



New Challenge of the Public Buildings: nZEB Findings from IEE RePublic_ZEB Project

L. Aelenei^a, H. Petran^b, J. Tarrés^c, G. Riva^d, A. Ferreira^a, S. Camelo^a, V. Corrado^e,
M. Šijanec-Zavrl^f, G. Stegnar^f, H. Gonçalves^a, Z. Magyarg^g, Salom^c, E. Polychroni^e, K. Sfakianaki^e

^aLNEG, Paço do Lumiar 22, Lisbon, 1649-038, Portugal

^bURBAN-INCERC, Sos. Pantelimon 266, 021652 Bucharest, Romania

^cIREC, Josep Pla 2, B2, Ground floor, 08019, Barcelona, SPAIN

^dCTI, via Scarlatti, 29, Milano, 20124, Italy

^ePOLITO, C.so Duca degli Abruzzi 24, 10129, Torino, Italy

^fZRMK, Dimiceva, 12, Ljubljana, 1000, Slovenia

^gBME, Muegyetem rkp. 3., Budapest, HU-1111, Hungary

^hCRES, 19th klm Marathonos Ave., GR 190 09 Pikerimi, Greece

SUMMARY

- European Project RePublic_ZEB
- Building applied concepts/methodologies: NZEB, cost-optimal
- NZEB overview definitions
- Project findings

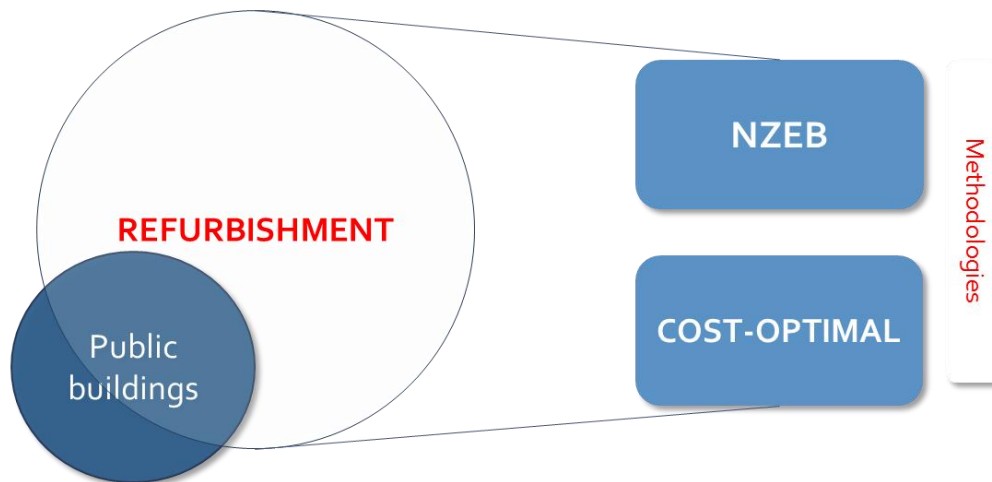
highlights...

REFurbishment of the PUBLIC building stock towards nZEB

RePublic_ZEB



Co-funded by the Intelligent Energy Europe Programme of the European Union



APPLIED CONCEPTS



DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 19 May 2010
on the energy performance of buildings

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 194(2) thereof,

Having regard to the proposal from the European Commission,

Having regard to the opinion of the European Economic and Social Committee⁽¹⁾,

Having regard to the opinion of the Committee of the Regions⁽²⁾,

Acting in accordance with the ordinary legislative procedure⁽³⁾,

Whereas:

(1) Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings⁽⁴⁾ has been amended⁽⁵⁾. Since further substantive amendments are to be made, it should be recast in the interests of clarity.

(2) An efficient, prudent, rational and sustainable utilization of energy applies, inter alia, to oil products, natural gas and solid fuels, which are essential sources of energy, but also the leading sources of carbon dioxide emissions.

(3) Buildings account for 40 % of total energy consumption in the Union. The sector is expanding, which is bound to increase its energy consumption. Therefore, reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the Union's energy dependency and greenhouse gas emissions.

⁽¹⁾ OJ C 277, 17.11.2009, p. 75.

⁽²⁾ OJ C 200, 25.2.2009, p. 41.

⁽³⁾ Position of the European Parliament of 23 April 2009 (not yet published in the Official Journal), position of the Council at first reading of 14 April 2010 (not yet published in the Official Journal), position of the European Parliament of 10 May 2010 (not yet published in the Official Journal).

