X-tendo

DESCRIPTION OF METHODOLOGIES AND CONCEPTS FOR THE TECHNICAL IMPLEMENTATION OF FEATURES ON IMPROVED HANDLING AND USE OF EPC DATA IN SELECTED COUNTRIES - FINANCING OPTIONS

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X-tendo

eXTENDing the energy performance assessment and certification schemes via a mOdular approach

D4.4 Description of methodologies and concepts for the technical implementation of each feature regarding improved handling and use of EPC data in selected implementing countries

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EXECUTIVE SUMMARY

The X-tendo project is developing a framework of ten "next-generation Energy Performance Certificates (EPC) features", aiming to improve compliance, usability and reliability of the EPC. These features are divided in two categories: 1) innovative indicators and 2) innovative data handling practices.

This report describes the methodologies and concepts for the technical implementation of each innovative data handling feature - **EPC databases, building logbook, enhanced recommendations, financing options and one-stop-shops**. It also presents in detail the country-specific implementation of the developed methodologies in the X-tendo target countries.

The present report builds on past projects activities and provides input to upcoming technical implementation tools and guidelines (excel spread and programming code), as well as the testing of the methodologies in each implementing country. For additional information and further background, previous project reports are listed below:

1. Introductory reports of the 10 innovative EPC features (Deliverable 2.3)
2. Description of implementing partners' user needs and detailed technical specifications regarding features on handling and use of EPC data (Deliverable 4.2)
3. Summary of implementing partners' user needs and detailed technical specifications (Deliverable 4.3)
4. Tools, concepts and guidelines for features: building logbook, enhanced recommendations and EPC databases (Toolbox – area per each feature)
5. Recommendations and replicability potential (Toolbox – area per each feature)

The described methodologies and concepts will be implemented and tested during the forthcoming stages of the project. Together with the general feature concept, also country-specific aspects of the methodology are presented. The complete set of materials will be accessible online via the X-tendo Toolbox (https://x-tendo.eu/toolbox/).

This document is the revised version of the report completed in April 2021.

INTRODUCTION

This report describes the methodologies and concepts for the technical implementation of each innovative EPC data handling feature - EPC databases, building logbook, enhanced recommendations, financing options and one-stop-shops.

Energy performance certificates (EPCs) are an important instrument across Europe to assess and register information about building's energy performance. They have the potential to be used as more than just as a energy label, as they can provide market participants with relevant information to assess, benchmark and plan the improvement of the building's energy performance. Besides the information included in each document, data handling and the effective use of the information for wider building improvement and decision-making purposes are becoming more and more important. The Renovation Wave Communication published by the European Commission in October 2020 reinforced the importance of the existing EPC frameworks to improve the data gathering, storage, data mining, data analysis and overall quality of EPCs. Furthermore, the Commissions' proposal to recast the Energy Performance of Buildings Directive 2018/844 (EPBD) introduces comprehensive improvements, such as rescaling, design, additional indicators, and the requirement for the certificates to be available in digital format.

The, especially in regard to the last point, the five X-tendo features explore different functionalities on how to handle with digital EPC data. The present document describes in detail the methodologies and concepts of each feature: EPC databases (Chapter 2), building logbook (Chapter 3), enhanced recommendations (Chapter 4), Financing options (Chapter 5) and one-stop-shops (Chapter 6). For the features EPC databases, building logbook and enhanced recommendation, the described methodologies will be implemented as tools (project report 4.5 "Tools, concepts and guidelines for features: building logbook, enhanced recommendations and EPC databases").

