Features and recommendations for next generation Energy Performance Certificates

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

July 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 (TU Wien)
Project Duration 2019–2022

Website https://x-tendo.eu/

Author(s) David Weatherall
Co-author(s) Harry Mayers, David Campbell, Caroline Green

Reviewed by David Weatherall, David Campbell
Date July 2022

Legal Notice

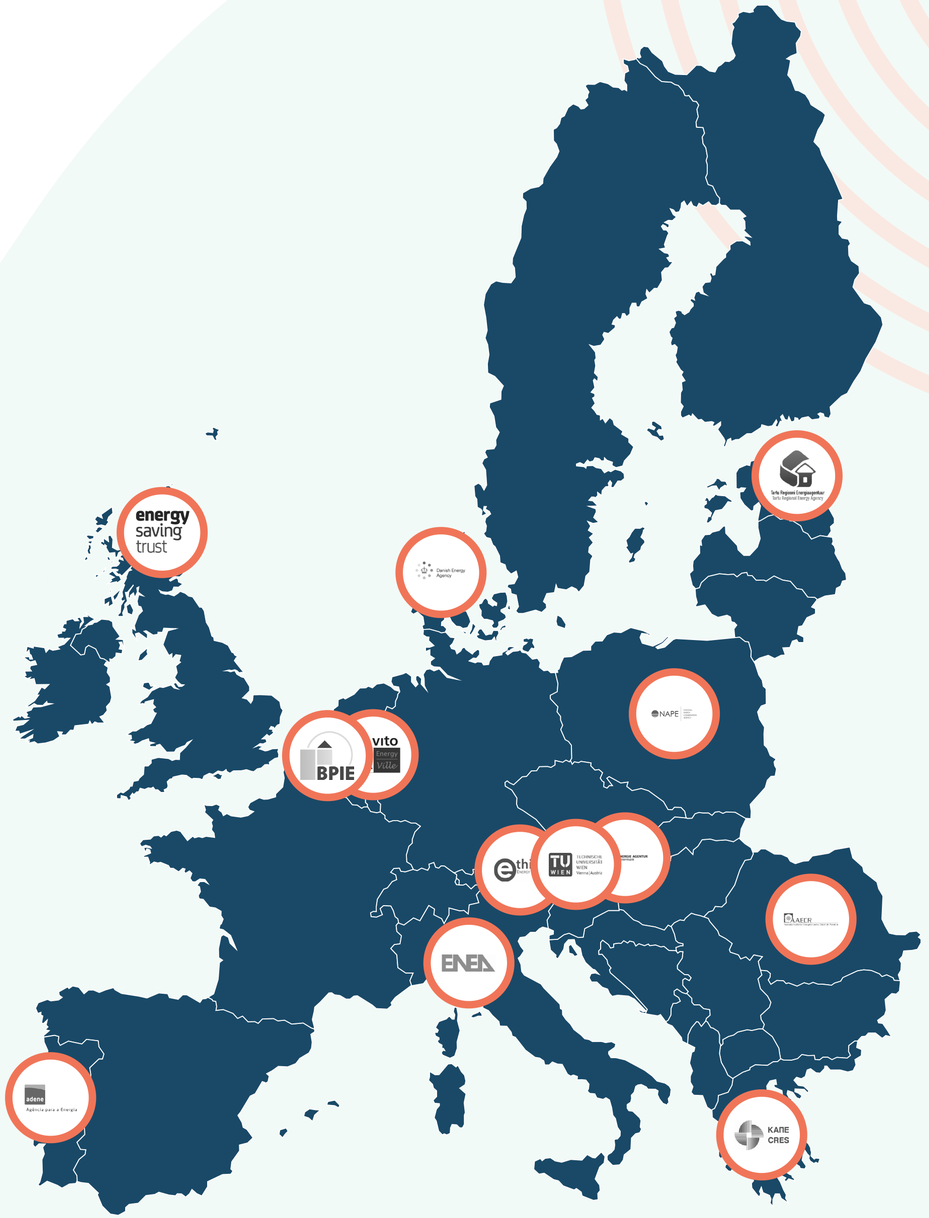
CONTENTS

Glossary of terms

BPIE Buildings Performance Institute Europe
CARP Comfort Assessment Rating Procedure
CO_2 Carbon dioxide
CORP Comfort Operational Rating Procedure
DEA Danish Energy Agency
DH District Heating
EPC Energy Performance Certificate
EST Energy Saving Trust
HEMS Home Energy Management Systems
OSS One Stop Shop
TBS Technical Building Systems

1 INTRODUCTION

X-tendo (eXTENDing the energy performance assessment and certification schemes via a mOdular approach) is a European Commission Horizon 2020 funded project, examining 10 features of the next generation of energy performance certificates (EPCs).



1

It has developed a toolbox to assist the implementation of the features into existing EPC schemes. This will provide public authorities with improved compliance, reliability, usability and convergence of the next generation of energy performance assessments and certification.

The features being tested are:

1. smart readiness
2. comfort
3. outdoor air pollution
4. real energy consumption
5. district heating
6. EPC databases
7. building logbook
8. enhanced recommendations
9. financing options
10. one stop shops

This document is intended to provide UK stakeholders with an introduction to X-tendo findings for the ten features, as presented at the Dcarbonise Glasgow 2022 conference.

Further information on X-tendo can be found through the project website, www.x-tendo.eu.

Figure 1 (opposite): *X-tendo: features for improving EPCs*

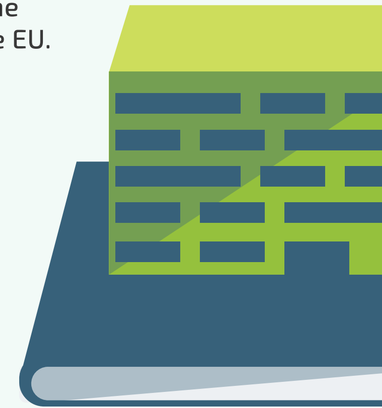
2 ROLE OF ENERGY SAVING TRUST

Energy Saving Trust helps households save energy, carbon and bills across the UK and delivers the Home Energy Scotland service (HES) for the Scottish Government. Through HES and other programmes, Energy Saving Trust speaks to thousands of householders each year about home improvements and has accumulated rich data for Scotland's – and the rest of Great Britain's – homes and households. Energy Saving Trust is also proud to manage Scotland's EPC database on behalf of the Government.

Energy Saving Trust has been very active in European collaborations, particularly with sister energy agencies from different European countries, for many years. One of these collaborations is X-tendo, a project focused on the future, the next generation, of Energy Performance Certificates. Organisations in different countries involved in administering national EPC schemes are working together to explore 10 different ways that EPCs could be developed, from improving the way recommendations are generated to providing households with better insight on financing alongside the certificate.

Due to Energy Saving Trust expertise in running the EPC Register for Scotland and the Scottish Government's Home Energy Scotland programme, Energy Saving Trust is participating as an Implementing Partner in X-tendo, testing the methodologies for the tailored recommendations and one stop shops features. As part of a consortium of 13 organisations from nine European countries, which together represent 40% of the EU building stock, Energy Saving Trust led on the work package for testing the innovative indicators and data handling approaches through a selection of test projects. These demonstrated the potential of the toolbox to deliver more reliable EPC schemes across the EU.

"a project focused on the future, the next generation, of Energy Performance Certificates."



3 EPC EVOLUTION

EPCs in Scotland are evolving. The current domestic EPC presents two headline metrics, one based on energy cost, another based on carbon emissions. These are key indicators for understanding the energy performance of our homes.

