REGIONALIZED INVENTORY DATA AND LCIA WITH ECOSPOLD2

Chris Mutel

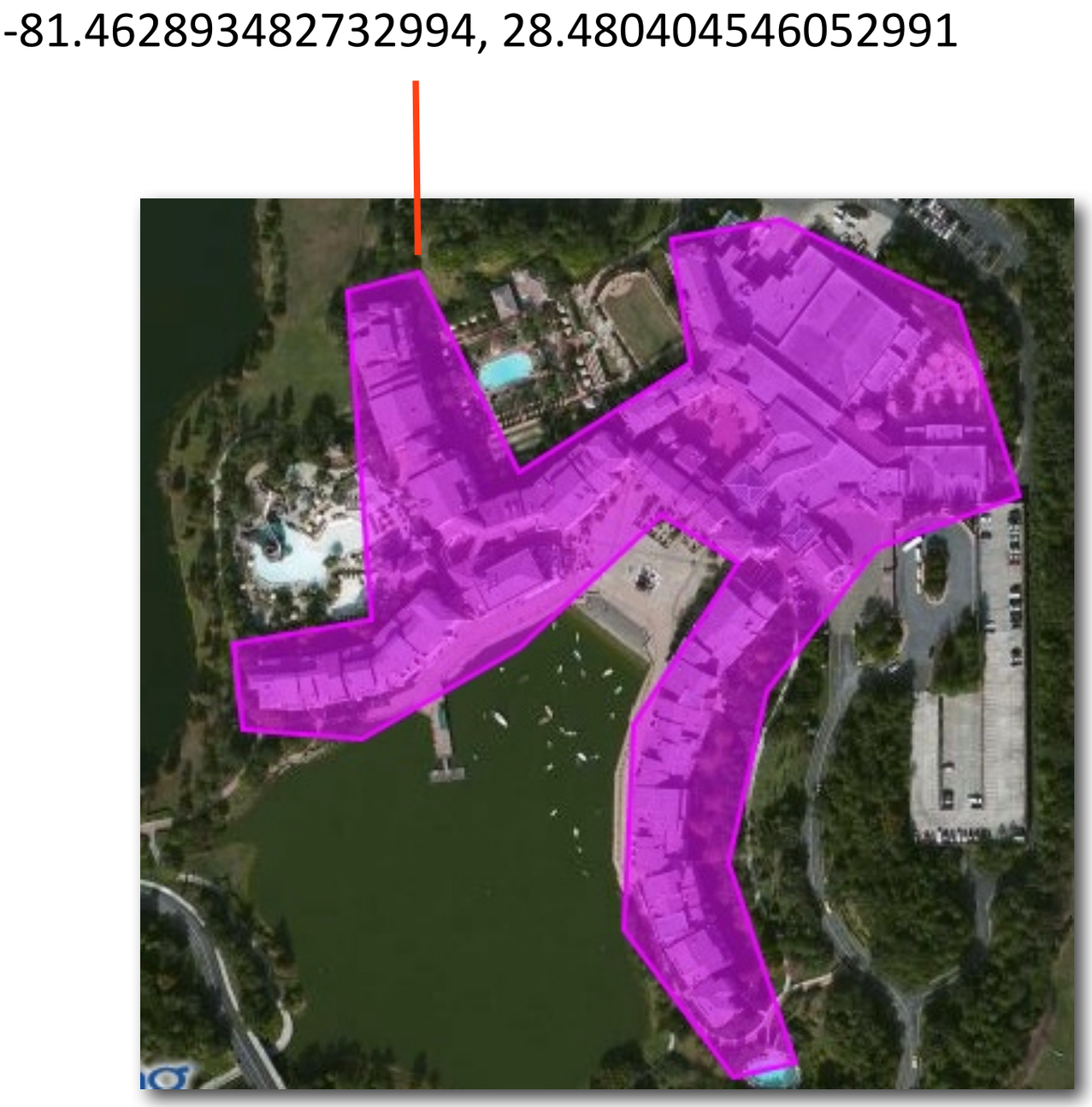
ETH Zurich, Institute for Environmental Engineering, Ecological Systems Design Group

