5Years FLUx 50

DITUR

Digital Twins for Upscaled Retrofits

Digital Twin for Upscaled Retrofits

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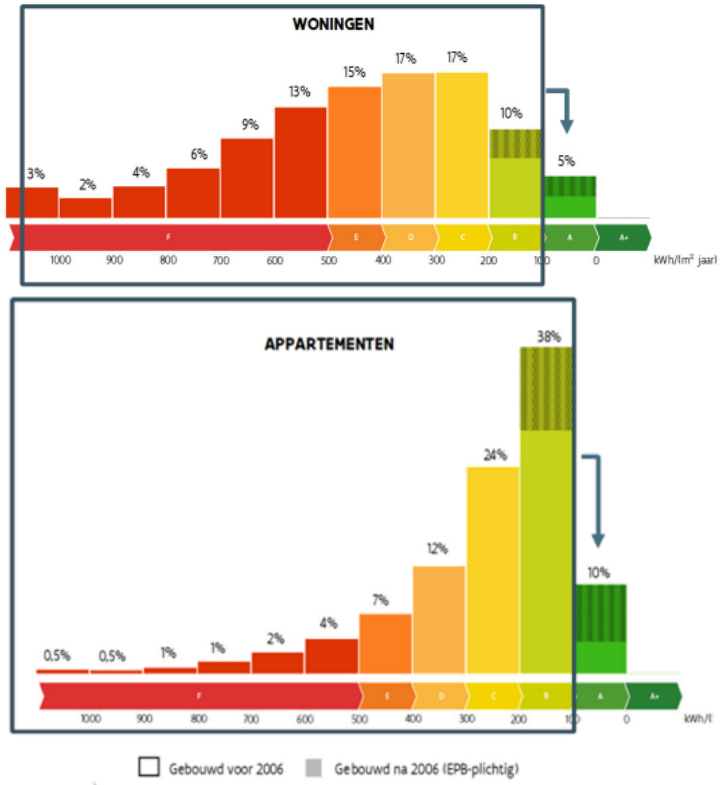
Now is the time


The Challenge…
< 100 kWh/m² by 2050

CARBON NEUTRAL BY 2050?



Energy Ville

Numerous Renovation programs – what sets DITUR apart?

- Benoplus
- Be Reel
- Renoseec
- Energiesprong
- Renoseec
- Wijkwerf
- Knauf Energy Solutions
- PMV pandenfonds
- Picardie Pass renovation
- Oktave
- Sustain Solutions
- Tighean
- Renowatt
- Better Home
- …

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Project partners

AGC Mirodan Bouwglas

- Expertise in building thermal energy sector (glass)
- Experience in B2B/B2C, installation and subcontractors management

AVINEON

- Expertise in data handling and visualisation
- Experience in digital twins concepts

june

- Expertise in B2C energy services
- Expertise in energy sensors and data

ZERO EMISSION SOLUTIONS

- Expertise in B2B/B2C building energy audit
- Experience in collective procurement

imec

- Experience in UX, citizen engagement & policy making (IMEC-SMIT)
- Expertise user-centred design, behavioural research (IMEC-MICT)

UNIVERSITEIT GENT

- Expertise in clustering of consumers and AI applied to energy data
- Expertise in techno-economical research

vito

- Expertise in urban energy management
- Expertise in building energy performance simulation

Energy Ville

Ditur in a nutshell

- **DITUR (DIGITAL TWIN FOR UPSCALED RETROFIT) THROUGH ICON COLLABORATION BETWEEN RESEARCH INSTITUES AND PRIVATE COMPANES**
  Investigating the **required characteristics** (source, frequency ,level of detail, ownership) of **data and data analytics** to support the energy transition in the built environment and lead to **new business models** for involved stakeholders Novel data sources (Lidar, smart meters, in-house sensors, IR-drones, …) and new data processing techniques in support of the renovation value chain.

