• UrbIS Products User Guide

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1. Introduction

1.1. **Context**

The mission of the UrbIS-Data service of the BRIC, which is responsible for digital cartography for the Brussels-Capital Region, is to:

- manage, produce and continuously update the geographical and alphanumeric databases of regional digital cartography;
- distribute these via the Brussels UrbIS®© (Brussels Urban Information System) product, accessible free of charge to both public administrations and private operators, as well as citizens, etc. within the limits prescribed by an Open-Data user licence.

This document is aimed at users of UrbIS data. Its purpose is to present the general principles of UrbIS and inform the user about the content and meaning of all the geographical and alphanumeric data of UrbIS products.

This guide is not concerned with the technical documentation of UrbIS products, which is the subject of other specific documents.

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1.2. UrbIS products

The term UrbIS comprises a coherent set of cartographical databases and services relating to the territory of the Brussels-Capital Region produced by the BRIC. UrbIS consists of a set of seven distinct products:

Table 1. Main characteristics of the UrbIS products.

UrbIS-Adm		UrbIS-Adm 3D	UrbIS-Topo	UrbIS-DTM	UrbIS-P&B	UrbIS-Fot	UrbIS-Ortho
Administrative and thematic data (municipalities, addresses, roads, railways, green areas, water bodies, areas of interest, etc.)	**Description**	Representation of buildings and bridges in 3D	Topographical data (front/rear/middle façades, pavement, markings, street furniture, etc.)	Digital terrain model (contour lines, TIN, GRID)	Cadastral data (parcels and codes, cadastral buildings, links to UrbIS-Adm addresses)	Aerial photos	Orthophotoplans
Vector data (points, lines, polygons, texts)	**Type of data**	Vector data (3D polygons, 3D solids)	Vector data (points, lines, polygons, texts)	Vector data (lines, polygons) and raster data (for the grid)	Vector data (polygons)	Matrix data (raster images)	Matrix data (raster images)
- Official list of the toponymy of public roads - 3D buildings and works of art	**Supplementary data**	-	-	LiDAR data (point cloud) TIN in SHP format Contour lines: SHP and DGN	-	Flight plan Geo-referencing files	Grid (subdivision) Geo-referencing files
Brussels-Capital Region	**Spatial coverage**	Brussels-Capital Region	Brussels-Capital Region	Partially covers the Brussels-Capital Region + Brussels municipalities	Brussels-Capital Region	Brussels-Capital Region	Brussels-Capital Region + Brussels municipalities
DGN, DWG, SHP, TAB, MDB	**Formats**	DGN, DWG, SHP, GML, CityGML	DGN, DWG, SHP, TAB, MDB	TIN: DGN GRID: MrSID LiDAR: LAS	DGN, DWG, SHP, TAB, MDB	MrSID, TIF, JPEG	MrSID, TIF, JPEG, ECW
1/500	**Scale / Resolution**	1/500	1/250	25 cm	1/500	10 cm	10 cm / 60 cm
Continuous updating, synchronised with the other layers and UrbIS products	**Update frequency**	Continuous updating, synchronised with the other layers and UrbIS products	Continuous updating, synchronised with the other layers and UrbIS products	-	Annually (synchronisation with UrbIS-Adm addresses)	Intermittently (+- every year, depending on the planned flights)	Intermittently (+- every year, depending on the planned flights)
Quarterly	**Update frequency for downloadable data**	Quarterly	Quarterly	Quarterly	Quarterly	Intermittently (+- every year, depending on the planned flights)	Intermittently (+- every year, depending on the planned flights)

1.3. Using UrbIS products

In many areas related to, for example, the environment, spatial planning, mobility, tourism, the police or the SIAMU (Fire and Emergency Medical Assistance Service), geographical information systems have become essential tools. They also provide the individual citizen with a great many uses directly related to his daily needs.

