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Joint Research Centre



GEO Human Planet Initiative

GEO GROUP ON
EARTH OBSERVATIONS



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

United Nations World Geospatial Information Congress

DEQING, CHINA

19-21 November 2018

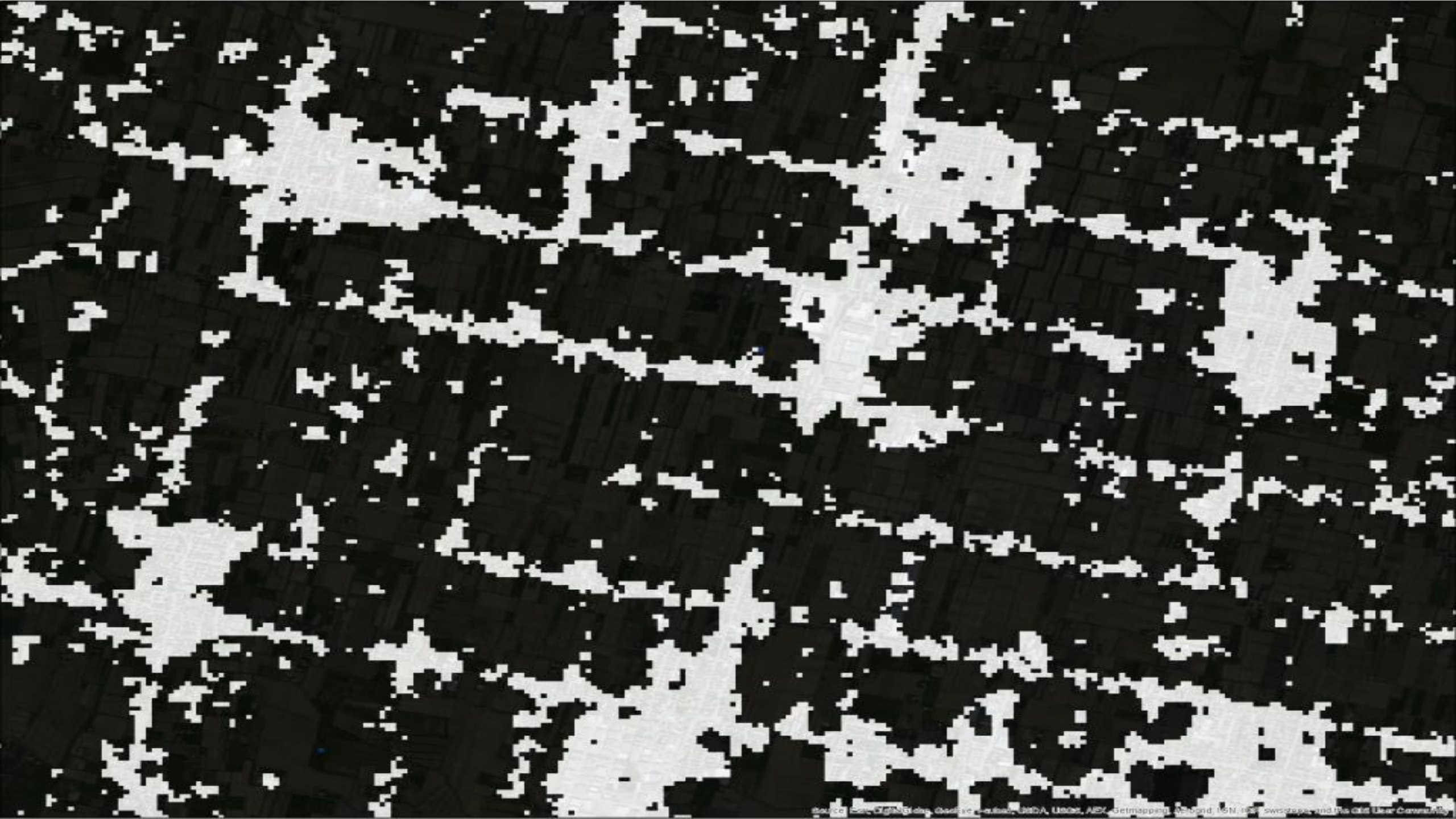


Global Mapping of Human settlements with EO data

Recent developments in the Global Human Settlement Layer

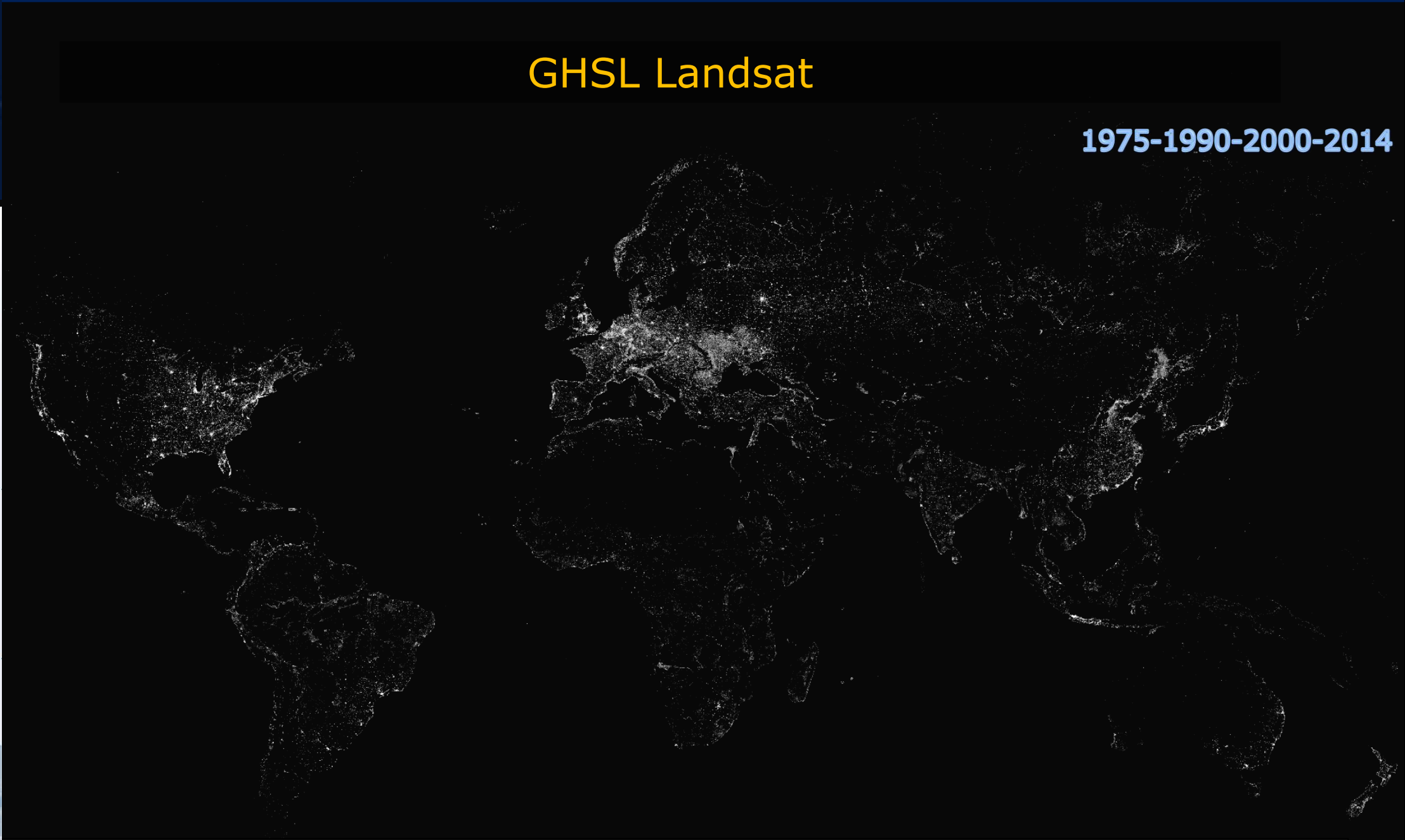
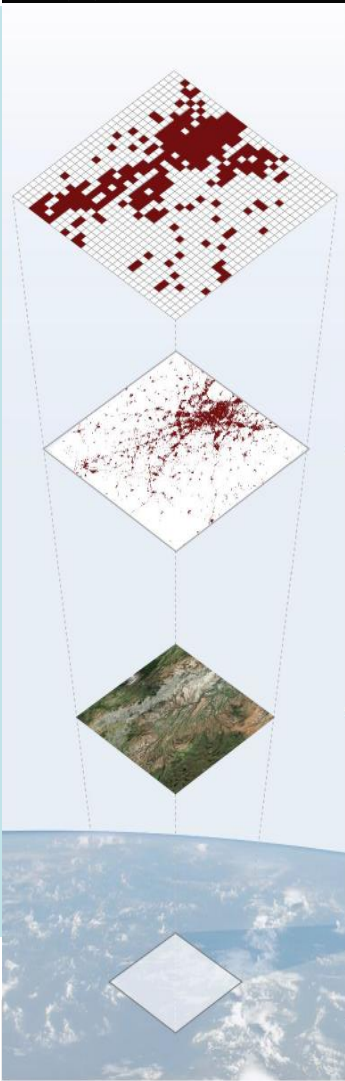
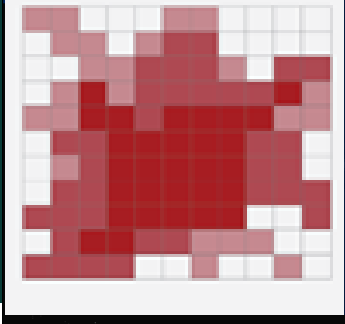
<http://ghsl.jrc.ec.europa.eu>

