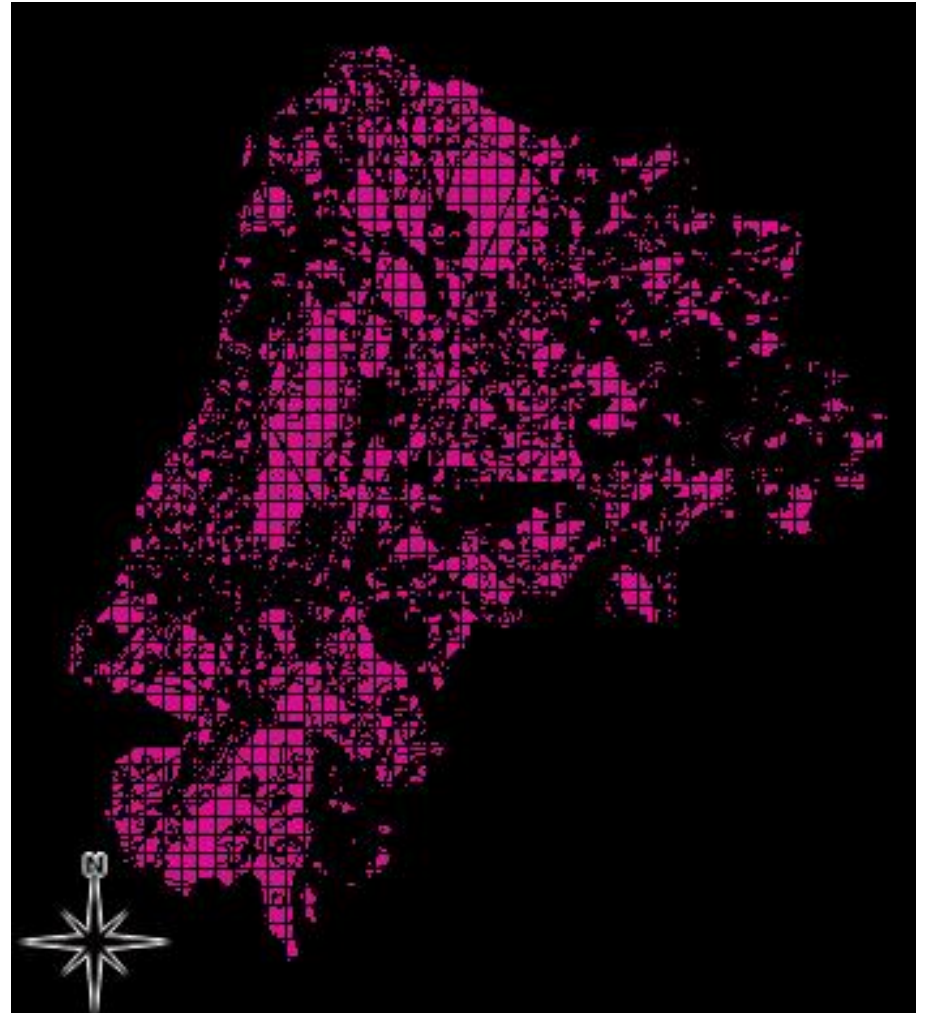
The Problem with Polygons

- OSM
 - Broken polygons
 - Intersecting polygons
 - osm2pgsql
- PostGIS
 - Multipolygons
 - many set operations (UNION/Intersection)
- Essential tool:
cleangeometry PostGIS
function (SOGIS)
<http://www.sogis1.so.ch/sogis/dl/postgis/cleanGeometry.sql>

