Unlock the value of Plus Energy Buildings and Neighbourhoods

Open workshop co-organized by sister projects Cultural-E, syn.ikia and EXCESS
14:00 - 15:30 CET

28 September 2022
Brussels and online

European Sustainable Energy Week
#EUSEW2022

cultural E+

syn.ikia | Sustainable plus energy neighbourhoods

EXCESS

European Commission

Important information before we start

Your microphone will be muted and your camera will be off. If you would like to speak, please raise your hand and we will give you the floor

We will use Sli.do for real-time polls/ Q&A/ chat box. Further instructions will be give later

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Important information before we start

This workshop will be recorded

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Active poll

10

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Which of the projects below are you familiar with? (You can select more than one option)

Cultural-e
70%

syn.ikia
50%

Excess
20%

Cultural-E

Welcome to the Open Workshop on Plus Energy Buildings and Neighbourhoods

Annamaria Belleri, Cultural-E project coordinator - EURAC

Niki Gaitani, syn.ikia project coordinator - NTNU

Andreas Tuerk, EXCESS project coordinator - Joanneum Research

Agenda

14:00 – 14:15 Welcome by the three project coordinators
(Cultural-E project: Annamaria Belleri, Synikia project: Niki Gaitani, Excess project: Andreas Türk)

14:15 - 14:30 Plus Energy Buildings for climate and cultural diversity
(Cultural-E project, Annamaria Belleri)

14:30 – 14:45 Sustainable Plus Energy Day Neighbourhoods
(syn.ikia project, Niki Gaitani and Jaume Salom)

14:45 – 15:00 PEB and community
(EXCESS project, Andreas Türk)

15:00 – 15:20 Plus Energy Buildings: How can data, users and social and community practices be reconciled? - open discussion
(moderated by Ralph Horne, RMIT & Cultural-E project)

15:20 – 15:30 Final remarks

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Plus Energy Buildings for cultural and climate diversity