Address the exponential growth of incoming EO image streams



GHSL Landsat

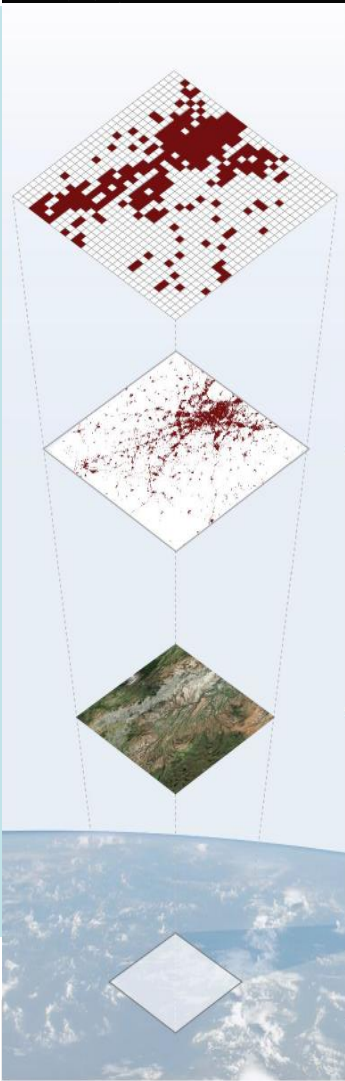
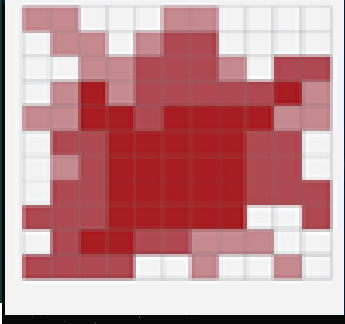
1975-1990-2000-2014



First available multi-temporal assessment of human settlements

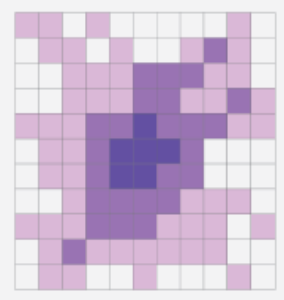
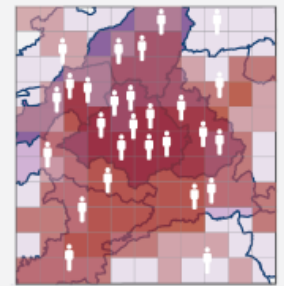
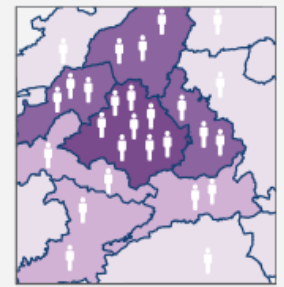
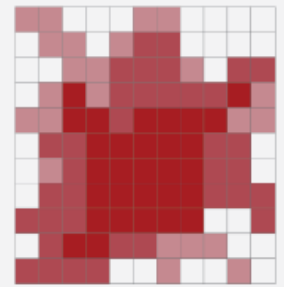
GHSL Landsat