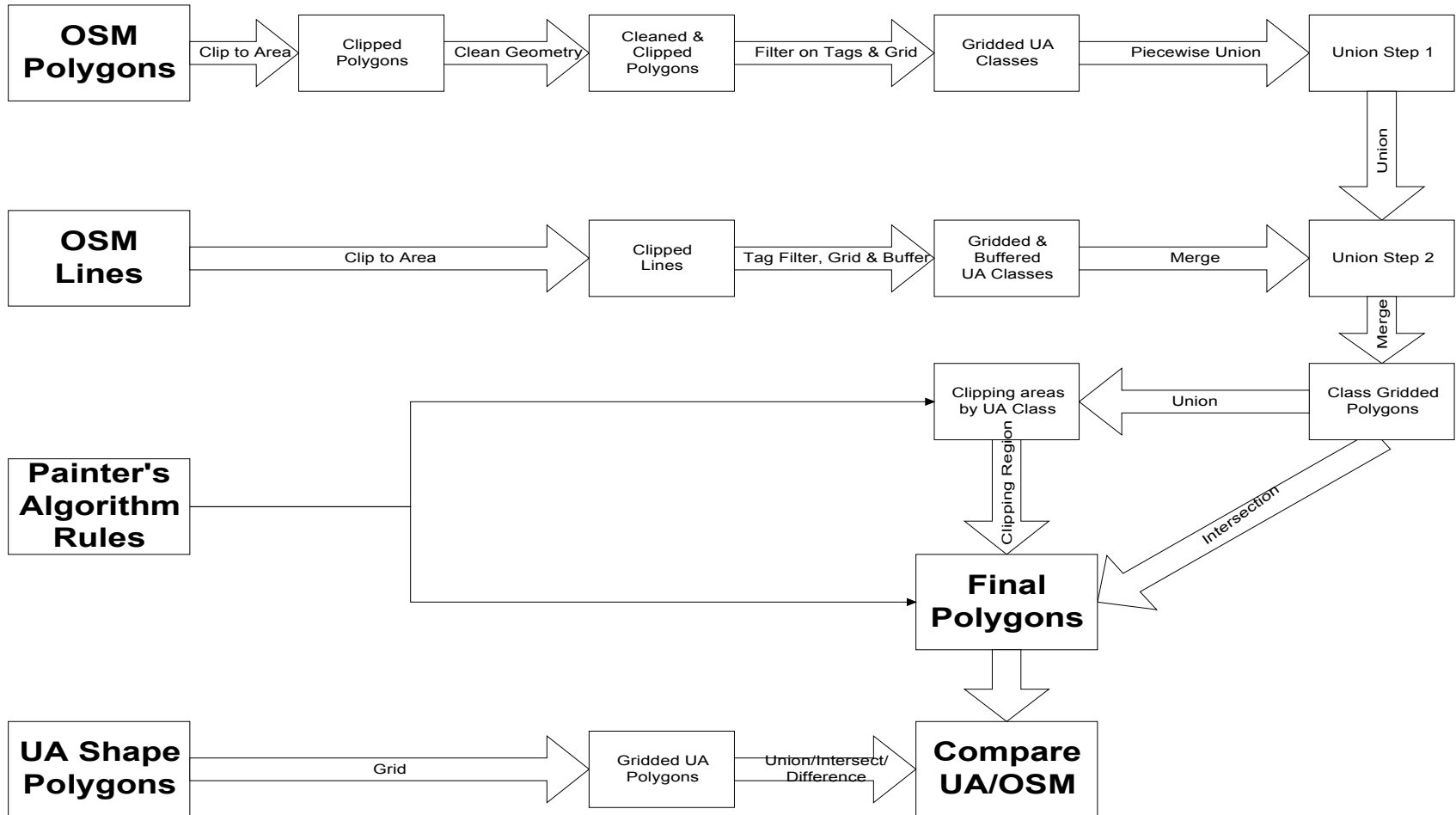


Gridded Output

- Intersection of all features on 1km grid
 - Reduce polygon size
 - Performance
 - Avoid joining on geometries (use key for grid cell)