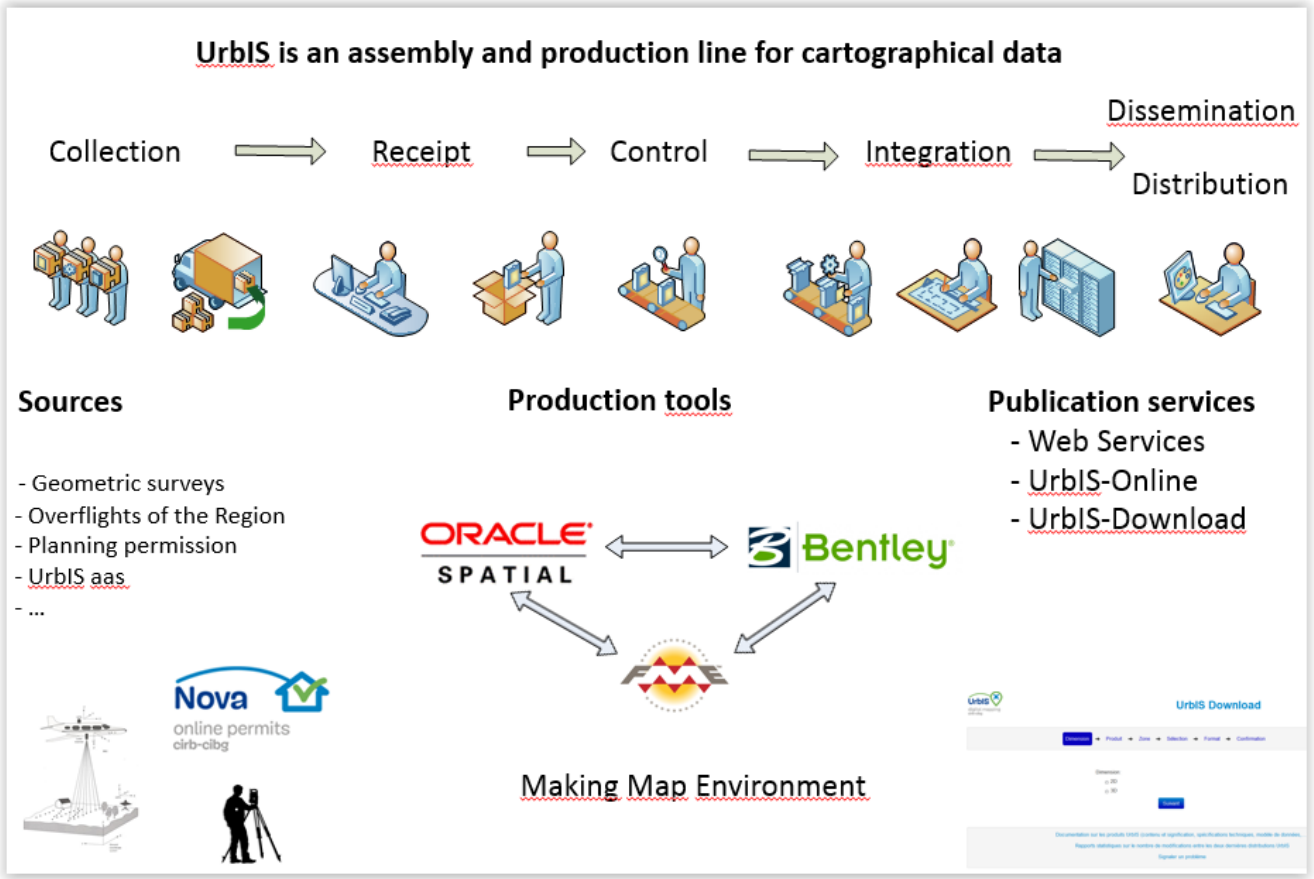
2. Producing UrbIS data

2.1. General process

The creation and maintenance of a cartographical database are long-term, ongoing operations requiring great precision. Since 2009, a new cartographical production environment has gradually been introduced. The implementation of this entire environment helped the various UrbIS products gradually be updated and made available more quickly.

The figure below provides an overview of the main phases leading to the updating of UrbIS data:

Figure 1. Overview of the various stages of generating UrbIS data



2.2. Collecting cartographical data

2.2.1. Sources of data

The UrbIS-Data services uses several data sources to update the databases.

UrbIS products are the result of the integration of data obtained directly or indirectly:

- from subcontractors tasked with updating UrbIS data for the BRIC using different techniques: photogrammetry, topographical surveys, etc. These sources mainly populate the database of the UrbIS-Topo product;
- from various public bodies, both at Federal level (Ministry of Foreign Affairs, Federal Police, Royal Belgian Institute of Natural Sciences, etc.), Regional level (Bruxelles-Mobilité, Bruxelles-Développement urbain, etc.), Municipal level (Brussels municipalities) and from public interest organisations (Brussels Intercommunal Transport Company, Bruxelles-Environnement, etc.). These sources populate the databases of the UrbIS-Adm and UrbIS-Topo products. The General Administration of Heritage Documentation provides data for the UrbIS-P&B product;
- from private organisations (Cambio etc.);
- from citizens, who can notify the BRIC of anomalies or errors relating to the data of all UrbIS products by simple mail using a dedicated form.

2.2.2. Difficulties

The collecting of data is a complex and crucial stage in the update process. The information is obtained through various channels: collection applications (e.g.: UrbIS as a service), provision of paper plans (e.g.: plans from planning permission application files, as-built plans, etc.), e-mails (e.g.: notifications by users), electronic files (private sector partners carrying out topographical surveys and photogrammetry operations), etc.

