TEP Urban

The Urban TEP – Joint Analysis of Multi-Source Data for Innovative Monitoring

Felix Bachofer

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Motivation

Urban challenges

- Water
- Energy
- Waste
- Food
- Risk adaptation and mitigation
- Growth management
- Living conditions
- Basic services
- Transportation
- ...
Data provision  
Data processing  
Analysis & Visualization  
Knowledge exchange

...all *data* and *tools* needed...

...available in **one place**!

*end-to-end solutions ready to use*
User community

Number of users: > 380
Number of organizations: 42

Key users:
- World Bank Group
- United Nations
- OECD
- World Food Programme
- Bill & Melinda Gates Found.
- Group on Earth Observation (GEO)
- WorldPop
- Columbia University (CIESIN)
- MININFRA Rwanda
- ….
Outlook

- Kick-Off for the next funding phase took place two weeks ago
- Streamlining of operations, design and functions (until March 2019)
- Release of more functions and datasets to the urban community (e.g. processing services, WSF products)
- Striving for sustainability during next phase

Global Urban Footprint (GUF) layer now available
Discover DLR’s new Global Urban Footprint (GUF) data at the Urban TEP platform and inspect the urban and rural human settlements pattern in a so far unique precision and consistency.

Urban Thematic Exploitation Platform (U-TEP)
urban-tep.eu
urban-tep.eo.esa.int
Live Demo

Portal
https://urban-tep.eo.esa.int/

Geobrowser
https://urban-tep.eo.esa.int/geobrowser/?id=portfolio#!&context=GUF%2FGUF2012-12m

TimeScan-Processing
https://urban-tep.eo.esa.int/geobrowser/?id=timescandev#!

Thematic Application
https://urban-tep.eo.esa.int/puma/tool/?id=78554&lang=en&needLogin=true
TimeScan Landsat 2015


~460,000 Landsat-8 scenes collected in 2014-2015

6 spectral indices, 5 temporal statistics, 30m spatial resolution

> 1.5 PB intermediate products, 25 TB final product
urban-tep.eo.esa.int
urban-tep.eu  (From 01.12.2018)

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Live Demo

1) Portal
   - Develop offer content
   - Tutorials & Videos
   - Connect with user communities

2) Product Portfolio
   - GUF / WSF
   - Nightlights
   - Geotagged Tweets

3) Time Scan on Demand
   - Information Aggregation

4) VISAT (predefined Thematic Applications)
   - WSF Evolution
   - Zoom to Hanoi
   - Single date / multidate
   - Tilt view / DGM
   - Bar Chart (population / settlement)
   - Scatterplot (population / settlement)
   - Table SDG 11.3.1: Area change normalized with population change
   - Polar table (Area change / pop chnage/ Gross national income ($ / capita)
   - If time available: Land-use
Chart 11

Back-up Slides
Global Urban Footprint (GUF) layer now available

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Urban Thematic Exploitation Platform (U-TEP)
User Communities

- Platform Portal

Connect with users and communities
### Chart 14

**User Support – Ticketing System**

#### User Support Functionalities

<table>
<thead>
<tr>
<th>Issue ID</th>
<th>Status</th>
<th>Priority</th>
<th>Subject</th>
<th>Assignee</th>
<th>Updated</th>
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<td>Received</td>
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<td>01/25/2018 09:06 AM</td>
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<td>Population exposure to natural hazards</td>
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<td>Andrea Knobberg</td>
<td>02/01/2018 01:02 AM</td>
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<td>Drone Mapping Use Case</td>
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<td>Jakub Bulhar</td>
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*Another tutorial video, this one is for on-demand processing services: [https://www.youtube.com/watch?v=wenfMRINuM4L]&feature=youtu.be*
APIs of U-TEP’s integrated software components are based on open standard specifications such as Open Cloud Computing Interface (OCCI) and Open Geospatial Consortium (OGC).

i) a web portal (geobrowser), interacting with an
ii) EO data catalogue (and associated data storage; based on Apache Lucene) and various internal and external Web Processing Services (WPS)
iii) a Visualisation and Analytics Toolbox (VISAT)

GitHub (https://github.com/urban-tep)
Development and Deployment of Processors

Processing Centers:

Salomon HPC cluster (Landsat data)

Calvalus cluster (Sentinel-2)

Geofarm (Sentinel-1)

Copernicus Data and Information Access Service (DIAS)
Product Portfolio
Geobrowser Product Portfolio

- Product and Service Portfolio
Tracing Global Urbanization: New Data from Space

- **Global Urban Footprint (GUF)**
  - Data base: 182,249 TerraSAR-X/TanDEM-X images (3m) collected in 2012 (308 TB)
  - Spatial resolution: 12 m (scientific use), 84m (non-profit use)
  - Release: November 2016
  - Users: >300 institutions from 43 countries

- **World Settlement Footprint (WSF)**
  - Use of free and open data
  - Multi-sensor (Sentinel-1, Landsat/Sentinel-2)
  - Multi-date (use of all scenes available)
  - Multi-facility (DLR, U-TEP, GEE)

**Product portfolio**
- **WSF 2015** (10m, binary mask)
- **WSF 2015 Density** (30m, imperviousness)
- **WSF 2015 Network** (settlement pattern)
- **WSF Evolution** (30m, 1984-2015)
- **WSF/GUF 3D** (average building volume)
World Settlement Footprint: TimeScan Landsat 2015

~460,000
Landsat-8 scenes collected in 2014-2015

6 spectral indices
5 temporal statistics

30m spatial resolution

> 1.5 PB intermediate products
25 TB final product
E.g. Pilot User: World Bank

Use case: UAV Mapping Service

Motivation: Demonstration of an approach for UAV mass data processing to orthomosaic and DTM (test area: Dar es Salaam, Tanzania, ~100 sqkm, 11832 images).

Methods: Orientation, matching, DTM processing, orthoproduction and mosaicing.

Results: 5cm resolution orthomosaic and 20cm DSM delivered to World Bank.
High Resolution / Local Level

Automated detection of information

Rule-based specification of building
Thematic Applications

Visualisation and Synergistic Data Analysis
Chart 28

**Thematic Applications**

Visualisation and Analytics Toolbox

**Global Urban Footprint Plus (GUF+)**
by DLR

The Global Urban Footprint + Evolution (GUF+ Evo) collection shows the status of the urban extent for the years 2015-2010-2000-1990. The GUF+ Evo...

May 16th 2015
Map: WSF Bangkok 1985, 1995, 2005 and 2015. Bar Chart & Table: SDG 11.3.1 Indicator: Population Change normalized by Settlement Area Change. The higher the ratio the more unbalanced the development between population and settlement area.
A: Accumulated nightlights intensity of 2015 in relation to the total population of a country in 2015
B: Number of geotagged tweets per capita 2016
C: Accumulated nightlights intensity of 2015 in relation to the electric power consumption per capita [kWh]
B: Gross national Income per capita (US$) (Development 1985 – 2015)
C: Urban population in % of total population (1985 – 2015)
Thematic Applications