X-tendo

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

JUNE 2022

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 845958.

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

June 2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 845958 .

Project Acronym	X-tendo
Project Name	eXTENDing the energy performance assessment and certification schemes via a mOdular approach
Project Coordinator	Lukas Kranzl und Iná Maia – TU Wien
Project Duration	2019 - 2022
Website	https://x-tendo.eu/

Deliverable No.	D4.4
Dissemination Level	Public
Work Package	WP4
Lead beneficiary	Technische Universität Wien
Contributing beneficiary(ies)	BPIE, ADENE, DEA, TREA, ENEA, CRES
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Date	June, 2022
File Name	D4.4_final

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https://x-tendo.eu/wp-content/uploads/2022/08/X-tendo-D4.4_v4_rev07_RDA_with-cover.pdf

TABLE OF CONTENT

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").

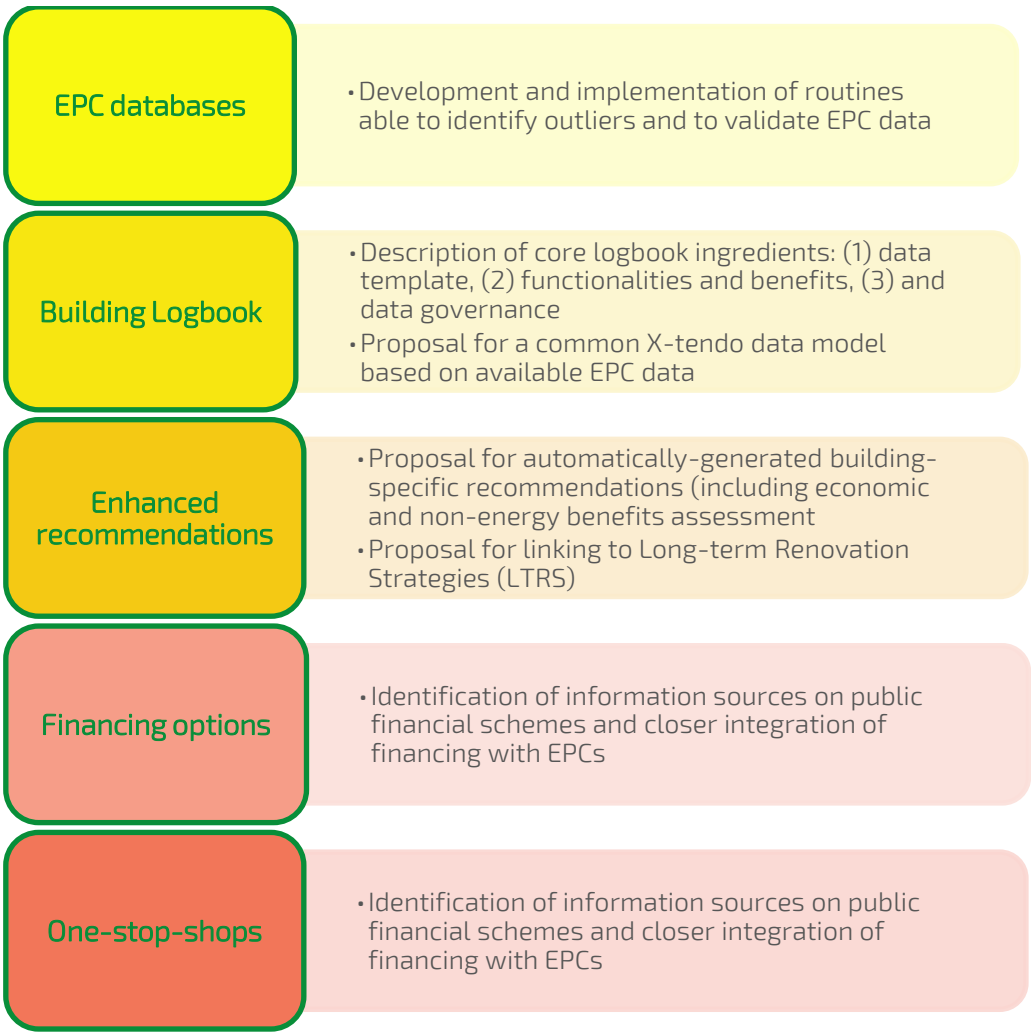

Figure 1: X-tendo methodology for features EPC databases, building logbook, enhanced recommendations, financing options and one-stop-shops