⁽⁴⁾ OJ L 1, 4.1.2003, p. 47.

EPBD Recast

(4) Management of energy demand is an important tool enabling the Union to influence the global energy market and hence the security of energy supply in the medium and long term.

(5) The European Council of March 2007 emphasized the need to increase energy efficiency in the Union so as to achieve the objective of reducing by 30 % the Union's energy consumption by 2020 and called for a thorough and rapid implementation of the priorities established in the Communication Commission entitled 'Action plan for energy efficiency: realizing the potential'. This action plan identified the significant potential for cost-effective energy savings in the buildings sector. The European Parliament, in its resolution of 31 January 2008, called for the strengthening of the provisions of Directive 2002/91/EC, and has called at various times, on the latest occasion in its resolution of 3 February 2009 on the Second Strategic Energy Review, for the 30 % energy efficiency target in 2020 to be made binding. Moreover, Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020⁽⁶⁾, sets national binding targets for CO₂ reduction for which energy efficiency in the building sector will be crucial, and Directive 2009/18/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources⁽⁷⁾ provides for the promotion of energy efficiency in the context of a binding target for energy from renewable sources accounting for 30 % of total Union energy consumption by 2020.

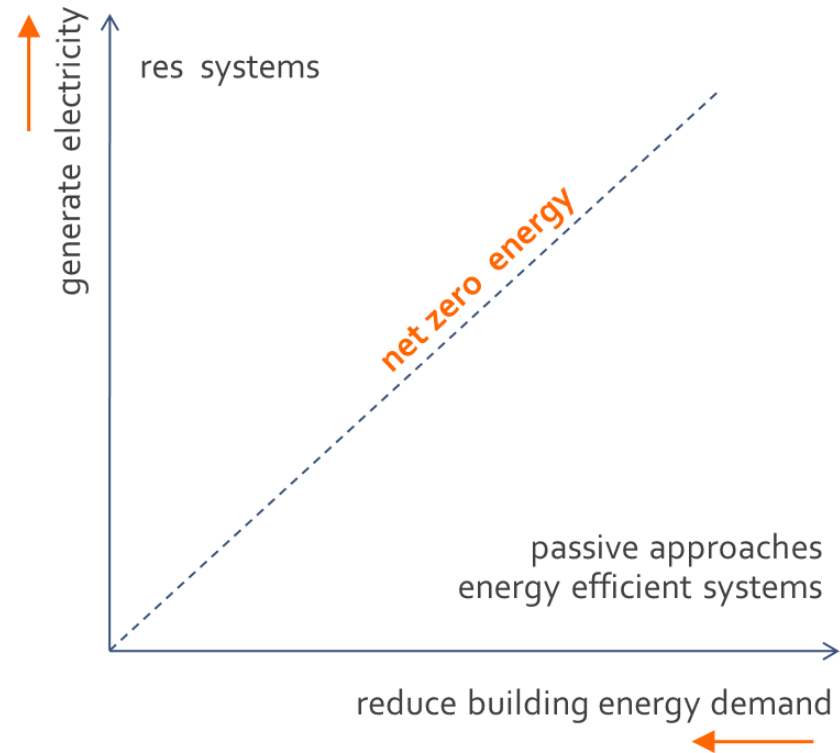
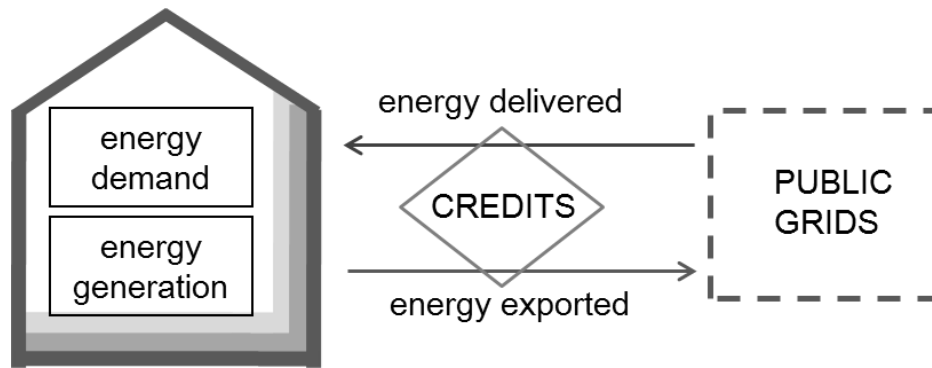
⁽⁶⁾ OJ L 140, 5.2.2009, p. 134.