1975-1990-2000-2014

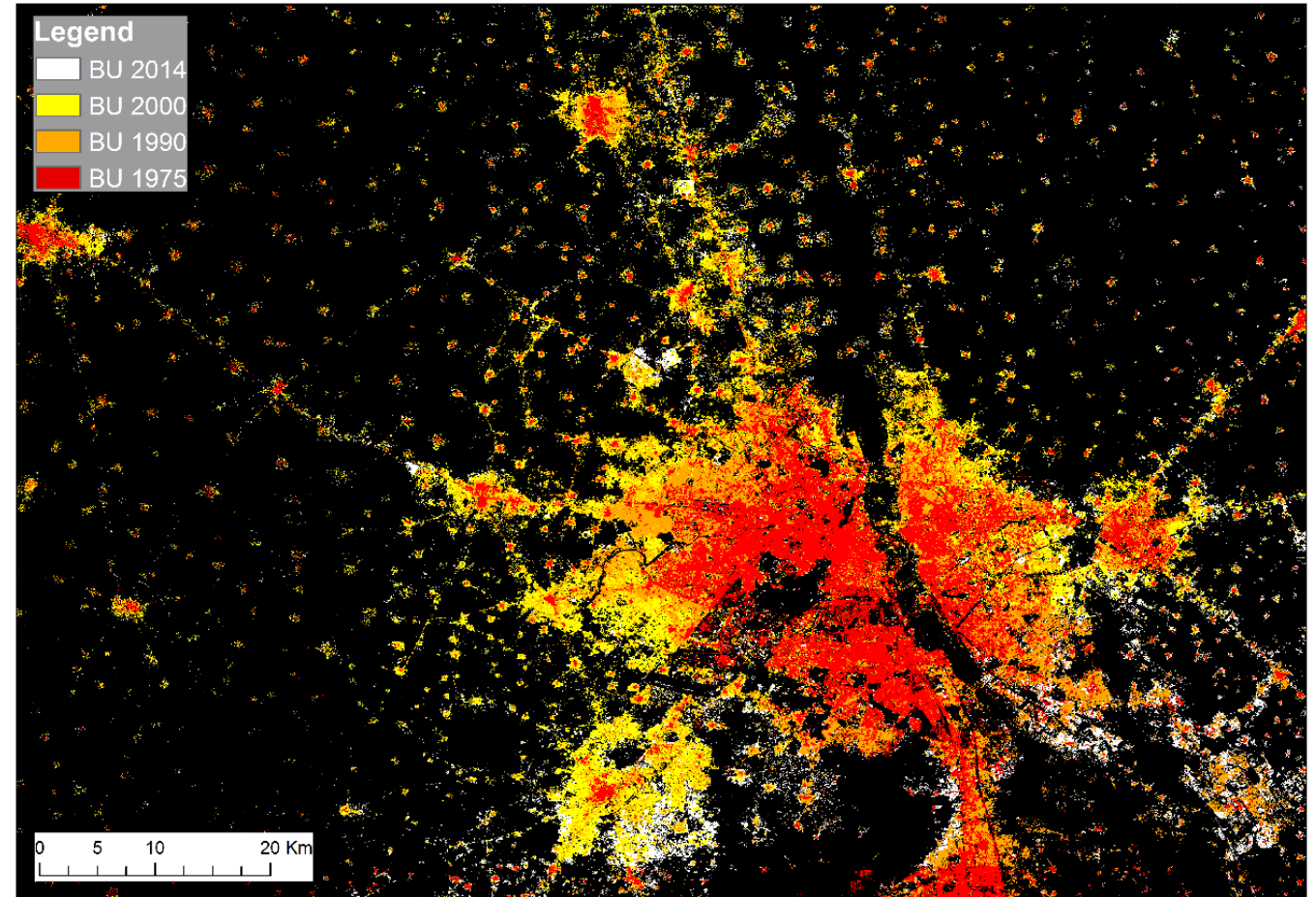
