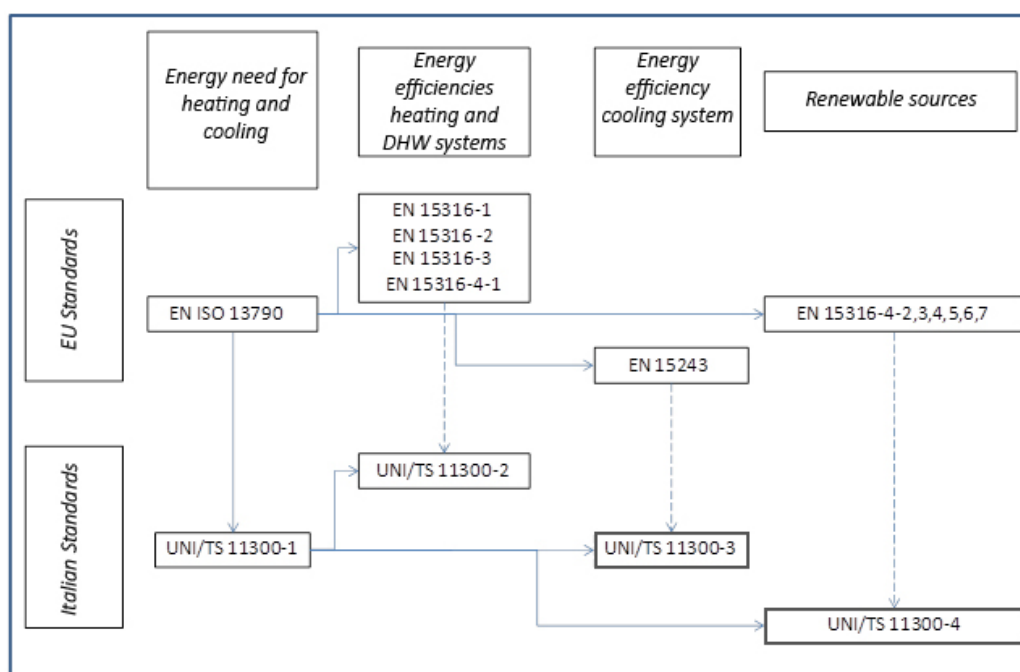


EXECUTIVE SUMMARY:

COUNTRY ASSUMPTIONS UNDERPINNING APPLICATION OF THE ENERGY USE EVALUATION METHODOLOGY TO THE REFERENCE BUILDINGS



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RePublic_ZEB Project

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Website: www.republiczeb.org

Project consortium



BME

WP3 Leader



BRE

WP6 Leader

BSERC

WP2 Leader



CRES

Partner



CTI

WP1-WP7 Leader
Coordination



EIHP

Partner



URBAN-INCERC

Partner



IREC

Partner



LNEG

WP5 Leader



MACEF

Partner



POLITO

WP 4 Leader



ZRMK

Partner

Project overview

The RePublic_ZEB project is focused on the energy and CO₂ emissions associated with existing public buildings and their refurbishment towards nZEB.

The **core objective** of the project is to:

- Define costs-benefit optimized “packages of measures” based on efficient and quality-guaranteed technologies for the refurbishment of the public building stock towards nZEB that are standardized and adopted by builders and building owners.

From this stems three **basic objectives**:

- (i) State-of-the-art assessment of the public building stock through a country-specific evaluation of the energy consumption and CO₂ emissions;
- (ii) Define reference buildings; and;
- (iii) Develop a common framework and a harmonized methodology for the definition of a nZEB concept for public buildings.

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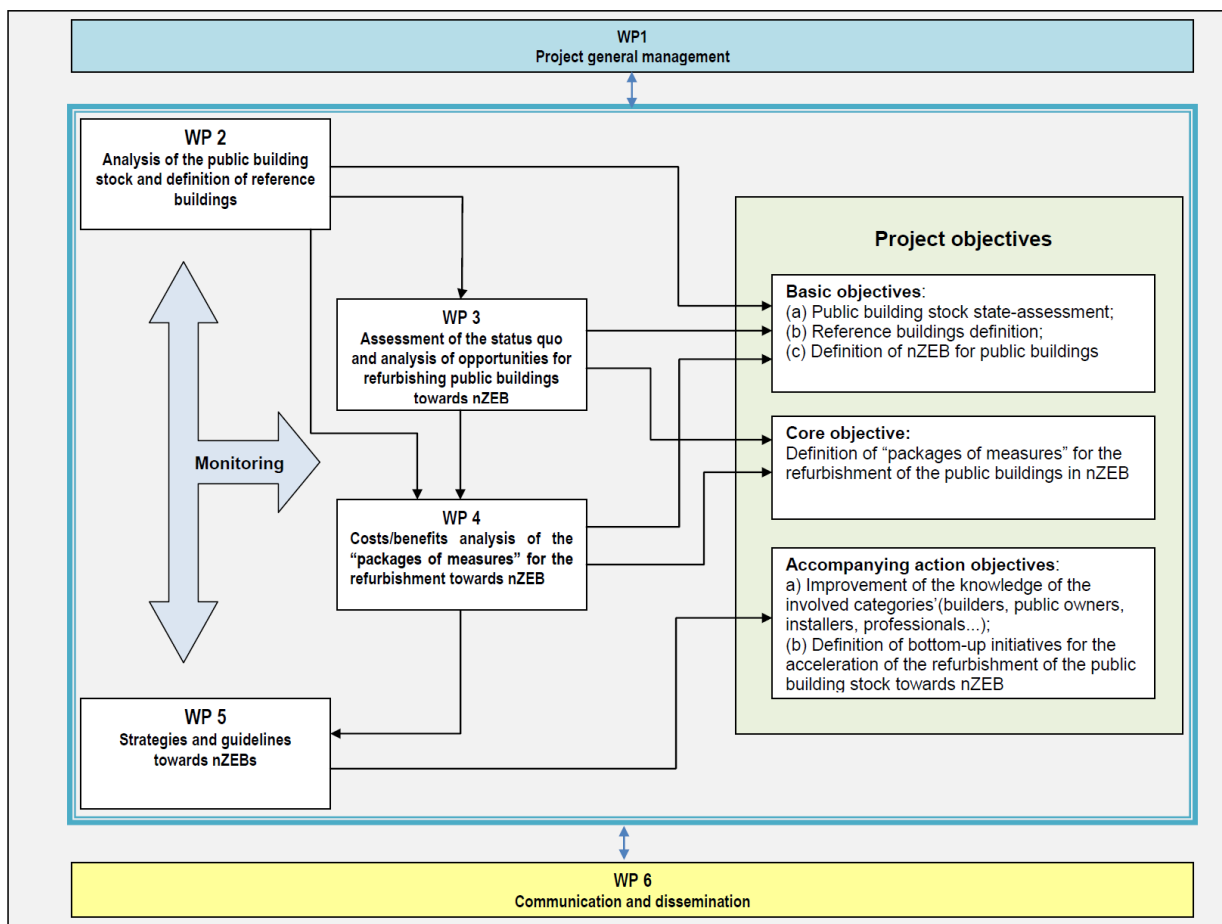
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Executive Summary