Article 9 Nearly zero-energy buildings

- by 31 December 2020, all new buildings are nearly zero- energy buildings;
- after 31 December 2018, *new buildings occupied and owned by public authorities are nearly zero-energy buildings.*
- draw up national plans for nZEB public sector leading example
 - Interim target by 2015
 - National definition for nZEB/NZEB (including building retrofit towards NZEB levels)

OVERVIEW NZEB, nearlyZEB

DEFINITIONS

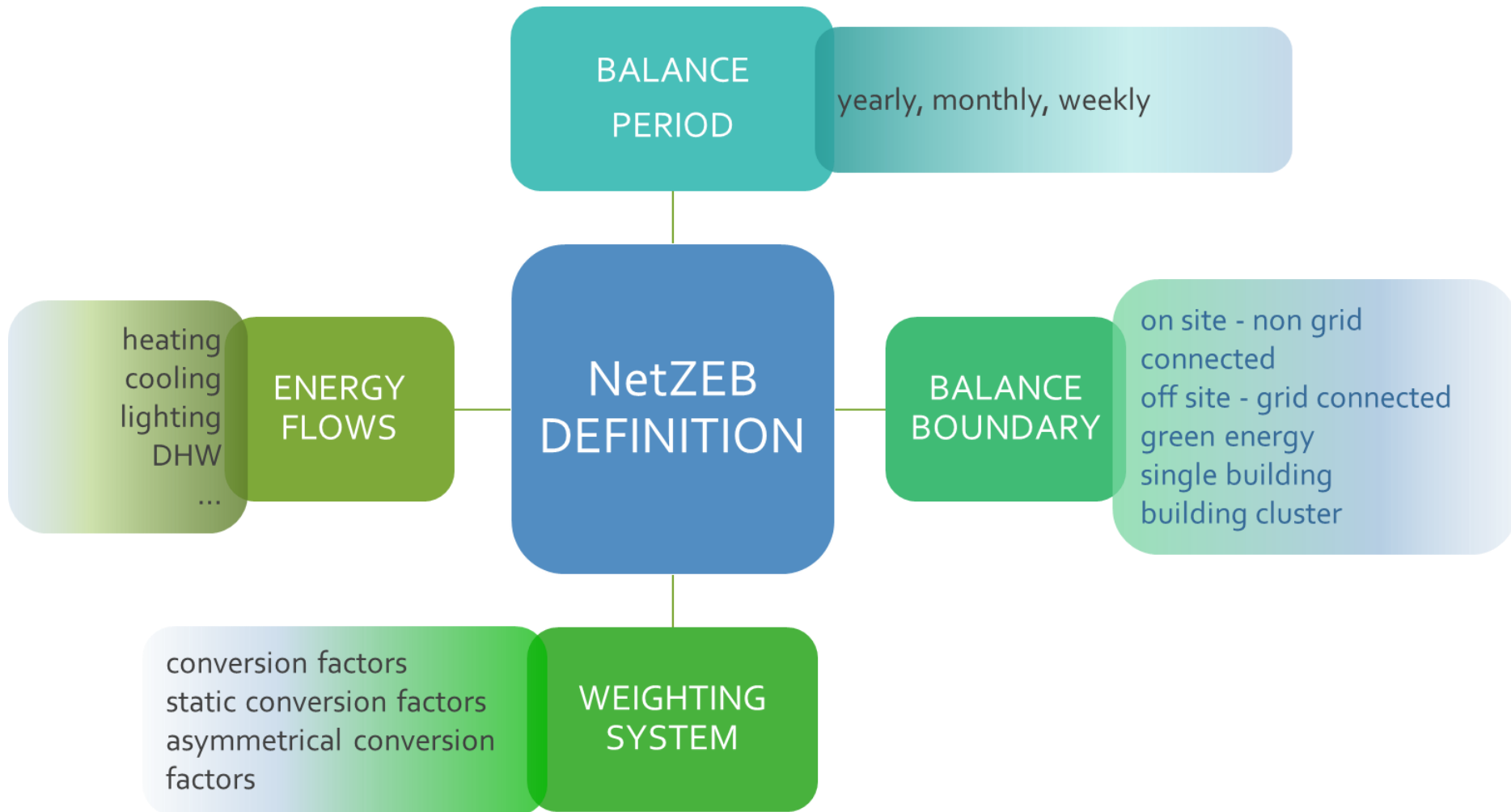


$$EB = \sum_i EE_i \times fe,i - ED_i \times fd,i$$

HOLLISTIC METHODOLOGY

- (a) Reducing energy demands
- (b) Energy generation

NZEB DEFINITIONS - parameters



OVERVIEW DEFINITIONS



- Use renewable energy sources available within the building's footprint.
- Use renewable energy sources available at the building site.
- Use renewable energy sources available off site to generate energy on site.
- Purchase off-site renewable energy sources.

Renewable Energy Supply option [Marszal et al. 2011]

OVERVIEW DEFINITIONS

		Net ZEB limited	Net ZEB primary	Net ZEB strategic	Net ZEB carbon
Building system boundary	Balance boundary	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING (only non residential buildings)	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS
Weighting system	Metric	PRIMARY ENERGY	PRIMARY ENERGY	Whichever metric desired	CARBON EMISSION
	Symmetry	SYMMETRIC	SYMMETRIC	SYMMETRIC or ASYMMETRIC	SYMMETRIC or ASYMMETRIC
	Time dependent accounting	STATIC OR QUASI-STATIC	STATIC OR QUASI-STATIC	STATIC OR QUASI-STATIC	STATIC OR QUASI-STATIC
Net ZEB balance	Energy efficiency	NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS ARE FULFILLED	NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS ARE FULFILLED	ANY NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS HAS TO BE FULFILLED	ANY NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS HAS TO BE FULFILLED
	Energy supply	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON/OFF SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES

Definitions [IEA Task 40, 2008-2013]

OVERVIEW DEFINITIONS

<p>building energy performance (EN15316-1:2007)</p>
<p>delivered energy (EN15603:2008)</p>
<p>exported energy (EN15603:2008)</p>
<p>net delivered energy (EN 15603:2008)</p>
<p>system boundary (EN 15603:2008)</p>

- Calculated or measured amount of energy delivered and exported actually used or estimated to meet the needs associated with heating, cooling, ventilation, domestic hot water, lighting and appliances.
- Energy, expressed per energy carrier, supplied to the technical building systems through the system boundary, to satisfy the uses taken into account or to produce electricity.
- Energy, expressed per energy carrier, delivered by the technical building systems through the system boundary and used outside the system boundary.
- Delivered minus exported energy, both expressed per energy carrier. Net delivered energy values are expressed separately for each energy carrier.
- Boundary that includes within it all areas associated with the building (both inside and outside of the building) where energy is used or produced.

