

→ EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT

Urban Development

City Academy: Geospatial Data Applications for Urban Development, Sao Paulo 16.-17.09.2019

Online platform for generating spatial analytics and statistics: UTEP

Tomas Soukup, GISAT



Online platform for generating spatial analytics and statistics: Urban Thematic Exploitation Platform (U-TEP)

Speaker



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Outline of the Presentation

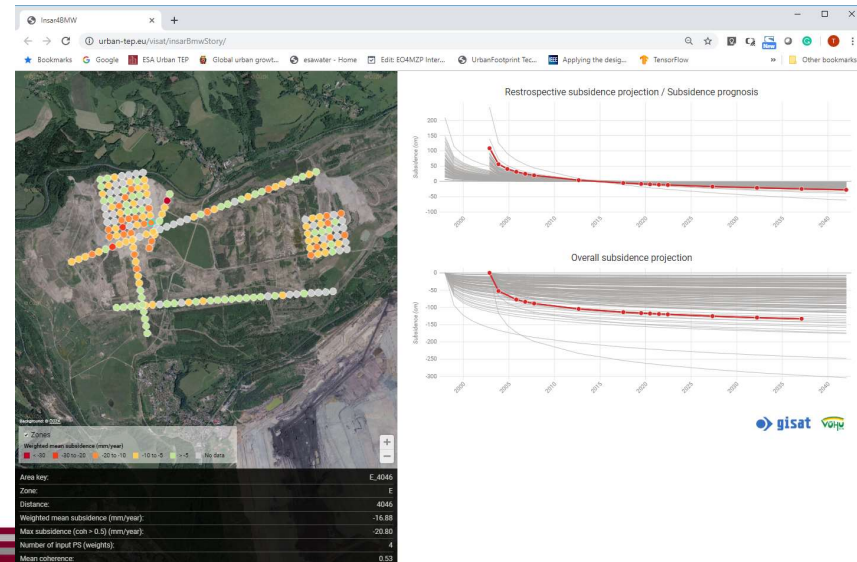
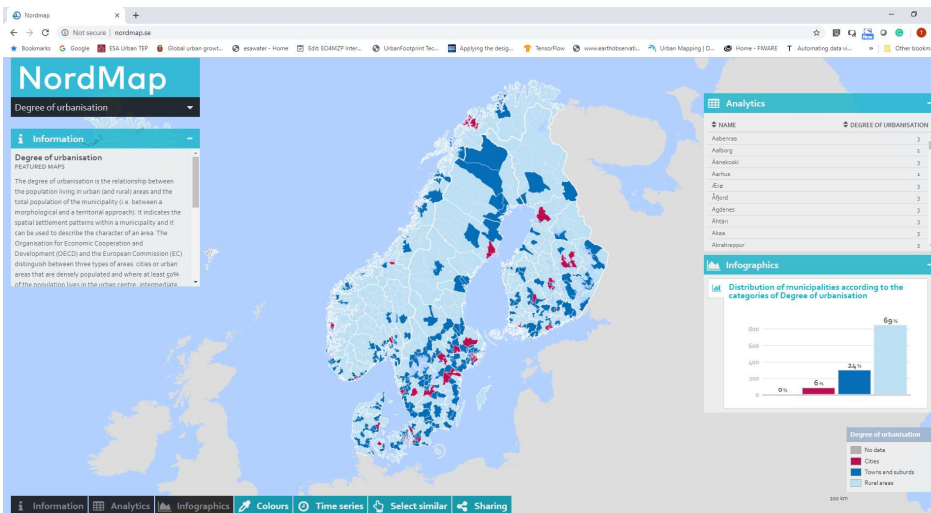
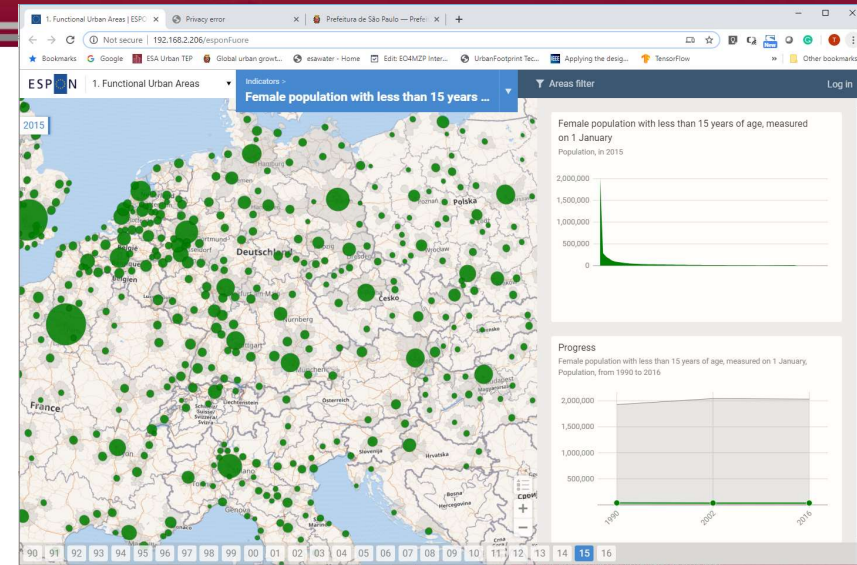
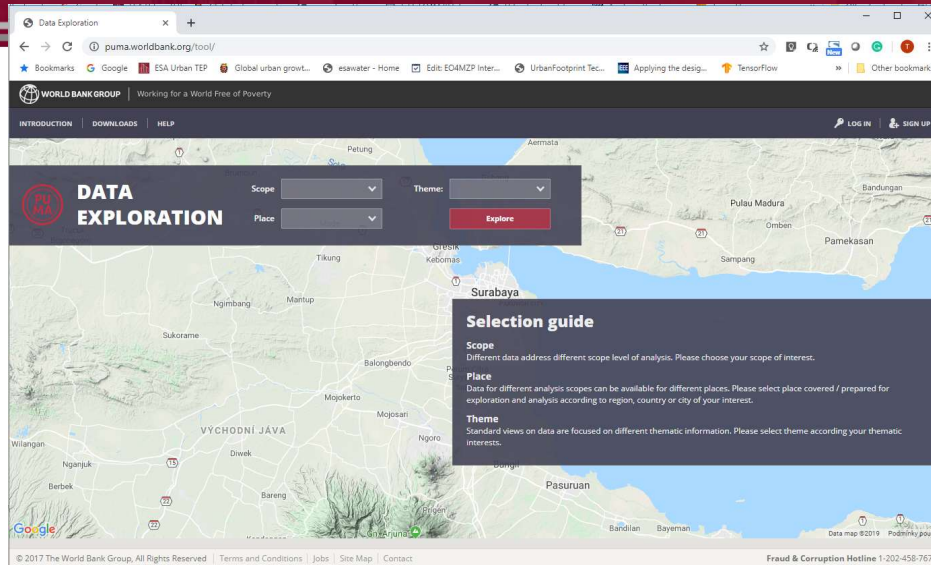


