Statistical Register of Places: opportunities for climate change and disaster risk related indicators

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From global to local and from local to global: climate change, hazardous events and disasters, sustainability

Which goals and which statistical measures?

UNECE Guidelines for Climate Change (CC) 2020 UNECE CC Core indicators (44), 2022 UN FDES Indicators (130)

UNECE Guidelines related to (2019) Measuring Hazardous Events and Disasters (MHED) and Core indicators (55) 2023

UN-IAEG SDGs Indicators: 231 indicators

The proposal revolution of all these frameworks: the economic, social, environmental and institutional goals have to be developed considering an integrated approach from global to local to leave no one behind

Statistical measures for a common language and is crucial to consider

Common geographies for a common language and for integration among domains

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The effectiveness of indicators and of data depends not only on the statistical design of the data, but also on an adequate geographical disaggregation that can demonstrate geographical variations of phenomena. This involves the creation of a spatial data infrastructure enabling standardized location references for mapping spatial location to statistical data units. It is recommended that the statistical data are referenced to the finest geographical scale possible, down to a geographic coordinate.

The assignment of a unique identifier to each location area allows linking with other statistical and geospatial data associated with the same geographic space. The geocoding of statistical data considerably expands the analytical possibilities, including integrating them into indicators and other data, but also analyzing the data from a geographical point of view.

The provision of these common geographies allow the generation of statistical data in a consistent manner, through cartographic grids or units with administrative or statistical boundaries. These allow statistical data to be aggregated/disaggregated at different levels for the purpose of their integration.

Common geographies for a common language and for integration among domains
An essential step

Istat is changing its production processes and aiming to an Integrated System of Statistical Registers: at the very heart of it lies the Statistical Register of Places (RSBL).

The geographical statistical information of Statistical Register of Places has an increasing potential to consider statistical measures related to climate change and sustainability.

The use of administrative data and of Statistical Registers is essential but it is a big challenge for methodological and institutional reasons related also to confidentiality issues.
Italian Integrated System of Statistical Registers (ISSR)

Business Registers

- Register of Groups of Companies
- Register of Local Business Units
- ASIA
- FARM Register
- Register for Public Administrations (REPA)
- No Profit Register

Basic Statistical Register of Production Units

- Basic Statistical Register of Public Administrations
- Thematic Register of Education

Register of places

- Basic Statistical Register of Activities
- Thematic Register of Labour

Basic Statistical Register of Persons and Families

Thematic Register of Education

Thematic Register of Labour

Register of Administrative and Statistical units

Register of Basic property units and Buildings

Register of Addresses

Enumeration areas

Disability Register

Income Register of Individuals and Households

Register of Basic property units and Buildings
Administrative and statistical data, a big challenge: Statistical Register of Places (RSBL)

RSBL: a complex system with several components

For each register component, variables are being built detailing several characteristics of the entity under study and information on their quality.

The challenge is the production of spatial information able to respond to the heightened need of detail statistical data integrating the different component

The goal is to have a detailed geography for the statistical units of all the other social and economic statistical register and of some surveys to improve statistical analyses

The construction process is complex and faces several issues:

• the very high number of objects involved and
• the integration of components stemming from different sources independent from each other.
Administrative and statistical data, a big challenge for sustainability and climate change: Statistical Register of Places (RSBL)

Statistical Register of Places: Which components?

Administrative territorial units and functional areas (7904 municipalities and LLMA, FUA, DEGURBA …)

Enumeration areas: many different archives of geographic data for 800000 georeferenced enumeration areas and 1.1 million microzones (infrastructures, green areas, ….)

Addresses and geographic coordinates: many administrative archives of data for 30 millions CUI Unique Identification Code of addresses geographic coordination XY of CUI, Quality indicators.

Buildings and basic property units: administrative archives Real Estate Registry from Cadastral agency, geographic agencies and open sources. Buildings are georefered. In 2021 29 millions Buildings of which 14.4 millions are residential.

The integration process has seen different methods applied to different entities in order to reach the highest quality possible result.