Annamaria Belleri, Eurac Research

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870072

LC-EEB-03-2019 New developments in plus energy houses

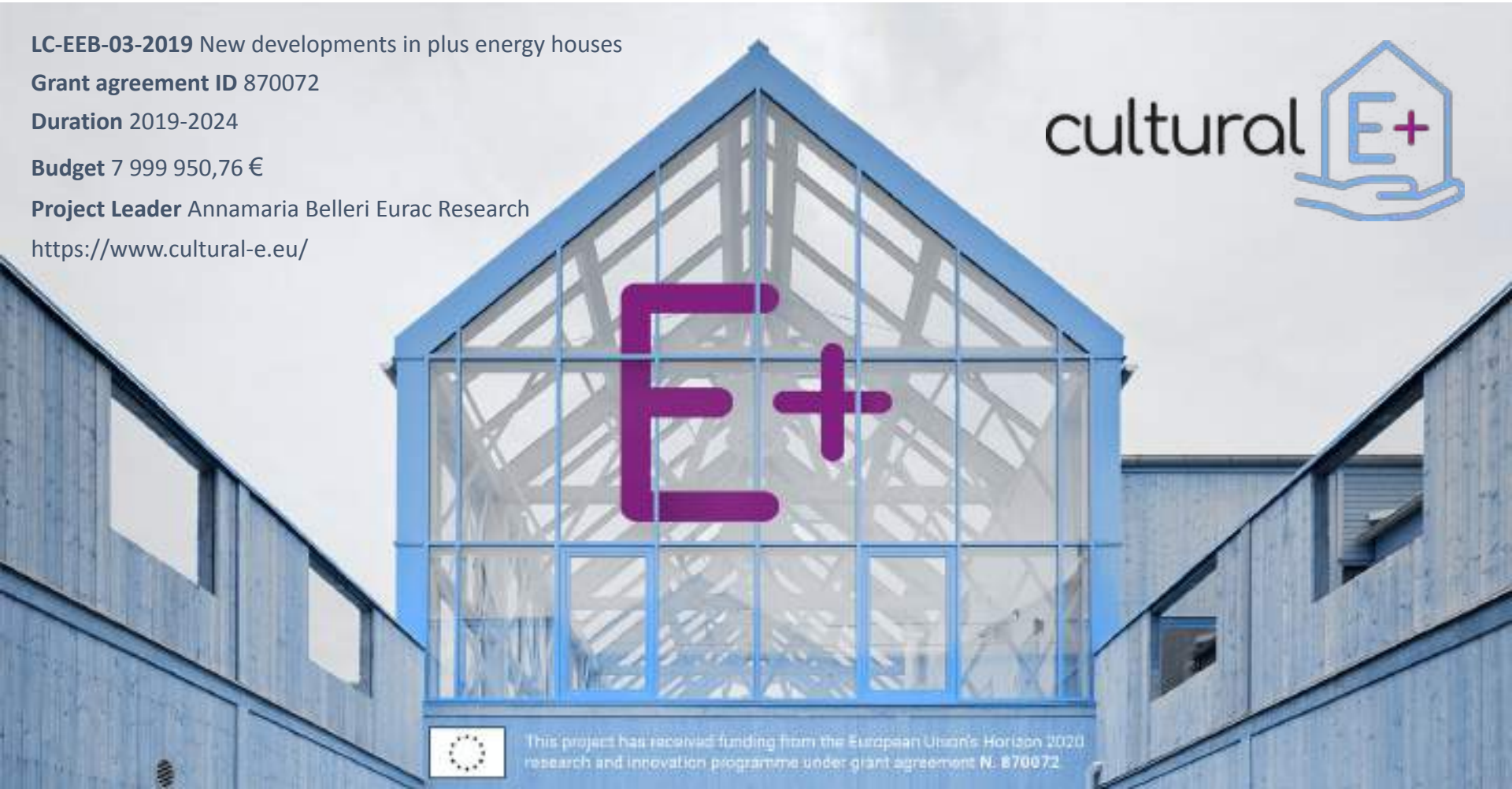
Grant agreement ID 870072

Duration 2019-2024

Budget 7 999 950,76 €

Project Leader Annamaria Belleri Eurac Research

https://www.cultural-e.eu/



Consortium as a whole

cultural E+

RTD PARTNERS

SOCIAL AND CULTURAL CLUSTERING — RMIT UNIVERSITY

CO-BENEFITS AND USER-BUILDING INTERACTION — Università Ca'Foscari Venezia; cmcc

LCA AND SOCIAL-ENVIRONMENTAL IMPACT — Universität Stuttgart

PROJECT COORDINATION, PLUS ENERGY BUILDING CONCEPT AND SOLUTION SETS — eurac research

STORAGE SYSTEM AND CONTROL — Brunel University London

TECHNOLOGY PROVIDERS

HOUSE MANAGEMENT SYSTEM — advanticsys

PACKED HEAT PUMP SYSTEM — ventive, naturally intelligent ventilation

ACTIVE WINDOW — EURO FIRE STRA

SMART AIR MOVEMENT — VORTICE

COMMUNICATION AND DISSEMINATION — ARCHITECTS' COUNCIL OF EUROPE, CONSEIL DES ARCHITECTES D'EUROPE

PROJECT ADVISORS + DEMO OWNERS

DEFINITION OF SOLUTION SETS FOR PEBs — eurac research; Abitcoop

SUPERVISING TECHNOLOGY DEVELOPMENTS — Nobatek INEF4; vilogia

SOLUTIONS FOR BUILDING FLEXIBILITY — SINTEF; BÆRUM KOMMUNE

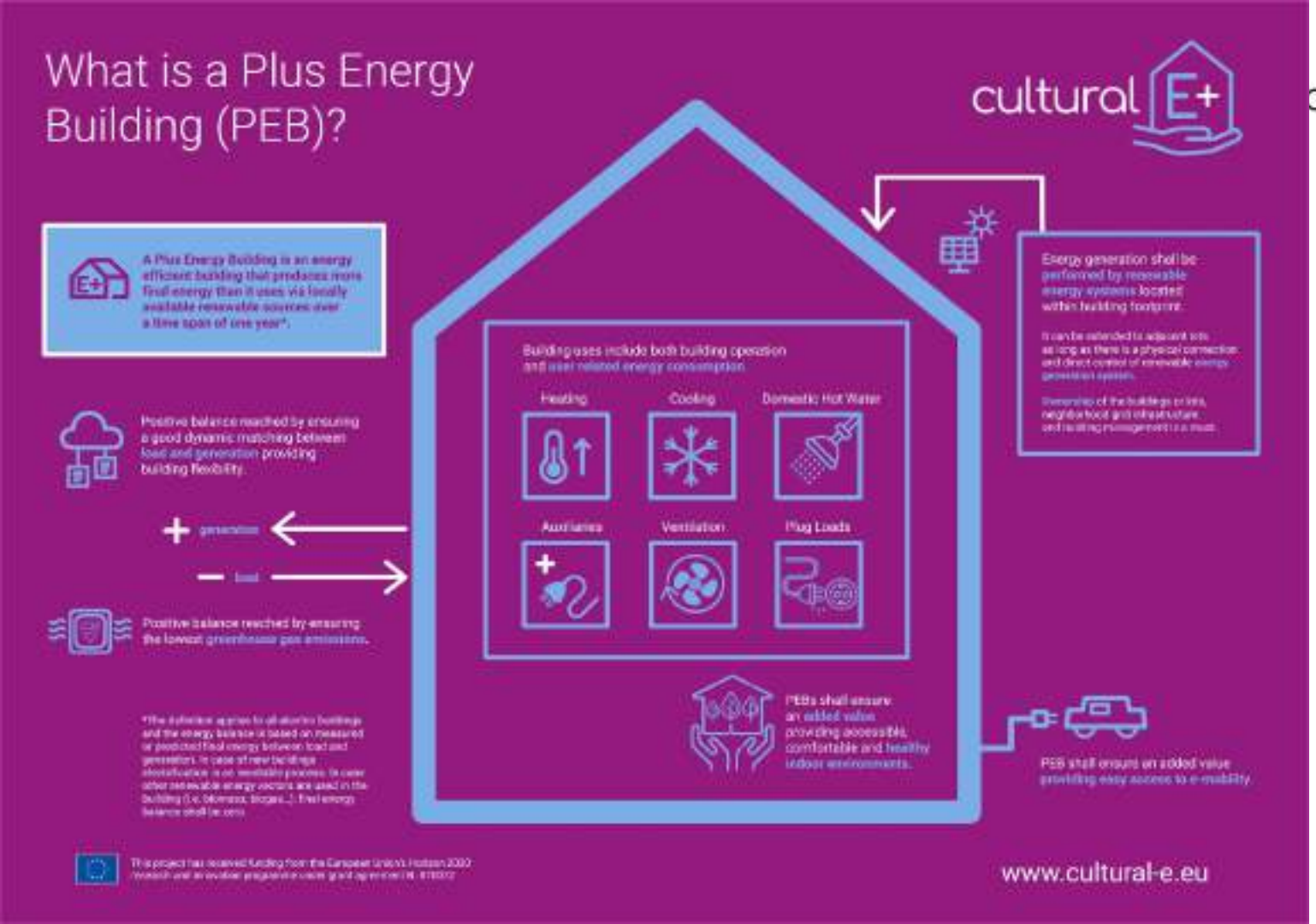
ECONOMIC ANALYSIS AND BUSINESS MODELS — stw; wohnbau Studio

Overall objective

To define viable, and tailorable technology concepts and business cases for Positive Energy Building.

Successful implementation requires an integrated **climate and cultural approach** that encompasses overall building configuration, technology selection, and user/systems interaction.

While the socio-technical combinations vary across contexts, **CULTURAL-E** solution-sets are being thought as comprehensive and easily replicable, thanks to reliable methods and practical guidelines



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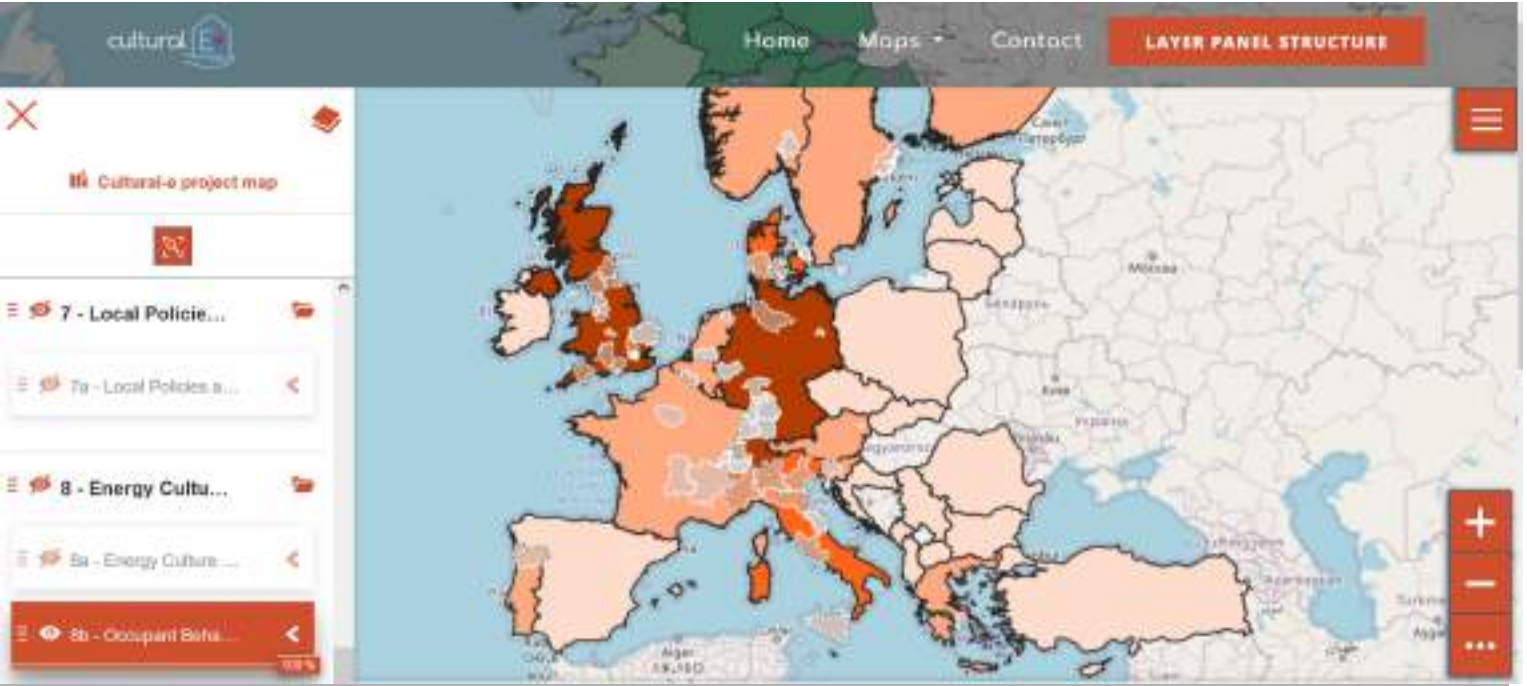
https://www.cultural-e.eu/peb-definition/