RePublic_ZEB

REfurbishment of the PUBLIC building stock towards nZEB
March 2014 – August 2016

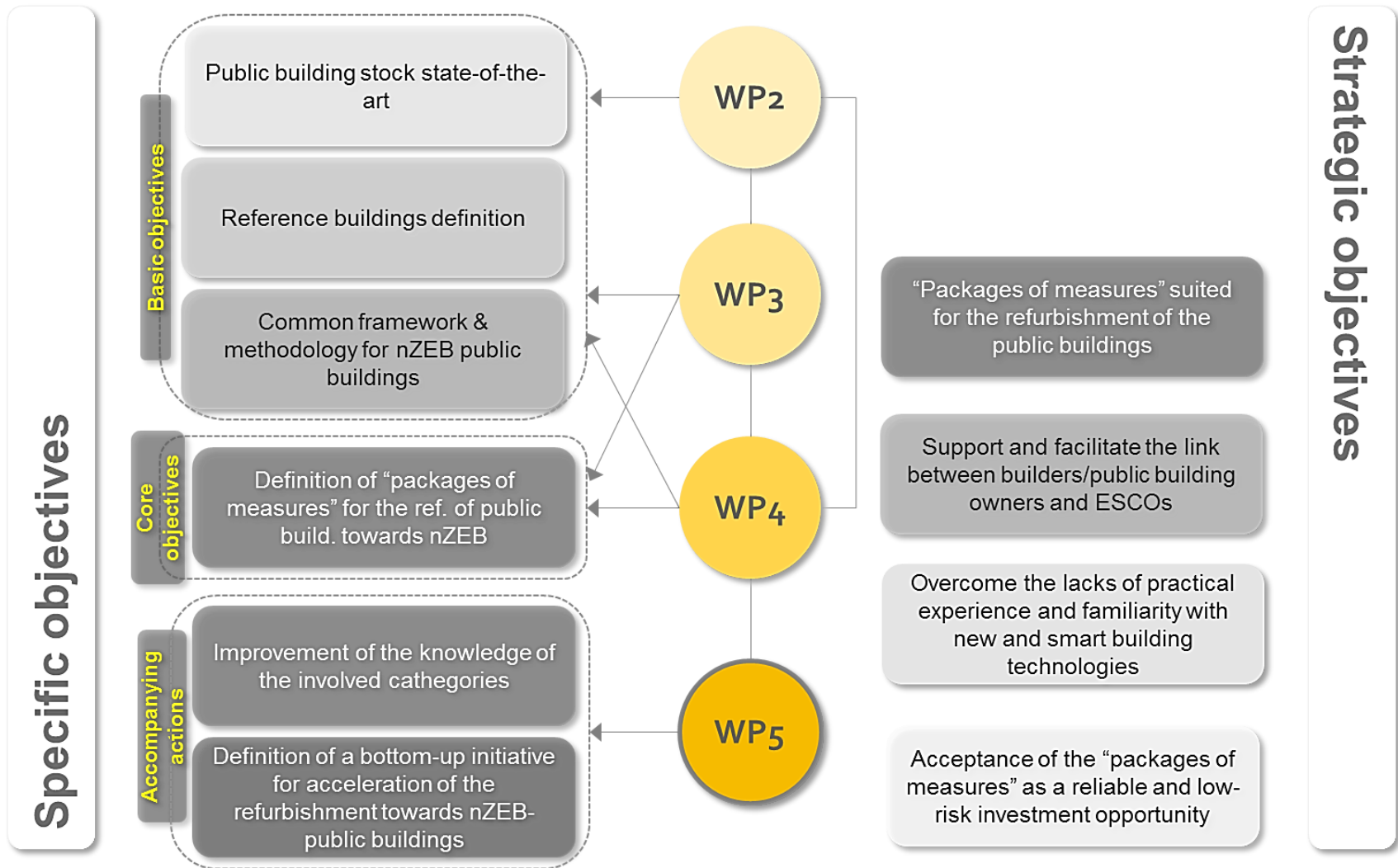
Coordination:

CTI (Italian Thermotechnical Committee Energy and Environment)

Partners



REPUBLIC_ZEB OBJECTIVES



ANALYSIS OF THE PUBLIC BUILDING STOCK

Educational
Schools
Universities
High schools

Other types of energy consuming buildings
civil and military airports
Rail stations, bus stations and harbor
Cinemas, concert halls, opera houses, theatres

