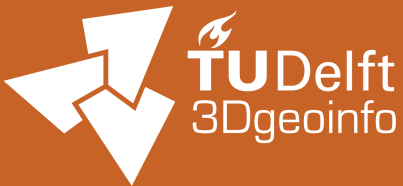
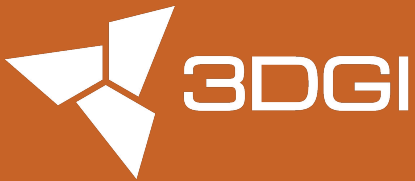


How can you use the 3DBAG?

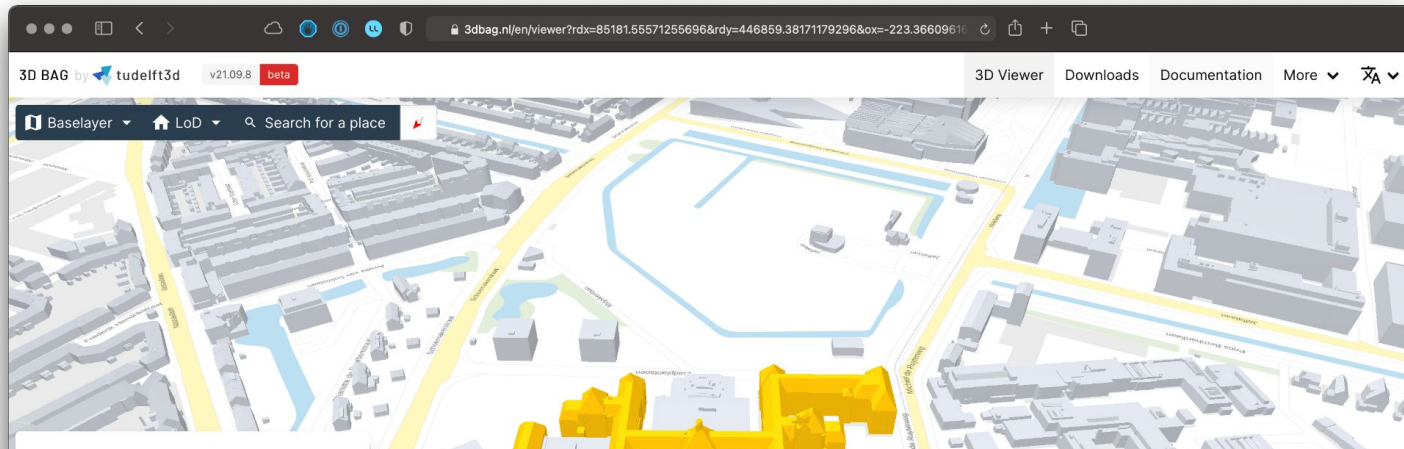
Balazs Dukai, Ravi Peters, Gina Stavropoulou,
Jantien Stoter

Geonovum Open Geodag
7-11-2024, Amersfoort



Contents

1. What is the 3DBAG? (Ravi Peters)
2. How to get the 3DBAG data? (Gina Stavropoulou)
3. How is 3DBAG used?
 - a. ESRI (Joris Bak)
 - b. NL3D (Arjan Koelewijn)
4. The next version of 3DBAG (Balázs Dukai)
5. 3DBAG organisation (Balázs Dukai)

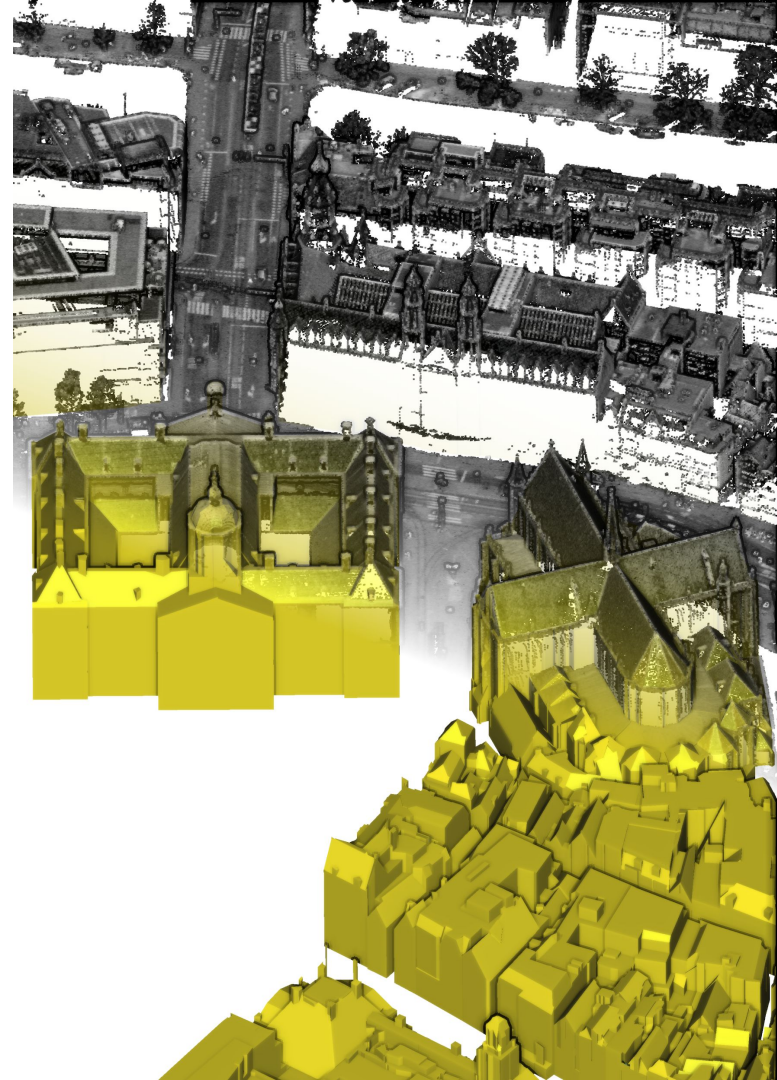


What is the 3DBAG?

What is the 3DBAG?

A dataset with **detailed 3D models** for **all buildings** in the Netherlands

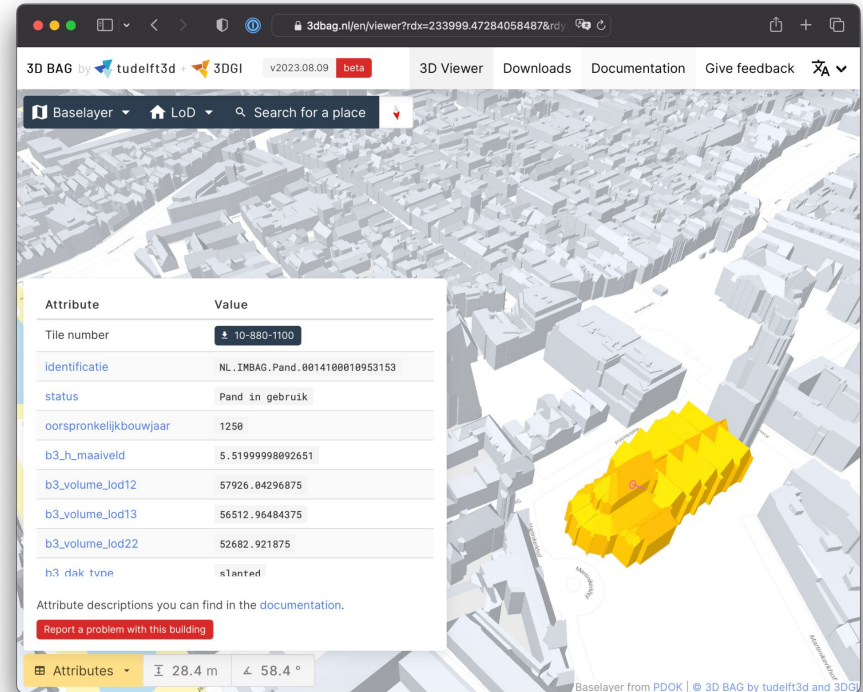
- ~10 million buildings
- Detailed roof structure
- Based on open government data
- Available as open data
- Built and maintained by a small team (3-5 persons)
@TU Delft 3D geoinformation & 3DGI



What is the 3DBAG?

