

DIGITALIZATION

SUSTAINABLE PLACES 2020

October 27-30, 2020
DIGITAL EVENT

European Commission | Horizon 2020
European Union funding for Research & Innovation

WORKSHOP on Digitalization Tools for an Energy- Efficient Renovation"



**RenoZEB
Collaboration Platform**

Asier Mediavilla (TECNALIA)



This project has received funding from the European Union's H2020 Research and Innovation under grant agreement No 768718. The sole responsibility for the content lies with the authors. It does not necessarily reflect the opinion of the European Union.

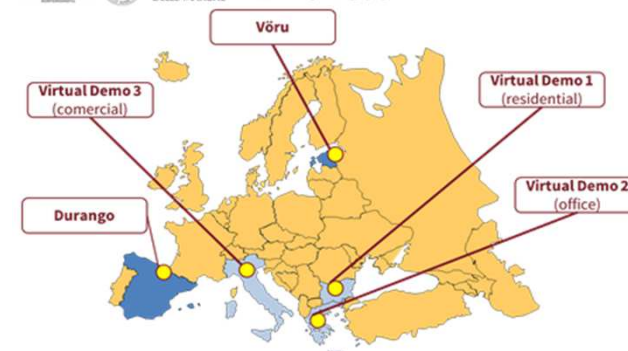
RenoZEB project: background

• Current situation

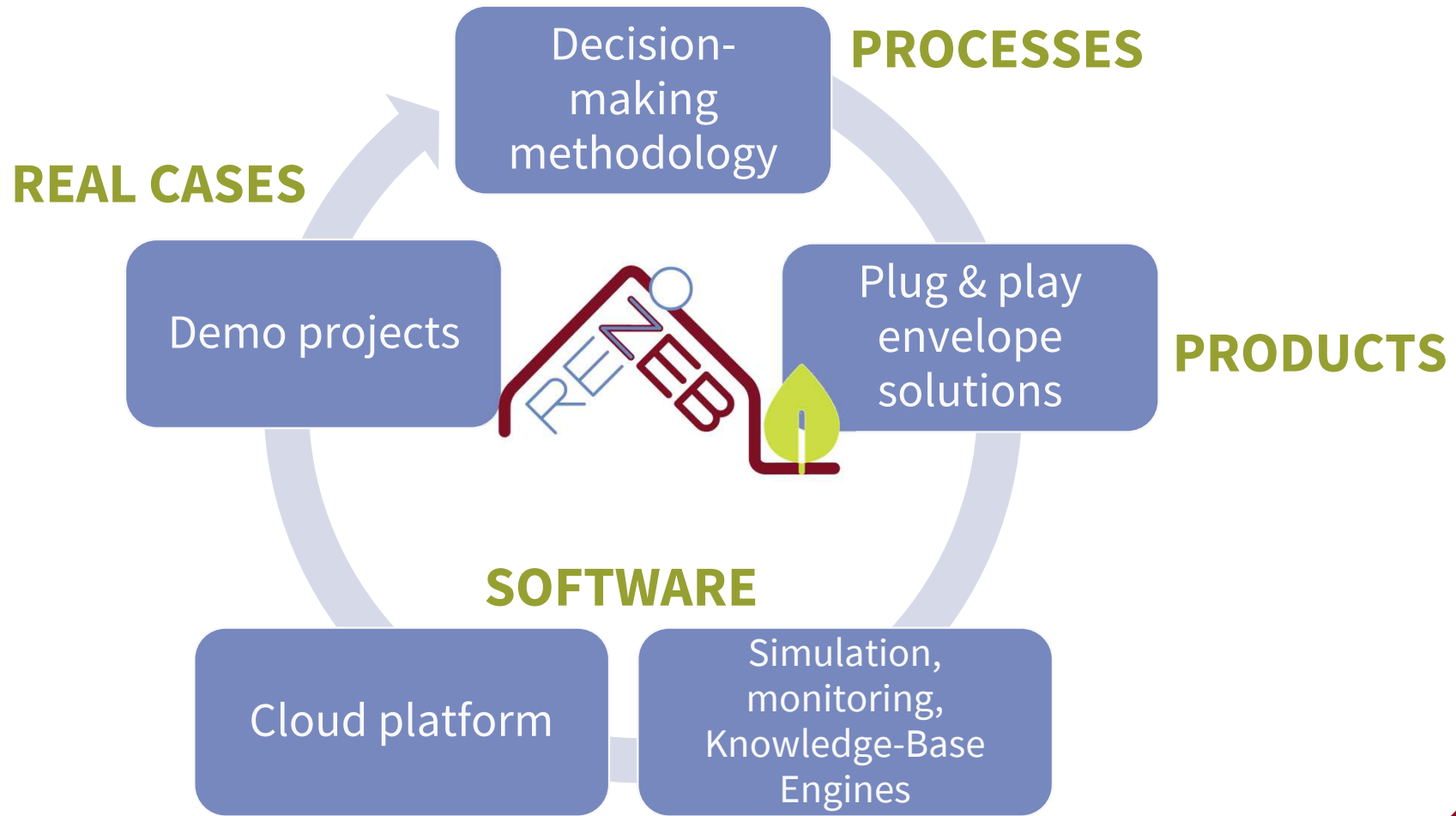
- **Only 1.2 %** of the building stock is **replaced annually** (target for 2050: **2.9%**)
- **Retrofitting** processes are **expensive, complex** and **disturbing**
- **Lack of information** about existing conditions, leading to **uncertainties** and **inefficiencies**
- **Poor** information **sharing**, multiple errors, lack of common view

• RenoZEB aim: to achieve

- 16% cost reduction of renovation
- 60% energy consumption reduction
- 65% renovation process time reduction