The Scottish Government consultation published in 2021 alongside the Heat in Building strategy proposed a shift in design of the domestic EPC to include three headline metrics, the cost and energy use metric and a new 'energy use rating' expressed in kilowatt hours per square metre per year. The advantage of this new energy use rating is that it will particularly help to make clear the benefits of energy efficiency from home improvements and new heating systems.

The evolving Energy Performance Certificate in Scotland

The proposed new format will therefore contain three metrics:

- Energy Use Rating
- Carbon Emissions Rating
- Energy Cost Rating

Energy Use Rating: Provides indicative energy use based on kWh/m²/year. The energy use rating is a new metric on the EPC.

Carbon Emission Rating: Provides calculated carbon dioxide emissions for a dwelling in kg CO_2/M²/year. This metric is the current EPC EER.

Energy Cost Rating: Provides indicative running costs expressed in pounds per year. This metric is the current EPC EER.

	kWh/m²/year		kg CO2/m²/year		Finance	
	Energy Use Rating		Carbon Emissions Rating		Energy Cost Rating	
	Current	Potential	Current	Potential	Current	Potential
A						
B						
C						
D						
E						
F						
G						

Figure 2: *Indicative layout of the three metrics to appear on the reformed EPC certificate. Taken from this report.*

3

Energy Performance Rating – Aligning with Net Zero

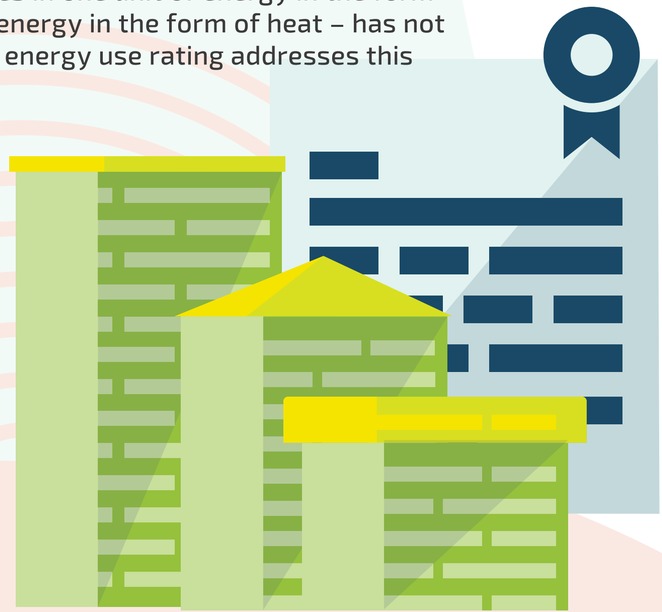
To ensure that the energy performance rating included on Energy Performance Certificates (EPCs) aligns with our net zero objectives we will reform the EPC assessment process before using it as the standard by which properties will be measured.

Our consultation on a revised metric to be included on the EPC considers how best to provide information to building owners on:

- measures needed to improve energy efficiency,
- an appropriate zero emissions heating supply,
- and the cost of heating following these improvements.

Figure 3: *Taken from the Heat in Buildings Strategy*

For example, one key problem with the two metrics used currently is that the principal benefit of a heat pump – that it takes in one unit of energy in the form of electricity and turns it into three units of energy in the form of heat – has not been particularly visible in the EPC. The new energy use rating addresses this problem.



Another criticism often made of current EPCs is that the information they provide about the costs and payback for homes if recommended measures are implemented can be very vague. For example, they might tell you to consider installing solid wall insulation but give you an indicative price that ranges over several thousand pounds. The evolution of the EPC in Scotland will continue with a Scottish Government plan for more robust recommendations. This idea of improving recommendations is expanded below through the very relevant achievements of X-tendo.

Beyond the immediate plans for the extension of EPCs, Scottish Government, in the Heat in Building Strategy, has decided to look at providing stronger information on heating systems – an appropriate zero emissions heating supply and the costs of new heating. This is a key development to deliver zero carbon heating in Scotland's buildings and further information is expected.

Delivering effective EPCs for business buildings can be more challenging than for homes. Business buildings, and their patterns of building energy use, are more diverse from one another than in homes, i.e. homes, however big or small, all fundamentally do the same sort of things. Consequently, EPCs that aim to provide a standardised assessment sometimes raise more questions for business buildings than they answer. This is another area the Scottish Government is currently looking at.

One approach developed in England and supported by Energy Saving Trust is to introduce an energy performance benchmarking system based on real monitored energy use in the largest business buildings. Making greater use of real energy use data is further discussed below.

4 X-TENDO APPROACH

The X-tendo project has been an exciting journey. The project started with ten fairly broadly conceived ideas for how EPCs could be improved – from a comfort indicator, through to better integration with building logbooks.

What the project has done in 13 countries over three years is to develop these concepts into calculation methodologies, assessment approaches and IT integration projects with leading academics and analysts developing the thinking about exactly how these can be implemented.

X-Tendo intends to develop a **toolbox with 10 functionalities** for updating the next generation of energy performance certificates, to **provide public authorities** with compliance, reliability, usability and convergence in the assessment and certification of energy performance of next generation buildings.

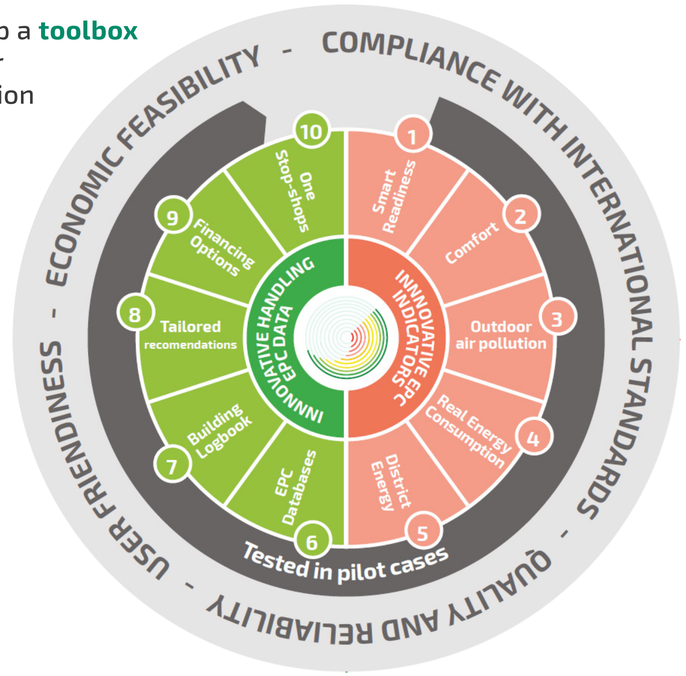


Figure 4: *X-tendo project.*

4

X-tendo then tested the approaches in real homes and buildings. Where relevant, the project also tested them against existing EPC systems and infrastructure. For example, a digital sandbox was used to test how new ways of handling EPC data could be integrated with the existing Greek national EPC database. Polish EPC assessors were asked to test additional questions and take extra measurements to assess air quality as part of their standard EPC assessment process. They were also asked if the assessors thought this was practical as an ongoing feature for implementation. X-tendo has carried out 34 of these testing processes across the participant countries, including in Scotland.

