NETWORKING VILLAGE
Energy Talk

TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM

#EUSEW2021

SUSTAINABLE ENERGY WEEK

EUSEW.EU
EUENERGYWEEK
@EUENERGYWEEK

e-SAFE has received funding from the European Union's Horizon 2020.
Coordination and support action programme under grant agreement No 893135.

THE e-SAFE SOLUTIONS

ENERGY AND SEISMIC RENOVATION OF NON-HISTORICAL BUILDINGS

Gianpiero Evola, PhD
University of Catania (Italy)

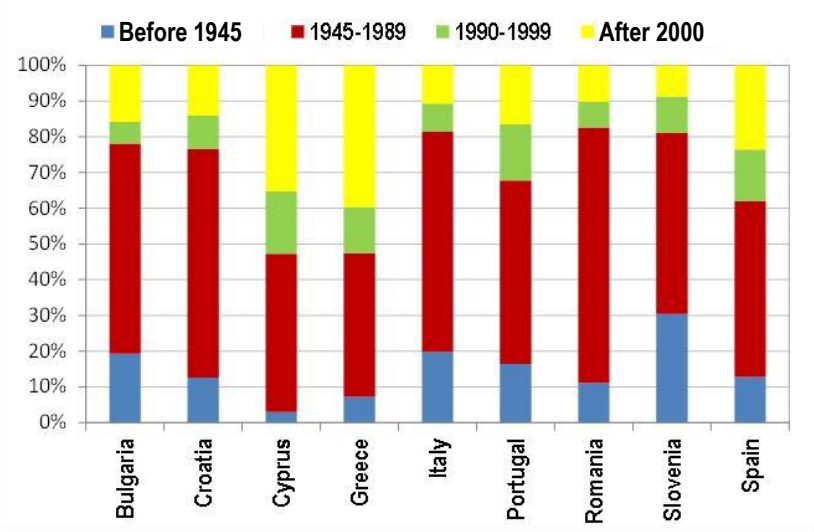
SUSTAINABLE ENERGY WEEK

NETWORKING VILLAGE
Energy Talk
TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM
#EUSEW2021

