



D2.4 Development Strategy Plan for the development of next generation EPC schemes

QualDeEPC H2020 project

MAIN AUTHOR: Daniela Kostova (EAP)

Co-authors: Dr. Stefan Thomas and Sriraj Gokarakonda (Wuppertal Institute)

DATE: 29/06/2020

PUBLIC

Project **QualDeEPC**

“High-quality Energy Performance Assessment and Certification in Europe
Accelerating Deep Energy Renovation”

Grant Agreement no. 847100

H2020-LC-SC3-EE-2018



Document Factsheet	
Project duration	From September 2019 to August 2022
Project website	www.qualdeepc.eu
Document	Deliverable 2.4: Development Strategy Plan for the development of next generation EPC schemes
Work Package	WP 2: Analysis of current practice and priorities for next-generation EPCs
Task	Task 2.4: Defining the development targets and actions to be performed in WP 3
Version	1
Version date	29/06/2020
Main Author	Daniela Kostova (EAP) Co-authors: Dr. Stefan Thomas and Sriraj Gokarakonda (Wuppertal Institute)
Contributors	QualDeEPC project partners: CRES, DENA, EAP, EKODOMA, ENERGIAKLUB, ESCAN, CIT ENERGY MANAGEMENT AB
Reviewers	Project coordinator: Dr. Stefan Thomas; all project partners
Type of deliverable	Report
Dissemination level	PU

Table 1: Document Factsheet

Document Status	
Review status	<input type="checkbox"/> Draft <input checked="" type="checkbox"/> WP leader accepted <input checked="" type="checkbox"/> Coordinator accepted
Action requested	<input type="checkbox"/> To be revised by partners <input type="checkbox"/> For approval by the WP leader <input type="checkbox"/> For approval by the Project Coordinator <input checked="" type="checkbox"/> To be delivered to the Commission

Table 2: Document status

Document History			
Version	Date	Main modification	Entity
Final	29/06/2020	-	-

Table 3: Document History



ABBREVIATIONS

EPC: Energy Performance Certificate

DHW: Domestic Hot water

HDD: Heating degree days

CDD: Cooling degree days

HEC: Home energy check

NZEB: Near Zero Energy Buildings

PROJECT PARTNERS

WI: Wuppertal Institut für KLIMA, UMWELT, ENERGIE gGMBH

CRES: Centre for renewable energy sources and saving

DENA: Deutsche Energie-Agentur GmbH (dena)

EAP: Energy agency of Plovdiv Association

EKODOMA

ENERGIACLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

E-P-C: EPC Project Corporation Climate. Sustainability. Communications. mbH

FEDARENE: Federation europeenne des agences et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB



PUBLISHABLE SUMMARY

This document presents the Development Strategy Plan, which will be guiding the development of next-generation EPC schemes in WP3 of the QualDeEPC project. The work for establishment of this Development Strategy Plan has been structured in the following steps:

- Selection of the priorities for development, based on a set of criteria and the outcomes of the previous tasks;
- Analysis of the concrete needs for development of EPCs, EPC schemes and processes, and tools related to the selected priorities, both in general and for the seven EU member states represented in the QualDeEPC consortium,
- Proposal of indicators for monitoring the success of the development phase (including the testing in WP 4), and
- Drafting the Development Strategy Plan and discussion with the European Commission as well as national authorities and certification bodies.

Among the elements of the overall common vision developed in Task 2.2, the Development Strategy Plan sets priorities for which elements the project will develop further and towards which outcome, serving which purpose.

The seven priorities selected are:

- A) Improving the recommendations for renovation provided on the EPCs towards deep energy renovation
- B) Online tool for comparing EPC recommendations to deep energy renovation recommendations
- C) Creating Deep Renovation Network Platforms
- D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry
- E) High user-friendliness of the EPC
- F) Voluntary/mandatory advertising guidelines for EPCs
- G) Improving compliance with the mandatory use of EPCs in real estate advertisements

The Development Strategy Plan also encompasses the country situation and needs as found by the consortium partners in Task 2.3, where the gaps and shortcomings in the current EPC schemes in the QualDeEPC country partners, and national priority approaches to their resolution were analysed. The Development Strategy Plan thereby also addresses the country-specific development needs for the selected priorities.

The Development Strategy Plan will thus provide the guidance for WP 3 for the development phase and to draft an enhanced EPC scheme as well as the tools needed, and specifically the Deep Renovation Network Platforms, and also for the testing in WP 4.