- **THE ATTENTION TO THE END-USER EMBARKMENT AND STAKEHOLDER MANAGEMENT** is often neglected while it remains a **blocking point in the renovation plans & ambitions of cities**, clearly demonstrated by a **low rate of renovation(<1%)** in Europe as a whole. For sure we will identify end-users concerns, blocking points and positive triggers to initiate renovation. DITUR will Develop and apply **novel participation & engagement techniques** including **behavioral change** strategies for different target groups and this approach will be executed and tested in small scale prototypes in interaction with **Local suppliers**

- **THE DIGITAL TWIN COMBINED WITH A ONE-TO-ONE AUDIT** will confirm and help to extend and improve our models and identify projects with the same renovation profile . It will reinforce our models reliability all along the project and for future expansion in Flanders with the goal of **efficient execution** and **maximum replicability**

- **PACKAGES PROPOSALS,** defined based on the concept of similar set of renovations, in a specific areas, is a unique perspective that combines **geographical scope** (for example a street or a set of streets) **with an efficiency/cost perspective** (same set of elements to renovate). This is definitely rather new to the market.

Energy Ville

Ditur in a nutshell

Complementarity partners

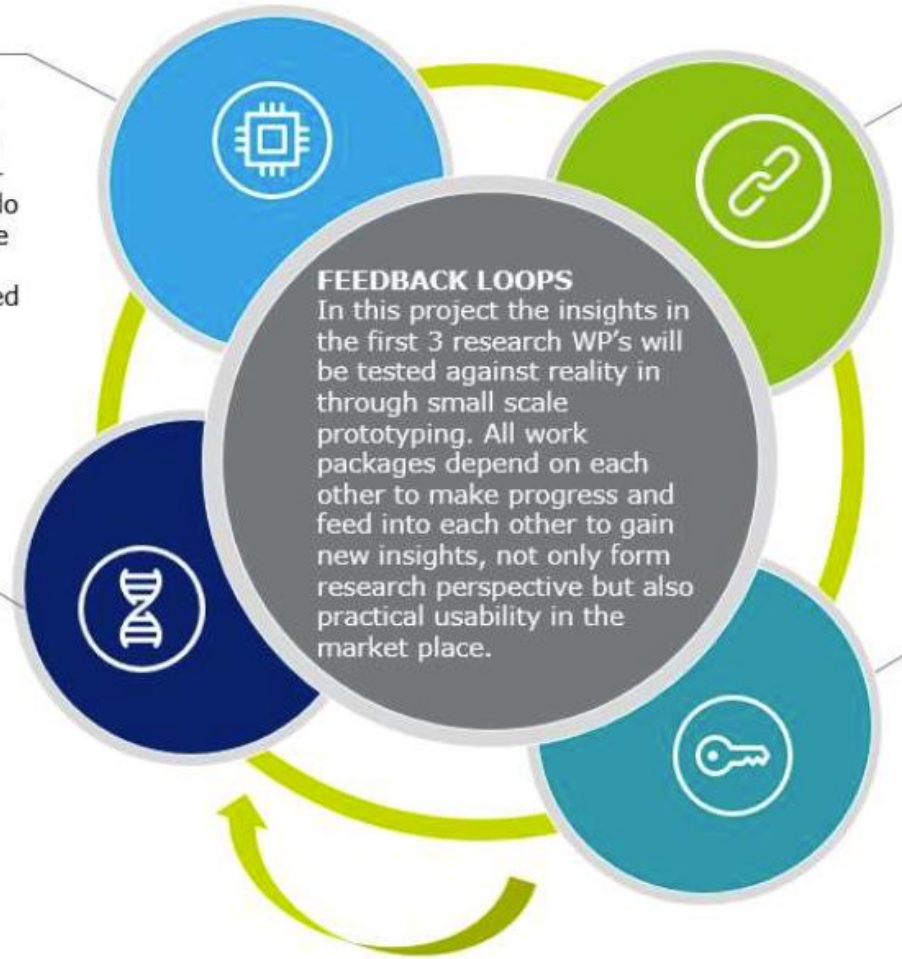
Research project with potential for Flanders and abroad in following development phase

Innovation focus on user centric approach instead of solution driven

Fast track **Impact** assessment on entire value and process chain

WP 0 Program Management Office

A general program management work package with PMO function will support the WP leaders in the execution of the work and keep track of the purpose, reach out to society and stakeholders and prepare next steps for upscaling



WP 1 Digital twin

The digital twin concept is the center of our data approach for upscaled retrofits. The research question is related to the data – what do we need to know and do better to support the of increase the renovation rate towards stakeholders – what is their need for increased impact, speed, insight

WP 2 Energy and asset analysis and clustering

Linking building characteristics to energy related data will lead to clustering opportunities, energy signature modelling, upscaling retrofit packages, investment optimization opportunities and secondary benefits (comfort, property value,...)

