Green Building Council Italia

In occasione di: KEY THE ENERGY TRANSITION EXPO

28 febbraio - 1 marzo 2024

Andrea Costa

Dati e metodologie per il Whole Life Carbon:la ricerca Eumetra e la roadmap italiana per la decarbonizzazione

Strumenti per la decarbonizzazione su scala urbana dal mondo dei progetti di ricerca EU fino all'Italia e la missione 100 città

Chi siamo

Founded	People	Offices	Research	Funds raised	First time EU
2012	**119**	**8** 4 Countries	**124** R&D projects	**591 M** Total R&D Portfolio	**43** Organizations

Turnover: **€9.1 Million (2023)**
Over half in commercial activities

Chi siamo


HEADQUARTER
▪Pavia, Italy
Italy
▪Milan
▪Catania
▪Padova
United Kingdom
▪ London
Spain
▪Madrid;
▪Barcelona
▪Bilbao
France
▪ Roquefort-les-Pins;
▪ Paris

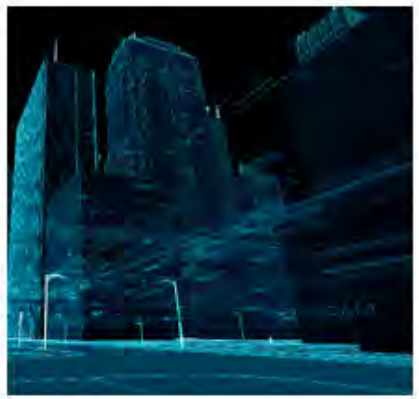
Chi siamo

Innovation

Commissione Europea

Innovative Products & Services

ESG Digital Twin Ecosystem for Real Estate



Sustainability Consulting & Energy Services

Chi siamo

Innovation

+CITYXCHANGE

iBECOME

MAKING PEDs

REGEN

Step-WISE

Innovative Products & Services

IES

greenpass

Sustainability Consulting & Energy Services

PAESC

Positive Energy Districts (PED)

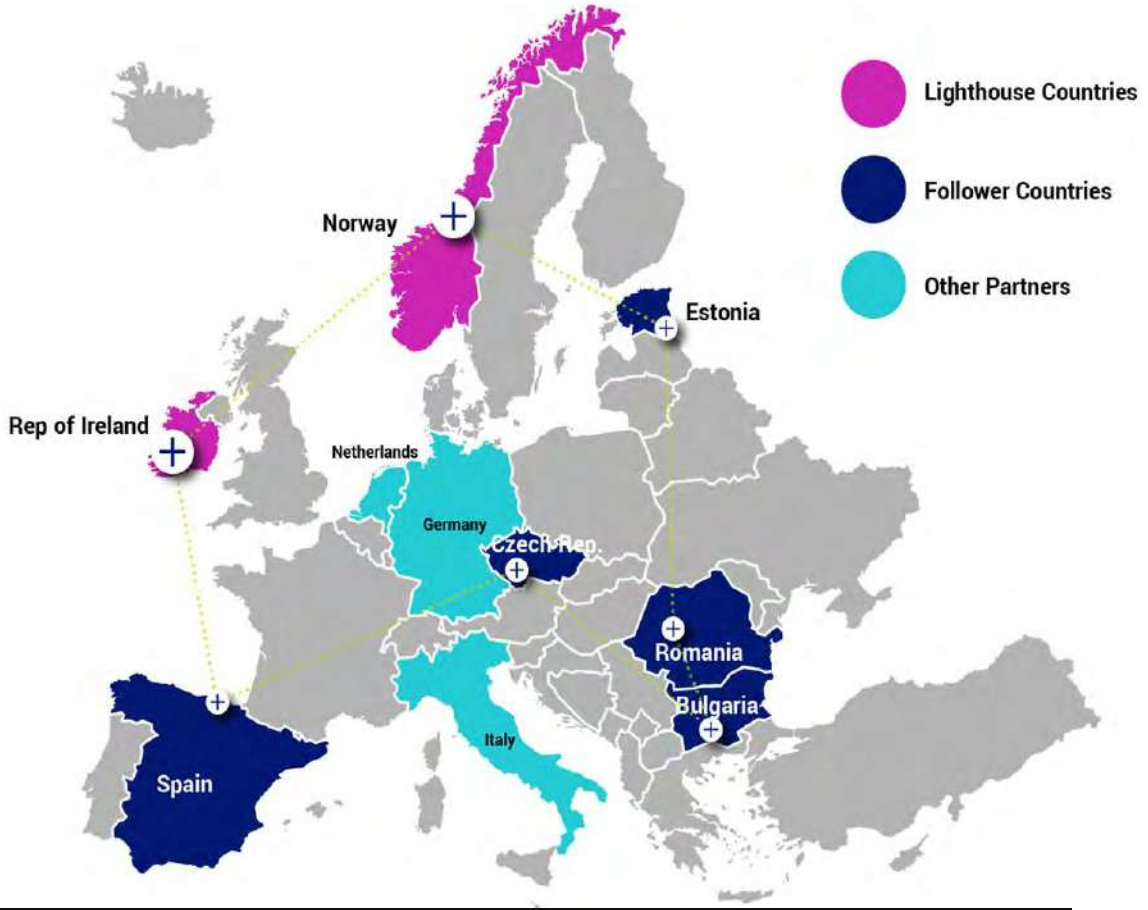
Comunità Energetiche Rinnovabili (CER)

Reinventing Cities

EU MISSIONS
100 CLIMATE-NEUTRAL AND SMART CITIES

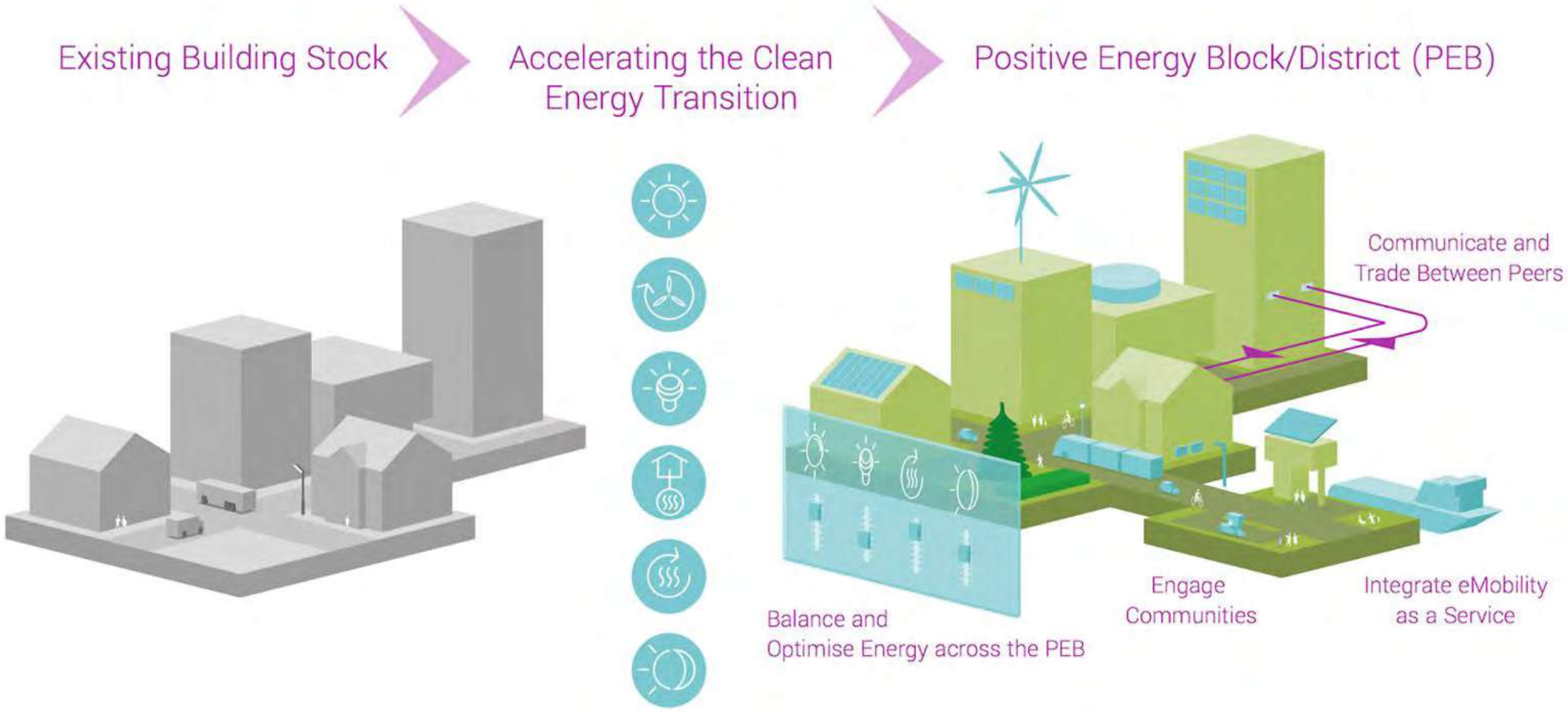
Il progetto +CityxChange

- EU H2020 Grant funded
- *Nov 2018 to Oct 2023*
- *32 partner organisation's*
- *7 countries*
- *2 Lighthouse Cities – Trondheim & Limerick*
- *5 Follower Cites: Alba Iulia, Pisek, Võru, Smolyan & Sestao*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 824260.
This page reflects only the authors' views and the European Commission/INEA is not responsible for any use that may be made of the information it contains.

Positive Energy Blocks



Obiettivi chiave e approccio

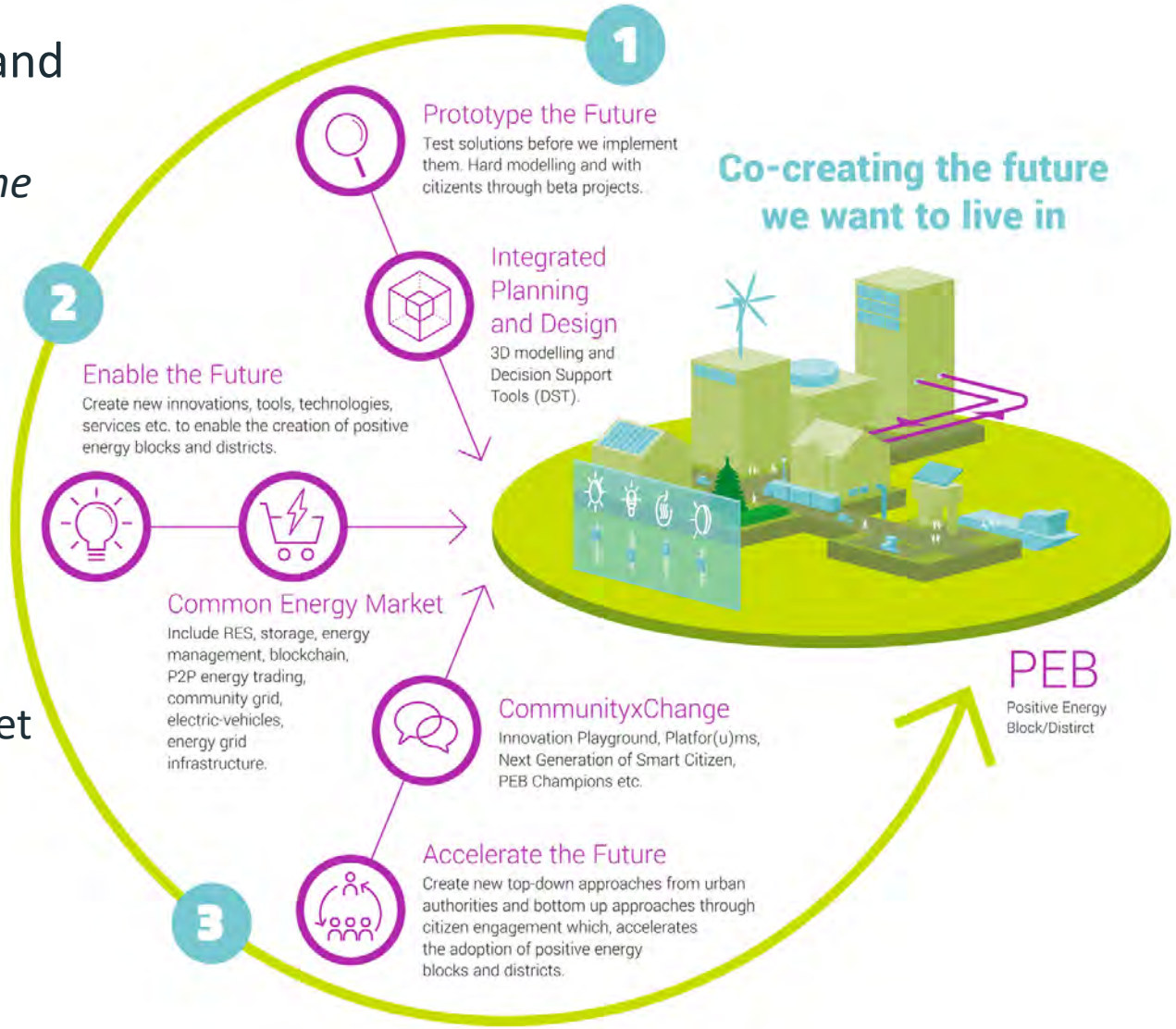
1- Supportare lo sviluppo di “Positive Energy Blocks and Districts”

Il Positive Energy Block (PEB) è un Gruppo di 3 o più edifici che produce più energia di quella che consuma in un anno.

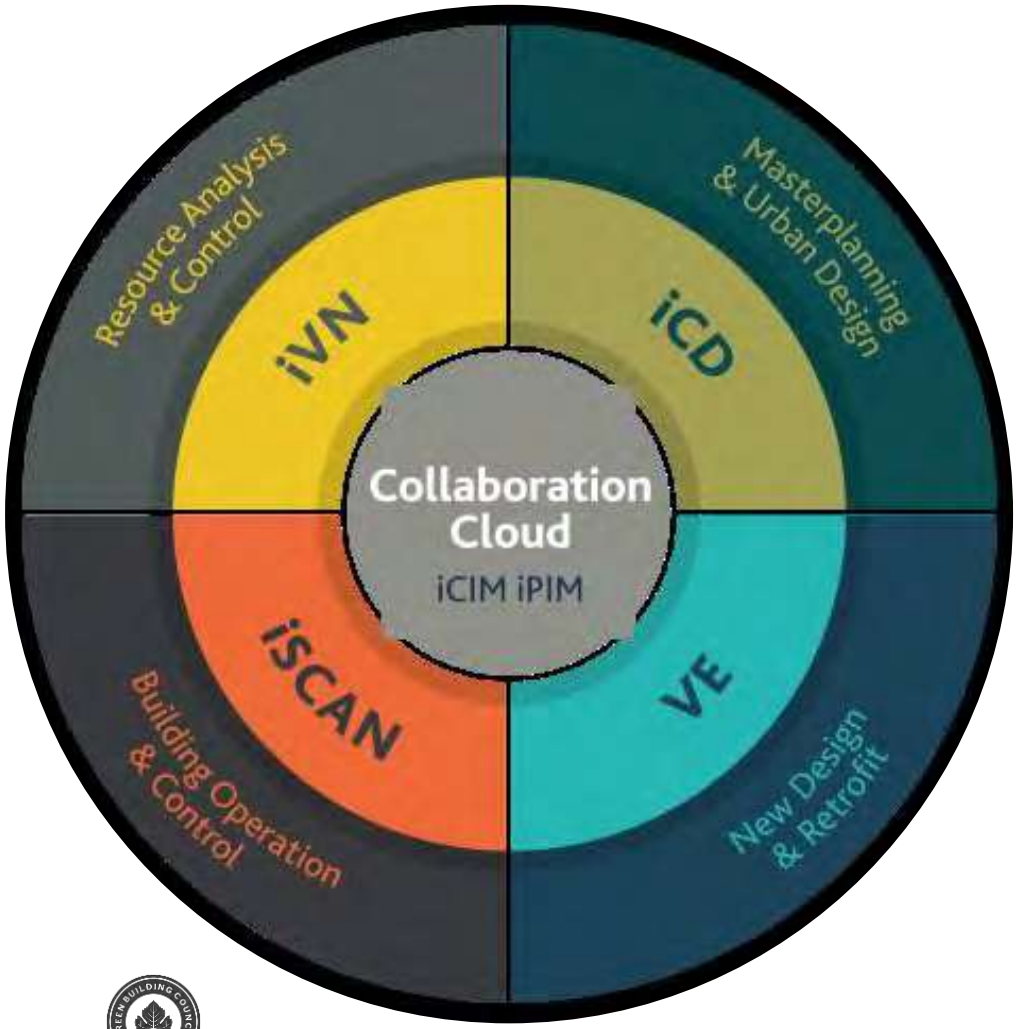
2- Scalare questo approccio come parte del piano Europeo di Net Zero cities entro il 2050

Questi obiettivi sono facilitati da un approccio che si basa su tre strategie:

1. Prototype the Future – Integrated Planning and Design
2. Enable the Future – Creation of a Common Energy Market
3. Accelerate the Future – CommunityxChange



Intelligent Community Lifecycle (ICL)



ICL è un ecosistema che aiuta a creare, pianificare, valutare e gestire le prestazioni energetiche di una comunità edifice e portafogli immobiliari e ora e con scenari futuri di decarbonizzazione.

