X-tendo

PRELIMINARY VERSION

TECHNISCHE UNIVERSITÄT WIEN
Vienna | Austria

EXPLORING METHODOLOGIES AND CONCEPTS FOR THE IMPLEMENTATION OF NEW ENERGY PERFORMANCE CERTIFICATES FEATURES FOR BETTER DATA HANDLING
LOGBOOK

JUNE 2021

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Preliminary version

This document is a preliminary version. It will be further adapted in the coming months through the findings of the test phase of the project.

Legal Notice

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EXECUTIVE SUMMARY

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

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

The present report builds on past projects activities. And, upcoming project activities include the technical implementation with excel spread and programming code, providing guidelines to handle with the tools as well as, the testing of the present methodology, in each implementing country. Below, the series of previous project reports are listed, which present complementary information to the present one:

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 user of EPC data (Deliverable 4.2)
3. Summary of implementing partners' user needs and detailed technical specifications (Deliverable 4.3)
4. Tools, concepts (country-specific for the Logbook feature) and guidelines for features Enhanced recommendations and EPC Database) (Deliverable 4.5)

Beyond that, the described the methodologies and concepts for the technical implementation methodology will be technically implemented and tested during the forthcoming stages of the project. The complete material will be online accessible in the X-tendo Toolbox.

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

1 INTRODUCTION

EPCs are the most widely available information documents on building energy performance across Europe. They have the potential to be used as more than just an informative document, as they have the potential to provide market participants with relevant information to assess, benchmark and improve the building's energy performance. Besides the information included in each document, the usage of these information and data handling are becoming more and more important. The recent 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 and overall quality of EPCs.

In this context, the five X-tendo EPC features **EPC databases, building logbooks, enhanced recommendations, financing options and one-stop shops** play a relevant role, targeting to improve the way EPC data is being handled and used for different objectives and targeted stakeholders. The main objectives of the features are summarized below. The present document describes in detail the methodologies and concepts for the technical implementation of each feature: EPC databases (Chapter 2), logbook (Chapter 3), enhanced recommendations (Chapter 4), Financing options (Chapter 5) and one-stop-shops (Chapter 6).

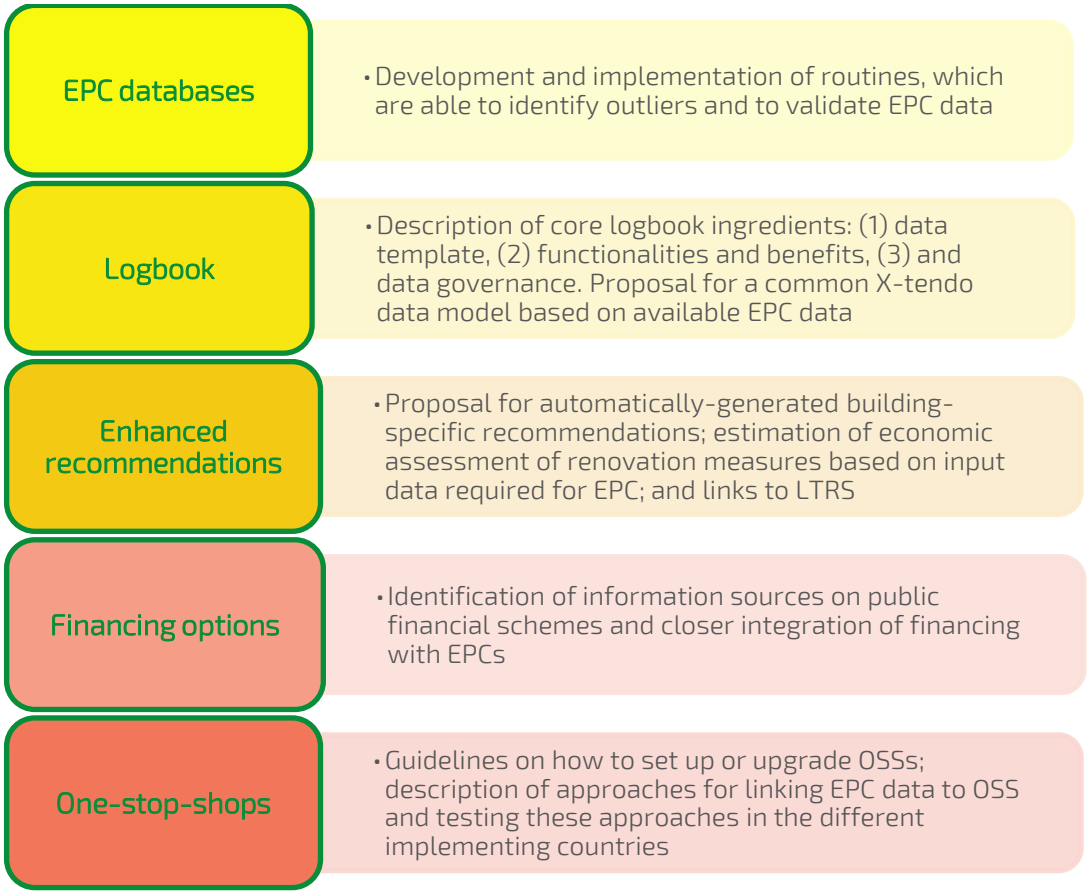
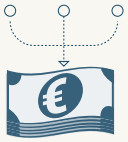