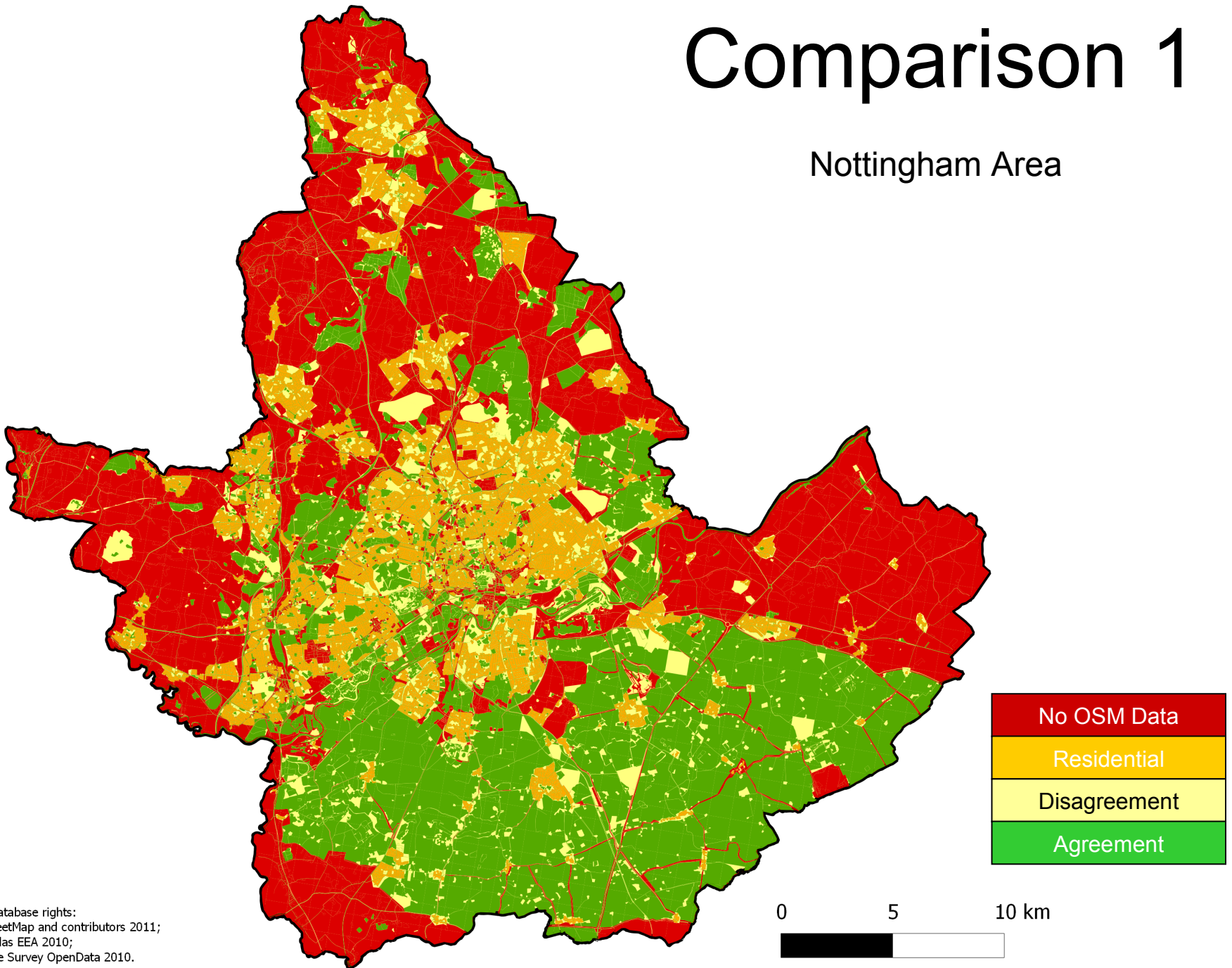


PostGIS Processing

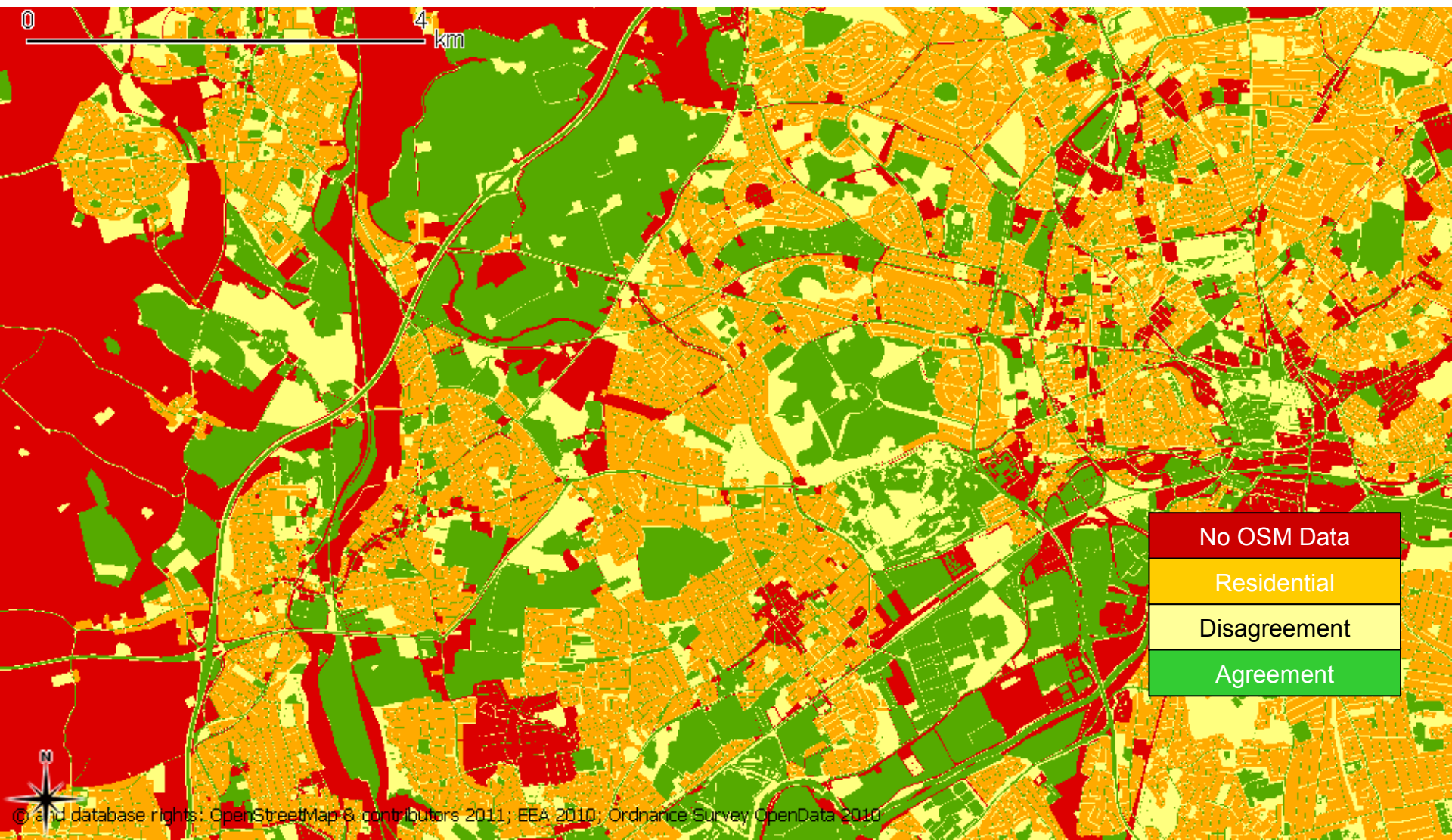


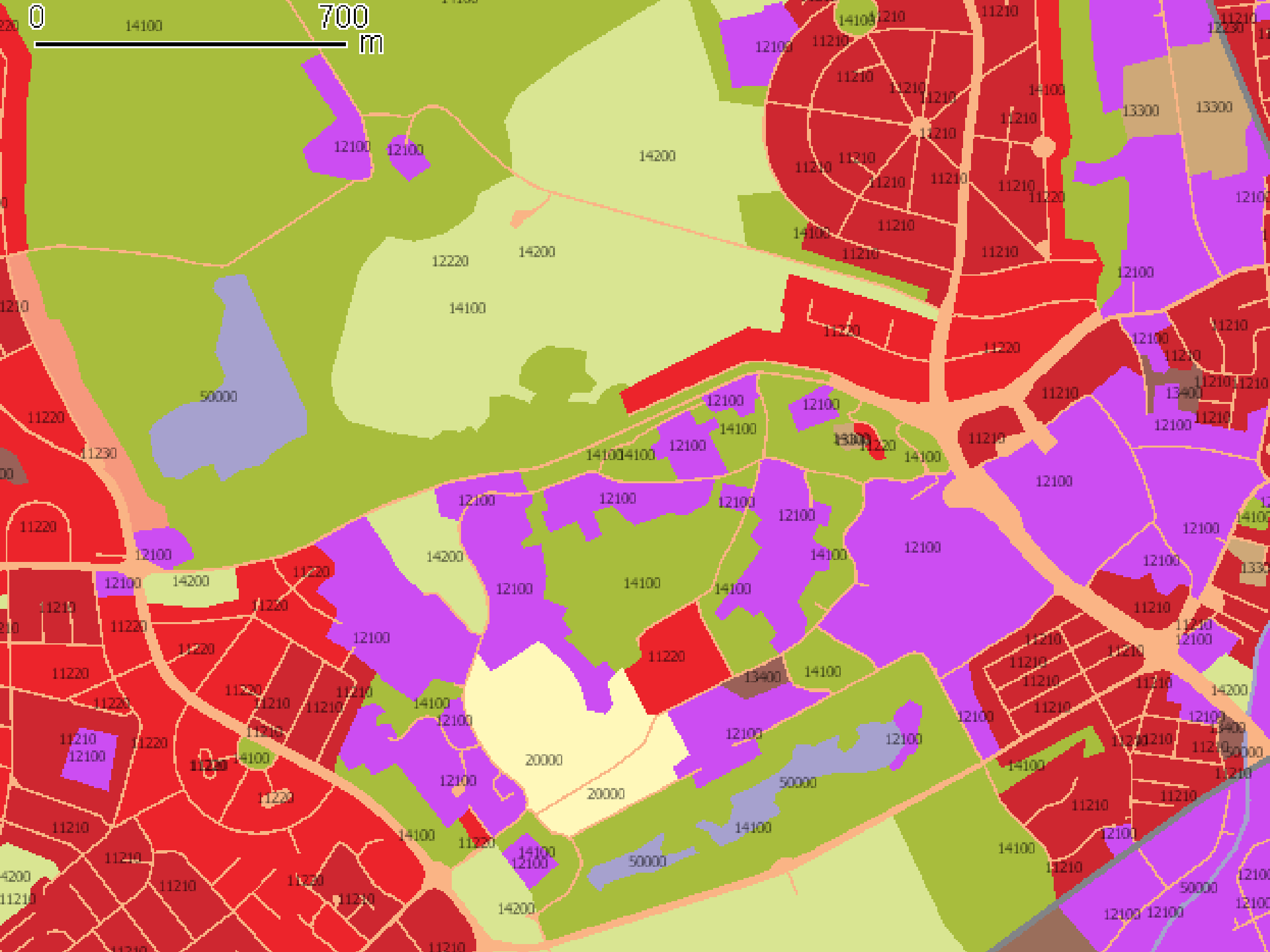
Comparison 1

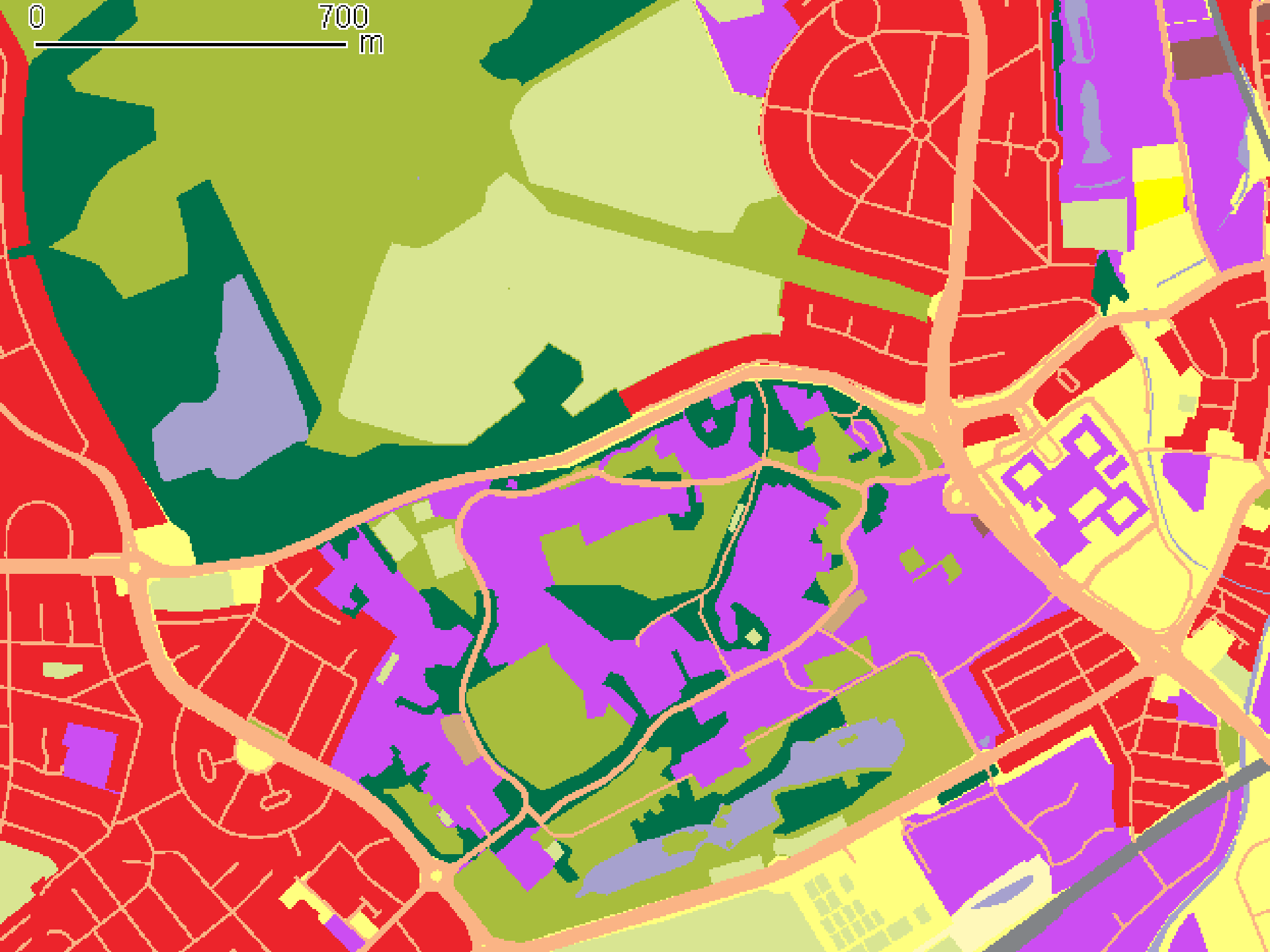
Nottingham Area



Comparison 2







0 700 m

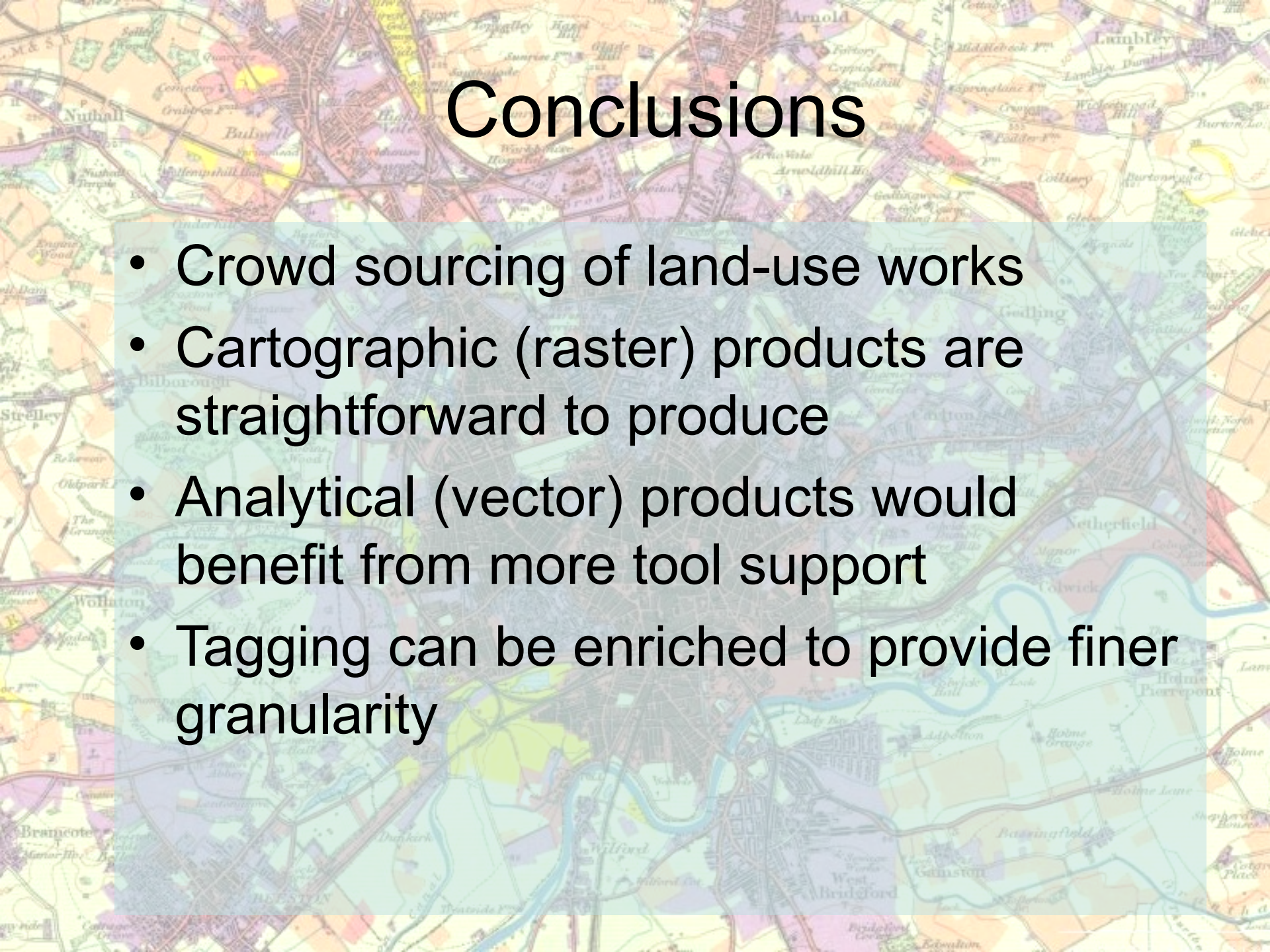