Email contact: mutel@ifu.baug.ethz.ch

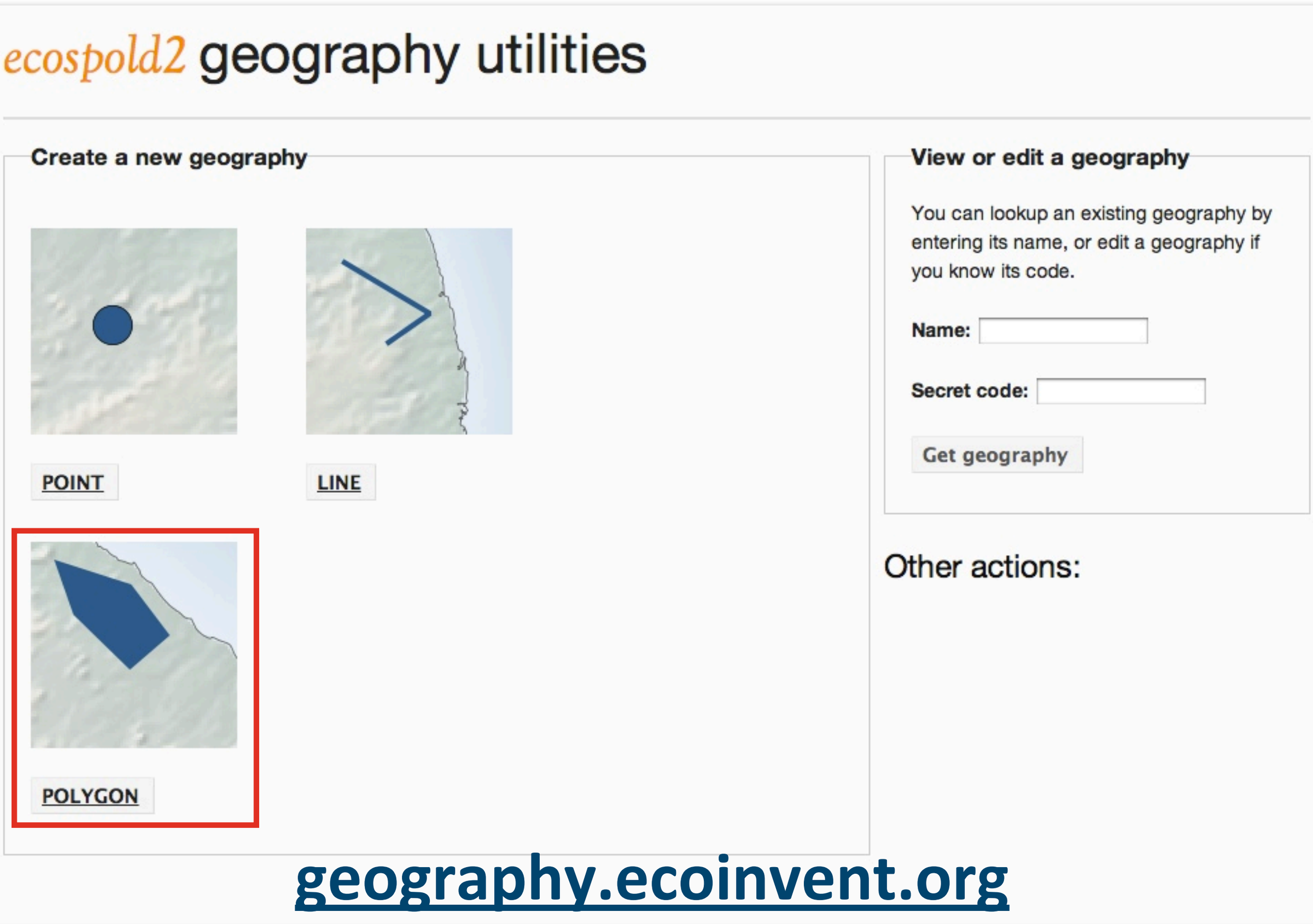
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