2.2.3. Notion of authentic data source

The notion of authentic data source is a key element in cartography, and especially for the UrbIS data. Some UrbIS data do indeed come from authentic data sources. An authentic source is the single manager and custodian of its data.

2.3. Data integration

Once the data have been collected from the various sources, the UrbIS-Data service acts mainly as data integrator:

- Identification of changes in the database;
- Integration of updates;
- Validation and control of quality.

2.3.1. Updating UrbIS-Topo

A large part of the work to update the database of the UrbIS-Topo product is based on the integration of data from cyclical photogrammetry operations and topographical surveys. These operations are carried out within the legal framework of procurement contracts.

2.3.1.1. Photogrammetry

At the moment, some of the UrbIS-Topo data are updated by photogrammetry every year by subcontractors appointed through public procurement procedures. Data from these subcontractors are integrated by the UrbIS-Data service, and go through a strict process involving various checks.

2.3.1.2. Topographical surveys

It is important to explain in detail the particular case of work sites. In point of fact, work sites profoundly alter the urban space: new manhole covers, widening of the roadway, addition of street furniture, planting of tall trees, etc. and therefore have a major impact on the updating of UrbIS data.

Different sources of information allow the UrbIS-Data service to locate large regional works, mostly carried out on roads. Once the work has been completed, the BRIC conducts a topographical survey of the site. The data recorded are then integrated directly into the UrbIS-Topo product.

2.3.2. Updating UrbIS-Adm 2D

UrbIS-Adm consists of administrative data, but also of data of a thematic nature. The data of the UrbIS-Adm product are largely derived from the data of the UrbIS-Topo product. The information allowing the update to take place mostly comes from public bodies: police districts (delimitation of police districts, police divisions, etc.), municipalities (notably to update the database of addresses, street names, etc.), etc. The UrbIS-Data service ensures an exchange with public administrations to make sure the data are updated.

2.3.3. Updating UrbIS-Adm 3D

A large part of UrbIS data are currently distributed in 2D.

In 2012, the BRIC awarded a major public contract entitled "Vols 2012" comprising a total of nine deliverables, several of which were linked to 3D.

These deliverables include in particular the three-dimensional modelling of buildings, of +/- 200 works of art and a digital terrain model. These data formed the initial 3D database.

Since the end of 2013, the 3D buildings and works of art have been available for download on the BRIC's website. These objects are modelled individually with a level of detail equivalent to LoD 2 (Level of Detail 2), as defined in the CityGML (City Geography Markup Language) exchange standard[1].

[1] For more information on this standard, visit http://www.citygml.org/

These 3D data are updated

- through using the technique of photogrammetry, using aerial photos taken while overflying the region
- with the help of plans.

2.3.4. Updating UrbIS-P&B

The data of the UrbIS-P&B product are supplied directly by the General Administration of Heritage Documentation. The role of the BRIC consists of integrating the data and ensuring a link between UrbIS-P&B and UrbIS-Adm (link between the buildings/cadastral parcels and the addresses of UrbIS).

2.3.5. Creating the UrbIS-DTM product

UrbIS-DTM (for UrbIS-Digital Terrain Model) is defined as "*the three-dimensional area describing the relief of the terrain, excluding objects placed on this (such as buildings, bridges or vegetation)*".

In May 2012, the BRIC organised an overflight of the territory of the Brussels-Capital Region. On this occasion, a LiDAR[2] survey was carried out using an airborne 3D laser. The LiDAR data (gross point plot with an average density of 32 points per m²) were then processed to generate a Digital Terrain Model (DTM).

There are several ways of representing a Digital Terrain Model:

- Vector elements: the relief is represented by contour lines;
- Grid: the ground relief is represented in the form of a Grid. The Grid is a matrix image formed from a set of pixels arranged in rows and columns. The value of each pixel is a whole or real number corresponding to the altitude level;
- TIN: here too the ground relief is represented in the form of a lattice made up of irregular triangles.

2.3.6. Updating UrbIS-Ortho and UrbIS-Fot data

Taking stereoscopic views and producing orthophoto plans for the whole of the Brussels region are operations that are carried out more or less every year by a subcontractor appointed following a public procurement procedure.

2.4. Frequency of data updates

UrbIS 2D data are continuously updated.

A new version of each UrbIS vector product is distributed each quarter.

[2] "light detection and ranging" or "laser detection and ranging" is a remote measuring technology based on analysing the properties of a light beam returning towards its transmitter.

It is, however, very important to realise that the updating of UrbIS data very much depends on the speed at which the spatial information managed by the competent services is made available.

