European Commission

JRC SCIENCE FOR POLICY REPORT

Atlas of the Human Planet 2016

Executive Summary

Mapping Human Presence on Earth with the Global Human Settlement Layer

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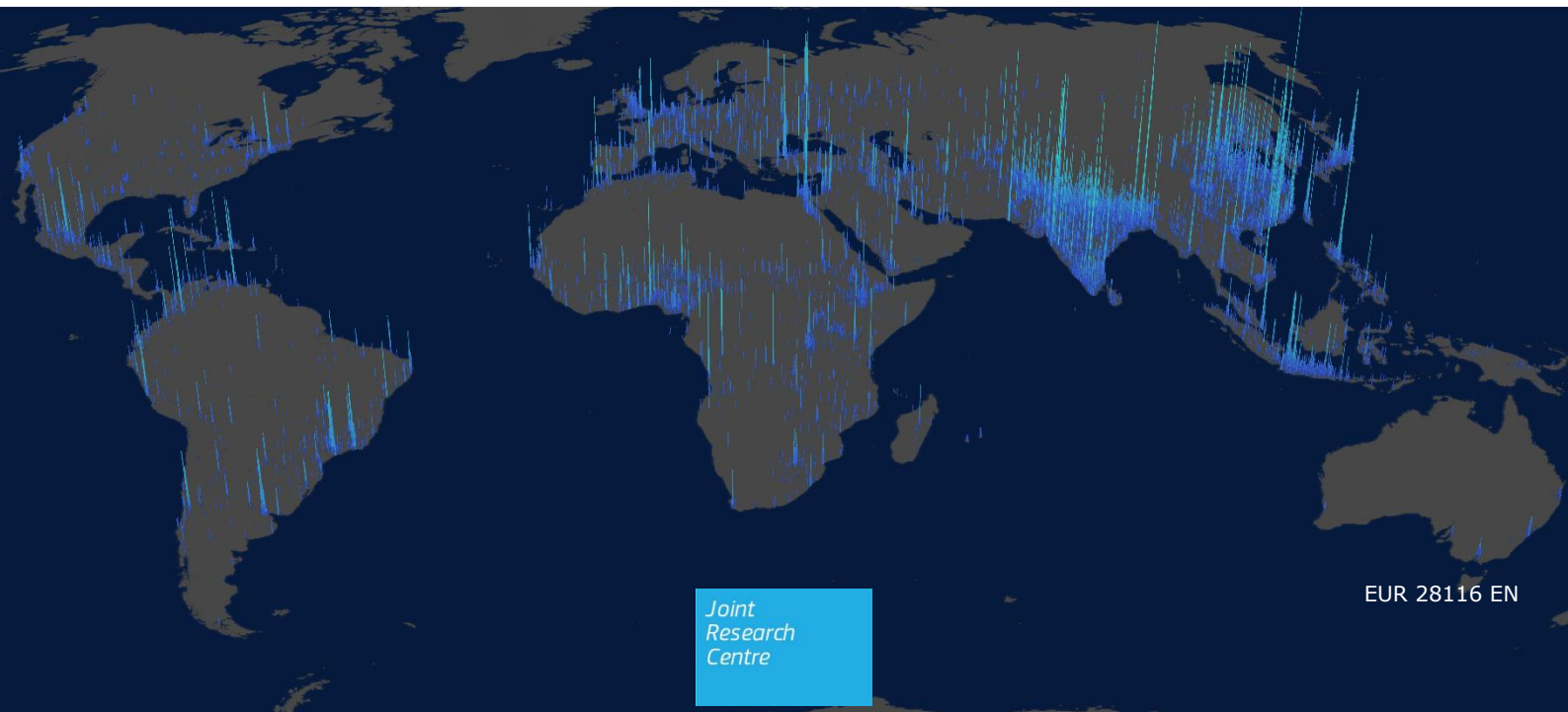

Joint Research Centre

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Policy context

The *Atlas of the Human Planet 2016* is the first outcome of the Human Planet Initiative. It aims to support the monitoring of the implementation of the post-2015 international frameworks: the UN Third Conference on Housing and Sustainable Urban Development (Habitat III, 2016), the post-2015 framework on Sustainable Development Goals (SDGs), the UN Framework Convention on Climate Change, and the Sendai Framework for Disaster Risk Reduction 2015-2030 (DRR). The Post-2015 international frameworks include targets to be achieved and measured through indicators that focus on measurable outcomes. These indicators are action oriented, global in nature and universally applicable. The Human Planet Initiative supports the implementation of a platform contributing to the UN Technology Facilitation Mechanism and enabling the test and the collective discussion of alternative options in operationalization of the indicators. The Human Planet Initiative is an international partnership. It started in 2014 with the "Manifesto for a Global Human Settlement Partnership"[1] which evolved to the "Human Planet Initiative" within the frame of the GEO work programme[2].

Key conclusions

The release 2016 of the *Atlas* illustrates the rationale and the first results obtained from the processing of large masses of data collected from three main sources: Earth Observation satellite sensors, national statistical surveys, and crowd sources as voluntary geographic information (VGI). These data have been processed by exploiting novel spatial data analytics tools allowing to handle their complexity, heterogeneity and large volume, and generating information and knowledge about the human presence on the planet Earth from the years 1975 to 2015. For the first time globally-consistent and detailed data of the human environment is available in the public domain. The empirical evidences supporting this release of the *Atlas* have been collected and processed within Global Human Settlement Layer (GHSL) of the European Commission, Joint Research Centre.