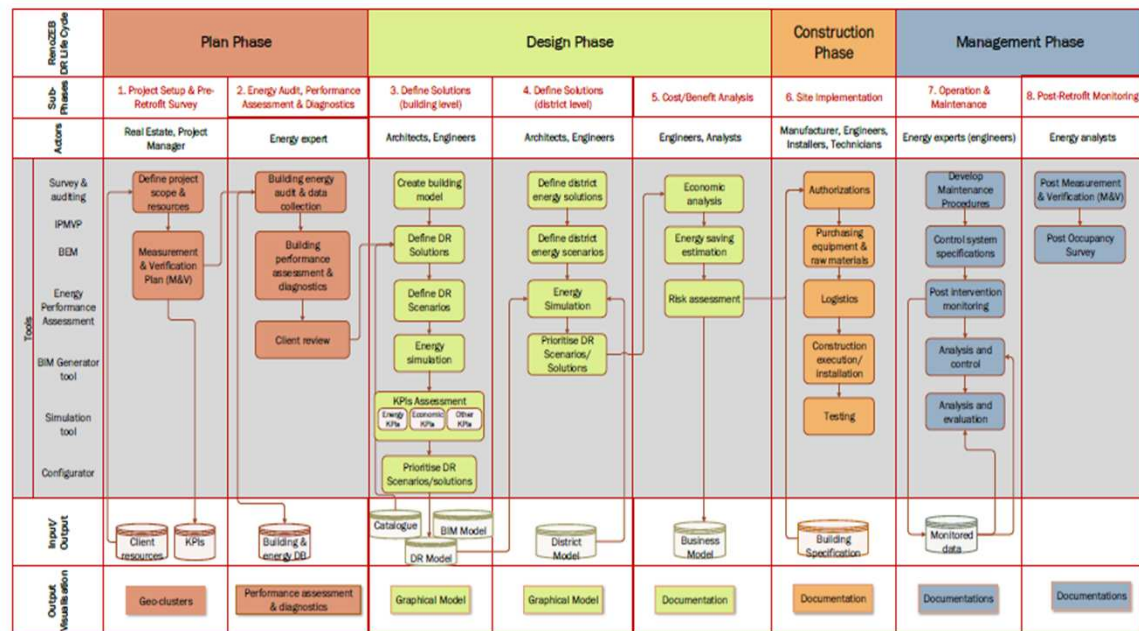


RenoZEB: proposed solution in a nutshell



RenoZEB: the methodology

- **Collaborative approach** through the whole value chain
- Goal: **nZEB** (reduce energy consumption, increase share of RES)
- **Low disruption/intrusiveness** during building renovation
- **Replicability** and **adaptability** through modularity in order to capture a large-scale renovation market
- **Property-value** as trigger



RenoZEB project: products and demos



Plug & Play product development



Mock-up installation



Validation in KUBIK (full-scale test infrastructure)

Renovation of real residential buildings



Durango (Spain)

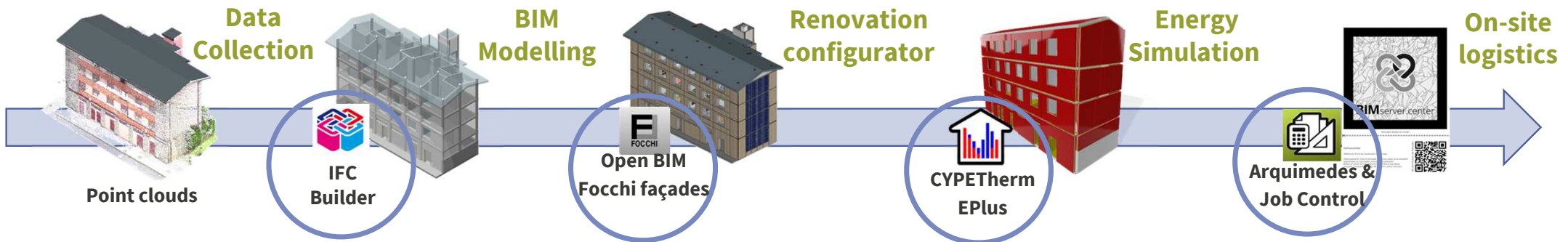


Võru (Estonia)

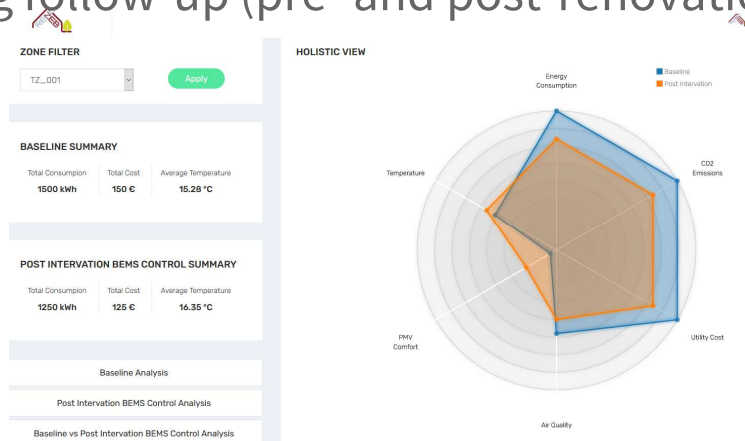


RenoZEB project: software tools

- **CYPE Suite**: set of free specialist tools to cover all renovation process. Some tools have been adapted or developed from scratch in the RenoZEB project

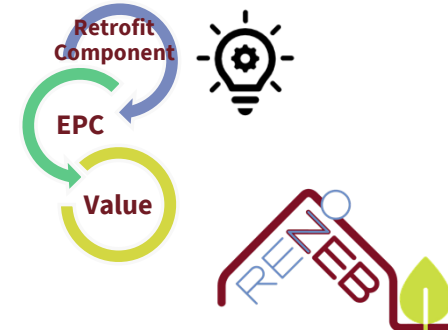


- **Monitoring tool**: web-app for building monitoring follow-up (pre- and post-renovation)