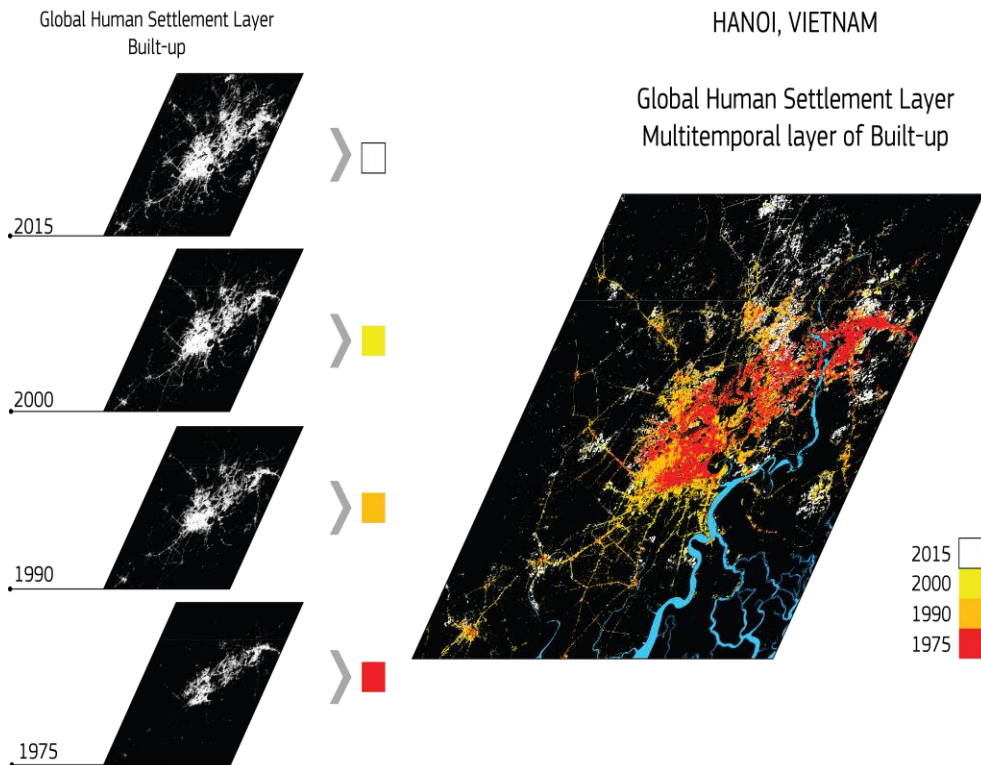