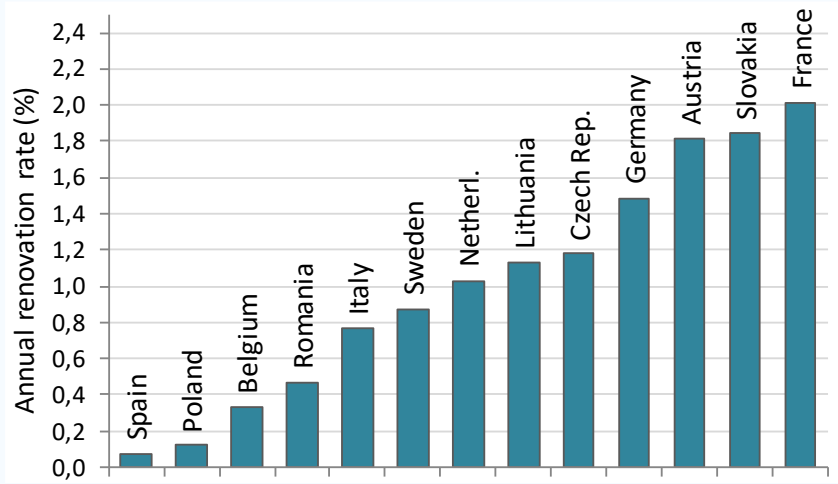
INTRODUCTION

Deep energy renovation of the EU building stock

Distribution of EU residential buildings by their **construction period**



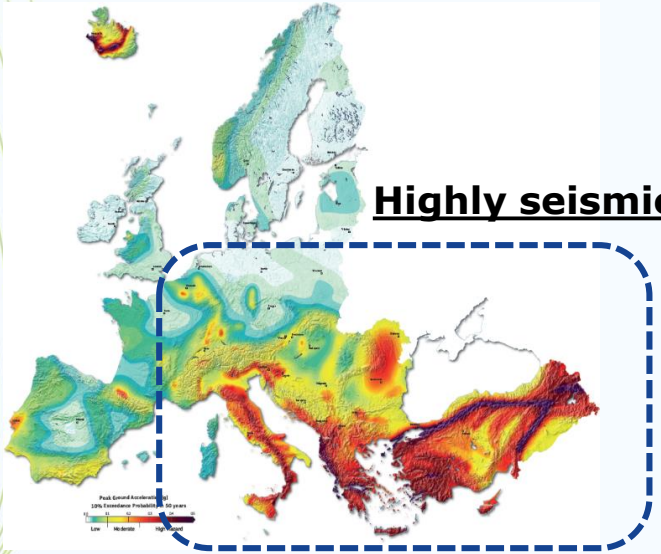
The building **renovation rate** is still highly **unsatisfactory**, since it hardly exceeds 1.2% on average



Source: https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-performance-of-buildings

INTRODUCTION

Seismic retrofit of the EU building stock



Highly seismic areas

About **50%** of European territory is **earthquake-prone**

In the **last 50 years** in Europe, earthquakes have caused:

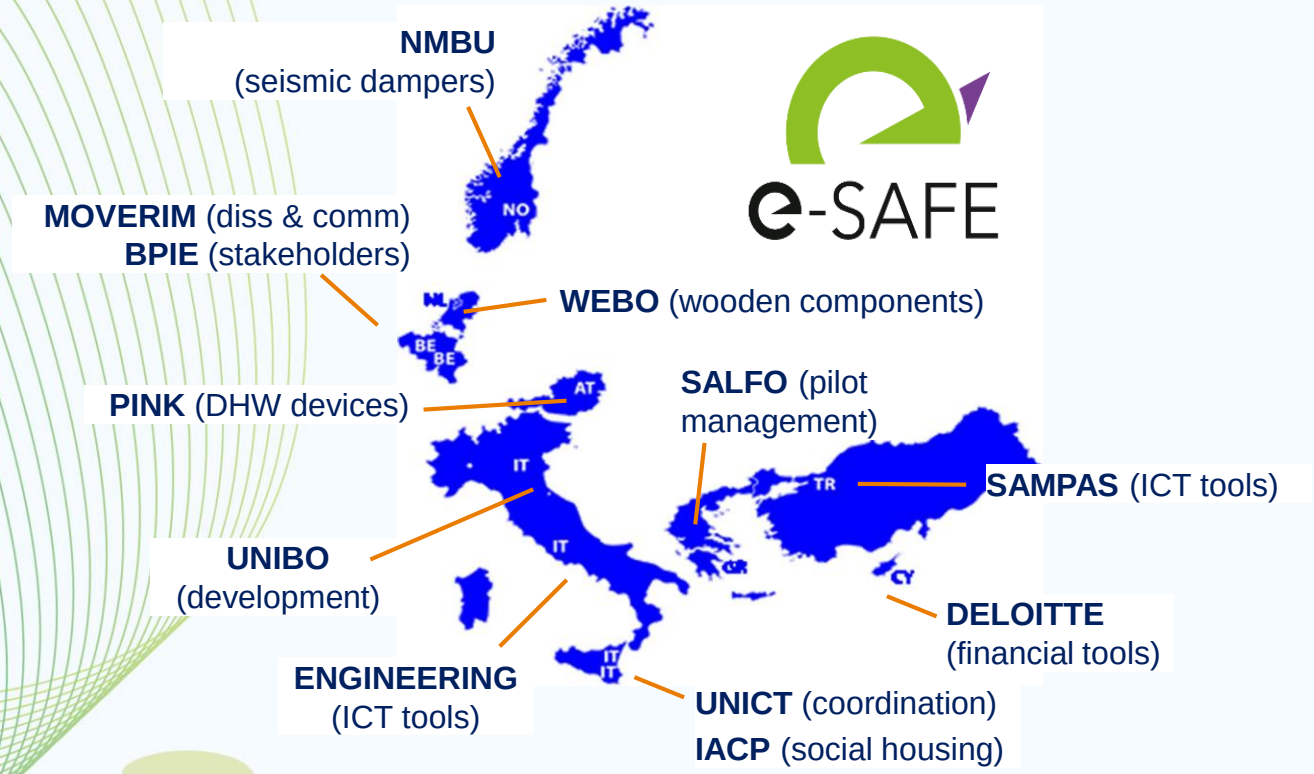
- over 36.000 deaths
- around 1.4 million people becoming homeless