Figure 1: X-tendo methodology for features EPC Databases, Logbook, Enhanced recommendations, Financing options and One-stop-shops

The methodology will be tested in different X-tendo target countries, as showed in the table below.

Table 1: Implementing and expert countries per features

	 EPC databases	 Building Logbooks	 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

2 LOGBOOK

2.1 Introduction

Improving the energy and climate performance of the building stock is a complex task, as building renovations typically involve a large number of stakeholders and intricate processes. Fragmentation in the sector is one of the most significant barriers to realising the efforts targeted at making the sector less carbon- and resource-intensive, as information is not effectively shared between different actors, which often leads to inefficiencies, time and cost overruns, performance and quality gaps.

Logbooks enable better decision-making throughout the building lifecycle, including management of technical and functional aspects, safety, conservation of economic value, certification, improved energy and environmental performance. Organised and shared data reduce uncertainty, but also the time and cost needed for collecting missing information. In this sense, building logbooks can reinforce the successful implementation of all other X-tendo features.

Over the lifespan of buildings, data is routinely collected by multiple stakeholders for various reasons as many decisions rely on data availability. However, the lack of a common approach and structure among stakeholders which would make this wealth of information widely available, organised and easily accessible, makes this data often unusable as it gets discarded, forgotten or it is not compatible with other stakeholders' systems. The lack of an overarching information management system structure shared across the built environment leads to information asymmetry, lack of transparency and higher risk for investment and renovation decisions.

"Building logbooks are a repository for detailed building information. Logbooks act as a single point of input, access, and visualisation of all the information associated with a building unit throughout its lifecycle."

2.2 Proposed methodology

Logbooks involve three core ingredients: (1) data template, (2) functionalities and benefits, and (3) data governance which are briefly summarised below:[1]

