The European Commission's science and knowledge service
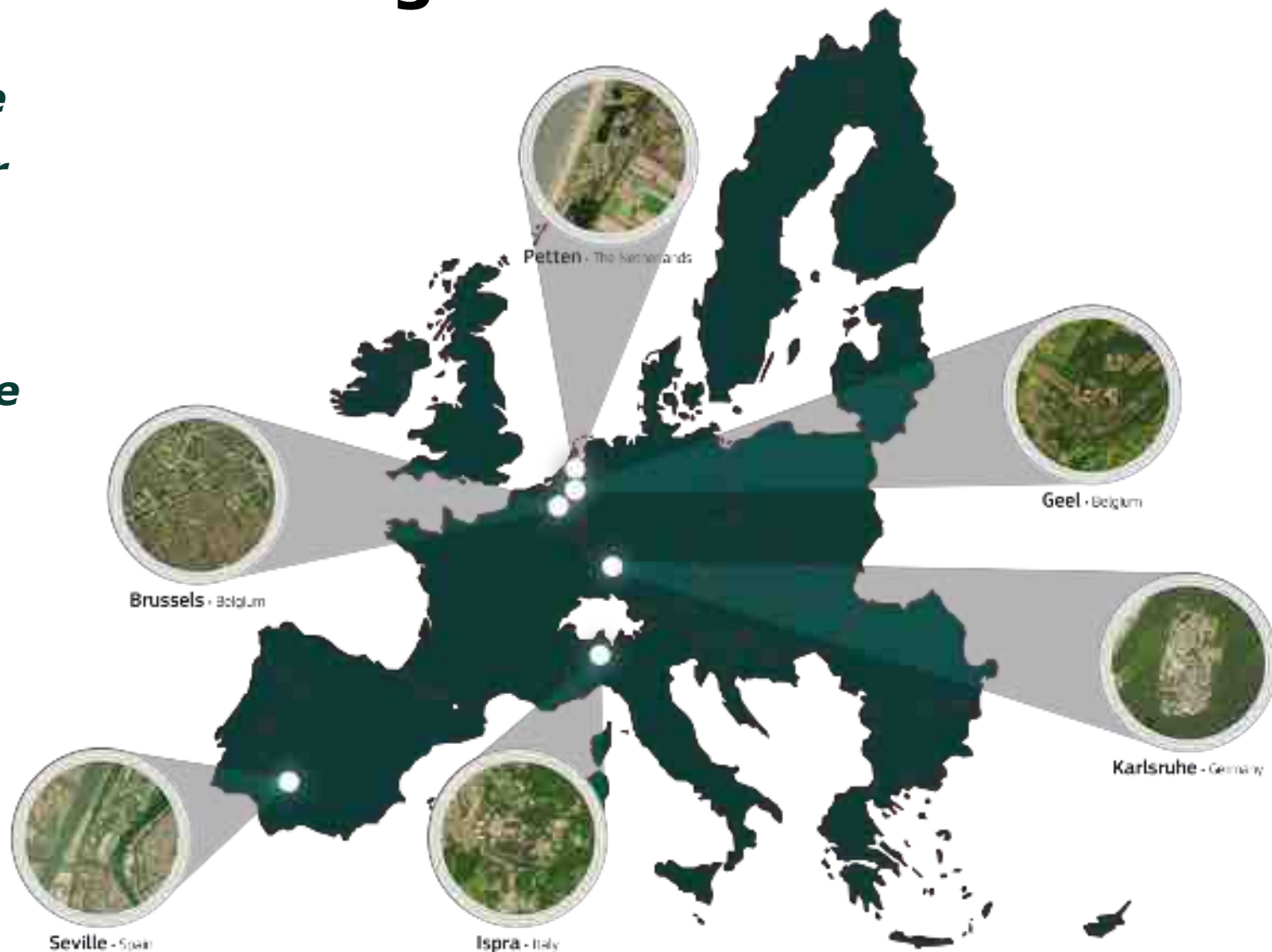
Joint Research Centre

European Commission

The Joint Research Centre at a glance

As the science and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle

3000 staff

Almost 75% are scientists and researchers.
Headquarters in Brussels and research facilities located in
5 Member States.

Petten · The Netherlands

Geel · Belgium

Brussels · Belgium

Karlsruhe · Germany

Seville · Spain

Ispra · Italy

European Commission

Big data and integrated systems for the Agenda 2030 Experience from the GEO Human Planet Initiative

Thomas Kemper, European Commission

United Nations / Germany International Conference on "International Cooperation for Low-Emission, Resilient Societies" – Bonn (Germany), 22-24 November, 2017