WP3 Participation and engagement

The aim of this work package is understand the DNA of the different stakeholder in the retrofit process – how to address, engage and support cities, citizens and contractors in the decision making process towards upscaled retrofits

WP4 Small scale prototypes

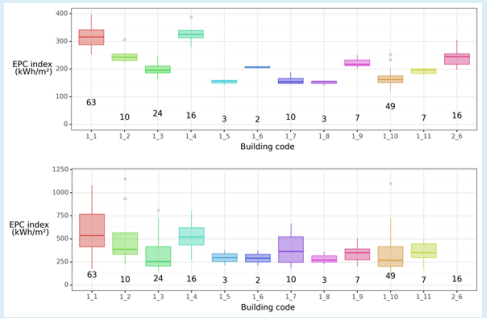
The research insights will be tested and validated in different test beds for several end user groups. KPI's for successful retrofits in the light of this project are among others speed, accuracy, performance, cost, impact...and will be compared against similar populations

Energy Ville

District energy calculations

Corrections based on knowledge building stock

1. No basement
2. Number of floors estimated on construction plans (for some buildings exclude attic)
    1. Correct volume
    2. Correct roof type (attic floor)
    3. Correct wall surface area
3. Construction year
4. Insulation walls/roofs and window specifics
5. Boiler specifics



Warmteproductie-mogelijkheden

Individuele warmtepompen

Lucht-water warmtepomp

~8000 € investeringskosten

Ook voor warmwaterproductie -> via zonnecollector

Hogetemperatuur-warmtenet

Assumptie 100% van gebouwen aangesloten

Zowel voor verwarming als warm water

Lagetemperatuur-warmtenet + Boosters

Lichte renovatie

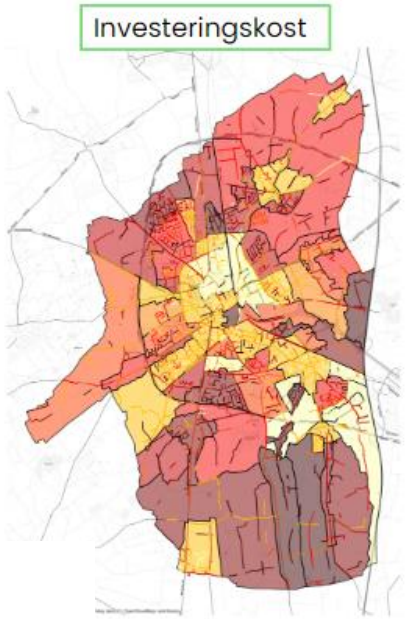
Assumptie 100% % van gebouwen aangesloten

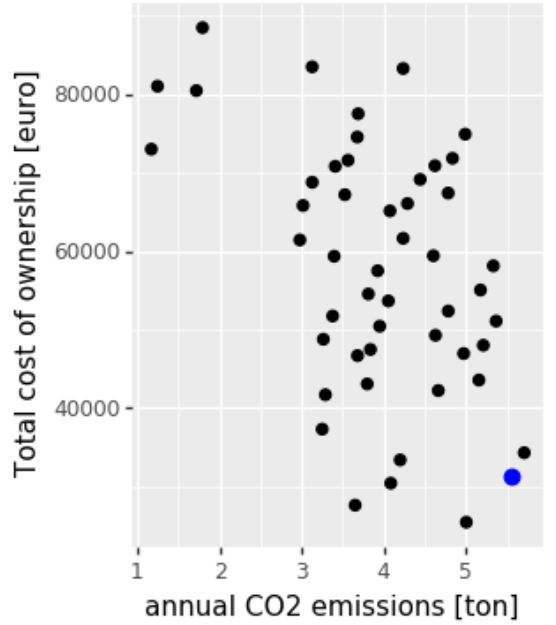
Booster warmtepomp: 5k€ investeringskosten

