Geospatial Earth Intelligence for the **Human Planet**

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9 July 2025

European Commission

Human Settlement information is essential for policy frameworks and crisis management

UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

SUSTAINABLE DEVELOPMENT GOALS

TOGETHER TOWARDS H III HABITAT III

11 SUSTAINABLE CITIES AND COMMUNITIES

PARIS2015 UN CLIMATE CHANGE CONFERENCE COP21·CMP11

European Green Deal

mission to deliver Earth Intelligence to everyone, everywhere.

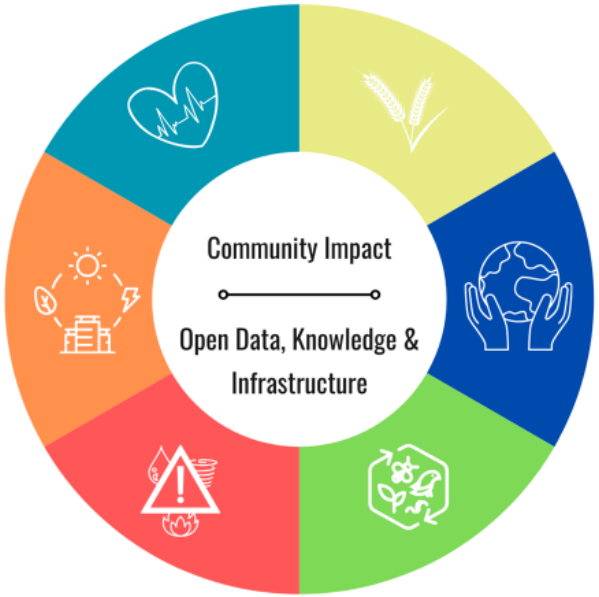
GEO is a global partnership involving 116 governments and over 162 organizations from academia, business, United Nations and civil society.

GEO brings together Earth Observation providers and users to promote **free, open and equitable access** to EO data and Earth Intelligence solutions.

By sharing this wealth of information and research, we ensure that **decisions made for Earth's future are based on the best available knowledge.**

GEO Post-2025 Work Programme

- Co-producing **Earth intelligence** solutions to address complex global challenges
- developing user-driven, integrated products and services that inform decis and empower society



Focus Areas:

- agriculture and food security
- water and land sustainability
- ecosystem, biodiversity and carbon management
- weather, hazard and disaster resilience
- **climate, energy and urbanization**
- one health
- community impact
- open data, knowledge and infrastructure

Human Planet

Challenge
Transform vast open geospatial data into **actionable intelligence that fully characterizes human settlements** (social, economic & environmental) to inform climate action, disaster risk reduction and the SDGs.

Solution
A global partnership leveraging advanced Earth observation, geospatial data and statistics to deliver **policy-relevant insights across multi-sectoral thematic areas**.

Impact

- Closes human settlement data gaps & supports SDGs
- Enhances risk knowledge and informs policy processes

https://earthobservations.org/groups/geo-human-planet

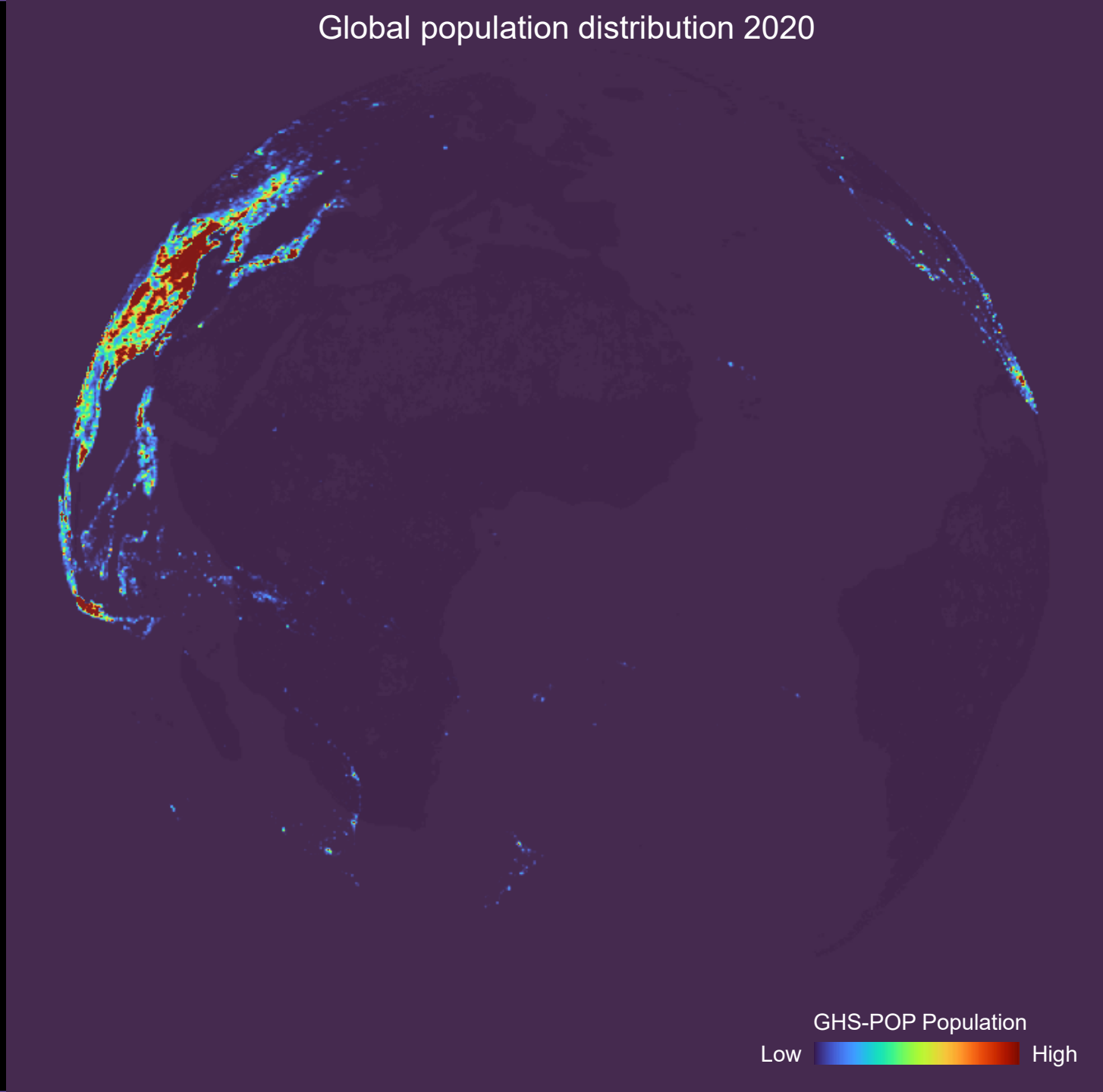
The Global Human Settlement Layer (GHSL) R2023A