First available multi-temporal assessment of human settlements

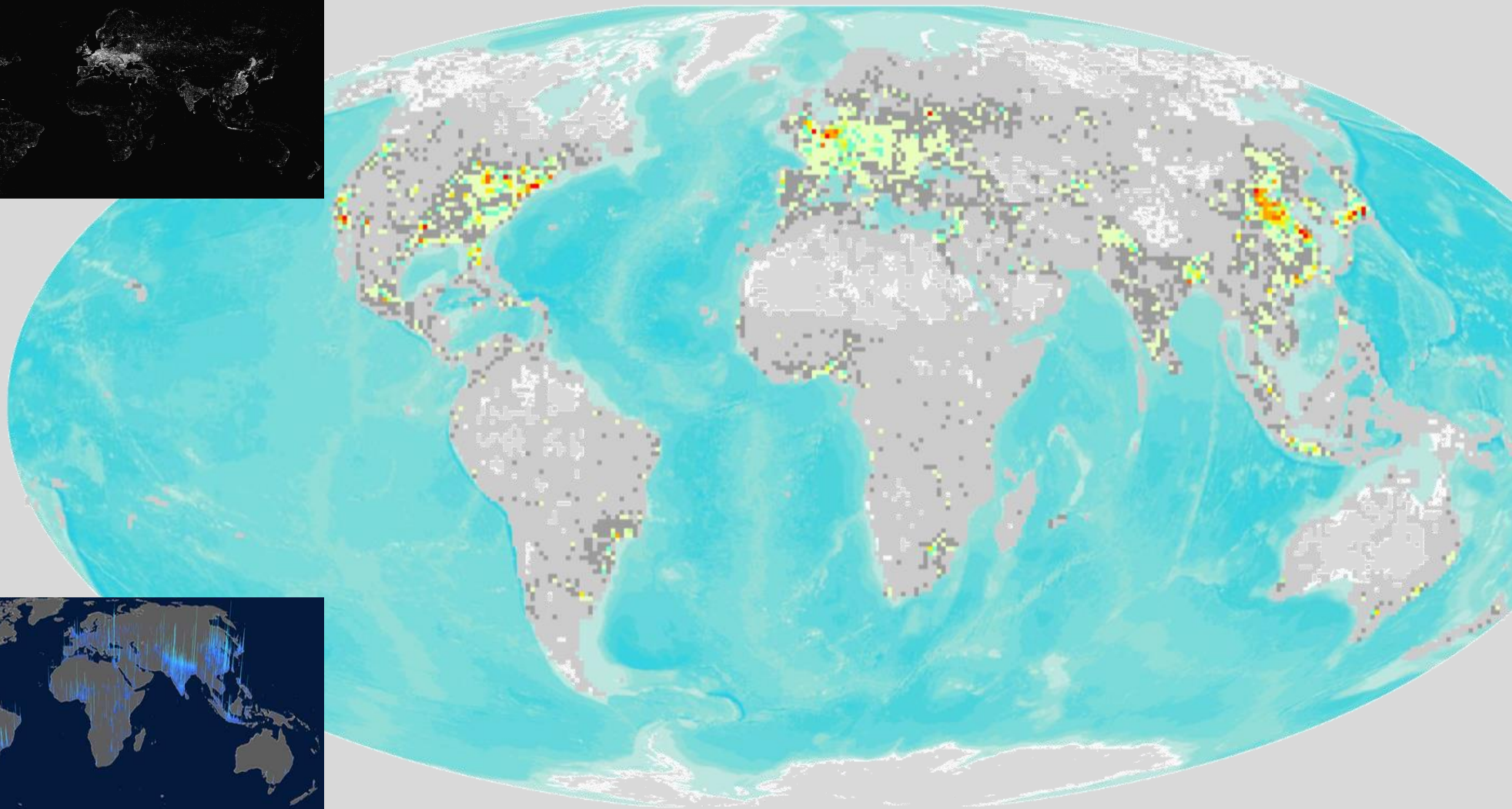
Global Population density



Multi-temporal built-up dataset



New degree of urbanization map



Urban Centre
(HDC)

Urban Cluster
(LDC)