GIS inventory locations

- Each location is as polygon, line, or point
  - Only (multi) polygons are used
  - Polygons are lists of lon/lat coordinates
- Coordinates stored in master XML file
  - Reference to “short name”, e.g. “US”



Adding new locations



This is the official way to add new locations to the ecoinvent 3 database. Click on “POLYGON”.

ecospold2 geography utilities

Add geography

Name

LCA conference site

Public

☑

Area

Population density (per km^2)

Population

300

The blue plus on the right side of the map switches map providers.

Shape

Description

Conference website: http://www.lcacenter.org/LCAXIII.aspx

geography.ecoinvent.org

Draw new polygons with the editing toolbar. Each vertex is a single click - a double click closes the polygon. You can then fill in extra data.

ecospold2 geography utilities

Edit geography

EcoSpold2 Export

KML Export

There are two ways that you can identify or find your geography later on. First, there is the name you chose, **LCA conference site**. You can enter this at the main page to reach this geography and view or export it. You can also use the secret code to edit the geography in the future. The secret code for this geography is **9y7ri1k5**. If you want others to be able to edit this geography, feel free to share this code.

Name

LCA conference site

Public

☑

Area

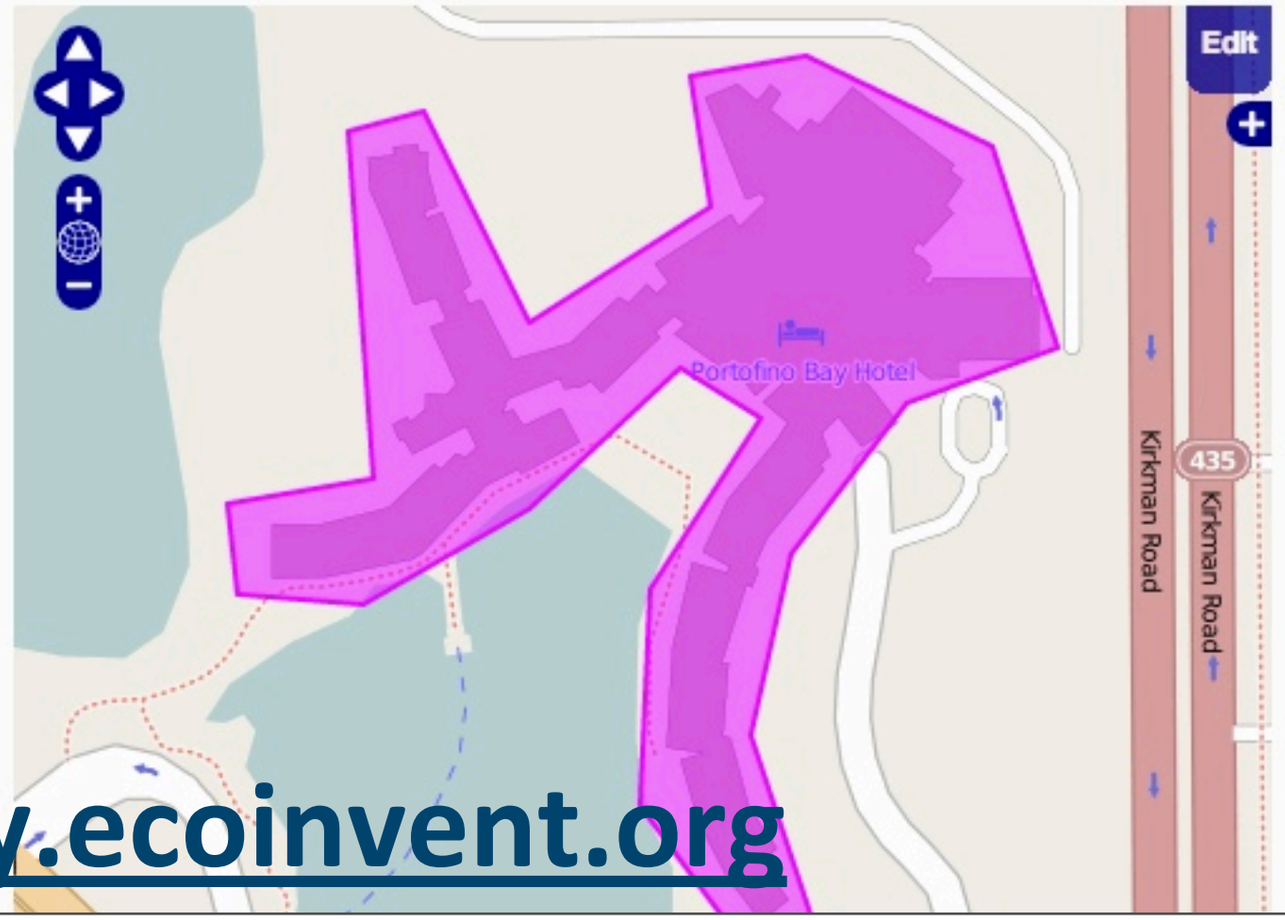
Population density (per km^2)