Lagetemperatuur-warmtenet + diepgaande renovatie

Assumptie 100% % van gebouwen aangesloten

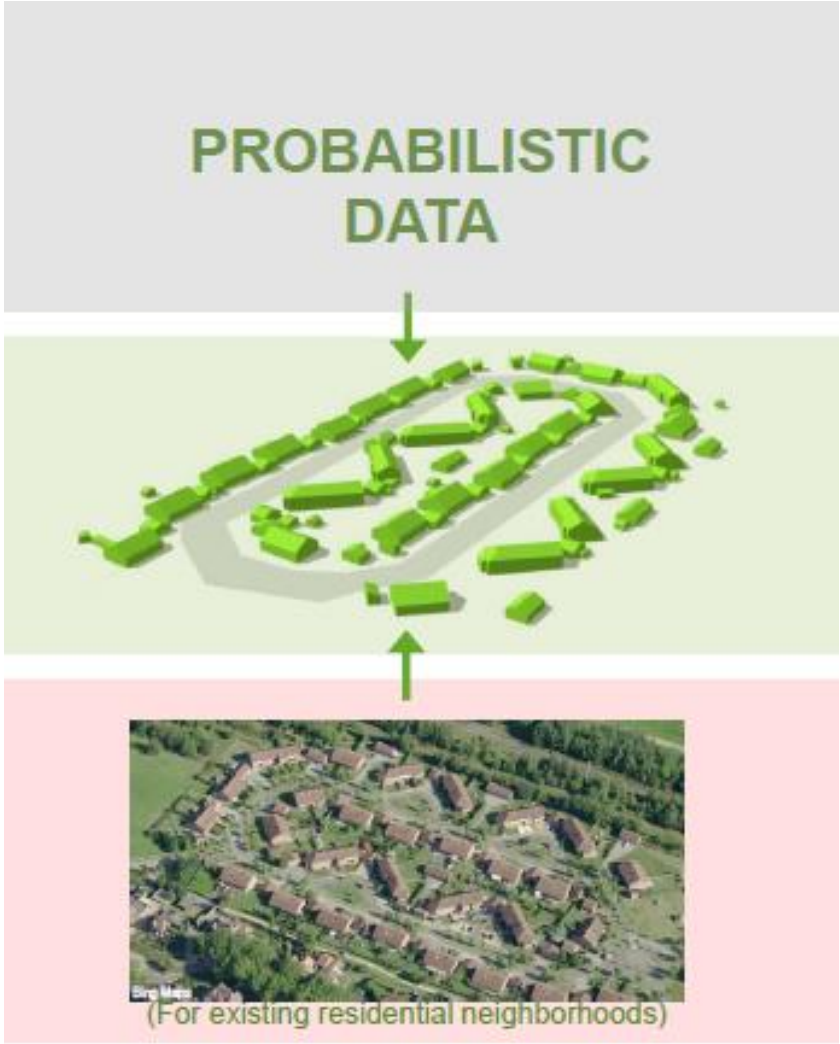
Elektrische boiler voor warm water: 500€ investeringskosten





Model Basic principles

- Modelling
  - Detailed simulations models: e.g. individual building simulation using EBECS *or IDEAS*
- Data
  - Bottom-up data where available (e.g. GIS building geometry, …)
  - Top-down fallback options where needed (e.g. inhabitants per statistical sector)
  - Statistical modelling and expert assumptions in between