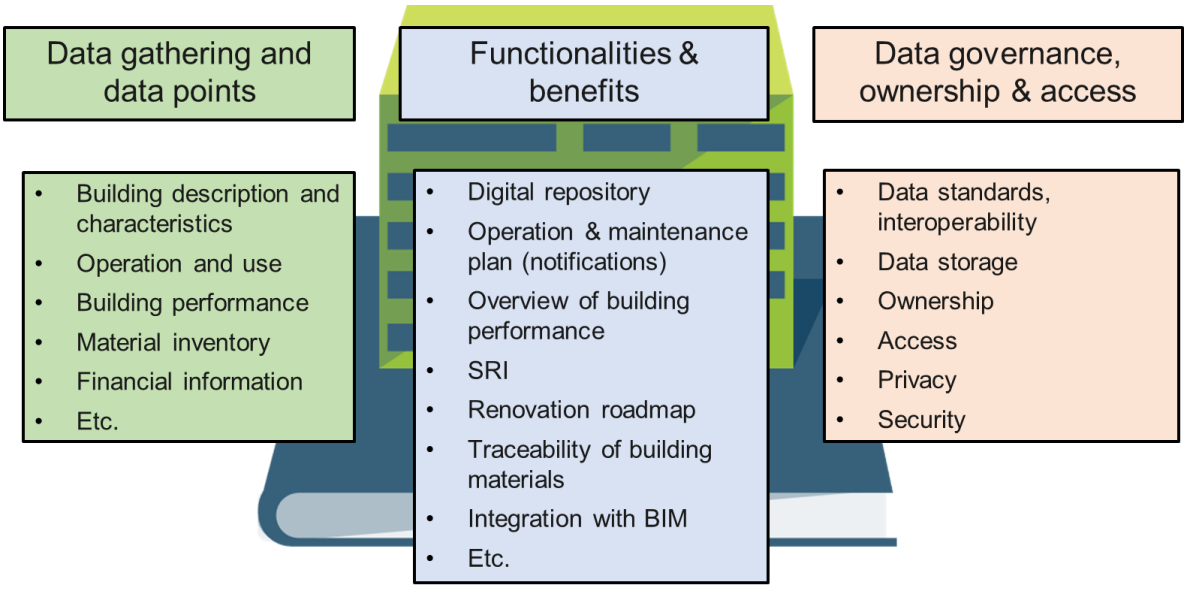


Figure 2: The building blocks of a logbook

Data template

The X-tendo logbook data template is based on a detailed country-specific scoping and review of the EPC data points that are relevant and reliable enough to be included in or linked to the logbook. The X-tendo report "Description of implementing partners' user needs and detailed technical specifications regarding features on handling and user of EPC data" includes a comprehensive data template for the required data fields and the current status of these in the three implementing countries. More broadly the organisation of logbook data needs to fulfil the following main requirements:

- The logbook should accommodate a wide range of data sources and data categories, including administrative data, building characteristics, energy performance data, operational, maintenance, and financial/legal information.
- The logbook should link with existing data sources and information tools, such as the Smart Readiness Indicator, Energy Performance Certificates, sustainability ratings and material passports.

[1] Also described in the project reports "Description of implementing partners' user needs and detailed technical specifications regarding features on handling and user of EPC data" (Deliverable 4.2) and "Summary of implementing partners' user needs and detailed technical specifications" (Deliverable 4.3).

- The advancement of ICT technologies in the built environment opens up new opportunities to collect data (e.g. sensors, real-time energy use, IoT) but also brings further data privacy and security constraints: the logbook should be able to accommodate these to fully reap the benefits. logbook should be sufficiently flexible to serve both national/regional needs and also to integrate into a wider European approach.

Functionalities & benefits

The X-tendo report "Description of implementing partners' user needs and detailed technical specifications regarding features on handling and user of EPC data" outlined the possible main functionalities and benefits of the logbook. Enabling these functionalities and benefits requires a common "logbook data infrastructure" that would provide: a) digital interface, b) interoperability, c) data syncing/matching, d) storage of data and information, and e) user-friendly navigation and visualisation.

- Functionalities refer to the services built around the logbook and the features mentioned above. Functionalities have corresponding benefits or sets of benefits for the user. The number and type of functionalities determine the scope, quality and type of information that the logbook covers. Examples could include building diagnosis and pre-emptive maintenance, tailored renovation recommendations and roadmaps, benchmarks, alerts and reminders, third party renovation services, etc. By linking the logbook with other existing databases and tools such as building registries, environmental certification systems and BIM models, the logbook can act as a one-stop-shop portal and bring together building sector stakeholders, overcome value chain fragmentation and enable new/streamlined services.
- Benefits represent the additional value delivered to logbook users. Rather than being limited to specific types of features and areas, such as energy or administrative information, the logbook has the potential to bring a wide range of benefits to different actors. Clearly articulating these benefits is crucial to get the buy-in of all market actors involved.