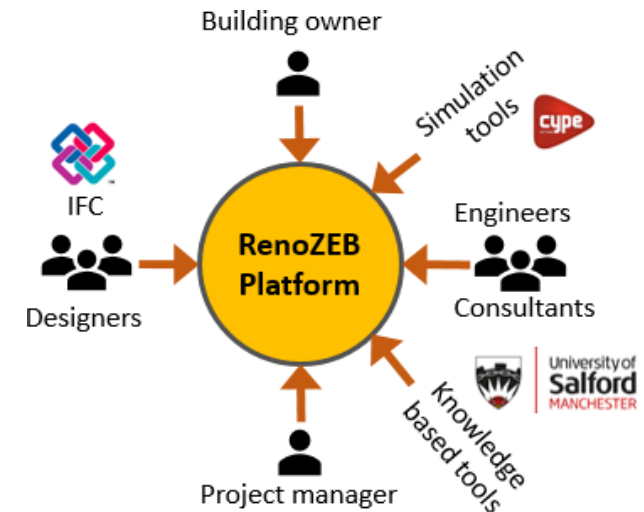
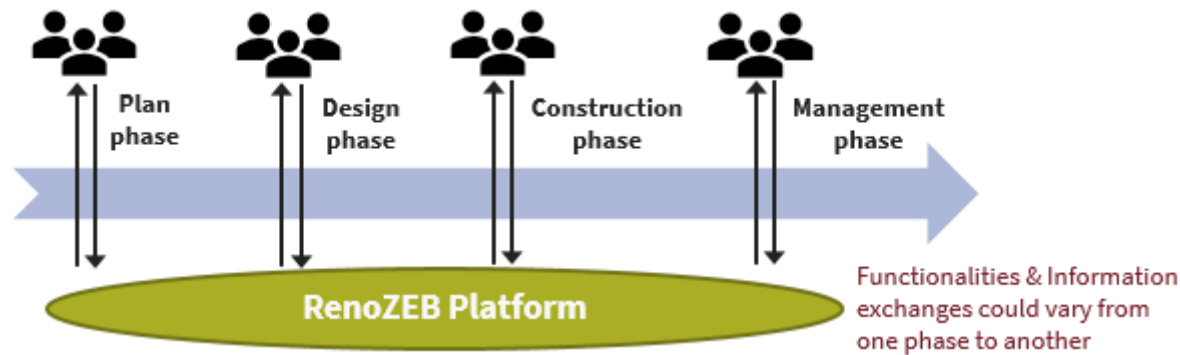
- **Knowledge base engine**: support in early decisions about suggestion of renovations and potential value increase of the building:

- Climate data module
- EPC data module



RenoZEB Collaboration Platform

- The central **collaboration point** or **Common Data Environment** to integrate deep renovation value chain
 - **“Workflow-aware”** → phases, tasks, issues...
 - **Decision-making** → manage/compare scenarios, strategies & KPIs
 - Project **dashboard** with a 3D **Open BIM** (IFC) viewer
 - **Public APIs** for integration of external tools

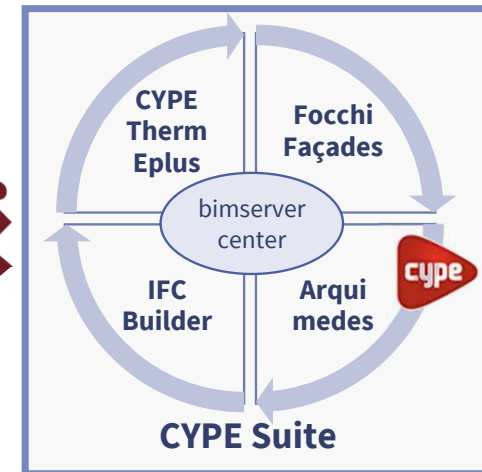
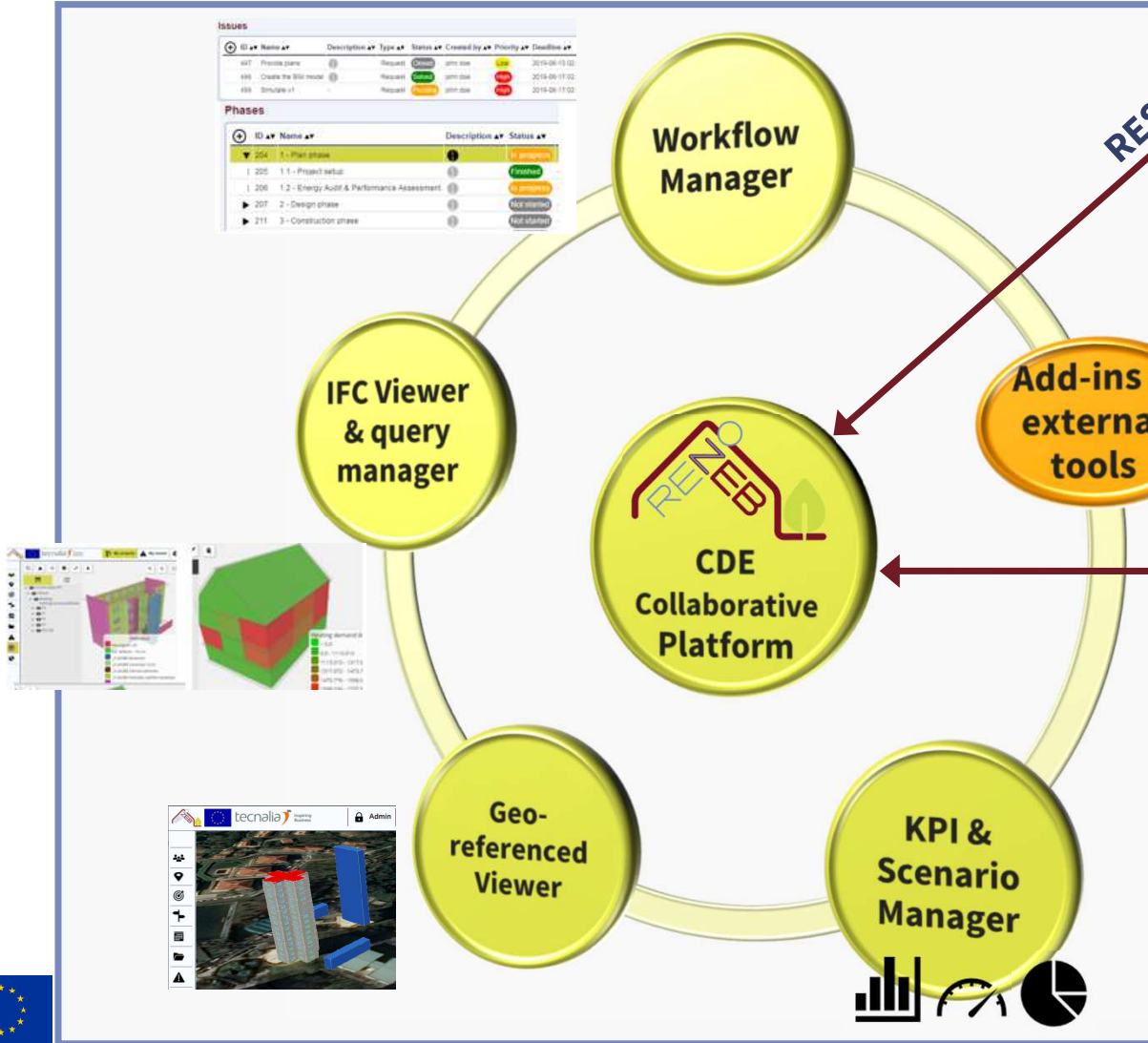