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 ONE-STOP-SHOP

1.1 Feature introduction

One-stop-shops (OSS) can be defined as a technical and financial assistance measure to facilitate the seamless implementation of building renovations through managing the project, providing technical assistance, helping to access financial mechanisms, benefits and support schemes, and to guide customers overall through their building renovation process. To provide these functionalities along with valuable building information, the data coming from the EPC plays a special role and should be linked to the OSS (among other sources of data).

OSS are typically engaged with residential building renovation. On one hand, the OSS acts as an intermediary that simplifies the fragmented customer journey and offer of renovation suppliers, for example, the aggregation of designers, suppliers, installers, financiers into a single package to the homeowners. An OSS also supports the renovation supply side of building renovation by mediating with the potential clients, using techniques such as organising offer packages, representing and branding, pooling projects, and managing the project implementation. The OSS is well-placed to facilitate the implementation of locally developed projects and strong and trustworthy partnerships between homeowners, local actors, and local governments.

This feature will link EPC data to the OSS functionality and test its applicability in different implementing countries taking into account their specific needs (e.g., corresponding existing EPC data, activities, etc.)

1.2 Proposed Methodology

A fully developed and operational one-stop-shop requires investment of time and financial resources which is beyond the scope and timeline of the X-tendo project. In this sense, the project took the opportunity to look to existent OSS (whenever possible), to propose improvement measures and test them, allowing the upgrade of existing OSS to future functionalities, by taking advantage of the next generations EPCs. In the specific situation of Romania (where there is not an OSS available), the project took the lessons learned from the other implementing partners and studied specific measures on how to setup an OSS.

OSS can have different approaches and types of stakeholders involved which may lead to different levels of expertise, skills and training needed. All these requirements are influenced by the functionalities of an OSS, that can range from simple marketing, communication and awareness, provide technical assistance and financial advice, support access to products and financial instruments, coordination of works or assurance of performance. Furthermore, it was also clear that different project partners are at different one-stop-shop maturity levels, as for example, Romania does not have an operating one-stop-shop running for energy renovation while UK has an operating hot-line advice centre.

To allow for flexible design across the participating MSs, a modular approach was developed. This means that the implementing partners could be exploring the link to EPCs and developing and testing specific modules considering their one-stop-shops needs and specifications. The outcome is particularly dedicated to public authorities, since these are usually the ones responsible for the EPCs schemes management, and will be on guidance on how to setup/upgrade and link the EPC schemes with One-stop-shops. The results from the testing will be presented in further reports of the X-tendo project.

The proposed methodology is divided in six guidance modules (Figure 2):

- One-stop-shop, in the case of partners that do not have an OSS already implemented
- Building logbook
- Enhanced recommendations
- Financing
- Marketplace
- Advice Center