TABLE OF CONTENTS

1	Introduction.....	7
2	Main objectives and Methodology for establishing a development strategy plan.....	9
2.1	Objectives of the Development Strategy Plan	9
2.2	Methodology	10
2.3	Criteria for selection	11
3	Selection of priorities	14
3.1	Analysis of longlist by criteria	14
3.1.1	Priorities selected in the Shortlist from National workshops	14
3.1.2	What can we develop and implement, and what will other projects do?	15
3.1.3	Success factors assessment	20
3.1.4	Ease of implementation, Chances to achieve political consensus and Need to change national legislation 21	
3.2	Final selection of priorities	23
4	The Development strategy plan: Concrete development needs for the priorities	26
4.1	EPCs and EPC schemes	26
4.1.1	General development needs and strategy plan	26
4.1.2	Country-specific development needs	39
4.2	Deep Renovation Network Platforms	92
4.2.1	General development needs and strategy plan	92
4.2.2	Country-specific development needs	110
4.3	Tools	118
4.3.1	General development needs	118
4.3.2	Country-specific development needs	122
4.4	Timetable and actors involved	128
5	Indicators for monitoring	133
6	Conclusions.....	137
7	References.....	138
8	Annexes.....	139
8.1	Annex: some examples of services provided by existing and proposed Deep Renovation Network Platforms and One-stop shops for renovation	139



INDEX OF TABLES

Figure 1 An overview for methodology for establishing a Development Strategy Plan	10
Figure 2 Criteria for selection of improvements for development	11
Figure 3 EPC elements selected as priorities for improvements by countries	15
Figure 4 Success factors assessment - Averaged country-specific normalized score for options in the longlist.....	20
Figure 5 Assessment of ease of implementation	23
Figure 6: Structure of one-stop-shop and Deep Renovation Network Platform	94
Figure 7: Structure of the Greek HEC tool.....	120
Figure 8 Indicators for monitoring	133

INDEX OF FIGURES

Table 1: Document Factsheet	2
Table 2: Document status	2
Table 3: Document History.....	2
Table 4 What can we develop and implement in the project.....	17
Table 5 What other projects do	19
Table 6 Ease of implementation, Chances to achieve political consensus and Need to change national legislation	22
Table 7 Development needs	31
Table 8 General development needs	38
Table 9 Country-specific development needs, stated by the stakeholders.....	41
Table 10 Minimal regulatory requirements for energy efficiency vs. improved recommendations....	43
Table 11 Minimal regulatory requirements for energy efficiency vs. improved recommendations....	50
Table 12 Minimal regulatory requirements for energy efficiency vs. improved recommendations....	58
Table 13 Minimal regulatory requirements for energy efficiency vs. improved recommendations....	63
Table 14 Minimal regulatory requirements for energy efficiency vs. improved recommendations....	70
Table 15 List of examples for not-mandatory trainings.....	74
Table 16 List of examples for not-mandatory trainings.....	78
Table 17 List of examples for not-mandatory trainings.....	80
Table 18 List of examples for not-mandatory trainings.....	82
Table 19: Existing and proposed Deep Renovation Network Platforms and one-stop-shops.....	105
Table 20: Overview of potential services and products of a Deep Renovation Network Platform	109
Table 21: Timetable and actors involved for development and testing	132
Table 22: Examples of services provided by existing and proposed Deep Renovation Network Platforms and One-stop shops for renovation	145



1 INTRODUCTION

The QualDeEPC project is aiming to both improve quality and cross-EU convergence of Energy Performance Certificate schemes, and the link between EPCs and deep renovation: High-quality Energy Performance Assessment and Certification in Europe Accelerating Deep Energy Renovation. The objective of the project is to improve the practical implementation of the assessment, issuance, design, and use of EPCs as well as their renovation recommendations, in the participating countries and beyond.

Work package 2 of the QualDeEPC project aims to develop the priorities for elements of EPC schemes that should be improved, and for which the project will develop proposals.