RenoZEB Collaboration Platform



University of Salford MANCHESTER

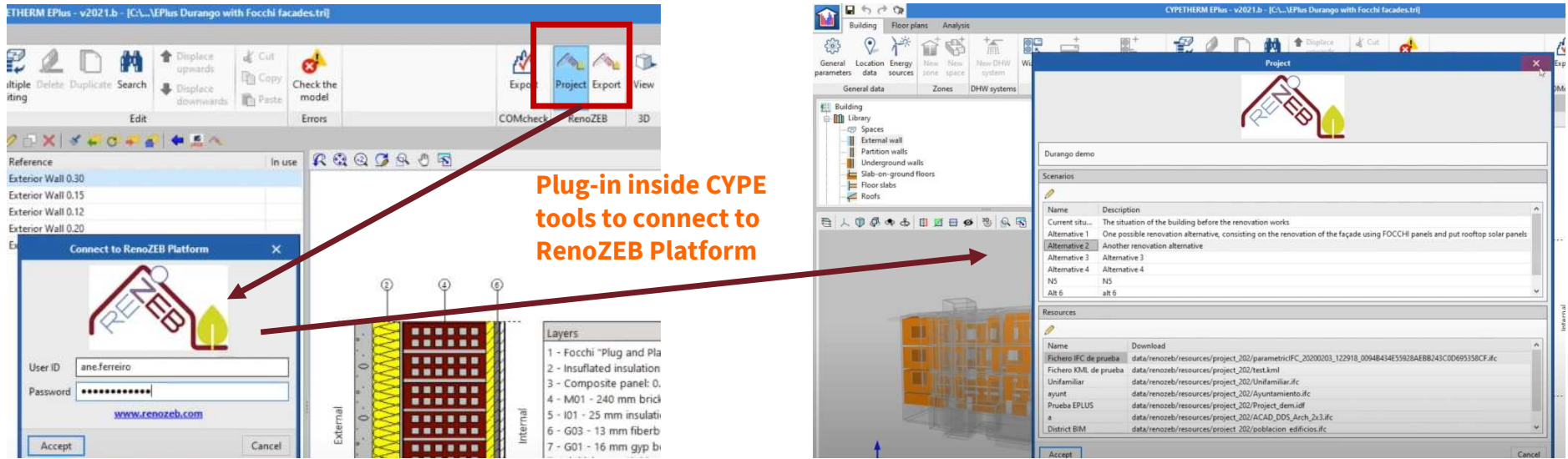
HIT HYPERTECH INNOVATIONS



RenoZEB Platform: 3rd party tools integration

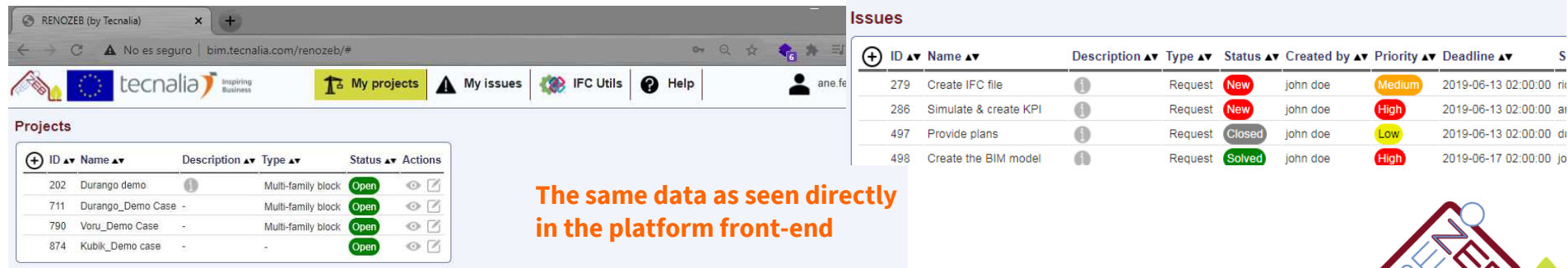
Plugin-based approach (using **REST-API**), e.g. CYPE-tools

