

DEVELOPING AN ONLINE 3D MODEL OF THE CITY OF GRONINGEN

Digital twins for spatial planning



The Dutch city of Groningen wants to follow in the footsteps of other cities such as Rotterdam, Hamburg, Singapore and Helsinki by developing a 3D digital model. For the team working on the 3D Digital City of Groningen project, the aim is for the image on the computer screen to be an identical replica of the reality outside.



The City of Groningen in the Netherlands is committed to working in 3D whenever possible; in fact, its motto is 'We work in 3D unless...'. The municipality's City Engineers, City Design and Geo & Data departments are currently working together to develop a digital 3D model of Groningen, both above and below ground. Stakeholders regard this '3D Digital City' project as a next step to optimize the entire construction chain, since the 3D model will enable spatial projects to be

carried out faster, more cost effectively and more transparently.

The importance of collaboration

In November 2019, the impressive Groninger Forum building opened in the city centre, serving as a meeting place and hub for inhabitants, students, government, business and cultural organizations. This building embodies the municipality's focus on collaboration. The importance of cooperation between spatial departments in the spatial planning and development process also became clearly apparent during the construction of the Groninger Forum and other projects to renew the city centre. The municipality embraced

the principles of Building Information Management (BIM) used in several construction processes and prepared a vision document on 3D. This vision corresponded completely with the coalition agreement document of the municipality.



Aerial imagery of the impressive Groninger Forum building.

Pilot projects

In 2019, Groningen successfully conducted two pilot projects. The first was a pilot project of the 3D underground of the former sugar factory complex called 'Suikerunietterrein'. The largely vacant site is to be redesigned, but there are objects in the subsoil that must be taken into account during the design. These were visualized in a 3D web map. The second pilot project was to build a 3D digital twin of the village of Ten Post, which is a few miles outside the city of Groningen, that the municipality could use for citizen participation, communication, planning and policymaking. Thanks to the success of these two pilot projects, the tender process for executing the 3D Digital City project as intended in the vision document was given the green light.

One company that got on board with the project at that point was [Future Insight](#), which has been focused on 3D digital cities since 2014, for the City of Rotterdam. It is currently involved in numerous 3D digital twin projects worldwide based on the combination of 3D city models with, for example, sensor information, simulations and BIM designs. This makes a digital twin widely applicable for authorities to use in the different phases of a project, from planning and communication to completion.



The company Avineon creates a state-of-the-art 3D city model with a level of detail LOD2.3, with a z-accuracy of 10cm and

flawless alignment with the 2D large-scale base map.

Future Insight's most important principle regarding a 3D digital twin is the use of open standards and technologies like CityGML and IFC as the basis for the solutions. This ensures that the solutions are flexible and scalable and can easily be reproduced by other customers or countries, while also offering the opportunity to connect with the newest open technologies that are available worldwide.

For the 3D Digital City project in Groningen, Future Insight's role is the storage of 3D city data and making it easily available online. But first, accurate 3D data is needed. [Kavel 10](#) – a company with a lot of international experience in collecting high-quality aerial imagery and Lidar point cloud data on a large scale – handled the 3D data collection aspect. The city of Groningen was flown with a 2.5cm GSD for the images and approximately 400 points per square metre with an overlap of 80/80%. The biggest advantage of this approach is the possibility for multiple use of the data that is acquired in one flight.



Modelling floods is one of the many applications of a 3D city model.

3D city model

Based on the resulting high-quality datasets, the company [Avineon](#) is creating a state-of-the-art 3D city model with a level of detail LOD2.3 (realistic roof modelling, taking into account dormers and roof overhangs, for buildings), with a z-accuracy of 10cm and flawless alignment with the 2D large-scale base map. Moreover, Avineon will add textures to the buildings, using its innovative, and largely automated, 3D modelling process which chains multiple tools together in a smart way. Avineon has developed this semi-automatic 3D modelling process based on many years of experience acquired working with customers such as Rotterdam, Brussels, Geneva, Bern and Neuchâtel.

Besides the buildings, Avineon will also model other features from the 2D base map, such as bridges, walls, steps and trees, to make the 3D Digital City representation even more true to life.



Kavel 10 handled the 3D data collection aspect.

Convenient and appealing

Lastly, all of this 3D information will be made available to the users, and it is important that this is done in a convenient and appealing way. First, the data will be stored in an open 3D CityGML database and the different layers will be published into open 3D Tiles services. This will make it easy to use the 3D data in multiple online tools without it having to be converted or distributed. As a result, all tools will automatically have up-to-date 3D data available directly from the source at the municipality of Groningen. Additionally, a download service will be made available, enabling everyone to download parts of the model to use in their own modelling tools such as SketchUp or Autocad.

The collaboration between the 3D specialists is enabling the requirements set by the City of Groningen to be met efficiently, and the municipality is taking an important and high-quality step closer to meeting its 3D digital ambitions. Groningen values cooperation highly, and this partnership between experts and the city is another example of how Groningen wants to work together to meet its innovative goals.

The development of the 3D Digital City will help Groningen to become a smart city, not only by optimizing communication with the inhabitants of the city and other stakeholders, but also by supporting faster and better decision-making. Above all, a better understanding of the design stage of the construction process will help to prevent failure costs in the realization phase. The 3D model that is now being developed will provide the foundation for ensuring that spatial projects can be carried out faster, more cost effectively and more transparently.