European Commission
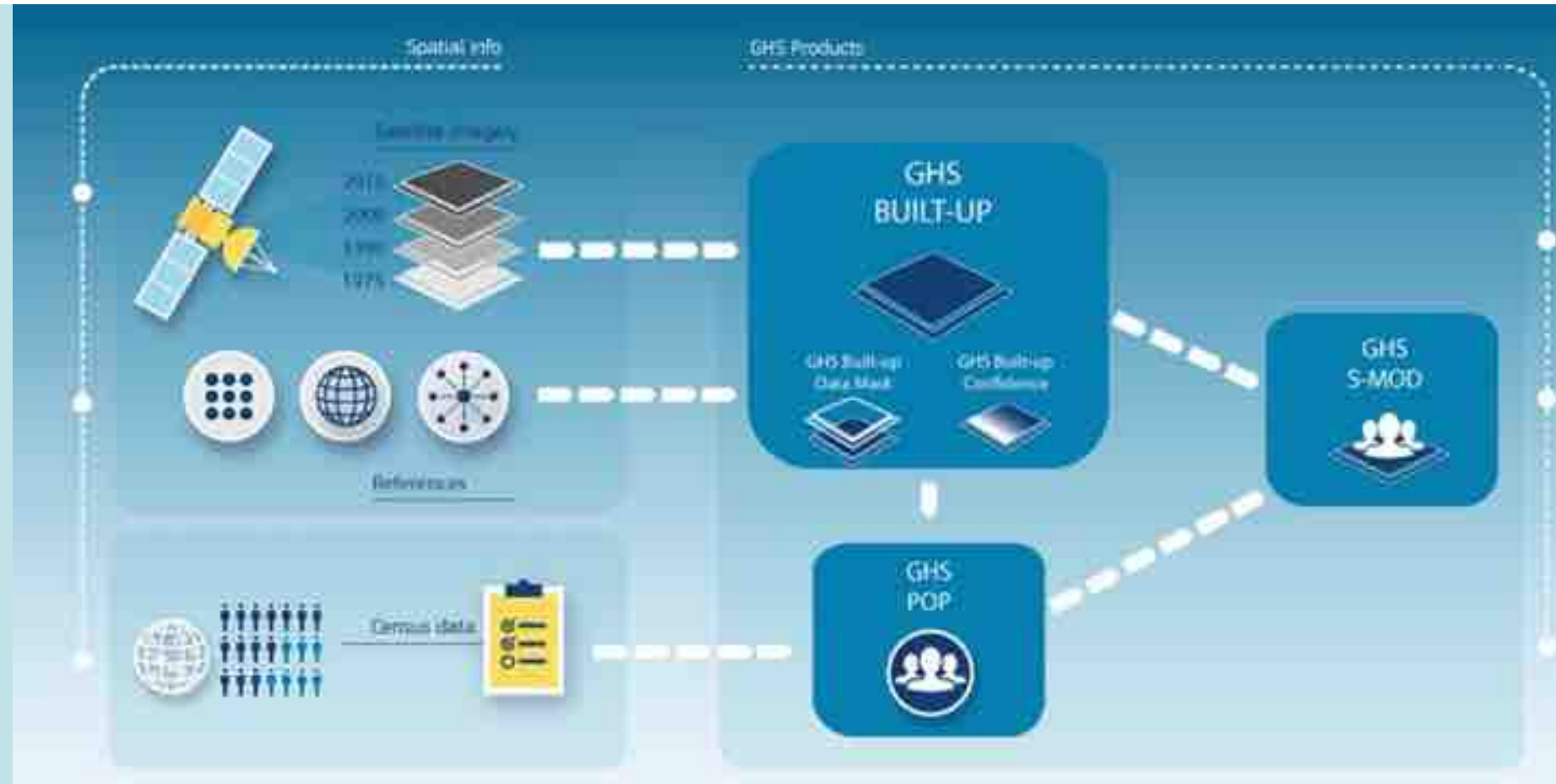
Geo-information on human settlements

- Required for **modeling**, **analysis**, **policy-making**
(i.e. producing indicators and monitoring targets):

- Sendai Framework for DRR 2015-2030 (adopted Mar. 2015)
- 2030 Agenda for Sustainable Development (SDGs, Sept. 2015)
- COP 21 Paris Agreement on Climate Change (Nov. 2016)
- Habitat3 – New Urban Agenda (Dec. 2016)

- **Exposure** (to hazards, pollutants,…)
- **Access** (to resources, services,…)
- **Impacts** (from natural disasters, environmental change,…)

Geo-information on human settlements

- Producing indicators and monitoring targets, global scope:

  - **Up-to-date**

  - **Detailed**

  - **Consistent** (comparable)

  - **Sustainable** (repeatable, cost-effective)

  - **Transparent** (clear methods)