Hotels and restaurants
Hotels
Other short-stay accommodation buildings

**Public Buildings
(EUROSTAT)**

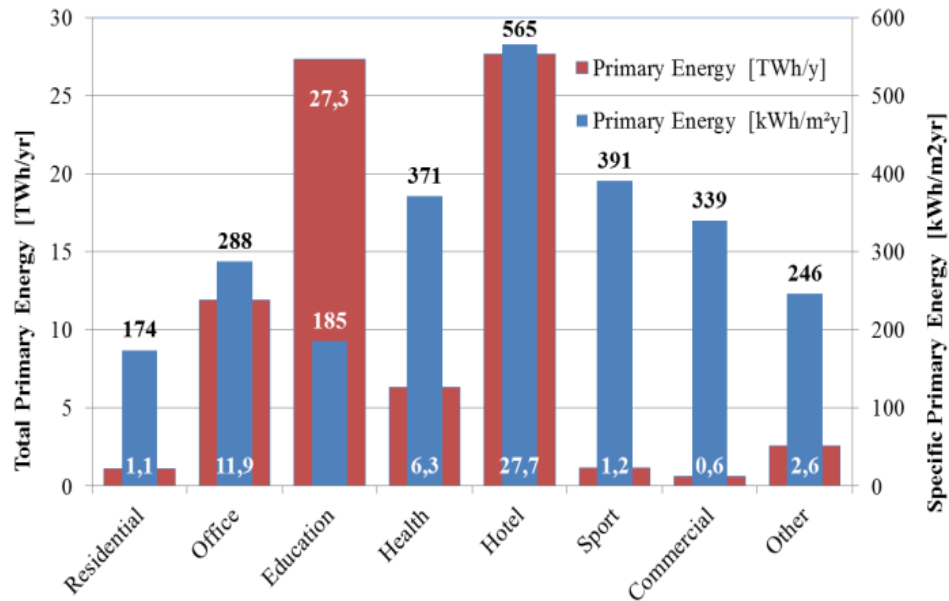
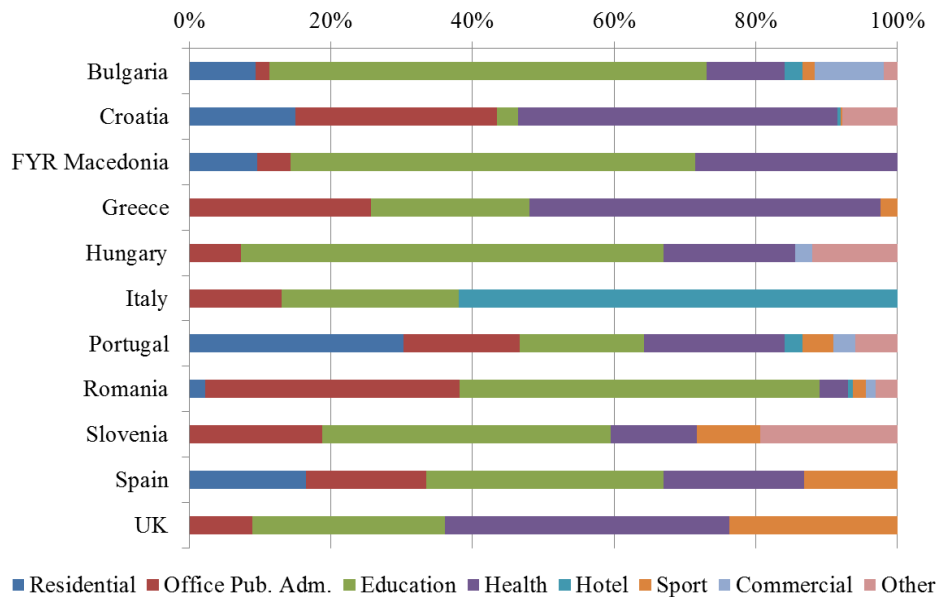
Sport facilities