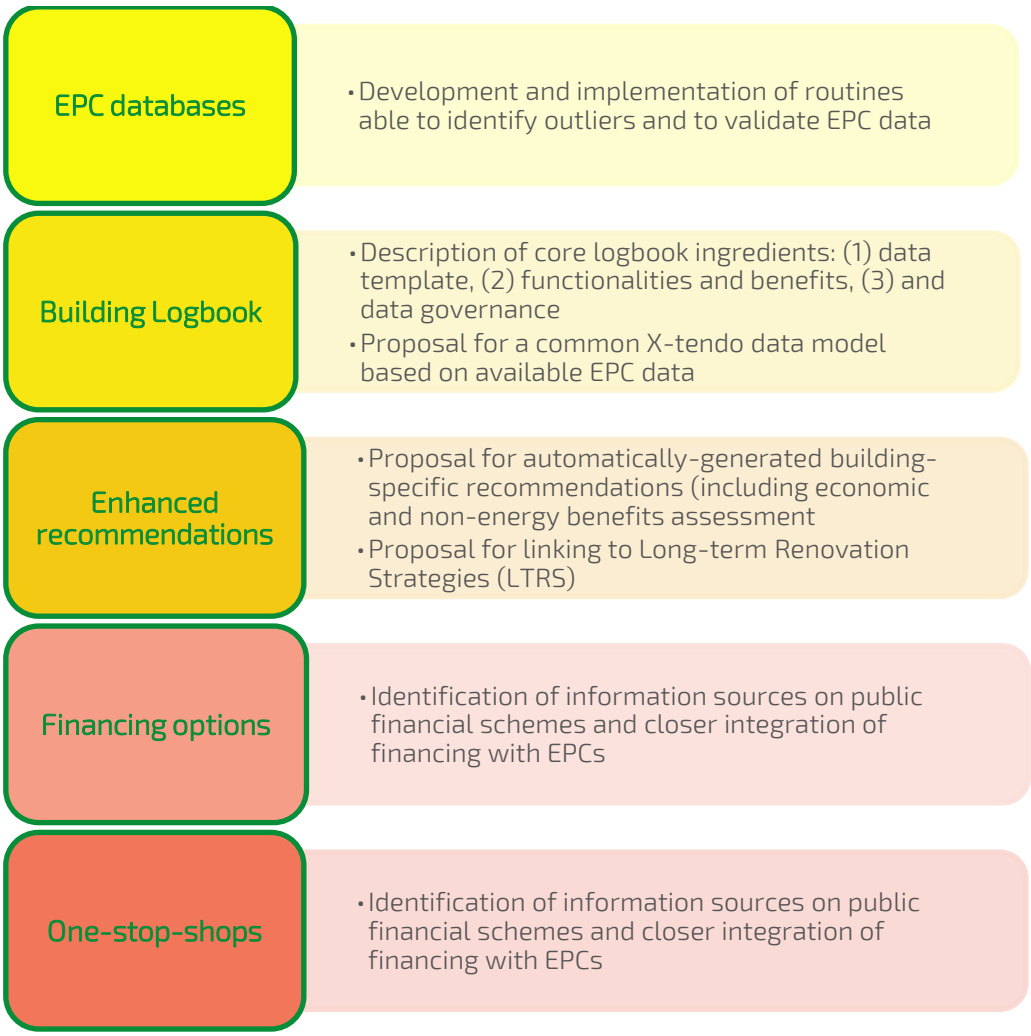

Figure 1: X-tendo methodology for features EPC databases, building logbook, enhanced recommendations, financing options and one-stop-shops

The methodology will be tested in different X-tendo implementing countries, as shown in the Table 1 below. The expert partners were responsible to share their national experience, especially relevant for setting up the final methodology.

	 EPC databases	 Building Logbook	 Enhanced Recommendations	 Financing Options	 One Stop Shops
Feature lead	*TU Wien*	*BPIE*	*TU Wien*	*ADENE*	*ADENE*
Austria, EAST			Expert		
Denmark, DEA	Implementer		Implementer	Implementer	Implementer
Estonia, TREA		Implementer			
Greece, CRES	Implementer	Implementer			
Italy, ENEA	Implementer				
Poland, NAPE			Implementer	Expert	
Portugal, ADENE		Expert / Implementer		Implementer	Expert
Romania, AAECR				Implementer	Implementer
UK, EST	Expert		Implementer		Implementer

Table 1: Implementing and expert countries per feature

1 FINANCING OPTIONS

1.1 Feature introduction

To meet the climate objectives of the European Union and support the transition to a clean energy system, there is a need to further unlock public and private financing and boost the energy renovations in buildings. EPCs and related buildings data play a key role to access to preferential financial instruments. EPCs can provide a market benchmark and clear eligibility criteria, as well as support financing decision-making and risk assessment. Furthermore, the provision of sources of information on financial support alongside with the EPC recommendations can help to persuade building users to undertake a renovation and will push the energy efficiency renovation market via additional information sources on public financial schemes. Linking this feature to existing EPC frameworks will help to overcome existing barriers between the financing institutions and the end-users, as well as increase the success rate of the existing financing schemes.