  - **Open & free**

The Global Human Settlement Layer project

- Models/methods

- Tools

- Geospatial data

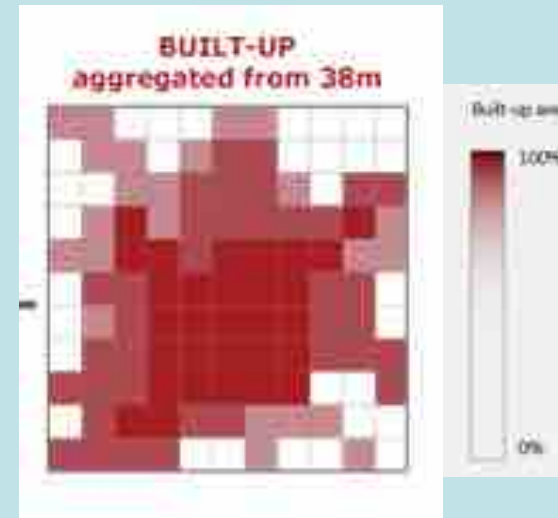- Capacity building

Creating a global built-up grid

Satellite imagery is processed to extract buildings

>

Share of area covered by buildings based on satellite imagery

>

Share of area covered by buildings aggregated to 1 km grid cells

BUILT-UP aggregated from 38m

**Low-level abstraction
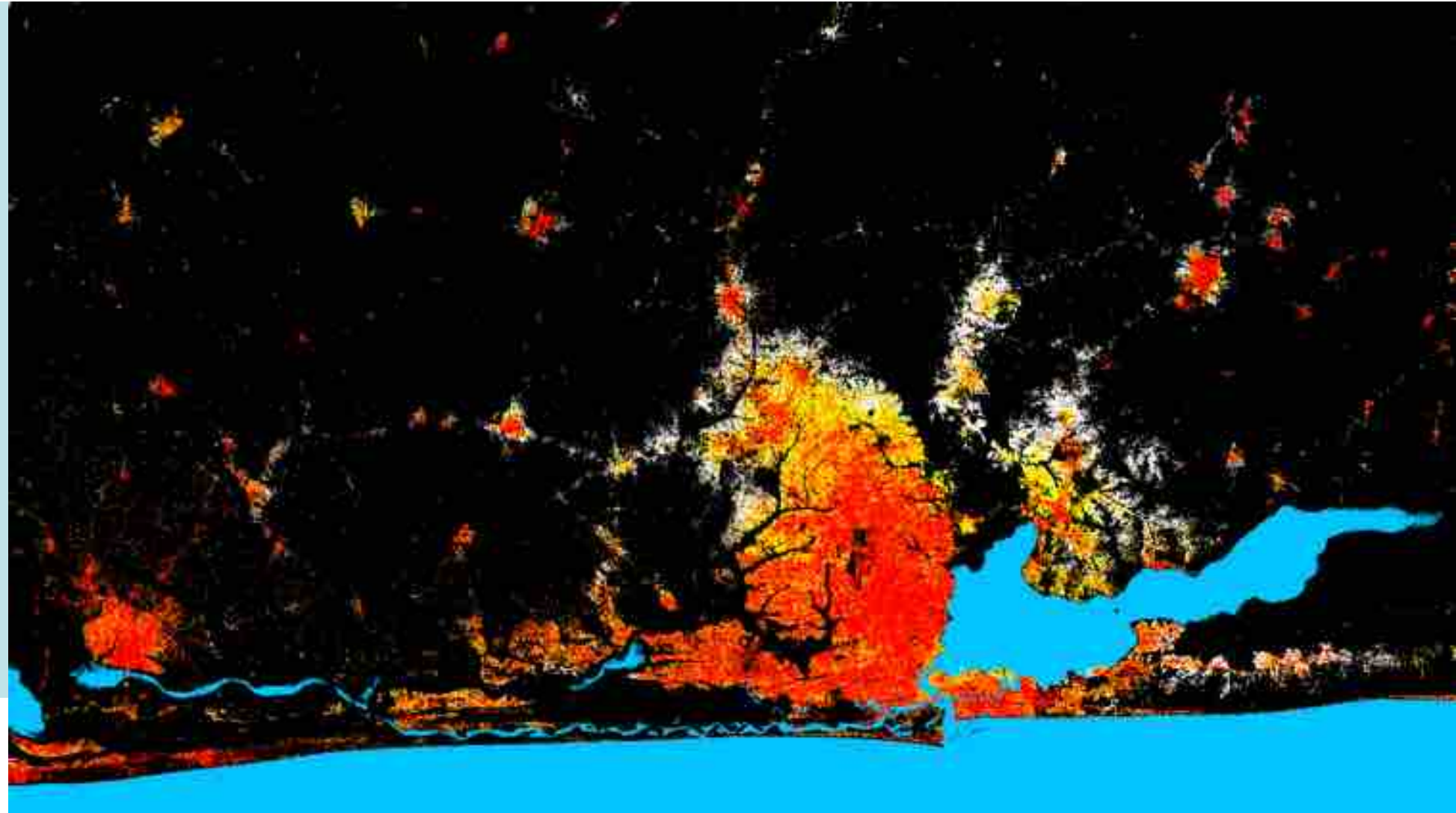improve semantic interoperability**

What we detect: "built-up area" = all spatial units (30x30m) where a building or part of a building can be recognized

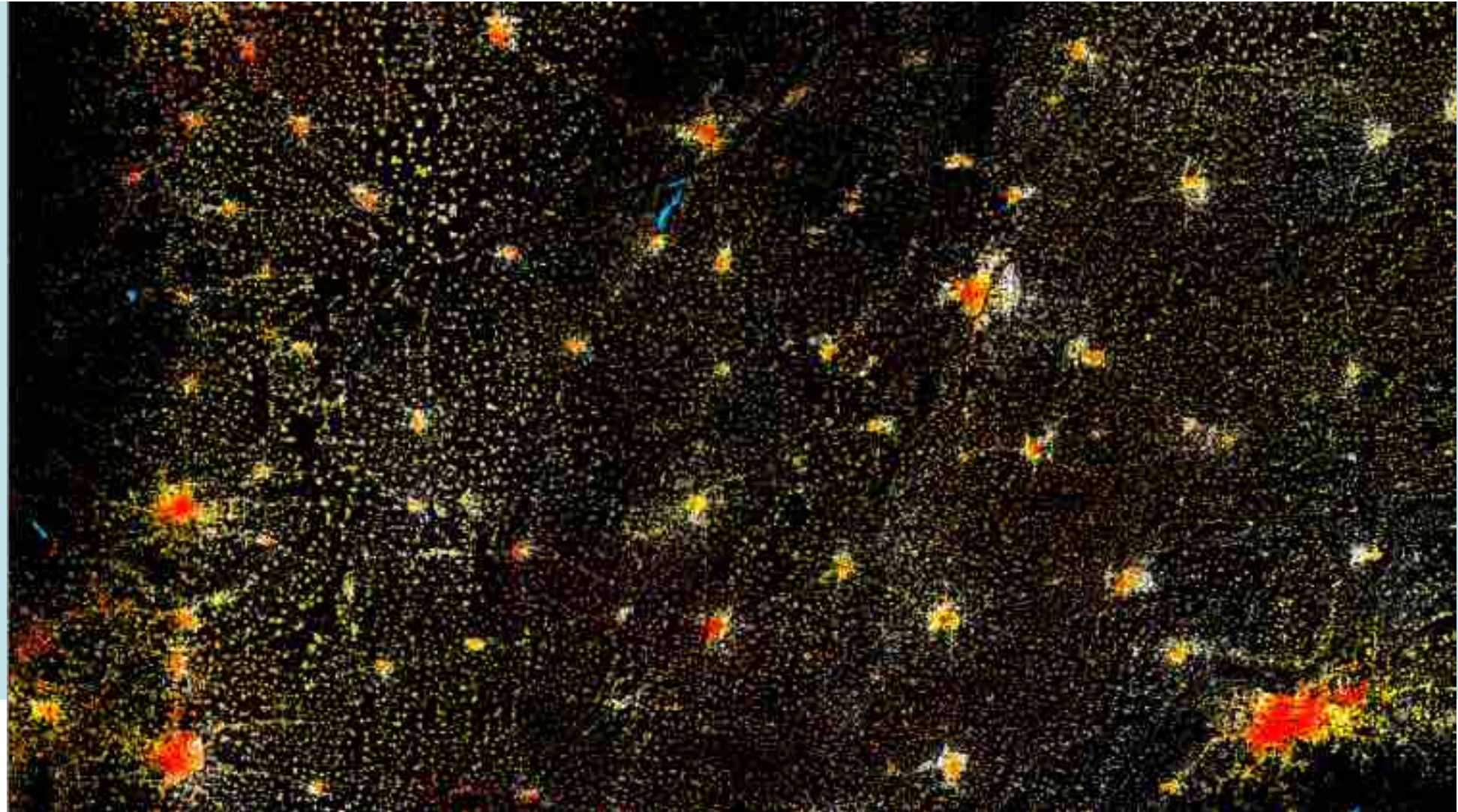# Monitoring urbanisation in the past 40 years

