TEP Urban

Collaborative Service Platform for EO-based Exploration and Generation of Thematic Information on the Built Environment

Motivation

In 15-20 years, cities will account for:

- 90% of population growth.
- 80% of increased prosperity.
- 60% of energy consumption.
- 60% of the world’s population.

- Emerging cities will create 50% the world’s gross domestic product.
- Currently 28 megacities, already 41 in 2030 (three in 1975).
Motivation

Chart 3

Shanghai

Urban Growth
Chart 5

NO2 distribution 2012 and trend 2002 – 2012 in Pearl river delta region, measured with SCIA time series data

Erbertseder et al., 2014
Motivation

**Urban Thematic Exploitation Platform (TEP Urban)**

- Explore **new opportunities** (enable livable cities)
  - Unique EO capabilities in Europe.
  - Big data perspective.
  - High-level IT-infrastructures.
  - Massive processing power.
  - Vast expert knowledge.
  - New media and ways of communication.
  - Increasing connectivity and networks.

- Initiate **step change** (technology, thematic, behavior)
  - Remote processing (users-to-the-data).
  - Enabling technology (large-scale exploitation, timeliness).
  - Distribution of expertise (increase assets).
  - Sharing data and technology (innovation, benchmarking).
  - Open, integrative, participatory, collaborative concepts (community stimulation, outreach).
• **TEP Urban - Thematic Fields of Application**
  - Global urban analyses and products.
  - On-demand regional and local hot spot observations.
  - Historical and long-term monitoring.
  - Integrative and comparative studies.

• **TEP Urban - Key Technical Functionalities**
  - Web-based, modular platform.
  - High-performance data access.
  - Multi-mission/multi-source data management.
  - Generic, high-level computing infrastructures.
  - State-of-the-art pre-processing, analysis, and visualization techniques.
  - Customizing functionalities for transfer of algorithms/products into services.
  - Functionalities to support networking, communication, and dissemination activities.
• Platform Design

- Systematic ingestion.
- Bulk production.
- On-demand processing.
- Customizing / R&D.
• **Thematic Applications and User Stories**
  
  • **Global Urban Observation.**
    • Key users: World Bank Group, GEO SB-04.
    • Scope: Globally applicable.

  • **On-demand Regional Analysis.**
    • Key users: World Bank Group, GEO SB-04, DG Regio, EEA.
    • Scope: Regional applications for six cities.
      • Cairo, Lagos, Delhi, Ho-Chi-Minh, Mexico City, Sao Paulo.

  • **Innovative Applications.**
    • Key users: ISOCARP, City of Prague, EEA, DG REGIO, private/commercial sector.
    • Scope: Local applications for selected areas (Prague as concept demonstrator).

  • **New EO Service and Product Development.**
    • Key users: Research centers, private/commercial sector.
    • Scope: Regional applications for selected cities / data sets.
• Global Urban Observation:  Global Urban Footprint
• Global Urban Observation: Global Human Settlements Properties and Pattern

Settlement mask raster data

Spatial network
• Global Urban Observation: **Global Human Settlements Properties and Pattern**

**Chart 12**

**Capabilities**

**Settlement mask raster data**

**Node attributes computation** (e.g., area, perimeter, eccentricity, equivalent diameter, shape index)
• Global Urban Observation: **Global Human Settlements Properties and Pattern**

**Settlement mask raster data**

**Edge weights computation** (e.g., centroid distance, minimum distance, number of intersected edges)
• Global Urban Observation: **Global Human Settlements Properties and Pattern**

**Location of settlements (red) in Malmö region**

**Spatial network (blue) and local relevance of settlements**
• On-demand Regional Analysis: **User-driven Data Access and Processing**

Fully-automated analysis of data streams and archives, including selection of scenes intersecting with user-defined areas of interest and push to processing facility (i.a., Landsat, Sentinel-1, Sentinel-2)
Capabilities

- On-demand Regional Analysis: **Imperviousness / Greenery Index**

Automated generation of imperviousness layer for user-defined area of interest
• Innovative Applications: Integration of individual data, services and products

Near-real-time mobility model service

Cellular phone position data
Source: Telefonica 02

Tourists routes based on Flickr and Picasa time stamps
• Innovative Applications: **Crowdsourcing**

Result of crowd-based evaluation of automatically classified urban objects (yellow) with contour line color defining the number of agreements between crowd and classification (0=low to 10=high)
• New EO Service and Product Development

Dataset and processor selection as well as request monitoring and result retrieval for on-demand processing by external users with the Calvalus portal (to be customized for TEP Urban)
Chart 20

Capabilities

• Team

Contracts Officer
DLR
B. Wild

Project Manager
DLR
T. Esch

Community Leader
ISU
Q. Weng

WP 2 Manager
DLR
T. Esch

WP 3 Manager
GS
T. Soukup

WP 4 Manager
TD
E. Mathot

WP 5 Manager
BC
M. Boettcher

WP 6 Manager
IT4I
V. Vondrak

Platform System Engineer
TD, GS
E. Mathot, T. Soukup

Processing System Engineer
BC, DLR, IT4I
M. Boettcher, A. Hirner, V. Vondrak

VA Processor Integration
Supervisor
DLR, BC, GS
M. Marconcini, M. Boettcher, T. Soukup

T. Esch
A. Hirner
M. Marconcini
A. Metz

M. Böttcher
C. Brockmann

F. Brito
E. Mathot
P. Pereira-Goncalves
E. Boissier

T. Soukup

M. Palkovič
F. Staněk
V. Vondrák
Expected Impact

- **Hub and Ecosystem of Knowledge and Functionalities**
  - Platform as *enabling technology*.
    - Technical: Linking big data, IT-infrastructures, processing and analysis solutions.
    - Thematic: Provision of standardized, new, and tailored products and services.
    - Societal: Improving access to and distribution of data, methods and information.
  - **Access point** for and **network** of stakeholders and experts.
    - GEO SB-04, World Bank, EEA, DG Regio, ISOCARP, and many more.
    - SAR4Urban, SEN4RUS, URBANFLUXES, and many more.
  - **Market place of ideas** and **driver of innovation**.
    - CloudEO, GIM, INDRA, Pallas Ludens, Planetek, SAP, Ticinum Aerospace.
  - Exploitation of **new user communities** outside EO/geo-sector.
  - Instrument to **gain of knowledge** on the urban system.
    - Close gaps in earth system science and increase effectiveness and sustainability of policy, planning, economy, and science.
Thank you for your attention!

Find more information about TEP Urban at:

https://urban-tep.eo.esa.int/#!

Bring in your expertise and requirements via the TEP Urban questionnaire:

https://urban-tep.eo.esa.int/#!pages/community

(Find online- and pdf-version at bottom of page)

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