1.2 Proposed Methodology

The methodology intends to identify information sources on public financial schemes that can be provided alongside the EPCs and explore how financing schemes can be more closely integrated with these, providing guidelines on approaches and mechanisms to achieve this goal. The outcome dedicated to public authorities will be guidance on how to link EPC schemes with financial instruments, which could be easily applied by the countries involved, either fully or running partially at least 2 of the 3 modules (Table 2): **Financing schemes portfolio** (mandatory, since it is crucial to have an overview of the available financing schemes in order to be able to proceed), **How to link EPCs to financing** (mandatory, since fostering synergies through EPCs is one of the goals of X-tendo project) and **How to communicate financing** (optional, since the focus is on developing a unique platform, which depends on the level of maturity and digitalization of EPC databases and financing platform in each country).

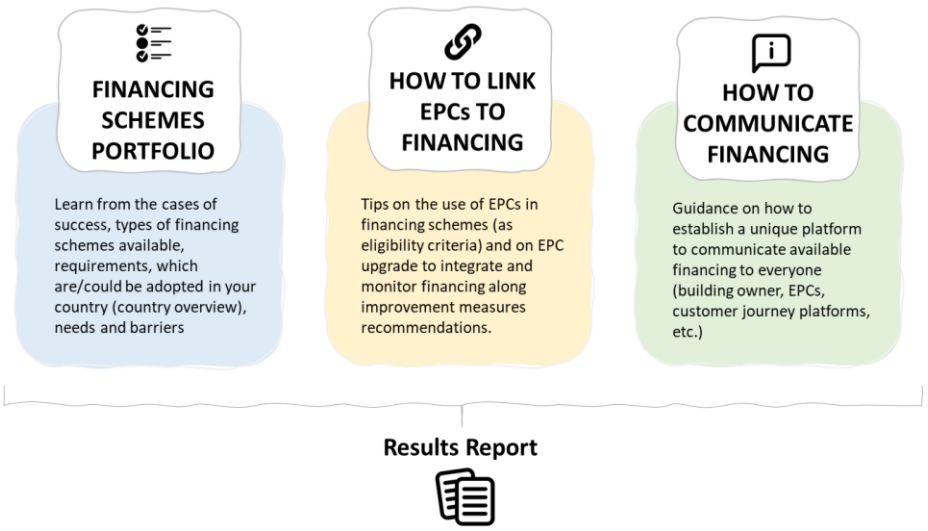

Table 2: Overview of Feature 9 - Financing Options methodology

Financing Schemes Portfolio

The X-tendo project has carried out a mapping to identify information sources on public financial schemes that can be provided alongside the EPC. The following actions can be taken to achieve this goal:

- List the types1 of mechanisms and available financing, including:
  - Access requirements (identify also if EPC is one requirement);
  - Type, focus and target audience;
  - Financing conditions;
  - Type of data used to underwrite and monitor the financing mechanisms;
  - Stakeholders involved, budget and timeframe;
- Available database and information
- Map the needs and barriers faced by financial institutions (SWOT Analysis)

[1] Identifying in which category integrates: Traditional well-established, Tested and growing in the market, New and innovative

Expected outcomes

- Financing Scheme types & description (Portfolio)
- Needs & Barriers
- Best Practices in the use of financing related to EPC
- Data needed to support financing schemes (EPCs and other)

