Open Data on the Human Planet to Accelerate the estimation of SDG indicators

Track: 7. The Digital Age
7A. Digital technologies and the SDGs: Past successes and future directions

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Earth observation are an efficient source of global information and the open data policy applied to the main missions of data acquisition like Copernicus and Landsat ensure a wealth of daily data to map the planet Earth. Simultaneous advances in data processing and geospatial data technology has facilitated the production of accurate, timely and thematically rich information systems on human settlements. The Human Planet Initiative, a contribution to the Group on Earth Observation work programme, was established to support novel evidence-based assessment of the human presence on the planet Earth. The Human Planet (HPI) 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. The HPI has evolved to become a key brokering platform of free and open data on human settlements supporting the estimation of several SDG indicators.

Rationale

The data thirsty monitoring framework of the Sustainable Development Goals requires new approaches to data collection in which integration is key and for which new technologies are essential. Moreover, monitoring frameworks require time-series data to monitor progress, forcing production methods to be sustainable over time. In this context the Human Planet Initiative (HPI) facilitates the cooperation among key global producers of global human settlements data. Its stakeholders (from 85 organisations from a diverse geographic composition) are engaged in the production, use, improvement and periodical update of population and built-up surface data, and employ large volume of geospatial data, and Earth Observation information for sustainable development.

The knowledge of where people live, how many they are, which are the demographic aspects of populations and the physical characteristics of settlements they inhabit is essential for several of the SDGs and supports a variety of societal policies ranging from development and cooperation to disaster risk management among others.

The Human Planet Initiative (HPI) is committed to develop a new generation of measurements and information products that provide new scientific evidence and more integrated understanding of the human presence on planet Earth in support of global policy processes with agreed,

actionable and goal-driven metrics. The goal is to generate the global-scale data and knowledge needed to advance our understanding of societal processes and their impact on Earth systems, and to generate useful indicators to inform policy.

The precursor of the initiative was launched in 2014 as Global Human Settlement Working Group[1] co-led by the Columbia University Center for International Earth Science Information Network and the European Commission Directorate General Joint Research Centre, establishing the strategic direction of the efforts, primarily devoted to the production and exploitation of a new generation of global settlement data rooted in the processing of large volumes of open data coming from Earth observation satellites and geospatial data modelling for supporting international agreements being launched in 2015-2016 (i.e. Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals, the New Urban Agenda, and the Paris Agreement). The realisation that 1. the picture of the global human footprint on the planet was incomplete (for example large human settlements were mapped and known, but smaller ones were oftentimes unaccounted); 2. The increasing capabilities of Earth Observation satellites combined with rapid advances in geospatial sciences, analytical methods and computing power have made detailed, measurable and globally consistent descriptions of the human-made habitat possible: 3. The scientific evidence supported by new technologies should enable global action to prevent and reduce disaster risk, eradicate extreme poverty and promote sustainable development, hence translating into policy and action; and 4. bringing together information producers, users and those responsible for related policies will facilitate the validation of existing and new global human settlement metrics, and will determine their fitness for purpose.

Since its inception, the initiative has grown in partners, thematic range and it has been further institutionalised into the Group on Earth Observation work programme. For example, with the mandate to provide services to international institutions and other stakeholders like in the framework of the Degree of Urbanisation method to facilitate comparison of urban and rural statistics at global level, as well as to produce global population grids and other open and free geospatial data for good.

Outputs and impacts of the initiative

The collaborative nature of the Human Planet Initiative relies on a constant and open exchange of information, technical solutions and research directions among peers that happens periodically at the Human Planet Forums (2017-2019-2023).

Moreover, partners continuously produce and update global datasets on human settlements, and engage with policymakers to facilitate the use of such datasets in support of global policy frameworks. The HPI proved to be very useful support to novel evidence-based assessment of the human presence on the planet Earth. Since its inception it has supported International Organisation to report on SDG indicators (i.e. SDG 11), its data are key to inform global policy reports like the International Panel for Climate Change, the Global Environmental Outlook, the Global Assessment Report and many others (Fig. 1).