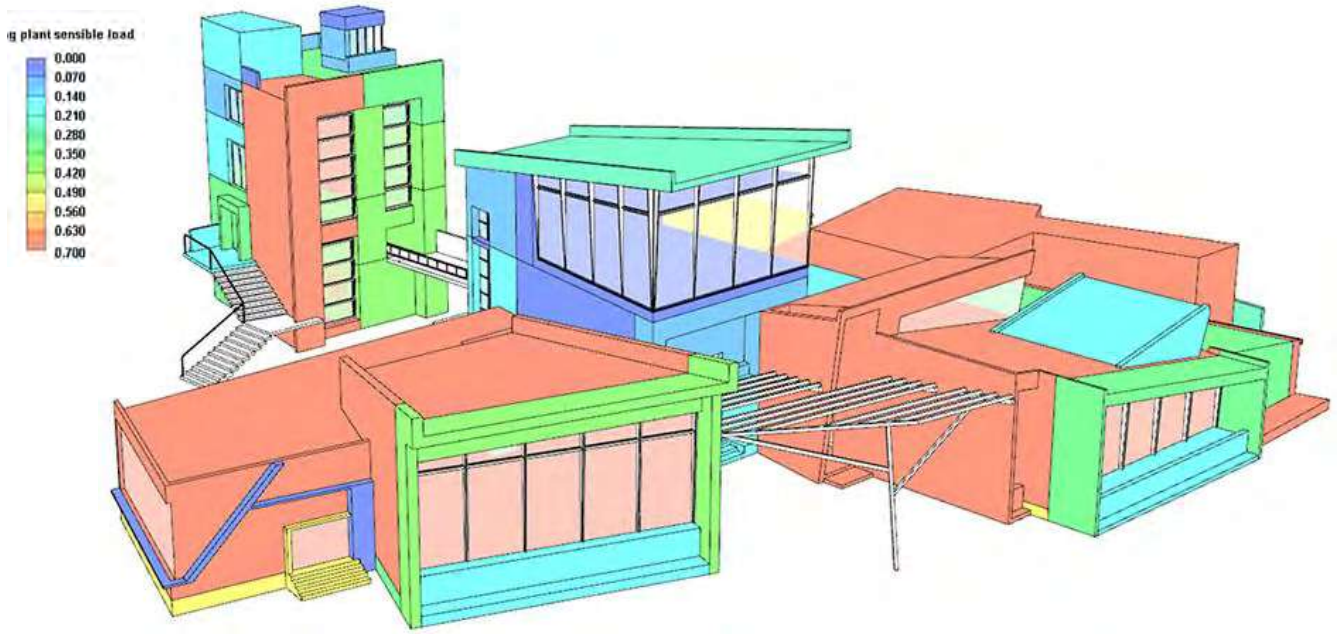
ICL crea modelli 3D dinamici che riflettono le prestazioni reali del contest che rappresentano.

Permette di ottenere risparmi energetici e di risorse per edifici, campus, comunità portafogli immobiliari e città.

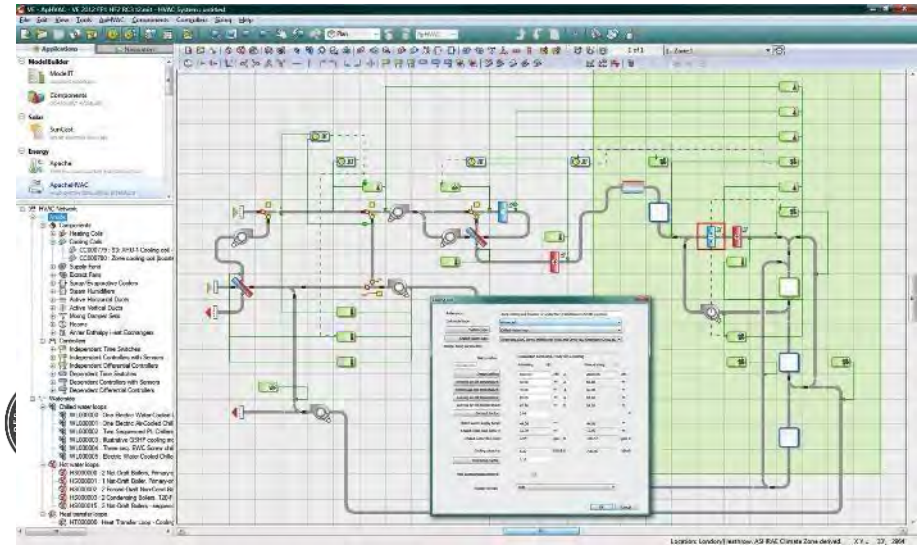
Come?

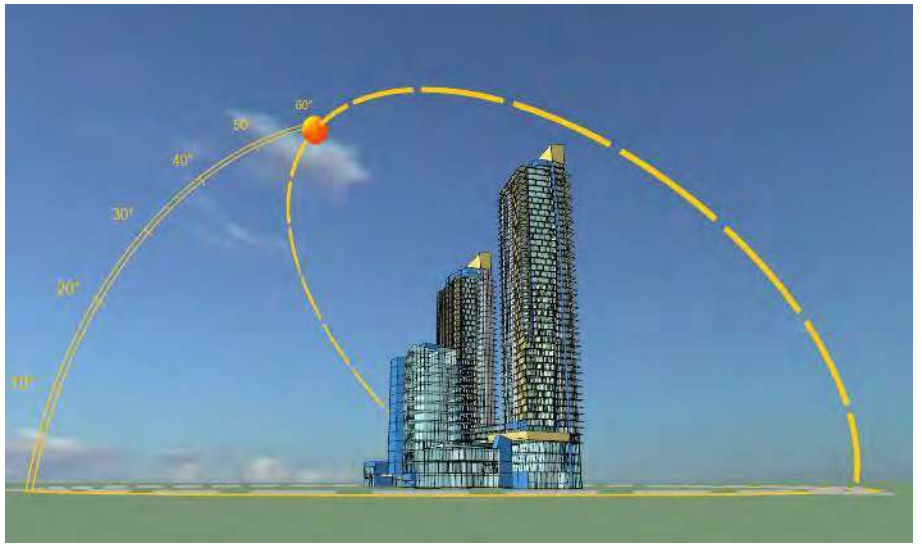
- Concentrando, visualizzando e analizzando dati da qualsiasi sorgente e tipologia di misura
- Colmando i dati mancanti attraverso la simulazione
- Creando dashboard customizzatili
- Supportando decisioni informate su impatto che portano

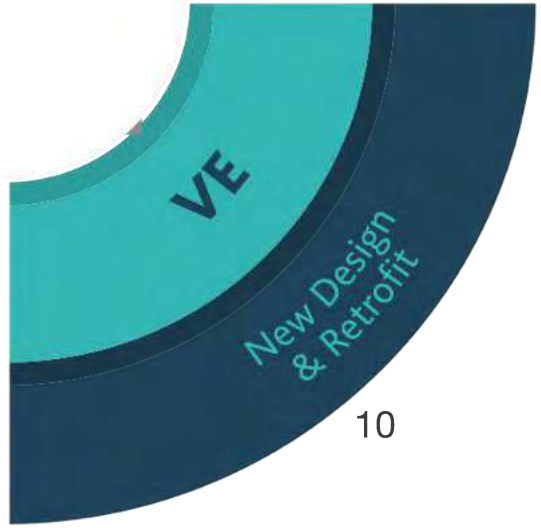
VE – Virtual Environment



Virtual Environment (VE)
Piattaforma di simulazione del sistema edificio impianto.
Software leader mondiale per le certificazioni LEED and BREEAM







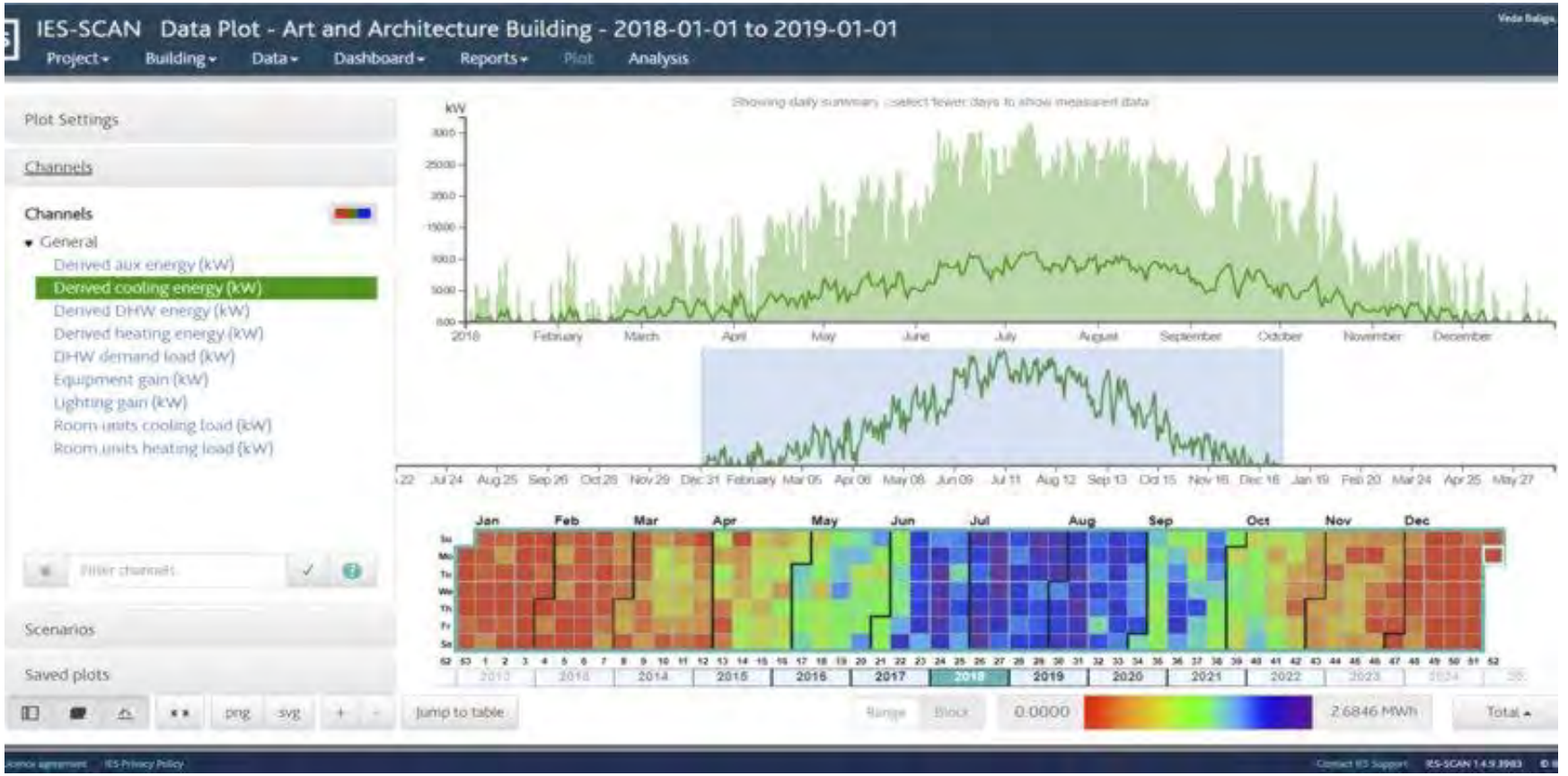
iCD - Intelligent Community design

Intelligent Community Design (ICD)
Simulazione energetica 3D a livello urbano per masterplan e studi di fattibilità e progettazione di massima di quartieri ed intere città e i loro relativi distretti energetici

iSCAN – Intelligent control and analysis

Intelligent Control and Analysis (iSCAN)

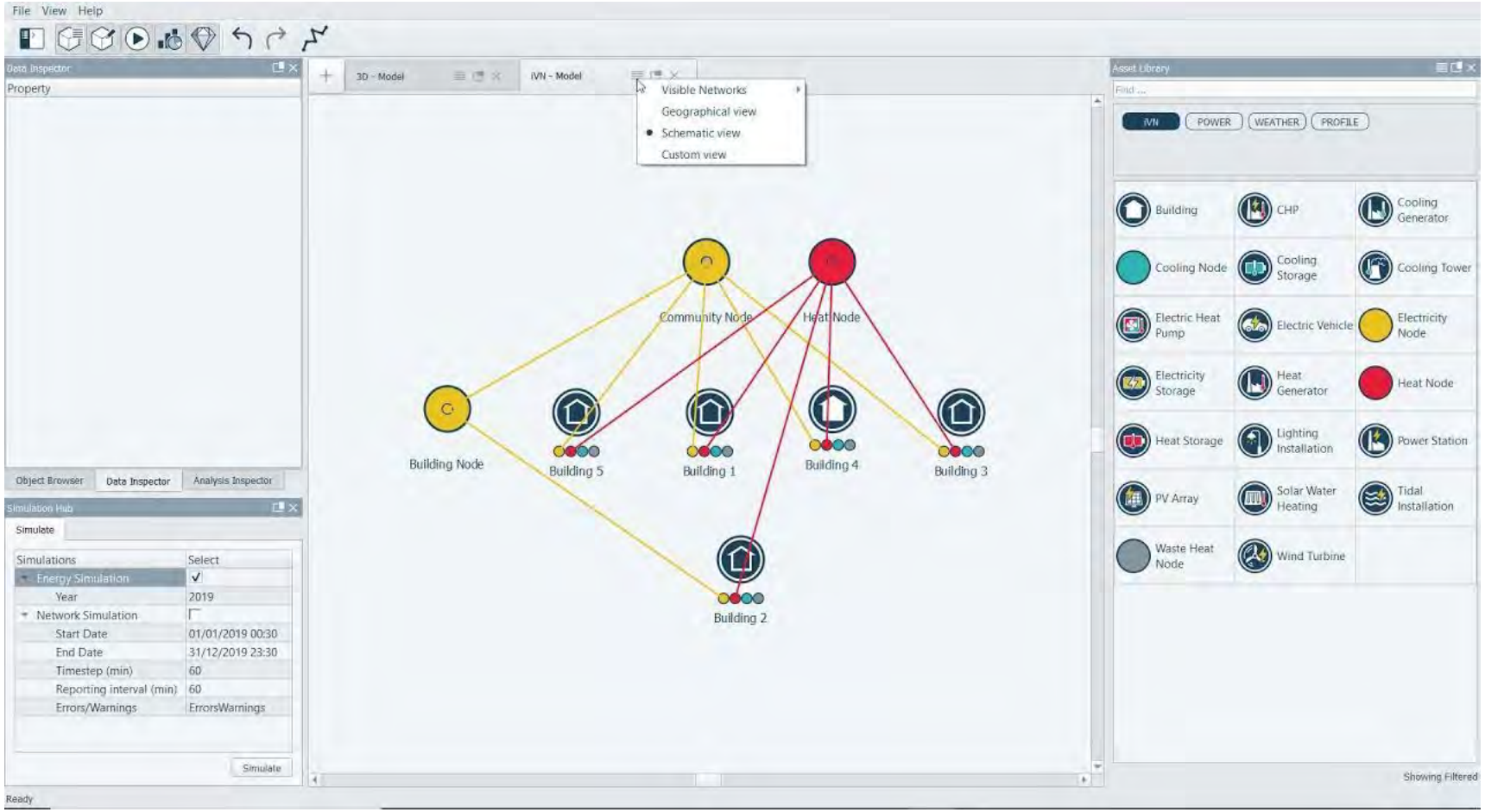
Piattaforma per l'integrazione e analisi dei dati prestazionali effettivi degli impianti e degli edifici a supporto della calibrazione dei modelli



iVN – Intelligent virtual network

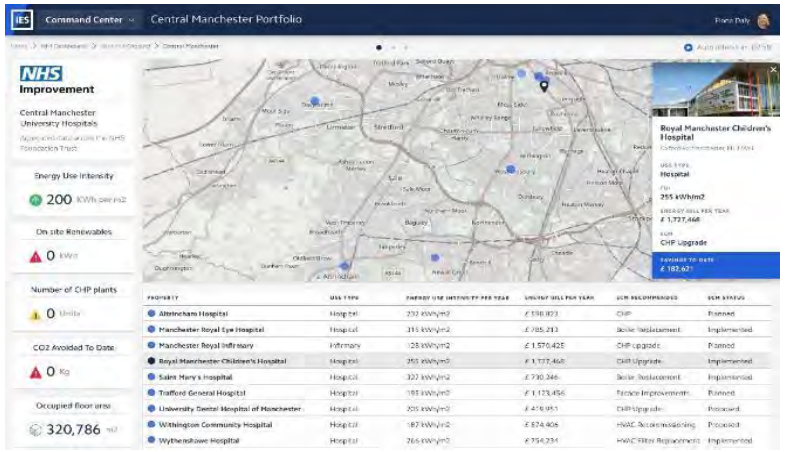
Intelligent Virtual Network (IVN)