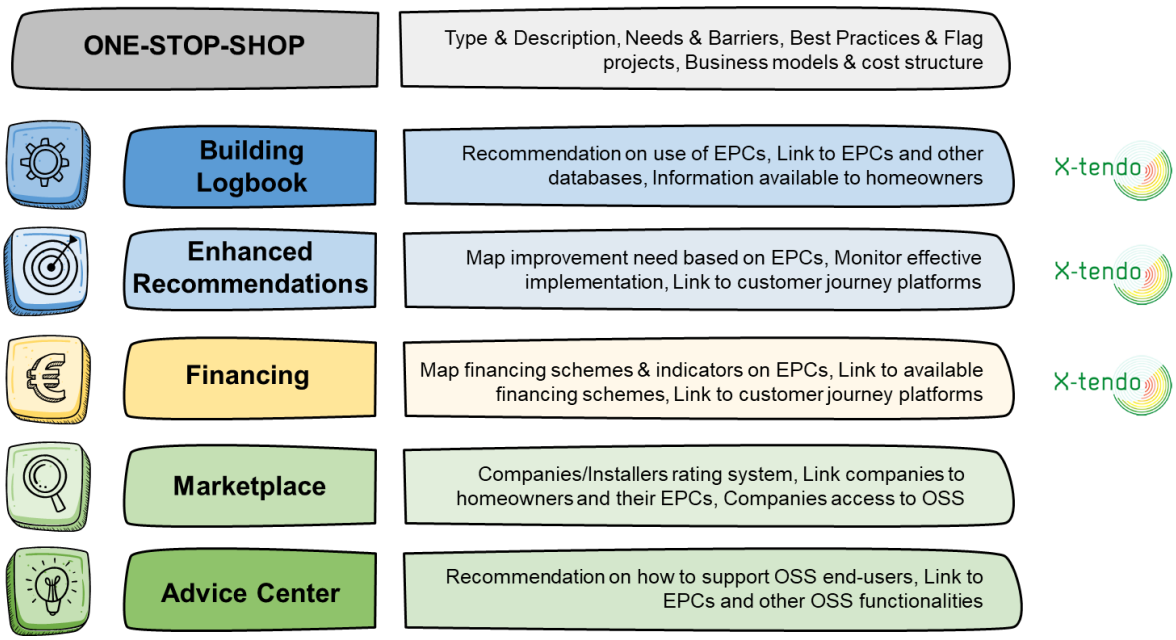

Figure 2: Overview of Feature 10 – One-stop-shops methodology

There is a common sense that an OSS dedicated to building renovation can involve many aspects that cross the whole customer journey from capturing the attention of the homeowner to access the OSS, to the implementation of measures and taking advantage of its benefits. Therefore, there are important synergies between this feature and other features developed under the X-tendo project, such as the Building Logbook, Enhanced Recommendations and Financing, whose outcomes could be integrated in the OSS concept, centralising in a single place several functionalities and providing a more effective and efficient service to all stakeholders benefiting from this tool.

It is, therefore, important to highlight the ability of this feature to link, integrate and boost other X-tendo features, being this one of the points to clearly discuss in the upcoming partners meetings.

The guidance resulting from the testing phase will need to be balanced across the challenges and expected benefits. Figure 3 summarizes some of these challenges identified by the implementing partners during the working meetings under the X-tendo project as well as some of the benefits resulting from the implementation of this methodology, specifically taking into consideration their country context.

