



The Urban Digital Twin of the City of Arnsberg: A Foundation for the Smart City

Fig. 1: 3D city model of Arnsberg with the castle ruins as a distinctive landmark in the urban and topographical context.

3D as a Basis for Climate Adaptation, Planning and Public Information

The City of Arnsberg is developing its Urban Digital Twin as a central foundation for digital applications in the areas of climate, planning and public information. The 3D twin was deliberately not designed as a stand-alone application, but as a platform for different use cases: from flood and heavy rainfall simulations to solar potential analysis and the visualization of wind turbines.

At the same time, the Digital Twin complements the city's existing 2D geoinformation services with a spatial perspective as well as additional analysis and visualization capabilities.



“The Digital Twin helps us to present complex topics in an understandable way and to make information accessible to different target groups.”

– **Yvonne Kaiser**, Smart City Project Manager, City of Arnsberg [[LinkedIn](#)]

Climate goals as a driver of development

The idea of a Digital Twin did not originate solely from Arnberg's Smart City strategy. The motivation to build the Digital Twin is also closely linked to the city's strategic climate goals. Arnberg is pursuing ambitious targets: the city administration is to be climate-neutral by 2030, and the entire city by 2035.

The Urban Digital Twin is intended to help make complex interrelationships visible, to support planning and decision-making processes, and to provide information in a way that is understandable for very different target groups.

Three key applications for climate, energy and urban development

1. Flood and heavy rainfall simulation

A central application area of the Digital Twin of Arnberg is the simulation of flood and heavy rainfall events. Different scenarios show which areas would be affected by events of varying intensity. This is particularly relevant for Arnberg,

as the Ruhr runs through the city area and has already caused flooding in the past.

The simulations enable citizens to make an initial assessment of possible risks and at the same time support technical planning for risk mitigation within the administration.



2. Solar potential analysis

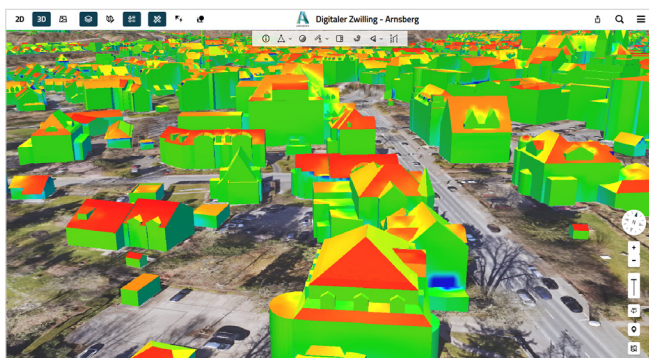


Fig. 3: Solar potential analysis in the 3D model – assessment of the suitability of building surfaces based on solar radiation and shading.

Citizens can directly use the 3D model to check whether their own roof areas, balconies or façades are suitable for photovoltaics. An automatically generated report provides information on solar radiation, solar potential and the economic efficiency of the selected areas and serves as a basis for further steps, such as discussions with contractors or energy consultants.

The city involved the consumer advice centre and installation companies at an early stage. Positive feedback from practice confirms the quality of the results.

The possibility of also taking balconies and façades as well as shading from dormers into account significantly extends the analysis beyond traditional roof surfaces.

3. Visualization of wind turbines

Wind energy is a relevant and widely discussed topic in Arnsberg. The 3D visualization in the Digital Twin shows planned and existing installations in their actual height and location and enables a realistic assessment of visibility.

“The visualization of planned wind turbines is a good example. Especially in sensitive planning topics such as wind energy, an Urban Digital Twin shows its added value: complex spatial relationships become understandable and discussions can be conducted in a more objective way.”

– **Dr. Stefan Trometer**, Managing Director / Business Development, Virtual City Systems [[LinkedIn](#)]

In contrast to static representations, this creates a comprehensible image that contributes to a more objective discussion.

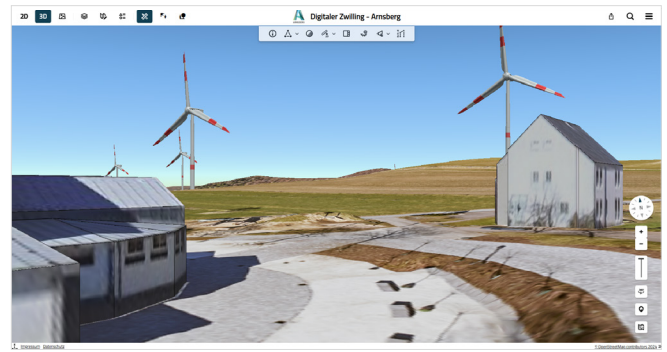


Fig. 4: Visualization of wind turbines in the Digital Twin – realistic assessment of height, location and visual impact in the surrounding area.