Downloadplatform 3dbag.nl

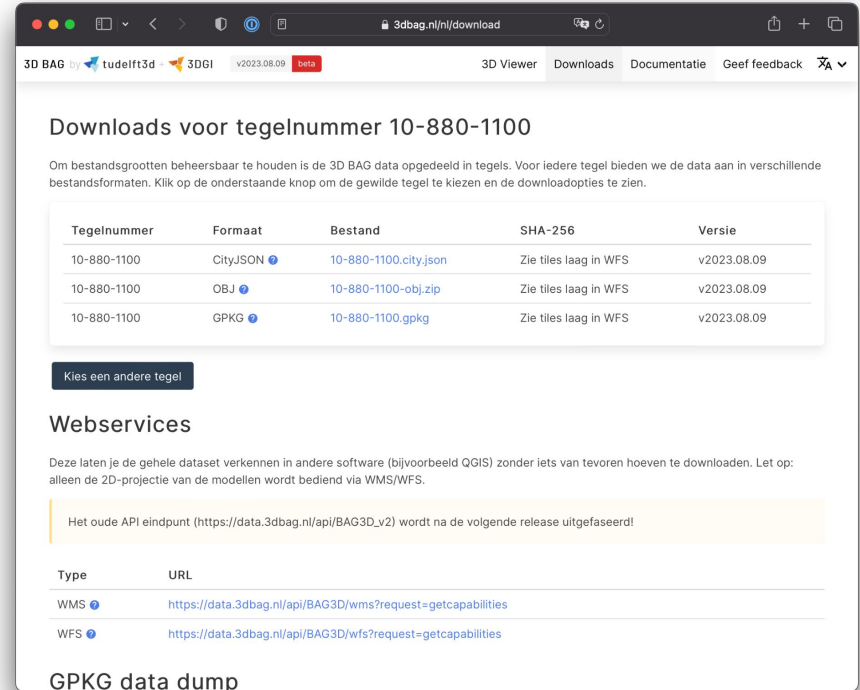
- 3D viewer
 - Directly view and inspect data
 - Also works on mobile



What is the 3DBAG?

Downloadplatform 3dbag.nl

- 3D viewer
 - Directly view and inspect data
 - Also works on mobile
- Data available in common GIS/3D formats



The screenshot shows a web browser window at the URL 3dbag.nl/nl/download. The page title is "3D BAG by tudelft3d" and it includes a "beta" badge. The main heading is "Downloads voor tegelnummer 10-880-1100". Below this, a paragraph explains that data is provided in tiles and can be downloaded in various formats. A table lists three download options for the tile number 10-880-1100:

Tegelnummer	Formaat	Bestand	SHA-256	Versie
10-880-1100	CityJSON	10-880-1100.city.json	Zie tiles laag in WFS	v2023.08.09
10-880-1100	OBJ	10-880-1100-obj.zip	Zie tiles laag in WFS	v2023.08.09
10-880-1100	GPKG	10-880-1100.gpkg	Zie tiles laag in WFS	v2023.08.09

Below the table is a button labeled "Kies een andere tegel". The "Webservices" section explains that the dataset can be explored in other software like QGIS without downloading, and provides the old API endpoint: https://data.3dbag.nl/api/BAG3D_v2. A table lists the WMS and WFS endpoints:

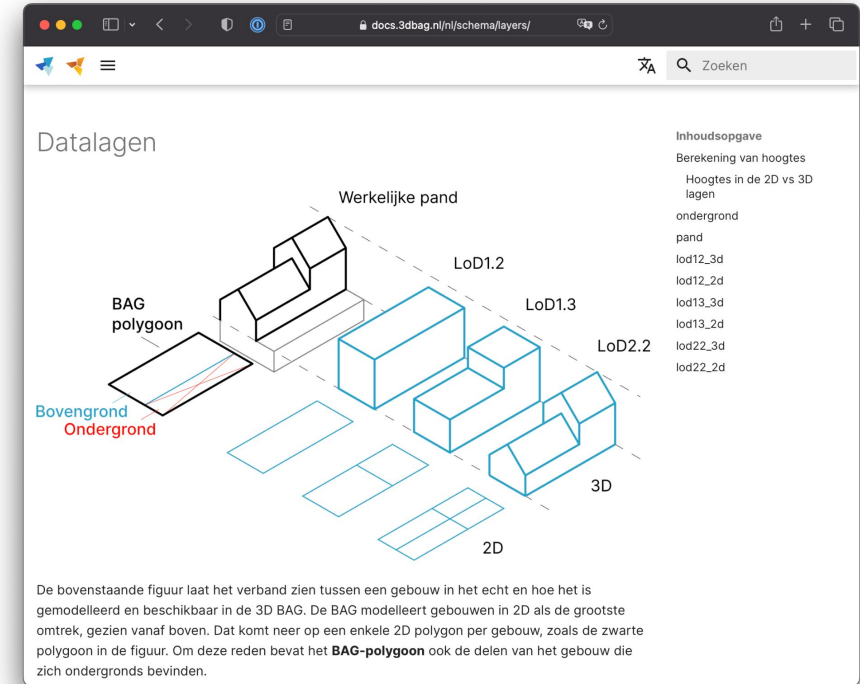
Type	URL
WMS	https://data.3dbag.nl/api/BAG3D/wms?request=getcapabilities
WFS	https://data.3dbag.nl/api/BAG3D/wfs?request=getcapabilities

The "GPKG data dump" section is partially visible at the bottom.

What is the 3DBAG?

Downloadplatform 3dbag.nl

- 3D viewer
 - Directly view and inspect data
 - Also works on mobile
- Data available in common GIS/3D formats
- Documentation
 - Describing the dataset and how to use it



The screenshot shows a web browser window displaying the 3DBAG website. The main content area features a 3D visualization of a building and its footprint. The building is shown in a 3D perspective view, with a dashed line indicating the 'Werkelijke pand' (actual building). Below it, the building is shown in a 2D footprint view, with a dashed line indicating the 'BAG polygoon' (BAG polygon). The footprint is divided into 'Bovengrond' (above ground) and 'Ondergrond' (below ground) sections. The 3D view is labeled '3D' and the 2D view is labeled '2D'. The footprint is also labeled with 'LoD1.2' and 'LoD1.3'.

Datalagen

Inhoudsopgave

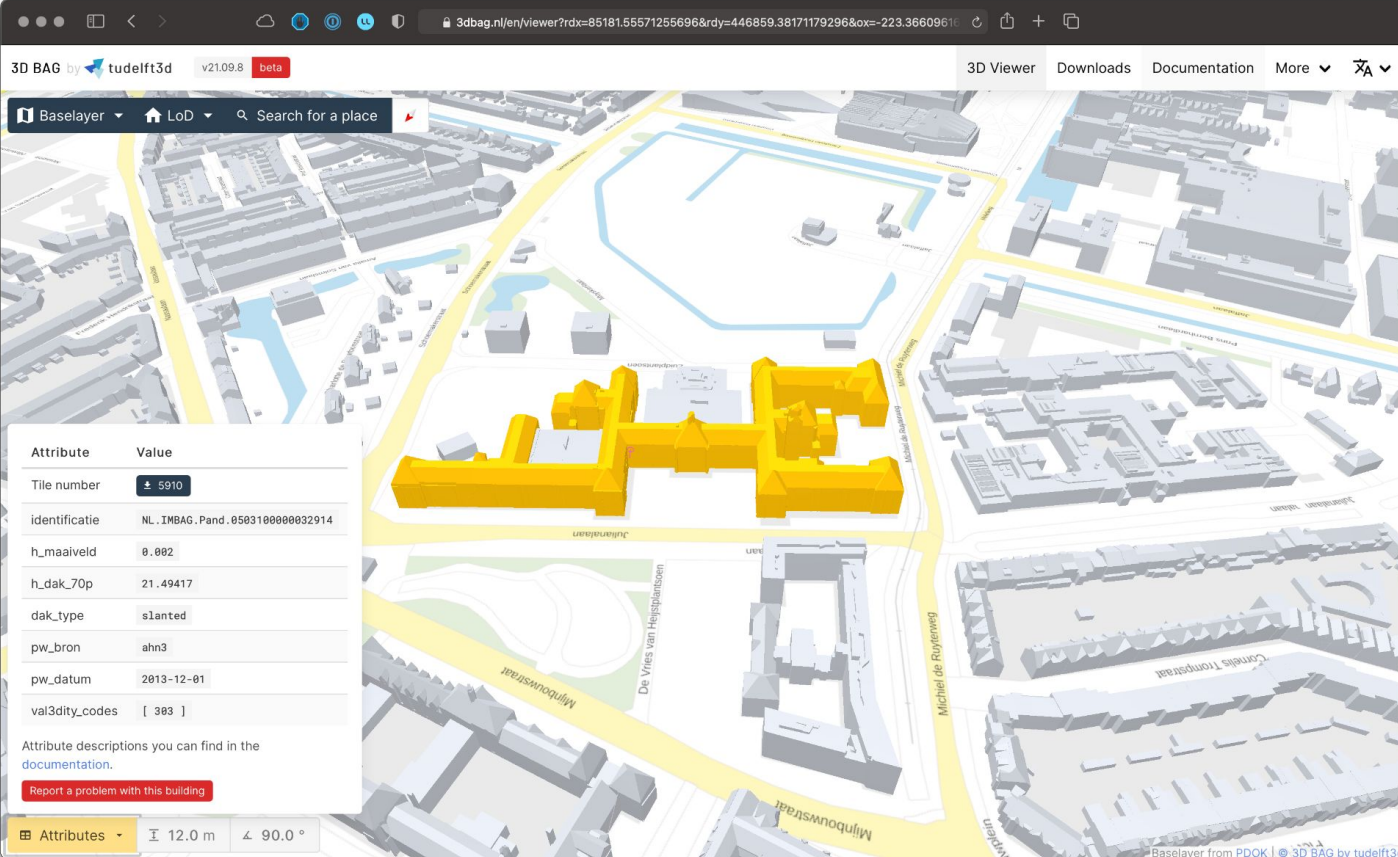
- Berekening van hoogtes
- Hoogtes in de 2D vs 3D lagen
- ondergrond
- pand
- lod12_3d
- lod12_2d
- lod13_3d
- lod13_2d
- lod22_3d
- lod22_2d

De bovenstaande figuur laat het verband zien tussen een gebouw in het echt en hoe het is gemodelleerd en beschikbaar in de 3D BAG. De BAG modelleert gebouwen in 2D als de grootste omtrek, gezien vanaf boven. Dat komt neer op een enkele 2D polygoon per gebouw, zoals de zwarte polygoon in de figuur. Om deze reden bevat het **BAG-polygoon** ook de delen van het gebouw die zich ondergronds bevinden.