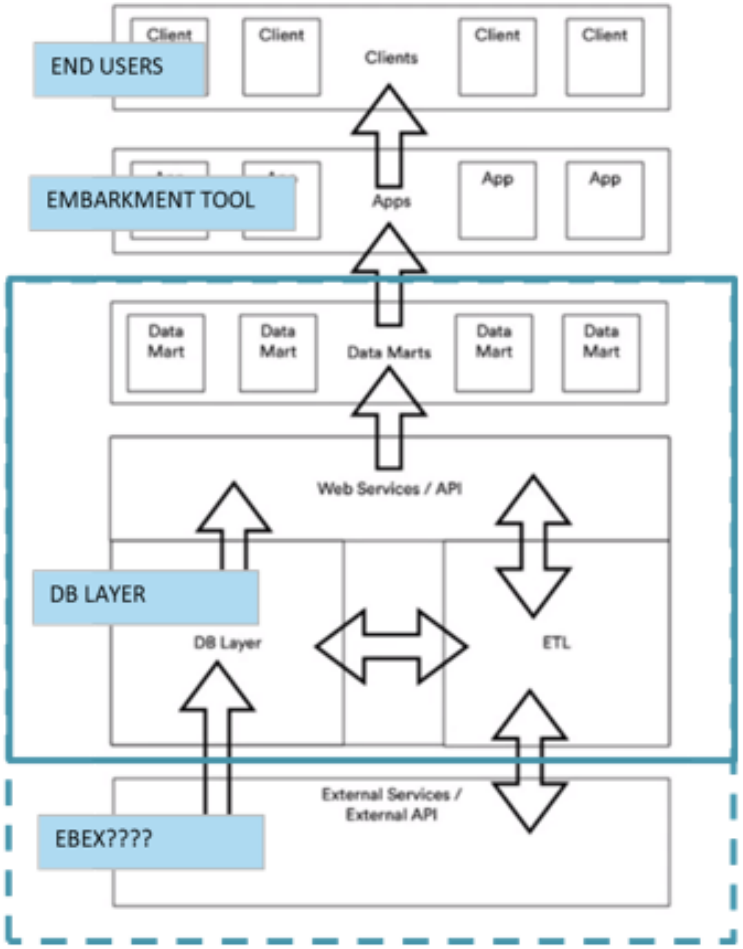
Data sources

- Detailed building level info
  - 3D building geometry (LOD 2) Basic
  - LOD 3. 1 – 2 – 3. Avineon MOdel
  - Function (e.g. residential, office, shop…)
  - Construction year
  - Heating system type
  - Number of inhabitants
  - 15 min consumption data – electricity and Gas – June dongels
  - Energy audits per building – ZES audits to check the modeling
- Aggregated on municipality level
  - Energy consumption data
  - Building envelope properties
  - Historic renovation permits

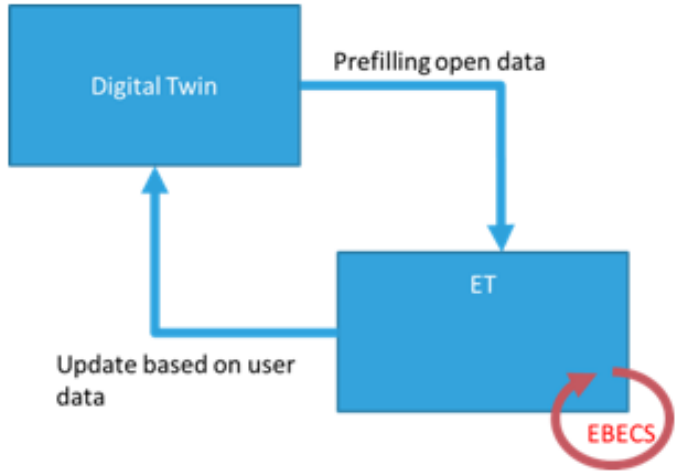
- Typical (open)data sources
  - Geometry : BGS & 3D-GRB (any .shp , .gml, .csv)
  - Consumption data: Fluvius open-data (street & statistical sector)
  - Construction year: Census (+ kadaster)
  - Building thermal properties: Metamodel trained on EPC database
  - Inhabitant characteristics: Census
  - Roads for dh: GRB (+ KLIP)
  - “Hernieuwbare energie-atlas”