- Intro
 - Rationale
 - UTEP / EO4SD Urban cooperation
- UTEP in nutshell
- Storylines
- More Resources

- EO4SD project work with a lot of data and generate a lot of information
- General **redline** of today – space is a key for integration, but so much information from different sources starts to be difficult to digest
- While traditional delivery options are still to be continued, producers, users and citizens look for alternatives – new delivery modes which would manage integration of these vast of data and deliver in more understandable, informative way.
- Whole information sector is going this way and EO is not the other exception - big data analytics and advanced visualization are more and more widely used, so the information are presented also in a bit more standards dashboard style allowing storytelling (not only factual, but also in emotional) to support the change and actions

- In GISAT, we are working in this direction for some years.

Context



→ EARTH OBSERVATION FOR SUSTAINABLE DEVELOPMENT
Urban development

European Space Agency

- For EO4SD Urban, we have teamed up with second ESA project called UTEP and integrated our data in this platform.
- In this presentation, we will deal with 2 examples:
 - 1- first presenting UTEP in EO4SD Urban context, functionalities and how you can use resources available
 - 2- showing Storylines - what can be easily done when you already have some data integrated on the platform We have prepare for GPSC three of them, from our data and I will go quickly through to show you what you can done with it.

UTEP Tools for City Report contents and much more

- Interactive exploration
- flexible granularity (context - hotspot - detail)
- multiple modes interconnected (map/table/graph)
- seamless 2D/3D presentation
- user visualization support, live views sharing
- result exports in multiple way

UTEP in a Nutshell



urban tep

Background Quick Start Publications & Media Partners

High Altitude Pseudo Satellites (HAPS) demo data available

Simulated products for urban applications of HAPS integrated in U-TEP

Discover HAPS

Community Workspace Data & Products Showcase Earth Observation Processing Services

News (full archive)

UrbanTEP at ESA Phi-Week
Join us at our digital poster / live demo of UrbanTEP on the ESA Phi-Week at Wednesday evening in Frascati, Italy (phiweek.esa.int).
6 days ago

22/07/2019 Webinar Recording is Available Online
The recording of the tutorial focused on bringing your own data into the platform is available online on YouTube:
2 months ago

Tweets (full archive)

OGC **Open Geospatial: OGC** @opengeospatial
RT @Percivall: Good news, #GeoTIFF 1.1 is published. @opengeospatial
<https://t.co/soB33bg55e>
19 minutes ago

OGC **Open Geospatial: OGC** @opengeospatial
We are taking OGC to the next level and we're looking for a Marketing Director to oversee and manage all OGC's mark... <https://t.co/eWT6IKvwwk>
an hour ago

Urban TEP has a new Privacy Policy, effective May 25th, 2018. [Learn more](#)

UTEP in a Nutshell



The screenshot shows a web browser window with the URL `urban-tep.eu/#!communities`. The page features a navigation bar with icons for LinkedIn, Facebook, and Twitter, and a user profile for 'Tomas.Soukup' with 400 points. Below the navigation are five main menu items: 'urban tep', 'Background', 'Quick Start', 'Publications & Media', and 'Partners'. The main content area is titled 'TEP Urban communities' and includes a search bar with the placeholder 'Type something...'. Below the search bar, it indicates '38 total results found.' and shows a list of four community cards:

- High Altitude Pseudo Satellites**: High Altitude Pseudo Satellites (HAPS) are stratospheric platforms that stay over a fixed point on Earth from weeks to months. Compared to ground-based systems, towers or aircraft, HAPS operate quasi-stationarily at an altitude of approximately 20 km. This allows them to complement or extend the capabilities of satellites in the domains of Earth Observation, Telecommunication and Navigation with the potential to further integrate with ground-based infrastructure. The HAPS group includes users and experts that are interested in the application and evolution of HAPS. 15 members, public. [Enter](#)
- Starter users**: Starter community where you can find applications and resources for managing your workspace and your data in the Urban TEP. 272 members, public. [Enter](#)
- EO4SD Urban**: An ESA project aimed at deriving key geo-information products from Earth Observation data in support of urban development programmes. [Enter](#)
- Gisat**: GISAT – making better decision about our environment The company mission is to provide its clients with wide range of value added, complete, high quality, affordable and 'state-of-the-art' geoinformation services based on the Earth Observation technology. GISAT brings to its domestic and international public and private clients geoinformation services from satellite data and processing. [Enter](#)

At the bottom of the page, there is a red banner with the text: 'Urban TEP has a new Privacy Policy, effective May 25th, 2018. [Learn more](#)' and a [Got it](#) button.

UTEP in a Nutshell



2015)

HAPS

DEMO: Settlements Analysis EU

DEMO: Functional Urban Areas

Local Studies

EO4SD Urban

- City Products Exploration - Demo
- Informal Settlements
- City Products Exploration

World Bank Group

- City Level Analysis SE Asia
- Built-up, Population per Countries
- Population distribution & density SE Asia

ESA Urban TEP



The main goal of the Urban Thematic Exploitation Platform (TEP) is the implementation of an instrument that helps addressing key research questions and societal challenges arising from the phenomenon of global urbanization.