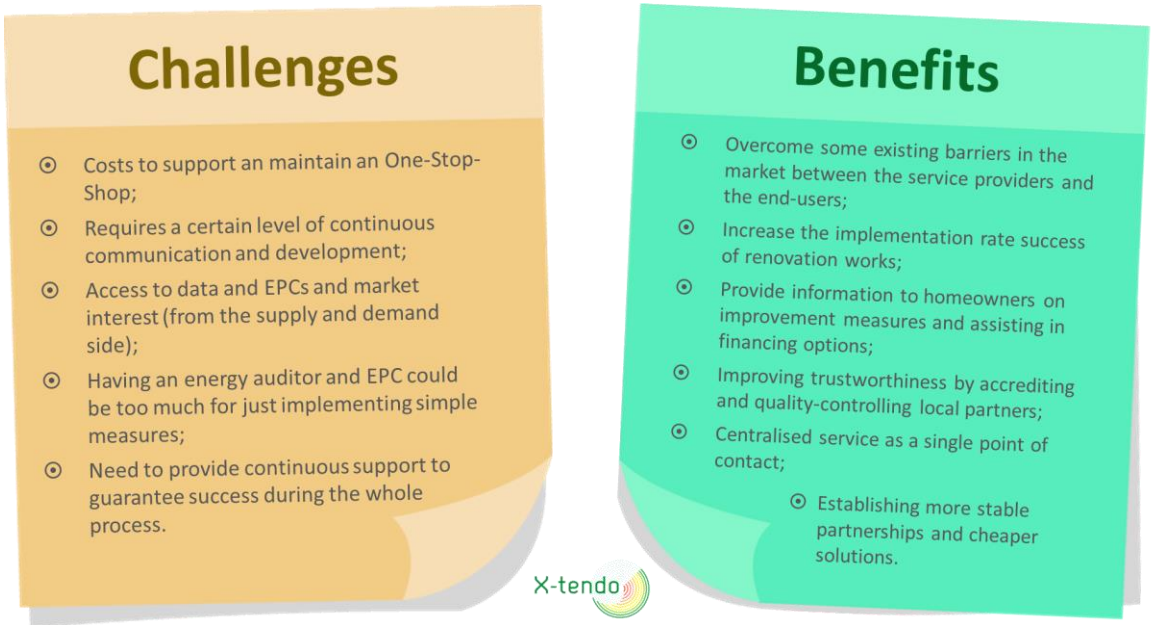

Figure 3: Main challenges/barriers and benefits of One-stop-shops methodology implementation in the X-tendo project

This identification was the starting point for the X-tendo OSS testing, which will be discussed further in upcoming reports on how to overcome the challenges/barriers and boost the opportunities in each implementing country.

1.3 Countries' implementation

There are 4 pilot countries participating in this feature testing (Table 2):

- Portugal (ADENE) will be testing the marketplace functionality, which complies the testing and implementation of the automatic improvement measures proposal (linked to the budget proposals given by the installers/companies) and the information on available financing mechanisms (which may be critical for the renovation uptake).
- Denmark (DEA) will be testing their OSS BetterHome, to obtain feedback on the performed energy renovations in residential buildings. They will conduct interviews

following homeowners from the initial phase to the end of the process, where is expected the recommendations from the BetterHome report to be already implemented.

- Scotland-UK (EST) will be testing on how to give the best advice to homeowner considering data from different data sources, such as EPC and smart meter data (provided with the homeowner's authorization) in order to improve the advice centre delivery.
- Romania (AAECR) will be testing the first steps in setting up a one-stop-shop, namely on what could be the most preferable option by scoring the preferences from different stakeholder's groups. Some potential solutions for testing were already identified such as i) professional association for an affordable fee/customer, and ii) energy efficiency department al local authorities for free. It will also be investigated if existing platforms, like those which intermediate between customers and construction/repairing/design services from registers companies might be interested in adding energy renovation and certification services. In all these three cases, and given the Romanian context, the building energy assessors must be part of the information process and offer services for energy performance certification and recommended measures.

	Portugal	Denmark	Scotland - UK	Romania
One-stop-shop	OSS Business Plan	-	-	Setting up an OSS
Building Logbook	Testing in Feature 7	-	-	-
Enhanced Recommendations	-	Enhanced recommendations feedback (homeowners)	-	-
Financing	Testing in Feature 9	Testing in Feature 9		Testing in Feature 9
Marketplace	Automatic improvement measures & information on financing	-	-	-
Advice Centre	-	-	Improve the Advice centre delivery (different data sources)	-

Table 2: Summary of X-tendo activity per implementing country

The following sections describe in more detail the concept of one-stop-shops in the implementing countries and on how the proposed methodology will be implemented.

Portugal – Portal casA+

Portal casA+ is a one stop shop dedicated to energy efficiency. The goal of this portal is to act as a property ID, facilitating the access of the homeowner to building related information while encouraging energy efficiency home improvements. The portal also facilitates communication between the homeowner, the building expert and companies/service suppliers.