Source: Bournas, D., Innovative Materials for Seismic and Energy Retrofitting of the Existing EU Buildings, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-81995-7, JCR109907.

http://esafe-buildings.eu/en/

The e-SAFE project

Energy and seismic retrofit of the EU building stock



The EU-funded H2020 innovation Project **e-SAFE** (energy and Seismic Affordable rEnovation solutions) has started in October 2020 and will end in October 2024

The project is developing and demonstrating new technical solutions for the energy and seismic deep renovation of non-historical buildings with reinforced-concrete (RC) frame

SUSTAINABLE ENERGY WEEK

NETWORKING VILLAGE
Energy Talk
TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM
#EUSEW2021

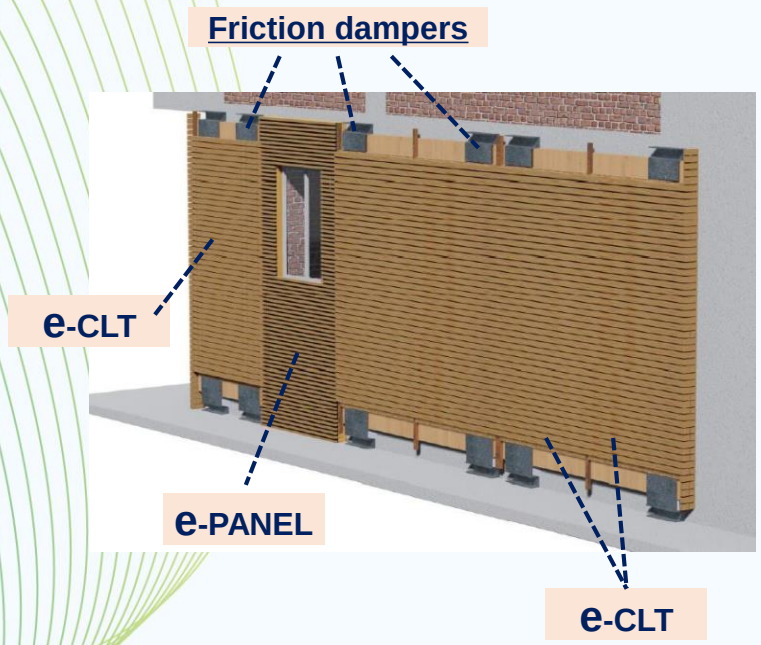
The e-SAFE concept: a new building skin

e-PANEL: prefabricated plug-and-play modules with timber-framed structure and bio-based insulation. It includes new wooden-framed windows with integrated shading devices

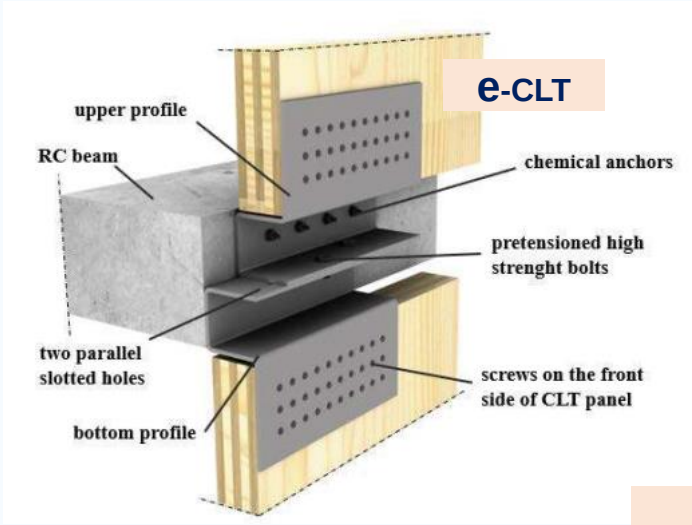
e-CLT: structural panels made of Cross Laminated Timber, which increase seismic performance through their connection to the existing RC beams with specifically designed friction dampers (seismic energy dissipation).