Data governance & ownership

Data governance refers to the process, organisation and standards implemented to ensure the effective and efficient storage of and access to data. The development and proper implementation of logbooks require settling a series of questions around data ownership, access, storage, privacy and security.

Developing and implementing a fully functional logbook thus requires:

- Development of the logbook data model, including protocols for data capturing and data sharing (e.g. via a common webservice).
- Stakeholder engagement over the use of data and access by third parties; map logbook related benefits, costs, drivers and potential challenges; mapping of information flows, i.e. who needs what data, when, from what sources and in what form?
- Clarifications of data governance requirements (both legal and technical, such as GDPR, IP rights, data access and storage)

The X-tendo implementing partners will take steps towards this broader ambition of developing fully functional building logbooks, however it should be noted that the development of complete products and services falls outside of the scope of this project. The concepts for the logbook implemented in the countries Greece, Portugal and Estonia will be described in the next chapter.

2.3 Description of logbook concepts in implementing countries

2.3.1 Estonia – Benchmarking application Energiamonitor

The benchmarking tool "Energiamonitor" is developed as an application for monitoring, analysing and reducing energy consumption in buildings. The tool contributes to energy improvement of buildings by visualising consumption data for individual users and nudging change in user behaviour. Users include building owners, facility managers and tenants who can easily access recommendations and tips for reducing energy consumption and saving costs by entering electricity, heating and water heating data. The tool has several features:

- It allows monitoring energy consumption and energy efficiency with vivid graphs;
- The application offers the ability to calculate the current energy label of the buildings and to compare and share the energy-related reports of the individual dwellings;
- Energiamonitor features a built-in dashboard to seek advice from energy experts regarding the potential renovations solutions based on the present condition of the building. The reference values are set according to the Estonian regulations and standards.
- The tool stores data for each building. In addition to basic physical data (area, capacity, number of dwellings/rooms, type of construction and main materials) and information on utilities systems (type of heating, power capacity, type of water heating etc.) there is also possibility to log all significant repairs and enhancements.

Energiamonitor includes logbook features, specifically the storage of consumption data, basic physical parameters of building (living and heating area, number of dwellings/rooms, volume etc), description of utilities´ systems and changes made to the above mentioned. Consumption data, if derived via remote metering, will be input automatically but manual monthly input is also an option.

Links between national Building Register and Energiamonitor are currently in the planning stage.

The Building Registry collects and organises a wide range of information on buildings including detailed design drawings, building characteristics and administrative/legal data on every building. There are also plans to store consumption data in this centralised database.

2.3.2 Greece – EPC registry web services

The X-tendo project will design a concept of how the present web-service can be extended and have an interface with a national logbook. The buildingcert.gr[2] web services[3] were developed by CRES and are current hosted in CRES's hardware and software infrastructure. The services enable third party applications to access a subset of EPC data for different purposes. Currently, it is used by two separate applications, namely:

a. The tax department web application which uses the CRES web services to perform validation checks on EPCs that are attached to lease agreements entered into the tax department's Information Systems, thus reinforcing the requirement of displaying an EPC at the point of selling or renting a property
b. The web application of the Greek government's energy efficiency funding scheme which uses the web services to extract EPC data needed for the assessment of funding requests. The EPC has a central role in the scheme as it is used for the assessment of the initial state of the building, the improvements proposed by the energy expert and the achieved performance levels via a second EPC issued after the improvements works were carried out.

