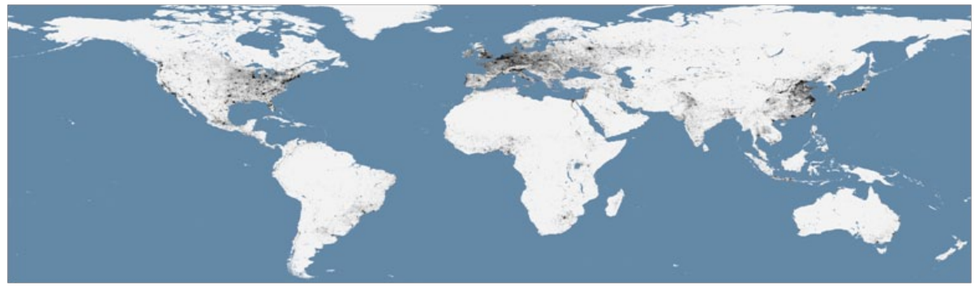
Global Urban Footprint (GUF)
Precise Map of Human Settlements Location

Global targets, Priority for Action 1, 4.



Application field: Currently, more than half of the world's population are urban dwellers and this number is still rapidly increasing. Settlements - and urban areas in particular - represent the centres of human activity. The environmental, economic, political, and societal impacts of urbanization are far-reaching. They include negative aspects like the loss of natural habitats, biodiversity and fertile soils, climate impacts, pollution, crime or traffic problems, making urbanization one of the most pressing global challenges. Accordingly, a profound understanding of the global spatial distribution and evolution of human settlements is a key requirement to enable sustainable development of urban and rural settlements.

Methodology and workflow: The GUF dataset is based on the radar (SAR) satellite imagery of the two German satellites, TerraSAR X and TanDEM X. A huge dataset of roughly 180,000 very high resolution SAR images, with about 3 m ground resolution, were processed for this dataset. At the German Remote Sensing Data Center (DFD) of the DLR, a newly developed method, implemented in the fully automated Urban Footprint processor, was used to generate a global raster map of the world's settlement patterns, resulting in the GUF data set.

Key results: The GUF product is a worldwide map of settlements with unprecedented spatial resolution of 0.4 arcsec (~12 m, for scientific use only) of the years 2010-2013. For

non-commercial use, the GUF is available with a spatial resolution of 2.8 arcsec (~84 m). The resulting map shows the Earth in three colours only: black for "urban areas", white for "land surface" and grey for "water". This reduction emphasizes the settlement patterns and allows for the analysis of urban structures.

Innovative impact: The GUF exhibits great potential for enhancing climate modelling, risk analyses in earthquake or tsunami regions, and the monitoring of human impact on

ecosystems. Moreover, it can also be employed as the basis for monitoring both the historical growth of different settlements, as well as their ongoing and future development. The GUF therefore allows for effective comparative analyses of urban dynamics amongst different regions of the world.

Global Partnership using Space-based technology applications for disaster risk reduction – GP-STAR

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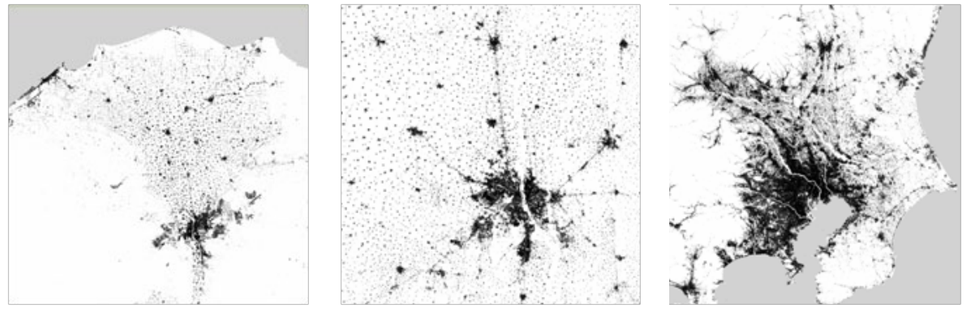
Application status: Data set available, operational.

Area of application: Local, regional, global level.



Cairo (Egypt), Delhi (India), Tokio (Japan)

Background: For a comprehensive and objective analysis of the settlement patterns, the DLR additionally developed an approach to display the spatial networks between the mapped settlements. It enables the computation of various form and centrality measures to characterize settlement patterns, at different spatial units, ranging from global to local scale.

Key publications:

Esch, T., Taubenböck, H., Roth, A., Heldens, W., Felbier, A., Thiel, M., Schmidt, M., Müller, A., Dech, S. (2012): TanDEM-X mission-new perspectives for the inventory and monitoring of global settlement patterns. Journal of Applied Remote Sensing, vol. 6, issue 1, 061702 (October 04, 2012); 21 pp., doi: 10.1117/1.JRS.6.061702.

Esch, T., Marconcini, M., Felbier, A., Roth, A., Heldens, W., Huber, M., Schwinger, M., Taubenböck, H., Müller, A., Dech, S. (2013) Urban Footprint Processor – Fully Automated Processing Chain Generating Settlement Masks from Global Data of the TanDEM-X Mission. IEEE Geoscience and Remote Sensing Letters, Vol. 10,.

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