Health care facilities
Hospitals
Other care buildings

Wholesale and retail trade service buildings

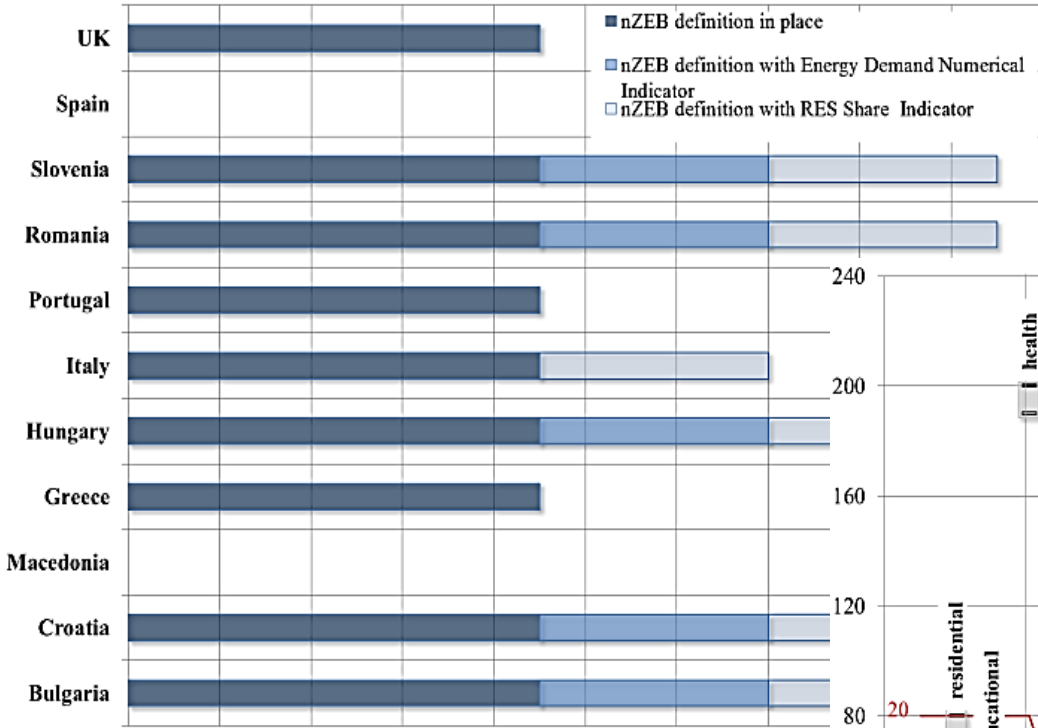
ANALYSIS OF THE PUBLIC BUILDING STOCK

Impact assessment for preliminary selection of reference buildings

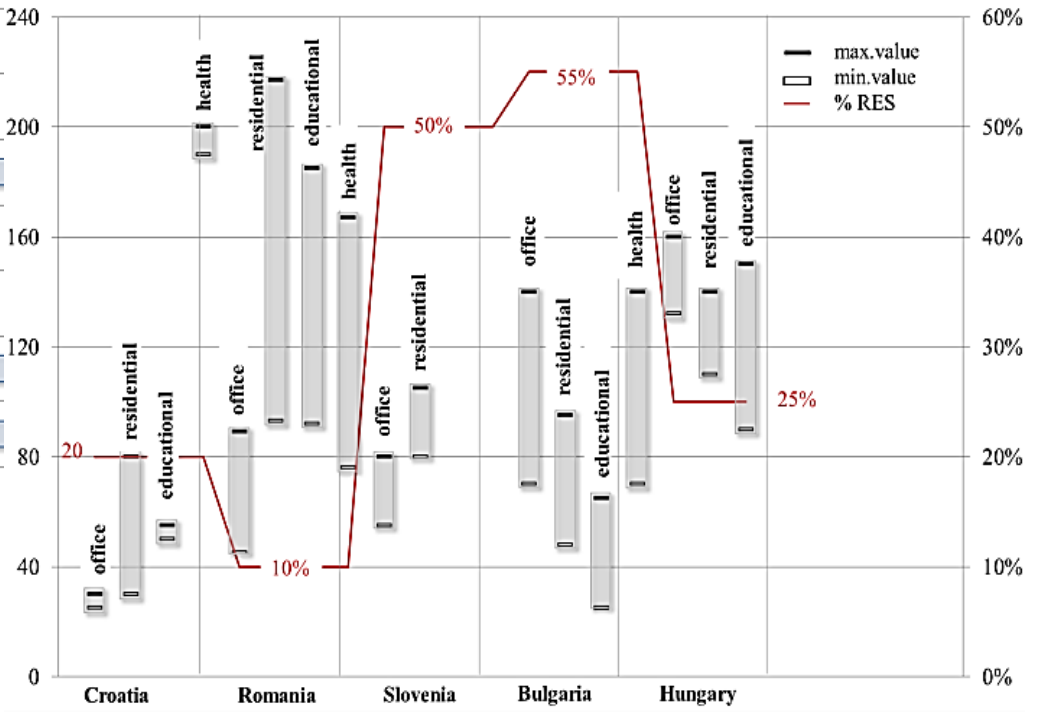


Total primary energy per building category in analysed countries.

NZEB DEFINITIONS APPLICATIONS



nZEB energy indicators



nZEB definition in place

DRIVERS AND BARRIERS

TRANSFORMATION INTO NZEB

DRIVERS	Bulgaria	Croatia	Macedonia	Greece	Hungary	Italy	Portugal	Romania	Slovenia	Spain	UK	BARRIERS
nZEB definition is described in the legislation												No numerical indicator for energy demand of nZEBs
Energy cost saving												No indicator of share of RES concerning nZEBs
Lower dependence on energy suppliers												No specifications of the boundary nZEB balance
Improved comfort												Requirements greatly vary locally within the country
Incentives and grants												Lack of financial instruments for renovation and nZEB
Tax deductions												High initial costs of investments
Low interest loans												Long payback time of investments
Best practices related to building renovation												Limited technical skill in the decision process
Best practices related to renovation to nZEB												Low number of demo renovation projects to nZEB
Demonstration nZEB projects												Lack of awareness concerning the economic benefits
Energy Performance Certification database												Uncertainties concerning the measurement and verification

This work is funded by IEE Project RePublic_ZEB, Grant agreement no. IEE/13/886/SI2.674899

Thank you

laura.aelenei@lneg.pt