How to Link EPCs to Financing

Additionally, X-tendo explored how financing schemes can be more closely integrated with EPCs, namely by considering the identification of available financing options, the link of EPC data with financial options, as well as effective communication with building owners/users. Therefore, the following actions can be taken to achieve this goal:

- Identify needed data from EPC for financing schemes (eligibility criteria);
- Identify which kind of information is available in EPC (financing related);
- Assess the level of interoperability between EPCs and other data sources;
- Detail how the improvement measures are evaluated and documented, including which type of data is recorded and their scope;
- Assess the suitability of methodologies used in the evaluation of energy performance of buildings for financing eligibility;
- Identify recommendations on the use of EPCs and data in financing schemes (eligibility criteria and how to present financial options and indicators).

How to communicate "Financing"

Centralising the existing financing mechanisms resulting from the country portfolio (stage 1) and the requirements to link these to EPC data (stage 2) on a single platform can be a great opportunity to make this information useful and easily available to everyone.
Therefore, the following actions can be taken to achieve this goal:

- List the type of mechanisms available and their digital address (from country portfolio);
- List the eligibility criteria based on EPCs (from link EPC to financing);
- Assess/identify the level of interoperability with financing platforms (from link EPC to financing);
- Assess/identify the level of interoperability with other platforms (EPCs, one-stop-shops, renovation passports, etc.);
- Create a platform governance & ownership plan to keep the platform updated

Expected outcomes

- Recommendations on how to setup a unique platform with all available financing mechanisms:
  - Data structure, maintenance, interoperability needs, etc.
  - Link to existing financing schemes and strategic/economic plans (country overview)
- Link of the recommendation needs identified in the EPC to financing schemes (e.g. digital EPC)
- Link of financing schemes to other platforms (one-stop-shop, renovation passports, etc.)

Regardless of the guidance given by the feature results report, they will always be important to identify the challenges that need to be overcome when setting-up this methodology. Similarly, there will also be several benefits resulting from it. Figure 2 summarizes some of these challenges identified by the implementing partners under the X-tendo project as well as some of the benefits boosted by implementing this methodology.

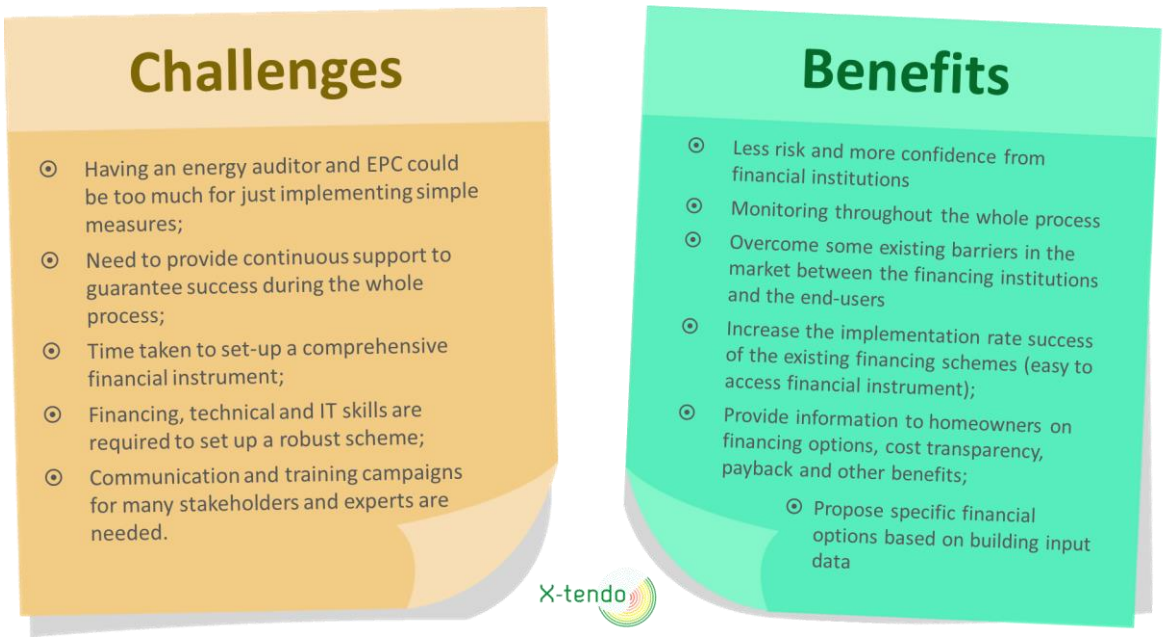

Figure 2: Main challenges and benefits of Financing options methodology implementation