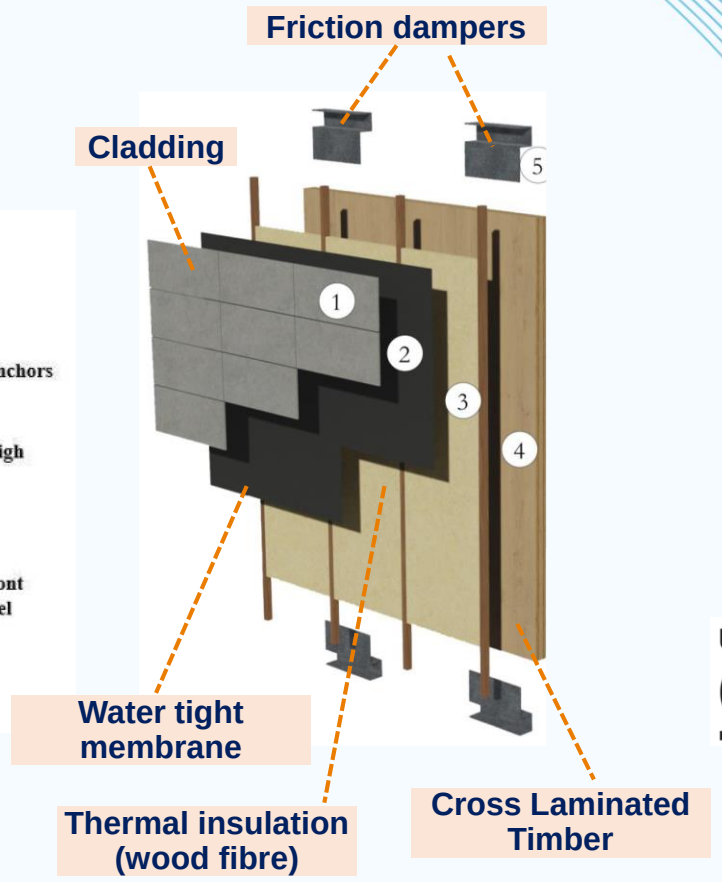
e-EXOS: exoskeleton with metal bracings and seismic dampers (alternative to CLT in highly seismic areas)