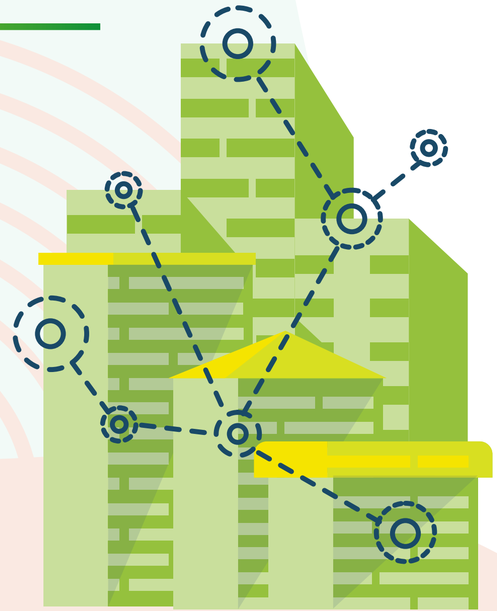
The net result is that X-tendo has ten features to propose to you. Ten ways in which EPCs could be enhanced. As this project nears its end, X-tendo colleagues are able to step back from the complexity of calculation methodologies and IT system integration to present quite clearly what has been developed, how it works and what benefits it can bring. These benefits are to improve EPCs, but ultimately, they are benefits that encourage homes and business buildings to be lower carbon, requiring less energy from the grid, and incurring lower bills.

This document provides a whistle-stop tour of the 10 X-tendo features, why X-tendo has focused on them, what the approach is, and what benefits it will bring if a feature is adopted as part of a national EPC systems. For the UK this means that these features can potentially be adopted into the three UK EPC systems: for Wales and England, for Scotland and for Northern Ireland. Two of the 10 features have been tested or reviewed on the ground in Scotland and therefore a little more detail is provided for these.

There are a couple of caveats in relation to this document. Firstly, although Energy Saving Trust works closely with the Scottish Government, and although Scottish Government civil servants have been interested in X-tendo, this is in no way a government project. The information provided in this document about the X-tendo results is not an indicator of official (or even likely official) direction on EPC policy in Scotland or other parts of the UK. Secondly, the approaches presented have a lot of methodological complexity behind them, which is not covered here. The whole point of X-tendo is that all the clever thinking, the algorithms and spreadsheets will be made available as open-source on the X-tendo website – www.x-tendo.eu – for anyone to use, however they see fit.

5 SMART READINESS

Buildings are becoming smart. It's not enough for a building to simply provide comfort, light and safety. A smart building uses data and connectivity to provide the user with the best possible facilities, while optimising its resource consumption. It can also enable the building to play a role in wider energy systems and smart grids.



The idea of the Smart Readiness Indicator in X-tendo is to measure and communicate how far a given individual building has reached on this journey. In other words, how well the building is able to adapt its operation to the needs of the occupants and the grid.

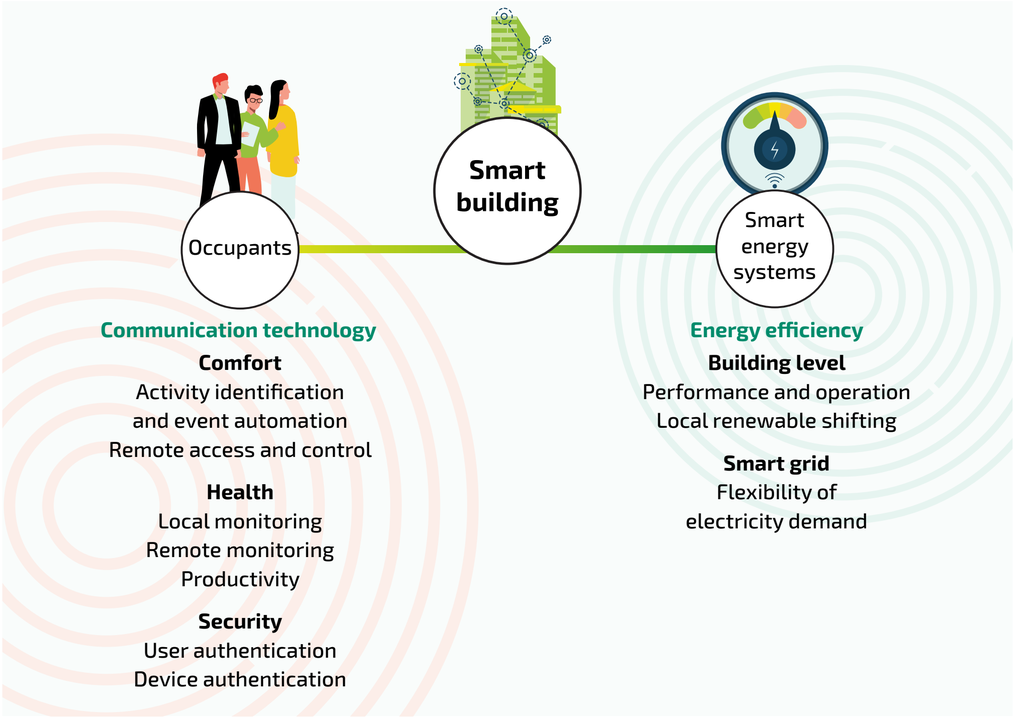
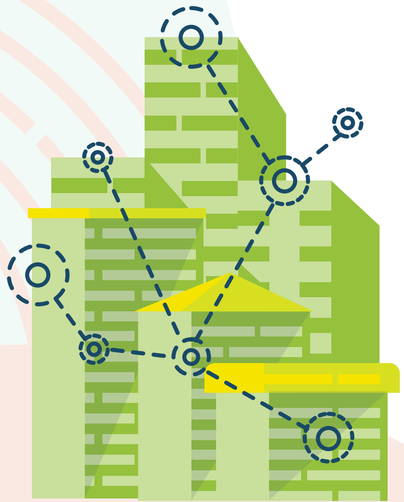


Figure 5: *Feature 1: Smart readiness indicator*

5

The X-tendo Smart Readiness Indicator spans nine areas of building functionality:

1. **Heating**: thermal storage, emission control systems, generators and energy consumption for space heating.
2. **Cooling**: thermal storage, emission control systems, generators and energy consumption for space cooling.
3. **Domestic hot water**: services dealing with the smarter control of generating, storing, and distributing potable hot water in a building.
4. **Controlled ventilation**: services for air flow control and indoor temperature control.
5. **Lighting**: electric lighting managed/controlled by a lighting system based on, for instance, time, daylight and occupancy.
6. **Dynamic building envelope**: control of openings and sun shading systems and/or windows.
7. **Electricity – renewables and storage**: both on-site renewables and storage (and in the future, potentially plug loads).
8. **Electric vehicle charging**: technical services provided by buildings to electric vehicles (EV) through recharging points, e.g. for electric consumption management and storage capabilities.
9. **Monitoring and control**: sensor data that can be provided by Technical Building Systems (TBS) and used by other services, and/or be combined into one overarching system such as a Home Energy Management System (HEMS).