1.3 Countries' implementation

In general, the methodology can be applied for all implementing countries considering the testing that suits better their country specificity and context. Table 3 presents the country specific implementation of the proposed methodology.

	Portugal	Denmark	Romania
Financing Schemes Portfolio	Country Portfolio	Country Portfolio	Country Portfolio
Link EPC to Financing	Link of EPCs with existing financing scheme	Recommendations on EPC upgrade	Link of EPCs with energy audits for financing
Communicate Financing	Interoperability of EPC database with the financing scheme platform*	Link between financial opportunities and renovation projects	-

*Identification of the functional specifications, not implementation

Table 3: Summary of X-tendo activity per implementing country

The focus of this feature testing along the implementing partners was on how to link EPCs to financing in order to deliver recommendations on the use of EPC in financing schemes (as eligibility criteria) but also on EPC upgrade to integrate and monitor financing along improvement measures recommendations.

Portugal (ADENE) will test the link of EPC with an existing financing scheme (IFFRU 2020), namely by evaluating the call implementation and how to advance on future calls setup and monitoring. It also includes technical assistance closely related with the EPC and how to interoperate the EPC database with the financing scheme platform. To achieve this goal, a workshop with relevant stakeholders will be organised under this feature, as well as technical meetings with the financing scheme team and a questionnaire to energy auditors.

Denmark (DEA) will be developing an analysis based on interviews that follow up with homeowners engaged in renovations right from the scoping and inception phase till the implementation and commissioning of the works. The purpose of the interviews will be to identify financial barriers and opportunities in the planning process of energy renovations.

Romania (AAECR) will be testing the link of EPCs (calculated performance) with energy audits for financing, specifically by calculating theoretical and real energy savings coupled with realistic economic efficiency indicators for recommended measures since most of the financing schemes available in Romania require the existence of an energy audit report.

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ANNEX I – PRE FABRICATED RECOMMENDATIONS

Number	Benefit
1	Decrease heating energy demand: every degree lower room temperature saves heating energy. Usually 20 to 22 C° is sufficient in living rooms, 18 to 20 C° in the kitchen, 23 C° in the bathroom and 16 to 18 C° in the bedroom.
2	Decrease heating energy demand and increase indoor air quality: tilted windows provide constant fresh air. However they also cool down the air. Correct ventilation should be provided 2 to 3 times a day for about 4 to 5 minutes, with open windows and doors in all rooms. This ensures the necessary air exchange.
3	Decrease heating energy demand by keeping radiators free: Prevent furniture, curtains and curtains in front of radiators so the heat can spread evenly throughout the room.
4	Decrease heating energy demand and increase thermal comfort with automatic regulation: programmable thermostats ensure more comfort and less heating energy consumption. This allows rooms to be heated according to the use of the room, and end-user presence.
5	Decrease heating energy demand and increase indoor air quality with efficiency radiators: if radiators do not warm up properly even though the thermostat is fully turned on, it causes a waste of energy. By using regular valves energy savings can be provided.
6	Decrease heating energy demand and increase indoor air quality by cleaning the radiator regularly. Dust has an insulating effect and reduces the efficiency of the radiator.
7	Decrease heating energy demand: install insulation panels behind radiators. An insulation layer behind the radiator reduces the heat loss via the outer wall. Attention: check regularly whether moisture is forming between the panel and the wall.
8	Decrease heating energy demand: windows insulation by using sealing tape can provide high energy savings with lower investments costs.
9	Decrease heating energy demand: keep blinds and curtains closed at night to prevent heat from escaping the room on cold nights.