Population

300.0

The blue plus on the right side of the map switches map providers.

Shape

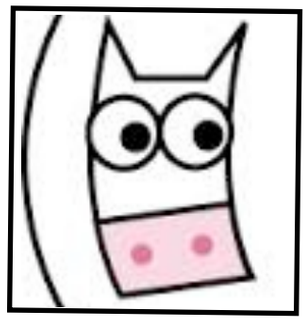


geography.ecoinvent.org

After saving, you can export the XML file, which should be emailed to the ecoinvent geography editor.

Global datasets

Global reference activity



Regional dataset

RoW (Rest of World) dataset

- same reference product
- different production volume
- different set of inputs

- same reference product
- global - regional P.V.
- difference in set of inputs

Credit: http://politicalcalculations.blogspot.ch/2010/02/how-science-is-supposed-to-work.html#.UkCXtGRjQXU

The global reference activity can be split into regional datasets and a “Rest of World” dataset. Emission factors and inputs multiplied by production volumes should sum to the global values.

Spatial resolution

Number of inventory datasets per location, ecoinvent 3.01	
Global	2836
“Rest of World”	2132
Europe	1077
Switzerland	1020
Cut-out continents (e.g. Europe without Switzerland)	119
Other country-level	1583
UN regions & subregions	28
Canadian provinces	268
Transmission grids	219

LCI databases are not yet regionalizing at a high spatial resolution

Strengths & weaknesses

- Good at handling arbitrary geometries
- Good at automatically calculating “Rest of World”
- Good start for regionalized LCA
- Bad at “cut-out” geometries
- Bad at small overlaps
- Bad at points and lines

“Cut-out” geometries are things like “Europe without Switzerland.”

Small overlaps are when GIS coordinates for countries overlap by a few cm^2, due to different data sources.

There is no clear procedure for points and lines, due to “no overlapping” rule.