Permette l'astrazione di consumi dei singoli edifici per simulare reti di teleriscaldamento, tele raffrescamento e smart grid elettrica per scenari di scambio potenza e energia (Demand Response)

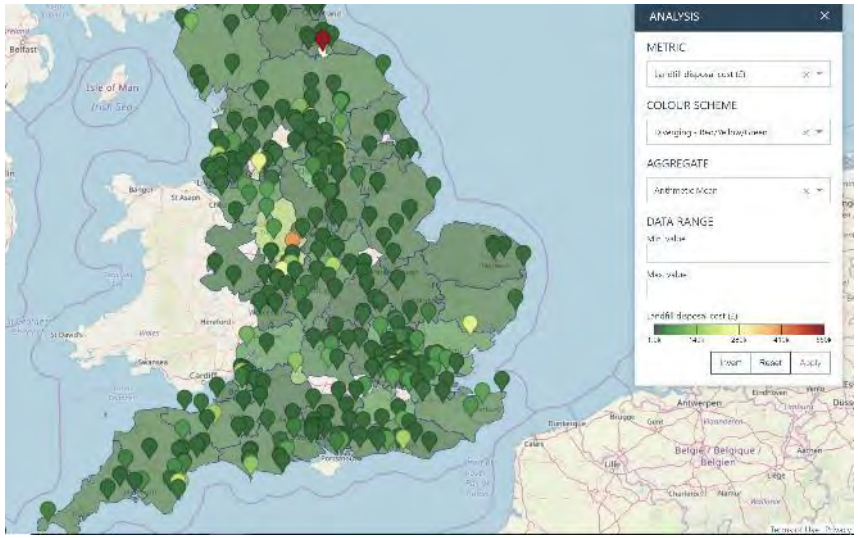


iCIM e iPIM – Collaboration cloud

I tools di ICL sono inoltre connessi ad “**ICL Collaboration Cloud”,** una piattaforma di collaborazione per dare vita ai progetti attraverso la visualizzazione dei dati in una Community (**iCIM**) o in un Portfolio (**iPIM**).



Collaboration Cloud
iCIM iPIM

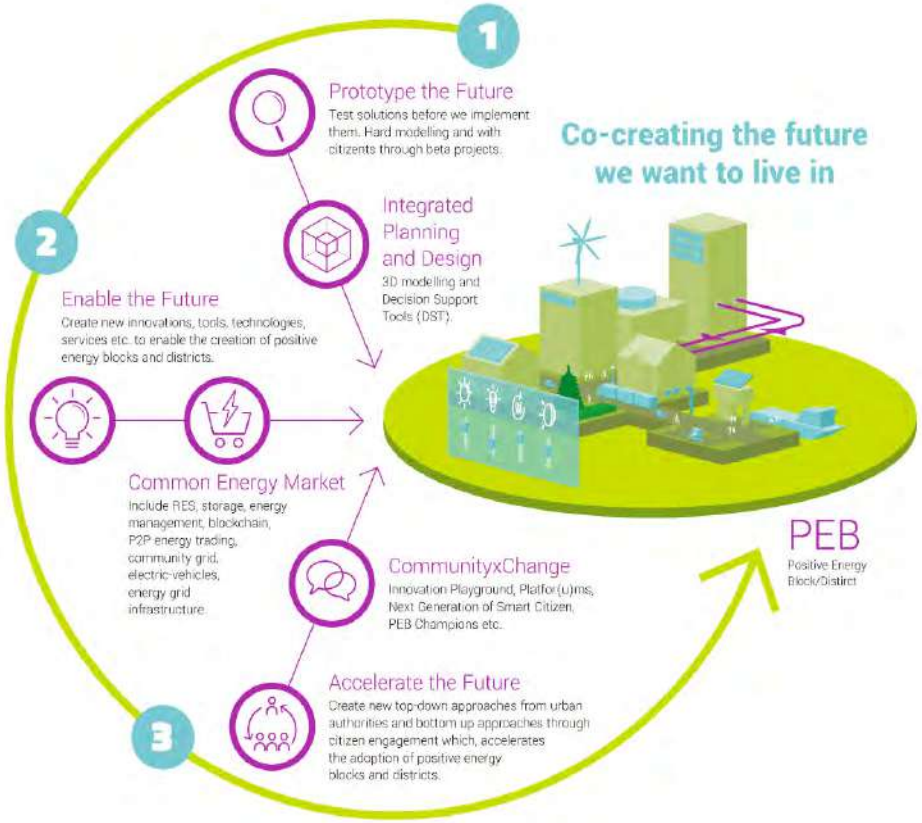


ICL all'interno del Progetto +CityxChange

- Si sono sviluppate funzionalità innovative sull'integrazione dei dati e sulla visualizzazione
- Si sono sviluppati Digital Twins per le 7 città nel progetto
- Si sono messe le basi per un **'Decision Support Tool'** per le città per creare roadmap di decarbonizzazione al 2050

Nello specifico:

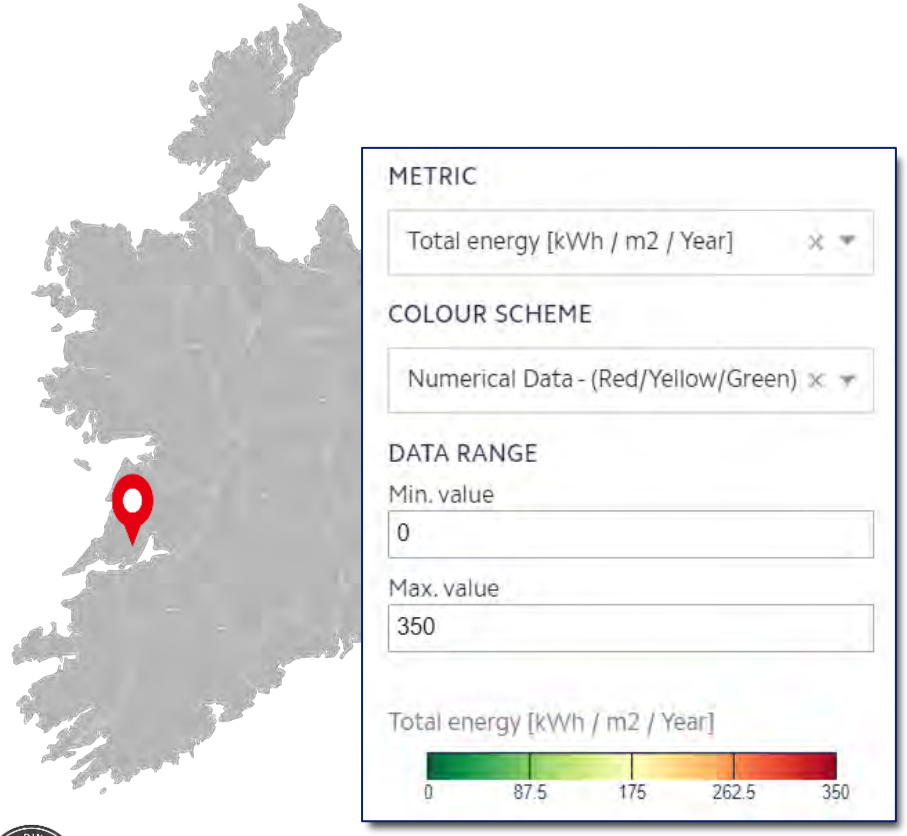
- **iSCAN** – per importare dati da BMS/energy meters diversi
- **VE** – sui singoli edifici chiave per analisi energetiche di dettaglio
- **iCD** – modelli energetici a livello di distretto e città integrati con quelli di dettaglio fatti nel VE anche usati per stimare i **profili di domanda della mobilità elettrica**
- **iVN** – modello delle reti energetiche sia in termini di domanda che di produzione locale da rinnovabili per ottimizzare lo scambio energetico
- **iCIM** – visualizzazione dei dati per fruizione su scala più ampia

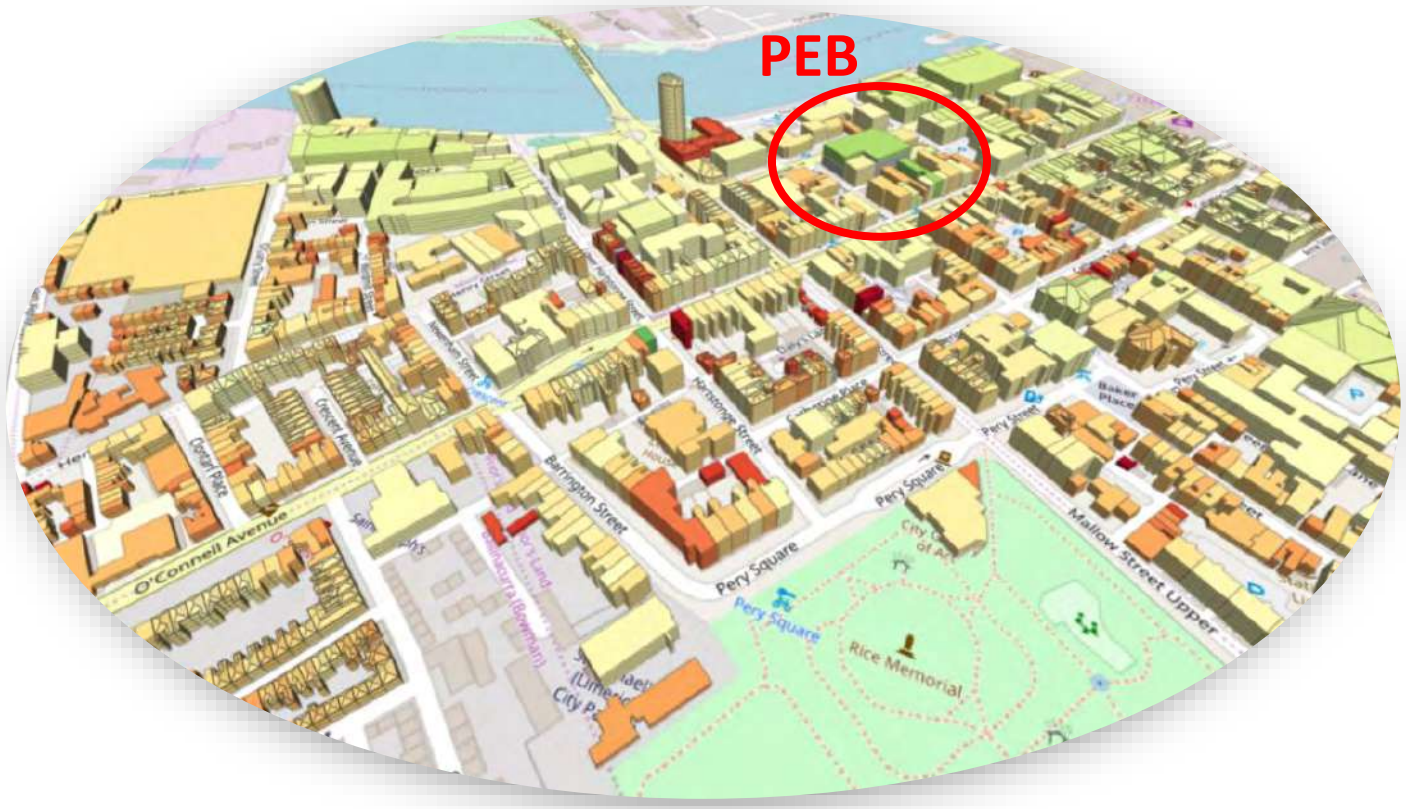


Results and Ongoing work

Limerick:

- Energy demand baseline for Limerick's Historic City Centre
- Energy demand baseline for Positive Energy Block (PEB)

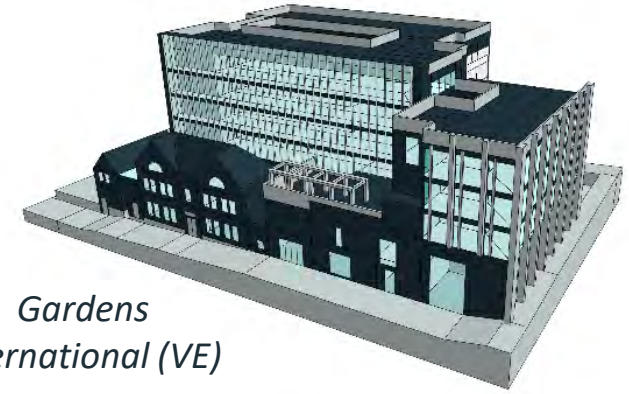




*Images shown in following slides are available in DST (IES ICL software)

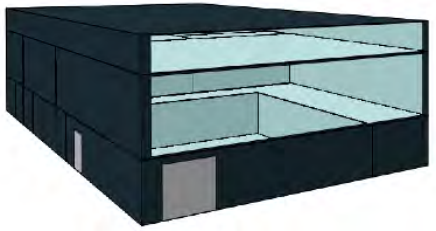
Limerick: Positive Energy Block Energy Model Baselines

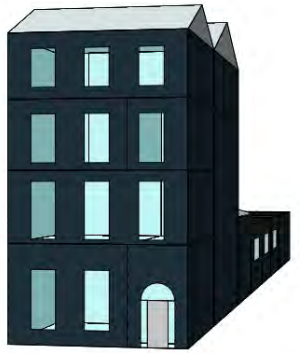
*Models calibrated against existing energy bills



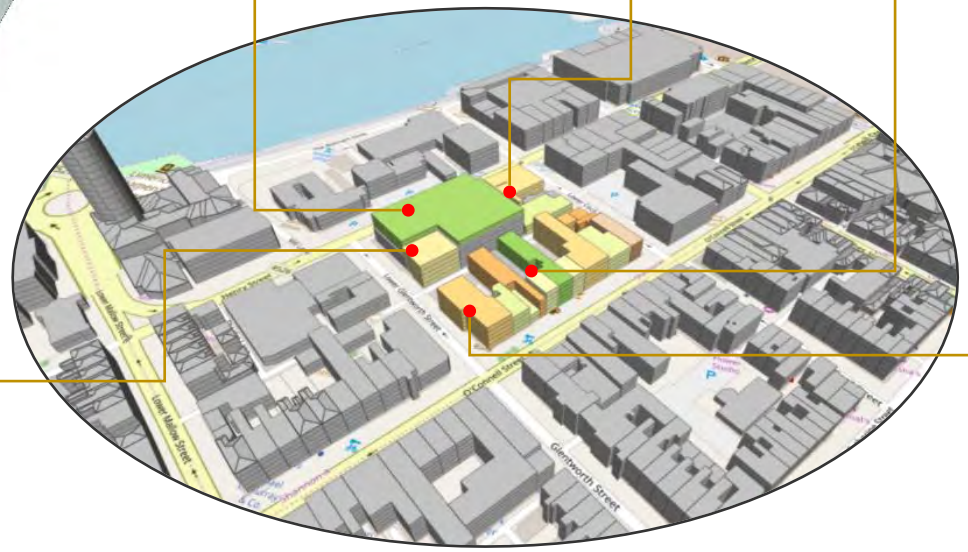
Gardens International (VE)

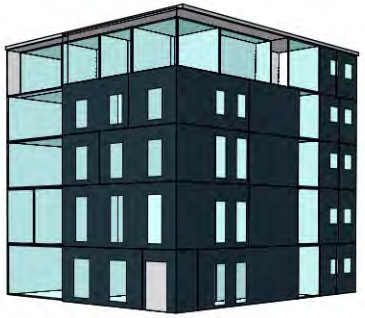
General Post Office (VE)