ANNEX II – RULES FIRST THRESHOLD CHECK (PER COUNTRY)

Greece

Variable Name	Rule
Climate zone	In the range [1;4]
U-value external wall	Greater than 0
U-value roof	Greater than 0
U-value door	Greater than 0
U-value floor against ground	Greater than 0
Surface area external wall	Greater than 0
Surface area roof	Greater than 0
Surface area door	Greater than 0
Surface area floor against ground	Greater than 0
Surface area window	Greater than 0
Window glazing U-value	Greater than 0
Window g-Value	Greater than 0
Sun protection (Shading)	Greater than 0
Heat Efficiency	Greater than 0
Cooling Efficiency	Greater than 0
Lighting	Greater than 0
Building use	In the range [1;60]
Reason	In the range [1;19] or Equals 99
Suggestions	If the energy class is C or worse, at least one suggestion is required
Primary Energy For Heating	Greater than 0
Primary Energy For Cooling	Greater than 0
Primary Energy For Lighting	Greater than 0
Primary Energy Consumption	Smaller than 5000
Reference Building Primary Energy Consumption	Smaller than 5000
CO2 emmissions	Greater than 0
Gross building area	Greater than 0
Useful building area	Greater than 0 and less than or equal to Gross building area

Useful building volume	Greater than 0
Heated area	Greater than 0 and less than or equal to Gross building area
Cooled area	Greater than 0 and less than or equal to Gross building area
Heating days	In the range [1;364]
Climate region	In the range [1;4]
Windows orientation	In the range [1;359]
Ventilation system type	Is not null
Mechanical ventilation system exists	In the range [0;1]
Heating energy source	Element of ["LPG", "Natural Gas", "Electricity", "Heating Diesel oil", "Transport Diesel oil", "Distrinct Heating (PPC)", "Distrinct Heating (Renewable)", "Biomass", "Standardized Biomass"]
Reference heating energy needs	Greater than 0
Building's heating energy needs	Greater than 0
Domestic hot water energy needs	Greater than 0
Useful heating energy (dhw)	Greater than 0
Useful electricity demand	Greater than 0
Primary energy demand	Greater than 0
Carbon dioxid emission	Greater than 0

Italy

Variable Name	**Rule**
Cadatral identification of buildig ID	Is not null
User profile (name or code)	In the range [0;14]
Statistical code of the Region	In the string range [01;22]
Regional ID of the EPC	Is not null
Heated area	Greater than 0
Cooled area	Greater than 0
Heated bruto-volume	Greater than 0
Cooled bruto-volume	Greater than 0

Building envelope area (heat loss area)	Greater than 0
Compactness (based on heat loss area)	Greater than 0
Heat degree days	Complex table-based check
Climate region	Complex table-based check
Yie-value periodic thermal transmittance	Greater than 0
Equivalent solar Area/net heated area Ratio	Greater than or equal to 0
Mechanical ventilation system exists	Boolean value
Building structure	In the range [0;14]
Heating energy sources	In the range [0;15] if Space heating service exists
Cooling energy sources	In the range [0;15] if Space heating service exists
Energy demand for each energy source	Greater than 0
EPhnd,lim -> indicator	Greater than 0
Building's heating energy needs	Greater than 0
Reference Global primary energy demand (not renewable)	Greater than 0
Global primary energy demand (not renewable)	Greater than or equal to 0
Global primary energy demand (renewable)	Greater than or equal to 0
Global carbon dioxid emission	Greater than 0
Exported eletrical energy (for example: PV)	Greater than or equal to 0 or null
Primary energy demand (not renewable)	Complex table-based check
Space heating service exists	True
Heating primary energy demand (not renewable)	Greater than or equal to 0
Heating primary energy demand (renewable)	Greater than or equal to 0
Heating system efficiency	Greater than 0
Space cooling service exists	Boolean value
Cooling primary energy demand (not renewable)	If Space cooling service exists then Greater than or equal to 0
Cooling primary energy demand (renewable)	If Space cooling service exists then Greater than or equal to 0
Cooling system efficiency	If Space cooling service exists then Greater than to 0
DHW service exists	True if user profile equals 0 or 2