The 3D BAG

3dbag.nl

Data:  



3D BAG by tudelft3d v21.09.8 beta

Baselayer | LoD | Search for a place

Attribute	Value
Tile number	5910
identificatie	NL_IMBAG_Pand.0593100000032914
h_maaiveld	0.002
h_dak_70p	21.49417
dak_type	s1anted
pw_bron	ahn3
pw_datum	2013-12-01
val3dity_codes	[383]

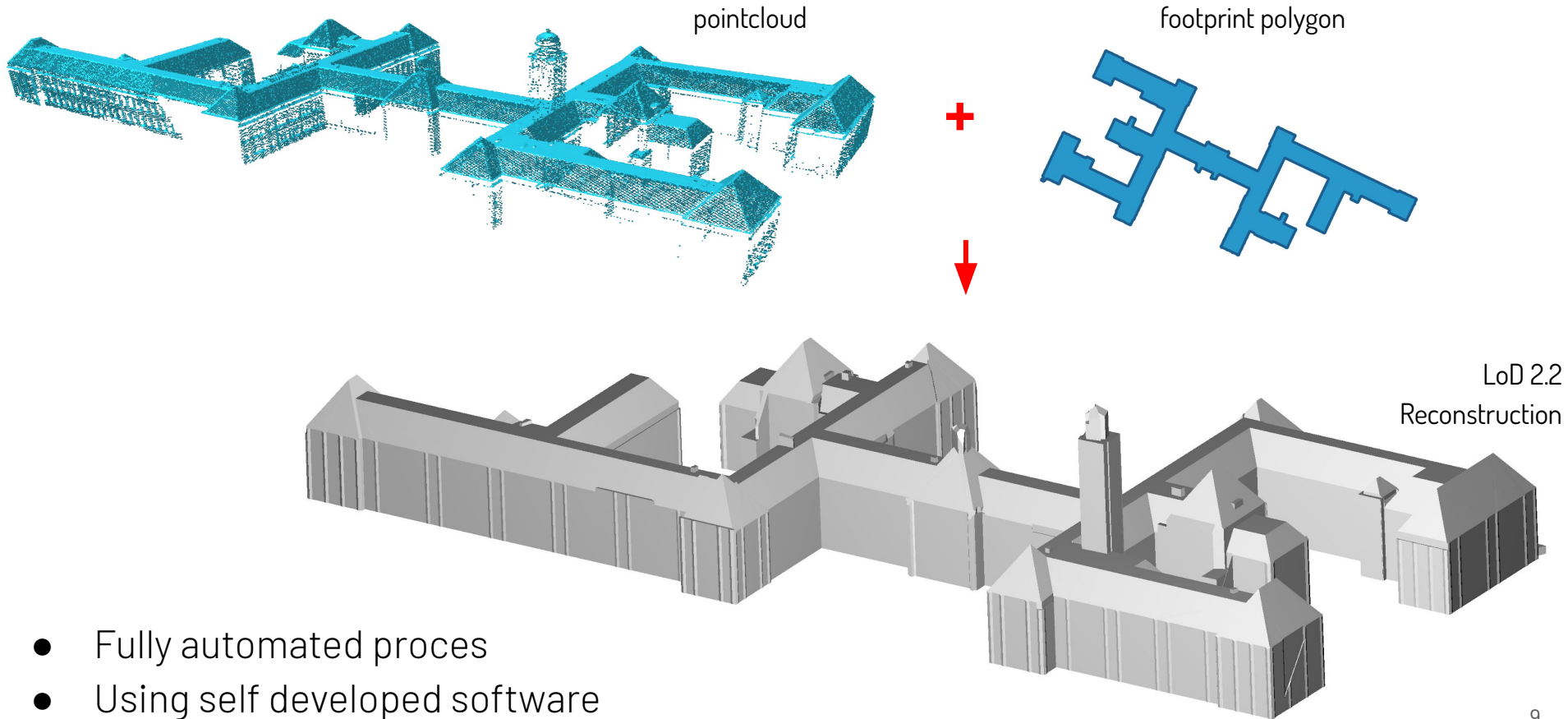
Attribute descriptions you can find in the [documentation](#).

[Report a problem with this building](#)

Attributes | 12.0 m | 90.0°

Baselayer from PDOK | 3D BAG by tudelft3d

How is 3DBAG made?



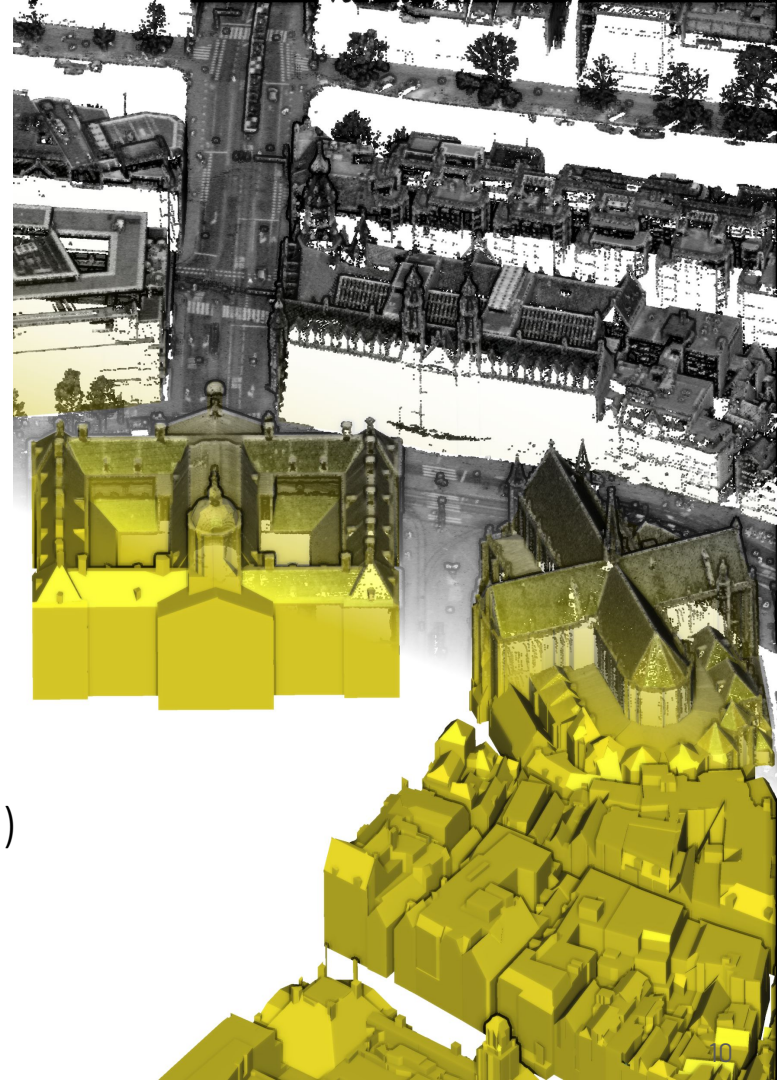
Built from Dutch open data

BAG <https://www.kadaster.nl/bag>

up-to-date building polygons + attributes
largest extent → roofprint + underground
positional accuracy 30cm

AHN <https://ahn.nl>

classified point cloud
positional accuracy ~23cm (height and planimetric)
8-15 pts/m² for buildings
occlusion and other no-data areas



How to get the 3DBAG data?