Figure 4 maps the implemented data flows, i.e. what data, from what sources (left) to which casA+ functionalities (right). The functionalities currently made available by casA+ OSS are as follows:

- **Building Logbook functionality**: that concentrates the majority of the data coming from the EPC database (through a webservice – WS), but also in information and documents uploaded by the homeowner (HO), working as a repository of information for further consultation;
- **Improvement Measures proposal functionality**: currently based on EPC recommendations to guide the homeowner on building renovation. However, it is foreseen in the near future to develop an automatic system to generate improvement measures based on the number of occupants and user profiles data (occupancy, appliances and lighting);
- **Budget proposals functionality**: linking the homeowners to installers, which can manage and propose services on building renovation based on the improvement needs identified by the homeowner in casA+;
- **Energy Saving Simulator functionality**: allow the homeowner to simulate his/her house energy performance and the impact of several improvement measures;
- **Request an EPC functionality**: access to EPC data (when an EPC is available), request of EPC renovation or request an EPC (when an EPC is not available) linking to the EPC auditors database;
- **Companies Directory functionality**: information on registered and qualified companies/installers which can propose services on building renovation to the homeowner;
- **Companies Directory Rating System functionality**: which allows the homeowner to evaluate the quality of the services provided by the installers/companies registered in casA+, as well as have access to other user opinions and evaluation;
- **Guides & Tips functionality**: guides and tips uploaded by the casA+ administrator on energy and water efficiency;

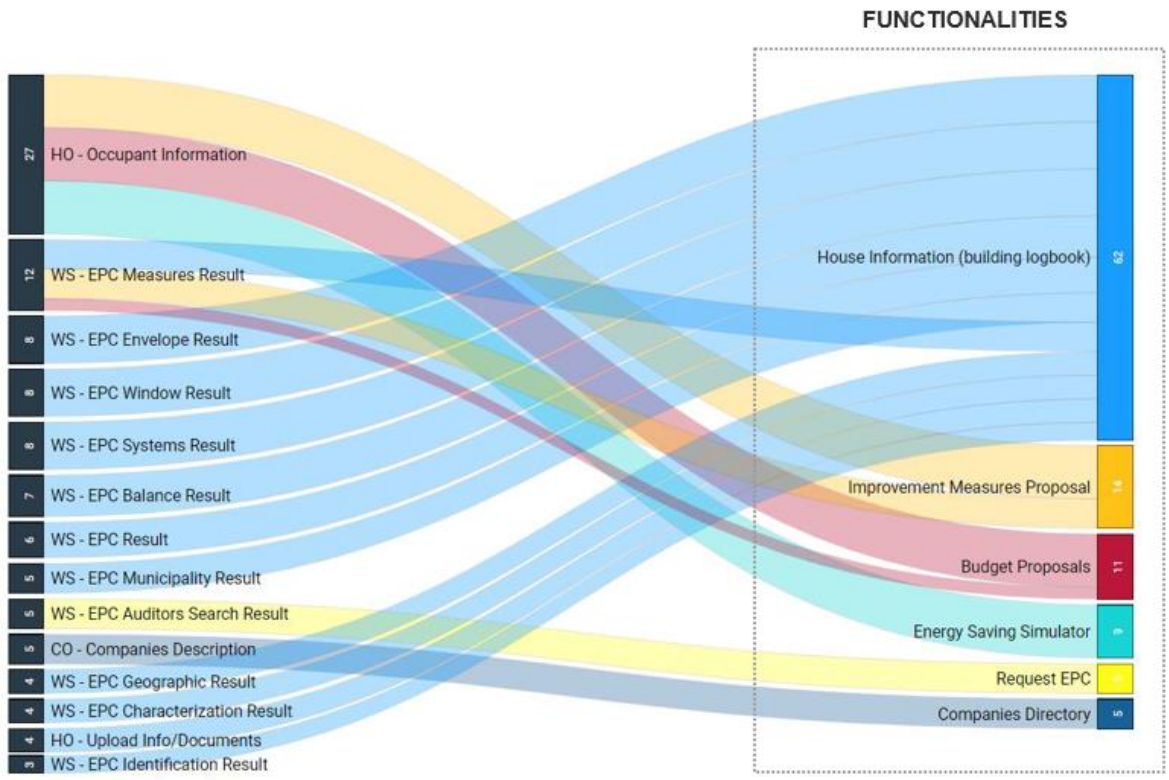

Figure 4 – casA+ data sources and functionalities currently available[1]