Climate and cultural drivers for energy demand

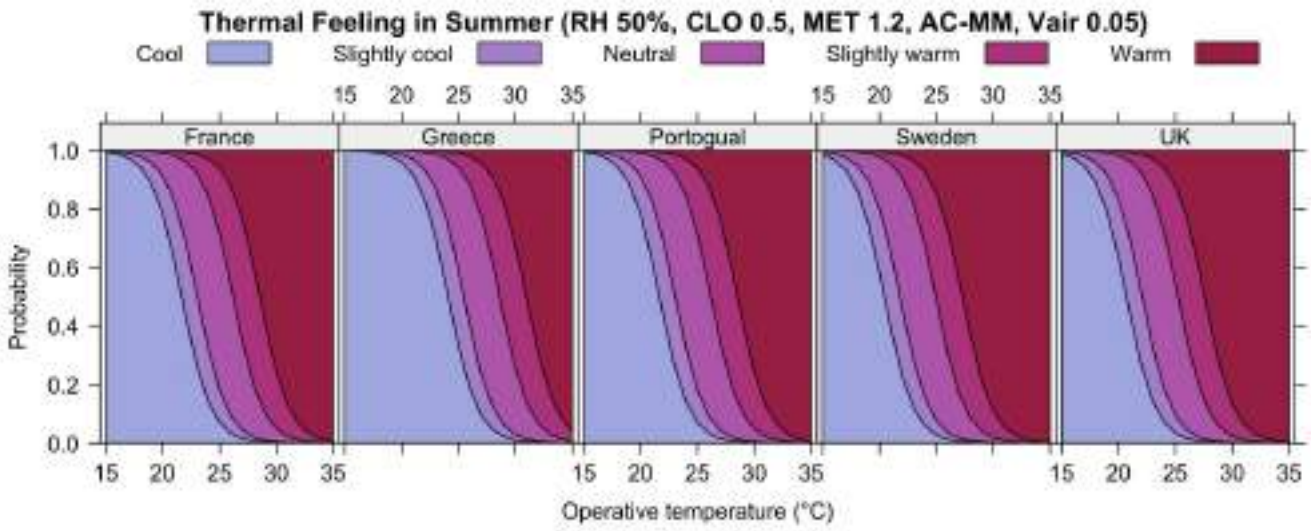


Beta-version published on Cultural-E website https://energyatlas.eurac.edu/

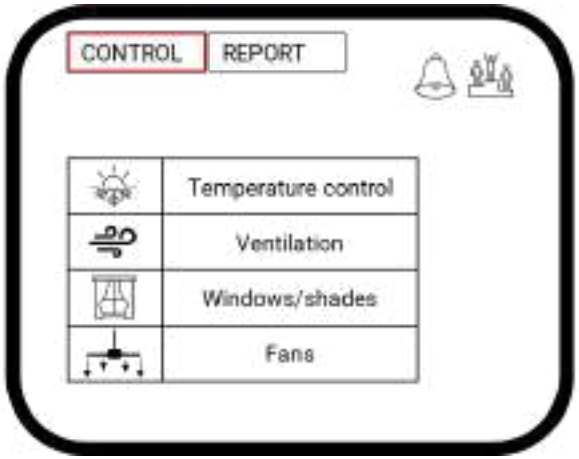
GIS map to inform PEB designers on occupant behaviour modelling, IEQ aspects and energy culture drivers

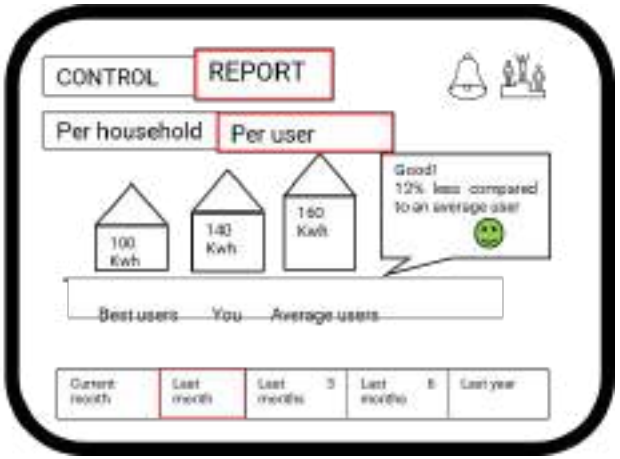
Redefinition of thermal comfort zones addressing climate diversity factors

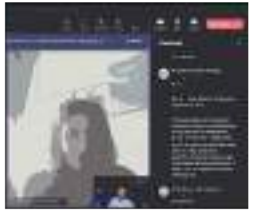
	MATERIAL CONDITIONS				ATTITUDES, PERCEPTIONS AND SOCIAL NORMS									EVERYDAY PRACTICES		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ENVIRONMENTAL ASPECT	Industry spin, economic competition and policies	Household size, design and construction	Energy access	Economic condition	Convenience, comfort and health	Connection with natural environment and adaptation	Living standard and socio-economic	Education level	Appearance, sensation and physical features	Age and gender	Disabilities and activity level	Family and societal structure	Media and marketing	Activities and meanings	Life-working balance and biorhythms	Time-space management
Air Quality environment	✓	✓	✓													
Hygro-thermal environment	✓	✓	✓													
Visual environment	✓	✓	✓													
Acoustic environment	✓	✓														
Human nature environment	✓	✓														