Client tool

Plug-in inside CYPE tools to connect to RenoZEB Platform

Platform

The same data as seen directly in the platform front-end

ID	Name	Description	Type	Status	Created by	Priority	Deadline
279	Create IFC file		Request	New	john doe	Medium	2019-06-13 02:00:00
286	Simulate & create KPI		Request	New	john doe	High	2019-06-13 02:00:00
497	Provide plans		Request	Closed	john doe	Low	2019-06-13 02:00:00
498	Create the BIM model		Request	Solved	john doe	High	2019-06-17 02:00:00

Presentation title, name of the

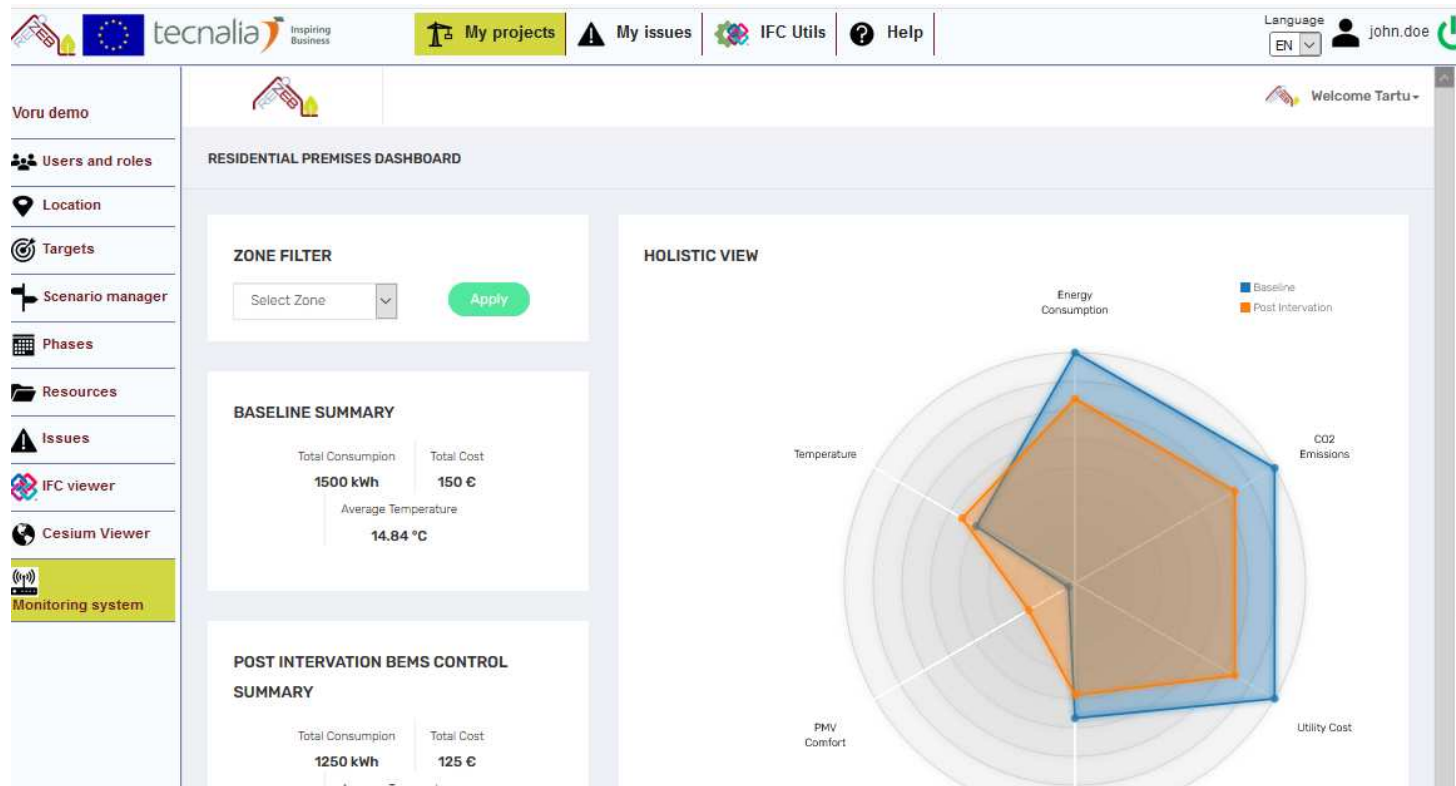


27/10/2020



RenoZEB Platform: 3rd party tools integration

Seamless GUI integration through HTML, e.g. monitoring system from HYPERTECH



27/10/2020

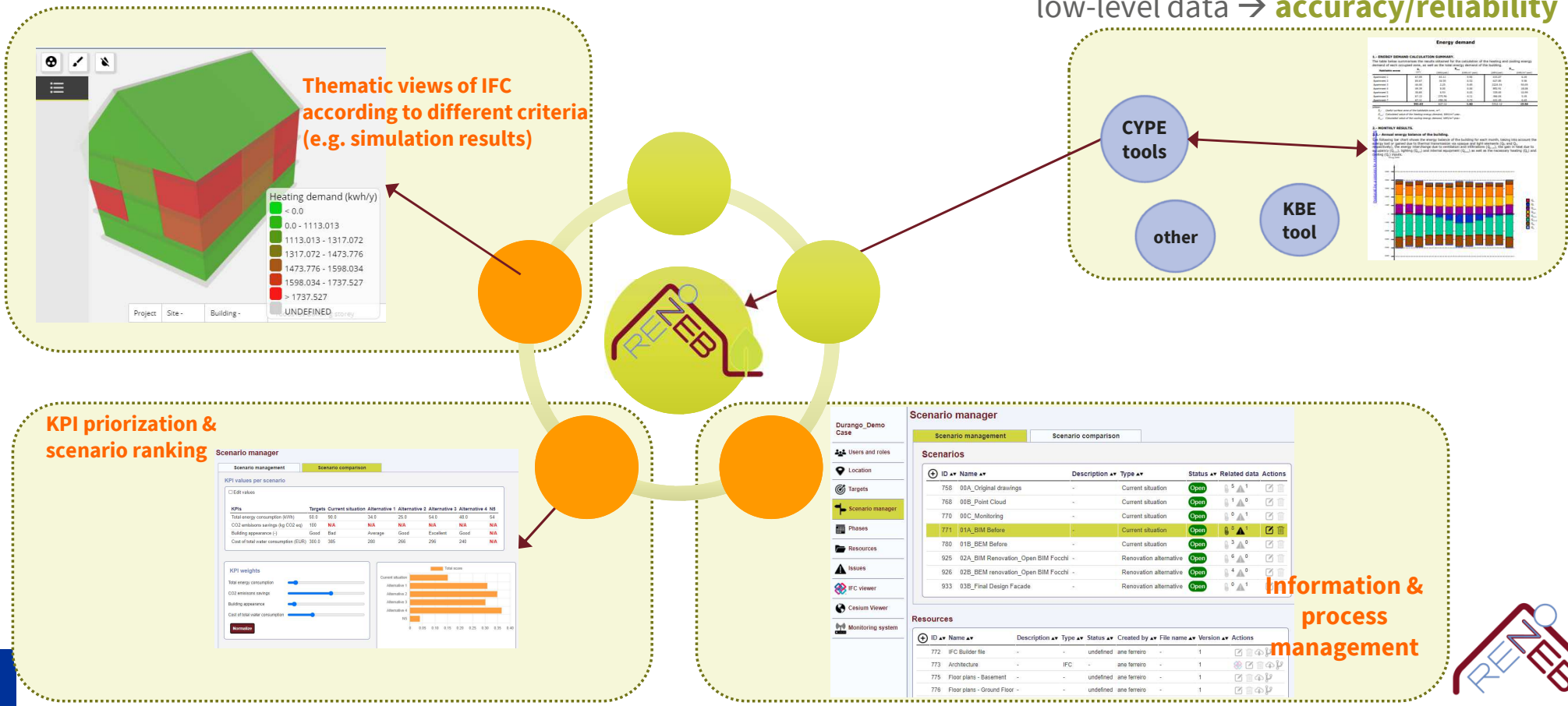
Presentation title, name of the



RenoZEB Collaboration Platform

Platform: “high-level” information → better communication, understanding & **decision-making**

Specialist tools: detailed calculations, low-level data → **accuracy/reliability**



Thematic views of IFC according to different criteria (e.g. simulation results)

Heating demand (kwh/y)

- < 0.0
- 0.0 - 1113.013
- 1113.013 - 1317.072
- 1317.072 - 1473.776
- 1473.776 - 1598.034
- 1598.034 - 1737.527
- > 1737.527

Project Site- Building - UNDEFINED story

CYPE tools

other

KBE tool

Energy demand

1. ENERGY DEMAND CALCULATION SUMMARY

Month	Heating	Cooling	Hot water	Total
Jan	15000	0	10000	25000
Feb	14000	0	10000	24000
Mar	13000	0	10000	23000
Apr	12000	0	10000	22000
May	11000	0	10000	21000
Jun	10000	0	10000	20000
Jul	10000	10000	10000	30000
Aug	10000	10000	10000	30000
Sep	11000	0	10000	21000
Oct	12000	0	10000	22000
Nov	13000	0	10000	23000
Dec	14000	0	10000	24000