maps characteristics of the built environment and the presence of human population

- at fine spatial resolution
- over long time periods (1975-2030)
- globally and consistent
- based on satellite & census data
- evidence-based policy action
- simple and easily interpretable assumptions

Designed to help stakeholder discussions

PESARESI, Martino, et al. Advances on the Global Human Settlement Layer by joint assessment of Earth Observation and population survey data. *International Journal of Digital Earth*, 2024, 17.1: https://doi.org/10.1080/17538947.2024.2390454



AI for shared understanding of geospatial Earth intelligence

	mainstream AI (largely dominating today R&D)	**AI for shared understanding** (largely to be developed, GHSL a small example)
Decisional paradigm	single decision-maker immersed in a competitive environment	multiple decision-makers immersed in a both cooperative and competitive environment (peer-negotiation frame)
Rationality model(*)	problem solving	problem setting
AI design & evaluation	focus on Efficiency and Accurateness criteria	focus on human-centric AI criteria
Goal of a good AI	competitive advantage	facilitate the **discussion on the problem setting criteria and the convergence of multiple informed decision-makers to a single policy decision**, based on Big Earth Data analytics
AI system paradigm	“command and control”	“shared platform” of **mediating artefacts** allowing the processing of Big Earth Data for collective understanding

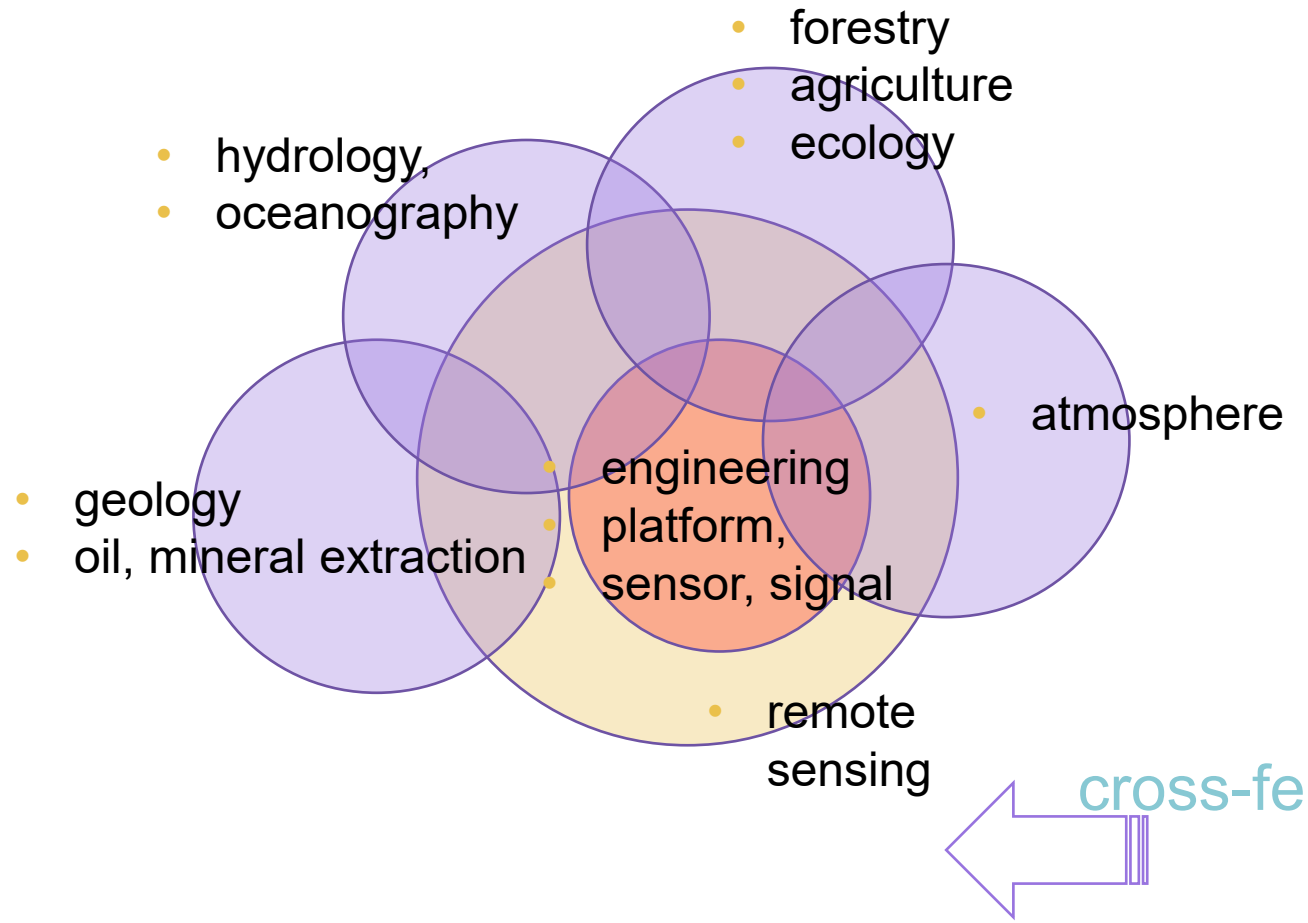
genesis of the GHSL : g-‘**H**’-s-l

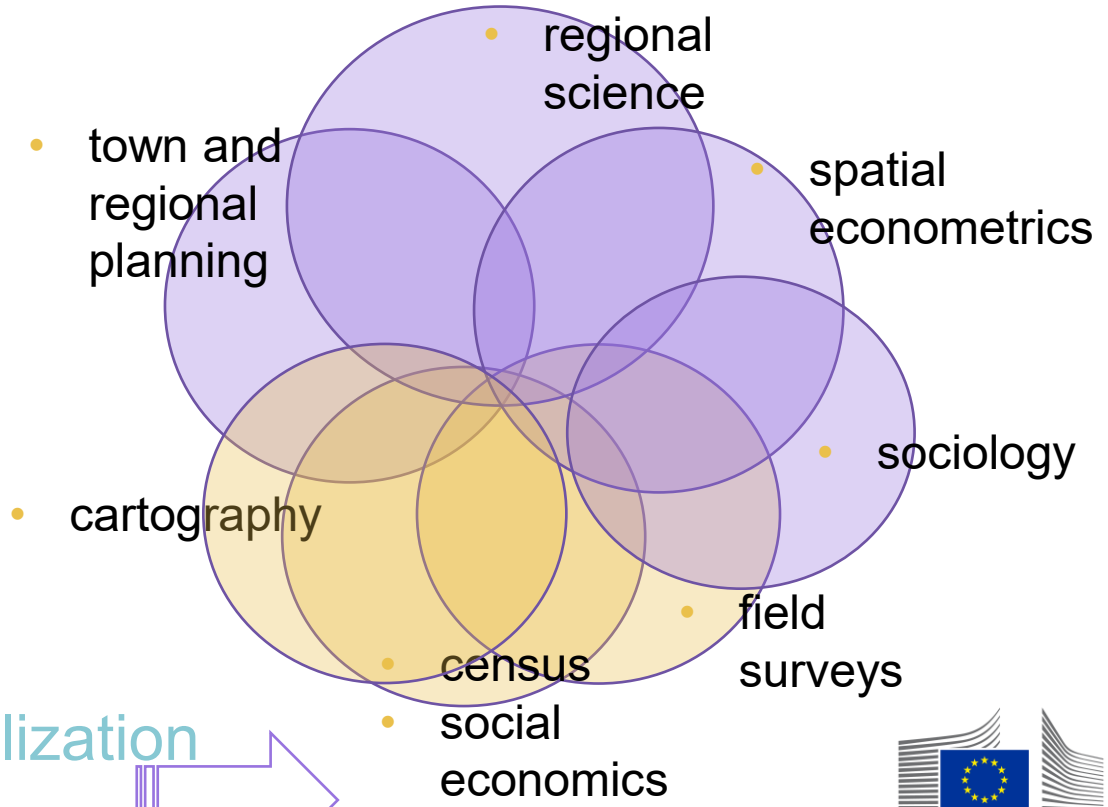
- earth sciences

→ *focus on monitoring*

- social sciences,
- econometrics,
- analysis of public policies

→ ***focus on understanding the logic of the human action***





cross-fertilization

GHSL information is *continuous quantitative*, centered on the presence of buildings (built-up surface and building volume per spatial unit) and their inhabitants (number of residents per spatial unit).