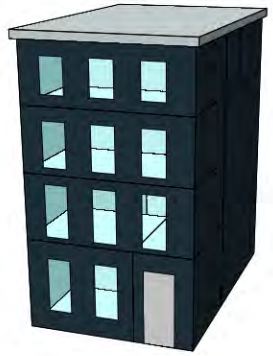


Rooney Auctioneers (VE)



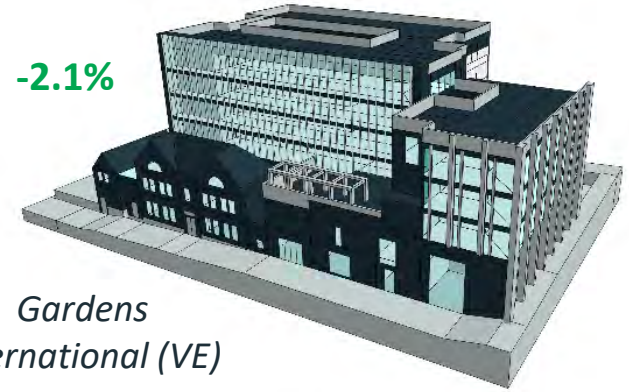


Youth Service (VE)



Chamber of Commerce (VE)

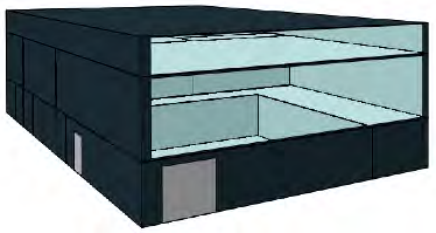
Limerick Simulations to Achieve PEB : Realistic retrofit buildings – improvement of energy use from baseline:



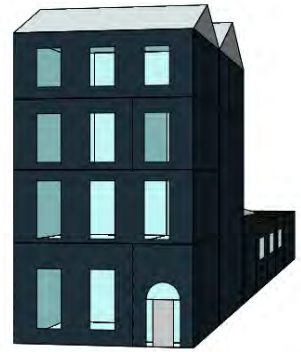
-2.1%

Gardens International (VE)

General Post Office (VE)

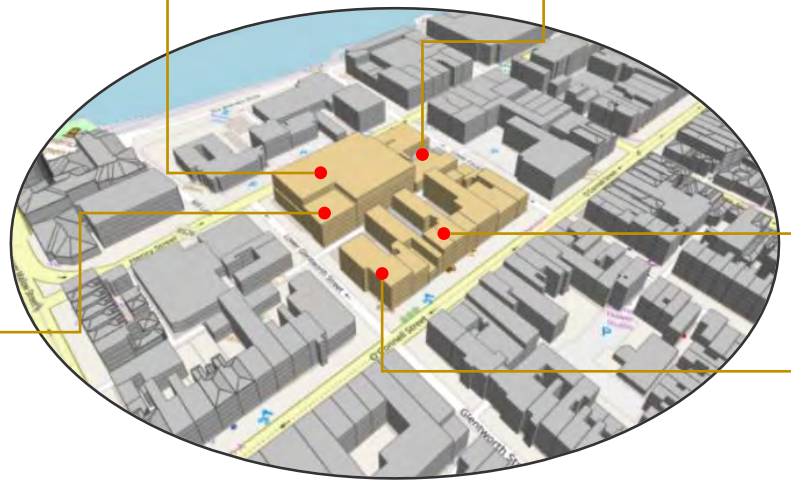


-56.8%

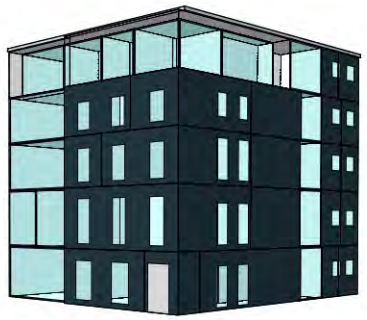


-62.4%

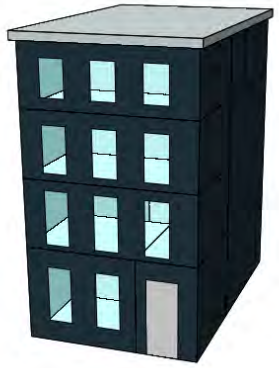
Rooney Auctioneers (VE)



-63.2%



Youth Service (VE)

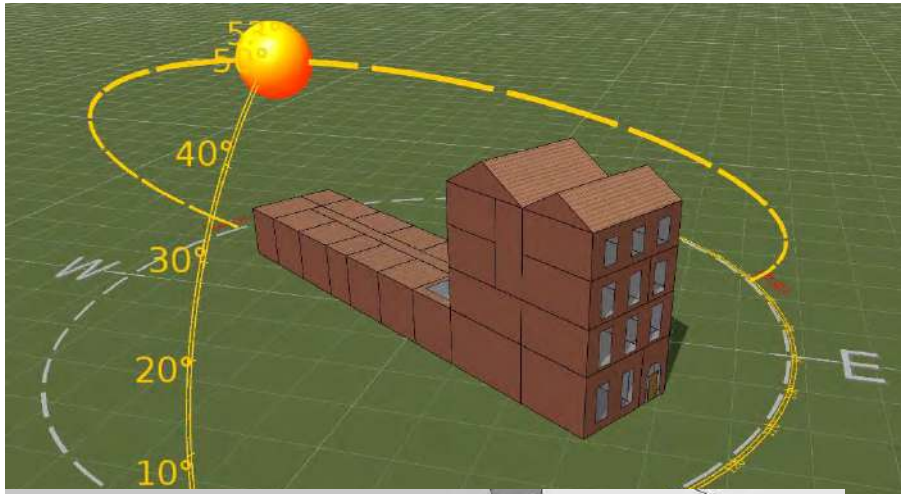


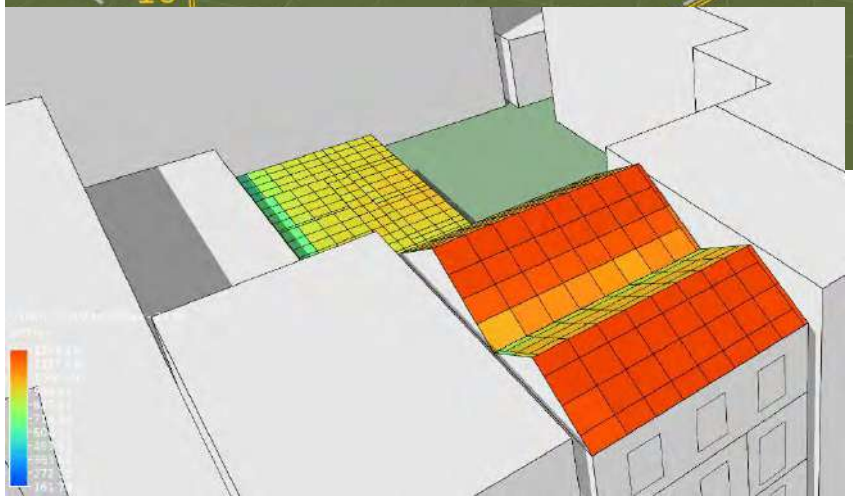
-86.9%

Chamber of Commerce (VE)

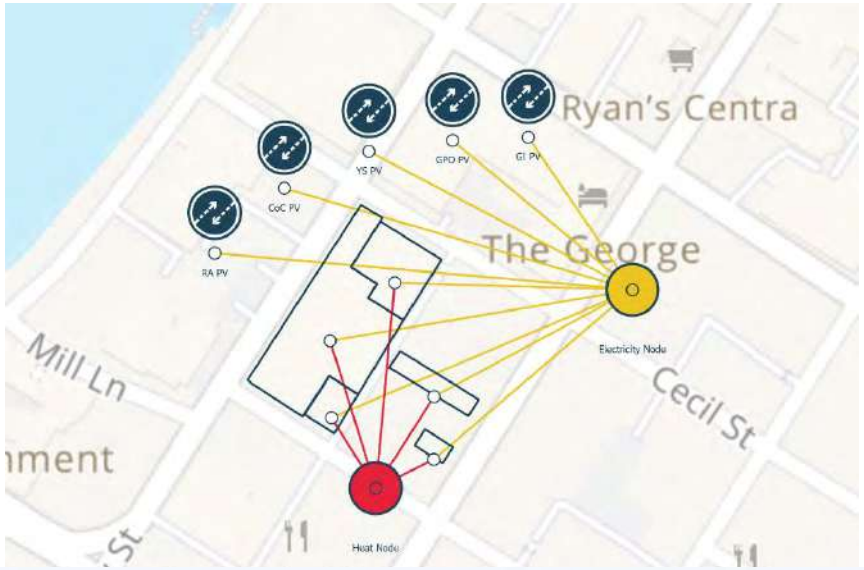
Limerick PEB: Integration of Renewable Energy

Example 1 building:



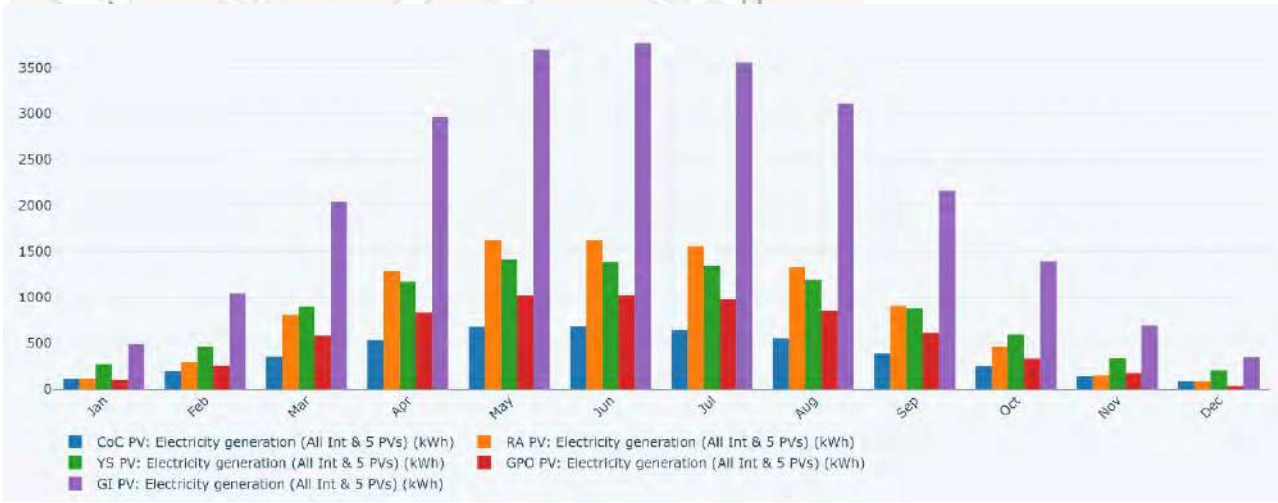


Example all PEB buidlings Solar PV integrated for energy sharing:

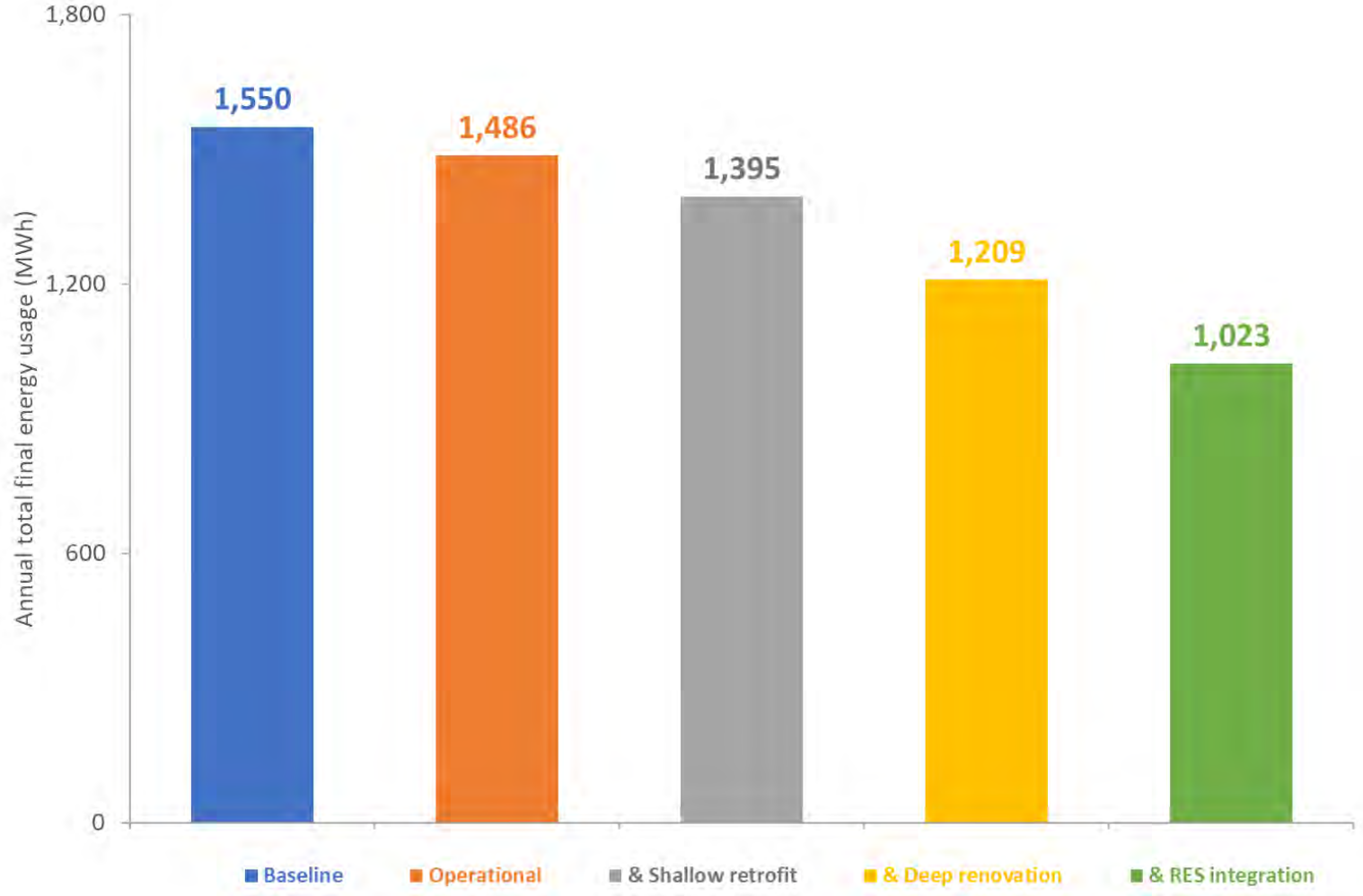


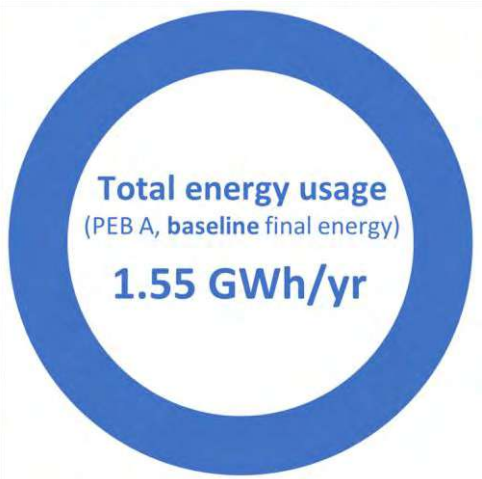
Included analysis on:

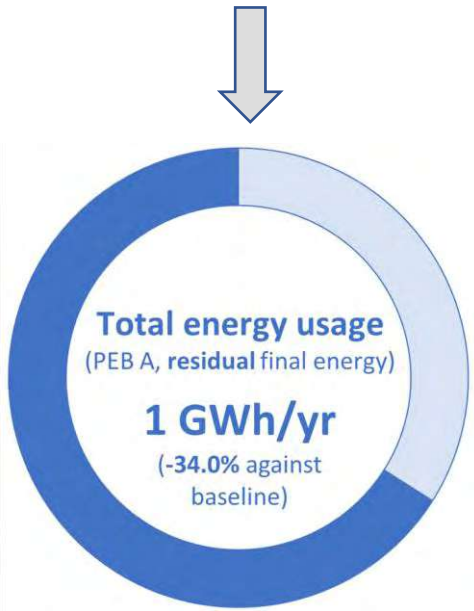
- Energy saving
- Energy sharing
- Cost and payback