Based on the outcomes of the previous tasks, such as:

- overview of the current situation in the EU member states; including the seven partner countries;
- report on best practices and the assessment of success factors;
- analysis of the gaps and shortcomings in the current EPC schemes ;

Task 2.4, *Priorities and planning for development of next generation EPCs*, has developed the Development Strategy Plan, which will thereafter be guiding the development of next-generation EPC schemes in WP3. To develop this plan, Task 2.4 performed the following steps:

- first, it selected the priorities for development, based on a set of criteria and the outcomes of the previous tasks;
- next, it analysed the concrete needs for development of EPCs, EPC schemes and processes, and tools related to the selected priorities, both in general and for the seven EU member states represented in the QualDeEPC consortium,
- third, it proposed indicators for monitoring the success of the development phase (including the testing in WP 4), and
- finally, it drafted the Development Strategy Plan and discussed it with the European Commission as well as national authorities and certification bodies.

Among the elements of the overall common vision developed in Task 2.2, the Development Strategy Plan sets priorities for which elements the project will develop further and towards which outcome, serving which purpose. A discussion among all partners was raised during the second project meeting about selection criteria for potential priorities for development.

The Development Strategy Plan also encompasses the country situation and needs as found by the consortium partners in Task 2.3, where the gaps and shortcomings in the current EPC schemes in the QualDeEPC country partners, and national priority approaches to their resolution were analysed.

A national section in the sections of the Development Strategy Plan (chapter 4) was written by each partner, addressing the country-specific development needs for the selected priorities, according to the current situation description from T2.1, analysis of success factors from T2.2, and deficit analysis from T2.3.

The Development Strategy Plan will thus be the guidance for WP 3 for the development phase and to draft an enhanced EPC scheme as well as the tools needed, and specifically the Deep Renovation Network Platforms.



This report presents the Development Strategy Plan. Following this introduction, chapter 2 explains the objectives and methodology of the task, as well as the criteria for the selection of priorities for development by QualDeEPC. Chapter 3 analysis the longlist of potential priorities that was developed in Deliverable D2.3 by the criteria, and presents the final selection in chapter 3.2.

For the seven priorities selected, Chapter 4 contains the core of the Development Strategy Plan. Chapter 4.1 discusses draft concepts and development needs for five of the seven priorities, which relate to EPCs and EPC schemes. Chapters 4.2 and 4.3 each address one of the remaining two priorities. In each of chapters 4.1 to 4.3, there is first a general analysis of development needs, followed by country-specific needs from each of the seven countries of implementation in QualDeEPC. Furthermore, chapter 4.4 holds an updated timetable and an overview of the partners and actors involved in the development work in WP 3.

It is also important to be able to monitor the success of the development phase. Indicators for this monitoring are developed in chapter 5.

Chapter 6 rounds off the report with conclusions.



2 MAIN OBJECTIVES AND METHODOLOGY FOR ESTABLISHING A DEVELOPMENT STRATEGY PLAN

2.1 Objectives of the Development Strategy Plan

The Development Strategy plan aims to provide a methodological framework how to select and develop the priorities for improvement, defined in task 2.4, and for monitoring the success of the development and testing work (WP 3 and 4, respectively) on EPCs and EPC schemes. In order to effectively improve the EPC schemes and development trajectories, strategic planning requires collective planning processes for tailor-made and realistic visions.

The main objective of the Development Strategy Plan is to enhance the quality and cross-EU convergence of Energy Performance Certificate (EPC) schemes, and the link between EPCs and deep renovation.

The specific objectives of the Development strategy are:

- to draft the strategy for development of next-generation EPC schemes in WP 3;
- to set priorities for which elements the project will develop further, and towards which outcome, serving which purpose.
- to stimulate intensive dialogue involving the important stakeholders at all EU and national level

The main outcome of this task is the joint Development Strategy Plan for the agreed common priorities. In addition, national sections in the Development Strategy Plan, drafted by each partner, are proposing approaches towards improving their EPC procedures.

The Strategy directly targets the QualDeEPC project partners involved in WP 3 and WP 4. Through the enhancement of EPC schemes via the selected priorities and the subsequent WPs 5 to 7 on dialogue and implementation, it indirectly also addresses national and local authorities, managing authorities, energy consulting companies, energy auditors and all other relevant stakeholders involved in the EPC scheme.

The implementation of the strategy will be in accordance with the principles of:

- Partnership - the widest possible involvement of all stakeholders: institutions at EU, national, regional, regional and municipal level, NGOs, energy consulting companies, energy auditors, tenants, owners, building investors, financial institutions, end users. Compliance with the principle of the partnership will contribute to the effective implementation of the strategy and increase the capacity to develop the measures and activities undertaken.
- Concentration - Efforts to implement the strategy will be focused on specific areas related to improvement of national and EU converged EPC schemes.
- Synergy - the elements for improvement considered for development in the strategy will be complemented by other initiatives and projects implemented and funded outside the measures planned in the strategy.
- Comprehensiveness – the strategy development should follow a specific methodology, in accordance with the outcomes from the previous tasks.