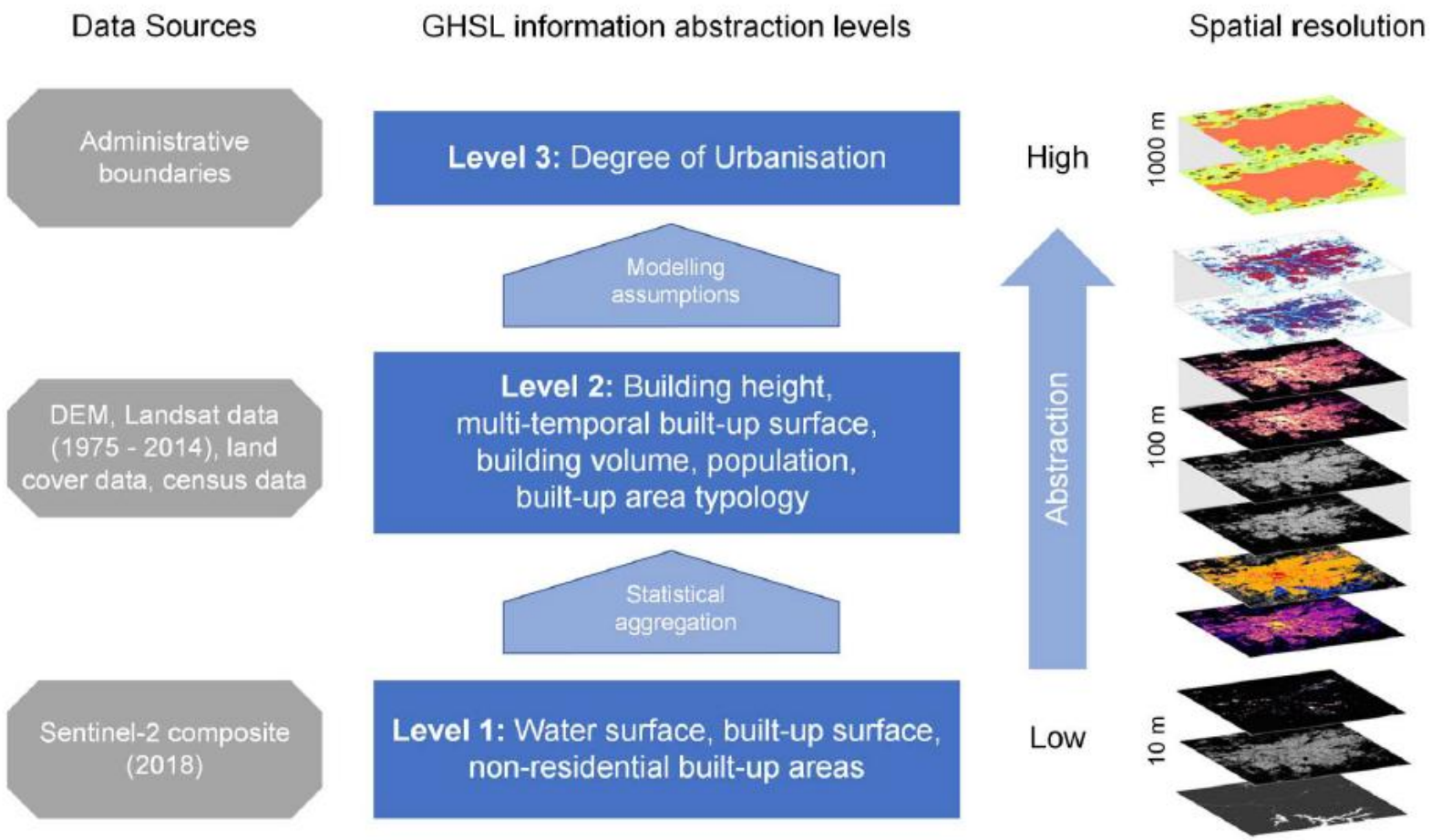


Figure 4. The GHSL hierarchical multiple-abstraction meta-model (HAMM) for spatial information production.

(**) PESARESI, Martino, et al. Advances on the Global Human Settlement Layer by joint assessment of Earth Observation and population survey data. *International Journal of Digital Earth*, 2024, 17.1: https://doi.org/10.1080/17538947.2024.2390454

GHSL example

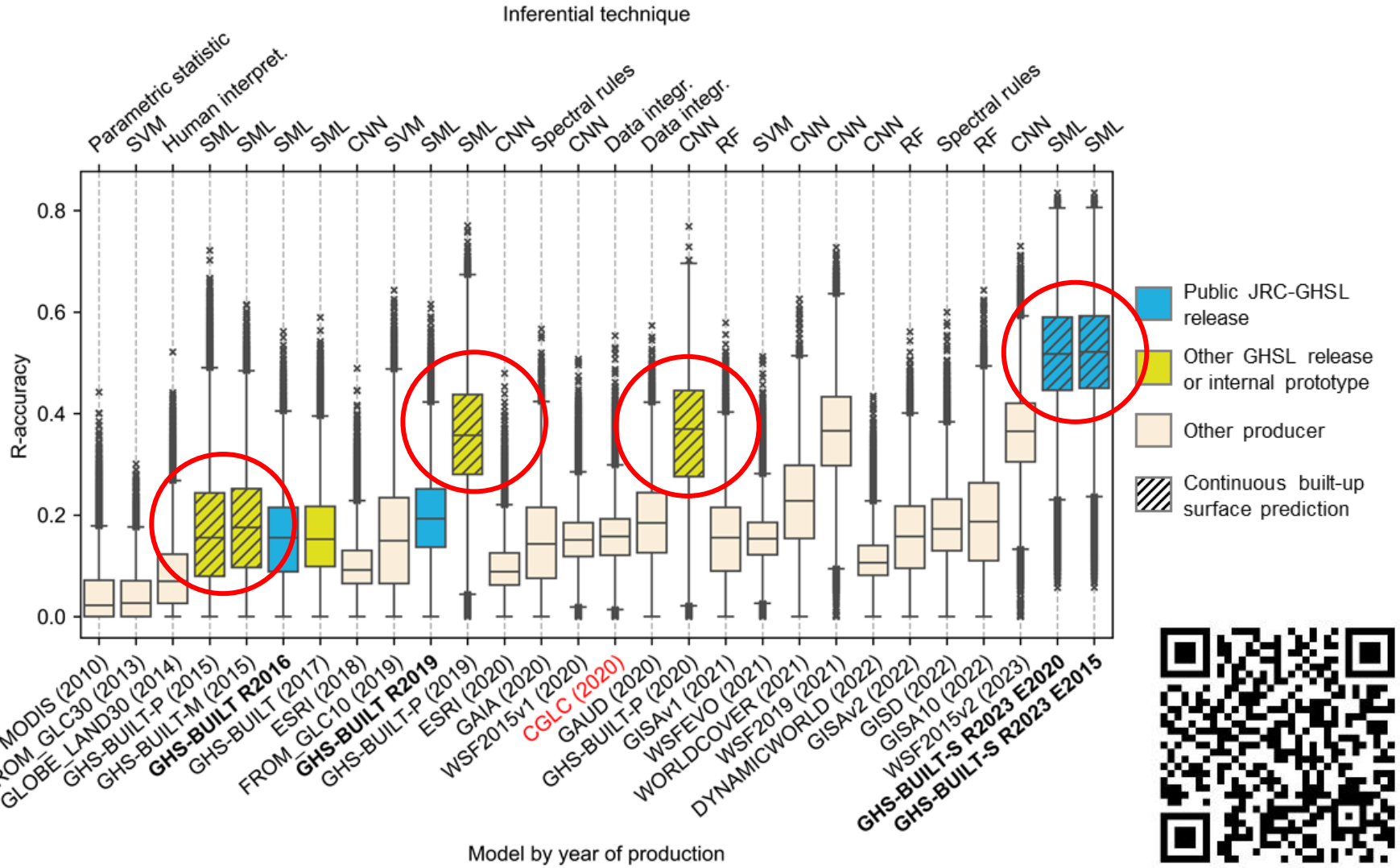
- "Responsible AI Design" applied to Big Earth Data for Policy domain
  "*to design AI applications that are transparent, comprehensible, monitorable and accountable by design, backed up by frameworks for auditing and evaluating with agreed international standards*" (*).

