CartoWeb.be

V2021.04

PRODUCT SPECIFICATION

NGI
Nationaal
Geografisch
Instituut

IGN
Institut
Géographique
National

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CartoWeb.be product specification

1. Overview

1.1 Information on the elaboration of the product specifications

Title: *CartoWeb.be* Product specification V2021.04
Reference date: 21/07/2020
Contacts: National Geographic Institute
Avenue de Cortenbergh 115, 1000 Brussels

Email: cartoweb@ngi.be
URL: http://www.ngi.be

Available languages: French, Dutch, German, English
Distribution format: PDF

1.2 Terminology and definitions

For the purposes of these product specifications, the following definitions apply.

Cache
Collection of images corresponding to the regular division of the territory represented. The cache is stored on a file server and the pre-generated images are sent to the user in accordance with their requests.

DTM
Digital Terrain Model. Created from altimetric data, it represents the surface of the bare earth (i.e. without vegetation or constructions) using a grid of regularly spaced points and indicating the altitude value.

Object catalogue
Catalogue containing the definition and description of object types, attributes, and object relationships that occur in one or more data sets. Where appropriate, an object catalogue also contains the operations that have been defined for the object types.

ITGI
This acronym represents "Topographical Inventory" (Inventaire Topo-Géographique/Topo-Geografische Inventaris) and refers to the vector data set that contains the NGI's topographical data.

The following exist:

- **ITGI-Vref**: which contains the most geometrically accurate and semantically detailed reference vector data. A 1:10,000 conceptual scale is used for this data set.
- **ITGI-Vgen**: which contains generalised vector data. The majority of this data is generated by selection and generalisation processes applied to our reference data. This processing can be defined more or less intensively and produces "synthesised" datasets that are used to generate maps on different scales. At NGI, three degrees of generalisation are applied:

1:25,000, 1:50,000 and 1:250,000, stored in the ITGI-Vgen25, the ITGI-Vgen50 and the ITGI-Vgen250 respectively.

Raster
Raster image composed of a pixel grid.

Toponym
A place name. The toponyms on the NGI maps can be used to identify places and refine the location. They are updated using municipal administrations and validated by the Royal Toponymy and Dialectology Commission.

1.3 Abbreviations used

BOSA: FPS Policy and Support
ERM : EuroRegionalMap
DTM: Digital Terrain Model
ITGI: Inventaire Topo-Géographique/Topo-Geografische Inventaris (Topo-Geographic Inventory)
NGI: National Geographic Institute
OGC: Open Geospatial Consortium
WMS: Web Map Service
WMTS: Web Map Tile Service
XML: Extensible Markup Language

1.4 Important documents and links

CartoWeb.be service:

- WMTS: https://cartoweb.wmts.ngi.be/1.0.0/WMTSCapabilities.xml
- WMS: https://cartoweb.wms.ngi.be/service?request=GetCapabilities&service=WMS&version=1.3.0

CartoWeb.be product page: https://www.ngi.be/website/fr/offre/geodonnees-numeriques/cartoweb-be-2/
Conditions of use of the *CartoWeb.be* service: https://www.ngi.be/website/fr/conditions-dutilisation-pour-le-service-cartoweb-be/
Conditions of use of the TopoMapViewer application: https://www.ngi.be/website/fr/gebruiksvoorwaarden-topomapviewer/

Metadata: https://www.geo.be/#!/catalog/details/0fdbe090-bd35-41b1-8835-823eb769eaee?l=fr
Legend : https://www.ngi.be/website/cw_legend_en/

Top10Vector product specification: https://www.geo.be/#!/catalog/details/e0fdc885-8851-482e-80c9-6a0ba3709761?l=en
DTM product specification: https://www.geo.be/#!/catalog/details/6657e6da-7345-416f-bef6-c6a8b2def9bd?l=en

TopoMapViewer application: http://www.ngi.be/topomapviewer/public?lang=fr
Federal geo.be geoportal: https://www.geo.be

2. Product identification

2.1 Title

CartoWeb.be

2.2 Brief description

CartoWeb.be is a web-service (*map service*) that comprises cartographic representations covering 11 different scale levels. The *CartoWeb.be* service is accessible on the following URL:

- WMTS : https://cartoweb.wmts.ngi.be/1.0.0/WMTSCapabilities.xml
- WMS: https://cartoweb.wms.ngi.be/service?request=GetCapabilities&service=WMS&version=1.3.0

The maps found on *CartoWeb.be* have been specifically developed to be viewed on a screen. They therefore differ from the other maps featured in the TopoMapViewer application and corresponding to raster images of the standard analogue (paper) topographic series of the NGI.