The e-SAFE concept: a new building skin

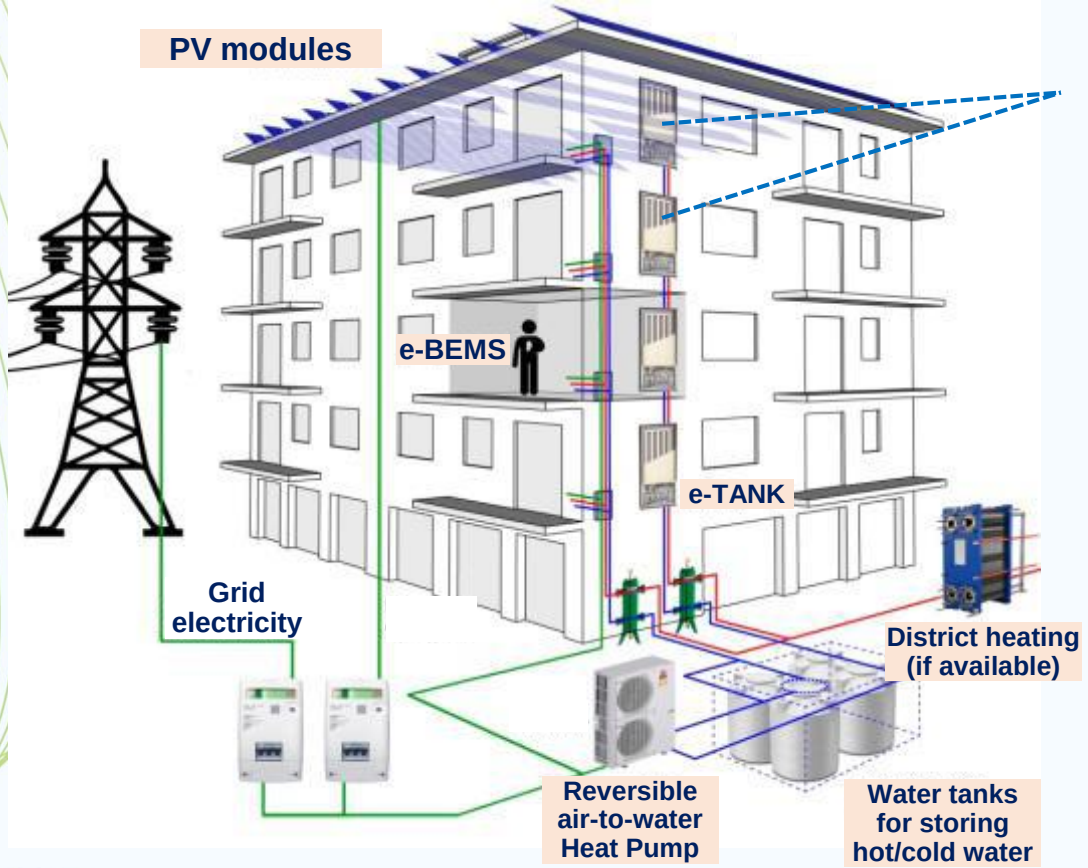


Friction dampers for seismic energy dissipation





The e-SAFE concept: technical systems



e-TANK

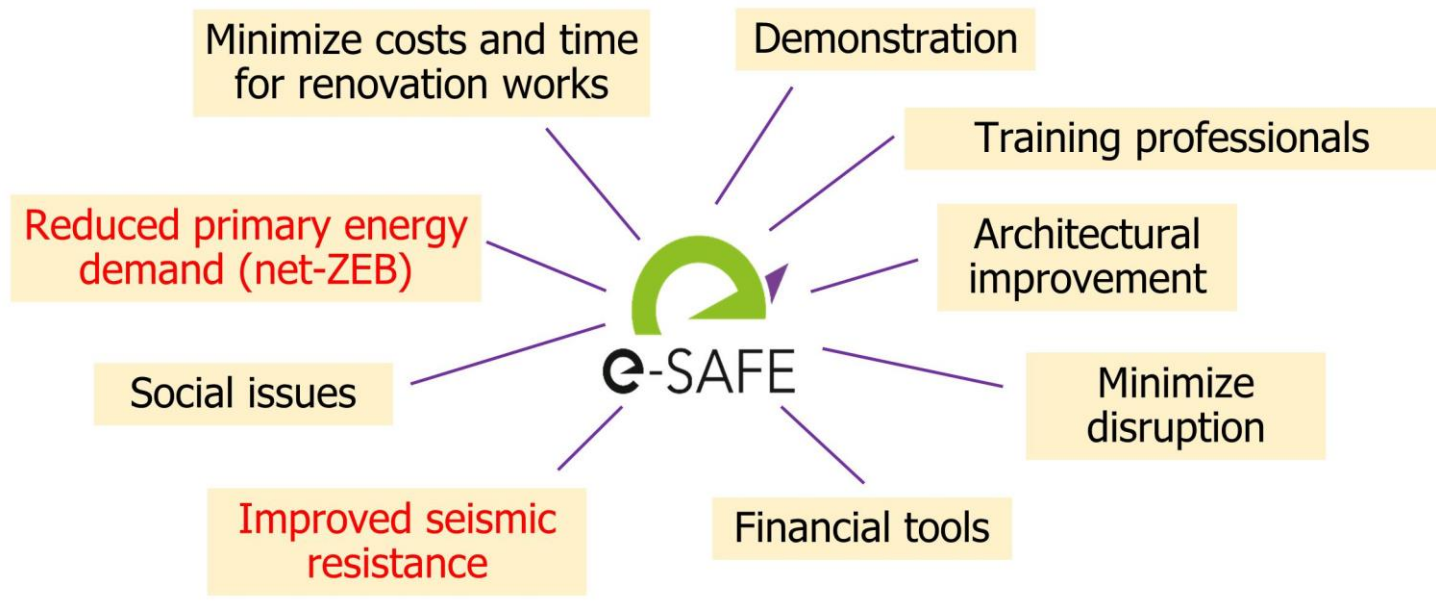
- Thin storage tanks for DHW (140 L)
- Plug-and-play hydraulic connections

e-THERM

- High-performance air-to-water electric heat pumps
- Full DC inverter technology
- Refrigerants with low GWP
- Insulated water tanks to store thermal energy
- PV modules with increased self-consumption rate
- Fan coils fed at low/medium temperature (< 45 °C)