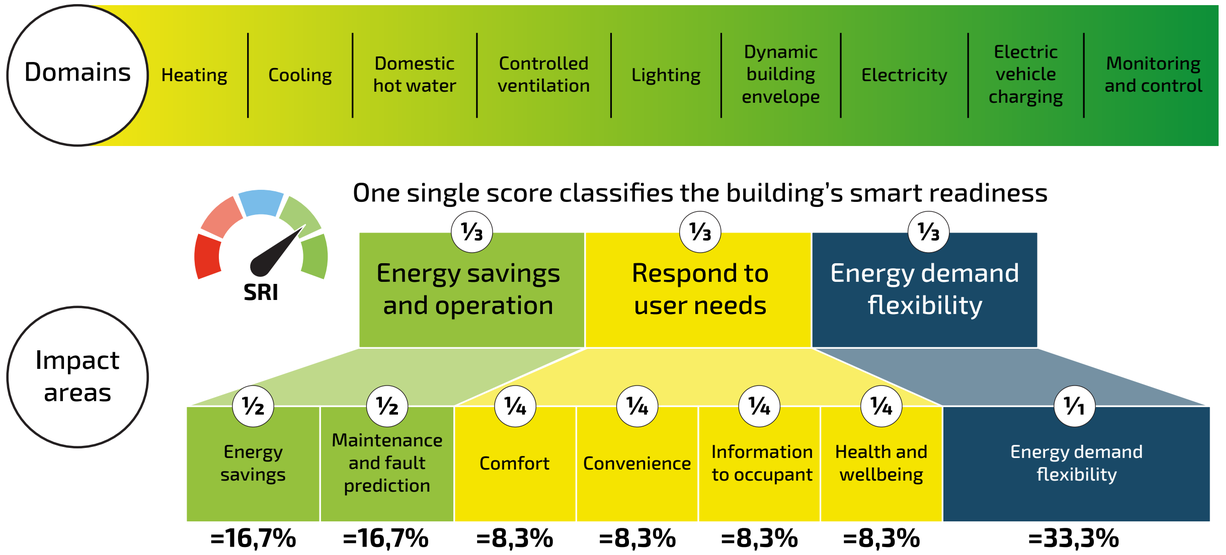


Figure 6: *Feature 1: Smart readiness indicator*

Based on an assessment of each of these nine functionalities, the Smart Readiness Indicator is calculated on the basis of seven impact areas, i.e. how the presence and functionality of installed ventilation, lighting and renewables systems etc. will affect the grid, householders' comfort and so on.

An algorithm is used to assess the relative weight of these different impacts and from that an overall Smart Readiness Indicator is created that could be included in an EPC.

Data collection for this process is through three possible approaches developed through X-tendo: a checklist that can be used by a homeowner; a checklist that needs to be completed by an expert energy assessor; or using monitored energy data.

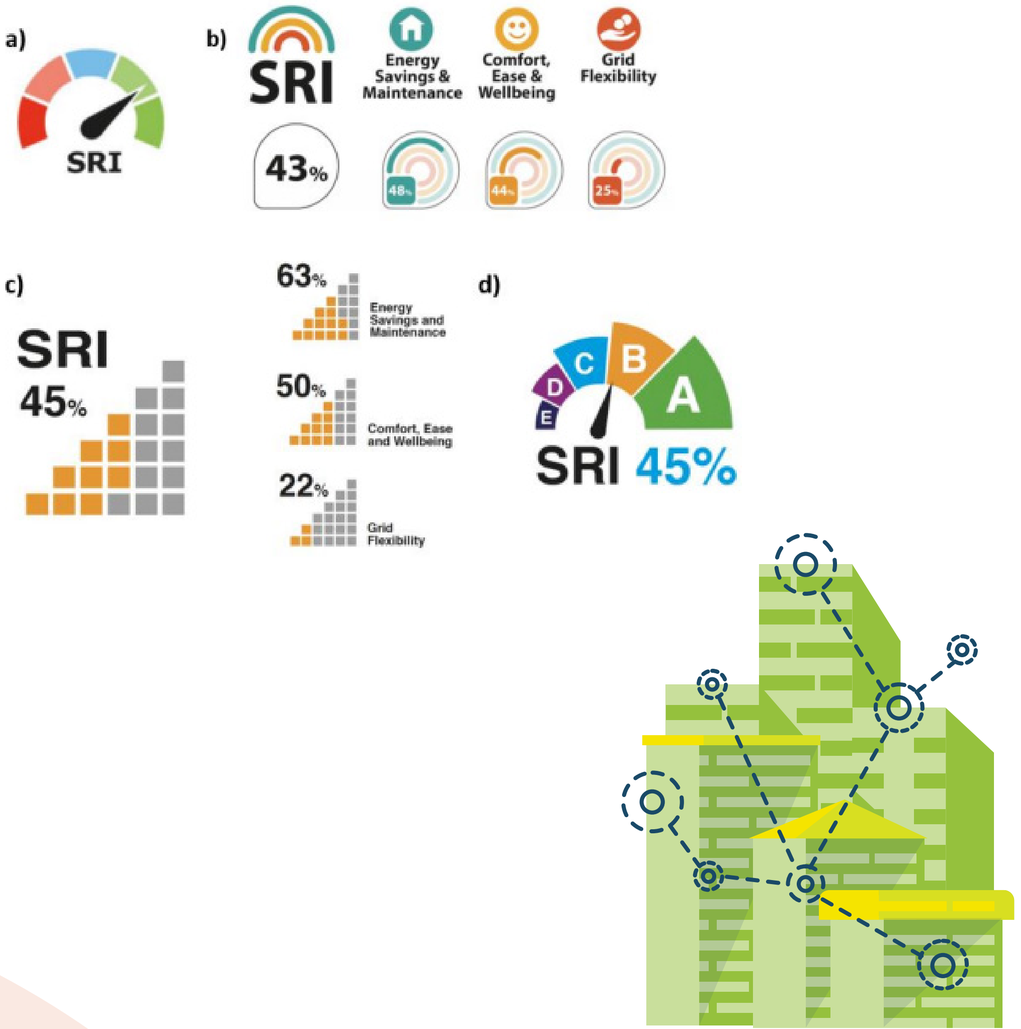
5

The X-tendo team has come up with some ideas on how the results should be presented:

IMPACTS

DOMAINS	Energy efficiency	Maintenance and fault protection	Comfort	Convenience	Health and well-being	Information to occupants	Energy flexibility & storage	SRI
Total	**39%**	**18%**	**60%**	**71%**	**48%**	**59%**	**0%**	**42%**
Heating	32%	18%	62%	55%	24%	74%	0%	
Sanitary hot water	17%	0%	45%	70%	67%	83%	0%	
Cooling	65%	51%	78%	72%	61%	55%	0%	
Controlled ventilation	41%	0%	55%	60%	34%	44%	0%	
Lighting	85%	14%	90%	100%	83%	15%	0%	
Dynamic building envelope	10%	0%	31%	56%	22%	46%	0%	
Electricity	10%	0%	-	-	-	68%	0%	
Electric vehicle charging	–	38%	-	82%	-	84%	0%	
Monitoring and control	52%	43%	62%	72%	45%	64%	0%	

Figure 6: *A Smart Readiness Indicator*



6 COMFORT

A decade ago, we used to emphasise that energy bills were what *really* made people invest in energy efficiency improvements. Over recent years, there has been a realisation that home comfort is an equally significant driver.

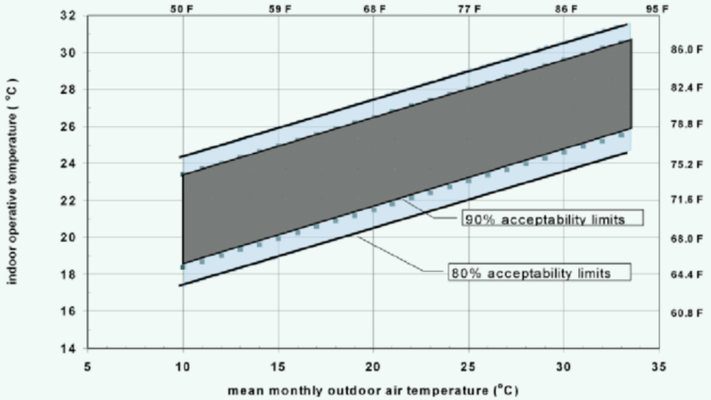
Adequate levels of indoor air quality, thermal comfort, lighting and acoustics in buildings are among the most important benefits and drivers for renovation. These aspects are currently not covered, or only covered in a very limited or indirect way, by EPCs in different countries.