GHSL-MT (2017)

- Lagos (NIGERIA)

(cyan)	water
(black)	land
(white)	BU 2014
(yellow)	BU 2000
(orange)	BU 1990
(red)	BU 1975

Monitoring urbanisation in the past 40 years

GHSL-MT (2017)

- Hengshi (CHINA)

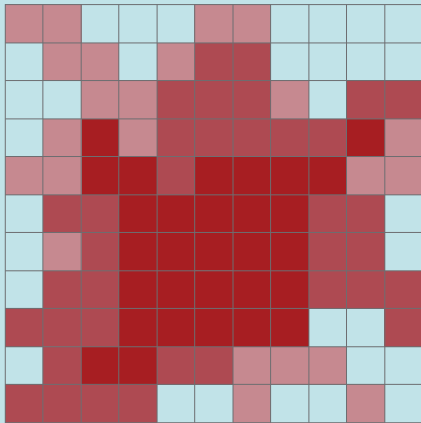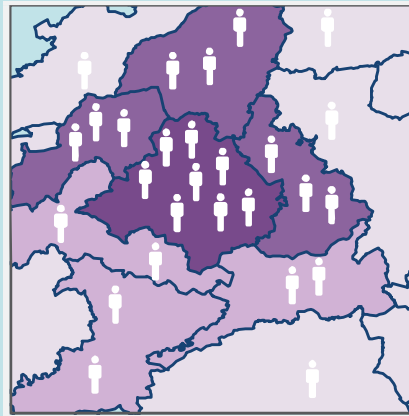|	
(cyan)	water
(black)	land
(white)	BU 2014
(yellow)	BU 2000
(orange)	BU 1990
(red)	BU 1975

Creating a global population grid
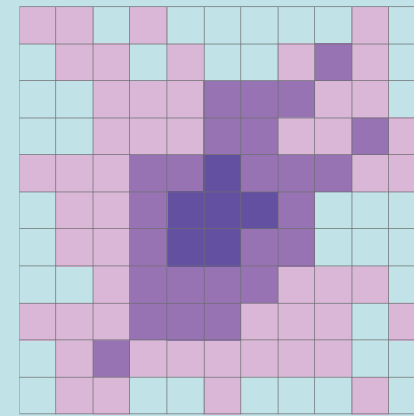
Share of area covered by buildings