The e-SAFE project

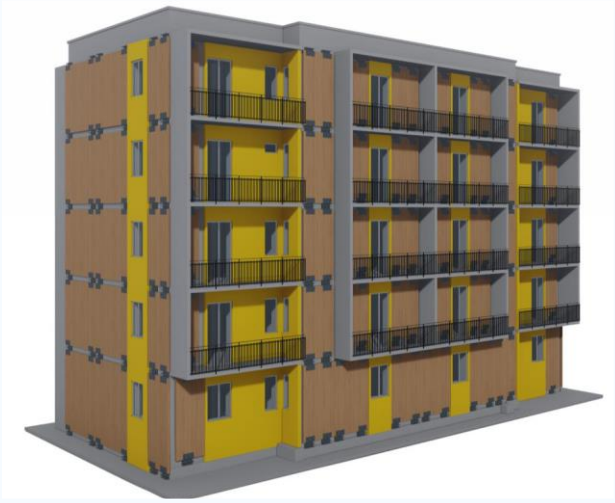
Energy and seismic retrofit of the EU building stock



The synergy of all these manifold aspects is expected to overcome the **barriers towards full market uptake**

The e-SAFE concept

Demonstration activities: the real pilot building



- Built in 1964
- Gross floor area: 1180 m^2
- RC frame and hollow clay bricks
- Current U = 1.1 W/(m^2K)
- Final **U < 0.3 W/(m^2K)**
- Current Energy Class: G

One **residential pilot building** located in Catania (Southern Italy) and owned by the Italian **Social Housing Institute**, will be renovated with the proposed technologies. **Monitoring activities** will last at least **one year**.

The e-SAFE concept

Towards the Green Deal objectives …

- Reduced time of installation (≃ 50% for combined seismic and deep energy renovation)
- Reduced occupants' disruption (prefabricated components installed only on the outside)
- Low environmental impact (recycled/recyclable materials with low carbon footprint)
- Reduced costs for renovation (≃ 40%) in comparison with traditional combined seismic and energy renovation actions that require invasive interventions on the entire building structure
- Very low non-renewable primary energy consumption (< 10 kWh/m^2 per year)
- Very high share of final energy coming from renewable energy sources (> 85%)
- Energy Class A (n-ZEB)

The e-SAFE concept

Co-design approach

A video with all proposed architectural solutions will soon be available on our Youtube channel

The e-SAFE concept

Demonstration: virtual pilots

Unlike the Italian pilot building, virtual pilots will not be renovated during the project. However, **e-SAFE** will follow the entire process resulting in the release of a detailed design for the renovation works.

Two virtual pilots will be selected through a **call for expression of interest**, launched in **April 2022**

- Earthquake prone EU countries
- Reinforced concrete frames
- Maximum 8 floors
- Poor seismic and energy performance

e-SAFE

Please contact:
secretariat@esafe-buildings.eu

e-SAFE has received funding from the European Union's Horizon 2020.
Coordination and support action programme under grant agreement No 893135.

Stay updated with e-SAFE

Gianpiero EVOLA, PhD
University of Catania
(Italy)

http://esafe-buildings.eu/en/

@eSAFEbuildings

esafe_buildings

www.facebook.com/esafebuildings

www.youtube.com/channel/UCeUVLI9cajywN5jBOd42pcA

SUSTAINABLE ENERGY WEEK

NETWORKING VILLAGE
Energy Talk
TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM
#EUSEW2021

EUSEW.EU

EUENERGYWEEK

@EUENERGYWEEK

SUSTAINABLE ENERGY WEEK

NETWORKING VILLAGE
Energy Talk

TOWARDS 2030: RESHAPING THE EUROPEAN ENERGY SYSTEM
#EUSEW2021