The X-tendo feature on Comfort allows the assessment of the levels of comfort in terms of Indoor Environmental Quality (thermal comfort, visual comfort, acoustic comfort and indoor air quality) for a given building (residential, office or school) through reliable and evidence-based inputs.

The assessment approach for calculation is designed for two types of buildings:

1. **Comfort Asset Rating Procedure (CARP)** – for buildings where a year's worth of occupancy data isn't available because it is newly constructed or renovated. This is based on a checklist used in the building by the assessor.
2. **Comfort Operational Rating Procedure (CORP)** – where people have been living in the building for more than a year. The comfort assessment provides real information about how comfortable the building is based on its actual operation. The rating is based on measurements (temperature, relative humidity, CO_2), surveys and checklists undertaken in the occupied building.

A challenge for the operational rating is that measuring humidity temperature and CO_2 inside the building requires the use of additional sensors and data gathering. That will inevitably add to the cost of producing the EPC.

Category	Indicators	Ranking/scale/score
Thermal comfort	PMV/PPD (conditioned spaces)	ASH RAE scale (-3 [cold], -2 [cool], -1 [slightly cool], 0 [neutral], +1 [slightly warm], +2 [warm], +3 [hot])
	Adaptive comfort (unconditioned spaces)	 Acceptability limits used (70-90%) based on number of occupants. Light grey area represents 70% acceptability and dark grey represents 80-90% acceptability
Visual comfort	lluminance level	Minimum requirements according to occupancy (e.g. office=500 Lux, corridor 100 Lux etc.)
	Daylight factor	50% of usable area throughout the building should have OF(> 3% very good, > 2% medium, > 1% slight, < 1% none)
Visual comfort	Size of fenestrations	Values for WWR (window-wall ratio) should be between 20-60%.
	Spatial daylight autonomy	Refers to the % of floor area that receives 300 Lux of daylight for min. 50% of annual occupied hours (LEED requirement 55-75%)
	Annual sunlight exposure	Refers to the % of floor area that receives 1000 Lux of direct sunlight for min. 250 occupied hours per year (LEED requirement max. 10%)

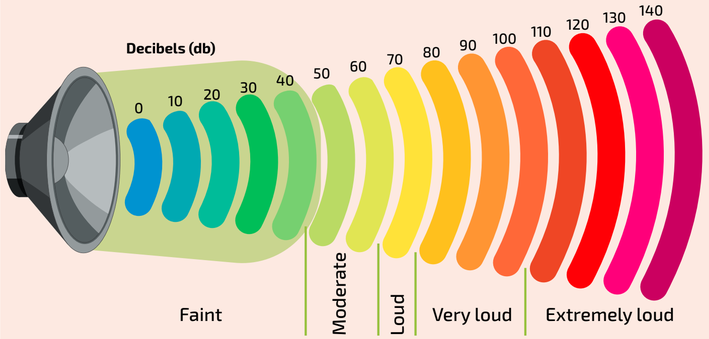
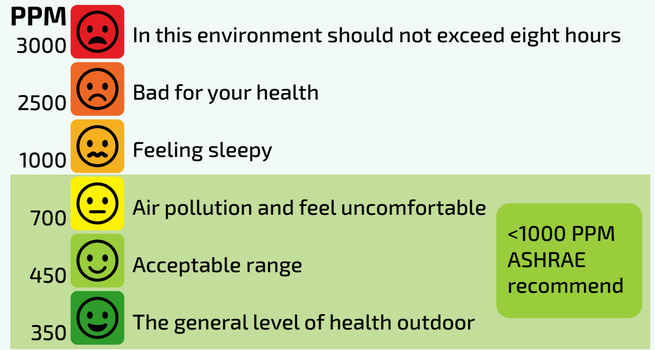
Category	Indicators	Ranking/scale/score
Acoustic comfort	Indoor ambient noise level	 Should not exceed 40 dB indoors
Indoor air quality	CO_2 concentration	 Specified values based on occupancy in standards

Figure 7: *Feature 2: Comfort indicator, source https://iotfactory.eu*

7 AIR POLLUTION

Carbon dioxide emissions associated with home energy use, whether directly from the home or from power plants is the key air pollutant reported on existing EPCs.

However, other pollutants are also very important such as in situations where local smog develops. Air is also supplied into buildings for hygienic reasons, which means the quality of outside air influences the indoor conditions.

The X-tendo feature on outdoor air pollution consists of a methodology for reporting on buildings' contribution to air pollution (Local Air Pollution Contributor Index) from its energy using systems as well as the air-filtration efficiency in ventilation systems (Indoor Air Purity Index).

This feature was developed in Poland, where air pollution associated with fossil fuel generation is a significant problem. But issues of indoor air quality resulting from transport on busy roads and urban centres mean this feature could have relevance to some UK homes.

"The X-tendo feature on outdoor air pollution consists of a methodology for reporting on buildings' contribution to air pollution"

8 REAL ENERGY CONSUMPTION

The fact that EPCs are based on modelled data is often a source of confusion for homeowners and households with people saying, “But my energy use is nothing like that”.

Arguably, EPCs have to be based on modelled data as it would be inaccurate for a certificate, designed to be used at the point a building changes hands, to be based on any particular household or business’s pattern of energy use.

However, there is clearly scope for some information on EPCs, or services derived from EPCs, to be based on real energy use data collected in the home. In the UK (as in many other countries) the Smart Metering roll-out offers the potential to use monitored energy data in the provision of advice, something Energy Saving Trust has been working on for a few years through Home Energy Scotland.

Research shows that the gap between real energy performance and EPC calculated performance can be significant. But attempting to create a standardised measure of energy performance based on measured energy consumption data creates several challenges, for example the weather can significantly affect a building’s energy consumption. Nonetheless, several principles and calculation models have already been developed to create a standardised energy performance measurement based on monitored data including a European Standard. The X-tendo approach builds on these methodologies.

Image: Mirko *Tobias Schäfer, under Creative Commoms Attribution License*

8

Full monitored data often isn't available for a building, either in terms of having a full year (or more) of data or covering all the energy use in the building. In fact, anyone whose been involved in an energy monitoring project will know that full, clean data is almost never available!

One of the key features of the X-tendo methodology is a planned approach for handling partial data, while still providing a standardised assessment of real energy use.

For the UK, such approaches will probably be more relevant to the non-domestic sector initially. In England and Wales, we already have Display Energy Certificates based on real energy use. These are also required in a more limited setting in Scotland. The UK Government has also proposed an operational rating-based benchmarking system for the largest offices in England. This is based on the successful Australian NABERS programme.

Using smart meter data to power the production of domestic EPCs may be something that is technically possible. Energy Saving Trust's view is that this may be some way off due to issues including: the need for a full roll-out of smart meters; ensuring that all the data flows from smart meters to advice providers are working smoothly; and managing the complex consents required for handling personal energy data.

"One of the key features of the X-tendo methodology is a planned approach for handling partial data, while still providing a standardised assessment of real energy use."

9 DISTRICT HEATING

District heating is a major component of Scotland's Heat Decarbonisation Strategy. Could an EPC provide better information for building owners about connecting to district heating systems and system operators about the potential for connecting homes in their area?