The first result can be seen with the production of a preliminary 1km population grid, dwelling data, enumeration areas.
Register of administrative and statistical territorial units with its dynamic portal to enquire structure and changes of territories

**Functionalities**

- Free search by date for lists of territories/classifications
- Free search by period for variations, history of units, legislations
- Visualisations of code changes by period
- Geography comparisons at different dates

**Territories**

- **Ancient geographies**
  Municipalities, Provinces, Circondari, Compartimenti (1861-1947)

- **Administrative geographies**
  Municipalities, Provinces, Metropolitan cities, Liberi consorzi, Regions (dal 1948)

- **Statistical geographies**
  Labour Market Areas and Industrial Districts; NUTS; Functional Urban Areas (FUA); Project Areas (SNAI, non-core areas)

**Classifications**

- **Policy areas** (cohesion policy)
- **Geographic and territorial**
  Elevation zones, Ecoregions, Littoral municipalities, etc.
- **European (Tercet)**
  Degree of urbanisation, Coastal areas, Mountain, Ecoregion etc.
RSBL Enumeration areas

It is a geo-referenced archive in which the territory of all 7,904 Italian municipalities is divided into enumeration areas (400,000 to 800,000) and micro-zones based on land cover (built-up, natural, infrastructure, water, etc.)

- Improved precision and detail of the drawing (significant increase in the number of vertices that make up the polygons of the sections)
- Consistency with land cover, evidenced through aerial photos
- Greater articulation of the 2011 sections of "scattered houses" (part of the residual territory with respect to inhabited localities)
- Delimitation of particular geographical objects (roads, infrastructures, rivers, agricultural and forest areas, etc.)
- In the past 2006 and 2016 dissemination .... provisional Enumeration Area’s 2021 is going to be published
- Integration validation and national mosaication is going to take place: first results in the next months
### RSBL Enumeration Area: an example of land classification

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Area or building for residential use</td>
</tr>
<tr>
<td>5</td>
<td>Urban park</td>
</tr>
<tr>
<td>6</td>
<td>Port area</td>
</tr>
<tr>
<td>8</td>
<td>Military barracks</td>
</tr>
<tr>
<td>9</td>
<td>Hospital, care institute,</td>
</tr>
<tr>
<td>10</td>
<td>Rail and railway infrastructure</td>
</tr>
<tr>
<td>12</td>
<td>Productive activities</td>
</tr>
<tr>
<td>16</td>
<td>Sports facility</td>
</tr>
<tr>
<td>19</td>
<td>Temporary detention centres for foreigners</td>
</tr>
<tr>
<td>22</td>
<td>Woodland</td>
</tr>
<tr>
<td>24</td>
<td>Penal institutions</td>
</tr>
<tr>
<td>25</td>
<td>Hotel, campsites, ecc.</td>
</tr>
<tr>
<td>26</td>
<td>Agricultural area</td>
</tr>
<tr>
<td>27</td>
<td>Lighthouse</td>
</tr>
<tr>
<td>29</td>
<td>Communal house</td>
</tr>
<tr>
<td>31</td>
<td>Museum area</td>
</tr>
<tr>
<td>37</td>
<td>Community services: schools, telecommunications etc.</td>
</tr>
<tr>
<td>50</td>
<td>Potabilizers</td>
</tr>
<tr>
<td>55</td>
<td>Shopping centers</td>
</tr>
</tbody>
</table>
Enumeration Area’s 2021: an example of land classification

- 64 Olive trees
- 63 Fruit trees
- 26 Cropland
- 28 Sparsely vegetated areas
- 21 Quarries
Enumeration Area’s 2021: Green areas

Monumental villa: A very big elegant building surrounded by gardens of historical significance

Green Urban areas: parks in urban areas rich in meadows and trees

Woodland: FAO definition ‘land with tree crown cover (or equivalent stocking level) of more than 10 percent and an area of more than 0.5 hectares (ha)’
RSBL- Addresses

**CUI**: Unique identification code of address

- **[CUI]**: 30 mln
- **[CUI-EAs]**: 27.8 mln (95%)
- **[CUI-XY]**: 24.1 mln (80%)

**Geographic Coordinates**

- **Annccsu**: National Archive of Addresses of Urban Streets
- **LAC**: Administrative Archive of resident population
- **AT**: Internal Revenue Agency
- **Cens2011**: Addresses used in Census Population 2011
- **RLP**: Real Estate Registry
Tipology of Geographic Coordinates

- Point Addresses
- Interpolated
- Approximated

Census Block
The main administrative source is the Cadastral Administrative Archive, which registers any Real Estate unit, therefore not only residential buildings. Other sources are considered: Regional Cartography, National Geoportal, Open Street Maps

Buildings have been georeferenced. The information of the geographical center of gravity is used to improve the quality of the georeferencing of the statistical units. The addresses of the buildings and of the dwellings are considered.