Source: JRC GHSL

+

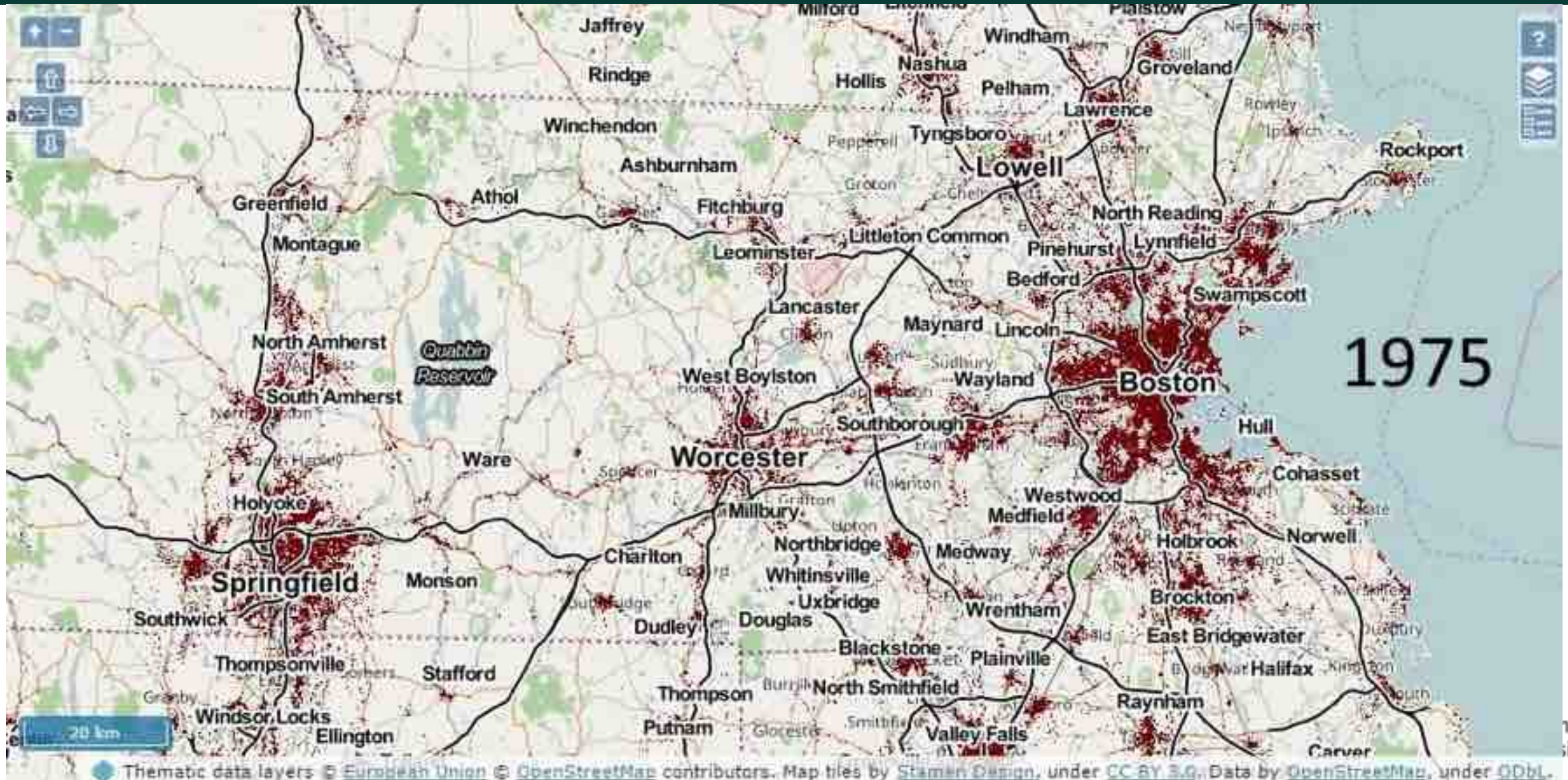**Census data on population**

Source: CIESIN, Columbia University

=

Total population by 1km grid cell

Source: JRC GHS Pop

European Commission
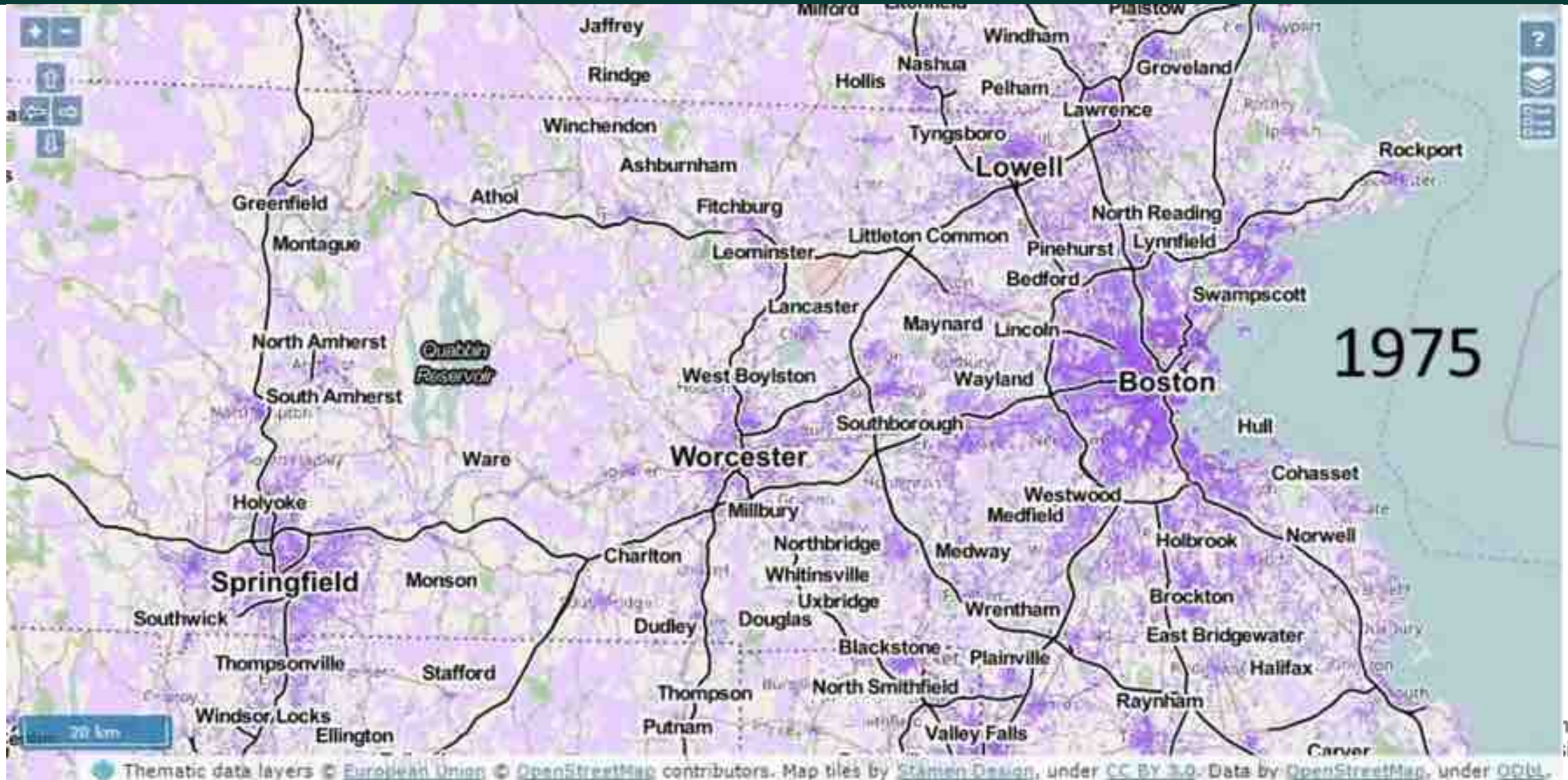
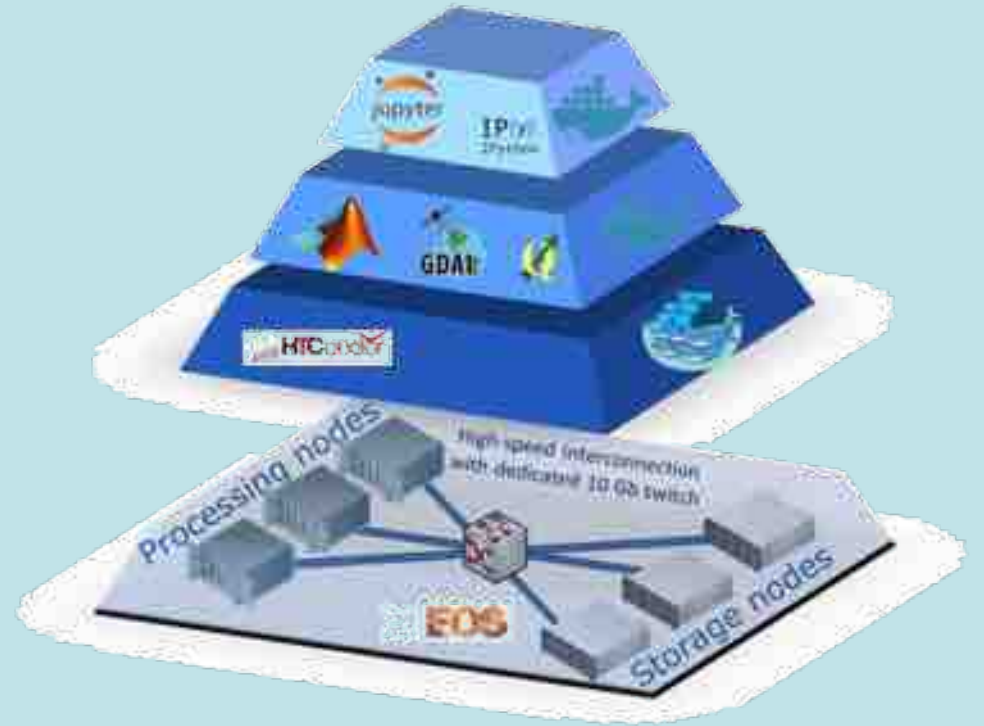# Mapping of built-up (1975-2015)