Attributes

b3_azimut

b3_bag_bag_overlap

b3_bouwlagen

b3_dak_type

b3_dd_id

b3_h_dak_50p

b3_h_dak_70p

b3_h_dak_max

b3_h_dak_min

b3_h_maaiveld

b3_hellingshoek

b3_kas_warenhuis

b3_kwaliteitsindicator

b3_mutatie_ahn3_ahn4

b3_nodata_fractie_ahn3

b3_nodata_fractie_ahn4

b3_nodata_radius_ahn3

b3_nodata_radius_ahn4

b3_opp_buitenmuur

b3_opp_dak_plat

b3_opp_dak_schuin

b3_opp_grond

b3_opp_scheidingsmuur

b3_pand_deel_id

b3_punt dichtheid_ahn3

b3_punt dichtheid_ahn4

b3_pw_bron

b3_pw_datum

b3_pw_selectie_reden

b3_reconstructie_onvolledig

b3_rmse_lod12

b3_rmse_lod13

b3_rmse_lod22

b3_val3dity_lod12

b3_val3dity_lod22

b3_volume_lod12

b3_volume_lod13

b3_volume_lod22

begingeldigheid

documentdatum

documentnummer

eindgeldigheid

eindregistratie

geconstateerd

identificatie

labels

oorspronkelijkbouwjaar

status

tijdstipeindregistratie

tijdstipinactief

tijdstipinactiefv

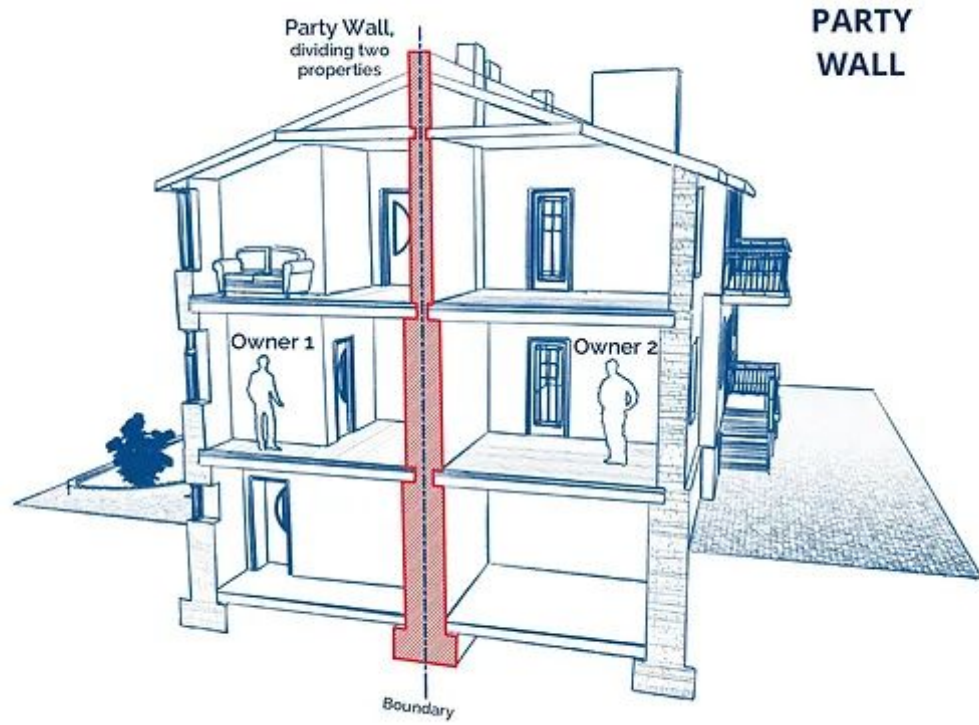
tijdstipnietbaglv

tijdstipregistratie

tijdstipregistratiev

voorkomenidentificatie

Party walls



File formats & Services

Individual tile formats

GPKG

OBJ

CityJSON

Full dataset

GPKG

Web Services

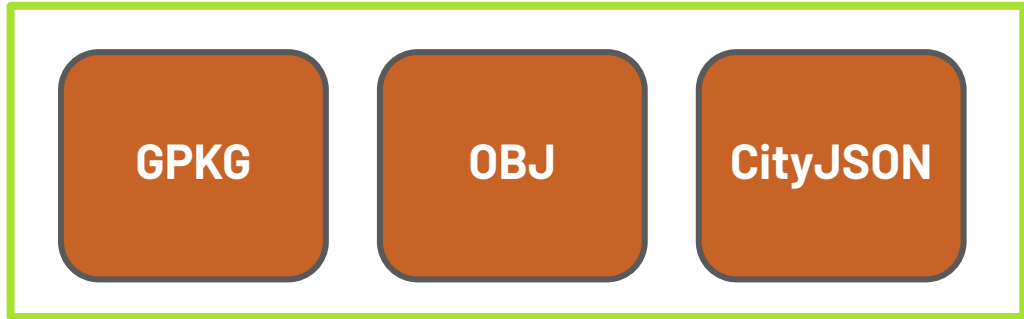
WFS

WMS

API

File formats & Services

Individual tile formats



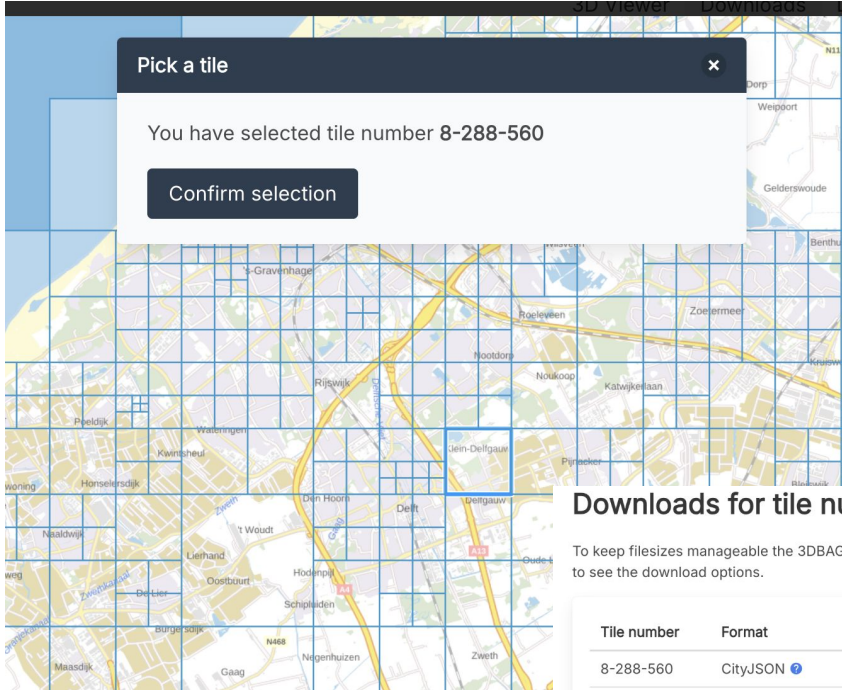
Full dataset



Web Services



How-To: Downloading 3DBAG tiles



Downloads for tile number 8-288-560

To keep filesizes manageable the 3DBAG dataset is subdivided in tiles. For each tile we offer the data in a number of different file formats. Use the button below to select the tile of interest to see the download options.

Tile number	Format	File	SHA-256	Version
8-288-560	CityJSON 🔗	8-288-560.city.json	163affe58ed35f4a86d79d524cf5d03e43e01c70f938663ab52964be5fb2aa8b	v2024.04.20
8-288-560	OBJ 🔗	8-288-560-obj.zip	fa3e331c0301a8ff41985d1a386ddd3d9dfabfdd233e88c265f45771217917ec	v2024.04.20
8-288-560	GPKG 🔗	8-288-560.gpkg	0fd6fe5d00ddce18774909218bf8eb5f7e4dd1c54d58a1d3f6b1c3c38143e1c0	v2024.04.20

How-To: Downloading 3DBAG tiles

All tiles within a bbox: Use the complete tile index (FlatGeoBuf)

```
{  
  'tile_id': '6/288/672',  
  'cj_sha256': 'b932ca1a5d10cca49f37d053fba6116c7ac33b18afc006f64cabcf20aee77d6d',  
  'gpkg_sha256': '3e31da3d82100fbc9bf867756ec056fd238b23d432e1bd1ba93ea8a564cfee0',  
  'obj_sha256': '90e58b5ea58463a3d0a12980bb7cd1a238dcfd3406ce13fb1472811a2aa5704c',  
  'cj_download': 'https://data.3dbag.nl/v20240420/tiles/6/288/672/6-288-672.city.json.gz',  
  'gpkg_download': 'https://data.3dbag.nl/v20240420/tiles/6/288/672/6-288-672.gpkg.gz',  
  'obj_download': 'https://data.3dbag.nl/v20240420/tiles/6/288/672/6-288-672-obj.zip'  
}
```

How-To: Downloading 3DBAG tiles

All tiles within a bbox: Use the complete tile index (FlatGeoBuf)

Python snippet:

```
from pathlib import Path
from urllib.request import urlretrieve
import flatgeobuf as fgb

outdir = Path("gpkg_tiles"); outdir.mkdir(exist_ok=True)
tile_ids = fgb.HTTPReader('https://data.3dbag.nl/v20240420/tile_index.fgb',
bbox=(84000, 477000, 86000, 478000))
for tile_id in tile_ids:
    url = tile_id.properties['gpkg_download']
    urlretrieve(url, outdir / url.split('/')[-1])
```