The *CartoWeb.be* symbolisation was developed in accordance with the light-emitting medium of the screen, characterised by a lower resolution (standard = 96 dpi); the colours used are less intense than on a paper map and the fine elements have been thickened (e.g. roadsides).

The symbolisation has also been designed for all scales, to make viewing using different zoom levels fluid.

The *CartoWeb.be* visualisation service complies with the standard WMTS protocol (see §6.1), which is specifically adapted to visualisation services created using a pre-generated cache. This is therefore a static web service.

At the end of 2015, a WMS version was also developed to meet the requirements of our users.

CartoWeb.be offers three different types of representation:

- The TOPO, version covering all scales (1:4,000,000, 1:2,000,000, 1:800,000, 1:500,000, 1:250,000, 1:100,000, 1:50,000, 1:25,000, 1:10,000, 1:5,000, 1:2,500). This version is similar to a "traditional" cartographic representation.

- The GREY version which has the same contents as the TOPO version. However, different shades of grey are used for the symbolisation and the specific hydrographic elements are represented in different shades of blue. It constitutes an ideal map background for a thematic overlay. It is available at 11 scale levels.

- The OVERLAY version, available only in the four largest scales (1:25,000, 1:10,000, 1:5,000, 1:2,500). This version uses the cartographic representation of a few themes only (road network, buildings, land use in part, hydrography, toponymy), which allows this layer to be effectively superposed onto other, mainly orthophotographic, data.

- The CROSSBORDER version, which is available only on the six smallest scales (1 :100 000, 1:250 000, 1:500 000, 1:800 000, 1 :2 000 000). This version shows the cartographic representation of the TOPO type, but is extended to the countries around Belgium for a zone which stretches to about 300 kilometer beyond

our borders. We suggest the users to place the TOPO component « on top of » the CROSSBORDER component in order to limit the number of graphic conflicts at the border.

Since 2019, *CartoWeb.be* has been recognised by the Federal Public Service Strategy and Support (DG Digital Transformation) as an authentic source.

2.3 Scope

CartoWeb.be allows the maps developed to be viewed on 11 different scale levels. This range of scales makes it possible to represent different types of information. On the smaller scales, the very generalised maps only show one theme at a time, such as administrative entities or the main networks, while the medium scales show topographic maps that are characteristic of the National Geographic Institute. These topographic maps are characterised by the representation of the relief, in the form of shading or contour lines, limited generalisation and the representation of as many items as possible showing the reality of the land. These maps are therefore tools for interpreting the land and finding one's location and bearings. The larger scales, which are extremely detailed, are more like maps; they have their specific use but do not provide a general overview of the landscape.

The main purpose of *CartoWeb.be* is to offer users a complete cartographic representation that is created and specifically adapted to the on-screen viewing of standard NGI data in its most up-to-date form. The result is a real cartography, not just a basic symbolisation that helps with interpretation.

The *CartoWeb.be* viewing service can be inserted into a web application or software belonging to the user, if this supports the WMTS/WMS protocol. The OVERLAY level can also be combined with other data owned by the user, such as orthophotos. The CROSSBORDER layer allows viewing a cartographic representation which is similar to that of the TOPO layer, but which stretches to a limited extent beyond our borders. This way, it allows viewing Belgium in its European context.

However, for users who do not have their own tools, the *Cartoweb.be* service can be viewed using the *viewer* type application of the NGI, the TopoMapViewer, and on the federal geoportal, *geo.be.*

Access to the viewing service is free of charge for all non-commercial use. The conditions of use are listed here: https://www.ngi.be/website/fr/gebruiksvoorwaarden-topomapviewer/

2.4 Topics

- Basic mapping;
- Altimetry;
- Land cover;
- Public utilities;
- Inland waters;
- Vegetation;
- Street names;
- Constructions;
- Transport;

2.5 Type of spatial representation;

- Raster data (raster images), within a pre-generated cache.

2.6 Spatial resolution

Fixed scale levels, for a standard screen with a resolution of 96 dpi:

- 1:4,000,000;
- 1:2,000,000;
- 1:800,000;
- 1:500,000;
- 1:250,000;
- 1:100,000;
- 1:50,000;
- 1:25,000;
- 1:10,000;
- 1:5,000;
- 1:2,500.

2.7 Geographical demarcation

CartoWeb.be is available for the entire Belgian territory.

The coordinates below demarcate a rectangular area within which all data are located.

Expressed in decimal degrees ETRS89:

– degree of longitude west side: 2.2° W,
– degree of longitude east side: 6.45° W,
– degree of latitude south side: 49.45° N,
– degree of latitude north side: 51.9° N.