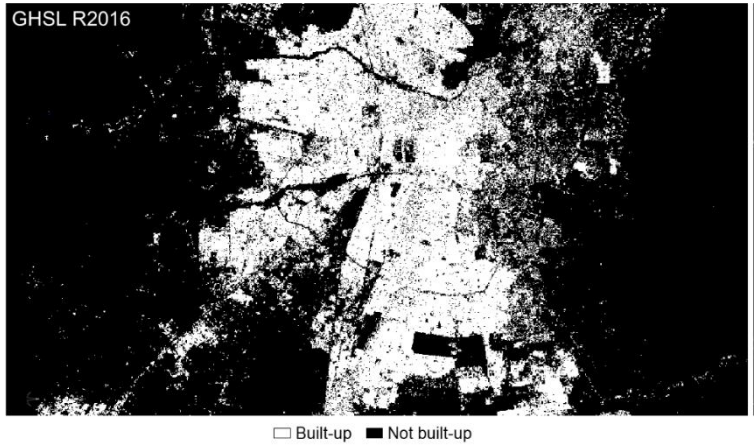
- "AI for shared human understanding"
  multiple-abstraction semantic (**), facilitating multiple-stakeholder problem setting

  human understandable model (**) facilitating discussion on the principia and convergence on collective decisions

(*) European Commission: Joint Research Centre, *Artificial intelligence – A European perspective*, Publications Office, 2018, https://data.europa.eu/doi/10.2760/11251