These web services can provide *back end* to the logbook data exchange, especially if the latter is implemented as an aggregator of data stored across various databases. In this sense, the logbook can access data from the tax department's or funding scheme's Information Systems, but also from other data sources such as the EPC Registry.

As of Dec. 2020, there are two endpoints[4] to the CRES web services. The first one, unofficially called *checkcert*, is used to check the validity of an EPC and access its most basic data. It is designed to be the basis on which all other endpoints are built upon. The second, unofficially called *exoik* (pronounced exeek – from the greek word `εξοικονόμηση' meaning 'saving') is used to access the EPC data needed by the above-mentioned funding scheme's information system.

[2] buildingcert.gr is the Greek EPC Registry web application and database.
[3] Web services are information systems that use the www infrastructure for A2A (application-to-application) data exchange, typically used to allow a web application (the data consumer application) to incorporate and use another web application's (the data provider application) data.
[4] In the web services terminology an endpoint is the part of the software to which the consumer application is connected. A web service can have multiple endpoints, each providing access to a different subset of the service's functionality

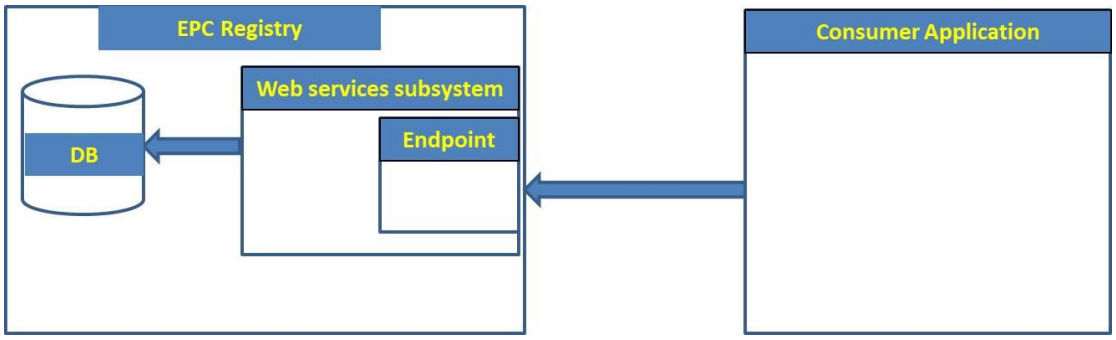


Figure 3: The concept of the Greek EPC registry web services

To use any of the two endpoints the consumer application sends mainly two pieces of data:

1. The 'protocol number' of the EPC which is the year of the EPC along with a sequential number within that year.
2. The *secucode*, which is a 16-digit code comprising latin alphabet uppercase letters and numbers, issued by buildingcert.gr when an EPC is finalized and printed on it.

These two parameters can be thought of as the username – password pair of the EPC, the former specifying which EPC should be accessed, while the latter ensures that the end user isn't just trying to refer to a random EPC, to which they should not be given access. The building owner can give the above mentioned information to anyone needing to check the validity of the EPC.

If the 'protocol number + secucode' validation check succeeds, the web service responds with the data requested by the consumer application. In the case of *checkcert* these data are:

1. The building address
2. The name(s) of the owner(s).
3. Energy data: Primary energy consumption of both the existing and the reference building, CO_2 emissions, energy class of the building

When accessing the *exoik* endpoint the consumer application receives the above data along with:

1. The initial construction year
2. A verbal description of each of the 'scenarios', i.e. the energy expert suggestions for improvement.
3. Primary energy consumption, CO_2 emissions and the energy class of the 'scenarios'.
4. P/V data[5] from the existing building (if it has P/V) or the scenarios, if the energy expert suggested installing P/V

When designing the buildingcert.gr web services, CRES aimed to keep the software development of both the services and the consumer applications, as simple as possible. Consequently, CRES opted for rather simple web service technologies: RESTful services

[5] In the context of the funding scheme, photovoltaics are especially important

accepting HTTP POST requests and responding in the JSON format. Authentication is done via an API key. When designing endpoints for a logbook, one might want to consider more advanced technologies, i.e. XML and SOAP based services.