Expressed in Lambert 2008 coordinates:

– X coordinate west side: 500,000 m,
– X coordinate east side: 800,000 m,
– Y coordinate south side: 515,000 m,
– Y coordinate north side: 790,000 m.

Expressed in Lambert 72 coordinates:

– X coordinate west side: 0 m,
– X coordinate east side: 300,000 m,
– Y coordinate south side: 15,000 m,
– Y coordinate north sides: 290,000 m.

Of course, the CartoWeb CROSSBORDER component covers a larger zone. The coordinates below demarcate a rectangular area within which all data are located.
It is important to specify that the extent covered in the v2021.02 version is not final. It will probably evolve in order to adapt itself to the viewing scale.

Expressed in decimal degrees ETRS89 :

– degree of longitude west side : -4,0° O,

– degree of longitude east side: 12,6° O,
– degree of latitude south side: 47,0° N,

– degree of latitude north side: 54,0° N.

3. Data content and structure

3.1 Description of the content

The *CartoWeb.be* viewing service offers three different types of representation:

- The TOPO and GREY layers in which the themes of the standard series of the NGI's topographic maps are symbolized : road network, rail network, hydrography, high tension network, constructions, land use and vegetation, local relief and specific zones, administrative entities and altimetry.

- The OVERLAY level contains a symbolisation of just a few themes: road network, constructions, land use (in part), hydrography and rail network. This level is intended to be applied in addition.

- The CROSSBORDER level contains a symbolisation and a semantic content which are similar to those of the TOPO layer, but the mapped data stretch beyond the Belgian territory.

These four types of representation follow the principles of conceptual and structural generalisations that are well known in cartography: the content of the cartographic representation is adapted in accordance with the scale and objective of the map.

The large scales (1:25,000, etc.) offer more space and can thus allow the representation of more topographical objects. These large scales also offer greater geometrical precision: the objects do not have to be moved to be viewed without being superposed between the symbols used, and thus correspond fairly accurately to the reality on the ground.

The small scales use an intensive generalisation process and therefore cannot effectively show more than a few themes.

Below is a brief description of the content represented at each level of *CartoWeb.be*.

- 1:4,000,000: this scale is the smallest in the *CartoWeb.be* product. It provides an overview of the Belgian territory, even on a small screen;

- 1:2,000,000: this map contains the major administrative entities : the regions, the provinces and their administrative centres. The representation of the main hydrographic network, the land use in terms of woods and forests, and the light shading provide a very general idea of the layout of the Belgian landscape;

- 1:800,000: the administrative districts and their centres are given. The hydrographic networks are denser, and airports, rail networks and motorways are shown. The main agglomerations (>50,000 inhabitants) in the country are also shown. Altimetry is represented by shading;

- 1:500,000: networks of all types are denser, down to the primary national network for roads. Land use is more detailed and the toponymy is extended to agglomerations that are not administrative centres;

- 1:250,000: all networks are more detailed and the road network goes as far as link roads. All agglomerations are represented, without exception. Land use becomes more diverse: we represent woods, orchards and bushes. The toponymy reaches municipal level;

- 1:100,000: the toponyms allow the identification of sections of municipalities; all road categories are represented (motorways, national roads, link roads and local roads), with the exception of restricted roads. All other themes are characterised by precision and greater graphic density;

- 1:50,000: all themes are denser and more precise. The toponymy now includes the name of the largest woods, hamlets and rivers;

- 1:25,000: dirt tracks, restricted roads, small hydrographic details and specific buildings are shown. The altimetry is no longer represented only by contour lines and spot heights. Localities are included in the toponymy;

- 1:10,000: the themes already represented in the previous scales are more precise, while specific zones appear. It should be noted that from this scale, and for the first time in an NGI product, street names are indicated (only for main roads);

- 1:5,000: this is now a "map" type representation, on which secondary names and small constructions are shown;

- 1:2,500: the most precise scale, where altimetry is no longer represented as we no longer have an overall vision. However, the microrelief and vegetation lines are added. Street names are given for all categories of road.

3.2 Legend

The complete legend for all the scales symbolised in *CartoWeb.be* can be downloaded in PDF format from the following link: https://www.ngi.be/website/cw_legend_en/

3.3 Description of the structure

CartoWeb.be is a static viewing service based on a series of caches. This means that the images sent to the user are pre-generated, calculated in advance and structured into a regular division of the mapped area.

Each scale has its own cache and its own image pre-divided into "tiles". Here are the characteristics of the "tiles":

- Format/Compression: PNG8
- Dimensions: 256 pixels x 256 pixels
- Resolution: 96 dpi

A pyramid is created to give structure to all the caches and guarantee coherence and geo-referencing between the different scale levels. There is a pyramid for the TOPO level, a pyramid for the OVERLAY level and a pyramid for the CROSSBORDER level.