How-To: Downloading 3DBAG tiles

All tiles within a bbox: Use the complete tile index (FlatGeoBuf)

Python snippet:

```
from pathlib import Path
from urllib.request import urlretrieve
import flatgeobuf as fgb

outdir = Path("gpkg_tiles"); outdir.mkdir(exist_ok=True)
tile_ids = fgb.HTTPReader('https://data.3dbag.nl/v20240420/tile_index.fgb',
bbox=(84000, 477000, 86000, 478000))
for tile_id in tile_ids:
    url = tile_id.properties['gpkg_download']
    urlretrieve(url, outdir / url.split('/')[-1])
```

Script in:

github.com/3DBAG/3dbag-scripts

How-To: 3DBAG-API

- Programmatic access to the 3DBAG data
- Returns cityJSONSeq
- Allows the retrieval of specific buildings and bbox operations
- Not yet OGC-compliant
- Only supported CRS: Amersfoort / RD New + NAP height (EPSG:7415)

<https://api.3dbag.nl/>

How-To: 3DBAG-API

Request Single Building:

<https://api.3dbag.nl/collections/pand/items/NL.IMBAG.Pand.0503100000032914>

Request All Buildings in a BBox:

<https://api.3dbag.nl/collections/pand/items?bbox=85000.00,446700.034,85300.011,447000.0>

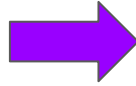
Instructions in:

api.3dbag.nl/api.html

How-To: 3DBAG-API

Request Single Building:

<https://api.3dbag.nl/collections/pand/items/NL.IMBAG.Pand.050310000032914>



CityJSONSeq

```
{
  "feature": {
    "CityObjects": {
      "NL.IMBAG.Pand.050310000032914": {
        "attributes": {
          "b3_bag_bag_overlap": 23.3554954528809,
          "b3_bouwlagen": null,
          "b3_dak_type": "slanted",
          "b3_h_dak_50p": 20.1499996185303,
          "b3_h_dak_70p": 21.5,
          "b3_h_dak_max": 52.8300018310547,
          "b3_h_dak_min": 0.939999997615814,
          "b3_h_maaiveld": 0.0020000000949949,
          "b3_kas_warenhuis": false,
          "b3_mutatie_ahn3_ahn4": false,
          "b3_nodata_fractie_ahn3": 0.000949908164329826,
          "b3_nodata_fractie_ahn4": 0.271673738956451,
          "b3_nodata_radius_ahn3": 0.76659369468689,
          "b3_nodata_radius_ahn4": 3.12317109107971,
          "b3_opp_buitenmuur": 19287.86,
          "b3_opp_dak_plat": 2240.14,
          "b3_opp_dak_schuin": 9948.24,
          "b3_opp_grond": 7894.57,
          "b3_opp_scheidingsmuur": 1406.73,
          "b3_punt dichtheid_ahn3": 18.9032707214355,
          "b3_punt dichtheid_ahn4": 27.572732925415,
          "b3_pw_bron": "AHN3",
          "b3_pw_datum": 2014,
          "b3_pw_selectie_reden": "_HIGHEST_YET_INSUFFICIENT_COVERAGE",
          "b3_reconstructie_onvolledig": false,
          "b3_rmse_lod12": 3.58611083030701,
          "b3_rmse_lod13": 2.86251378059387,
          "b3_rmse_lod22": 0.478037446737289,
          "b3_val3dity_lod12": "[]",
          "b3_val3dity_lod13": "[]",
          "b3_val3dity_lod22": "[303]",
          "b3_volume_lod12": 169719.15625,
          "b3_volume_lod13": 169433.0625,

```

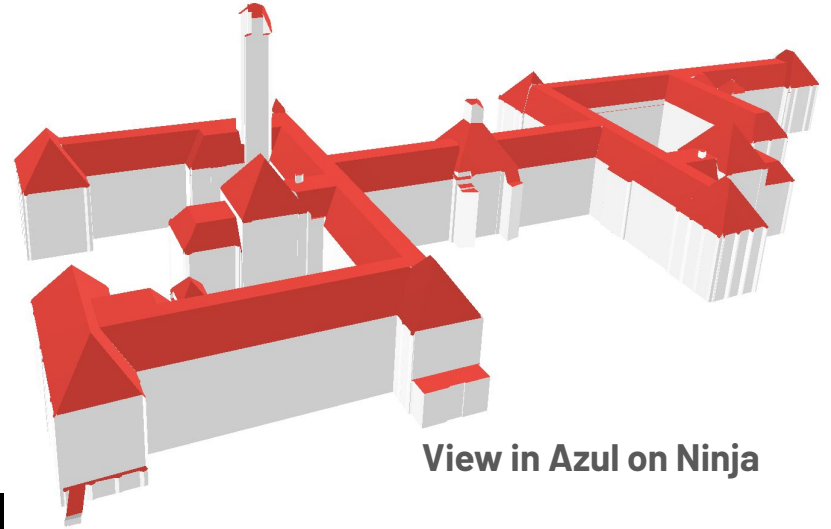
How-To: 3DBAG-API

Request Single Building:

<https://api.3dbag.nl/collections/pand/items/NL.IMBAG.Pand.050310000032914>



```
BUILDING_ID = "NL.IMBAG.Pand.050310000032914"
request = f"https://api.3dbag.nl/collections/pand/items/{BUILDING_ID}"
with urllib.request.urlopen(request) as response:
    j = json.loads(response.read().decode('utf-8'))
    with open(f"{BUILDING_ID}.city.jsonl", "w") as my_file:
        my_file.write(json.dumps(j["metadata"]) + "\n")
        if "feature" in j:
            my_file.write(json.dumps(j["feature"]) + "\n")
        if "features" in j:
            for f in j["features"]:
                my_file.write(json.dumps(f) + "\n")
```



View in Azul on Ninja

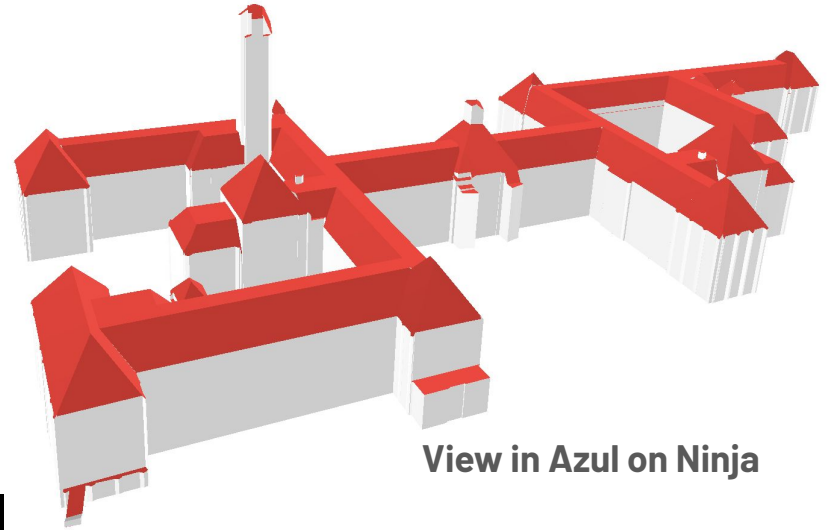
How-To: 3DBAG-API

Request Single Building:

<https://api.3dbag.nl/collections/pand/items/NL.IMBAG.Pand.050310000032914>



```
BUILDING_ID = "NL.IMBAG.Pand.050310000032914"
request = f"https://api.3dbag.nl/collections/pand/items/{BUILDING_ID}"
with urllib.request.urlopen(request) as response:
    j = json.loads(response.read().decode('utf-8'))
    with open(f"{BUILDING_ID}.city.jsonl", "w") as my_file:
        my_file.write(json.dumps(j["metadata"]) + "\n")
        if "feature" in j:
            my_file.write(json.dumps(j["feature"]) + "\n")
        if "features" in j:
            for f in j["features"]:
                my_file.write(json.dumps(f) + "\n")
```



