THE POTENTIAL OF OPENSTREETMAP FOR LAND USE/LAND COVER MAPPING

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This presentation is available on nobohan.be/blog.

OBJECTIVE

Explore the potential of OpenStreetMap for land-use/land-cover mapping.

Comparaison of the forest areas in Corine Land Cover (CLC) and OpenStreetMap (OSM) in Southern Belgium (Province of Luxembourg)

OSM IN RESEARCH

Some scientists have already worked on this issue:

- General review about OSM in science applications: Neis & Zielstra, *Recent Developments and Future Trends in Volunteered Geographic Information Research: The Case of OpenStreetMap*, Future Internet, 2014 [link]
- Assessment of land-use classification and accuracy in OSM in Vienna, Austria : Arsanjani et al., *Toward mapping land-use patterns from volunteered geographic information*, International Journal of Geographical Information Science, 2013 [link]
- Comparison of OSM against Corine Land Cover in Portugal : Estima & Painho, *Exploratory analysis of OpenStreetMap for land use classification*, 2013 [link]
- Accuracy of natural features in OSM (several countries): Winstanley, *A study of data representation of natural features in OpenStreetMap*, Proceedings of GIScience, 2010 [link]

HOW LAND-USE/LAND-COVER IS MAPPED IN OSM?

- by digitalization on aerial imagery, with user/terrain knowledge
- by semi-automated import from other database (including Corine Land Cover)

METHODOLOGY

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- Corine Land Cover data accessed here
- OSM data downloaded from overpass-turbo.eu
- Clip the Corine Land Cover & OSM layers onto the province of Luxembourg
- Make the intersection & symmetrical difference of the Corine Land Cover & OSM layers
- Compute the areas of intersected polygons and sum of the areas that share the same attributes
- Done with QGIS 2.8 & LibreOffice Calc

ABOUT THE TAGS USED FOR FOREST MAPPING IN OSM

landuse=forest Most used!

natural=wood Not used a lot

wood=deciduous/coniferous/mixed ! Deprecated ! wood=* is now deprecated and is replaced by leaf_type=* and leaf_cycle*. See the discussion and the vote on the OSM wiki here.

leaf_type=broadleaved/needleleaved/mixed describes the type of leaves for forest vegetation

leaf_cycle=deciduous/evergreen/mixed describes the phenology of plant species in forests

OVERPASS-TURBO QUERIES

```
[out:json][timeout:25];
// fetch area "Luxembourg" to search in
area['name:fr'='Luxembourg'][admin_level=6]->.sear
// gather results
(
  // query part for: "forest"
  way["landuse"="forest"](area.searchArea);
  relation["landuse"="forest"](area.searchArea);

  way["natural"="wood"](area.searchArea);
  relation["natural"="wood"](area.searchArea);

  way["leaf_type"](area.searchArea);
  relation["leaf_type"](area.searchArea);

  way["leaf_cycle"](area.searchArea);
  relation["leaf_cycle"](area.searchArea);

  way["wood"](area.searchArea);
  relation["wood"](area.searchArea);

);
// print results
out geom;
>;
out skel qt;
```

RESULTS

FREQUENCY OF OSM TAGS FOR FOREST AREAS IN PROVINCE OF LUX.

Forested areas in OSM were defined as the polygons (way + relation) that have *landuse=forest* or *natural=wood*.

- 23.6 % of forested areas in OSM are still tagged with the deprecated wood=deciduous/coniferous/mixed!
- 27.5 % of forested areas in OSM only are tagged with leaf_type=broadleaved/needleleaved/mixed
- 19.0 % of forested areas in OSM only are tagged with leaf_cycle=deciduous/evergreen/mixed
- 50.5 % of forested areas in OSM are only tagged with landuse=forest OR natural=wood without trees and/or phenology information.

CONFUSION MATRIX (% OF AREA)

Open-Street-Map / Corine Land Cover	leaf_type= broadleaved OR wood= deciduous OR leaf_cycle= deciduous	leaf_type= needleleaved OR leaf_cycle= evergreen OR wood= coniferous	leaf_type= mixed OR leaf_cycle= mixed OR wood= mixed	landuse= forest OR natural = wood ONLY	No OSM tag	Sum (ha)
311 (broad-leaved)	5.1%	0.0%	8.4%	10.5%	1.0%	**25.0%**
312 (coniferous)	3.5%	0.1%	5.3%	10.0%	2.4%	**21.4%**
313 (mixed)	10.7%	0.1%	8.9%	18.1%	6.2%	**44.1%**
No CLC tag	1.3%	0.1%	2.0%	6.1%	/	**9.5%**
Sum	**20.7%**	**0.3%**	**24.7%**	**44.7%**	**9.6%**	**100.0%**

MAP

Comparison map

DATA CHARACTERISTICS

While Corine Land Cover has a minimal description threshold of 25 ha, much smaller polygons (< 25 ha) do exist in OSM.

KEY RESULTS:

Open-Street-Map / Corine Land Cover	leaf_type= broadleaved OR wood= deciduous OR leaf_cycle= deciduous	leaf_type= needleleaved OR leaf_cycle= evergreen OR wood= coniferous	leaf_type= mixed OR leaf_cycle= mixed OR wood= mixed	landuse= forest OR natural = wood ONLY	No OSM tag	Sum (ha)
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Sum	20.7%	0.3%	24.7%	44.7%	9.6%	100.0%

- Poor matching of OSM and Corine Land Cover classes
- About half of forest area in OSM is tagged with landuse=forest / natural=wood only (no class description)
- The mixed forest class (i.e., "313" in Corine Land Cover and wood/leaf_type /leaf_cycle=mixed) is often used as a "catch-all" class!
- Comparison OSM vs Corine Land Cover: Some OSM data were actually imported from Corine Land Cover! OSM-France even did massive imports of Corine Land Cover into OSM.

PERSPECTIVES: OSM LAND-USE INFORMATION IN RESEARCH

- Forest type mapping, tree composition: toward up-to-date information
- Collaboration between crowdsourced geodata collection and professional land-use mapping project/agencies would be welcome.
- At the long term, frequently updated information could be used for historical reconstruction of land-use --> In the future, would it be possible to use OSM to study land-use/land-cover changes?
- Farmsourcing / agriculture mapping: An agriculture map can be derived from OSM data: e.g., the ITO agriculture map that is using the tags landuse=farm, farmland, greenhouse_horticulture, meadow, orchard, etc. The tag "crop" describing the type of the crop (wheat, corn, etc.) also exists. Yearly updated information is needed!
- Easy/open access data means widely used data: e.g., see GoogleMaps imagery.

THANKS FOR YOUR ATTENTION