How green is green?
Using open land cover databases in the search for potentially healthy neighbourhoods from the immunological point of view

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Trends in Finland

Prevalences of coeliac disease and type 1 diabetes

- Type 1 diabetes
- Coeliac disease

Asthma

Allergic rhinitis


Latvala et al. BJM 2005
Lack of microbial exposure

UN: World Urbanization Prospects 2014
ADELE (Autoimmune Defense and Living Environment)

Multidisiplinary research and development project from January 2015 –
Funded mainly by Tekes, Finnish Funding Agency for Innovations

Environmental Ecology
Sociology

Immunology
Microbiology

Urban Planning & Design
GIS Analysis

+ partering companies & scientific collaborators
Urbanization and indoor microbiota

The diversity (richness, OTU level) of total bacterial community and other major phyla in doormat litter in relation to the percentage of built area within the 200 m radius of the study sites.

- rural sites
- urban sites.

Courtyards in Finland

- 12 sites
  - 4 high-rise blocks (suburban, Lahti region)
  - 4 row houses (suburban, Oulu and Tampere regions)
  - 4 one family houses (countryside, Lahti region)
- rather big yards (5 500 m² to 9 200 m²)
- vegetation survey at sites during summer 2015 (total N=114)
- comparison with two popular land cover databases: Corine Land Cover and OpenStreetMap
Corine Land Cover

Producer: European Environment Agency + national bodies
Covers 38 countries in Europe (5.8 Mkm$^2$)
44 land cover classes
Corine Land Cover

Resolution: raster 20 x 20 m
Corine Land Cover

**Pros:**
- Reliable
- Lot of classes
- Pan-European
- Comparison between updates possible

**Cons:**
- Update needed (CLC 2018 is coming)
- Needs coding for effective use
- No data for plant species
OpenStreetMap

Created by Steve Coast in 2004
Open wiki-type community driven project
- big cities accurate and regularly updated, countryside areas not so
- not always reliable in detail level
Resolution varies: in many cities about 1 meter
Land use classes: 20 (+12 traffic areas)
OpenStreetMap

+ Accurate in many cities
  Updating all the time
  Worldwide

- Not very reliable in all places (e.g. countryside)
  Needs coding for effective use
  No data for plant species
## Comparison / courtyards

### Average land cover types suburban/countryside

<table>
<thead>
<tr>
<th></th>
<th>Suburban/high-rise block</th>
<th>Countryside one family house</th>
<th>Suburban rowhouse</th>
<th>Tampere rowhouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-site survey</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Corine</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>OpenStreetMap</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>6.08</strong></td>
<td><strong>3.42</strong></td>
<td><strong>1.67</strong></td>
<td></td>
</tr>
</tbody>
</table>
Comparison / 200 m radius

<table>
<thead>
<tr>
<th>Location</th>
<th>Land Cover Type</th>
<th>Corine</th>
<th>OpenStreetMap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahti 1</td>
<td>suburban high-rise block</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Lahti 2</td>
<td>suburban high-rise block</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Lahti 3</td>
<td>suburban high-rise block</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Lahti 4</td>
<td>suburban high-rise block</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Lahti 5</td>
<td>countryside one family house</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Lahti 6</td>
<td>countryside one family house</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Lahti 7</td>
<td>countryside one family house</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Lahti 8</td>
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<td>3</td>
</tr>
<tr>
<td>Oulu 9</td>
<td>suburban rowhouse</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Oulu 10</td>
<td>suburban rowhouse</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Tampere 11</td>
<td>suburban rowhouse</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Tampere 12</td>
<td>suburban rowhouse</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

**Average**
- Corine: 7,50
- OpenStreetMap: 5,25/2,75

suburban/countryside
Comparison

Aerial photo

Corine Land Cover 2012

OpenStreetMap
Extra: **Landsat**

Oldest land cover satellite, launched 1972
Huge archive
Partial updates 6-11 times a year
Resolution varies: raster 30 m (4 basic classes globally)
2 x 2 m (500 sites, 7 classes)

**Landsat Missions: Imaging the Earth Since 1972**

- Reliable
- World-wide
- Lots of related data and surveys
- Great time series available

- Not many land cover classes in the most cases
- No data for plant species
Extra: Biomassa Atlas

www.biomassa-atlas.luke.fi
Extra: Biomassa Atlas

Specific biotypes and biomasses for some species
About 200 land use and biomass units
No need for coding
Easy to use
Quick results

Available only in Finland (coming soon in Baltic countries)
Very low resolution, but higher resolution data exist (see the picture)
Extra: Foursquare & Instagram

**FOURSQUARE**
Created in 2009
About 55 million monthly active users
About 600 million shared photos

**INSTAGRAM**
Created in 2010
About 700 million monthly active users
Over 40 billion shared photos
Extra: Foursquare & Instagram

Urban metaMorphology Lab at TUT: www.spinunit.eu

Helsinki, life in transit

Revealing the social life of mobility places in the city
Conclusions

1. Corine Land Cover was more accurate and reliable in the study sites than OpenStreetMap, especially in the countryside.

2. No relevant plant species or biomass data available in Corine Land Cover or OpenStreetMap.

3. Therefore Biomassa Atlas would be very interesting in scientific use, if its resolution becomes better in the actual www-page.

4. With human behaviour related research projects, social media open data are very promising.
THANK YOU!