Self-evolutionary learning approach

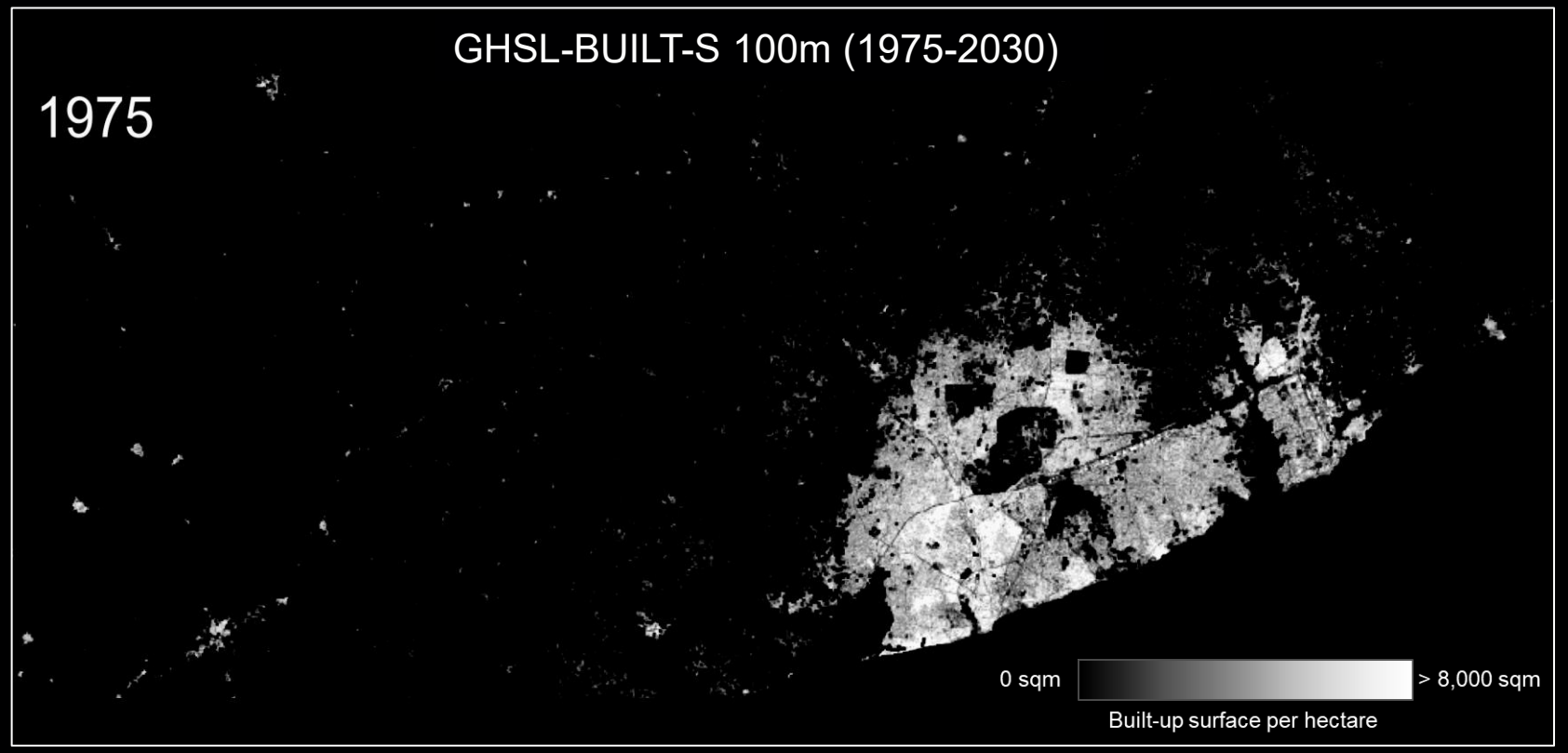


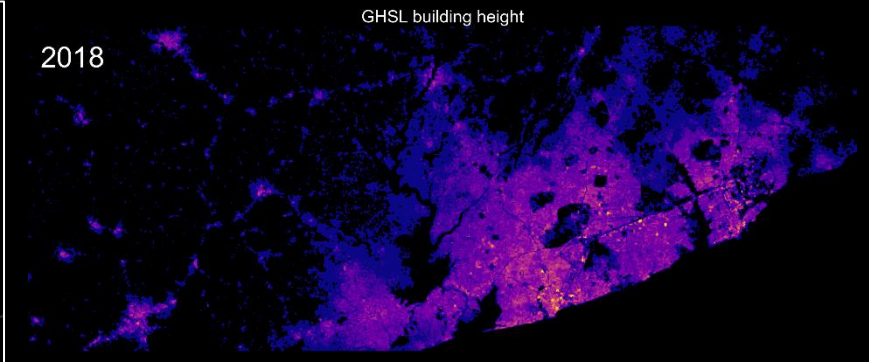


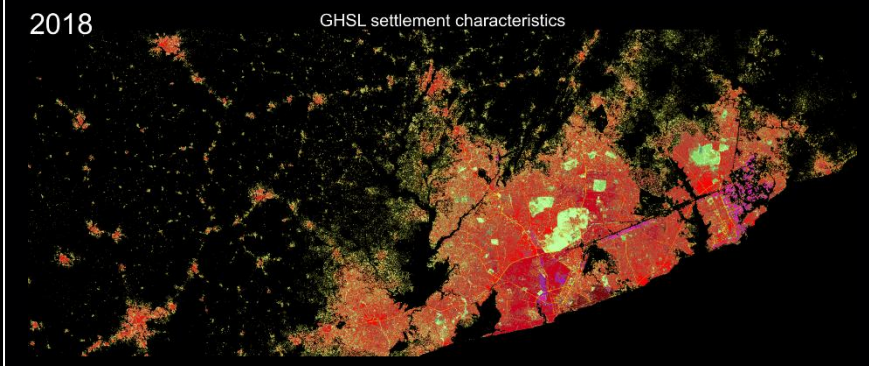
Pesaresi, M., Schiavina, M., Politis, P., Freire, S., Krasnodębska, K., Uhl, J. H., ... & Kemper, T. (2024). Advances on the Global Human Settlement Layer by joint assessment of Earth Observation and population survey data. *International Journal of Digital Earth*, *17*(1), 2390454.