Also, despite using an efficient and fast production environment, the route to be taken by a piece of information from the moment it is collected by the BRIC to the moment it is distributed may take time. As a result, discrepancies may appear between UrbIS databases and the reality on the ground.

2.5. Checking the quality of the data

2.5.1. Data supplied by authentic sources

In the case of data supplied by authentic sources, the role of the BRIC consists of integrating these data as they are into UrbIS products. Several routine checks are carried out (completeness of data etc.) to ensure consistency with the UrbIS data.

2.5.2. Data supplied by subcontractors

Quality controls are generally carried out on the basis of sampling plans.

Several checks are carried out:

- Verification of the format of the files supplied, adherence to the structure of UrbIS data, the number of objects recorded;
- Verification of the completeness of the data (coverage of the area etc. ;
- Adherence to the technical specifications and the data dictionary;
- Sundry checks relating to the quality of the data;
- Compliance with geometric and topological rules;
- For topographical surveys, the UrbIS-Data service also carries out checks on the ground.

2.5.3. Ongoing quality controls

Several quality controls are built into the production environment, to ensure that the datasets comply with the data models and technical specifications of the UrbIS data. Corrective actions are undertaken periodically by cartographers.

3. UrbIS products

3.1. Location system (geographical coordinates)

The geographical coordinates system used by UrbIS is the following: **GCS_Belge_1972.**
Representation system (projection systems)
The projection system used by UrbIS is the following: **Belge 1972 / Belgian Lambert 72.**

3.2. Representing UrbIS data

3.2.1. Models

Depending on the cartographical approach, the representation of data in UrbIS is based on two models:

- Vector model: the vector model is the representation of the data content in the form of points, lines or polygons.
- Raster model: the raster model is the representation of the data content in the form of images.

UrbIS products therefore consist either of vector products or of raster-type products The full list of datasets may be consulted in the table of UrbIS products (see document "Tables of UrbIS products").

3.2.2. Geometric rules

Certain logistical, geometric and/or topological constraints should always be checked (for example, a polygon must always be closed), to adhere to the data model. These constraints are presented in the form of rules that allow the validity of the data model to be ensured.

UrbIS uses three types of geometric figure to represent objects in 2D or 3D:

- **Point**
- **Line (or polyline)**
- **Polygon:** [note that the segments of a polygon may not intersect/cross (no figure 8)]. Polygons with holes and multipolygons are permitted.

3.3. History management

The history of the data enables users:

- to ensure the life cycle of UrbIS objects is respected (maintenance of an object's identifier throughout its "life");
- to identify the data that have been modified between two distributions;
- to consult the state of UrbIS data on a given date.

This history may be downloaded directly through the UrbIS-Download interface.

3.4. Access to data

3.4.1. Rights, licence and copyright

Since 1 April 2013, access to UrbIS products has not only been free, their use is now subject to an Open Data licence.

Access to the UrbIS-P&B product is strictly limited to the administrations of the Brussels-Capital Region. However, these data may be obtained under certain conditions. Access authorisation may be granted by the General Administrator of Heritage Documentation in response to a reasoned request submitted to him or her.

The user agrees to include the BRIC logo (downloadable from the UrbIS-Solution pages of the BRIC website) as well as the following message in any information, application programmes or third-party product it is authorised to transmit to a third party, regardless of the type of carrier used to transmit the data:

« Réalisé avec Brussels UrbIS®© - Distribution & Copyright CIRB »

or

« Verwezenlijkt door middel van Brussels UrbIS®© - Verdeling & Copyright CIBG »

or

« Realized by means of Brussels UrbIS®© - Distribution & Copyright CIRB »

3.4.2. Downloading

UrbIS data are accessible free of charge by direct download from the BRIC website.

The UrbIS-Data service makes available the latest version of UrbIS data (UrbIS-Topo, UrbIS-Adm, UrbS-Adm 3D, UrbIS-P&B, UrbIS-Ortho, UrbIS-DTM) as well as access to an update history.

3.4.3. Dissemination and Web Services

The dissemination of data consists of making the UrbIS data accessible for consultation (no editing) via the WebServices of the BRIC (UrbIS-Online, WMS, WFS, etc.).

3.4.4. Distribution formats

UrbIS data are distributed in various formats, with which different data structures are associated. They may be in the form of ‘graphic files’ accompanied by an ‘Access file’ containing alphanumeric data. This is the case with AutoCAD. In the other formats distributed, the alphanumeric information is integrated directly into these ‘graphic files’ (see ‘dbf’ files for ESRI Shp, ‘dat’ files for MapInfo Tab, directly integrated into the 'dgn' files of Microstation).