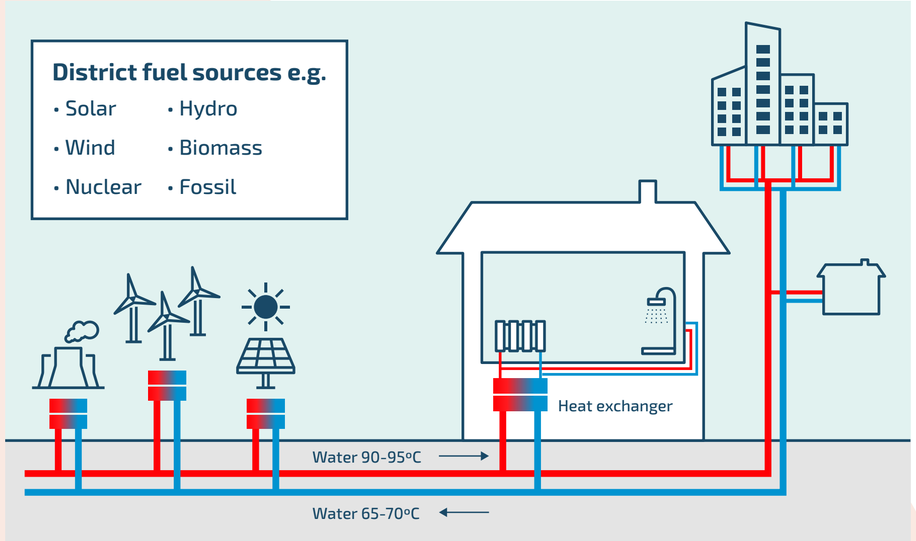


Figure 8: *Feature 5: District heating*

A key aspect of delivering low carbon district heating is reducing the temperatures in the system. Our diagram here shows a traditional DH system with high flow and return temperatures. Using lower temperatures poses challenges but can open up the potential to use lower temperature, lower carbon heat sources liked solar thermal or waste heat from industrial processes.

The X-tendo district heating indicator is based on two elements:

1. A measure of the temperatures needed in the building that is the subject of the EPC, to deliver its heating. As the temperature demanded for comfortable spaces usually lies in the range of 18 to22°C there is a significant potential for lower supply and return temperatures. However, heat supply and distribution systems installed in many buildings operate at supply temperatures well above these required temperatures.
2. An indication of the carbon impact of the nearest DH system (and the future plans for decarbonisation of the DH network). This is about the potential for district heating connections, so the building is not necessarily already connected to the system analysed.

10 EPC DATABASES

The features described so far all relate to indicators on EPCs – the ways of measuring different aspects of a building's performance and reporting it on a certificate.

X-tendo also considers approaches to 'data handling', which means making the best use of EPC data and enabling the data to be used to power wider services in support of decarbonisation and retrofit.

EPC databases	Development and implementation of routines, which are able to identify outliers and to validate EPC data;
Logbook	Description of core logbook ingredients: (1) data template, (2) functionalities and benefits, (3) and data governance. Proposal for a common X-tendo data model based on available EPC data
Enhanced recommendations	Proposal for automatically-generated building-specific recommendations; estimation of economic assessment of renovation measures based on input data required for EPC; and links to LTRS
Financing options	Identification of information sources on public financial schemes and closer integration of financing with EPCs
One-stop-shops	Guidelines on how to set up or upgrade OSSs; description of approaches for linking EPC data to OSS and testing these approaches in the different implementing countries

Figure 9: *X-tendo:Innovative data handling features*

EPCs with errors are not uncommon including sometimes very basic errors regarding facts about the home or building that has been assessed. The Scottish Government has taken several steps to address quality control of EPCs, including smart auditing – checks within the EPC database to make sure that the numbers and measurements reported on EPCs make sense.

10

This sort of smart auditing might check whether a value seems out of plausible range, e.g. a home with a 1500m² floor area is very unlikely. It can also check where values seem likely to be inconsistent for that home, e.g. where a small house is reported as having a huge area of windows. Smart auditing can also flag inconsistencies between homes in the same area, for example where an EPC states a home is a terrace when all the other EPCs for homes on that street are for semi-detached homes.

X-tendo has developed a standardised approach to this sort of quality control of EPCs using databases, which has been tested by the agencies responsible for EPC databases in Denmark, Greece and Italy.

In Denmark, as in Scotland, the Danish Energy Agency has already implemented standardised rules to verify the EPCs in the database and to identify potentially risky EPCs that are then manually checked. While issuing the EPC in Denmark, the energy auditor receives automatically generated warnings from a smart auditing process if data seems out of range.

The next stage of development in Denmark, which was taken forward as part of X-tendo, involved identifying the rules that are frequently violated and exploring the reasons for these. Once a common error and the reason behind it is known, then training and awareness programmes for assessors can help prevent it arising in future. The feedback loop back to the assessor is shown in Figure 10.

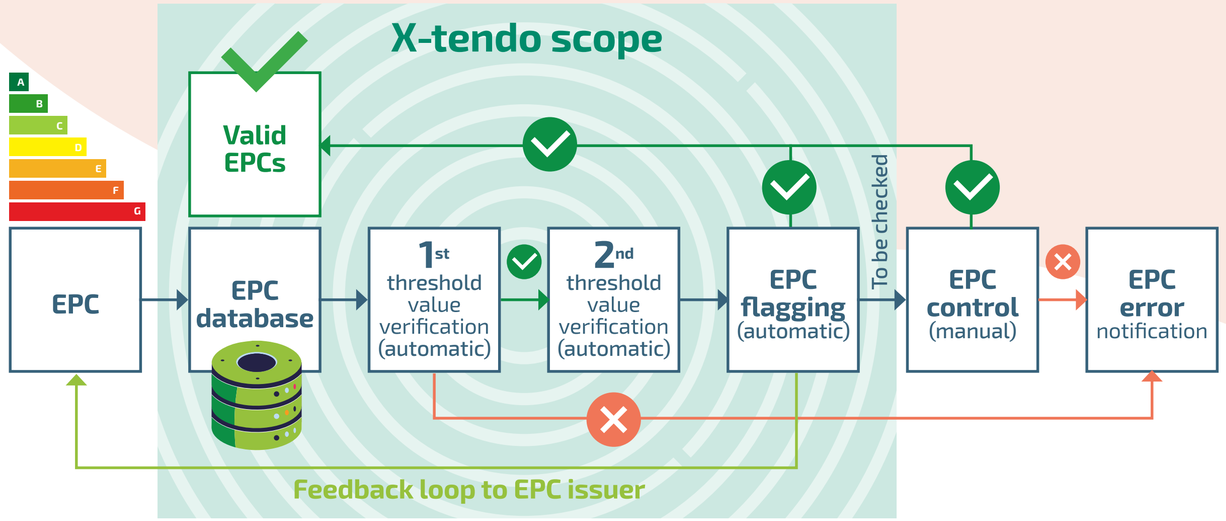


Figure 10: *EPC Databases (or – spotting dodgy data)*

As a result of implementing this X-tendo feature, the Danish Energy Agency now know that a majority of errors in producing Danish EPCs occur in the information provided about building roofs. They have been able to investigate the reasons for this and have pinpointed the problem as a lack of documented building plans from the period before the 2000s. This means that energy auditors are estimating roof U-values for buildings constructed before this period, which they should be doing using assumptions based on the building regulations in force in the 1990s and earlier.