Therefore, the Urban TEP represents a web-based platform that allows users to effectively utilize Earth Observation (EO) imagery and existing auxiliary data (e.g., geo-data, statistics) to measure and assess key properties of the urban environment and monitor the past and future spatiotemporal development of settlements.

Key elements of the Urban TEP are the provision of easy and high performance access to EO data streams and archived data, multi-mission and multi-source data management and processing infrastructures, modular pre-processing and analysis procedures (value adding processors), user-oriented functionalities for

Statistics – understanding intensity and ‘cons / forms’ flows



Storyline

Global Urban Growth Dynamic Monitoring (using WSF)



GLOBAL URBAN GROWTH GREEN AREAS LAND ASSETS STRUCTURE

Global Urban Growth Dynamics Monitoring

Earth Observation data can provide unprecedented insight into long term trends in urban growth dynamics globally

The urbanized World is our playground. Facing global massive urbanization trends in climate change context, urban expansion needs to be monitored to ensure it proceeds on a sustainable basis, does not impair or overexploit environmental resources, nor worsen the quality and life and safety of the urban population. Nowadays, EO based global products are available for urban studies to be done in rich spatial-temporal context, quickly and accurately.

Settlement Area Expansion (1985-2015)

Tianjin

Dakar

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	No data		

Settlement Area Expansion (area growth in km²)

Maximum settlement area (km²) displayed: Full range 2000 km² 500 km²

The documentation of urban expansion over time can reveal different phases of urbanisation as illustrated above - early growth period, slow or rapid expansion, acceleration or saturation. Information about the expansion phase and its dynamics are important to cluster cities with similar evolution path and support lesson-learned exchange between individual cities.

Settlement Area Expansion (annual growth rate in %)

Maximum settlement area growth rate (%) displayed: Full range 15% 5%

Similarly, urban expansion rate over time can be also compared between different cities as illustrated above to explore development trajectories in the context of existing urban policy framework in particular city and time.

Urban Expansion Coefficient

As EO4SD-Urban contribution to the GPSC's 3rd Global Meeting Urban Growth Dynamics Monitoring Storyline for all GPSC Cities is available at <https://urban-tep.eu/visat/scudeoStories19/globalWsfu>

Storyline

City Land Assets Structure and Evolution



GLOBAL URBAN GROWTH GREEN AREAS LAND ASSETS STRUCTURE

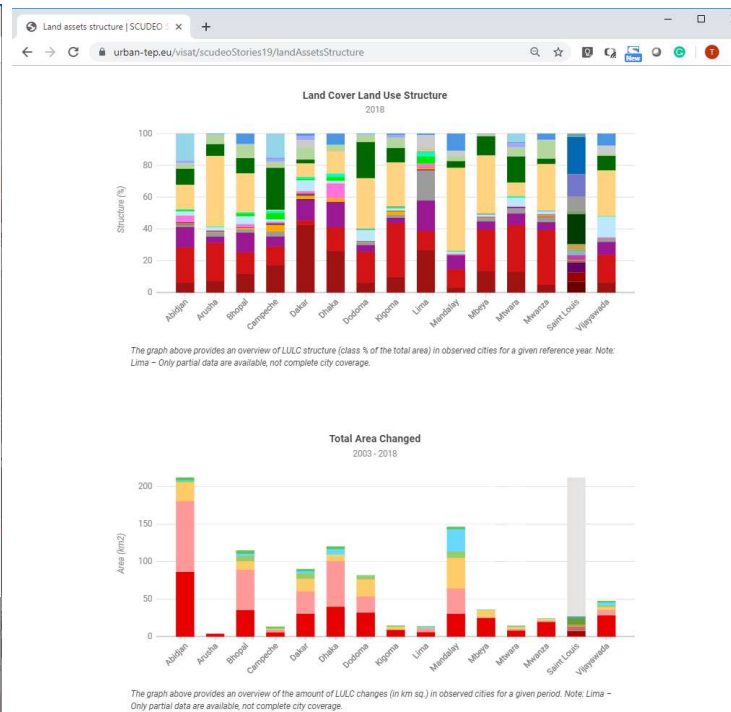
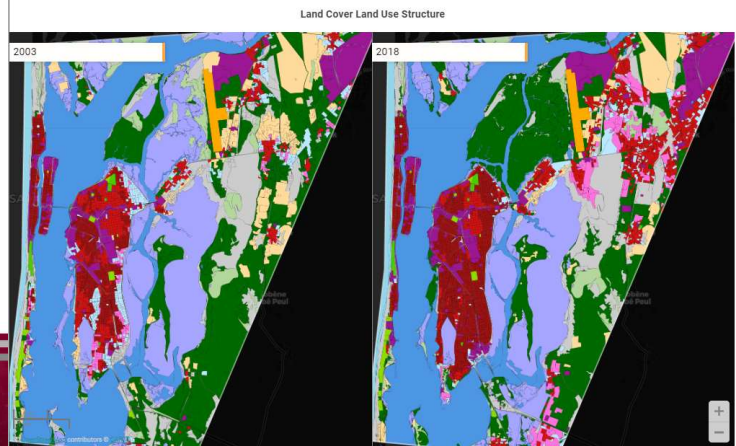
City Land Assets Structure and Evolution