This document is one of a series of executive summary of the core deliverables of the RePublic_ZEB project. This is a summary of first deliverable in Work Package (WP) 4. The flow chart below shows its context in the overall project.



1. Objective

The objectives of this report are to:

- Describe the common methodology to calculate the energy performance (EP) of the project's reference buildings
- Compare this to the national EP methodologies used by the project partners and identify key differences

2. Common tool

This report details the common methodology to calculate the total global primary energy use according to the definition in prEN ISO/DIS 52000-1:2015 (which substituted prEN 15603:2015), and to collect the country/project partner assumptions for the application of the energy use evaluation methodology.

Three different calculation options were considered as set out in Table 1 below.

Option	Level of detail	Description	Reference
1	Simple	<p>Common tool provided by POLITO which allows assessment of:</p> <ul style="list-style-type: none"> energy need for heating/cooling/DHW; for each energy carrier and/or source, the energy demand for heating/cooling/DHW/ventilation and lighting; for each service, the non-renewable/renewable/total primary energy; Renewable Energy Ratio, RER. 	EN standards
2	Simple	National EP assessment tools (different for each country)	EN standards
3	Detailed	Dynamic simulation tools (chosen by each partner)	Existing SW (e.g. EnergyPlus, ESPr, TRNSYS, IDA ICE etc.)

NB. Even for Option 1, national assumptions regarding climatic data, occupancy data, and default values of thermal parameters are considered.

Table 1. Different calculation options for the EP evaluation

The main assumptions underpinning the common tool are:

- continuous heating and cooling;
- monthly time step;
- convective and radiative parts of sensible internal heat gains are considered together;
- infiltration and the ventilation rate are considered together;
- heating and cooling seasons can be either fixed at national level, or based on building characteristics and climatic data;
- the emission sub-system in the technical systems is considered separately from the control sub-system;
- the sub-system of the technical systems are modelled by means of fixed efficiencies, according to the technical characteristics; the tool does not perform an holistic calculation (e.g. efficiency expressed after the energy balance has been calculated).

As shown in Table 2 below, most of the partners will use the common tool provided by POLITO.

	OPTIONS			REFERENCE TOOL
	(1) Common tool provided by POLITO	(2) EP assessment national tool	(3) Dynamic simulation tool	
Bulgaria		X		(2)
Croatia	X	X		(1)
Former Yugoslav Republic of Macedonia	X			(1)
Greece	X			(1)
Hungary	X	X		(1)
Italy	X		X	(1)
Portugal	X	X	X	(1)
Romania	X		X	(1)
Slovenia	X	X	X	(1)
Spain	X			(1)
UK	X	X		(1)

Table 2. Calculation tools adopted for the energy performance evaluation

3. Comparison of common tool with national methodologies

The use of the common tool as a reference was recommended so as to make it easier to compare results among the different countries. Nevertheless, partners were free to adopt the most suitable calculation methodology. For that reason, Bulgaria, Croatia, Hungary, Portugal, Slovenia and the UK will also perform calculation by means of national tools; in addition, Italy, Romania, Portugal and Slovenia will use dynamic simulation tools.

For each of the project countries the report goes through the following issues relating to space heating/cooling and (de)humidification, technical systems and renewables:

- Calculation method
- Zone/Room heat balance
- External surface heat transfer
- Thermal transmission through the envelope
- Solar gains through glazing components
- Ventilation
- Lighting
- Occupancy and internal gains
- External conditions
- Solar collectors
- Heat pumps
- PV panels

to highlight differences in the assumptions concerning calculation methodologies and parameter defaults. The report also has extensive tables in an appendix that compares national reference values for the following variables:

ZEROING IN ON ENERGY

- Heating set-point (and set-back) temperatures for the different reference building categories
- Cooling set-point temperatures for the different reference building categories
- Heating and cooling season for the specific reference buildings
- Overall internal sensible heat gains: monthly time-averaged value
- Air flow rate (infiltration + ventilation): monthly time-averaged value
- DHW energy service
- Primary energy factors for different energy carriers/sources (renewable and non-renewable), although some countries have no values for non-renewable sources.