Further investigation is now needed as to whether assessors are accurately reporting the U-value for these older buildings. If yes, then the buildings were not built in compliance with the building regulations in force. If no, building assessors are making mistakes and require further training.

In either case the database investigation and feedback loop is making new use of EPC data to highlight important issues for assessing and understanding the condition of the Danish building stock.

11 BUILDING LOGBOOKS

Building logbooks for homes are an increasingly high-profile idea. In the UK, several commercial providers are now offering residential logbook services.

Data gathering and data points	Functionalities and benefits	Data governance, ownership and access
• Building description and characteristics • Operation and use • Building performance • Material inventory • Financial information • Etc.	• Digital repository • Operation & maintenance plan (notifications) • Overview of building performance • SRI • Renovation roadmap • Traceability of building materials • Integration with BIM • Etc.	• Data standards, interoperability • Data storage • Ownership • Access • Privacy • Security

Figure 11: *Building logbooks*

Over the lifespan of buildings, data is routinely collected by lots of different companies – government bodies and building owners – for various reasons, as many decisions rely on data availability.

There is a huge potential to bring this together to help building and occupiers care for and improve their building, particularly at key building trigger points all the way through from construction to refurbishment to demolition.

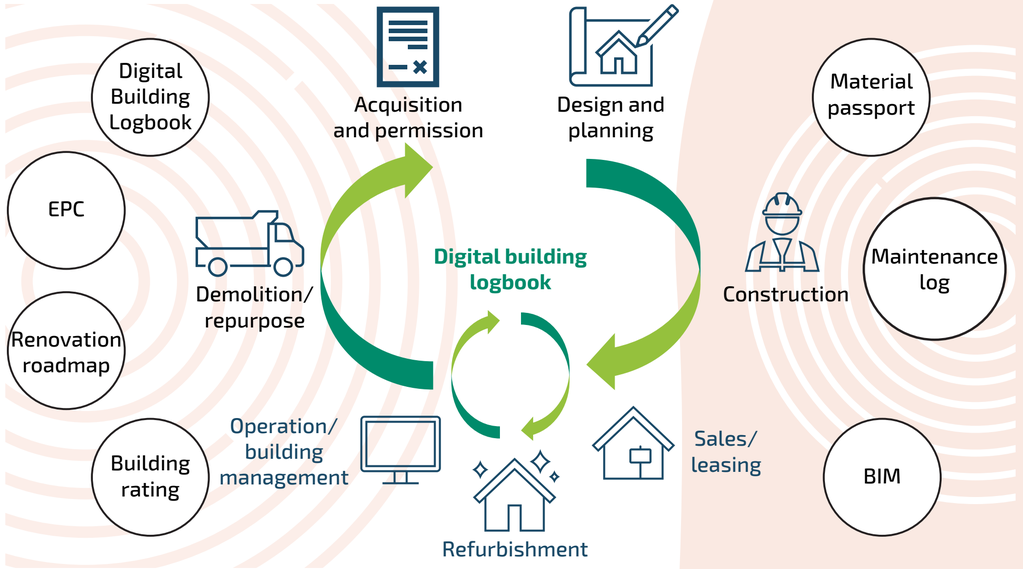


Figure 12: *Building logbooks*

11

A key application of building logbooks is making energy renovation easier. As part of X-tendo, specifications of the key fields that will go into a building logbook have been created. This has been tested in a number of countries, including Portugal.

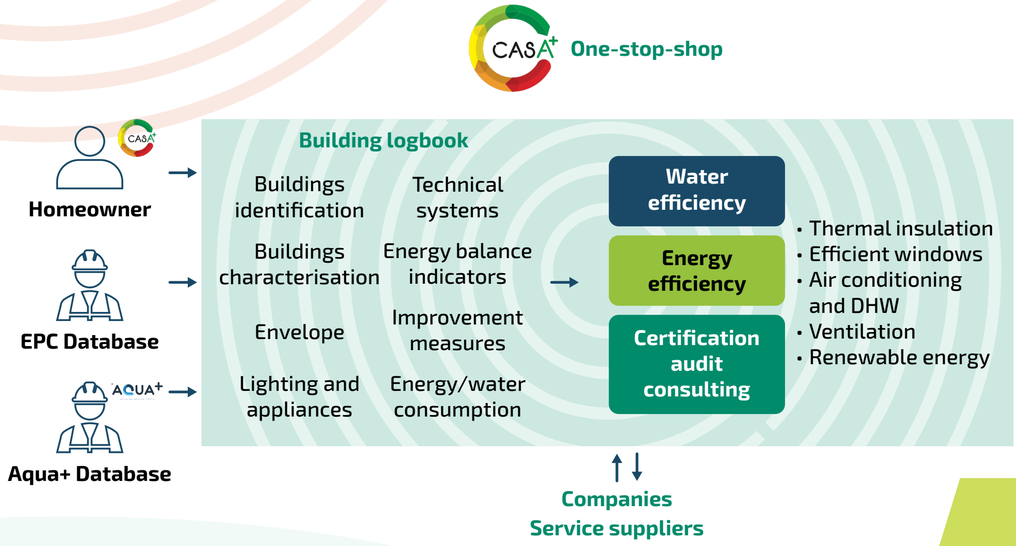


Figure 13: *Portuguese Building Logbook integrated into CASA+*

In Portugal a service called CASA+ (Casa Mais – Home Plus) has been steadily developed by the Portuguese Energy Agency. Using data from EPCs it provides recommendations for improvement measures. CASA+ is increasingly evolving into a full building logbook service, steadily bringing in more data, alongside EPC data, to provide a full record of facts about the home. This goes far beyond recommended energy saving measures to also provide land-registry information for the home, advice on water use (through integration with a parallel Aqua+ service) and facts about all the main energy using systems in the home.

One of the merits of a logbook is the potential to make data readily available to companies who can deliver home improvements and repairs. In the case of CASA+ the idea is that energy and water efficiency companies will be able to access parts of the logbook data (for example on the building fabric or the heating system) and provide quotes for the works needed. The building logbook stores EPC data, making available a historic overview of data from expired EPCs or retrofitted building components.

Energy Saving Trust holds EPC data on behalf of Scottish Government and also provides the Home Energy Scotland advice service. We are keen to explore building logbook developments and – working with Trustmark and the UK Residential Logbooks Association – have recently developed a plan to do this.

"With CASA+ the idea is that energy and water efficiency companies will be able to access parts of the logbook data and provide quotes for the works needed."

12 ENHANCED RECOMMENDATIONS

X-tendo has developed an approach to providing enhanced recommendations based on three levels, as shown in Figure 14.

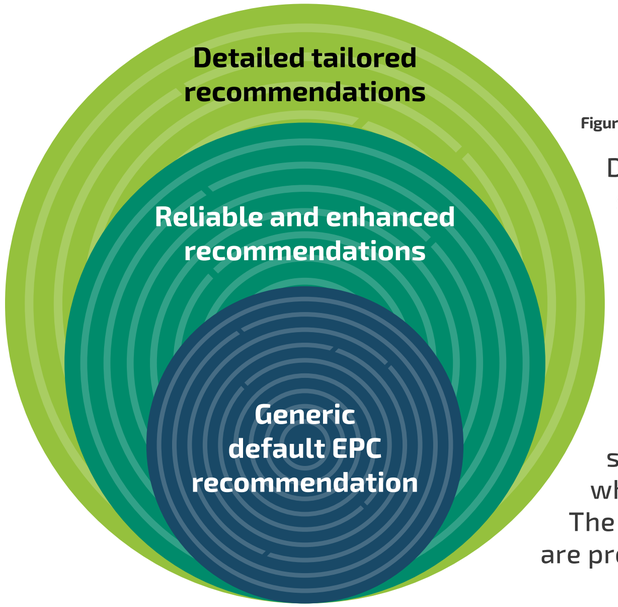


Figure 14: *Enhanced recommendations*

Different countries are at different levels of sophistication in terms of the functionality of their EPCs in providing detailed recommendations. Currently, the EPC software automatically generates recommendations on domestic EPCs in Scotland. For example, an uninsulated solid wall home will be automatically recommended solid wall insulation, although assessors can manually supress recommendations if there are reasons why they might not be right for that property. The prices on EPCs for recommended improvements are provided on the basis of a broad, common ranges.