The HPI delivers free and open data on human settlements, like the Global Human Settlement Layer, and also disseminates story maps to illustrate the estimation of SDG indicators with resources produced by the initiative. For example, story maps on Access to Public Transport in

[1] Global Human Settlement Working Group Manifesto: https://www.earthobservations.org/documents/ghs/ghs_brochure.pdf

Urban Centers[2], and land consumption[3] (SDG 11), on rural access index[4] (SDG 9), exposure to natural hazards[5] (Sendai Framework for Disaster Risk Reduction) but also community engagement and knowledge/data brokering initiatives (like the Earth Observation Toolkit for Sustainable Cities and Human Settlements[6]) to illustrate how digital technologies and partnerships support SDG applications.

Figure 1 synthetic overview of policy documents at intergovernmental level leveraging on HPI data

The Initiative supports the entire cycle of policymaking with scientific data and analyses, not only it provides open and free data, but also tools and know-how transfer (i.e. capacity development) to assist partners in gaining new competences and skills. Examples of this kind are the Degree of Urbanisation capacity development that the European Commission Joint Research Centre delivers jointly with UN-Habitat and the UN Statistics Division to harmonise urban and rural statistics and indicators. Many other examples include the work of the IDEAMAPS Network[7] to develop and maintain an Integrated DEprived Area MAPping System, or that of the POPGrid Data Collaborative[8] to advance the use and impact of geospatial population and infrastructure data for accelerating the production of high quality, georeferenced data on population, human settlements, and infrastructure.

Moreover, the JRC has edited periodic editions of the Atlas of the Human Planet[9] as release of the new findings related to the human presence on Earth as compiled from the new global evidences gathered by the international scientific community. Every release of the Atlas addresses the mission of the GEO Human Planet Initiative from different perspectives, including the assessment of the human and physical exposure to threats, the impact of human activities on ecosystems, and the human access to resources.

A key principle of the Initiative is the free and open access to datasets, HPI datasets are freely available for download on several institutional repositories including the Global Earth Observation

[2] https://storymaps.arcgis.com/stories/739a8aed89b6449c96b4fb38ff58bb8b
[3] https://storymaps.arcgis.com/stories/f572cd59a2de49238dbd44540219da2d
[4] https://storymaps.arcgis.com/stories/581caffdd32f44ae968eb21460fe1ede
[5] https://storymaps.arcgis.com/stories/c15c3ca4239443a1b816a59bc81e987b
[6] https://storymaps.arcgis.com/collections/6f87b83bf8d243a688a6f732cbede898?item=1
[7] https://ideamapsnetwork.org/
[8] https://www.popgrid.org/
[9] Atlas of the Human Planet https://ghsl.jrc.ec.europa.eu/atlasOverview.php

System of Systems (GEOSS Portal[10]), the Socioeconomic Data and Applications Center (SEDAC[11]), and the European Commission JRC Open Data Catalogue[12] among others.

Future work

The HPI has delivered on its aspiration providing global open and free geospatial dataset mapping human presence on the planet, in the form of population grids, human settlement maps, and other thematic dataset across socio-economic and environment domains. These achievements have consolidated an understanding of human settlements that was not available before, in particular, it was possible to *leave no one off the map*[13] and to allow discussions and policy action on human settlement of any size.

Now that questions like how many cities are there in the world in 2020? and how many they were in 1990 or even earlier? what's the total global amount of built-up land? Where is the highest population density recorded? How much has population globally increased in low elevated costal zones? It is possible to focus on a further thematic characterisation of human settlement maps, for example products like population grids by age and sex would be beneficial for several development and cooperation applications. Information on the thematic characterisation of built-up surfaces (i.e. by land use, height and volume, and structural characteristics) would be key for improved population mapping and crisis management. Another key aspect is the capability to continuously update such datasets. In this regard the European Union Copernicus Programme via the Exposure Mapping Component of the Emergency Management Service is going to ensure biennial release of the Global Human Settlement Layer built-up maps.

As the initiative mature, the initial objectives devoted to the generation of global open and free human settlements data evolve to a more structural support to policymaking with continuously updated information and policy relevant indicator monitoring and knowledge brokering in initiatives like the EO4SDG to promote and facilitate the use of open geospatial data for monitoring the SDGs.

[10] GEOSS Portal: https://www.geoportal.org/
[11] SEDAC https://sedac.ciesin.columbia.edu/data/sets/browse
[12] JRC Open Data Catalogue https://data.jrc.ec.europa.eu/
[13] Leaving No One Off The Map: A Guide For Gridded Population Data For Sustainable Development https://www.unsdsn.org/leaving-no-one-off-the-map-a-guide-for-gridded-population-data-for-sustainable-development