Annual	120000	0	100000	220000

2. MONTHLY RESULTS

3. Annual energy balance of the building

KPI prioritization & scenario ranking

Scenario manager

KPI values per scenario

KPIs	Targets	Current situation	Alternative 1	Alternative 2	Alternative 3	Alternative 4	HS
Total energy consumption (kWh)	55.0	95.0	34.0	25.0	54.0	40.0	54
CO2 emissions savings (kg CO2 eq)	100	N/A	365	N/A	N/A	N/A	N/A
Building appearance (-)	Good	Bad	Average	Good	Excellent	Good	N/A
Cost of total water consumption (EUR)	360.0	385	280	295	240	N/A	N/A

KPI weights

Total energy consumption: [Slider]

CO2 emissions savings: [Slider]

Building appearance: [Slider]

Cost of total water consumption: [Slider]

Current situation: [Bar chart]

Alternative 1: [Bar chart]

Alternative 2: [Bar chart]

Alternative 3: [Bar chart]

Alternative 4: [Bar chart]

HS: [Bar chart]

Scenario manager

Scenario management | Scenario comparison

Scenarios

ID	Name	Description	Type	Status	Related data	Actions
758	00A_Original drawings	-	Current situation	Open		
768	00B_Point Cloud	-	Current situation	Open		
770	00C_Monitoring	-	Current situation	Open		
771	01A_BIM Before	-	Current situation	Open		
780	01B_BEM Before	-	Current situation	Open		
925	02A_BIM Renovation_Open BIM Focchi	-	Renovation alternative	Open		
926	02B_BEM renovation_Open BIM Focchi	-	Renovation alternative	Open		
933	03B_Final Design Facade	-	Renovation alternative	Open		

Resources

ID	Name	Description	Type	Status	Created by	File name	Version	Actions
772	IFC Builder file	-	undefined	ana fernero	-	-	1	
773	Architecture	-	IFC	ana fernero	-	-	1	
775	Floor plans - Basement	-	undefined	ana fernero	-	-	1	
776	Floor plans - Ground Floor	-	undefined	ana fernero	-	-	1	

