3DxVERSE

Digital Twins for Sustainable Travel and Living Communities

EU Project GA Number: 101168258

DIGITAL-2024-CLOUD-DATA-AI-07-DIGITALTWIN

Digital Europe Programme (DIGITAL)

Towards networked Local Digital Twins in the EU

3DxVERSE Living-in.EU signatory event:
The four EU CitiVerse projects: Overview and latest developments
24-2-2026

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4 CitiVerse projects

3DxVERSE:

Aadorp-Almelo

Hamburg

Timisoara

Aruba

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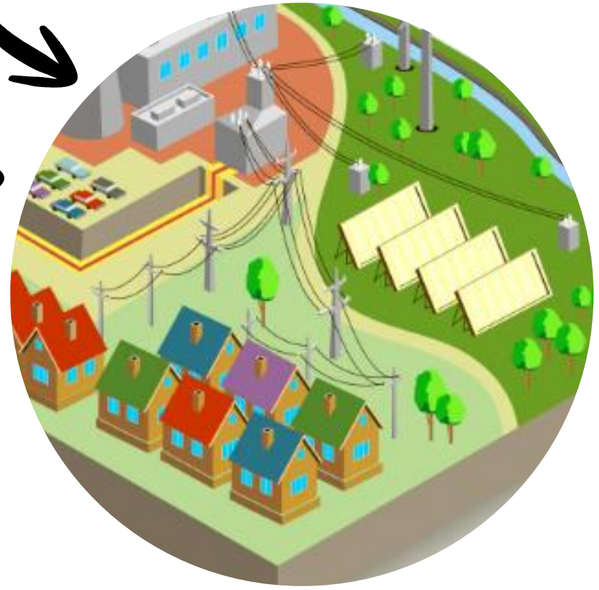
AADORP LDT

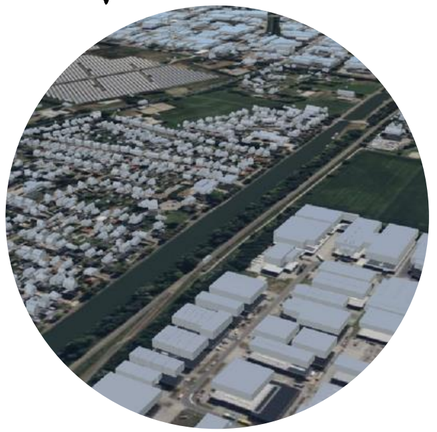
KANAAL FRONT

https://www.youtube.com/watch?v=V9zM-YROjtY



A DIGITAL TWIN OF AADORP

ENERGY DT



HYDROGEN DT

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IMPORTANCE OF THE PROJECT

- Buildings consume ~40% of total energy in Europe.
- Major contributor to CO_2 emissions → climate change.
- Improving efficiency = lower costs + sustainability.

EU & Dutch climate targets

- EU Green Deal → climate neutrality by 2050.
- Paris Agreement commits to global climate goal
- Dutch Climate Act: 49% reduction of greenhouse gas emissions by 2030, 95% by 2050

PROBLEM STATEMENT

- Cities face rising energy demand & climate pressures.
- Buildings = major energy use & CO_2 emissions.
- Energy labels data is often missing/incomplete.
- Data gaps block planning & retrofitting decisions.
- Labels don't reflect design & usage differences.

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SITE AADORP

1251 units

600 homes

Legend

Boundary

Buildings

Coordinate Reference System: Amersfoort / RD New (EPSG:28992)
Projection: Dutch National Grid (RD New)
Datum: Amersfoort
Units: Meters

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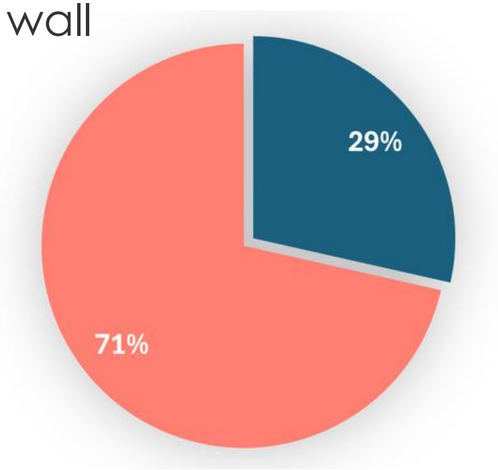
ESTIMATING MISSING ENERGY LABELS

Problem: A large share of buildings in Aadorp had no official energy label, limiting city-scale analysis.
888 units out of 1251 has no energy label data

Approach: Developing ML models using building attributes (year, function, floors, wall area, roof type, etc.).