Earth Observation data can provide insight into Land Use and Land Cover (LULC) assets structure and evaluate quantity and quality of LULC changes

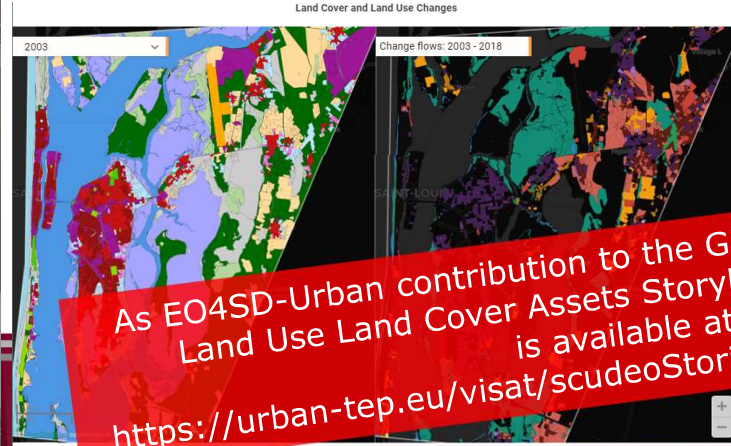
Land is a non-renewable resource and its quantity and quality play a vital role in the development of a city. Land structure and spatial-temporal patterns to a large extent influence city livability and resilience as well as determine physical constraints, opportunities and potential for further development.

Saint Louis

Distribution and the spatial composition of LULC classes for two reference years is presented in the maps below. Pick the city from the pull-down menu on the top to display the maps for respective city.



The graph above provides an overview of the amount of LULC changes (in km sq.) in observed cities for a given period. Note: Lima - Only partial data are available, not complete city coverage.



As EO4SD-Urban contribution to the GPSC's 3rd Global Meeting Land Use Land Cover Assets Storyline for several Cities is available at <https://urban-tep.eu/visat/scudeoStories19/landAssetsStructure>

Storyline

Mapping and monitoring of Urban Green Areas



Green areas | SCUDEO Stories

urban-tep.eu/visat/scudeoStories19/greenAreas

GLOBAL URBAN GROWTH GREEN AREAS LAND ASSETS STRUCTURE

Mapping and monitoring of urban green areas

How green, open and public spaces are defined – opportunities and limitations.

EO4SD-Urban provides a range of tailored products derived by advanced analysis of recent very high resolution satellite imagery to describe distribution of urban green areas in the city, their structure and typology and evolution over the time. This presentation brings simple but powerful examples of mapping and statistical outputs derived directly from EO4SD-Urban's Urban Green baseline products, which provide means for high level comparative analysis between different cities.

