The European Commission’s science and knowledge service

Joint Research Centre
Global Human Settlement data in support of SDG’s Achievements and Technical Challenges

Daniele Ehrlich and GHSL team

Session Title: Innovative Techniques for Big Earth Observation Data Analytics

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Global Mapping of Human settlements with EO data

Recent developments in the Global Human Settlement Layer

http://ghsl.jrc.ec.europa.eu

Address the exponential growth of incoming EO image streams
First available multi-temporal assessment of human settlements
First available multi-temporal assessment of human settlements
Multi-temporal built-up dataset

HANOI, VIETNAM

Global Human Settlement Layer
Multitemporal layer of Built-up

Legend
- BU 2014
- BU 2000
- BU 1990
- BU 1975

Global Human Settlement Layer
Built-up

2015
2000
1990
1975
New degree of urbanization map
13000 City Centres
GHSL – City Centre Database

Geography
- Elevation
- Travel time to capital
- River basin
- Income class
- Name of the center
- etc.

Environment
- Climate
- Biome
- Temperature
- Precipitation
- Greenness
- CO₂ concentration
- PM2.5 emission

DRR – exposure to
- Flood
- Earthquake
- Storm surge
- Heatwave

Socio-economic
- Population
- Built-up areas
- GDP
- HDI
- Nighttime lights
- area

Estimate 3 SDG indicators

GHSL – City Centre Database SDG-11
Global Built-up area map

First available multi-temporal assessment of human settlements
Characteristics of the automatic image information mining of GHSL

- **Robustness** towards Real-World Big Earth scenarios that involve large-volume, largely heterogeneous/unstructured data sources and **rapidly changing data specifications**, 
- Enhanced **semantic interoperability** and robustness against multi-stakeholder international information decision support scenarios 
- Effectiveness in **time-critical image-derived** analytics requirements set by crisis management applications.
GHSL scope

• Operates in an **open and free data and methods access policy** (open input, open method, open output),

• Facilitate reproducible, scientifically defendable, fine-scale, synoptic, complete, planetary-size, and cost-effective information production,

• **Facilitate information** sharing and multilateral democratization of the information production, and collective knowledge building.
Requirements

• GHSL procedures avoids the use of Artificial Intelligence methods based on stochastic iterative optimization processes as Random Forest, Deep Learning and similar frameworks

• GHSL methods are deterministic in order to generate reproducible results over time.

• The data must provide univocal set of explicit rules that can be publicly controlled and that provide a objective understanding of the issue
Self-learning, artificial intelligence data cubes

Information refinement, Knowledge Abstraction levels (semantic depth)

Space

Time

z

y

x

Adaptive self learning / optimization

Reference tiling system

Version numbering

Global grids

Large-volume, rapidly-changing, heterogeneous multi-stakeholder data immersed in artificial intelligence ecosystem supporting the extraction of information, evidences and knowledge by automatic associative analysis in the spatial and thematic data domains
GHSL - Global Human Settlement Layer

A new open and free tool for assessing the human presence on the planet

- Produces new global spatial information, evidence-based analytics and knowledge describing the human presence on the planet
- Operates in an open and free data and methods access policy (open input, open method, open output)
- Supported by the Joint Research Centre (JRC) and the DG for Regional Development (DG REGIO) of the European Commission, together with the international partnership GEO Human Planet Initiative

News

05/02/2018 The new GHSL city centres data base describes more than 10,000 urban centres identified by the application of the "Degree of Urbanization" model to the GHSL baseline data

https://ghsl.jrc.ec.europa.eu/