The GHSL baseline data released with the *Atlas* provides a framework that allows learning from the last 40 years and to closely monitor the impact of the policies of today and the future. It practically demonstrates how new open data and innovative data processing technologies may support novel global awareness on urbanization trends and dynamics. It provides a new view on global urbanisation processes. The systematic global assessment is a pre-requisite to apply uniform definitions of settlements such as the degree of urbanisation[3] used by Eurostat. Most urban indicators are extremely sensitive to where boundary is drawn, such as air quality, presence of open space or access to public transport. Comparing cities internationally using a collection of national definitions will generate many distortions. Cities defined very tightly will have worse air quality, less open space, but better access to public transport than cities defined more widely. Therefor a uniform definition is needed to make meaningful comparisons and allow cities to learn from each other.

Main findings

While the number of people on the globe is considered well monitored by statistical offices, there is little consistent, open and detailed information on the spatial distribution of population, and hardly any information on the built-up areas with complete, global coverage. For the first time, with the GHSL baseline it is possible to analyse in a consistent, detailed frame the development of built-up areas, population and settlements of the whole planet in the past 40 years.

This *Atlas* using GHSL baseline shows that in the past 40 years built-up areas increased by approximately 2.5 times globally, while population increased by a factor of 1.8. The

[1] GEO 2014 - Manifesto for a Global Human Settlement Partnership http://www.earthobservations.org/ghs.php
[2] The GEO Human Planet Initiative - https://www.earthobservations.org
[3] Dijkstra & Poelman, "A harmonised definition of cities and rural areas: the new degree of urbanisation"

changes in population and built-up areas show big regional differences. The strongest growth is observed in Low Income Countries (LIC). In the past 40 years the population of Africa tripled and the built-up area quadrupled. Instead the population of Europe kept stable while the built-up area doubled.

Today, most of the world's population is living in agglomerations with a density greater than 1,500 people per square kilometre and more than 50,000 total inhabitants. These agglomerations are qualified as *Urban Centres* in the *Atlas*. More than 13,000 individual *Urban Centres* have been reported in the GHSL baseline of the year 2015. *Urban clusters* capture the dense *Urban Centres*, as well as the surrounding suburbs and towns. They are defined as clusters of cells with more than 300 people per square kilometre and at least 5,000 inhabitants. Over the past 40 years, their extent has virtually doubled. *Urban Clusters* increased from 4% of the global land mass in 1975 to 7.6% in 2015, this is approximately half the size of the European Union.

Much of the population and built-up areas increases took place in locations at risk to natural disasters. For example, the world urban population of coastal areas has doubled in the last 40 years from 45 to 88 million people. The different growth trends lead also to an unequal distribution of *Built-up per capita*. *Built-up per capita* in *Urban Clusters* in Northern America is almost ten times that of Asia. National variability is even greater. Similarly, large regional and income inequalities are reported in accessing the electric energy as observed from night light emissions of *Urban Centres*. Moreover, a relative decline of night light emissions can be observed in *Urban Centres* of high income countries, possibly related to the implementation of environmental protection and energy saving policies. Finally, accordingly to the evidences collected by the GHSL and reported in this *Atlas*, our *Urban Centres*, towns and suburbs are getting greener: the average intensity of vegetation associated to built-up areas in the whole *Urban Clusters* of the planet has increased by 38% in the past 25 years.

Related and future JRC work

The GHSL is one of the core datasets used in the GEO Human Planet initiative, and is the main baseline used in the first release of the *Atlas of the Human Planet* 2016. The GHSL concept was initialized by the JRC in 2010-2011[4]. GHSL activities are currently supported by the JRC scientific working plan 2016-2019 in the frame of the JRC Directorate E "Space, Security & Migration". The JRC, together with the Directorate-General for Regional and Urban Policy (DG REGIO) and Directorate-General (DG) for Internal Market, Industry, Entrepreneurship and SMEs (DG GROWTH) are working towards a regular and operational monitoring of global built-up and population based on the processing of Sentinel Earth Observation data produced by the European Copernicus space program. At the JRC, the GHSL framework of data and tools supports the Knowledge Centres for Disaster Risk Management, Sustainable Development, Territorial Modelling, and Security & Migration. Moreover, the GHSL is one key test case contributing to the JRC Earth Observation and Social Sensing Big Data Pilot project in the frame of the JRC Text & Data Mining Competence Centre.

Quick guide

The *Atlas of the Human Planet* 2016 is based on evidences collected by the GHSL project of the JRC. GHSL combines satellite and census data to produce high resolution, global open information on built-up area and population. In the current release supporting the *Atlas* 2016, it covers the epochs 1975, 1990, 2000 and 2015. The data sets are used to understand, where and in which built environment people live, how the settlements and the population change over time. This knowledge is used in policy areas including environmental impact assessment, risk assessment, transport, health care services, education, natural disasters and hazards and urban planning.

[4] https://ec.europa.eu/jrc/en/news/mapping-human-settlements-globally-8276