Limerick: Overall PEB Results





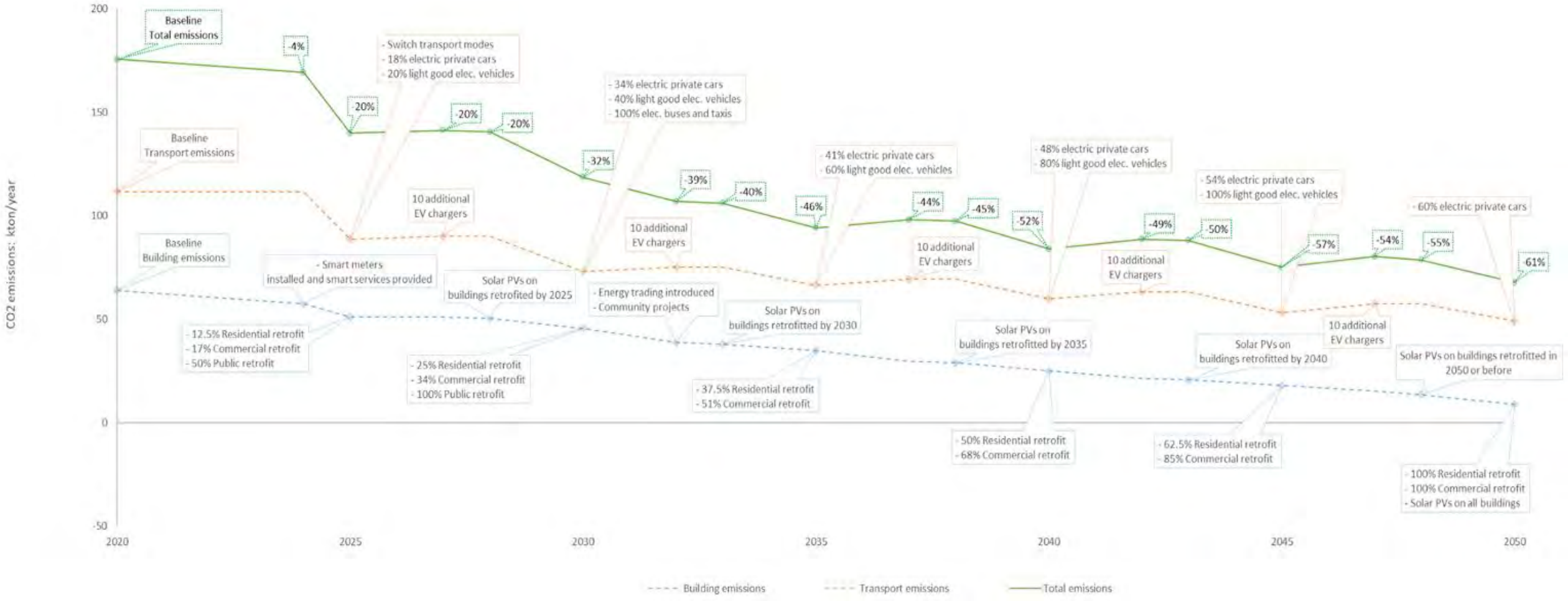


Limerick 2050 Roadmap to Decarbonisation

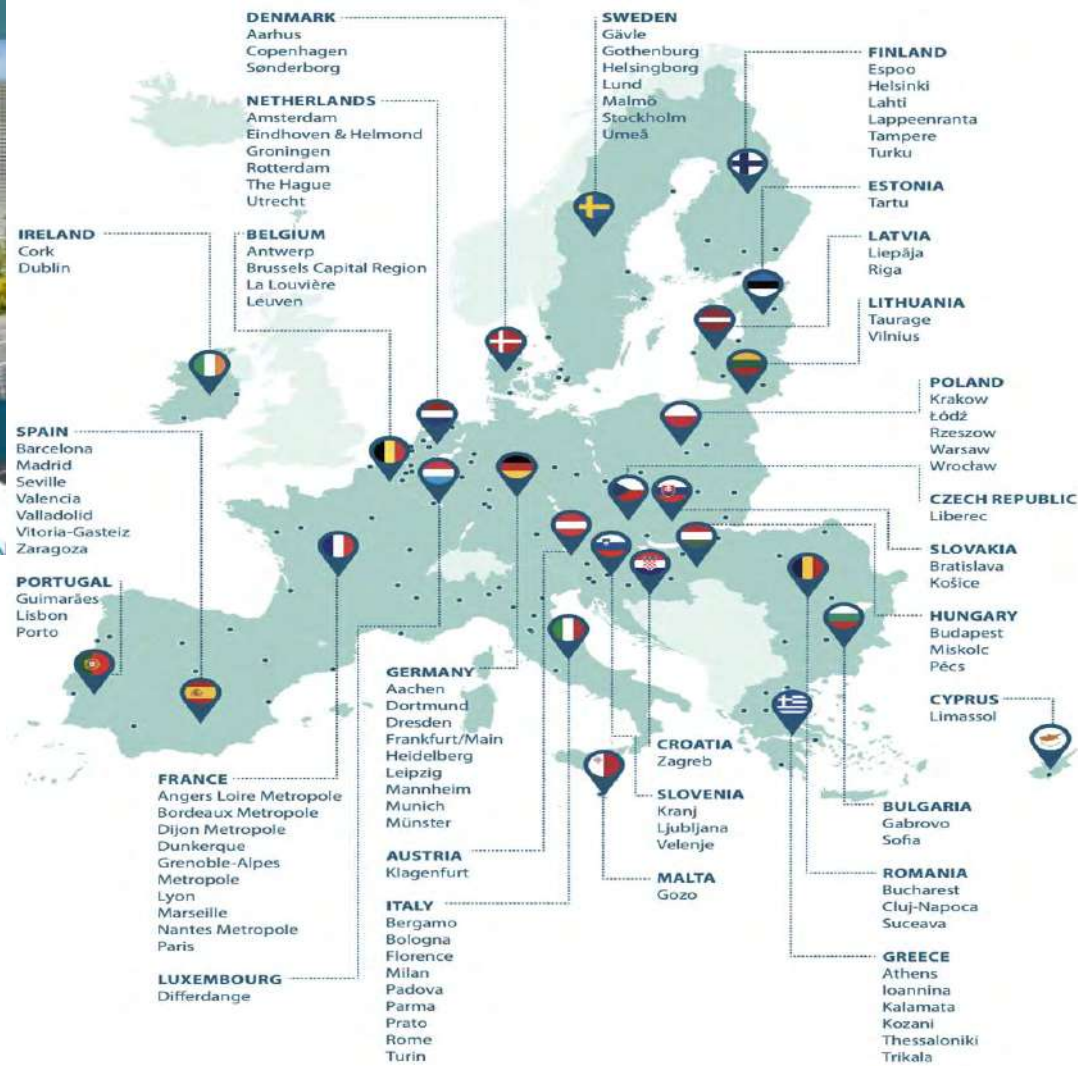
Considered Historic City Centre already Baseline and applied:

- Recommended retrofit measures across the area in 5 year intervals (see below from DST)
- Solar PV where possible in time intervals
- Transition to EVs in time intervals
- Smart of metering energy reduction
- Energy sharing incentives
- Behavioral energy reduction campaigns

Limerick 2050 Roadmap to Decarbonisation



APPLICAZIONI IN ITALIA



APPLICAZIONI IN ITALIA

Replicazione Italiana

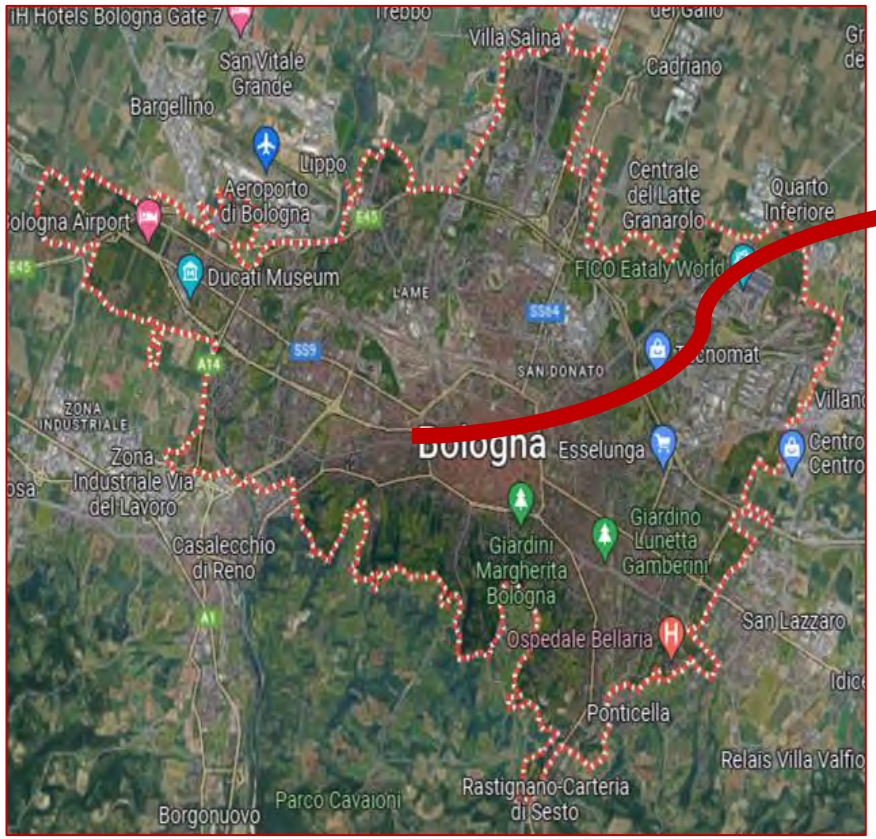
Bologna	Milano	Roma	Udine	Crispiano
Area: 140,86 km² Inhabitants: 388 171	Area: 181,67 km² Inhabitants: 1 361 908	Area: 1 287,36 km² Inhabitants: 2 746 639	Area: 57,17 km² Inhabitants: 97 841	Area: ~ 111 km² Inhabitants: 13 770
Buildings: 1080 Area: 7 750 218 m² Inhabitants: ~ 23 000 	Buildings: 31 Area: 50 132 m² Inhabitants: 97 841 	Buildings: 155 Area: ~ 660 696 m² Inhabitants: ~7610 	Buildings: 10 (2 Schools, 1 Shopping mall, 7 Apartment blocks) Area: 134 400 m² Inhabitants: ~1000 (405 Apartments) 	Buildings: 7 (1 municipal building, 1 library, 2 schools, 2 offices, 1 sport center) Area: ~ 16 000 m² Occupancy: ~750 people/day 
•- geoJSON file containing: - Number of floors - Year of construction - Building Type - Installed PV Capacity	iCD model with this information: - Building Type - Year of construction - Envelope description & U_{value} - HVAC & DHW system	- GIS file containing: - Building Type - Number of floors - Roof Type - Potential roof area for PV	- Building's plans and sections - Technical reports of the interventions - Buildings' Energy Performance Certificates	Building plans, survey reports, and energy requalification projects holding: - Boulding geometry - Envelope description - Building type, Construction year

APPLICAZIONI IN ITALIA

Replicazione Italiana – Bologna Centro

•**Bologna:** 140, 86 km²

•Inhabitants: 388 171



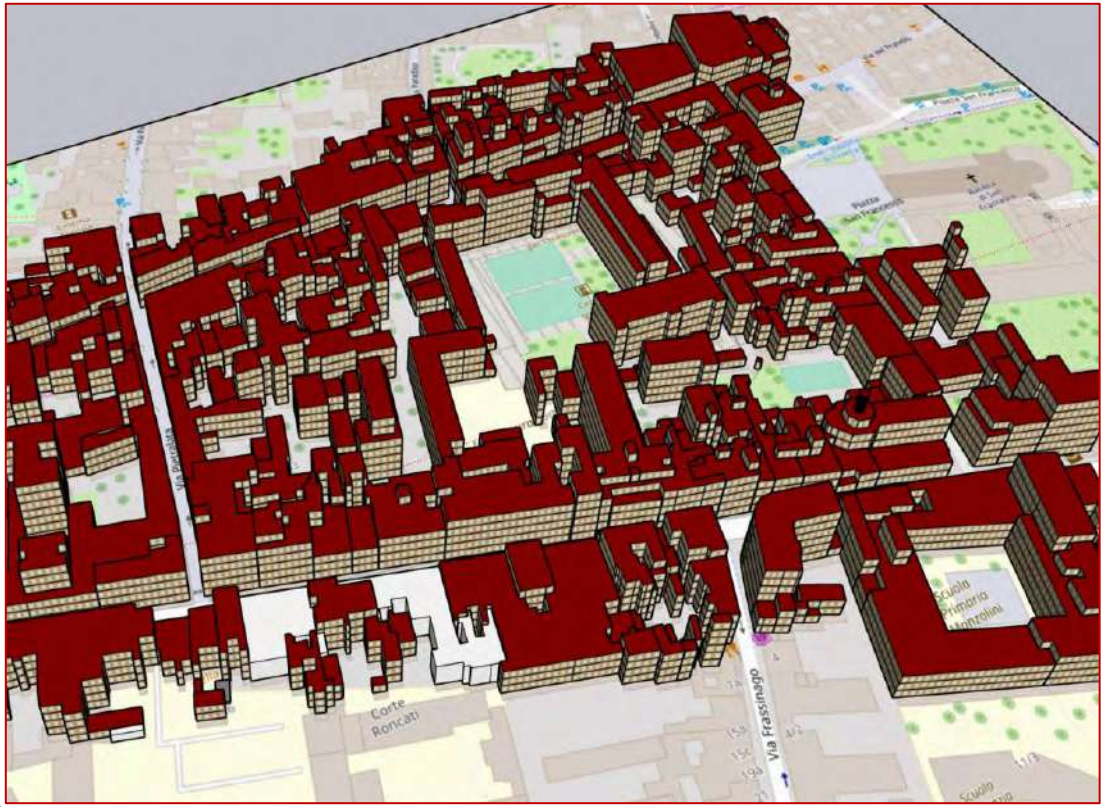
Specific area of interest: 54 Buildings (57 519 m²)

Inhabitants: around 1 000

APPLICAZIONI IN ITALIA

Replicazione Italiana – Bologna Centro

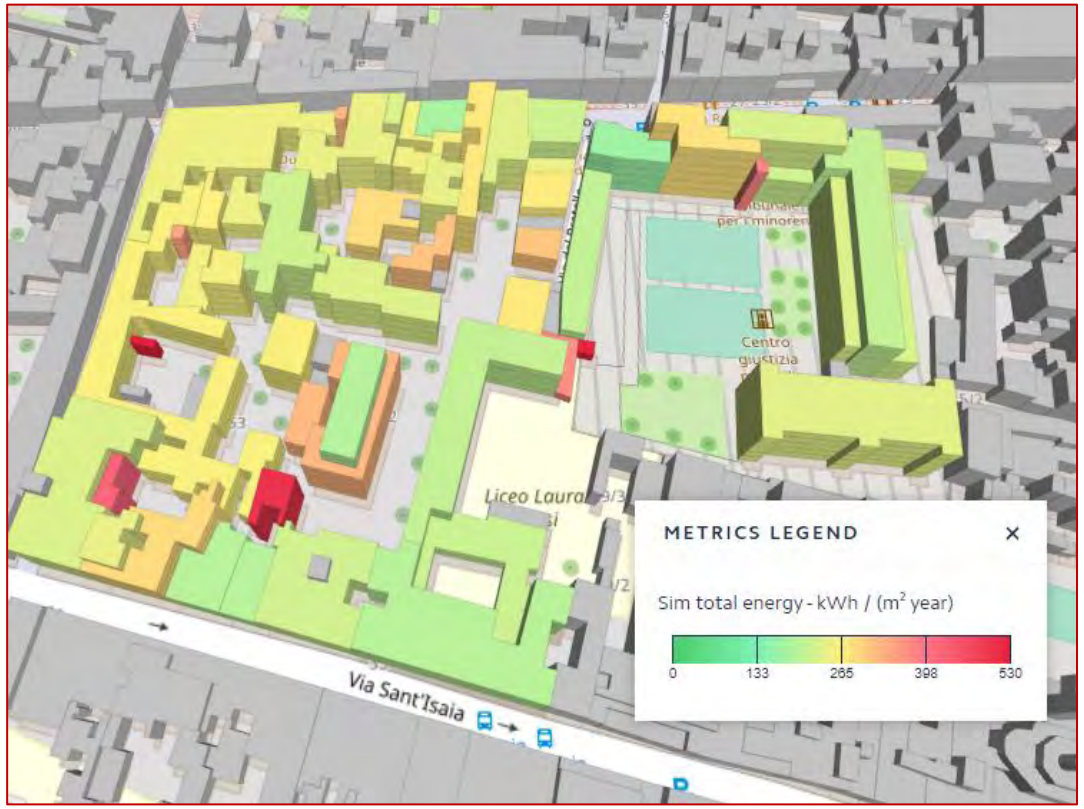
•**Model set up from iCD plugin in Sketchup:**