DHW primary energy demand (not renewable)	If DHW service exists then Greater than or equal to 0
DHW primary energy demand (renewable)	If DHW service exists then Greater than or equal to 0
DHW system efficiency	If DHW service exists then Greater than 0
Mech Vent primary energy demand (not renewable)	If Mechanical_Ventilation System Exists then Greater than or equal to 0
Mech Vent primary energy demand (renewable)	If Mechanical_Ventilation System Exists then Greater than or equal to 0
Mech Vent system efficiency	If Mechanical_Ventilation System Exists then Greater than 0
Lightning is considered	Boolean value
Lighting primary energy demand (not renewable)	If Lightning is considered then Greater than or equal to 0
Lighting primary energy demand (renewable)	If Lightning is considered then Greater than or equal to 0
Lighting system efficiency	If Lightning is considered then Greater than 0
Transport systems are considered/exist	Boolean value
Transport primary energy demand (not renewable)	If Transport systems are considered then Greater than or equal to 0
Transport primary energy demand (renewable)	If Transport systems are considered then Greater than or equal to 0
Transport system efficiency	If Transport systems are considered then Greater than 0

ANNEX III – CLUSTER PARAMETERS (PER COUNTRY)

Greece

Building uses

Residential single family houses
Residential multifamily houses
Hotels of continuous yearly operation
Hotels of intermittent operation – summer
Primary education schools
Secondary education schools
Higher education buildings
Hospitals
Offices

Climate zones

A
B
C
D

Construction period

1	Before 1980	no any insulation regulations in force
2	1980-2010	1st Building Insulation Regulation
3	2010-todate	2010-Transposition of EPBD & 1st Energy Performance Regulation

Renovation period

1	No renovation
2	2010-2017
3	after 2017

Italy

Building uses

1	Residential
2	Office buildings
3	Commercial buildings
4	Buildings for industrial and craft activities
5	Other not residential

Building constructions period

1	Before 1945
2	1945-1976
3	1977-1991
4	1992-2005
5	2006-2015
6	From 2016

Climate zone

1	A+B (<= 900 HDD)
2	C (901<=HDD<=1400)
3	D (1401<=HDD<=2100)
4	E (2101<=HDD<=3000)
5	F (HDD>= 3001)

ANNEX IV – PARAMETERS SECOND THRESHOLD CHECK (PER COUNTRY)

Greece

Envelope characteristics	**Unit / comment**
U-value external wall	W/m2K
U-value roof	W/m2K
U-value floor against ground	W/m2K
U-value floor on pilotis	W/m2K
U-value windows	W/m2K
Energy consumption class	
Total Primary Energy Consumption	kWh/m2
HVAC Systems Data	
Heating System Efficiency	SCOP
Cooling System Efficiency	SEER
Mechanical Ventilation system (air supply)	m3/h
Solar Collector Area	m2
Energy Consumption Indicators	
Total final Energy Consumption	kWh/m2
Energy Consumption for Heating (final)	kWh/m2
Energy Consumption for Cooling (final)	kWh/m2
Energy Consumption for Lighting ** (final)	kWh/m2
Energy Consumption for DHW (final	kWh/m2

** only for non-residential

Italy

Building characteristics	**Unit / comments**
compactness	1/m
yie-value periodic thermal transmittance	W/m2K
Equivalent solar Area/net heated area Ratio	[-]
Specific energy demand indicators	
building's heating energy needs	kWh/m²a
Global primary energy demand (not renewable)	kWh/m²a
Global primary energy demand (renewable)	kWh/m²a
Global carbon dioxid emission	kg/m²a
Specific energy demand indicators	
Heating primary energy demand (not renewable)	kWh/m²a
DHW primary energy demand (not renewable)	kWh/m²a
Dimensionless energy indicators	
Heating primary energy demand (not renewable)/building's heating energy needs ratio	[-]
Reachable global primary energy demand (not renewable)/ Global primary energy demand (not renewable) ratio	[-]

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