Rural Grid
Cells



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

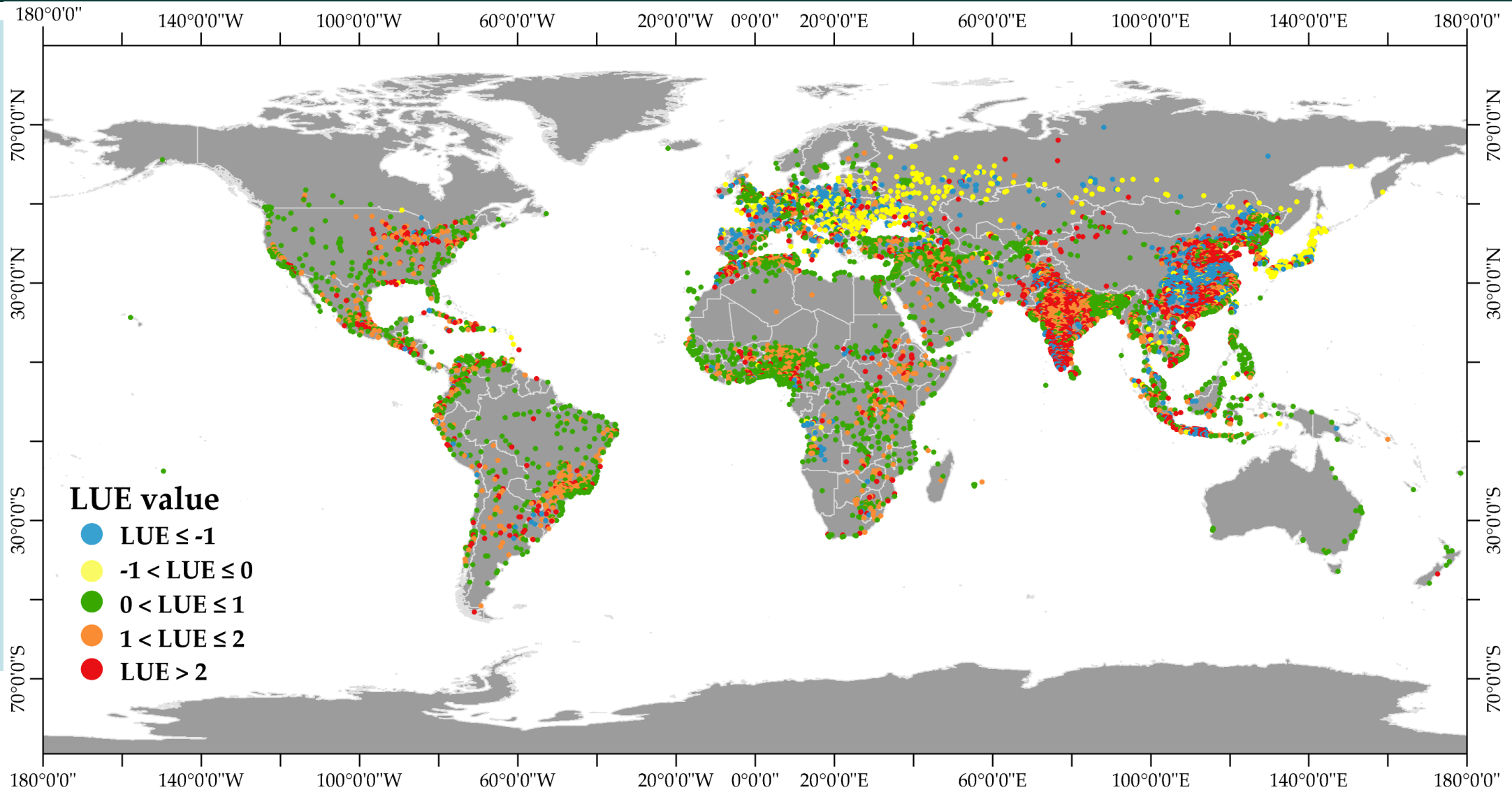
- Population
- Built-up areas
- GDP
- HDI
- Nighttime lights
- area



Estimate **3 SDG** indicators

Multi-temporal information
1975-1990-2000-2015

GHSL – City Centre Database SDG-11



Global Built-up area map

1975-1990-2000-2014



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

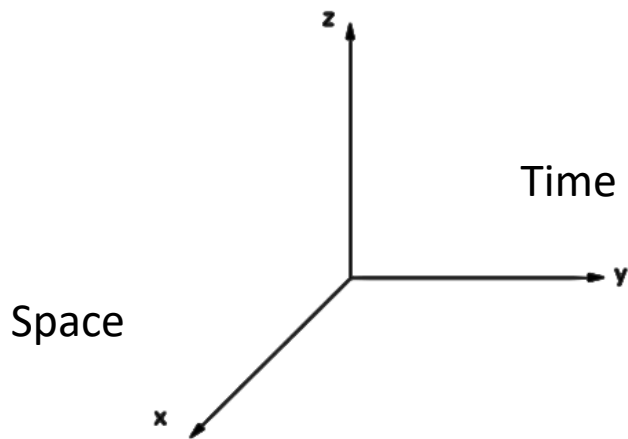
- Operates in an open and free data and methods access policy (open input, open method, open output),
- Facilitate reproducible, scientifically defensible, fine-scale, synoptic, complete, planetary-size, and cost-effective information production,
- **Facilitate information** sharing and multilateral democratization of the information production, and collective knowledge building.