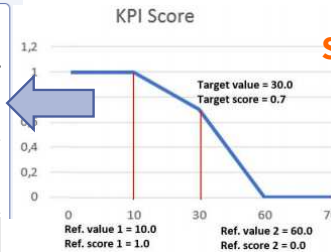
Information & process management



RenoZEB Platform: KPI/scenario manager

Targets

Name	Domain	Value type	Granularity	Target	Scoring ?
<input checked="" type="checkbox"/> Total energy consumption (C_tot)	Real	Energy	Building	50.0 kWh	100.0 0 50.0 0.7 25.0 1
<input type="checkbox"/> Heating energy consumption (C_heat)	Real	Energy	Building	kWh	
<input type="checkbox"/> Energy Performance Certificate (EPC)	Option	Environment	Building	A	
<input checked="" type="checkbox"/> Building appearance (B_aesth)	Option	Social	Building	Good	Bad 0 Regular 0.25 Average 0.50 Good 0.75 Excellent 1



Select KPIs & their scoring system

- Durango demo
- Users and roles
- Location
- Targets
- Scenario manager**
- Phases
- Resources
- Issues
- IFC viewer
- Cesium Viewer

Create renovation scenarios

Scenario manager

Scenario management | Scenario comparison

Scenarios

ID	Name	Description	Type	Status	Related data	Actions
272	Current situation		Current situation	Open		
273	Alternative 1		Renovation alternative	Open		
274	Alternative 2		Renovation alternative	Open		
275	Alternative 3		Renovation alternative	Open		
276	Alternative 4		Renovation alternative	Open		

Issues

ID	Name	Description	Type	Status	Created by	Priority	Deadline
279	Create IFC file		Request	New	john doe	Medium	2019-06-13 02:00:00
286	Simulate & create KPI		Request	New	john doe	High	2019-06-13 02:00:00

Resources

ID	Name	Description	Type	Status	Created by	File name	Version	Actions
282	Current status IFC		IFC	undefined	richard roe		1	

Select KPI weights and rank scenarios

Scenario management | **Scenario comparison**

KPI values per scenario

Edit values

KPIs	Targets	Current situation	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Total energy consumption	50.0	90.0	35.0	25.0	54.0	48.0
Building appearance	Good	Bad	Average	Good	Excellent	Good
Cost of total water consumption	300.0	385	280	266	296	240

KPI weights

Total energy consumption: [Slider]

Building appearance: [Slider]

Cost of total water consumption: [Slider]

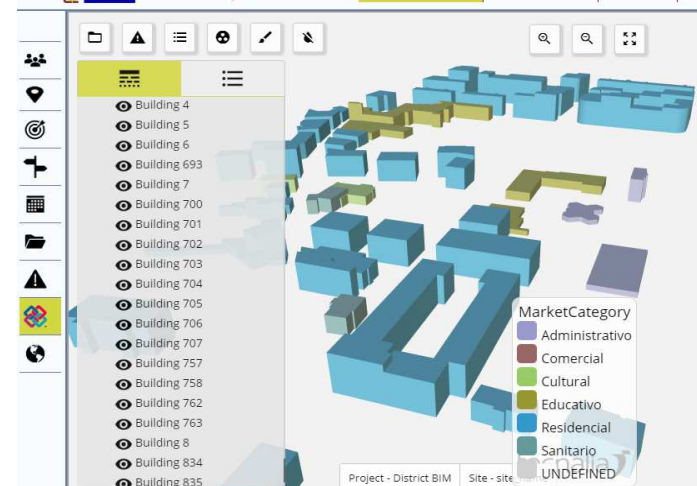
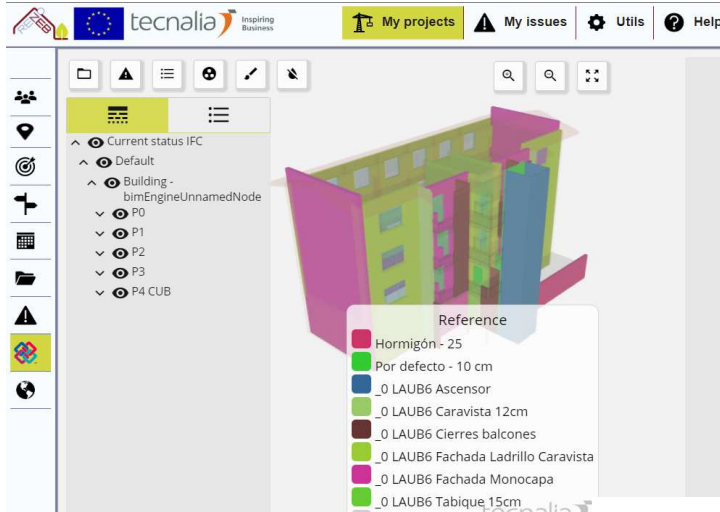
Normalize

Total score

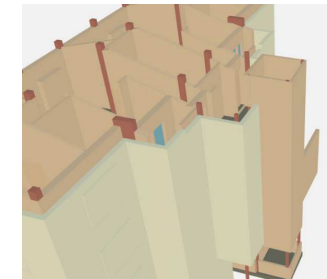
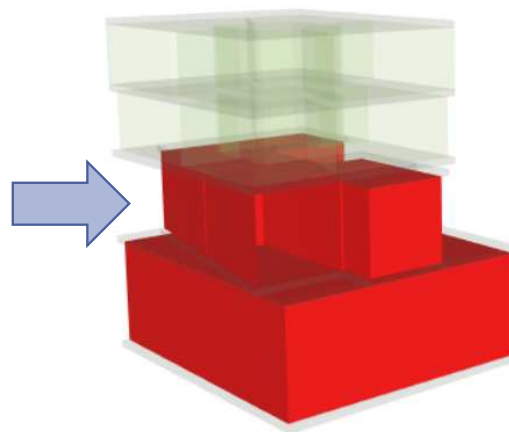
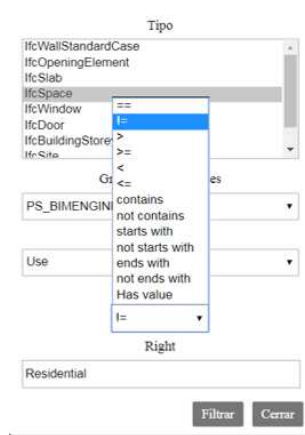