Abidjan

Distribution of artificial green areas (consisting of two classes) in the current year is presented in the map format. Pick the city from pull-down menu in the top-left corner to display the map for respective city. Status in former time horizon (as mapped using archived imagery) and changes between the two horizons can be presented in the same manner to show spatially explicit patterns of areas subject to transition: either uptake (formation) of former green areas by other classes or their consumption e.g. by urban sprawl or infilling.

Green Areas Distribution

2005 2018

Land assets structure | SCUDEO

urban-tep.eu/visat/scudeoStories19/landAssetsStructure

Green Areas Share (%)

City	Share (%)
Abidjan	2.5
Addis	1.5
Beijing	4.5
Copenhagen	10.5
Dakar	3.5
Doha	7.5
Dublin	3.5
Geneva	2.5
Harare	1.5
Helsinki	2.5
Istanbul	1.5
Lima	10.5
London	2.5
Madrid	1.5
Mexico	2.5
Moscow	1.5
New York	2.5
Paris	1.5
Rome	1.5
Seoul	2.5
Singapore	1.5
Stockholm	1.5
Taipei	1.5
Tokyo	1.5
Vienna	1.5
Warsaw	1.5
Zurich	1.5

Graph shows comparison of relative metric: share of artificial urban green areas on total area of the city, and on total area of artificial urban areas (urban fabric).

Green Areas vs. City Total Area

Scatter plot facilitates identification of clusters depending on relationship between total size of the cities and total area of their green areas. The bubble size represents population as of 2018 / 2019 (source: United Nations, 2018; World Population review, 2019).

Urban Green Area (km2)

Abidjan 2005/2018

Year	Area (km2)
2005	3.5
2018	4.5

Graph shows overall area of urban green in two time horizons.

Green Area Flows

Abidjan 2005/2018

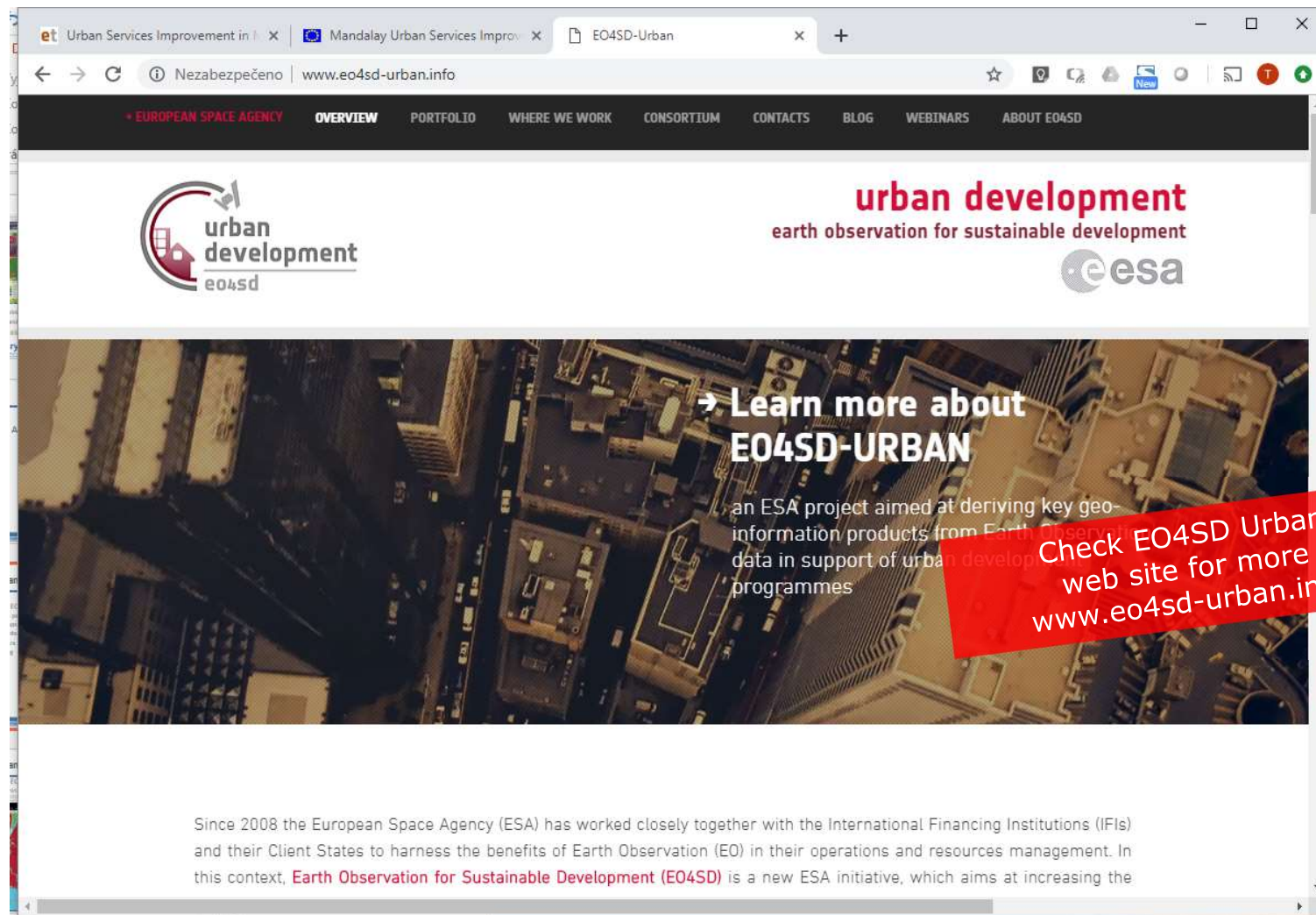
Legend:

- Discontinuous dense residential urban fabric (50% - 80% sealed)
- Commercial and industrial uses
- Collector roads
- Construction class
- Land without current use (Vacant Land not obviously being prepared for construction)

As EO4SD-Urban contribution to the GPSC's 3rd Global Meeting Green Areas Storyline for selected cities is available at <https://urban-tep.eu/visat/scudeoStories19/greenAreas>

More Resources

More Resources



More Resources



Layers

- Analytical Units Layers
 - Area outlines
- Thematic Layers
 - Share of urban fabric (% of AU area)
 - Share of artificial land (% of AU area)
- Info Layers
 - Land Cover Land Use
 - LULC (VHR) - Urban Fabric
 - LULC (VHR) - Level I
 - LULC (VHR) - Level II
 - LULC (VHR) - Level III
 - LULC (VHR) - Level IV - City Sp.
 - Urban Green
 - Urban Green (VHR) - Level III
 - Urban Green (VHR) - Level IV -
 - Floods
 - Flood - Hazard (EOTAP assessment)
- Background layers
 - Carto DB basemap
 - Carto DB basemap dark
 - Wikimedia
 - Bing Aerial
 - Sentinel 2 (satellite)
 - White Layer
 - Black Layer
 - Stamen tile
 - Stamen terrain

Areas 1 - 11 of 11

Area	Value
Amarapura	2.5
Aungmyethazan	2.5
Chanayethazan	2.5
Chanmyathazi	2.5
Madaya	2.5
Mahaungmyay	2.5
Patheingyi	2.5
Pyigyigon	2.5
Sagaing	2.5
Singing	2.5
Tada-U	2.5

Structure of urban fabric [%]

Area	Urban Fabric (%)
Amarapura	100
Aungmyethazan	100
Chanayethazan	100
Chanmyathazi	100
Madaya	100
Mahaungmyay	100
Patheingyi	100
Pyigyigon	100
Sagaing	100
Singing	100
Tada-U	100

Urban fabric vs. Indus., Comm., Transp. vs. Artificial land

Category	Percentage
110 - Urban Fabric	100%
100 - Artificial Surfaces	0%

Web Exploration Tool available at <https://urban-tep.eu>

Thank you for your attention!

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