

## Urban TEP City Data Cube service

Urban TEP sets up, hosts, and serves a city data cube for the area of a city and its surrounding with a number of thematic variables ranging from RGB to WSF and a certain temporal extent. The City Cube is extended daily with new data and keeps a constant period (one year) available all the time. The data cube can be used to combine it with other urban data. Native data cube tools and interfaces like the viewer and the API are available.

A city cube service comprises layers Sentinel-2 RGB, Sentinel-2 false colour, Sentinel-2 NDVI (all 10m), Landsat-8 RGB (pan-sharpened, 15m), Landsat-8 false colour (30m), WSF (8m), WSF Density, WSF Evolution (yearly), 5 variables from ERA5 or CAMS (interpolated, 250m), Land cover from Copernicus Land Monitoring service (100m). The cube has a spatial coverage of up to 60 km x 60 km, a temporal extent of one year, up to daily resolution, updated daily with deletion of old data (rolling archive). The cube is hosted in the cloud. It can be accessed with the data cube viewer and data cube API (web service and Python SDK). In the future, the data can also be accessed as layers in Urban-TEP VISAT. Analytic tools include the xcube API, xcube viewer, and an option for Jupyter Lab.

In addition, a subscription to City Data Cube comes with up to 400000 processing units per month of the Sentinel Hub for data cube layers served on-the-fly as well as six support cases.

Cities may have their own data from heterogeneous sources. A data cube is the way to combine them into one service. Optional services by Urban-TEP are provided to create and maintain customised cubes with:

- Tailored integration of vector or point data, e.g. administrative units or sensor data
- Additional layers, in particular layers provided by the customer for a specific city, but also e.g. additional high-resolution layers from Copernicus Land Monitoring Service
- Customised integration, e.g. to ensure frictionless functioning within existing systems and processes
- Extended time series, enlarged spatial area

- Virtual Processing Environment (pre-configured Jupyter Lab environment, pay-per use)
- Training

These activities can be requested in addition to the city cube service.

## **Urban TEP VISAT**

VISAT is the visualisation and analytical component of the Urban TEP platform. The framework enables integration, visualisation and analysis of various datasets from various sources including OGC compliant web services (WMS, WFS, WCS, WPS, WCPS, etc.). In this context it will also provide integration to the products stored in data cubes.

Data are categorized based upon the available context – thematic, geographic and temporal - provided by metadata, which simplifies the usage for non-expert while providing more complex tools for expert users and coupled with visualisation and analytical functionalities. Technically, the platform is an integration of multiple tools and applications, deployed in a single container together with underlying infrastructure.

VISAT supports user-specific views. The concept of user templates is introduced to adapt the VISAT service offer. A template is a type of user interface with predefined data connections and tools to meet the objective of a specific VISAT application.

A VISAT service is comprised of:

- Access to various data sources including data cubes
- Access to user-defined data
- Access to existing Urban TEP functionalities
- Access to existing Urban TEP templates
- and what is included in the chosen package below

Following activities can be requested in addition to the VISAT service:

- Service design concept support
- Tailored integration into user environment
- Webinars
- Training

Urban TEP provides several processing centres with pre-installed data processors and user-provided data processors. Urban TEP offers to host data processors and processing chains provided by a customer (service provider, data provider, research project, etc.) in a processing centre.

The On-demand Processing Service offers processing on request. The customer specifies input collection, temporal and spatial extent, the processor to be applied, and its parameters. Processing requests can be submitted using a GUI in the portal and WPS as machine-to-machine interface. After processing, the customer can access the result dataset for download or further use on the platform.

Input data can be Sentinel data and datasets from the Urban TEP data portfolio. Depending on the processing centre, also Landsat data can be used as input.

A processor can be provided and uploaded by the customer. Example processor software packages and interface for processor upload are available. Support is provided during processor integration and external request interface integration.

A budget of monthly processing resources is included in the offer. Within this budget, requests can be submitted by the customer without additional costs. Additional resources will be offered if required.

This service is intended for medium to large scale urban data processing that takes advantage of the combination of satellite data and the Urban TEP portfolio. It is also intended for system-to-system integration with a user's system and Urban-TEP as backend.

Algorithms provided:

- user-provided data processors with support for integration,
- optional selection of open-source processors from Sentinel Toolboxes and other processing frameworks.
- Urban TEP timescan for Landsat-8 and for Sentinel-2
- The data processing service is comprised of:
  - availability of the service described above
  - access to the input data

- up to 2000 processing requests per month computing in the volume of up to 1000 core hours, 8 GB RAM per product
- 6 support cases per year

Optional services by Urban-TEP are:

- Algorithm development
- Processor optimization for High-Performance Computing (HPC) environment
- Support during processor testing on the platform
- Output dataset hosting, integration of the output dataset as layers into VISAT
- Systematic processing as data-driven service to process new data every day
- Bulk processing of large datasets and provision of the processing result
- Training and workshop for processor integration

These activities can be requested in addition to the on-demand processing service.