Mapping of population (1975-2015)

Advances in Big Data Processing

- Landsat data volume:
  - 32,808 data sets with a volume of **23 TB**
- Single computer: **210 days**
- Computer cluster: **2 weeks**
- JRC Earth Observation Data Processing Platform (JEODPP): **1 day**

GEO Human Planet Initiative

- New initiative in the **GEO 2017-2019 work programme** supporting the GEO Strategic Plan 2016-2025.

- Aims to support novel evidence-based assessment of the **human presence on the planet Earth**.

- Leverages on **advances of Earth Observation technologies** and geo-spatial data analytics for improving the global awareness on the **spatial patterns** and **processes** of the today's urbanizing world.

European Commission
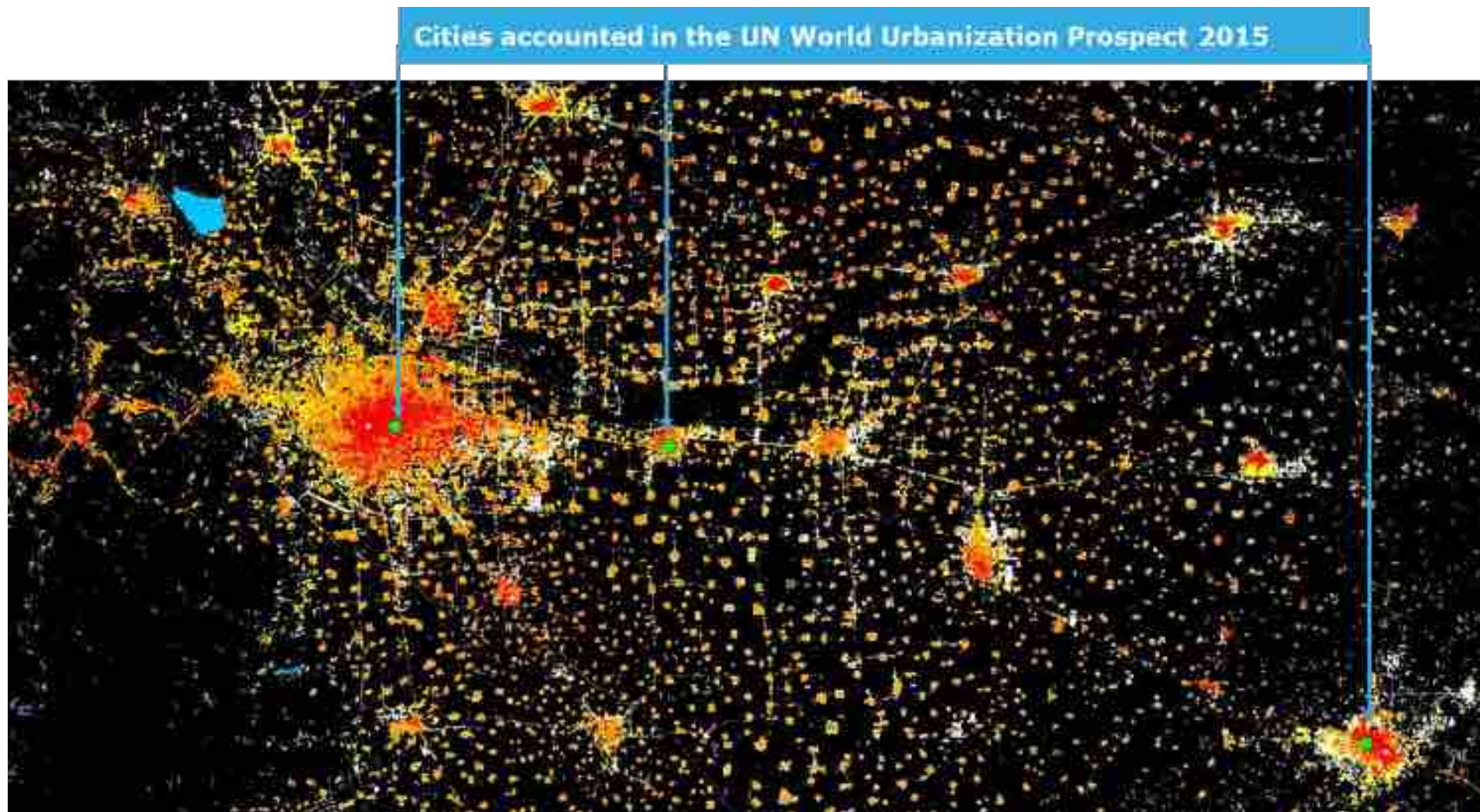
Human Planet Initiative Core Group

Human Planet Working Groups

Human Planet Expert Group	Institution	Contact person
Global harmonized definition of cities and settlements	European Commission, DG for Regional and Urban Policy	L. Dijkstra
Global Settlements in Disaster Risk Reduction	UNOOSA, UN-SPIDER Program	J. Post
Global Urban Climate and Mitigation Planning	University of Dublin, World Urban Database and Access Portal Tool (WUDAPT)	G. Mills
Global updated and historical baseline data on built-up areas	European Commission, Joint Research Centre	T. Kemper
Global high resolution age-structured population maps 2000 – 2020	Univ. of Southampton, WorldPop Project, Flowminder Foundation	A.J. Tatem
Global Settlements, Infrastructure, and Population Data Intercomparison	Columbia University, Center for International Earth Science Information Network (CIESIN)	R. Chen
Global future population grids including demography and migration	City University New York, Demographic Research	D.Balk
Global urban metabolism	University of Denver, Geography & Environment	P. Sutton
Urbanization dynamics in China and the "one belt one road" region	Chinese Academy of Sciences, Institute of Remote Sensing and Digital Earth	L.L. Lu
Capacity building and trainee-ships	University of Twente, Faculty of Geo-Information Science and Earth Observation	R. Sliuzas
Poverty Mapping	George Washington University, Center for Urban and Environmental Research	R. Engstrom