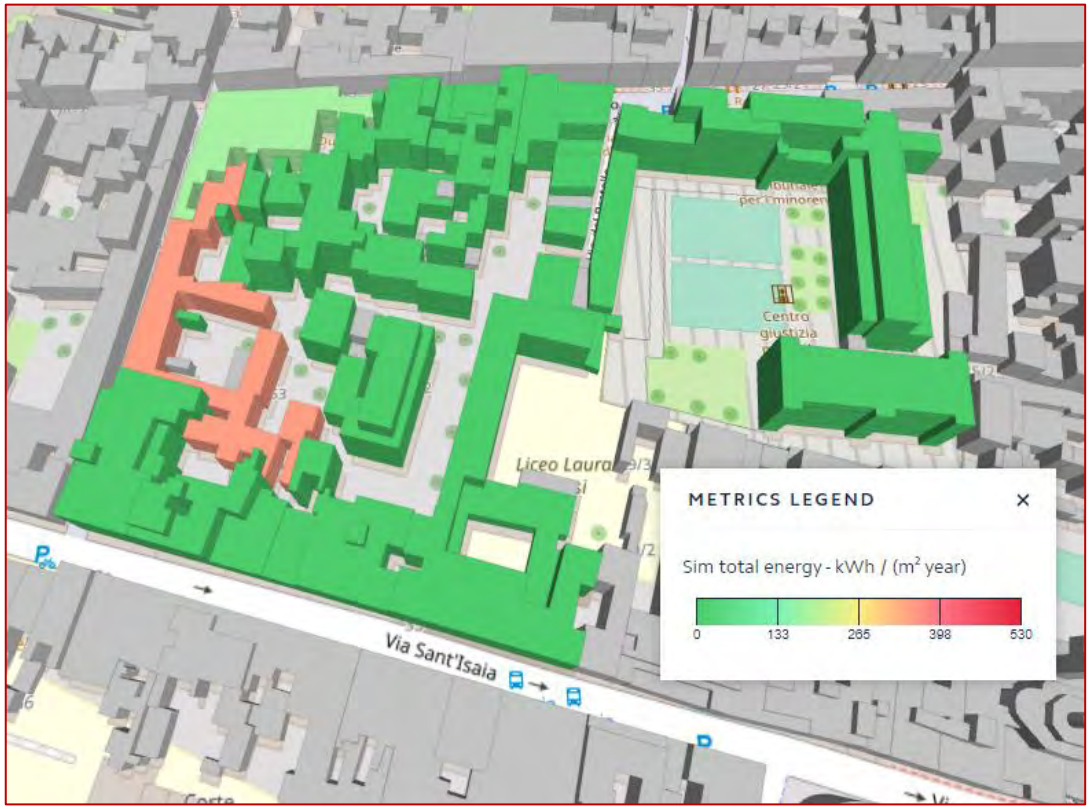
https://icim.iesve.com/trial/#/metrics-viewer/c63d7bd6-b95f-40a5-aba9-a1d8a2574a03

Building Type *(view from iCIM)*

Replicazione Italiana – Bologna Centro



Sim total energy BASELINE (kWh/m² per year) *(view from iCIM)*



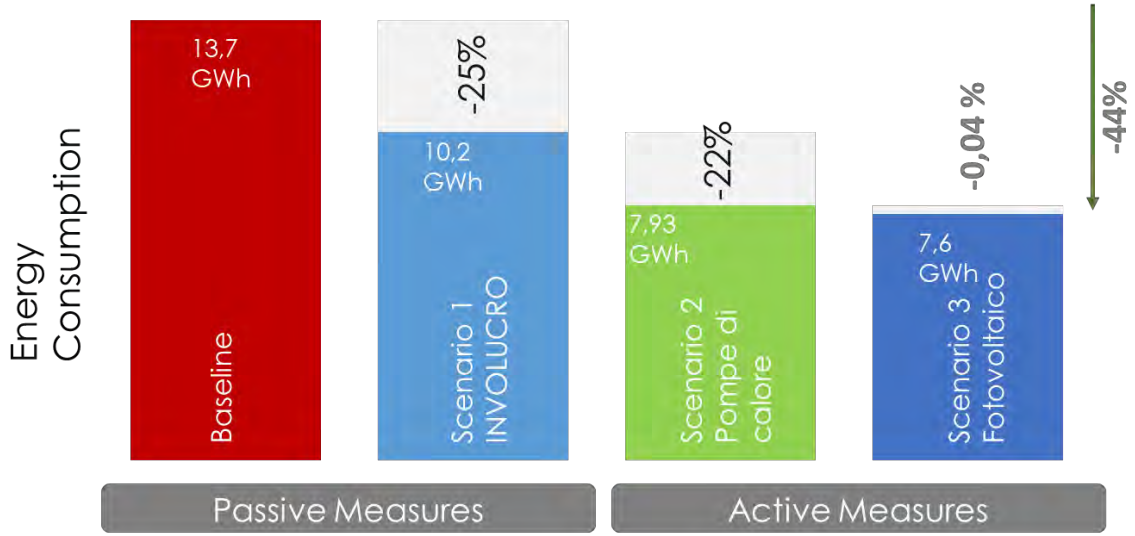
Sim total energy SCENARIO 1 (kWh/m² per year) *(view from iCIM)*

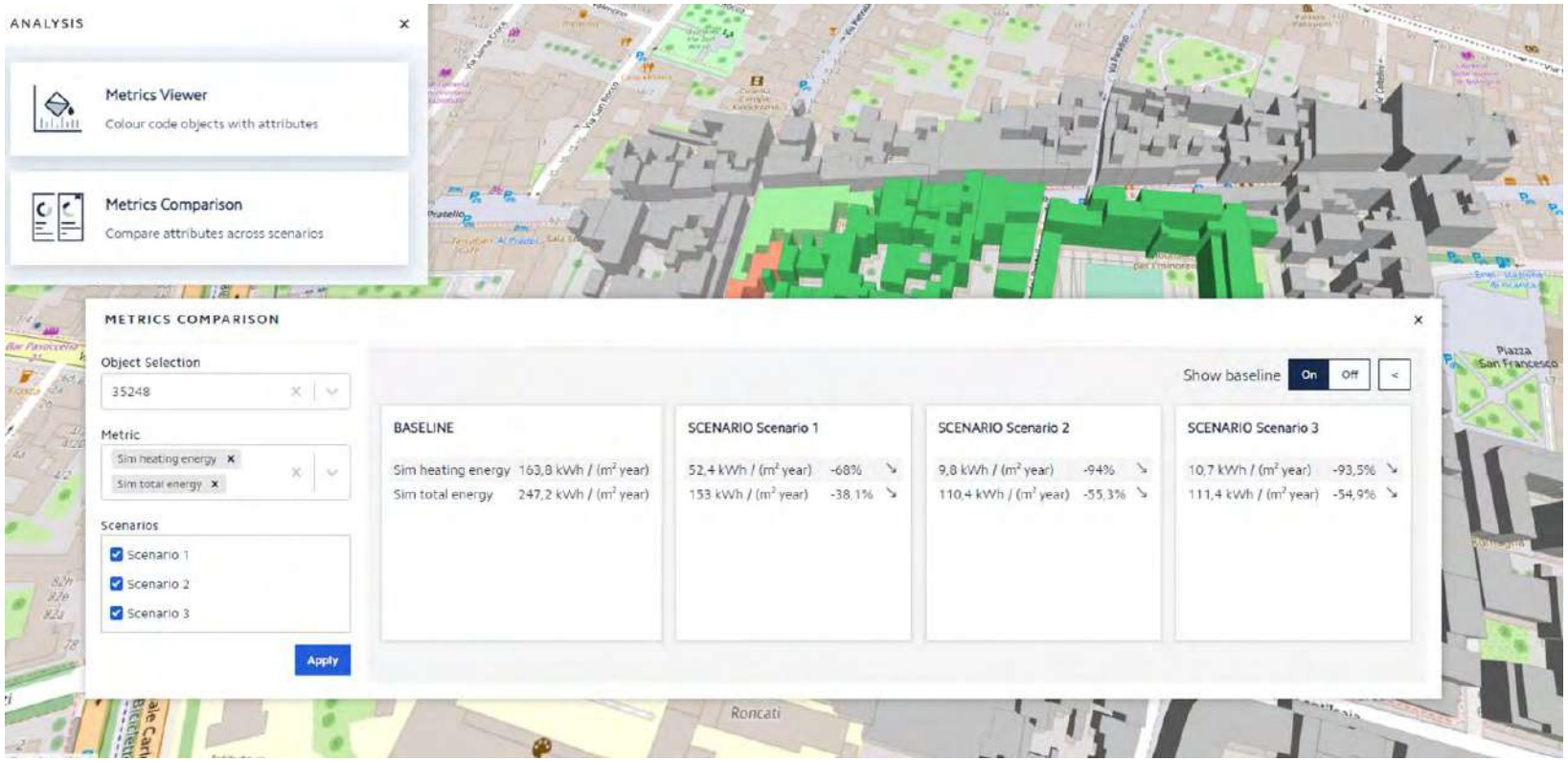
Replicazione Italiana – Bologna Centro

	Baseline	Scenari	
Involucro opaco	U = 2.2 ÷ 1.95 W/m2K	U = 0.23 W/m2K	S1
Involucro trasparente	U = 3.17 ÷ 2.64 W/m2K	U = 1.30 W/m^{2}K	
Pavimento	U = 0.71 W/m2K	U = 0.29 W/m^{2}K	
Tetto	U = 1.56 W/m2K	U = 0.24 W/m^{2}K	
Impianto	Caldaia a gas (Old/Modern)	Pompa di calore COP=4	S2
Fotovoltaico	0	274 MWh	S3