Understand variables that users bring into buildings and provide interventions designed to shift user energy practices







Develop climate and cultural tailored solution sets

Cloud-based HMS

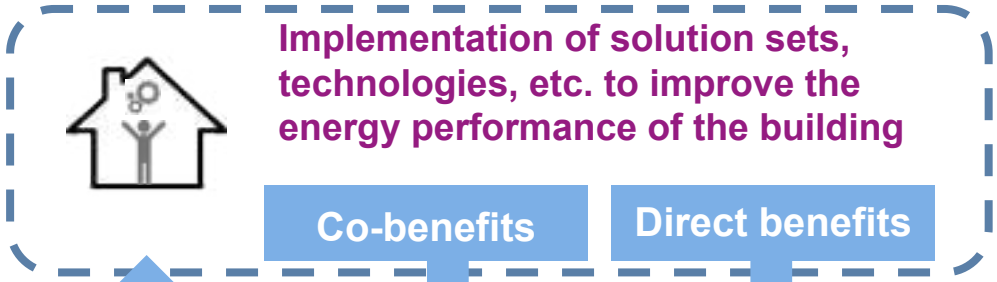
Smart air movement

Smart hybrid ventilation

Decentralized packed HP

Strategies for building flexibility

Valuate the co-benefits of PEBs



Household level

- Improved thermal comfort, Acoustic comfort, visual comfort, indoor air quality, health improvement, safety, increased productivity, lower cost of energy, lower maintenance cost, etc

Community level

Incentives for construction, lower energy cost, mitigation of climate change, reduction in atm. Pollution, reduction of construction/demolition waste, conservation of ecosystem, improvement of social welfare, mortality/morbidity reduction and energy security

Demonstrate PEB

Elgfaret 80-82
Apartment building for assisted living

Private social housing

Private real estate

Private cooperative

Thank you for you attention!

Annamaria Belleri

Eurac Research

annamaria.belleri@eurac.edu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870072

- **LC-EEB-03-2019** New developments in plus energy houses
- **Grant agreement ID** 869918 - IA
- **Duration** 2020-2024
- **Budget** 7 435 279 €
- **Project Leader Niki Gaitani** NTNU
- https://www.synikia.eu/

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NTNU Norwegian University of Science and Technology

This project has received funding from the European Union's Horizon 2020 Research and innovation programme under Grant Agreement N 869918

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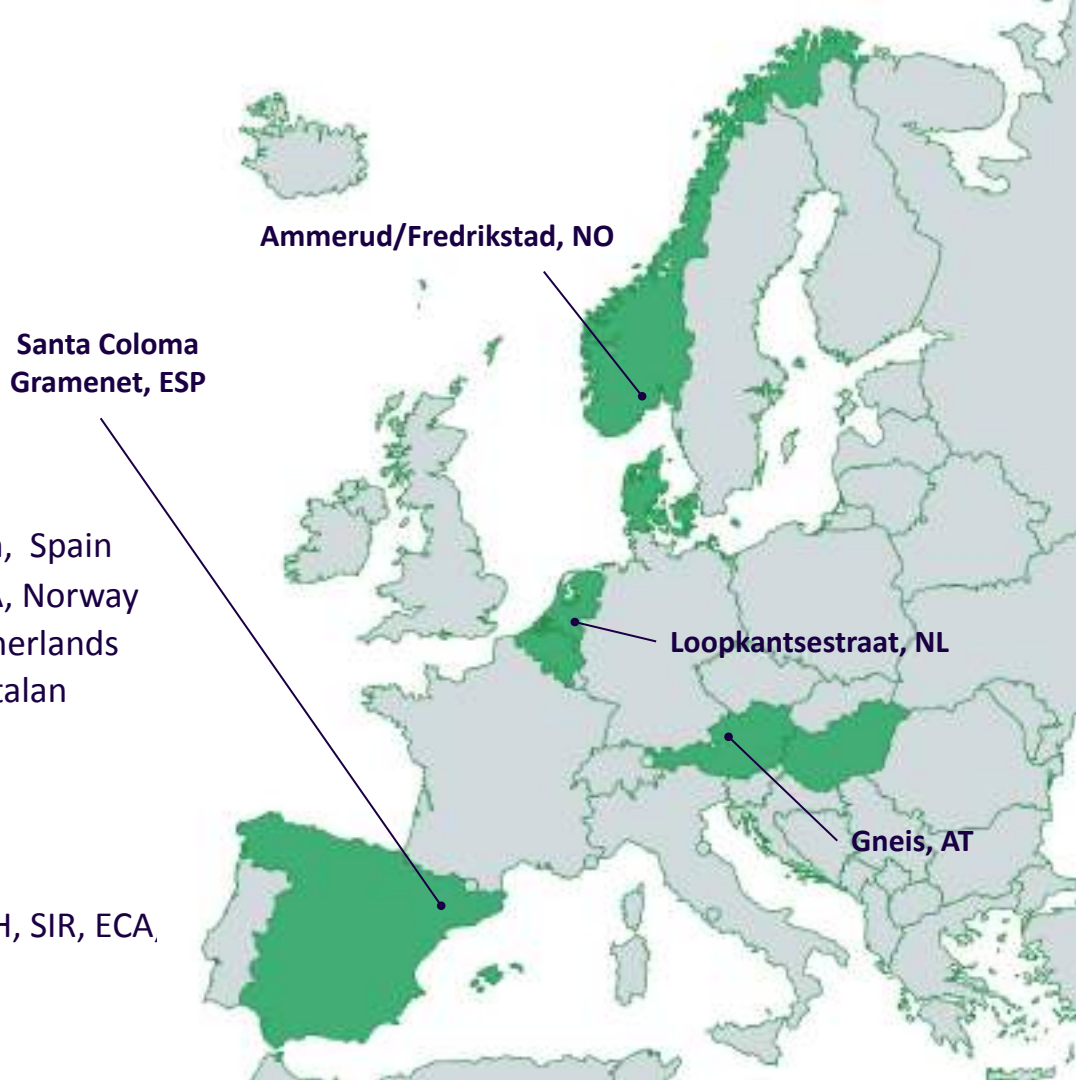
Consortium

1. **Coordinator** – NTNU, Norway
2. DTU, Denmark
3. BPIE, Belgium
4. SINTEF, Norway
5. HOUSING EUROPE, Belgium
6. IREC, Catalonia Institute for Energy Research, Spain
7. **Demo Neighbourhood** – OBOS/ ARCA NOVA, Norway
8. **Demo Neighbourhood**– AREA WOVEN, Netherlands
9. **Demo Neighbourhood**– INCASOL – Land Catalan Institute, Spain
10. TNO, Netherlands
11. ENFOR, Denmark
12. ABUD, Hungary
13. **Demo Neighbourhood** – HEIMAT OSTERRICH, SIR, ECA, Austria