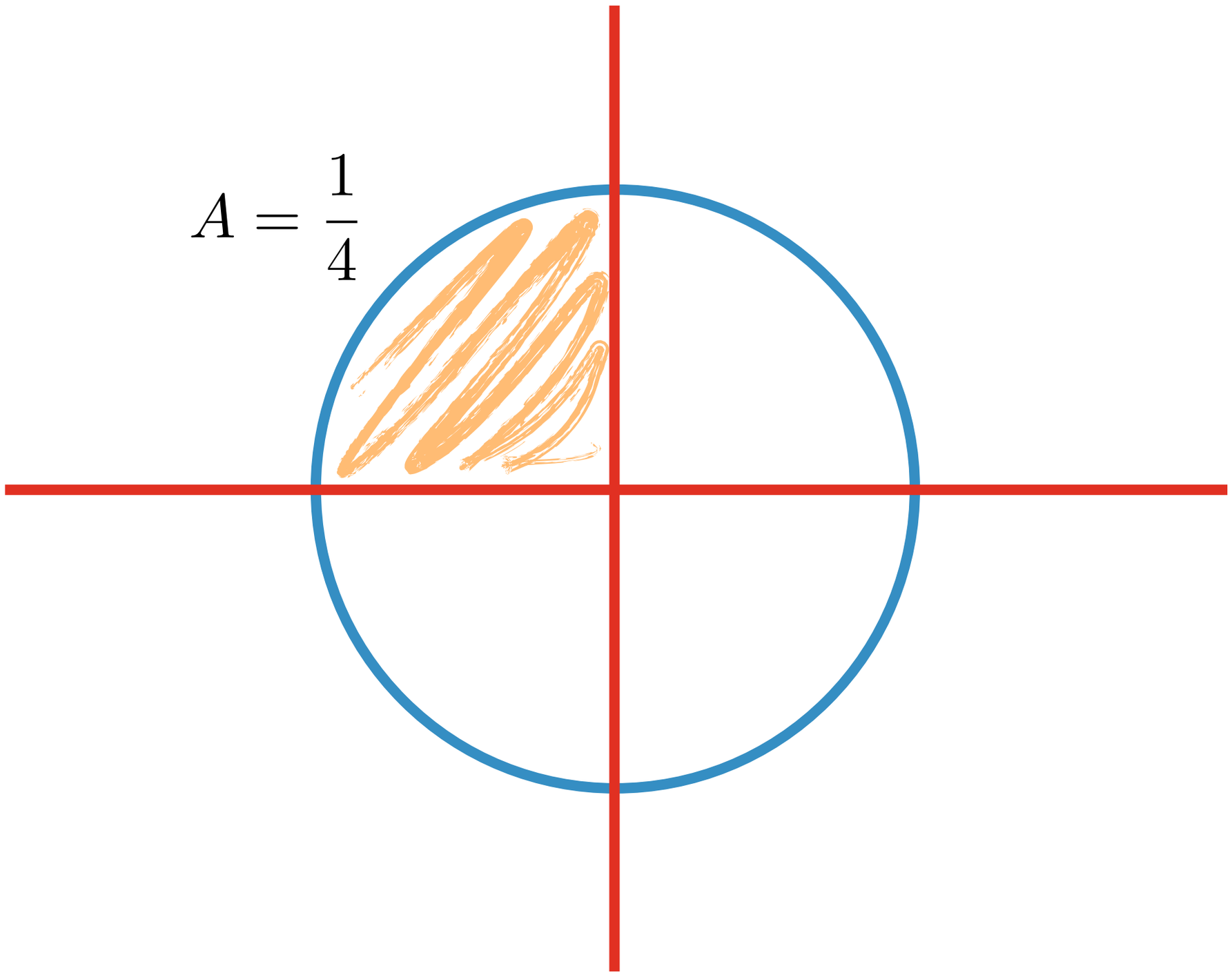
Regionalized LCIA

- Standard is in progress
  - … for many moons
- Basic idea is simple

```
-Shapes
  -Shape id=”some id”
    -KML
-CFs
  -CF shape_id=”some id” value=”1.0” weight=”1.0” flow=”some flow”
    -Parameterization also possible
```

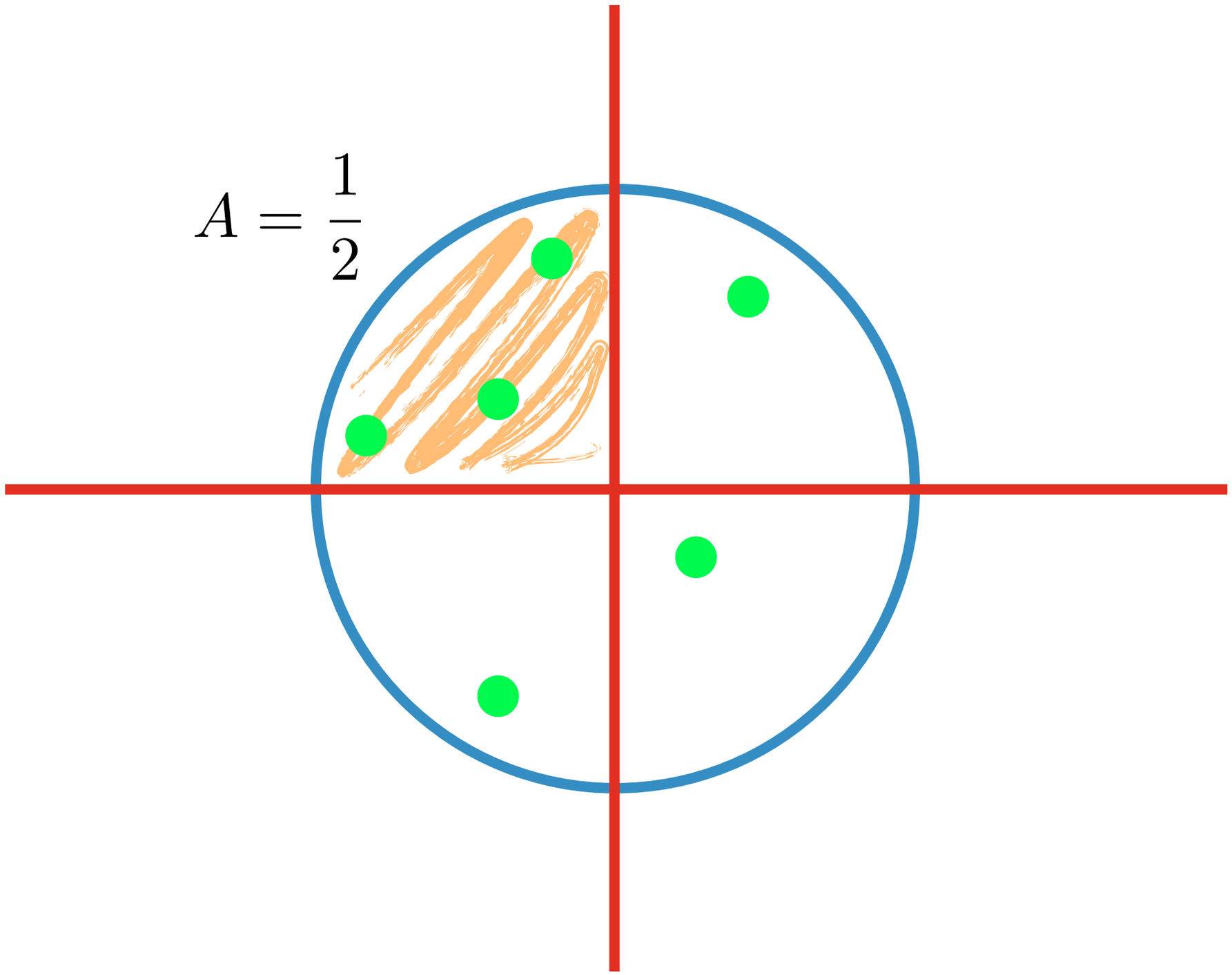
Change of support problem

$$A = \frac{1}{4}$$



How do we match LCI and LCIA maps? One way is by area.

Change of support problem



Another way is by measuring industrial activity. Many times population density is used as a proxy for industrial activity.

Open questions

- Global coverage of regionalized inventories
- Lines and points - without double counting
- Matching spatial scales
  - Weighting and proxy weighting
  - Uncertainty mixes
  - GIS in LCA software?
- Other approaches exist e.g. offshoring presentation

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

ESD
ecological systems design

Thank you for your attention.

 **mutel@ifu.baug.ethz.ch**