APPLICAZIONI IN ITALIA

Replicazione Italiana





APPLICAZIONI IN ITALIA

Milano – Reinventing Cities

C40 CITIES

Reinventing Cities Milan

IES + greenpass

APPLICAZIONI IN ITALIA

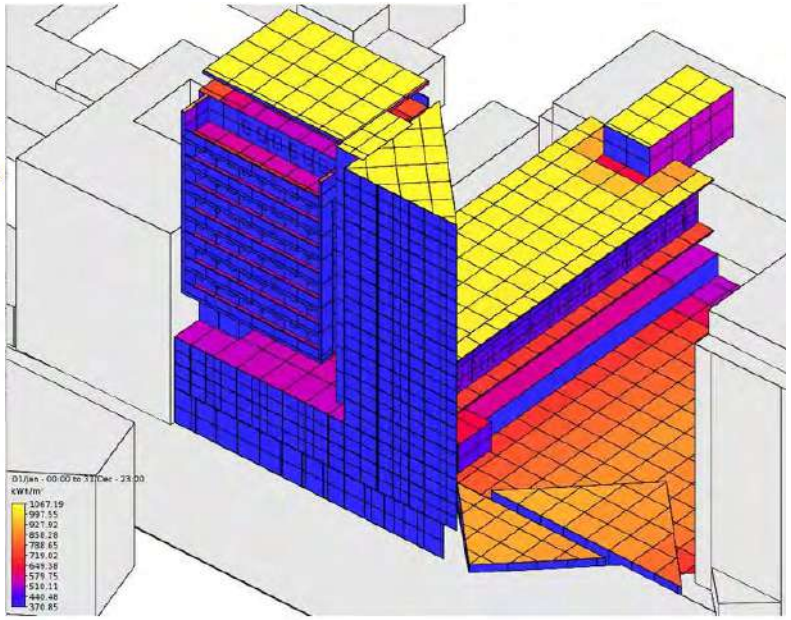
Milano – Reinventing Cities

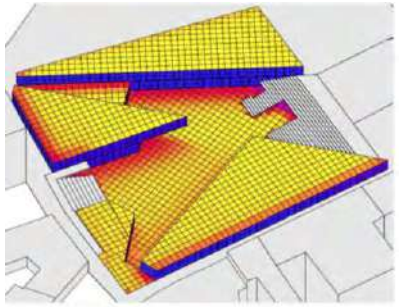
C40 CITIES

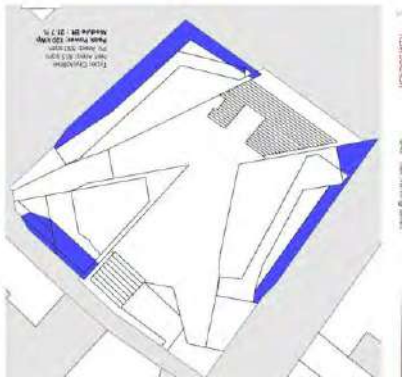
Reinventing Cities Milan

IES + greenpass

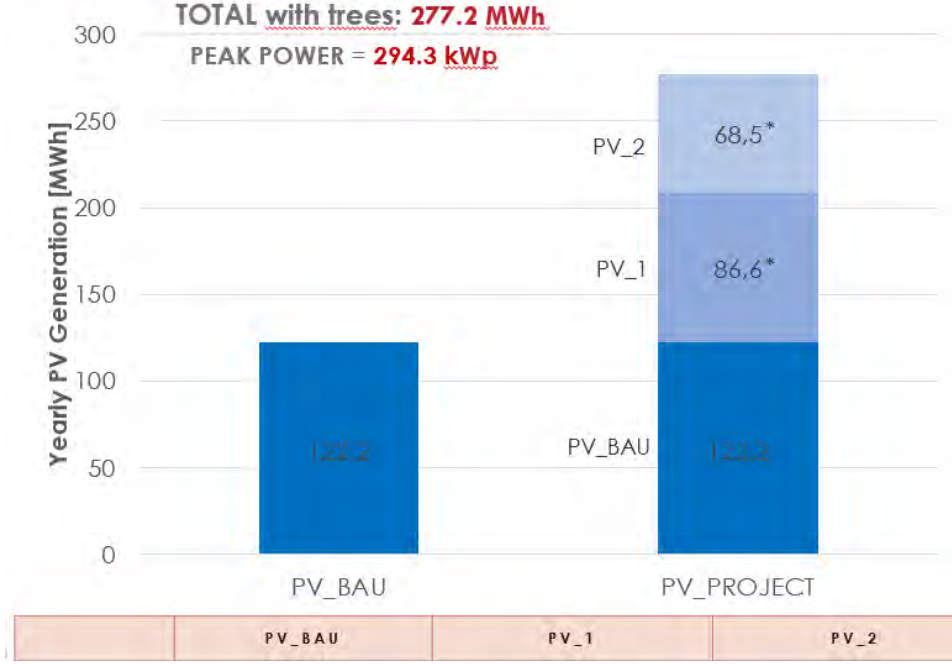
Radiation Analysis

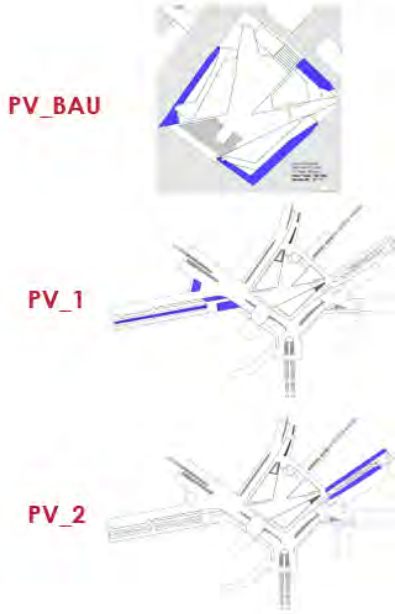






Yearly On-Site PV Energy Generation





* The efficiency of the PVs was reduced by 30% in order to consider the local

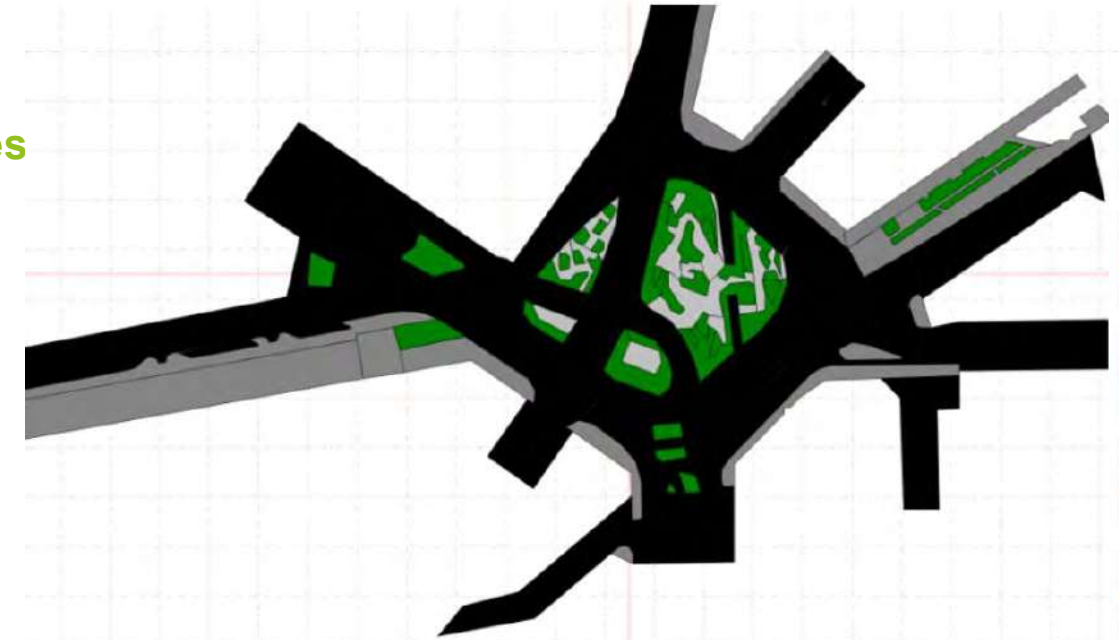
APPLICAZIONI IN ITALIA

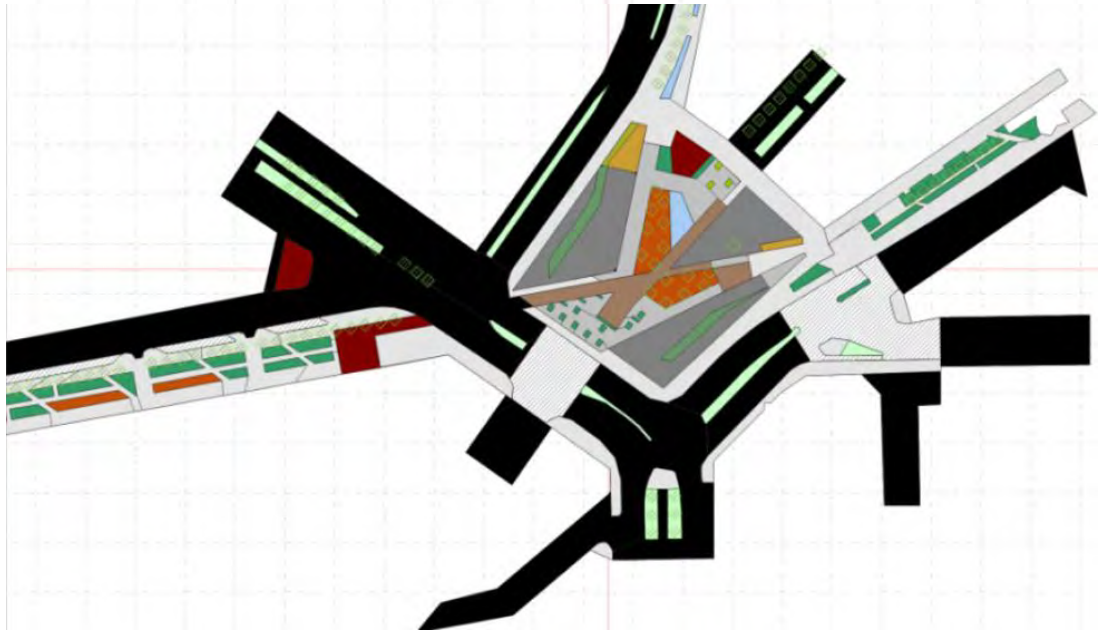
Milano – Reinventing Cities

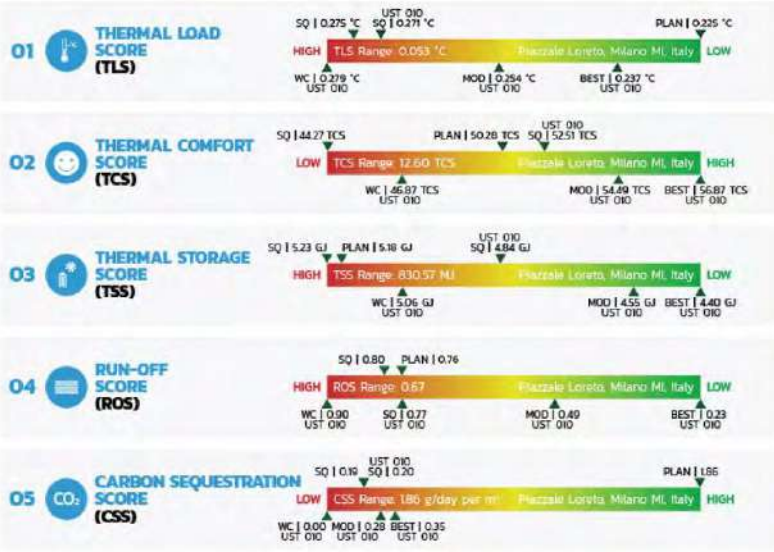
C40 CITIES

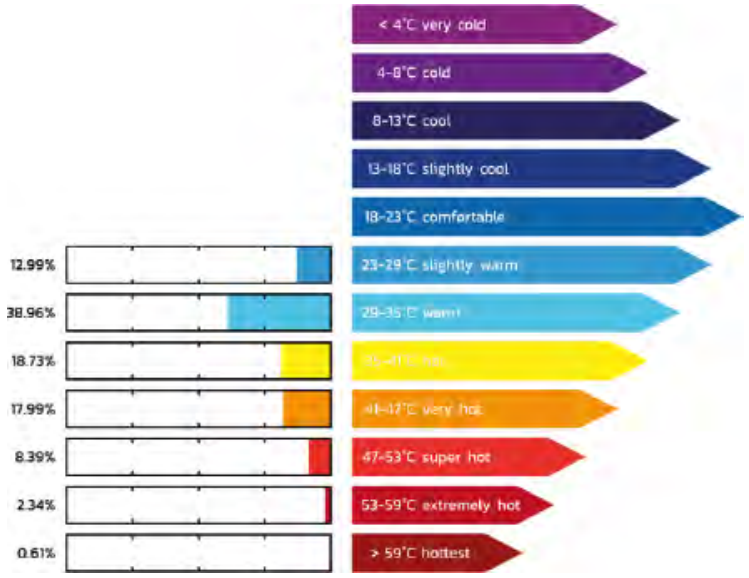
Reinventing Cities Milan

IES + greenpass





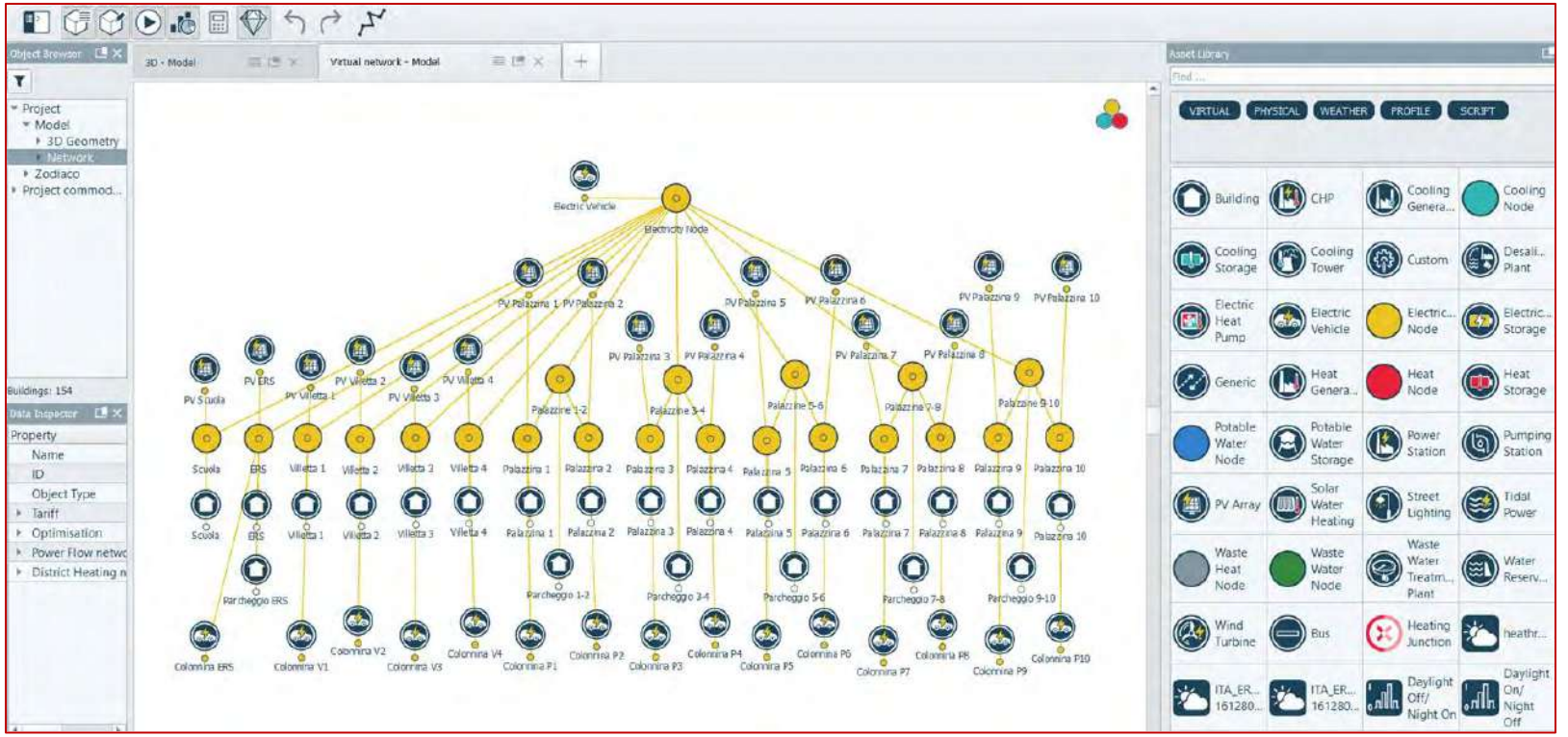


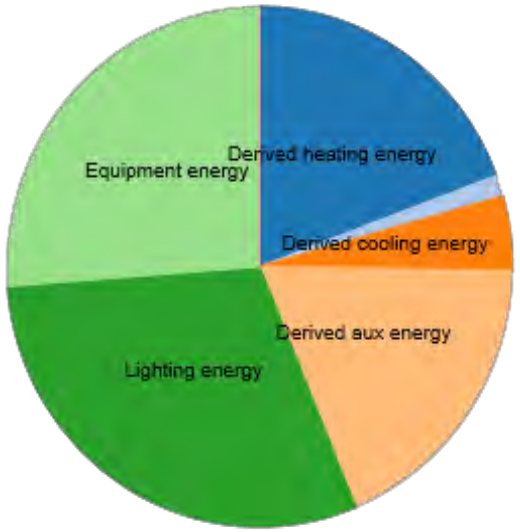


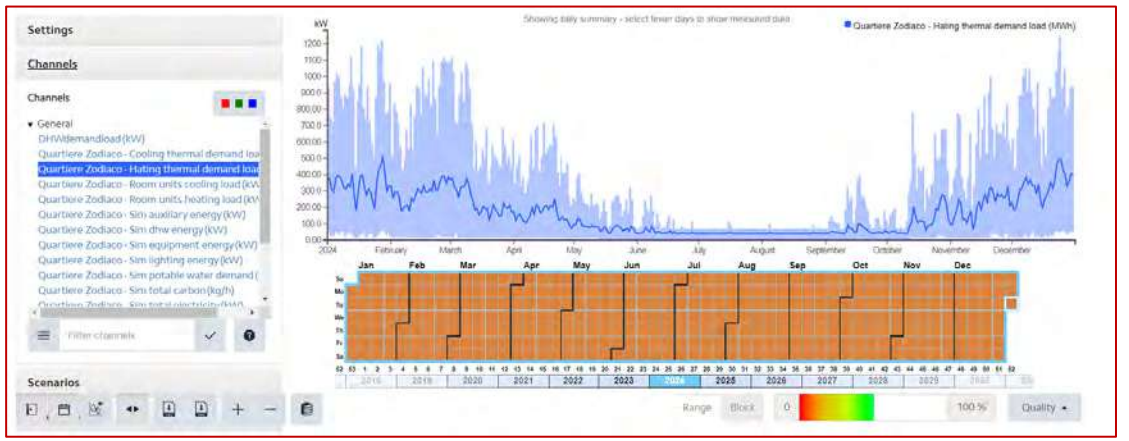
APPLICAZIONI IN ITALIA

CER

Supportare la creazione delle Comunità Energetiche Rinnovabili e valutare diversi scenari mediante uno studio energetico, climatico ed ambientale delle diverse soluzioni