2.3.3 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.

The target audience of Portal casA+ are homeowners and tenants, building experts and energy/water efficiency companies. In the future, Portal casA+ is intended to be expanded to multiple owners, public authorities and financial institutions.

The building logbook is the foundation of Portal casA+. The data can be uploaded into the portal in 3 different ways (Figure 4):

1. By the homeowner when the building does not have any EPC or when additional information - not available in the EPC - is required. The homeowners can access the portal via their EPC which offers organised access to all information about the building
2. By the Portuguese EPC Registry Database - SCE (Sistema de Certificação Energética dos Edifícios) to upload energy related information
3. By the Portuguese Water Performance Classification Database – AQUA+ (Classificação de Eficiência Hídrica de Edifícios);

The information stored in the building logbook is organised across 8 categories: Building Identification (EPC code, INSPIRE ID, etc.), Building Characterization (construction period, type of building, etc.), Envelope (walls, roof, etc.), Lighting & Appliances (light bulbs, washing machine, fridge, etc.), Technical Systems (heating, cooling, DHW, etc.), Energy Balance Indicators (heating, cooling, DHW energy needs), Improvement Measures (Type of measure, cost, payback period, etc.) and Energy/Water Consumption.

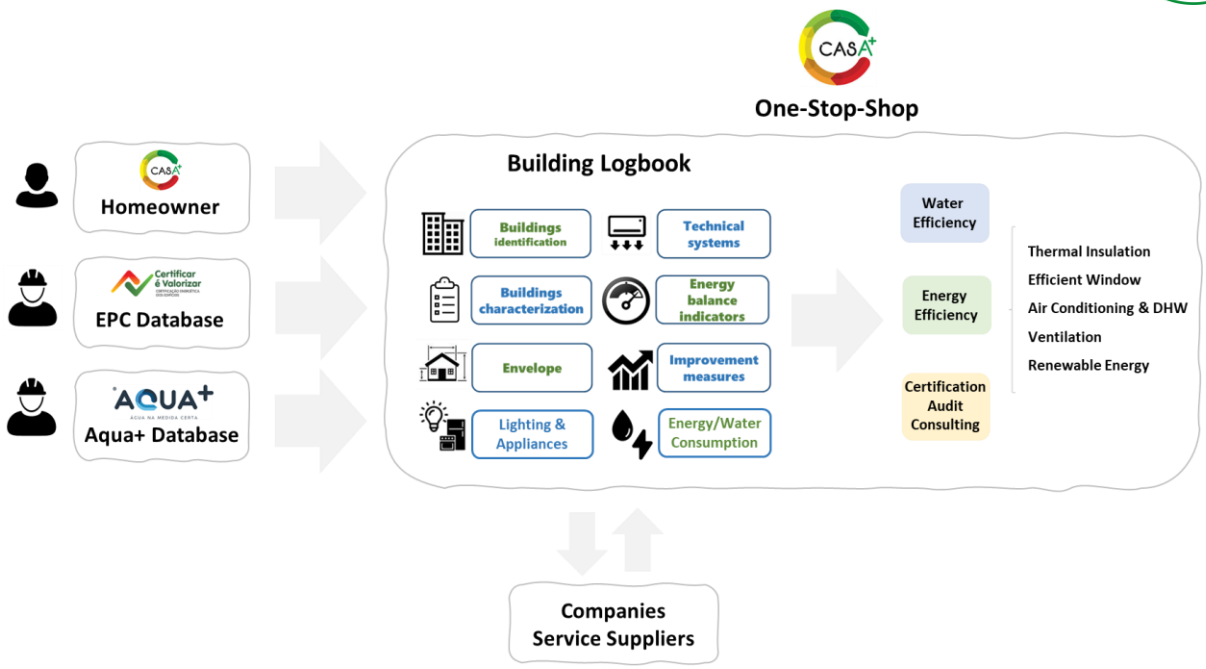


Figure 4: Portuguese Building Logbook integrated in Portal casA+

Building experts have an important role in the portal, as they are responsible for informing homeowners about the improvement measures recommended in the EPC and AQUA+ or even advise about the advantages of producing a new EPC/AQUA+. Energy and Water efficiency companies will be able to access parts of the logbook data (as for example Envelope or Technical systems) and to propose commercial offers on the execution of the improvement works. The building logbook stores EPC and AQUA+ data, making also available a historic overview of data from expired EPCs or retrofitted building components.

In the beginning of 2020, ADENE conducted user tests with small groups of users. In a first stage, ADENE led focus groups and collected the opinion of its employees, while in the second stage, tests were conducted with a larger sample involving students and professionals from the energy and water efficiency sectors. These tests consisted in an evaluation survey on the navigation, design and intuitiveness of the portal. The results were encouraging, and the feedback helped to improve some design features of the portal and the inclusion of new functionalities.

The building logbook enable different casA+ functionalities organised in 7 main action areas: Thermal Insulation, Efficient Windows, Air Conditioning & DHW, Ventilation, Renewable Energy (these 5 related to Energy Efficiency), Water Efficiency and Certification/Audit/Consulting.

Some of these areas, namely the water efficiency and the auditing/consulting are still in development phase. However, ADENE expects to launch these new functionalities by the end of the current year, and further develop the financial incentives theme in 2022.