This pyramid, or series of caches, is characterised by a tiling scheme that includes all the service parameters, such as the viewing scales, the definition of the tiles (size and format), the original coordinates of the caches and the projection used.

As is standard practice, this tiling scheme is defined in the service metadata, which can be accessed via the *"GetCapabilities"* request.

4. Production metadata

The service metadata is available on the Metadata Portal: https://www.geo.be/#!/catalog/details/0fdbe090-bd35-41b1-8835-823eb769eaee?l=fr

4.1 Data origin

4.1.1. Initial creation of vector data

The cartographies contained in *CartoWeb.be* TOPO, GREY & OVERLAY have been created through the symbolisation of the standard NGI vector sets: ITGI-Vref, ITGI-Vgen25, ITGI-Vgen50, ITGI-Vgen250, DTM.

A standard product is available at NGI for some of the data sets used.
The paragraphs below contain a brief description of the vector data sets and/or the standard project associated with them, as well as a link to the product specification for the version used to create the *CartoWeb.be* V2021.04 product.

The product specification is the most complete reference document, as it contains the objects catalogue.

It should be stated that for the different scales, *CartoWeb.be* also contains toponymic information, map lettering and contour lines that have not as yet been integrated into the standard NGI products.

The CartoWeb CROSSBORDER layer on the other hand has been created on the basis of an extract of the pan-European dataset *EuroRegionalMap* on a 1:250 000 scale. These are harmonised and homogeneous data, which have been produced by the European national mapping and land register agencies, on the basis of official national data. The IGN produces the Belgian data for ERM. *EuroRegionalMap* is a product which is managed and furnished byEuroGeographics ©. More information can be found on: https://eurogeographics.org/maps-for-europe/euroregionalmap/

The cartographic contents of the Cartoweb GREY layer are identical to those of the TOPO layer. Its symbolisation in different shades of grey and blue is directly derived from the colour shades of the TOPO layer. For each pixel within each tile, the parameters for shade, saturation and brightness are adapted, which results in a greyscale map representation (with the exception of the hydrographic objects).

The transposition of the shades is done directly on the tiles of the cache of CartoWeb TOPO. As a result, the response time when you consult a GREY tile is a little bit longer than for the other layers.

4.1.2. ITGI-Vref

The ITGI-Vref contains the most geometrically accurate and semantically detailed reference vector data. A 1:10,000 conceptual scale is used for this data set. The data contained here is updated for the entire territory in six years.

More information on the content and structure of the ITGI-Vref data can be found in the *Top10Vector* product specification. This is the standard product generated from the ITGI-Vref.

The product *Top10Vector* contains the ITGI-Vref data at a given time and are not always consistent with the situation as featured in *CartoWeb.be*, which always displays the most up-to-date data.

Release used (*Top10Vector*): V5.5 (2020)
Product specification link: http://publish.geo.be/geonetwork/srv/api/records/e0fdc885-8851-482e-80c9-6a0ba3709761/attachments/Top10Vector_ProductSpecification_FR.pdf

4.1.3. ITGI-Vgen25, ITGI-Vgen50

The ITGI-Vgen contains generalised vector data. The majority of this data is generated by selection and generalisation processes applied to our reference data (ITGI-Vref). This type of processing can be defined more or less intensively and produces "synthesised" datasets that are used to generate maps on different scales.

In *CartoWeb.be*, the generalised ITGI-Vgen25 and ITGI-Vgen50 data is used for cartographic representations using the medium scales.

The 4th ITGI-Vgen50 update has been underway since 2016 and will be completed in 2021.

4.1.4. ITGI-Vgen250

The highest degree of generalisation applied to the NGI can generate a cartographic dataset at 1:250,000. This is the smallest scale maintained by the NGI and allows the representation of the major infrastructures, transportation networks and inhabited locations.

This data is available within the standard *EuroRegionalMap Belgium* product, which meets the specifications defined at European level by EuroGeographics ©.

More information on the content of the ITGI-Vgen250 and the structure of the data within the EuroRegionalMap Belgium product can be found in the following product specification: https://eurogeographics.org/wp-content/uploads/2018/05/ERM_v11-1_DataSpecification.pdf

4.1.5. Digital Terrain Model

The DTM is a homogenous, regular points grid that covers the entire Belgian territory and indicates the ground level so that the surface can be modelled.

Within *CartoWeb.be*, the DTM has been used to obtain the representation of the relief in the smaller scales, in the form of shading.