DITUR in its ecosystem

Design of the digital twin

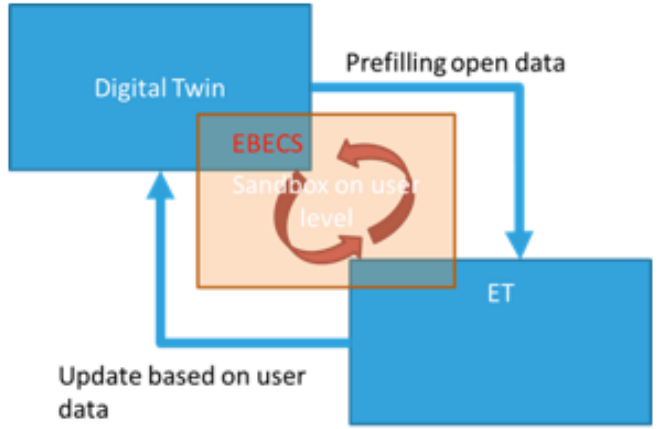


Digital Twin

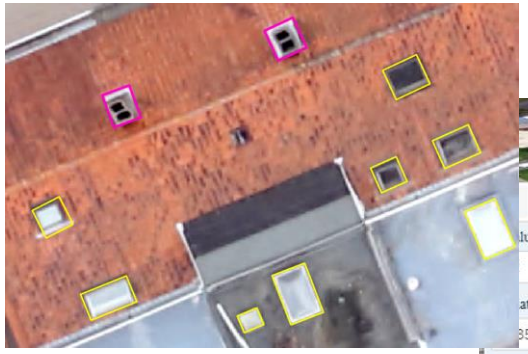


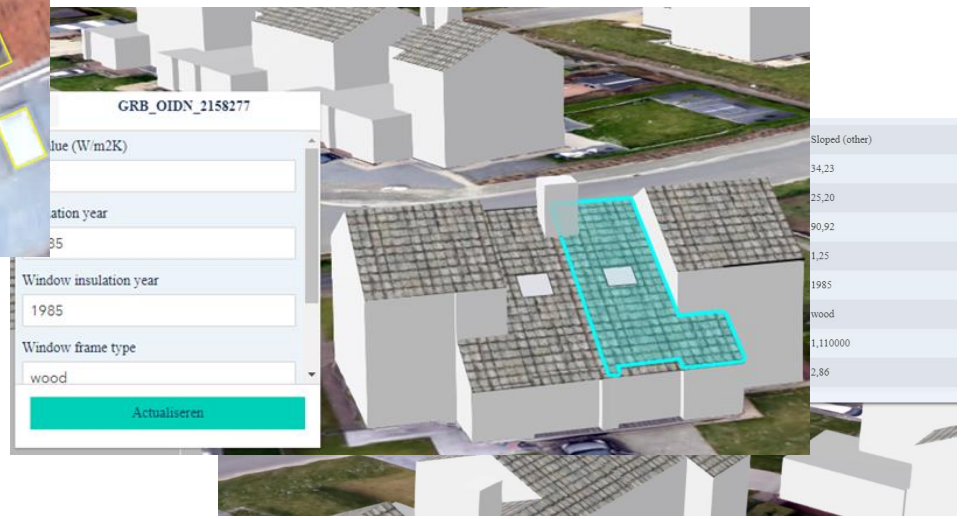
Recommended PoC stack

3D format - CityGML
3D model simulations - Random3DCity
3D Visualization - Cesium
DB - PostgreSQL/PostGIS + 3dCityDB extension
ETL - FME (Server)
Scripting/Coding - JavaScript