“With the viewshed analysis, you can, for example, see from your own balcony what a wind turbine actually looks like and how it appears – not just how it is shown in a montage.”

– **Yvonne Kaiser**, Smart City Project Manager, City of Arnsberg [[LinkedIn](#)]

The solution: Integrated 3D platform with VCS technology

For the development and operation of the Digital Twin, the City of Arnsberg relies on an integrated solution based on technologies from Virtual City Systems. The following are used, among others:

- **VC Map** serves as the central 3D visualization interface for citizens and professional users and makes topics such as flooding, solar potential or wind turbines interactively accessible.
- **VC Planner** supports visualization and professional planning in the 3D city model, for example for flood and heavy rainfall scenarios or other urban planning topics.
- **VC Solar** provides detailed solar potential analyses including report downloads on solar radiation, yield and economic efficiency of suitable areas.
- **VC Publisher** enables the provision, maintenance and subsequent independent extension of 3D content by the city administration.

The different components work together seamlessly and enable both internal use within the administration as well as the public provision of selected content. With VC Publisher, content and models can be updated and expanded independently by the city – for example geodata, bridges or other infrastructures.

Concrete benefits for different target groups

The Digital Twin is already actively used by different user groups, each deriving a different benefit for administration, infrastructure stakeholders and the public.

Administration and planning

Departments use the 3D model to support planning processes, to visualize projects and also to quickly determine measurements. Many questions can be clarified directly on the computer, without the need for on-site appointments.

Views and spatial situations from the 3D map can be used as a basis for internal coordination, presentations and participation processes – either via screenshots or directly by viewing the model together.

Utilities and infrastructure

Municipal utilities also use the Digital Twin to digitally pre-check routes, properties and spatial situations. This significantly facilitates the preparation and coordination of infrastructure measures.

Citizens

For citizens, the Digital Twin creates low-threshold access to planning and climate topics. Spatial relationships become transparently understandable and developments in the immediate living environment tangible.

Why 3D makes the difference

The added value of the Digital Twin lies not only in visualization. Its strength lies in the combination of spatial representation and professional analysis.

Compared to traditional 2D applications, the 3D environment opens up new possibilities:

- realistic assessment of visibility, heights and distances
- additional analysis options through the spatial representation of buildings and surfaces
- improved comprehensibility for non-expert target groups

The solar potential analysis clearly illustrates the added value of 3D. While traditional 2D applications mainly consider roof surfaces, the 3D representation additionally enables a realistic assessment of buildings, surfaces and shading situations. This results in significantly more precise and realistic evaluations. This makes the Digital Twin a practical tool for administration, business and the public alike.



Smart Cities South Westphalia: Developing digital solutions together

Arnsberg is part of the “5 for South Westphalia” network, established within the federal funding programme “Model Projects Smart Cities”. Together with the cities of Soest, Menden, Olpe and Bad Berleburg, Arnsberg is working on digital solutions for key future challenges.

The Urban Digital Twin plays an important role within this network. It connects climate protection, urban planning and public information on a shared data and visualization basis and creates the foundation for further digital applications. Within the City of Arnsberg, the Smart City team works closely with departments such as GIS and planning, while also being responsible for external communication and knowledge transfer – for example through information services, training and exchange with other municipalities.

Communication and involvement as a success factor

The development of the Digital Twin in Arnsberg was not only a technical but also a communicative project. Questions and differing expectations – and thus the level of interest – from the public made it clear how important transparent communication and early involvement are. The city therefore actively engages in dialogue with citizens as well as with different departments inside and outside the administration.

Information and developments related to the Digital Twin are continuously communicated and contextualized through events, training and other formats. At the same time, internal use of the Digital Twin is being further expanded. Workshops and training support departments in integrating the possibilities of the 3D platform more strongly into existing processes.

Looking ahead: The Digital Twin continues to grow

The Digital Twin in Arnsberg has been designed as a growing system from the outset. New data from a recent aerial survey is currently being integrated.

Planned, among other things:

- more realistic representation of vegetation, especially forests
- addition and updating of infrastructure such as bridges
- expansion of independent data maintenance by the administration
- integration of additional specialist information



“The Digital Twin is not a stand-alone project for us, but a foundation that continues to grow – with new applications, additional information and as a tool for data-based and climate-conscious urban development.”

– **Yvonne Kaiser**, Smart City Project Manager, City of Arnsberg [[LinkedIn](#)]



Since 2005, we have been developing software for Urban Digital Twins to make cities more efficient, sustainable, and future-proof. Discover innovative solutions for managing, distributing, and using digital 3D city models. Our technology connects complex geospatial data and supports applications ranging from visualization to urban simulations. It strengthens cross-disciplinary collaboration and provides a solid foundation for informed decision-making. We are committed to open standards and open-source technologies for maximum flexibility.