Mission

Increase the share of **SUSTAINABLE NEIGHBOURHOODS WITH SURPLUS RENEWABLE ENERGY** in different contexts, climates and markets in Europe

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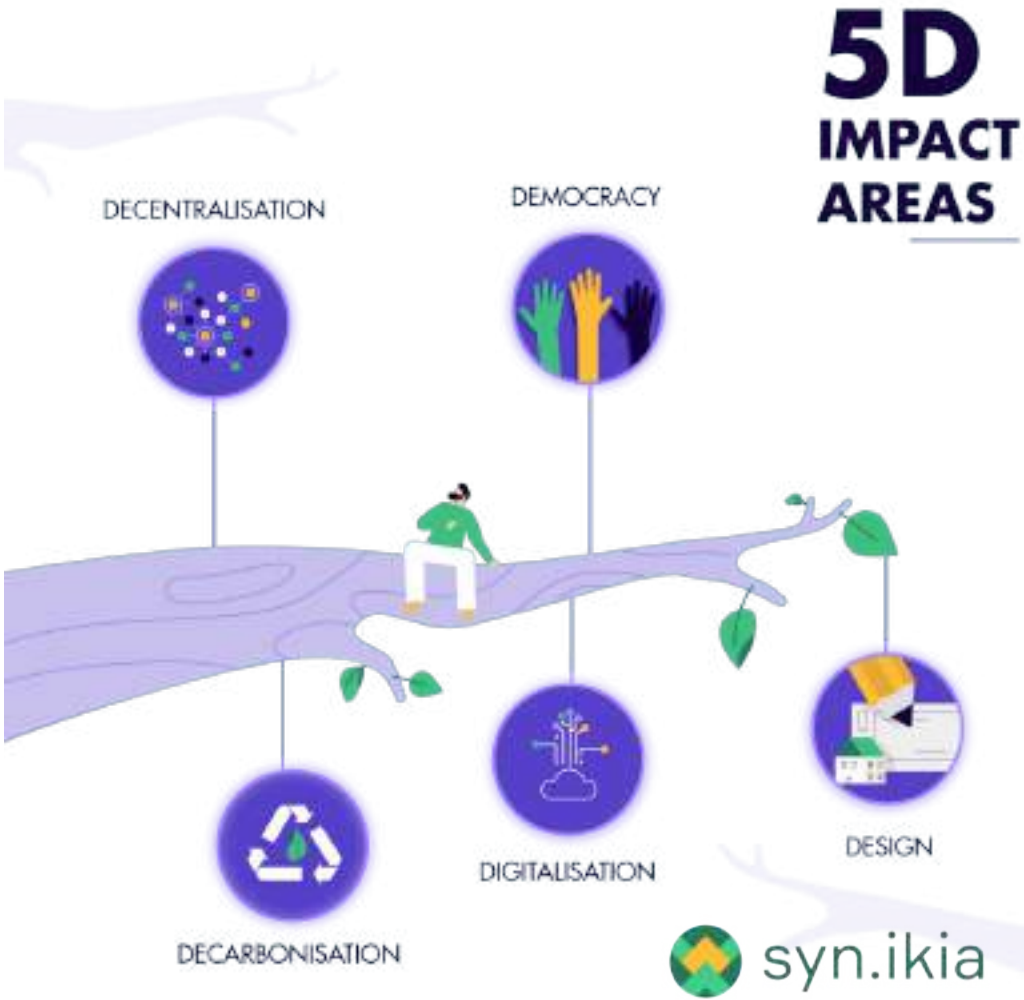
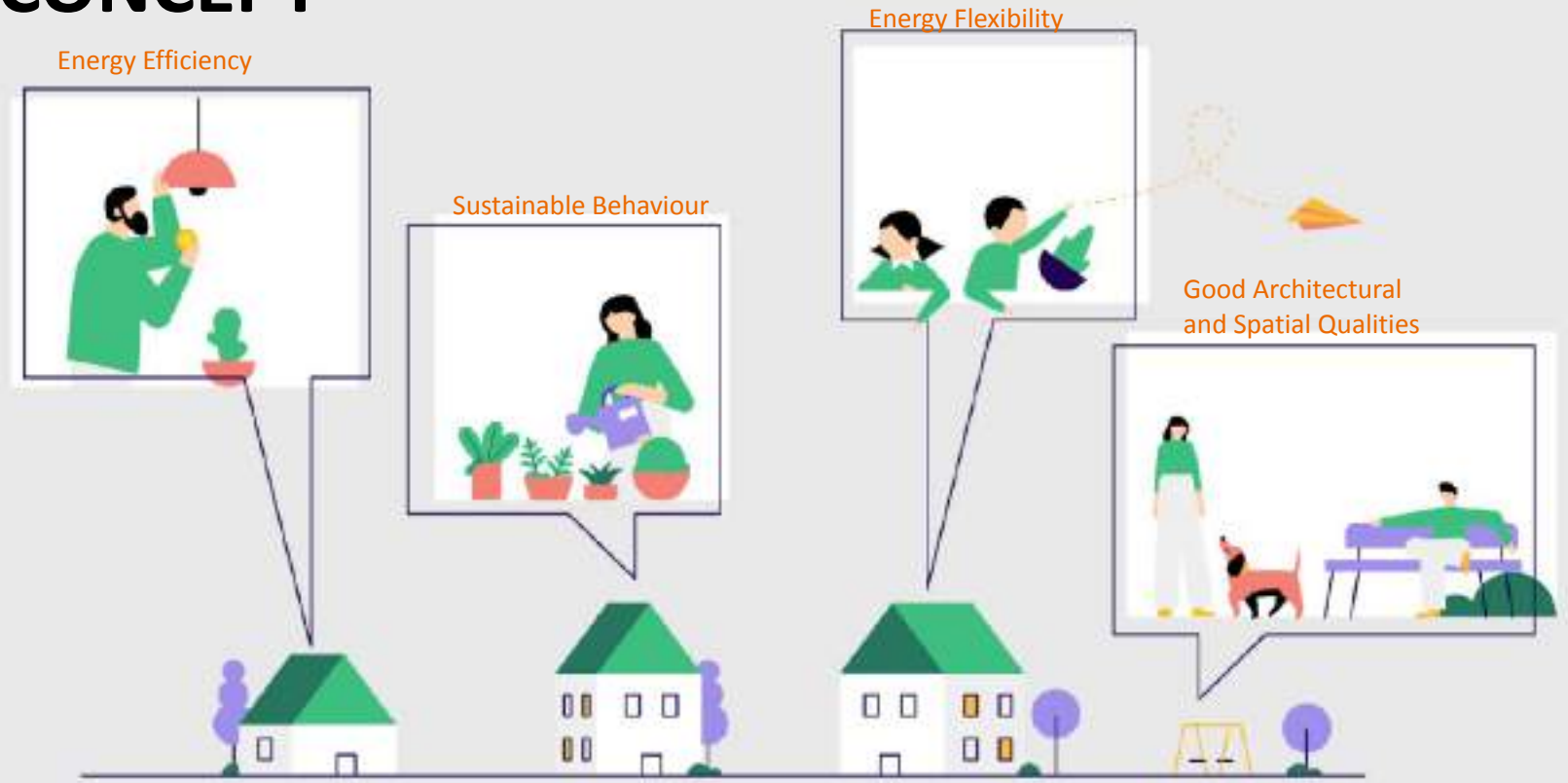
syn.ikia is a Greek word meaning neighbourhood