Applications on the DT





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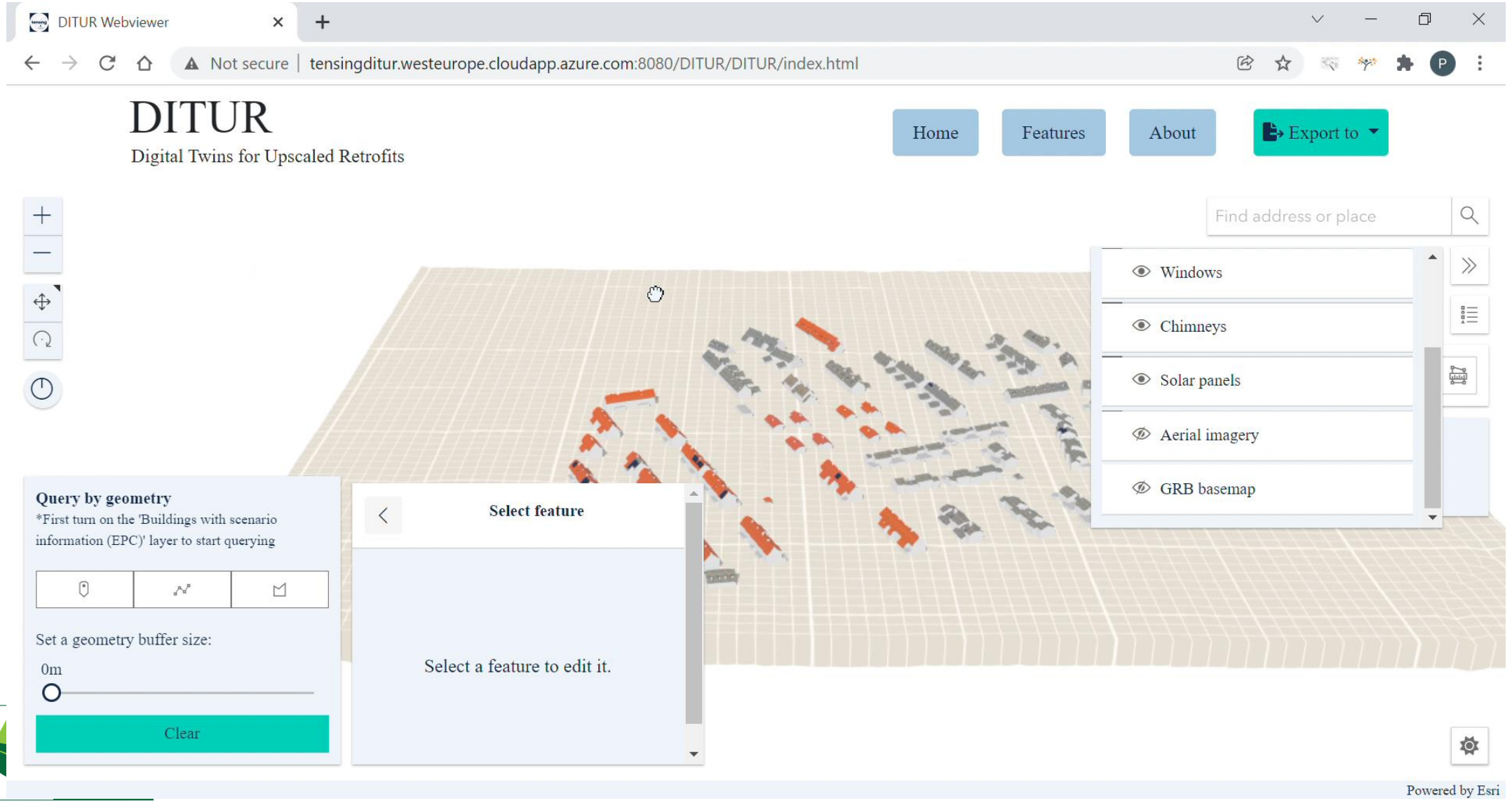