Missing % of energy labels

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Current Energy Label:
N/A
Electricity Avg: N/A kWh
Net Electricity Avg: N/A kWh
Gas Avg: N/A m³
Select target retrofit label:
A+++ A++ A+ A B
C D E F G
Select All Buildings with this Energy Label
Estimated Retrofit Cost: €0
1.0
0.8
0.6
0.4
0.2
0
€ or kg
Retrofit Cost
Annual Savings
CO₂ Savings
Estimated Annual Savings: €0
Payback Period: – years
CO₂ Reduction: 0 kg/year
A+++ A++ A+ A B
C D E F G
3600x
Jul 10 2025
10:33:51 UTC
CESIUM ion Upgrade for commercial use. Data attribution
2025 00:00:00 UTC
Aug 29 2025 02:00:00 UTC
Aug 29 2025 04:00:00 UTC
Aug 29 2025 06:00:00 UTC
Aug 29 2025 08:00:00 UTC
Aug 29 2025 10:00:00 UTC
Aug 29 2025 12:00:00 UTC
Aug 29 2025 14:00:00 UTC
Aug 29 2025 16:00:00 UTC
Aug 29 2025 18:00:00 UTC
Aug 29 2025 20:00:0

HYDROGEN DIGITAL TWIN

Goal

Integrate local hydrogen production and storage data into the Aadorp Digital Twin to support real-time energy balancing and scenario modelling.

Key Inputs

- Ground-mounted solar park: 560 kWp (~1,600 panels)
- Roof-mounted solar panels: 520 kWp (~1,600 panels)
- Total solar capacity feeding potential hydrogen production

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HYDROGEN DIGITAL TWIN

To make the hydrogen project and its link to **Almelo Energie** clear and visually accessible, an **ESDL model** was mapped in TNO's **Map Editor**, imported into **ArcGIS Pro**, and visualized in **ArcGIS Online**. This approach enables spatial presentation of the pipeline route and connected homes - bringing the energy transition to life through the digital twin.

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KANAAL FRONT

New green village heart with 42 homes/appartments with a Local Digital Twin

Location and Background

- **Village of Aadorp,** municipality of Almelo, along the canal near community centre 't Aahoes.
- Create a lively, green, energy-neutral and safe village heart on the canal.
- Combine housing, community functions and attractive public space.

Main Components & PED Ambition

- New and renewed housing with a village-scale look for starters and seniors.
- A future-proof community centre 't Aahoes as social heart.
- Green, climate-adaptive public space with shade, water and seating.
- Positive Energy District (PED): area aims to produce more renewable energy over a year than it uses.

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PARTICIPATION, STAKEHOLDERS & NEXT STEPS

- Residents and Dorpscoöperatie Aadorp: co-design and feedback in workshops and investment decisions.
- Municipality of Almelo: planning, permits.
- 't Aahoes and local organisations: strengthen the social heart of the village.
- **Next:** refine design, further develop the digital twin and prepare decisions for phased implementation.

IN ALL ....

- Kanaalfront Aadorp is a green, safe and social village heart on the canal,
- designed together with residents and supported by a Local Digital Twin.

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FUTURE WORK

- Add more features: insulation, HVAC, renovation, and climate.
- Include people's behaviour & willingness-to-pay using hoomdossier.
- Test with real energy use data.
- Try the method on other towns/cities.
- Use ranges (not fixed values) for retrofit results.
- Adding the hydrogen LDT.
- **Using the DT for the Kanaalfront making Aadorp an**

Positive Energy District

THE CURRENT LDT OF AADORP

https://storymaps.arcgis.com/stories/3847ee26a61a47bfbfb49d54f5e65cf5

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Thank you..

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https://kadambari-17.github.io/Cesium-Energy-Dashboard/

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