Focus Areas

- DECENTRALISATION
- DEMOCRACY
- DECARBONISATION
- DESIGN
- DIGITALISATION



CONCEPT



https://www.youtube.com/watch?v=8QOL_Kot5dU

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Our Demo Neighbourhoods

Subarctic climate
Oslo/Fredrikstad, Norway

Marine climate
Uden, Netherlands

Continental climate
Salzburg, Austria

Mediterranean climate
Barcelona, Spain

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Demo neighbourhood Fredrikstad

56 Housing units

- Establishing a neighbourhood energy system
- Architecturally integrated PV
- Smart house technology
- Smart charging of electric vehicles
- Low carbon design, largely wood-based construction, prefab elements
- Use of recycled materials
- Social sustainability with emphasis on shared spaces and IT platform for energy awareness

Demo neighbourhood Uden

39 Housing units

- Digital twins at neighbourhood scale
- Integrating sensors (HVAC) allowing smart controls and diagnostics
- Load balancing at building & neighbourhood level
- Tenant involvement for enhanced user satisfaction
- Performance guarantee
- Social beautiful concept

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Demo neighbourhood Barcelona

38 Housing units

- District heating network
- Energy sharing with the neighbour buildings
- Energy manager and visualisation
- Renewable energy generation is beyond the requirements of building code
- Innovative public procurement with sustainable and environmental requirements

Demo neighbourhood Salzburg

230 Housing units

- Energy sharing with the neighbour buildings
- Smart home technology
- Integrated energy systems and low temperature microgrid
- Renovation incentives
- Participatory design
- User behaviour assessment

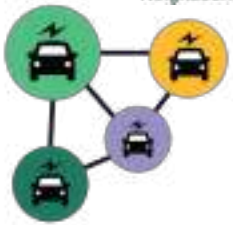
Innovations & Social Sustainability

Integrated Energy Design Process at Neighbourhood Scale

Business Models for Sustainable Plus Energy Neighbourhoods

Syn.ikia Digital Cloud Hub

Digital Twin® Neighbourhood Scale Digital Twin



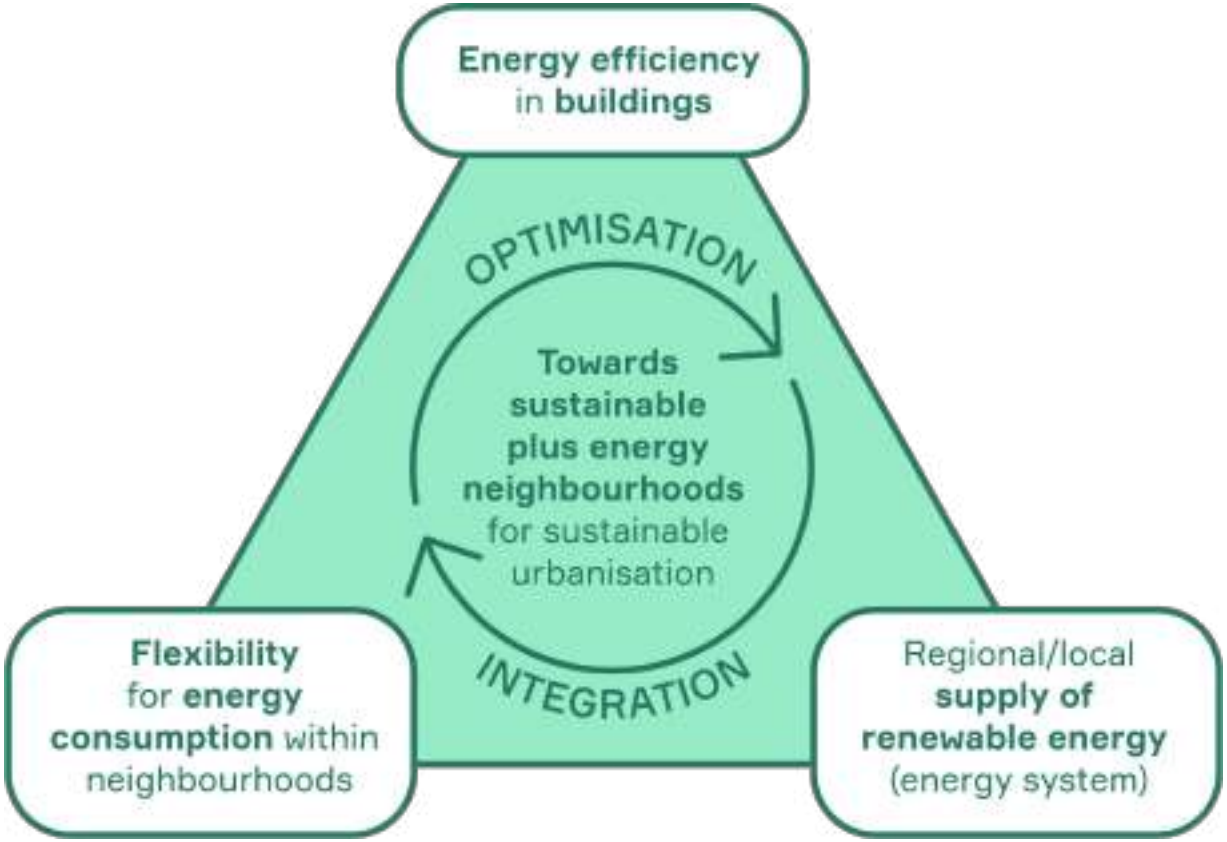
Smart Charging of Vehicles at Neighbourhood Level

Innovative Policy Development Tools

Neighbourhood Scale User Engagement Process

Syn.ikia Flexibility Functions

Sustainable Plus Energy Neighbourhoods SPEN



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Our SPEN Definition

A Sustainable Plus Energy Neighbourhood SPEN is a highly energy efficient & energy flexible neighbourhood with a surplus of energy from renewables sources