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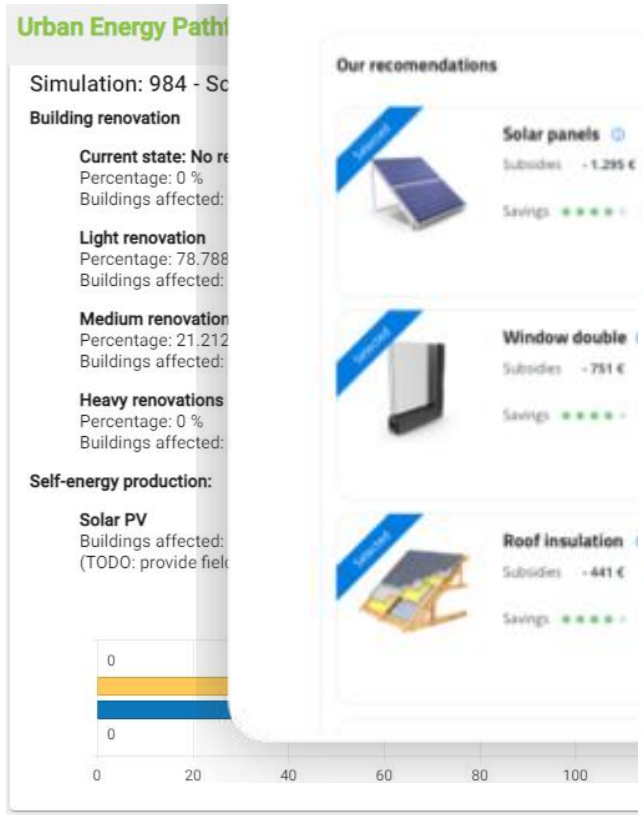

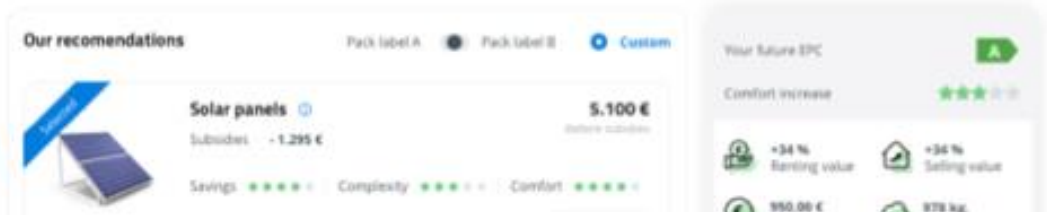

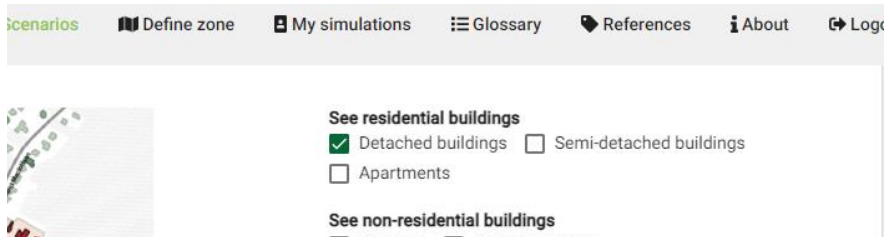

Estimated costs

General

Concept	Total investment (M€)	Energy savings (M€)	Period: Current 202
Light renovations	1,539,100	57,207	
Medium renovations	839,300	119,805.7	
Heavy renovations	0	0	

Collectief BENOveren en BENO+ vormen "the perfect match"

BENO+ volgt de standaardprocedure zoals uitgeschreven voor de Fluviuspremie voor Collectieve renovaties

Advies

Tijdens een energiescan wordt de energieprestatie van de woning in kaart gebracht, en worden aan-bevelingen voor energie-besparende maatregelen uitgelegd.

Offertes

Voor alle energie-besparende maatregelen waarin interesse is, worden offertes opgevraagd bij kwaliteitsgerichte aannemers.

Opvolging

Wordt er overgegaan tot investeren? Dan begeleiden coaches bij de voorbereidingen (omgevingsvergunning, groene leningen,…) en zijn éij het aanspreekpunt voor de burger en de aannemer.

Premies

Na afronding van de werken worden alle premies aangevraagd die op de situatie van de burger van toepassing zijn.

DITUR Main Contacts

Pieter Van Den Steen

Pieter.vandensteen@EnergyVille.be
+32 496 65 67 35

Glenn Reynders - Energyville

Valerie Barlet – AGC

Rob Van Welsenaere- Avineon

Siegfried Depuydt - Avineon

Alex Polfliet – ZES

Niels Vandeghinste

Vincent De Dobbeleer – June

Matthias Strobbe – Ugent IDLab

Nanouk Verhulst – IMEC

Bram Van Acker - UGent