Agreement

This aerial map shows a rural landscape with a river flowing through it. The land is divided into various colored zones: green for agricultural fields, yellow for open land, and purple for built-up areas or forests. A scale bar at the top left indicates a distance of 700 meters. A legend box at the bottom right is labeled 'Agreement'.

Comparison: Numbers

UA Class	Area in hectares			% variance
	UK029L (A)	Not in OSM (B)	OSM (C)	C %(A-B)
11100,112x0	13430.9	1654.7	12822.2	109.00%
11300	271.6	167	55.6	53.00%
12100	5351.9	1856.8	2240.4	64.00%
12210	122.8	3.7	183.8	154.00%
12220	2923.8	420.5	3445.3	138.00%
12230	308.3	54.3	393.1	155.00%
12400	402.9	375.3	197.8	714.00%
13100	321	153.1	43.8	26.00%
13300	232.8	167	38.1	58.00%
13400	177.9	375.3	302.4	-153.00%
14100	1376.7	349.7	1187.9	116.00%
14200	3014.7	890.9	1752	82.00%
20000	56038.2	29784.8	25478.2	97.00%
30000	5490.6	2260.4	3208.7	99.00%
50000	904.6	111.3	903.9	114.00%





Conclusions

- Crowd sourcing of land-use works
- Cartographic (raster) products are straightforward to produce
- Analytical (vector) products would benefit from more tool support
- Tagging can be enriched to provide finer granularity