RenoZEB Platform: Model visualization & audit

Possibility to **filter & query** IFC models (even district/multi-building approach)



Sample query:
"select non-residential zones"

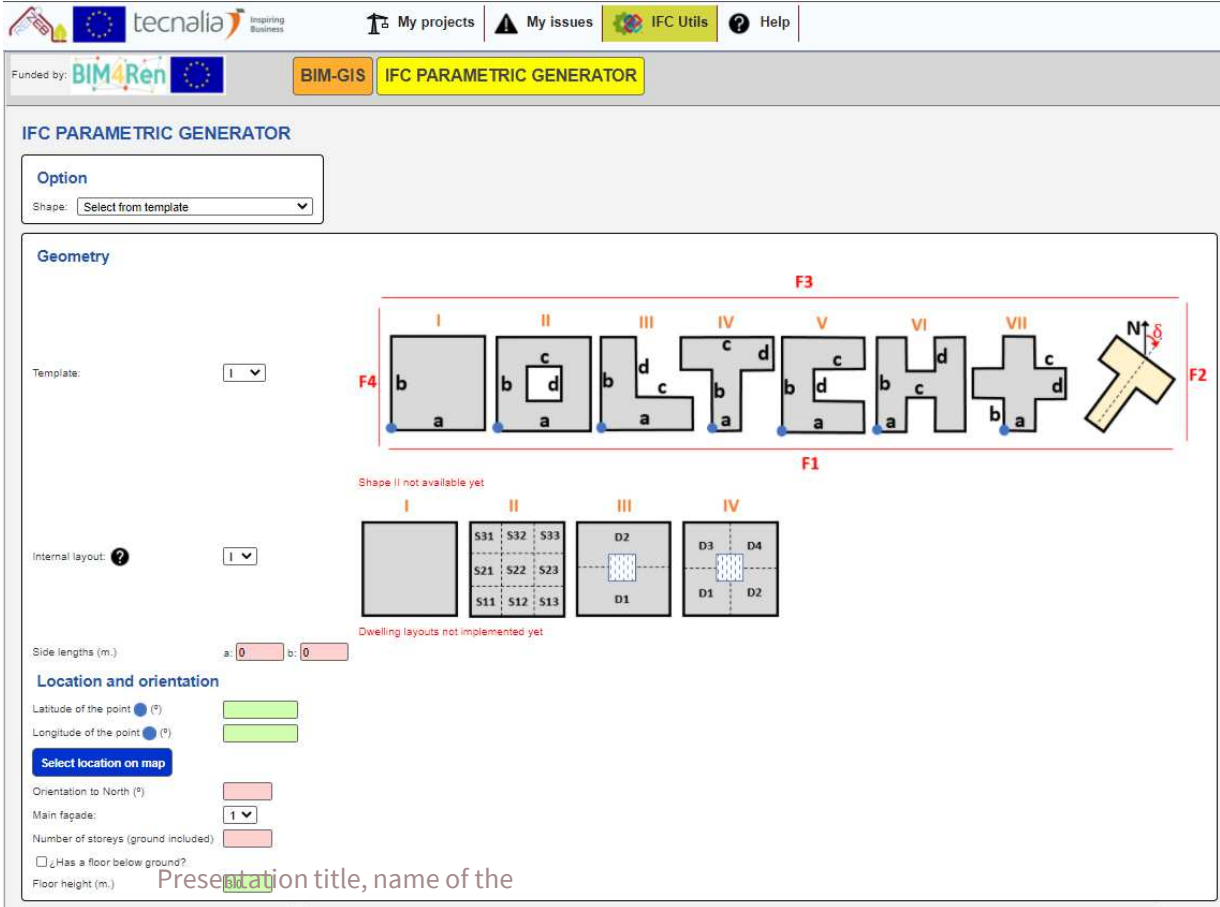


Multi-model views: e.g. before & after renovation

RenoZEB Platform: add-ins & utilities

Modular architecture, which enables to add new functionalities

As an example, **IFC auto-generation & BIM-GIS interoperability** services, developed in another H2020 project)

The screenshot shows the 'IFC PARAMETRIC GENERATOR' web interface. The top navigation bar includes 'My projects', 'My issues', 'IFC Utils', and 'Help'. Below the navigation, there are logos for 'Funded by BIM4Ren' and 'BIM-GIS IFC PARAMETRIC GENERATOR'. The main content area is titled 'IFC PARAMETRIC GENERATOR' and contains several sections:

- Option:** A dropdown menu for 'Shape' with the value 'Select from template'.
- Geometry:** A large diagram showing a building footprint divided into seven sections (I-VII) and four facades (F1-F4). A north arrow is also present.
- Template:** A dropdown menu with the value 'I'.
- Internal layout:** A dropdown menu with the value 'I'. Below it, there are four diagrams labeled I, II, III, and IV, representing different internal layouts. Diagram II shows a grid of rooms labeled S11-S33 and D1-D4. Diagram III shows a central area labeled D2. Diagram IV shows a central area labeled D3 and D4. A note below these diagrams states 'Dwelling layouts not implemented yet'.
- Side lengths (m.):** Input fields for 'a' and 'b', both set to '0'.
- Location and orientation:**
 - Latitude of the point (°): Input field.
 - Longitude of the point (°): Input field.
 - 'Select location on map' button.
 - Orientation to North (°): Input field.
 - Main facade: Dropdown menu with value '1'.
 - Number of storeys (ground included): Input field.
 - Checkbox for 'Has a floor below ground?'.
 - Floor height (m.): Input field.

At the bottom of the interface, there is a text input field with the placeholder 'Presentation title, name of the'.



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