The portal is available online, although in a pilot mode. Since September 2020 it had 27 companies registered, split across the 5 action areas related to energy efficiency. ADENE is now preparing a series of webinars and training sessions targeting energy efficiency

companies. These workshops are aimed to inform companies about the registration criteria, the requirements and functionalities of casA+ and the best practices to manage the improvement measures proposals available for the different action areas.

casA+ current overview

The functionalities enabled by the building logbook which are currently available in casA+ are:

- Access to the building related information and available financial incentives;
- Registration with associated EPC (not mandatory);
- Registration, use and interaction with both consumer and companies;
- Improvement measures proposals and access to a list of service suppliers to simplify the energy and water renovation of buildings;
- Energy and water efficiency guides and recommendations;
- Housing energy efficiency simulator.

In the close future, ADENE intends to add the following features:

- Energy and water consumption monitoring;
- Renovation or request of an EPC or AQUA+;
- New action areas on "water efficiency" and "audit and consulting".

One of the greatest challenges to the building logbook development and implementation is the availability and access of the EPC data, since the majority of the data comes from this data source. According to the existing legislation, EPCs are being issued by energy assessors following a request by homeowners . However, the implementation of the newly revised EPBD will give the authorisation to ADEN to provide EPCs via Portal casA+, upon proof of ownership. It is expected that the number of buildings with registered EPCs will significantly increase which will enable more data to be logged and further functionalities to be added.

Similarly, it is expected that the "water efficiency" area will be supported by AQUA+, an ADENE initiative which is already implemented for residential buildings. AQUA+ is a system for evaluating and classifying properties based on its water use. The AQUA+ database will provide the building logbook data on the infrastructure, water using equipment and fitouts of the buildings, as well as improvement measures on water efficiency.

The official launch of Portal casA+ is planned to take place in March 2021.

Questions that should be addressed in the future:

- Interaction with stakeholders and added casA+ functionalities: ADENE will organise a series of webinars with stakeholder associations representing the building sector, homeowners, building experts, banks and service suppliers;
- Validation process to access EPC/AQUA+ and how to promote EPC/AQUA+ data exchange between former and new homeowners. casA+ has already a functioning algorithm to validate the homeowner identity. ADENE intends to improve and extend this mechanism in order to facilitate the transfer of EPC/AQUA+ data between the former and the new homeowner, via portal casA+.

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