Under the X-tendo methodology, a survey and a workshop on OSS attractiveness will be taken with relevant stakeholders in order to collect feedback on existing and future functionalities according to their needs and perception/willingness to subscribe casA+. In this survey and workshop, it will be presented the following functionalities foreseen to be implemented up to the end of the year:

- **Building's Dashboard Components**: where all the building's data are organized into categories of information, allowing the homeowner to visualize their house characteristics as well as add/upload information missing;
- **Financing opportunities**: available financing mechanisms for building renovation related to energy and water efficiency.
- **Monitoring consumption (energy/water) functionality**: energy and water household consumption and benchmark with other users with similar characteristics;

[1] More information and detail on this graph available in X-tendo report D4.5 - Tools / IT-components and related documentation of the proposed calculation and data handling procedures to be tested in WP5 (https://x-tendo.eu/toolbox/)

- Request an AQUA+ functionality: access to AQUA+ data (when a water certificate is available), request the AQUA+ renovation or request an AQUA+ (when an AQUA+ is not available) linking to the AQUA+ auditors database;

Denmark - BetterHome

The *BetterHome* is a Danish consultancy scheme (based on voluntary and a market-driven system) which can be considered an OSS. The purpose with the scheme is to:

- Promote of refurbishment of private residential buildings;
- Remove barriers – make it simpler/ easier and more manageable for homeowners and create a scheme that the homeowners can trust.

The *BetterHome* scheme is an extension of the EPC scheme and can be based on an existing EPC for a building. The *BetterHome* calculations are also performed in the same tool as the EPC's, to ensure comparability and easy data transfer. The scheme also provides counselling through all of the building renovation process, and can support the homeowners in the following phases of a renovation:

- Screening of the building: The consultant will screen the building and map the potential of energy renovations.
- The BetterHome Plan: The consultant will perform a better home plan. This plan will be based on the dialogue with the homeowners and it is then possible to include other needs like maintenance needs, aesthetics, interior design and other functionalities. The BetterHome plan will also contain calculations, recommendations and budget key numbers, which can be used, for example, as documentation when applying for a loan.
- The BetterHome Project: The consultant will function as a project manager and will help the homeowners with project design, tendering, construction process management, handover and follow-up.

During the X-tendo project there will be conducted a series of interviews (which will be detailed in the upcoming reports) with the purpose of identifying some of the barriers and opportunities regarding the BetterHome scheme. On the basis of the interviews there will be conducted an analysis, which will investigate and discuss the results. This analysis will strive to enlighten concrete revisions and improvements to the BetterHome scheme in Denmark.

Scotland – UK – Home Energy Scotland

Home Energy Scotland is a developed one stop shop, covering advice, financing and supply-chain engagement for everyone living in Scotland. In 2019 the Network helped more than 90,000 customers in Scotland and even with these very large volumes, customer satisfaction was at 97%. The lifetime savings on energy bills by customers using the network in 2017-18 is estimated to be more than £82 million and lifetime carbon savings more than

300,000 tonnes CO2. Total lifetime energy bill savings from the network since its inception are estimated to be well over a billion pounds.

Home Energy Scotland is managed centrally by the Energy Saving Trust on behalf of the Scottish Government. Advice is provided at local level across Scotland by five local agencies covering areas as shown in **Error! Reference source not found.**. This ensures that the very different needs across different areas, particularly the diverse needs of the highly rural Highlands and Islands and the urbanised central region, are addressed.