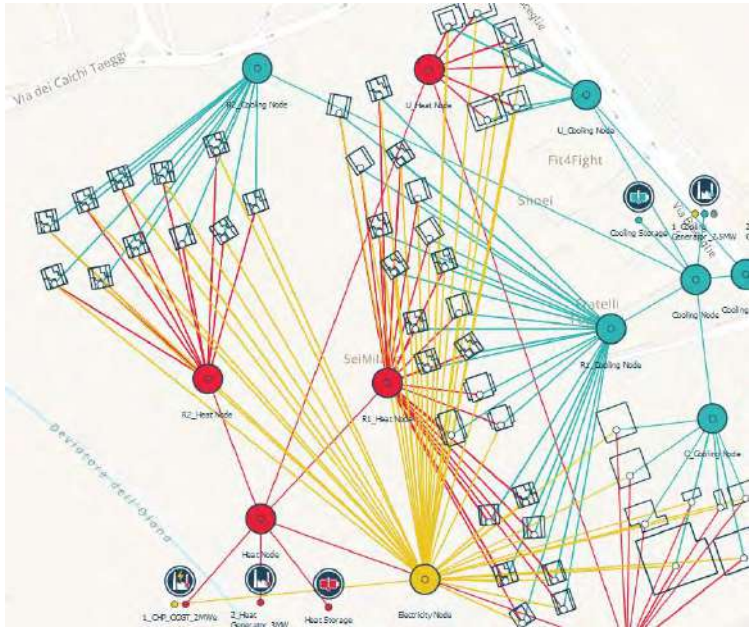


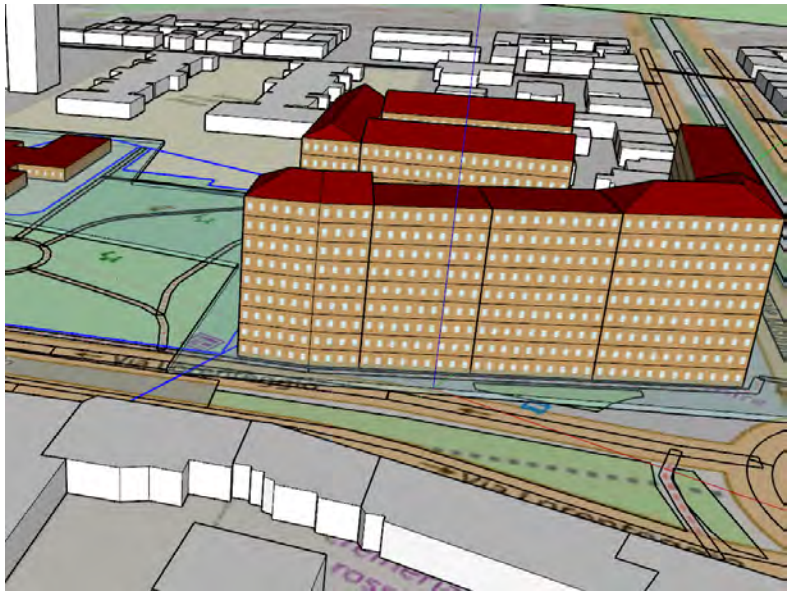


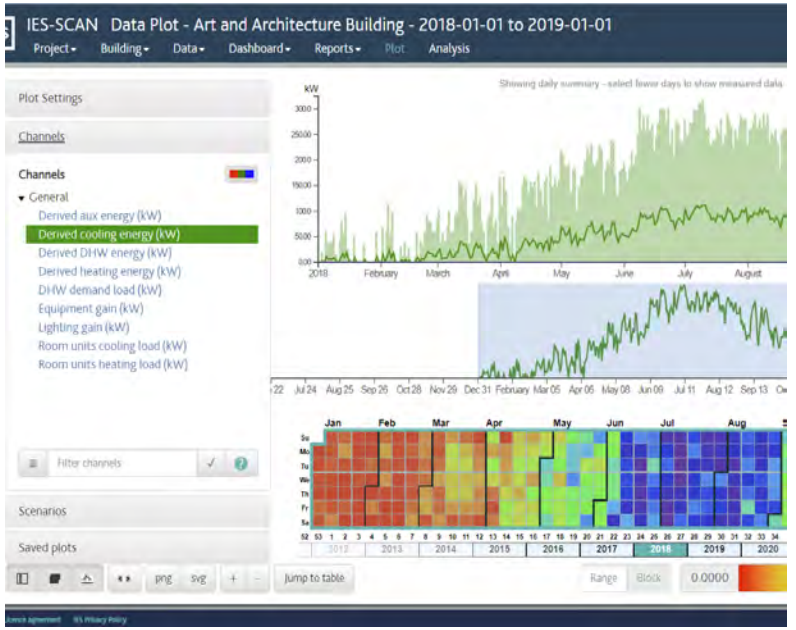


APPLICAZIONI IN ITALIA

Milano
AMAT Edilizia Residenziale Pubblica





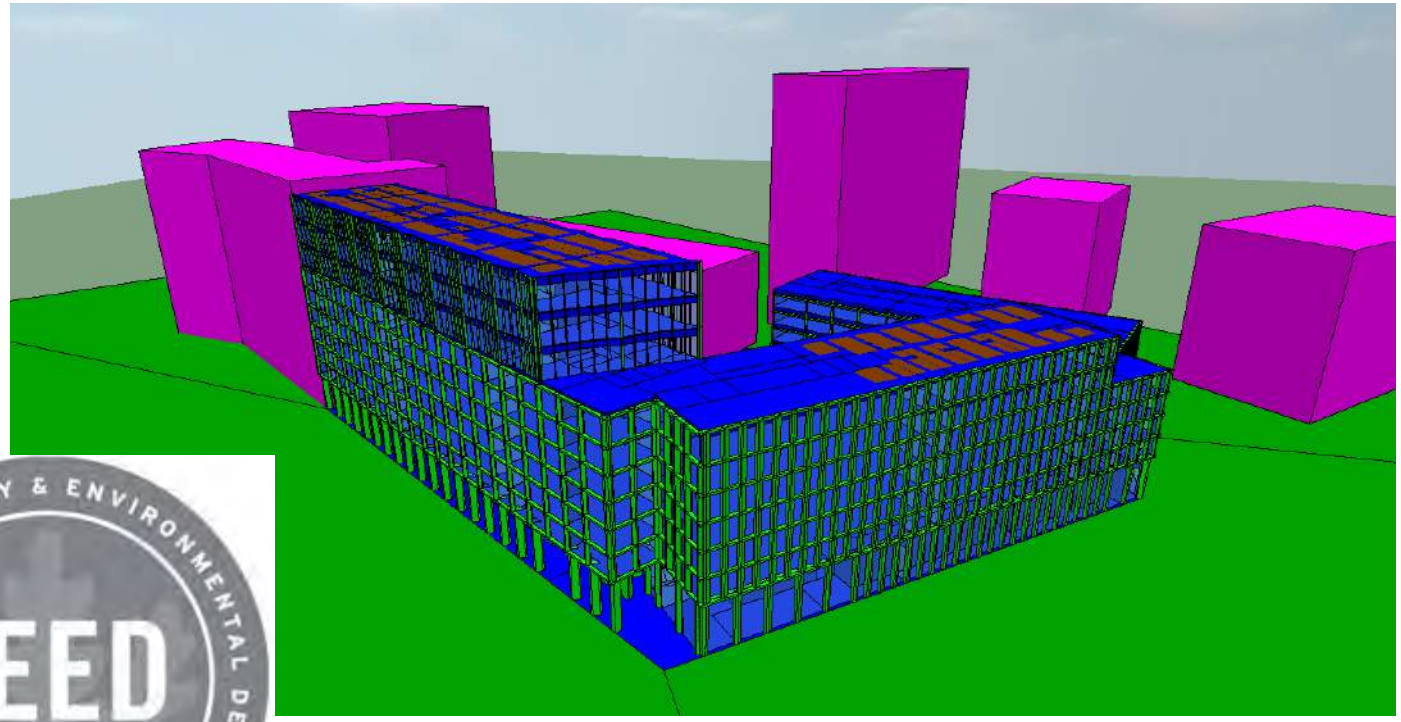


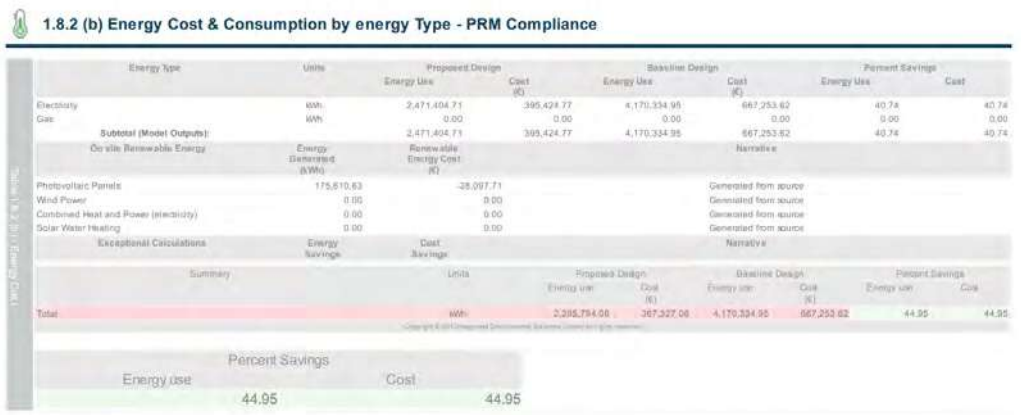
APPLICAZIONI IN ITALIA

Modellazione LEED, BREEAM

Nel LEED si confronta il modello BASELINE (da ASHRAE 90.1) con il modello Proposed (Progetto Esecutivo).
In base ai «cost savings» raggiunti si attribuisce un punteggio per il LEED:

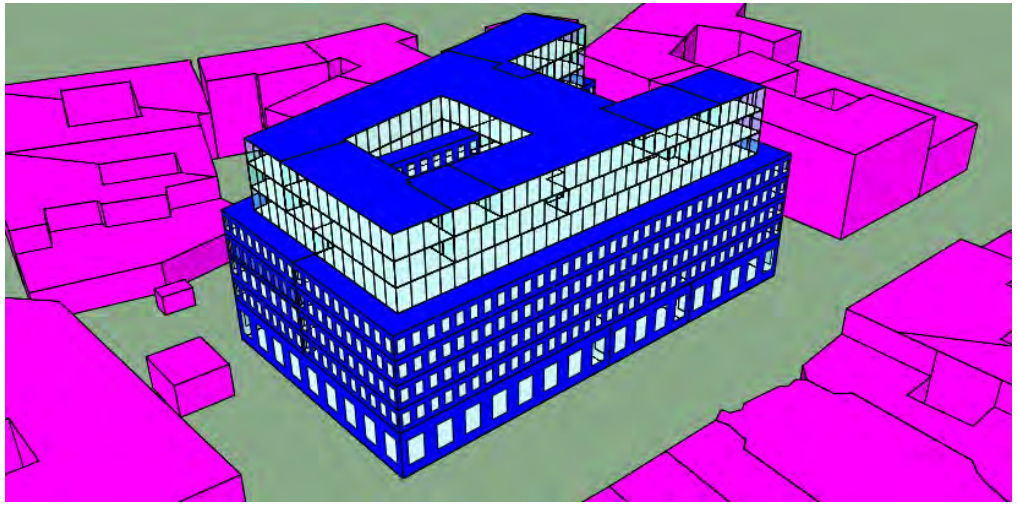
% improvement in energy performance (for new construction)	Points
6	1
8	2
10	3
12	4
14	5
16	6
18	7
20	8
22	9
24	10
26	11
29	12
32	13
35	14
38	15
42	16
46	17
50	18



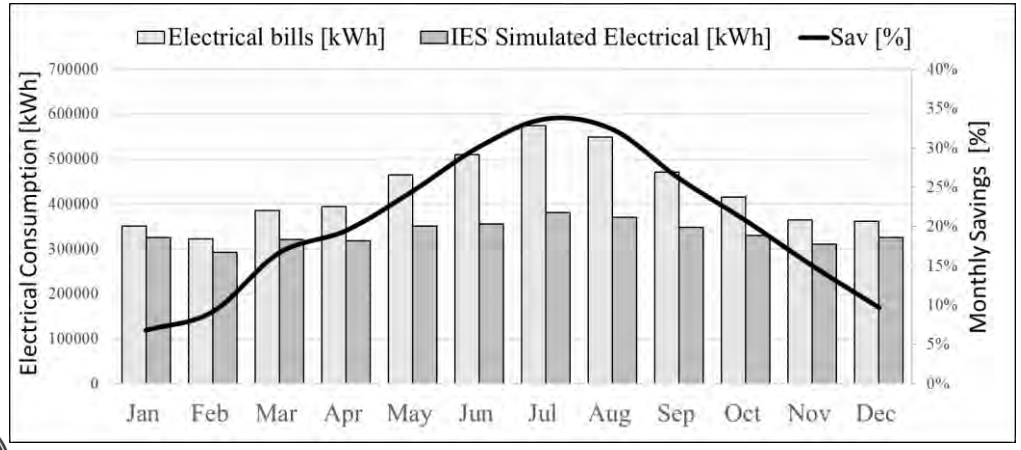


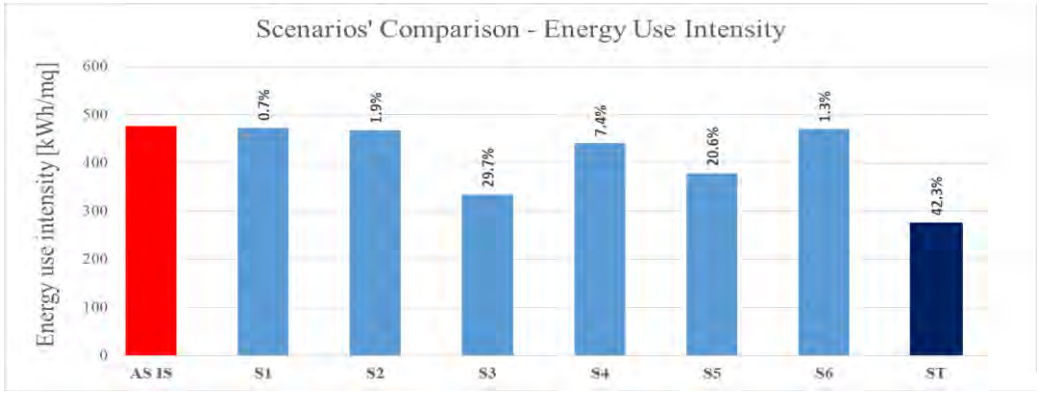
APPLICAZIONI IN ITALIA

Scenari di decarbonizzazione e ottimizzazione su edifici esistenti



SCENARIOS \ KPIs		Description	Annual Consumption [GWh]	CO2 Emissions [tonCo2e]	Energy Use Intensity [KWh/mq]	Total Energy Use Intensity [KWh/mq]	Total CO2 Emissions [tonCo2e]
AS IS	*Electrical*	Baseline Model	5,12	80,81	216,88	475,95	406,55
	Natural Gas		4,66	325,74	197,46		
S1	*Electrical*	Application of anti-UV films	5,03	79,49	213,33	472,54	406,19
	Natural Gas		4,67	326,70	198,05		
S2	*Electrical*	Replacement of fancoils	5,08	80,27	215,41	466,88	395,39
	Natural Gas		4,51	315,13	191,03		
S3	*Electrical*	Replacement of AHUs	4,71	74,39	199,66	334,55	225,47
	Natural Gas		2,16	151,08	91,58		
S4	*Electrical*	Replacement of cooling groups	4,54	71,76	192,60	440,67	386,89
	Natural Gas		4,51	315,13	191,03		
S5	*Electrical*	Replacement of boilers	5,00	79,04	212,12	378,01	271,97
	Natural Gas		2,76	192,93	116,96		
S6	*Electrical*	Photovoltaic System	5,14	81,21	217,94	469,78	396,33
	Natural Gas		4,51	315,13	191,03		
ST	*Electrical*	All previous scenarios	4,03	63,68	170,89	274,68	176,23
	Natural Gas		1,61	112,55	68,23		





APPLICAZIONI IN ITALIA

Usare in fase operativa i modelli energetici dinamici calibrati

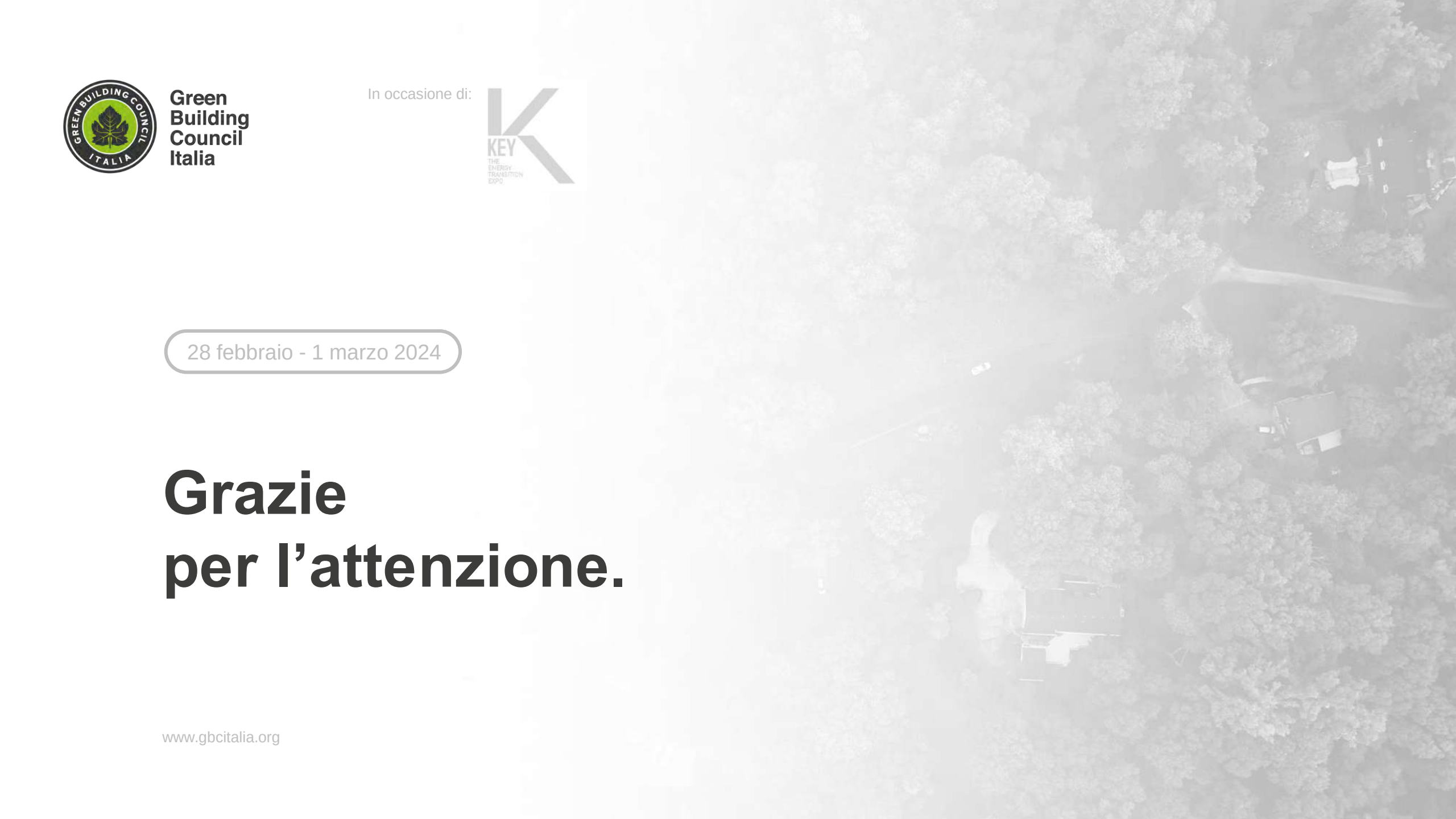
iBECOME

Green Building Council Italia

In occasione di: KEY THE ENERGY TRANSITION EXPO

28 febbraio - 1 marzo 2024

Grazie per l’attenzione.



www.gbcitalia.org