- *A SPEN is embedded in an urban and regional energy system and is driven by renewable energy to provide optimized security and flexibility of supply.*
- *A SPEN is based on a high level of* ***energy efficiency****, in order to keep* ***annual local energy consumption lower*** *than the amount of locally* ***produced renewable energy****.*
- *A SPEN* ***enables*** *increased use of* ***renewable energy*** *within the local and regional energy system by offering optimized* ***flexibility*** *and by managing* ***consumption*** *and* ***storage*** *capacities* ***according to demand****.*
- *A SPEN couples the built environment with* ***sustainable energy production, consumption,*** *and* ***mobility*** *(e.g. EV charging) to create added value and incentives for the consumers and the society.*
- *A SPEN makes optimal use of advanced materials, local RES, and other low carbon solutions (i.e. local storage, smart energy grids, demand-response, cutting-edge energy management systems, user interaction, and ICT).*
- *A SPEN offers affordable living, improved indoor environment, and well-being for the inhabitants.*

An evaluation framework for Sustainable Plus Energy Neighbourhoods: Moving beyond the traditional building energy assessment, Energies, 2021, 14, 4314. https://doi.org/10.3390/en14144314

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Key Performance Indicators will be assessed

at two spatial levels

to evaluate the demos

- Building

- Neighbourhood

Objectives in

Sustainable Positive Energy Neighbourhoods

(SPEN)

Cost efficiency

Quality of indoor environment

Social inclussiveness

Net-zero greenhouse gas emissions & carbon footprint reduction

Managing renewable energy production & power performance

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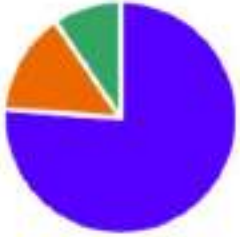
Multidimensional Analysis

Design (Economic sustainability)

Democracy

Digitalisation & Decentralisation (Flexibility)

Decarbonisation



Design (Wellbeing)

Indicator categories

- Energy & environment
- Smartness & flexibility
- Economical
- Social
- IEQ

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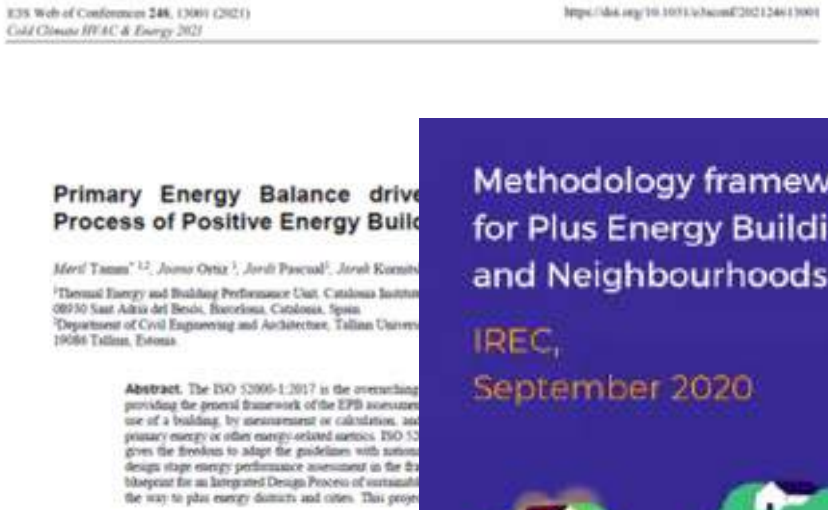
Documents

- Five categories of indicators defined
  - Energy and Environmental (9)
  - Economic (11)
  - Indoor Environmental Quality (IEQ) (8)
  - Social (14)
  - Smartness and Energy Flexibility (2)

- Definition of KPIs
- Guidelines to implement in design and operational phases of projects
- Additional materials as surveys / checklists


E3S Web of Conferences **246**, 13001 (2021) https://doi.org/10.1051/e3sconf/202124613001
Cold Climate HVAC & Energy 2021

Primary Energy Balance drive
Process of Positive Energy Build

Meril Tamm[1,2], *Jaume Ortiz*[1], *Jordi Pascual*[1], *Jorek Kurnitski*[2]

[1]Thermal Energy and Building Performance Unit, Catalonia Institute
08930 Sant Adrià del Besòs, Barcelona, Catalonia, Spain
[2]Department of Civil Engineering and Architecture, Tallinn University
19086 Tallinn, Estonia

Abstract. The ISO 52000-1:2017 is the overarching
providing the general framework of the EPB assessmen
use of a building, by measurement or calculation, and
primary energy or other energy-related metrics. ISO 52
gives the freedom to adapt the guidelines with nationa
design stage energy performance assessment in the fr
blueprint for an Integrated Design Process of sustainabl
the way to plus energy districts and cities. This projec

"An evaluation framework for Sustainable Plus Energy Neighbourhoods: Moving beyond the traditional building energy assessment", https://doi.org/10.3390/en14144314

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Thank you!

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NTNU
Norwegian University of
Science and Technology


DTU
Technical University
of Denmark


BPIE


SINTEF


HOUSING
EUROPE


IREC


ARCA NOVA
GRUPP


area


INCASÒL
Institut Català
del Sòl


TNO
innovation
for life


ENFOR


ABUD
Advanced Building
& Urban Design


HEIMAT
OSTERREICH


SIR


ECA


syn.ikia

Sister project workshop

PEB and energy communities

Andreas Türk , Joanneum Research

28.09.2022

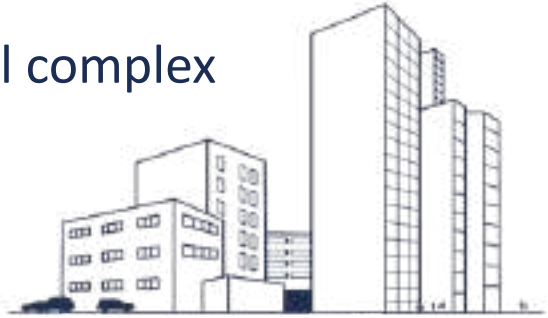
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 870157. This document reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

Background: EXCESS-project

- EXCESS is about FleXible user-CEntric Energy poSitive houseS
- How nearly-zero energy buildings can be transformed into positive energy buildings (PEBs)?
- Five years, starting in 2019
- 21 partners from 8 countries
- 4 demos in 4 climate zones

EXCESS Demos

- Former industrial complex in Graz, Austria



- Apartment building in Helsinki, Finland

- Social housing complex in Hasselt, Belgium

- Multi-apartment block in Granada, Spain

PEB definition for EXCESS

Positive Energy Building:

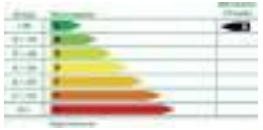
- **an energy efficient building**
- **produces more energy than it uses via renewable sources,** over a time span of one year.
- high self- consumption rate
- high energy flexibility
- high quality indoor environment **maintaining the comfort and well being** of the building occupants.
- able to **integrate the future technologies** like electric vehicles to maximize the onsite consumption and share the surplus renewable energy.