Advice

In Scotland householders (owner occupiers, tenants) and smaller private landlords are able to access free, independent, personalised and impartial advice from the Home Energy Scotland service. Broadly, three types of advice are provided under Home Energy Scotland:

1. Personalised advice delivered over the phone by trained advisors working from regional advice centres across Scotland;
2. Free, in-home expert advice for households identified as needing in-depth advice and support: very vulnerable households, people installing more complex home energy measures and some private landlords;
3. Online advice consisting of both static webpages and online tools, managed and provided centrally by Energy Saving Trust on behalf of the Scottish Government;
1. A "Green Homes Network" of exemplar low energy/carbon homes reinforces these three advice channels.

Financial Support

Home Energy Scotland provides customers with "one-stop-shop" access to the financial (and other) support for home energy efficiency offered by the Scottish Government under the Home Energy Efficiency Programme for Scotland as shown in the diagram below (Figure 5):

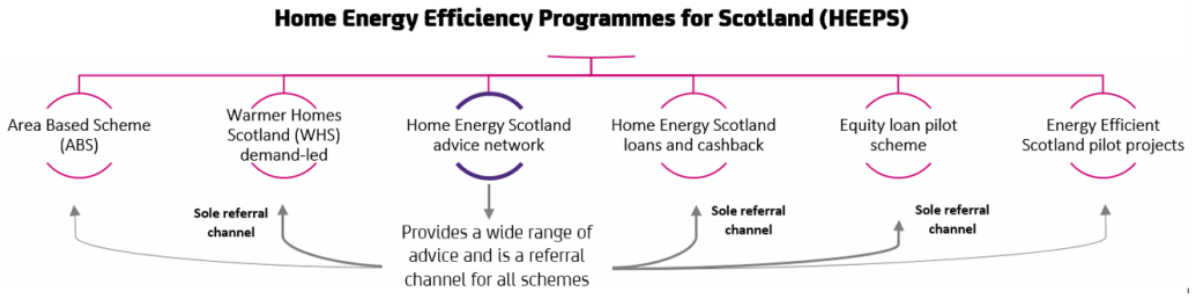

Figure 5 - Home Energy Efficiency Programme for Scotland

Supply Chain support and Development

Home Energy Scotland helps connect its advice customers with the supply chain through online tools including a renewable installer finder.

A parallel activity to Home Energy Scotland is the Sustainable Energy Supply Chain programme which provides assistance and support to businesses in Scotland to help them to participate fully and effectively in the supply chain for energy efficiency and home renewables installations. The programme also seeks to raise standards across the supply chain and ensure householders and business can access suppliers regardless of their location.

Planned X-tendo Test Project

The planned X-tendo development activity for the OSS relates to advice – see Figure 2 above. In Scotland the advice is provided over the telephone and in-person as described above.

Smart meters are being rolled out across Scotland providing householders with personalised access to their energy bills data on a half hourly basis. This can be used to provide advice on behaviour change and detailed advice on the bill saving impacts of installed measures. Energy Saving Trust has developed a data interface to allow advisors to see householders' smart meter data, when the householder gives permission for this.

Home Energy Scotland advice to householders in Scotland is already informed by the Energy Performance Certificate data for their home. EPC data and recommendations are based on an asset-based (i.e. standardised building performance) assessment. This is very different from the real energy use data available from smart meters.

Therefore, there is a challenge for advisors working with these two data sets and the Scotland test project will develop systems to help advisors use both smart meter and EPC data in parallel.

Romania

As stated before, currently Romania does not have an operating one-stop-shop for improving building energy performance. In this sense, under the X-tendo project, Romania will be testing the one-stop-shop methodology considering the first steps needed to setup a one-stop-shop, in three different contexts: (i) using a blog/forum approach within a professional site, for a small fee at registration; (ii) using the energy efficiency departments at local authorities, for free, or (iii) using an existing platform that intermediates between customers and services offered by different companies, for a fee per request, if the platform host agrees.

The OSS functionalities will be decided with relevant stakeholders after a full inquiry. Linkages to geographical energy auditors lists, to financing mechanisms sites, to major companies performing renovation measures or providing renovation materials and/or

technologies, and to local authorities responsible in monitoring and reporting renovation of buildings will be explored and evaluated.

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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	[-]

X-tendo

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

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 845958.