Human Planet Working Steering Committee

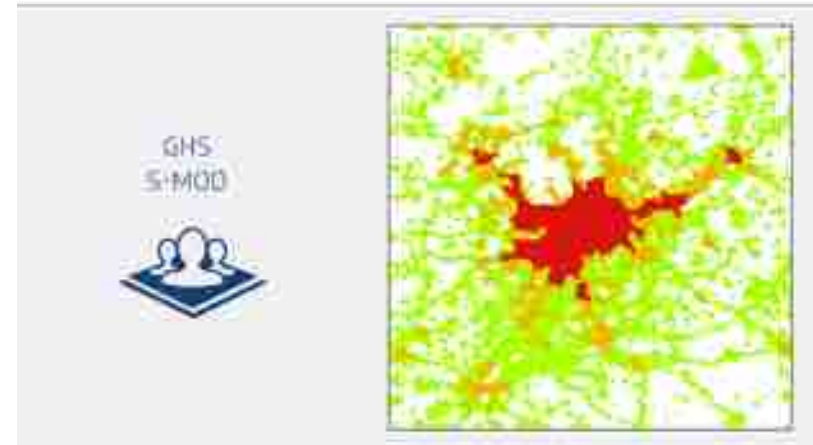| Contact person	Institution
ALAN BELWARD	European Commission, JRC
ANDREW J TATEM	University of Southampton
ANGEL SHLOMO	New York University
ARBAB KHAN	UN Food and Agriculture Organization
BENJAMIN BECHTEL	University of Hamburg
ROBERT CHEN	Columbia University
CHAO REN	Chinese University of Hong Kong
DAVINA JACKSON	Goldsmiths University of London
DEBORAH BALK	City University of New York, Institute for Demographic Research
ELEN HAMILTON	The World Bank (WB)
EUGENIE L. BIRCH	University of Pennsylvania
GERALD MILLS	University College Dublin
GORA MBOUP	Global Observatory linking Research to Action (GORA)
JOACHIM POST	UN Office for Outer Space Affairs
LEWIS DIJKSTRA	European Commission, DG REGIO
LINLIN LU	Chinese Academy of Sciences
MARK R. MONTGOMERY	Population Council
PAUL C. SUTTON	University of Denver
RICHARD SLIUZAS	University of Twente
SARA HERTOG	UN Population Division, Department of Economic and Social Affairs
SHAROLYN ANDERSON	University of South Australia
STEFAN LEYK	Colorado University
STEFFEN FRITZ	International Institute for Applied System Analysis (IIASA)
THOMAS KEMPER	European Commission, JRC
TIMOTHY F TRAINOR	US Census Bureau, UN GGIM
VINCENT SEAMAN	Bill & Melinda Gates Foundation
MARC LEVY	Columbia University, Center for International Earth Science Information Network (CIESIN)
THOMAS ESCH	German Aerospace Center (DLR)
ROBERT NDUGWA	United Nations Human Settlements Programme (UN-Habitat)

European Commission

Discovering new elements
(example Beijing, China)

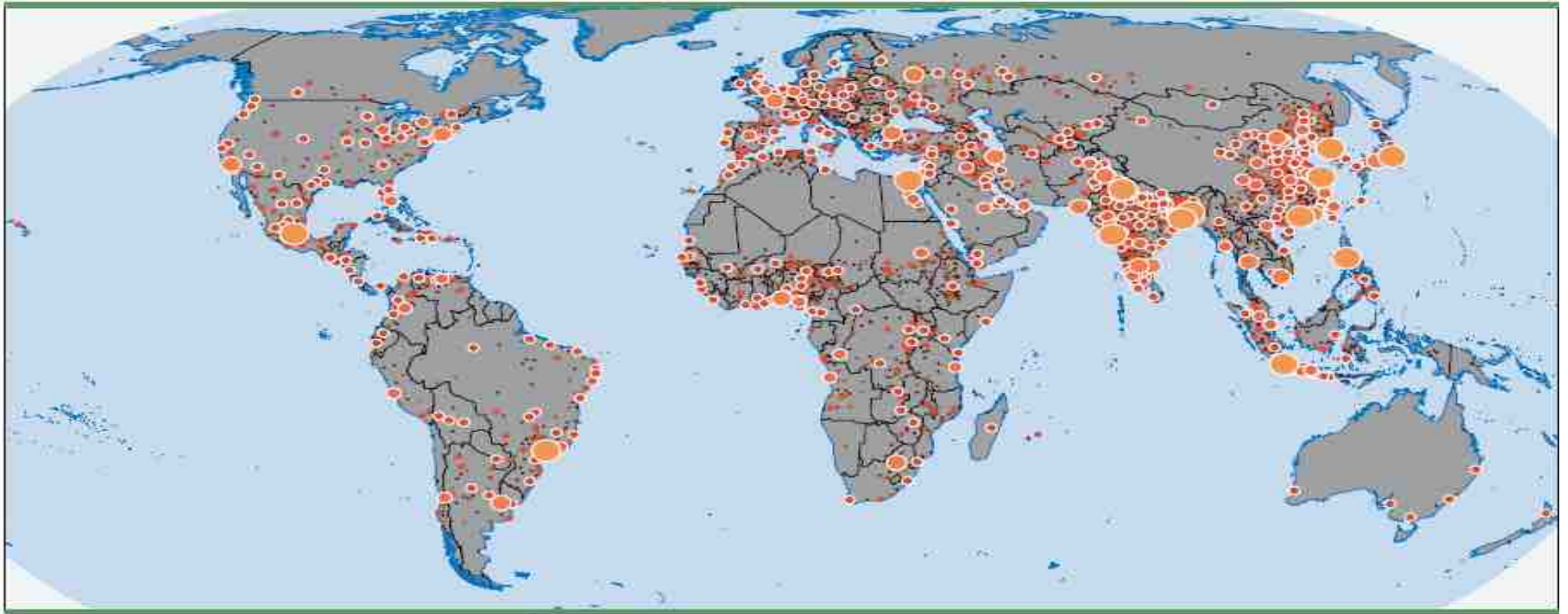Cities accounted in the UN World Urbanization Prospect 2015