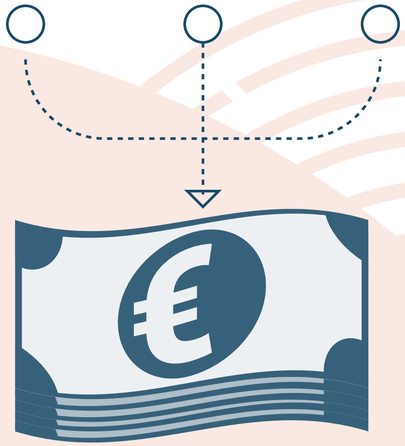
"Different countries are at different levels of sophistication in terms of the functionality of their EPCs in providing detailed recommendations."

X-tendo aimed to develop a new approach and demonstrate how recommendations can be enhanced in three ways:

1. Firstly, for automatically generated recommendations, to provide wider information on the benefits of the measures, beyond just technical and economic considerations.
2. Secondly, demonstrating approaches to displaying the costs of recommended measures.
3. Thirdly, setting target values for recommendations (e.g. in terms of the U-value, insulation performance) to be achieved by insulation to guarantee that they are in line with national long-term and climate strategies for the building stock.

13 FINANCING

Decarbonising our homes and buildings is going to involve billions of pounds of expenditure over the next few years. The result will be lower energy bills and more comfortable and higher quality homes, as well as tackling climate change. But individual homeowners will need financing options to help pay the upfront costs. It is unlikely that all that financing support will come from the Government.



Moves to drive the private finance market for renovation have come particularly from the UK Government, which has set up the UK Green Finance Taskforce and consulted on a plan to require mortgage providers to bring their portfolio of mortgaged homes up to an average rating of 'C'.

Financing schemes portfolio	How to link epcs to financing	How to communicate financing
Learn from the cases of success, types of financing schemes available, requirements, which are/could be adopted in your country (country overview), needs and barriers.	Tips on the use of EPCs in financing schemes (as eligibility criteria) and on EPC upgrade to integrate and monitor financing along improvement measures recommendations.	Guidance on how to establish a unique platform to communicate available financing to everyone (building owner, EPCs, customer journey platforms, etc.)

Figure 17: *Financing*

X-tendo developed some principles as to how EPCs can support provision of private finance. The recommendations point in two directions.

Firstly, in providing information about the home and potential improvements to finance providers, EPC data can be used as an eligibility criterion for financing. For example, EPC 'C' is emerging across the UK as a key threshold for accessing financing support. By strengthening databases' interoperability, finance providers can readily draw on EPC data to help automate renovation finance decision-making. The EPC can also be used to document effective implementation (monitoring) of improvement measures provided by green finance.

The X-tendo recommendations also point to the information about financing that is provided to the building owner via the EPC and related systems. As a result, X-tendo provides guidance about how to present financing options (such as green mortgages) on the EPCs, and automatic links recommended measures to specific available financing schemes (e.g. Digital EPC).

14 ONE STOP SHOP

In a normal year, around 1% of Scottish households call Home Energy Scotland – our national home energy advice one stop shop. With the current energy bill crisis, the numbers are likely to increase.

One stop shops (OSS) are advisory services designed to make it easy for households who need help with energy efficiency and carbon saving, to access finance, benefits and support schemes. They also link to suppliers – the idea being to enable homeowners and residents to move towards and through their building renovation process as smoothly as possible.

One-stop-shop	**Type & Description, Needs & Barriers, Best Practices & Flag projects, Business models & cost structure**
Building logbook	Recommendation on use of EPCs, Link to EPCs and other databases, information available to homeowners
Enhanced recommendations	Map Improvement need based on EPCs, Monitor effective implementation, link to customer journey platforms
Financing	Map financing scheme & indicators on EPCs, link to available financing schemes, link to customer journey platforms
Marketplace	Companies/installers rating system, link companies to homeowners and their EPCs, companies access to OSS
Advice centre	Recommendation on how to support OSS end-users, link to EPCs and other OSS functionalities

Figure 18: *The One Stop Shop*

14

There are many barriers to making progress in upgrading our buildings and the OSS provides a single point of information and help. As such, the OSS brings together many of the concepts already discussed in this document – help with financing, potentially creating a building logbook and maximising the value of EPC data.

When OSS can draw on accurate EPC data, they can provide much richer advice and advisors need to ask far fewer questions from customers.

As part of the X-tendo project, Energy Saving Trust took frontline Home Energy Scotland advisors away for a brief break from their very busy schedules to identify how they saw EPC data being used more as part of the continuous improvement process of the HES one stop shop service.

A key focus was on the potential to use EPC data with smart meter data to provide a detailed picture of the householder and the home and how they use energy. Acknowledging that this sort of detailed personal data handling requires clear customer consent at every stage, our HES advisors explored how we can develop robust, fast and accessible approaches to gathering that consent, without putting customers off.

A richer picture of the home and household enables more customer-led engagement with more flexible support to householders. This enables advice on the exact funding and information that is right for the customer. Advisors also referenced the need for additional services for specific groups of customers, particularly vulnerable customers.

Finally, Home Energy Scotland uses multiple digital advice tools and technical enhancements, which could all make use of richer data.

X-tendo did not produce a single Europe-wide set of methodologies for delivering an OSS service as it did for other features. Instead, this is an approach that needs to be at the centre of national home and business building decarbonisation strategies and plans. An approach that can make maximum use of EPC data.

“A richer picture of the home and household enables more customer-led engagement with more flexible support to householders. This enables advice on the exact funding and information that is right for the customer.”

15 CONCLUSION

Overall, the ten features developed and tested in the X-tendo project provide a promising direction to advance existing EPC schemes. Not only to support taking necessary measures to enhance energy performance but extending beyond that, to providing information to owners and tenants, as well as the relevant market actors, facilitating a much needed push for renovations.

X-tendo features were developed to empower the end-user with more information and help them take necessary actions for renovation. However, experts also found that all the data gathered by the new features are highly relevant for the public authorities, but that not all outputs are relevant to the end-user. While most of the features are directly useful to the end-user, others are meant for quality assurance (such as EPC database), tracking progress by public authorities (such as district heating), and planning and setting targets for environmental policies (using the outdoor air pollution feature). Each feature is distinct in its application and entails careful planning for its implementation into existing EPC schemes.

After rigorous development and testing of features in the X-tendo countries, the X-tendo project has identified a series of recommendations for policy uptake and formulation that would be beneficial in the implementation of new features. The developed features are provided in the form of a toolbox on the official X-tendo website, www.x-tendo.eu , to enable public authorities to implement them effectively.

For further detailed information on the X-tendo please visit www.x-tendo.eu

www.x-tendo.eu

#Xtendoproject