Requirements

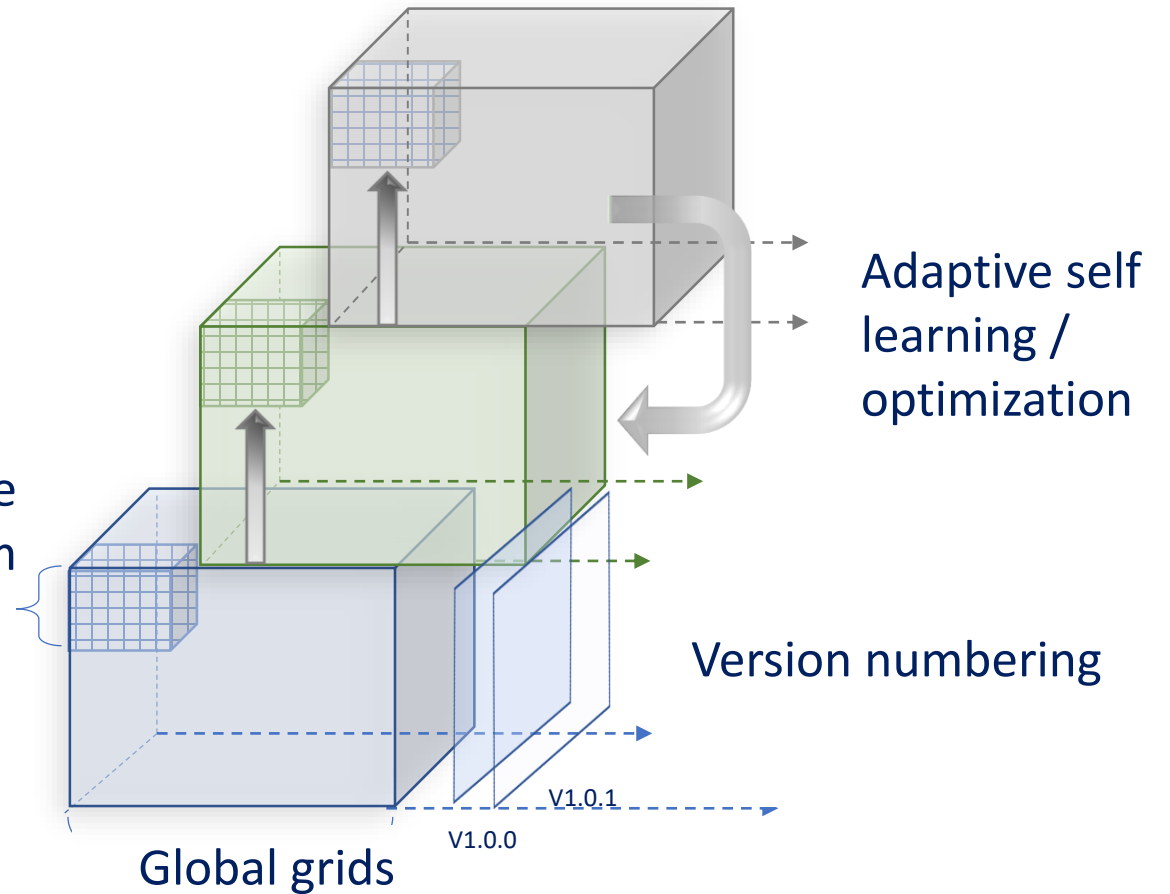
- GHSL procedures avoids the use of Artificial Intelligence methods based on stochastic iterative optimization processes as Random Forest, Deep Learning and similar frameworks
- GHSL methods are deterministic in order to generate reproducible results over time.
- The data must provide univocal set of 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*)



Reference
tiling system



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



EUROPEAN COMMISSION

Global Human Settlement

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- Home
- About
- Copernicus
- GEO
- Documents
- Atlases
- Applications
- Global Definition
- Data
- Tools
- Visualisation
- News

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*



2000

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