View in Azul on Ninja

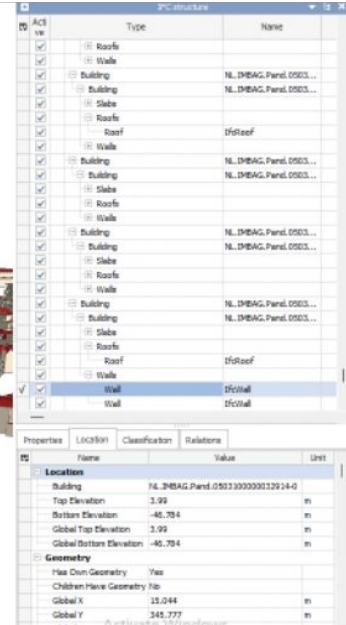
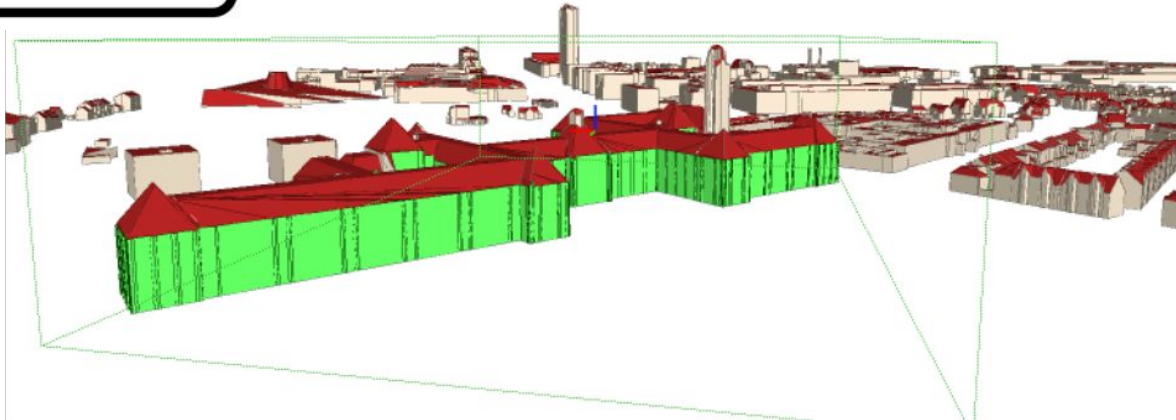
Script in:

github.com/3DBAG/3dbag-scripts

File formats & Services: IFC (soon)



Converter: [cityjson2ifc](#)



How is 3DBAG used?



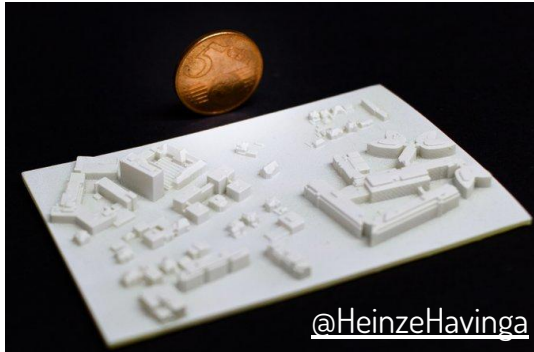
Heating energy demand

Computational Fluid Dynamics

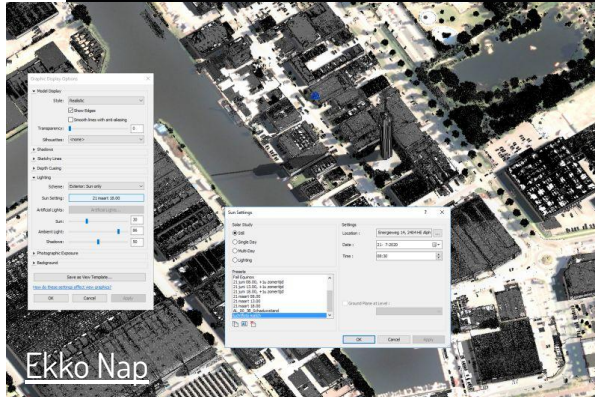
Solar panel potential

3D BAG in practice

<https://docs.3dbag.nl/en/overview/media/>



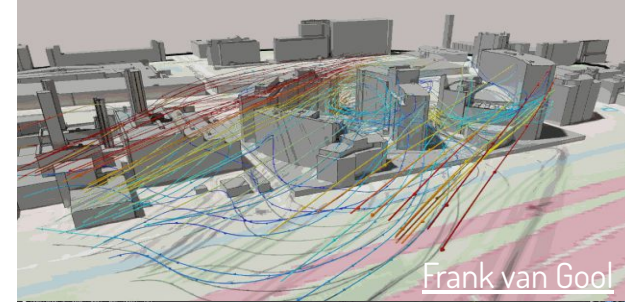
@HeinzeHavinga



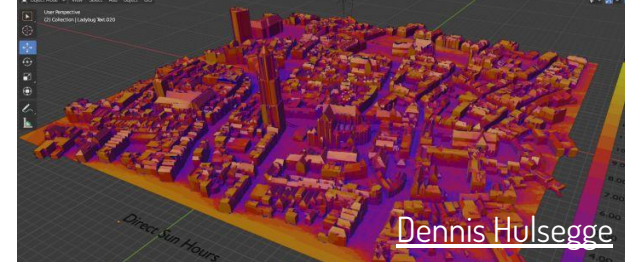
Ekko Nap



Tygron



Frank van Gool



Dennis Hulsegge

User presentations

3DBAG organisation and contributors

Organisational status

- Established through research projects
- WaU (Kadaster) financed software refactor (2024)
 - Performed by 3DGI and TU3D
 - => <https://github.com/3DBAG>
- 3DBAG now past research phase. Per month:
 - ~ 100 000 tegel downloads
 - ~ 850 000 webservice queries
- Looking for stable role
 - Financing + Status
 - For example in ZoN Datafundament NGII

The screenshot shows the website interface for Datafundament. At the top, there is a navigation bar with links for 'Datafundament', 'Actueel', 'Visie', 'Dataproducten', 'Projecten', 'Praktijk', and 'Doe mee'. A search bar is located on the right. Below the navigation bar, the 'Dataproducten' section is highlighted, with a sub-section 'Direct aan de slag'. A paragraph explains that the page lists available products and that data is sourced from geo-basisregistraties. A grid of product tiles is displayed, with 'BAG 3D' circled in red. Below this is the 'Dataportalen' section, followed by 'Andere producten'. Two product images are shown at the bottom: '3D Basisvoorziening' (a 3D city model) and 'API Bestuurlijke grenzen' (a map showing administrative boundaries).

9 Contact

↑ Datafundament Actueel Visie **Dataproducten** Projecten Praktijk Doe mee Zoeken 🔍

Over ons

Datafundament > Dataproducten

Dataproducten

Direct aan de slag

Op deze pagina vind je alle producten die op dit moment al beschikbaar zijn. Hiermee kun je dus meteen zelf aan de slag. De data voor deze producten komen uit de geo-basisregistraties.

Viewers Geo-basisregistraties

Kaarten van Nederland	PDOK viewer	BAGviewer	BGT viewer
Topotijdreis	Ondergrond	BRT producten	WOZ-waardeloket
Ondergrond in 3D	Cijfers op de kaart	BAG 3D	Kadaster 3D

Dataportalen

PDOK	Satelliet-dataportaal	Klimaat-effectAtlas	Nationaal Georegister
------	-----------------------	---------------------	-----------------------

Andere producten

3D Basisvoorziening

Met het open databestand uit de 3D Basisvoorziening kun je in 1 keer een realistische simulatie van de omgeving inladen en gemakkelijk wijzigen.

API Bestuurlijke grenzen

Binnen het project Bestuurlijke Gebieden is een API opgeleverd. Alle gebruikers die behoefte hebben aan de bestuurlijke grenzen van gemeenten,

3DBAG Innovatieplatform

- Goal:
 - Securing the future of 3DBAG:
 - Maintain software + innovations
 - Data updates
 - Collaboration in future developments
- In coordination with Kadaster 3D Basisvoorziening
 - While maintaining OS software and innovation from academic world
- Activities 2024:
 - Start user community (October 2)
 - Listen to wishes and feedback from users
 - Kick-off developers community (**13 november online**)
 - AHN5 update (for 2/3 NL)
- Exploring long term role/financing



Rijksdienst voor Onderneming
Nederland



Rijksinstituut voor Volksgezondheid
en Milieu
Ministerie van Volksgezondheid,
Welzijn en Sport

3DBAG on GitHub

<https://github.com/3DBAG>

The screenshot shows the GitHub profile page for the 3DBAG organization. At the top, there is a navigation bar with 'Overview', 'Repositories 13', 'Discussions', 'Projects 2', 'Packages', 'Teams', 'People 5', 'Insights', and 'Settings'. The profile header includes the organization name '3DBAG', a location 'Netherlands', a website 'https://3dbag.nl/en/viewer', an email 'info@3dbag.nl', and a button to 'Unfollow'. The main content area displays the 'README .md' file, which contains the following text:

3DBAG

This is the GitHub organisation of the 3DBAG Innovation Platform. This place is used for collaborating on the software that used for producing the 3DBAG, for organising the 3DBAG development and communicating with the 3DBAG users and contributors.

The main platform for communication are the [Discussions](#). If you have any questions or comments about the 3DBAG in general, about a specific software or you spotted an error, please review first if you question has been answered already. If not, don't hesitate to open a new discussion.