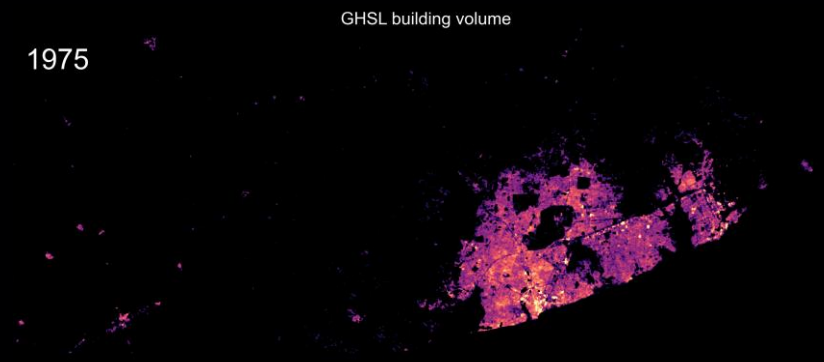
Selected datasets of GHSL Release 2023A

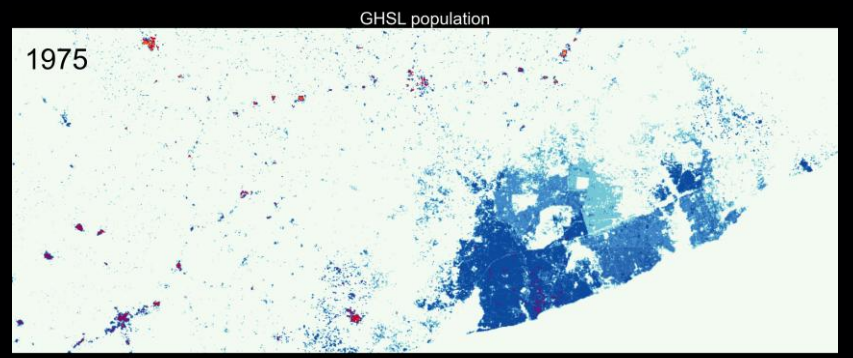
Accra, Ghana

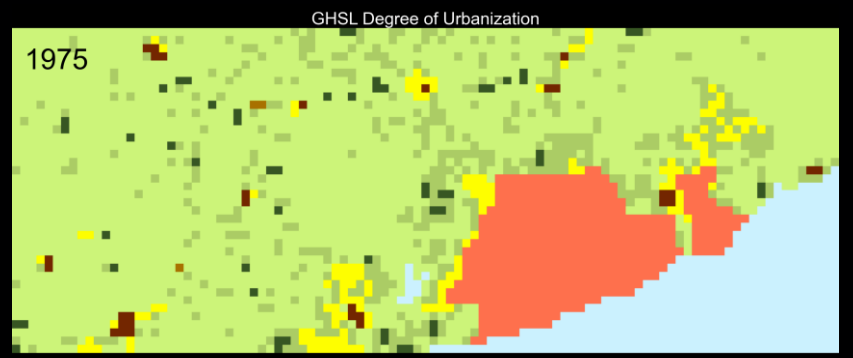










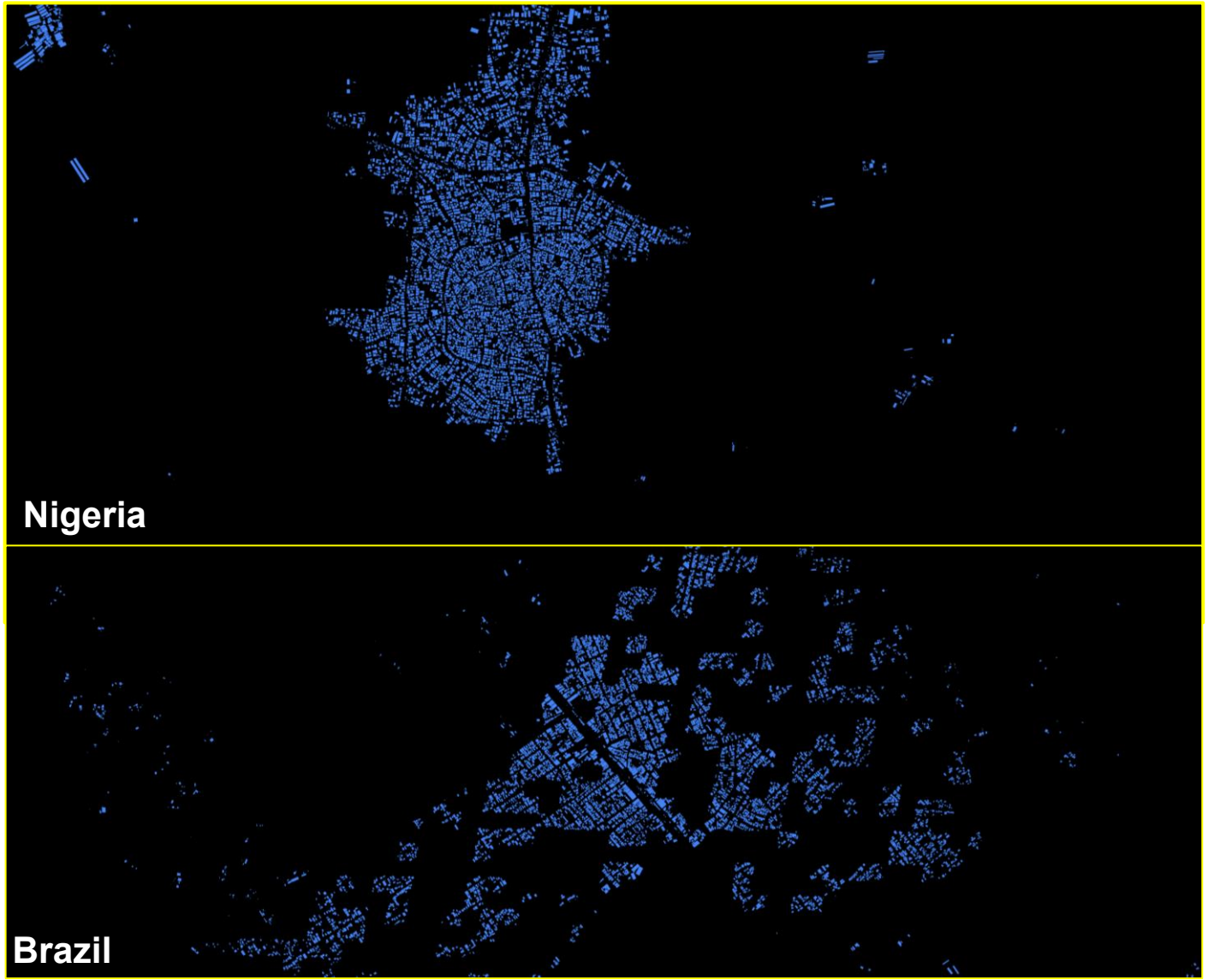


GHS-OBAT: **Global Open Building Attribute Table**

Settlement dynamics integrating building footprints (Overture) and GHSL attributes

1975 - 2020

Viz. by Dr. Johannes Uhl



European Commission

Joint Research Centre Data Catalogue

Uhl, Johannes H; Florio, Pietro; Politis, Panagiotis; Goch, Katarzyna; Melchiorri, Michele; Pesaresi, Martino; Kemper, Thomas (2024): **GHS-OBAT R2024A - GHS Building Attributes at footprint level, with age, function and morphological information**
doi: 10.2905/f41a22f1-5741-4c41-86eb-6384654f6927

ELSEVIER

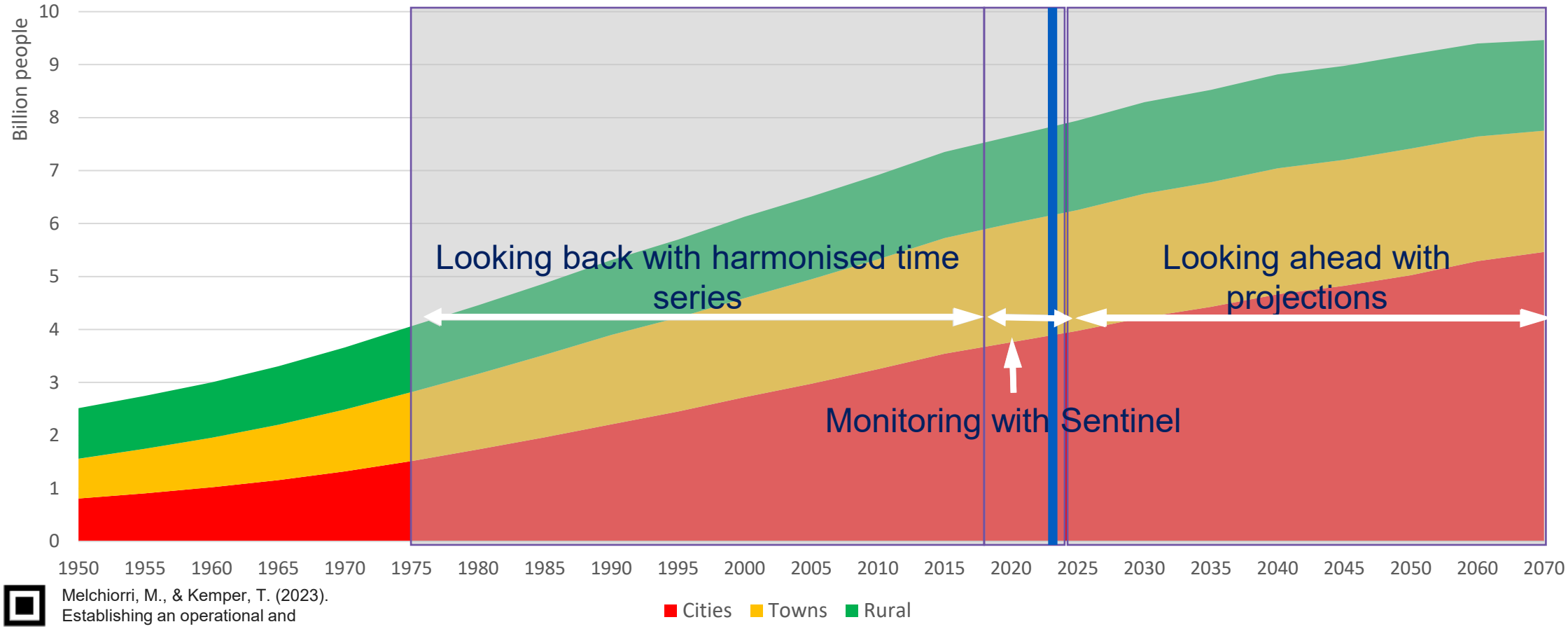
Data in Brief
Volume 61, August 2025, 111751