Release used: 2016
Specific product link:https://www.geo.be/#!/catalog/details/6657e6da-7345-416f-bef6-c6a8b2def9bd?l=fr

4.2 Update process

The updating of the *CartoWeb.be* product is heavily dependent on the updating of the vector data that it includes.

On the *CartoWeb.be* product page, you will find a map showing the dates of the orthophotos used for the vector update of the larger *CartoWeb.be* scales. You will also find the update dates for the railway network, the administrative data, the high tension network and the street names.

Since 2017, *CartoWeb.be* has undergone isolated updates carried out from time to time according to an independent process. These isolated updates are an addition to the updates carried out sheet by sheet over the longer cycle of our usual production process.

The comments posted via the tool « Send a comment » of the *TopoMapViewer* are processed through this quick updating process, which is mainly based on orthophoto interpretation.

The street names displayed at the largest scales come from TomTom and their use is protected by copyright.

The data for the foreign parts, symbolised on the smallest scales of the CartoWeb CROSSBORDER, come from a EuroGeographics © dataset, which is updated once a year. Viewing this layer is subject to copyright.

5. Reference systems

5.1 Geographic reference systems

CartoWeb.be is available in the standard NGI projection system, the Belgian Lambert 2008 (Cartesian coordinates, EPSG:3812). The non-compliant spherical Web Mercator (EPSG: 3857) projection has also been available since September 2014. The WMS version of *CartoWeb.be* is also available in Lambert72 (EPSG: 31370), UTM31N (EPSG: 25831), UTM32N (EPSG: 25832), WGS84 (EPSG: 4326), ETRS89 (EPSG: 4258) and LAEA Europe (EPSG: 3035).

All the Cartesian coordinates in the plan are derived from geographical coordinates to which we have applied a given map projection. The geodetic reference system on which the Lambert 2008 projection is based is the ETRS 89 (*European Terrestrial System* 1989). This is the official international reference in Europe, and is also used as a basis for the UTM coordinates provided to the NGI.

The Web Mercator projection is considered as a reference for viewing services on the Web. Web Mercator projects ellipsoidal coordinates onto the map using the Mercator spherical equations; the reference ellipsoid is WGS84 and the radius of the sphere is equal to the semi-major axis of this same ellipsoid. This is very widespread, in particular in *Google Maps*, and makes it easier to superpose the layers of information available on the WEB onto *CartoWeb.be*.

Nevertheless, it should be stated that although Web Mercator is used on the WEB, its use must be limited to viewing. The distortions produced by this transformation make the values provided by any measurements unreliable.

The LAEA Europe projection is a standard projection, defined for Europe and recommended by INSPIRE.

6. Delivery information

6.1 Distribution support

CartoWeb.be is a web viewing service created in accordance with the **WMTS** protocol, as established in the documentation referenced below.

Name	Web Map Tile Service
Version	1.0.0
Specifications	OpenGIS® Web Map Tile Service Implementation Standard Implementation Specification, 2010-04-06, OGC Document Number 07-057r7
Language	English
URL	http://www.opengeospatial.org/standards/wmts

The *CartoWeb.be* viewing service can be accessed from any compatible web application or software.

A **WMS** version has been available since the end of 2015, as established in the documentation referenced below:

Name	Web Map Service
Version	1.3.0
Specifications	OpenGIS® Web Map Server Implementation Specification, 2006-03-15, OGC Document Number 06-042
Language	English
URL	http://www.opengeospatial.org/standards/wms

The *CartoWeb.be* pyramid (series of caches) has been available since 2018 in a standard product called ***CartoWeb-Tiles***. This product, intended for a limited public, exists for the TOPO and OVERLAY versions of *CartoWeb.be*, in the Lambert 2008 and Web Mercator projections.

The pyramid and the tiling scheme provided allow users to recreate the *CartoWeb.be* web service on their own servers, online or offline.

The product and its product specification can be obtained, under certain conditions, by making a specific request to the following address: cartoweb@ngi.be

CartoWeb.be can also be viewed via the existing NGI interface, the *TopoMapViewer* application and on the federal geoportal, *geo.be*.

6.2 Delivery units

CartoWeb.be is a viewing service for the entire Belgian territory. Nevertheless, as mentioned above, the cache is laid out in a regular tile grid that is 256 pixels x 256 pixels and in PNG format.

For each request, the server sends the client the tile that corresponds to the scale number and the order numbers of the file in accordance with both dimensions.

CartoWeb.be is a viewing service in which it is not possible to select one theme rather than another; all the themes are displayed simultaneously.

6.3 Available data formats

The only available format for the tiles is PNG.