The software that you will find in this organisation:

- [3dbag-api](#): OGC Features API that serves the 3DBAG CityJSON data at <https://api.3dbag.nl/>
- [3dbag-dashboard](#): Quality dashboard for the 3DBAG at <https://3dbag.nl/en/dashboard>
- [3dbag-docs](#): The 3DBAG documentation at <https://docs.3dbag.nl/en/>
- [3dbag-pipeline](#): Production pipeline that orchestrates source data ingestion, preprocessing, building reconstruction, postprocessing and deployment
- [3dbag-viewer](#): The 3D viewer at <https://3dbag.nl/en/viewer>
- [CityBuf](#): Experimental CityJSON encoding as FlatBuffers
- [geodepot](#): Test data management system for geodata
- [geodepot-api](#): API to a geodepot repository
- [roofer](#): Automatic LoD2.2 building reconstruction that generates the 3D building models of the 3DBAG

Below the README, there is a 'Pinned' section with four repositories:

- 3dbag-viewer** (Public): 36 stars, 11 forks
- roofer** (Public): Automatic LoD2.2 building reconstruction, 14 stars, 3 forks
- 3dbag-pipeline** (Public): 3DBAG production pipeline, 2 stars
- 3dbag-api** (Public): 3D BAG API, 1 star

On the right side of the profile, there are sections for 'View as: Public', 'Top discussions this past month', and 'People'.

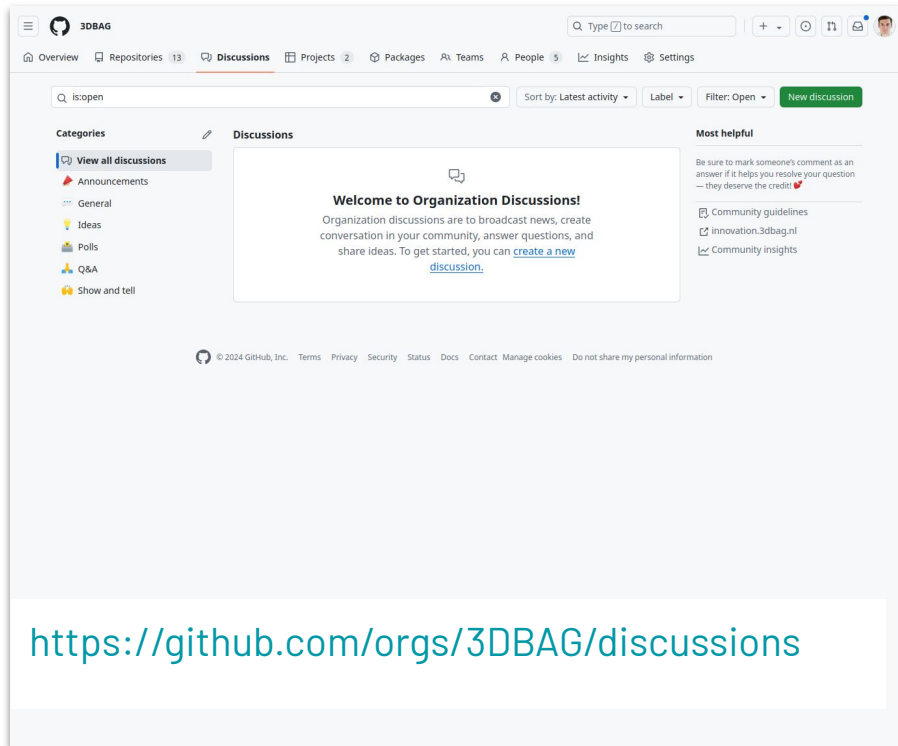
We are ready for contributors

- all software Open Source
- permissive licenses (MIT, Apache-2.0, GPLv3)
- independent governance and coordination by Geonovum (3DBAG Innovation Platform)
- public communication forum (GitHub, Geoforum)
- contributor guidelines (in progress)
- public roadmap (in progress)

- 3DBAG **Developers' bijeenkomst**
 - 13 November
 - voor 3DBAG software users and developers
 - Roadmap software developments

Question, feedback, bug? Let us know!

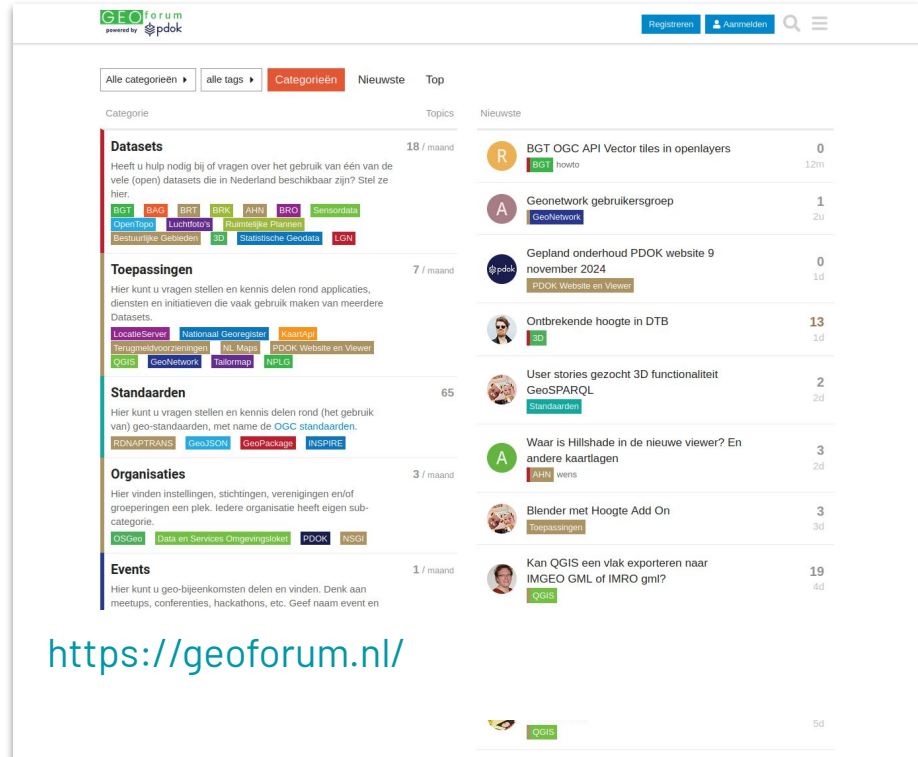
3DBAG software



The screenshot shows the GitHub Discussions page for the 3DBAG organization. The page title is "3DBAG" and the navigation bar includes "Overview", "Repositories 13", "Discussions", "Projects 2", "Packages", "Teams", "People 3", "Insights", and "Settings". The search bar contains "isopen". The left sidebar shows "Categories" with "View all discussions" selected, and "Discussions" with "Welcome to Organization Discussions!". The main content area features a welcome message: "Welcome to Organization Discussions! Organization discussions are to broadcast news, create conversation in your community, answer questions, and share ideas. To get started, you can [create a new discussion](#)." Below this, there are links for "Community guidelines", "innovation.3dbag.nl", and "Community insights". The footer includes "© 2024 GitHub, Inc." and various links like "Terms", "Privacy", "Security", "Status", "Docs", "Contact", and "Manage cookies".

<https://github.com/orgs/3DBAG/discussions>

3DBAG data



The screenshot shows the GEOforum.nl website, powered by PDK. The navigation bar includes "Registreren" and "Aanmelden". The main content area is titled "Alle categorieën" and "alle tags". The left sidebar shows "Categorie" and "Topics". The main content area lists several categories with their respective topics and descriptions:

- Datasets** (18 / maand): Heeft u hulp nodig bij of vragen over het gebruik van één van de vele (open) datasets die in Nederland beschikbaar zijn? Stel ze hier. Tags: BGT, BAG, BRT, BRK, AHN, BRO, Sensordata, OpenTopo, Luchtfoto's, Ruimtelijke Plannen, Bestuurlijke Gebieden, 3D, Statistische Geodata, LGN.
- Toepassingen** (7 / maand): Hier kunt u vragen stellen en kennis delen rond applicaties, diensten en initiatieven die vaak gebruik maken van meerdere Datasets. Tags: LocatieServer, Nationaal Georegister, KwartOp, Terenrijnvoorzieningen, NL Missie, PDK Website en Viewer, QGIS, GeoNetwork, Tekstmap, NPLC.
- Standaarden** (65): Hier kunt u vragen stellen en kennis delen rond (het gebruik van) geo-standaarden, met name de OGC standaarden. Tags: RDNAPTTRANS, GeoJSON, GeoPackage, INSPIRE.
- Organisaties** (3 / maand): Hier vinden instellingen, stichtingen, verenigingen en/of groepingen een plek. Iedere organisatie heeft eigen sub-categorie. Tags: OSGeo, Data en Services Omgevingsakkoord, PDK, NSGI.
- Events** (1 / maand): Hier kunt u geo-bijeenkomsten delen en vinden. Denk aan meetups, conferenties, hackathons, etc. Geef naam event en

The right sidebar shows a list of topics with their respective authors and counts:

- BGT OGC API Vector tiles in openlayers (0)
- Geonetwork gebruikersgroep (1)
- Gepland onderhoud PDK website 9 november 2024 (0)
- Ontbrekende hoogte in DTB (13)
- User stories gezocht 3D functionaliteit GeoSPARQL (2)
- Waar is Hillshade in de nieuwe viewer? En andere kaartlagen (3)
- Blender met Hoogte Add On (3)
- Kan QGIS een vlak exporteren naar IMGEO GML of IMRO gml? (19)
- QGIS (5d)

<https://geoforum.nl/>

The next version of 3DBAG

Next steps?