Perspective Article

GHS-OBAT: Global, open building attribute data reporting age, function, height and compactness at footprint level

Pietro Florio [a], Panagiotis Politis [b], Katarzyna Krasnodębska [c], Johannes H. Uhl [a], Michele Melchiorri [a], Ana M. Martinez [a], Georgia Kakoulaki [a], Martino Pesaresi [a], Thomas Kemper [a]

GHSL framework: time series | monitoring | Projections

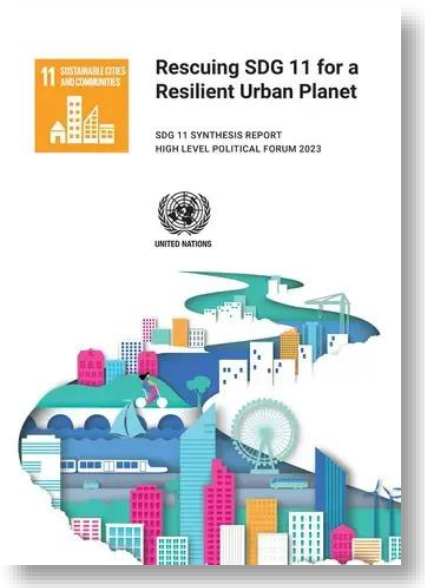


Melchiorri, M., & Kemper, T. (2023). Establishing an operational and continuous monitoring of global built-up surfaces with the Copernicus Global Human Settlement Layer. In *2023 Joint Urban Remote Sensing Event (JURSE)* (pp. 1-4). IEEE. https://doi.org/10.1109/JURSE57346.2023.10144201

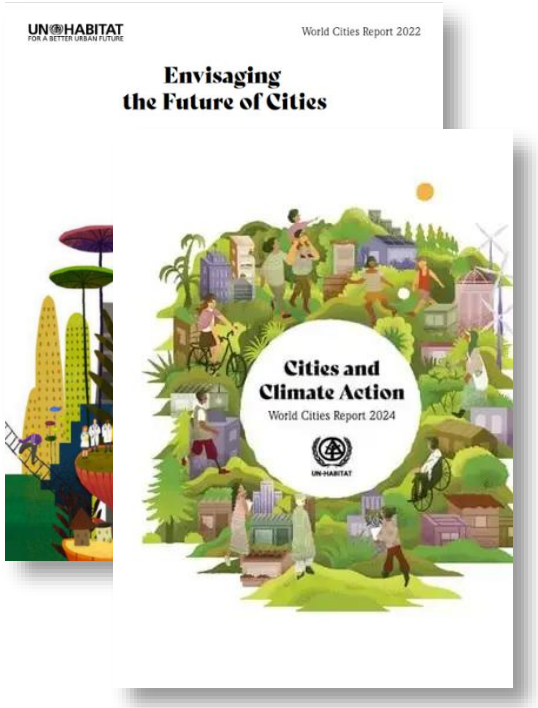
GHSL Release 2023

GHSL release 2022 2024 2026

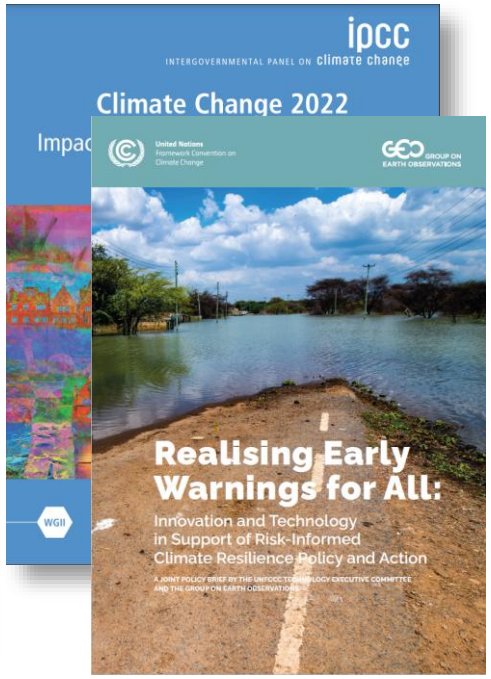
Supporting international policy frameworks



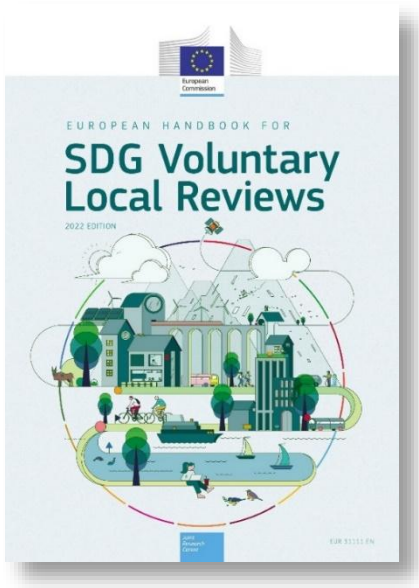
UN SDG 11 synthesis report



UN-Habitat World Cities Reports



IPCC 6th Assessment Report
EW4ALL policy brief



EU Handbook for SDG Voluntary Local Reviews

UNEP 6th Global Environmental Outlook

Digital Public Goods Alliance

EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS

Earth Observations Toolkit for SUSTAINABLE CITIES AND HUMAN SETTLEMENTS

Thank you
and keep in touch

EU Science Hub
Joint-research-centre.ec.europa.eu

Global Human Settlement Layer
https://human-settlement.emergency.copernicus.eu/
jrc-ghsl@ec.europa.eu

esa PROGRAMME OF THE EUROPEAN UNION Copernicus Emergency Management Implemented by European Commission