Dissemination of dwelling May 2023.

Geostatistical analyses, integrated new indicators and possible future uses for climate change and disaster risk statistics are ongoing ...also with Civil Protection and Ministry of Environment and Energy
RSBL: Buildings and Basic property units Register *(data expressed in thousands)*

**BUILDINGS**
- Total: 29,830
- Residential: 16,810
- Non-residential: 13,020

**CONVENTIONAL DWELLINGS**
- Total: 35,272
- Occupied: 26,041
- Unoccupied: 9,231
From administrative data to statistical data, a big challenge for RSBL integration and for Integrated Register System

**Process:** updates of administrative archives, processing to check the quality of data

Methodological approach to consider the **interlinkages and complex integration strategies** considering the confidentiality issues

**Integration** of RSBI population register (also census) with the RSBL Register of the Places to consider the population in. **Integration** of **Economic registers** with the RSBL in progress: experimental phase

Every kind of information with geographic coordinates could be integrated. The final integrated product will allow the possibility of geo-referencing information for flexible outputs.

**Climate change and sustainability statistics** can be improved considering anthropic pressure
From administrative data to statistical data: a big challenge for RSBL integration and for the Integrated System of Statistical Registers

CUI = Address identifier
UIU = Basic property unit identifier

CUI – UIU = Link stemming from the integration process in RSBL
From administrative to statistical data, a big challenge for climate change, hazardous events and disasters, sustainability: Statistical Register of Places (RSBL)

Looking at hazardous events and disasters
From administrative to statistical data, a big challenge for climate change, hazardous events and disasters, sustainability: Statistical Register of Places (RSBL)

The geographical statistical information of Statistical Register of Places has an increasing potential to consider statistical measures related to climate change, hazardous events and disasters, sustainability.

- Ex-ante analysis of areas presenting high risks of fires, flood, or earthquake, …
- Ex-post analyses of areas hit by natural disasters, production of tool-set of ready statistical indicators
- Disaster Prevention: Building at less than a specified distance from rivers, lakes, sea …Buildings next to industries, Buildings in contaminated toxic areas
- Disaster Recovery: Building in areas hit by earthquakes, landslides, floods, extreme weather conditions, caught on fires …
- Building involved in severe heatwave in large municipalities
- Green cover in urban areas using high resolution remote sensed images via the production of vegetation indices, and extraction of statistical information linked to the total vegetation cover in the major Italian urban centres; very useful to consider sustainability and climate change indicators
- Air pollution analysed considering very detailed territorial area and linked with exposed population
- Land consumption, Protected areas, Energy consumption in residential buildings …
WebGIS for geo-referenced statistics

Census mapping cartography and indicators with hospitals overlaid
Population Grids: from local to global

Population grid statistics as an alternative to population statistics for administrative areas. Population grids are a powerful tool to describe our society and to study the interrelationships between human activities and the environment. They are particularly useful for analyzing phenomena, and their causes, which are independent of administrative boundaries, such as, fires, flooding, commuting and urban sprawl, air pollution …

320,000 cells
400mila polygons in EAs2011
700mila polygons in EAs2021
Population Grids on Gistat
Population Grids on Gistat: flood in Emilia Romagna
Population Grids on Gistat: flood in Emilia Romagna
Population Grids on Giset: fires in Palermo (waste release) and air pollution
Climate Change, Disaster and Hazardous events, territorial and geographic data: statistics to not leave behind are necessary and possible

A richer statistical mosaic to integrate the different dimensions promoting improvements in the production of statistical measures inside the national statistical system

From Global to local and from local to global for a common language: geostatistical and territorial analyses are integration factors because in territory the integration among economic, social, environmental, institutional domains could improve looking forward to Climate change, hazardous events and Sustainability

An increasing work in progress… dissemination ready and in the next months:

- Gis tool for Population Grid and for enumeration areas
  https://www.istat.it/it/archivio/155162
- Final Population Grid 2021
- Final enumeration areas 2021 considering 2021 Population

Thanks for your attention

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