Global Definition of Cities and Settlements

- Voluntary Commitment of the European Union, OECD, World Bank and FAO
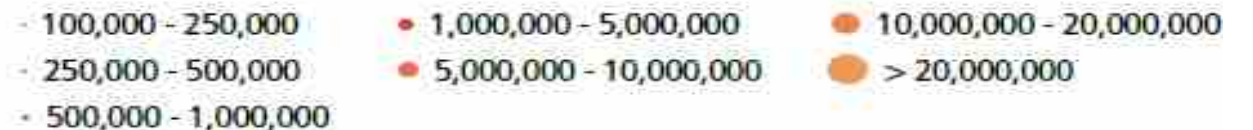
- Evidence based policy support

European Commission
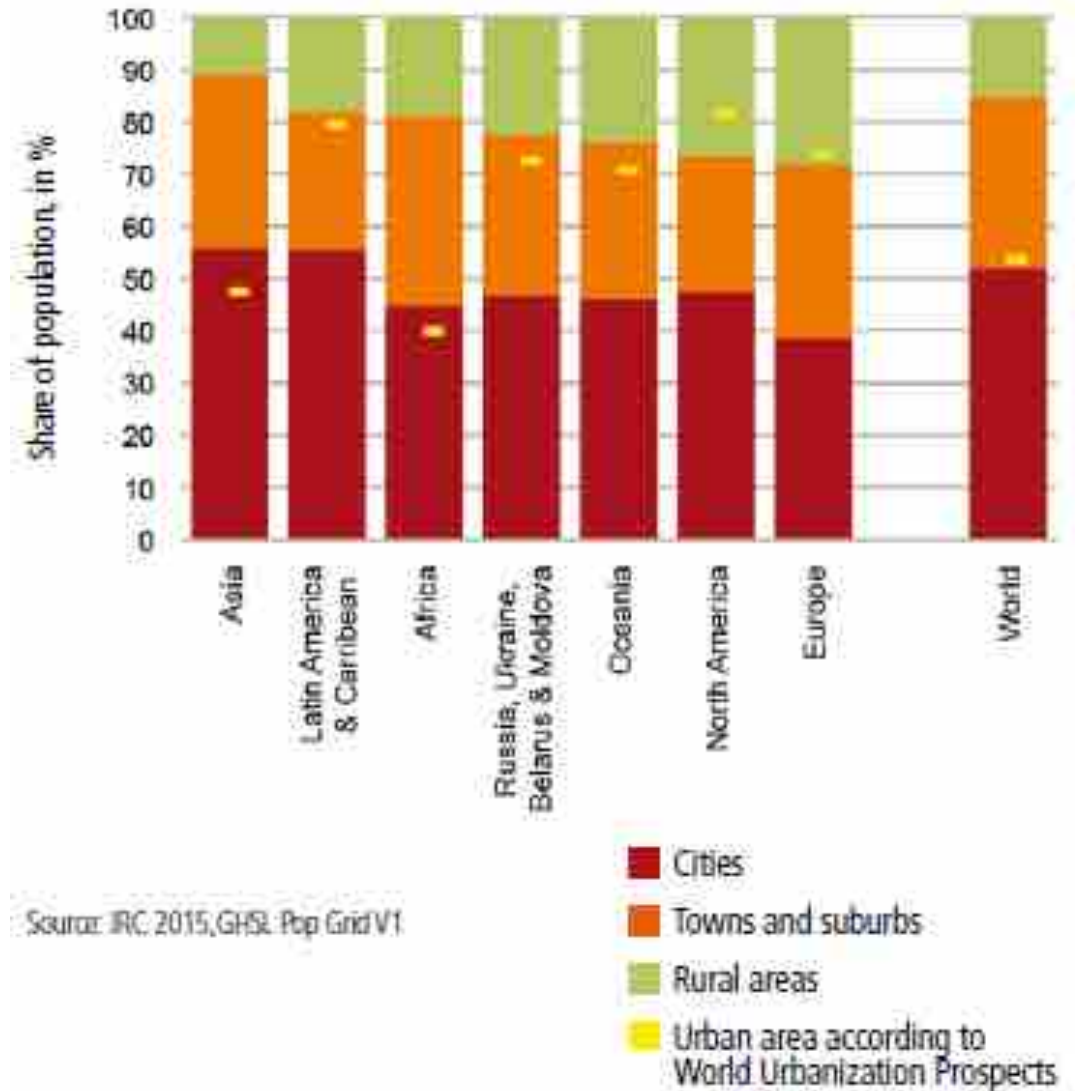
Global Definition of Cities and Settlements

Source : JRC (GHS – POP Global Settlement Model)

Inhabitants

- · 100,000 - 250,000
- · 250,000 - 500,000
- · 500,000 - 1,000,000
- • 1,000,000 - 5,000,000
- • 5,000,000 - 10,000,000
- ● 10,000,000 - 20,000,000
- ● > 20,000,000

Global Definition of Cities and Settlements

- Major changes in the degree of urbanisation in Asia and Africa

Source: JRC 2015, GHSL Pop Grid V1

Legend:
- Cities
- Towns and suburbs
- Rural areas
- Urban area according to World Urbanization Prospects

Conclusions

- Free and open data and methods
    - Leave no one behind
    - Create trust (reproducibility)

- Combination of EO data with non-EO data

- Networking outside the EO community is important

Thanks

Any questions?
You can find me thomas.kemper@ec.europa.eu

Joint Research Centre (JRC)
Directorate E. Space, Security & Migration
Disaster Risk Management Unit

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