PEB business models

- Technologies exist
- Integrated concepts are emerging
- Well-designed business models:
  - recognized as a crucial element needed for a wider roll-out of PEBs
  - seem to be largely missing

 This presentation highlights potential business models & their contribution to the different PEB elements

Elements for value proposition in PEB BM

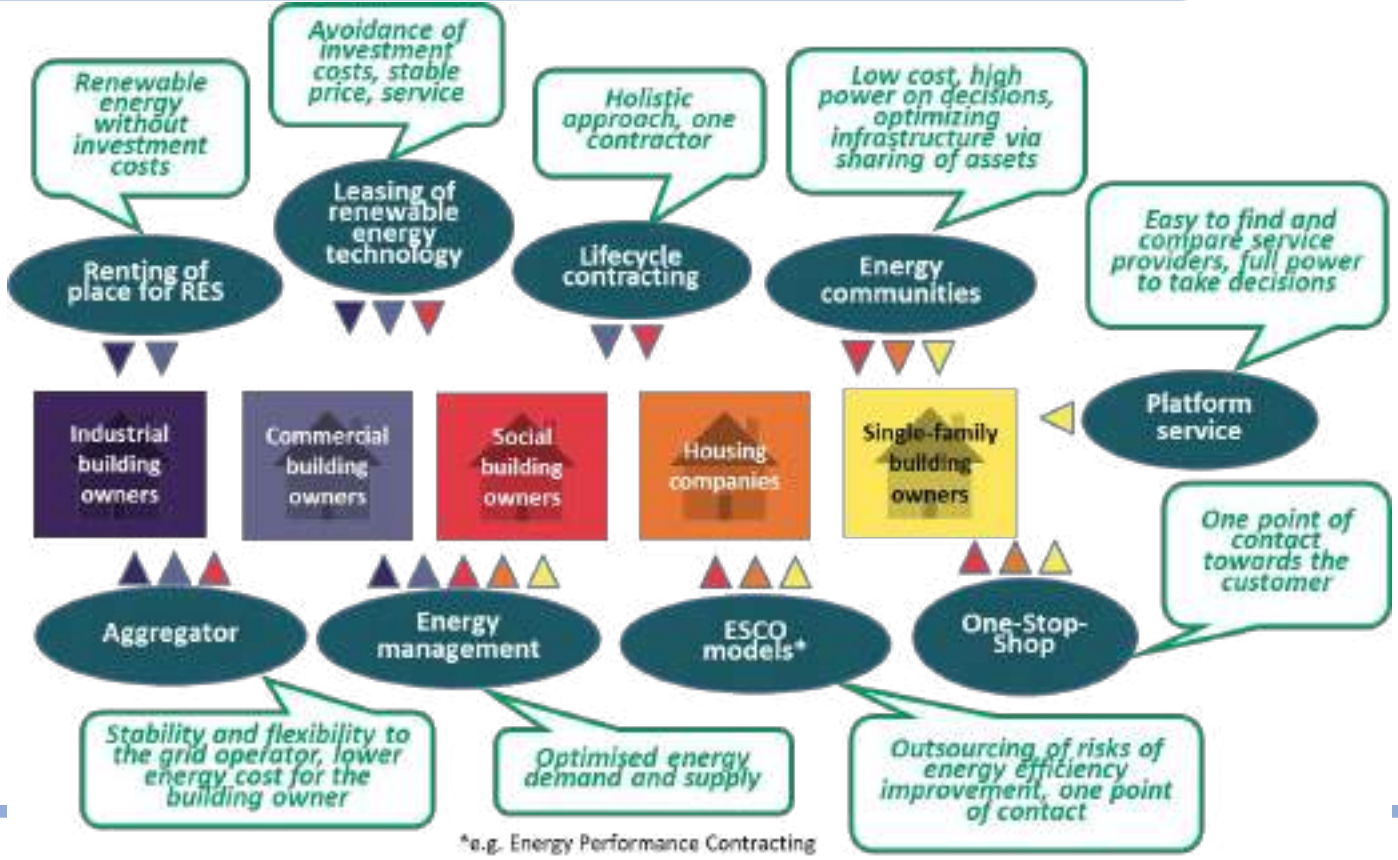


- Energy efficiency
- Renewable energy technologies integrated into the building or site

- Optimization of the energy demand and supply during the operational phase > flexibility towards the energy grids

- Ability to maintain the quality of the service (e.g. indoor environmental quality)

Business model approaches



Renewable and Citizen Energy Communities

- Mirroring autonomous and virtual PEDs?
- PED fostering sharing and optimisation
- Basis for providing flexibilities to markets
- Organisational format for the technical concept of PEDs?

Business conditions vary by country

- Regulations
- Socioeconomic conditions
- Building traditions
- Climate
- Availability of renewable energy

Contact: Andreas Türk
Joanneum Research
Mailto: andreas.tuerk@joanneum.at

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Plus Energy Buildings: How can data, users and social and community practices be reconciled?

Ralph Horne, RMIT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870072

Sustainable positive energy buildings or neighbourhoods?

Discussion with speakers and audience

Annamaria Belleri, Cultural-E project coordinator - EURAC

Niki Gaitani, syn.ikia project coordinator - NTNU, Jaume Salom - IREC

Andreas Tuerk, EXCESS project coordinator - Joanneum Research

What is needed from policy and regulatory perspective?

Discussion with speakers and audience

Annamaria Belleri, Cultural-E project coordinator - EURAC

Niki Gaitani, syn.ikia project coordinator - NTNU, Jaume Salom - IREC

Andreas Tuerk, EXCESS project coordinator - Joanneum Research

What do you see as main drivers and barriers of the market uptake of PEB?

Discussion with speakers and audience

Annamaria Belleri, Cultural-E project coordinator - EURAC

Niki Gaitani, syn.ikia project coordinator - NTNU, Jaume Salom - IREC

Andreas Tuerk, EXCESS project coordinator - Joanneum Research

Technology smartness vs complexity

Discussion with speakers and audience

Annamaria Belleri, Cultural-E project coordinator - EURAC

Niki Gaitani, syn.ikia project coordinator - NTNU, Jaume Salom - IREC

Andreas Tuerk, EXCESS project coordinator - Joanneum Research

Thank you for you attention!

Contacts:

Ralph Horne

ralph.horne@rmit.edu.au

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870072

Any questions?

If you are connected online, please use the Sli.do chat box

Thank you for joining us today

More information can be found at

https://www.cultural-e.eu/

https://www.synikia.eu/

https://positive-energy-buildings.eu/

Cultural–E has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N. 870072.
Syn.ikia has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N. 869918.
EXCESS has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N. 870157.