Currently working on a new 3DBAG version:

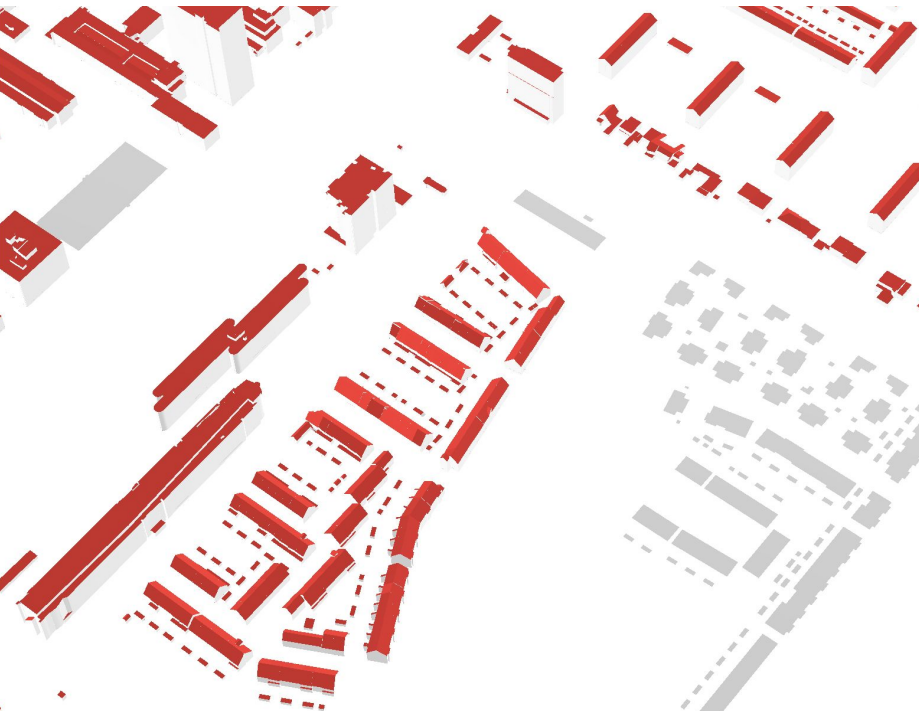
- using our improved software pipeline
 - outputs also object without 3D geometry (eg. due to no points)
 - Improved detection glass roofs
- AHN5 pointcloud Update
 - update buildings west NL

Versions after:

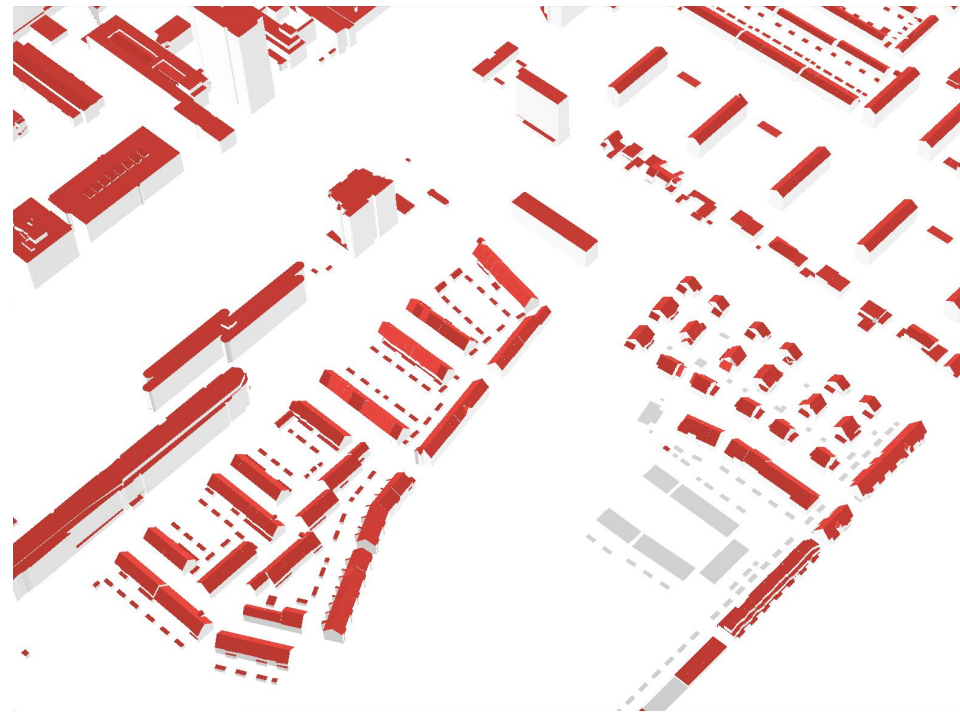
- Add IFC as tile format
- Update 3DBAG webviewer + 3D Tiles
- Improvements reconstruction algorithm
 - Improved plane detection
 - Better geometry regularisation
 - Improved dormer detection
- ...



AHN5 sneak preview

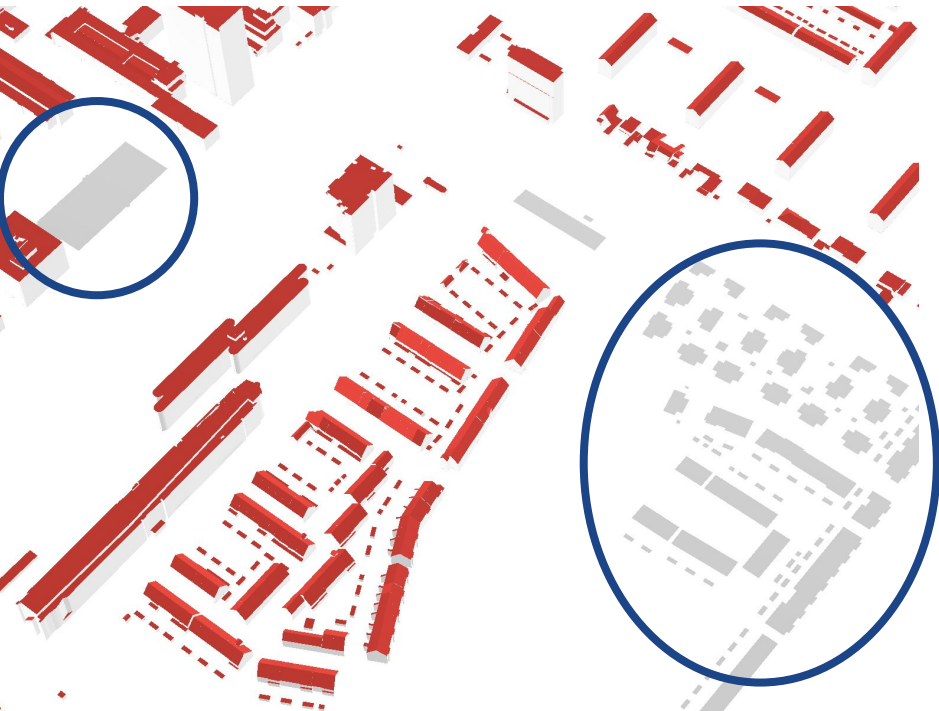


AHN4



AHN5

AHN5 sneak preview

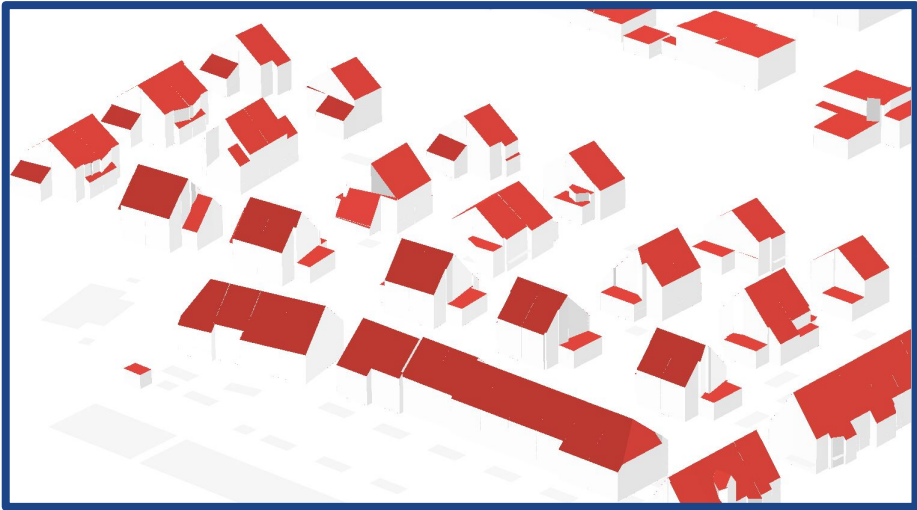


AHN4



AHN5

AHN5 sneak preview



AHN5

Thank you!



Register for 3DBAG
newsletter:

