ESPON FUORE - Functional Urban Areas and Regions in Europe

https://www.espon.eu/functional-urban-areas-tool

Roger Milego, UAB - Autonomous University of Barcelona
Background
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- Former ESPON OLAP Cubes, developed within ESPON M4D
Objectives
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- Building an updated ESPON OLAP Cube (named in this project ESPON Spatial Multidimensional Database or ESPON SMD) with estimated indicators for FUAs and other functional regions.

- Developing a Web Tool to exploit the new ESPON SMD and facilitate the analysis of the data and benchmarking of the different functional regions.
Selected functional regions
Selection of functional regions (criteria)

- **Type of region**: the region is not a simple aggregation of NUTS, but a territory based on geographical, socio-economic and/or functional relationships

- **Coverage**: at least 28 countries of the 28+4 that compose the ESPON space are covered in a consistent manner

- **Delineation**: clear geometries (ideally based on EBM LAU units) are available and the delineation methodology can be consistently applied over the ESPON space.
Nine functional regions

- TERCET Functional Urban Areas (FUA)
- TERCET Coasts
- Eurostat’s Maritime Service Areas (MSA) Coasts
- Mountains
- Islands
- Sparsely Populated Areas (SPA)
- Border “narrow” (45 min)
- Border “large” (90 min)
- Green Infrastructure potential areas

ESPON GEOSPECS
ESPON GRETA
TERCET FUA

Functional urban areas - reporting units

Regional level aggregation of LAUs (version Census 2011)
Source: ESPON FUORES, 2019
Origin of data: Eurostat - TERCET.
Eurostat’s MSA

MSA coasts - reporting units

Regional level aggregation of LAs (version Census 2011)
Source: ESPON FUORE, 2019
Origin of data: EUROSTAT - Maritime service areas

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Mountains

Mountain massifs - reporting units
Islands - reporting units
Border areas “narrow”
Border areas "large"
Green Infrastructure - reporting units

Regional level aggregation of LAUs (version Census 2011)  
Source: ESPON FUORES, 2019  
Orig of data: ESPON GRETA  
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Methodology
Data sources

- **Indicators**: ESPON Base indicators (demography, employment, education, economy, energy, society, R&D, ITS).

- **Data integrator**: ER Grid 1 km² for Europe + *Ad hoc* grid for Outermost regions.

- **Ancillary datasets**:
  - European Settlement Map (ESM) 10m (JRC)
  - CLC-R (refined) 100m (JRC)
  - Statistical classification of economic activities in the European Community (NACE) (ESPON GEOSPECS, from NSI sources)
Disaggregation/estimation at 1 km²

<table>
<thead>
<tr>
<th>Indicator type</th>
<th>ancillary dataset</th>
<th>CLC classes</th>
<th>weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic, Education,</td>
<td>ESM</td>
<td>Rural, urban, others; class 1</td>
<td>Batista &amp; Poelman 2016</td>
</tr>
<tr>
<td>ITS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment, Society</td>
<td>NACE total population</td>
<td>Main activity sectors; class 2</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Economy, R&amp;D</td>
<td>NACE by type of activity</td>
<td>Main activity sectors; class 2</td>
<td>OCDE</td>
</tr>
<tr>
<td>Energy</td>
<td>NACE by type of activity</td>
<td>Main activity sectors, Eurostat, GHG emissions; class 2 and 3, respectively</td>
<td>EEA Report No 8/2017; Eurostats</td>
</tr>
</tbody>
</table>
Current status

- **Automated** procedures developed (scripts).
- Spatial Multidimensional **Database** set up.
- Demographic indicators already **estimated**. Under validation.
- Currently disaggregating **socio-economic** and other indicators.
Web Data Analysis Tool
Online estimation of indicators by functional region

- **Embedded** in the ESPON FUORE web tool.
- Advanced users will be able to **upload** a NUTS indicator and obtain an **estimation** at **functional region level**.
- Possibility to choose between different **weighting matrices**.
- **Preview** of results on **chart** and **map**
- Results eventually shown in the **web tool**.
In [5]:
# fua = fua.drop(['shape.leng', 'shape.area', 'analytical', 'overlapping', 'index', 'gid', 'id'], axis=1)

In [6]:
def f(x):
   return x

country = interactive(f, x = countries)

In [7]:
display(country)

In [20]:
fua_selected = fua.loc[fua['cntr'] == country.result]

In [21]:
## Do some data cleaning to allow fua plot
fua_t = fua.loc[fua['cntr'] == country.result].T
# fua_plot = pd.DataFrame(fua_t.rename(columns=fua_t.loc['name']).drop(['objectid', 'fua code x', 'fua code y', 'geom', 'fua'], axis=1), columns=fua_t.columns)
fua_plot = pd.DataFrame(fua_t.rename(columns=fua_t.loc['fua name']).drop(['objectid', 'id', 'fua_ind', 'parent id', 'fua'], axis=1), columns=fua_t.columns)
fua_plot['year'] = fua_plot.index
# fua_plot['year'] = fua_plot['year'].str.replace('fua_','').astype(int)
fua_plot['year'] = fua_plot['year'].astype(int)

In [24]:
cities = list(fua_selected['fua name'])
city = interactive(f, x = cities)

Chose the city

In [25]:
widg = widgets.SelectMultiple(
options=cities,
values=[cities[1]],
rows=len(cities),
description='FUA',
disabled=False)

# list(fua_plot.drop(['year'], axis=1).columns.values)

In [26]:
#ignore this
def iteration(my_list, r):

The web tool
ESPON FUORE web tool

- **Main result** of the project.
- Currently in its *alpha version*. *Beta* version in October.
- **Interactive** web tool of interlinked **maps** and **charts**, aimed at comparing and **benchmarking** funcional regions.
- **Time-series** visualisation.
- Powerful **filtering** and **benchmarking** to be implemented in *beta* version.
Some screenshots
Thank you!

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This presentation will be made available at: www.espon.eu/Iasi