2.2 Methodology

The Development Strategy Plan encompasses the country situation and needs as found by the consortium partners in Task 2.3, as well as the overall vision for introducing a common EU framework for EPC schemes provided by Task 2.2.

The methodology for establishing the Development Strategy Plan is shown in the following graphic:



Figure 1 An overview for methodology for establishing a Development Strategy Plan

In the 2nd project meeting, a discussion among the partners was raised in order to define criteria for the selection of improvements for development such as Priorities selected in the Shortlist from National workshops; What can we develop and implement, and what will other projects do; Success factors as analysed; Ease of implementation; Chances to achieve political consensus; and Does the option require a change in the national legislation. The criteria for selection are described in detail in [Chapter 2.3](#).

On the basis of these selection criteria and discussions a shortlist of 7 priorities for improvement have been selected (cf. Chapter 3.2) to be developed (in WP3) and tested (in WP4) according to general development needs assessment and country-specific needs.

Each partner has been asked to draft national sections for each priority in the Development Strategy Plan, proposing adapted development needs towards improving their EPC procedures, according to the deficit analysis (Task 2.3) and the distilled success factors (Task 2.2).

Discussions about the Development Strategy Plan with the European Commission (EASME) as well as national authorities and certification bodies were organized, in order to confirm the selection of priorities and to obtain comments that help to refine the methodology and strategy for development.

Finally, each plan should include indicators for monitoring the success of its implementation. Therefore, the plan includes such indicators to monitor, how successful WP 3 will be in the development of the priority elements for enhanced EPC schemes and the related tools.



2.3 Criteria for selection

In the 2nd project meeting, a discussion among the partners was raised in order to define criteria for the selection of improvements for development. The finally selected criteria are shown in the following graphic:

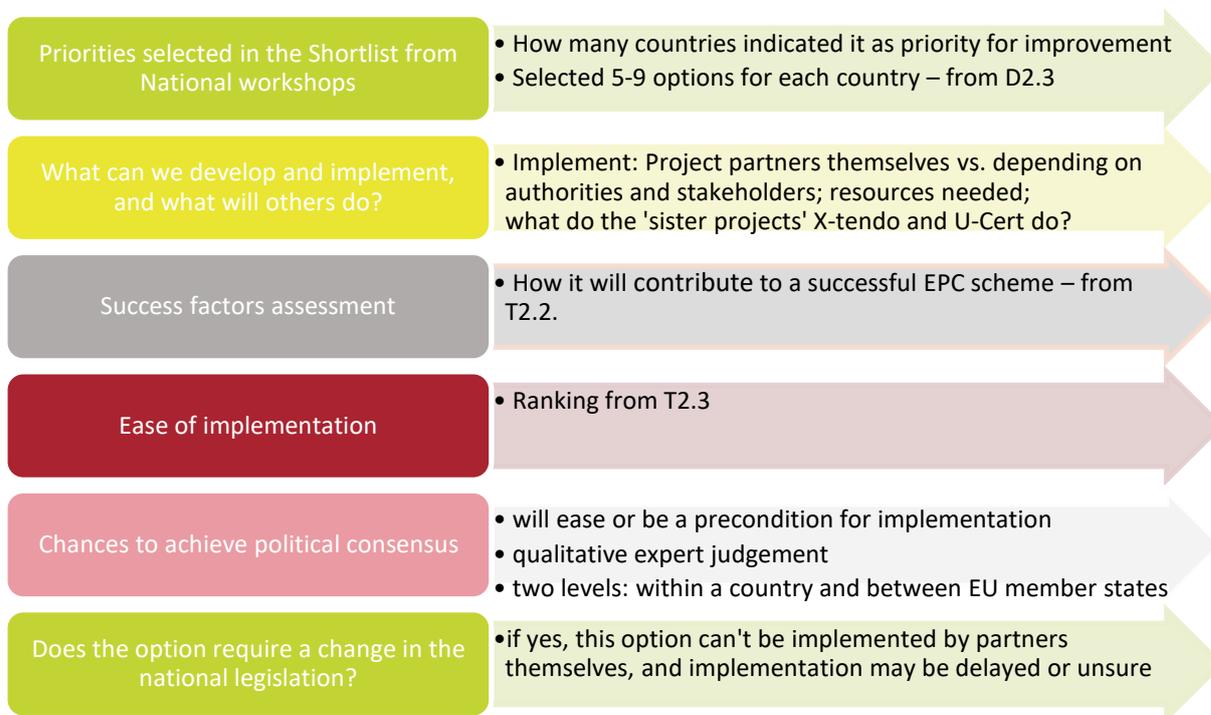


Figure 2 Criteria for selection of improvements for development

These criteria will be developed and assessed as follows:

Priorities selected in the Shortlist from National workshops

QualDeEPC partners in each country have organized a stakeholder workshop to discuss the shortcomings of the existing practices and brainstorm improvement options outlined in the long list of options. In general, the workshops have been organised in three parts:

1. First, the priority for improvements has been discussed for all EPC elements
2. Second, the priority for improvements has been discussed from the overall long list of EPC elements
3. Third, a final priority for improvements has been identified from the above-mentioned two categories.

Elements from the longlist have been assessed by the number of countries that support them to be a priority.

What can we develop and implement, and what will others do?

What could be developed has already been identified at project proposal stage. It was analysed what project partners could develop by themselves vs. depending on authorities and stakeholders involved; resources needed, etc. This information was presented at the national workshops among the stakeholders. It was analysed further at this stage, if needed for the decision on priorities.



Options that the QualDeEPC project and its partners can develop and implement themselves could be given a positive rating here.

It is also analysed what the 'sister projects' X-tendo and U-Cert will implement, in order to create synergies between the projects. On the one hand, if they address the same or similar things, this creates the need to avoid double work, but also the potential for cooperation, sharing development efforts, and implementation in a higher number of EU Member States, fostering convergence at EU level. On the other hand, if an element is not among the priorities of these two projects, QualDeEPC's efforts will complement theirs in any case, which will be positive.

Success factors assessment

Through a common template, established in T2.2., all the elements for improvement have been assessed in terms of their impact in terms of six success factors – Transparency, Cost-effectiveness, Reliability, Functionality/Usability, Comparability and Neutrality. First, all elements were scored with regard to their impact on these factors in order to identify their overall impact towards a successful EPC scheme and then, all the partners defined a country-specific weightage of these success factors and a weighted score was calculated. A detailed overview of the analysis is given in Deliverable D2.2. The overall score is taken for the analysis here. The higher the score, the more positive this will be for the selection as a priority.

Ease of implementation

During the assessment of the current situation for EPC schemes in T2.1 and development needs in T2.3, the country partners collected feedback from stakeholders in the partner countries. This included their opinion on priority needs for improvement of various EPC elements in the existing EPC schemes. For this purpose, the country partners conducted bilateral interviews with various stakeholder groups and filled in special questionnaires, where they assessed the priority for improvements, ease of implementation, and importance of various EPC elements.

The ease of implementation is scored from 1 to 5 (1 being very easy for implementation) and was also analysed in D2.3 for the various elements. It is an important factor to assess the applicability of the selected elements at national level. The easier the implementation, the more positive this will be for the selection as a priority.

Chances to achieve political consensus

A political consensus will greatly ease implementation of an element of enhanced EPC schemes or may even be a precondition for its implementation. If the project team judges that the chances of achieving political consensus for an element may be low, this may indicate that it would not be wise to choose it as a priority. However, this can only be assessed through a qualitative judgement by the experts in the project team. The chances of achieving political consensus will be ranked as either high, medium, or low. They should at least be assessed as medium.

In addition, this criterion may have two levels for an element. The first is the chance of achieving political consensus within each of the seven countries of QualDeEPC partners. The second level is the EU level, where it may be needed to achieve political consensus between member states, in case that the element requires changes in EU legislation.

Does the option require a change in the national legislation?



Some of the elements require a change in the national legislation, and in this regards they cannot be implemented by the partners themselves and need dialogue with national authorities. This could also be seen as a sub-criterion for ease of implementation.



3 SELECTION OF PRIORITIES

3.1 Analysis of longlist by criteria

This section presents the results of the analysis of the longlist of options by the criteria defined in section 3.1, which has been the basis for the final selection of 7 priorities (chapter 3.2) for the further development, dialogue, and implementation work of the QualDeEPC project.

This analysis is partly based on the results of the previous tasks within WP 2 of the project:

- Analysis of the current situation (Task 2.1) was presented in D2.1, by a detailed analysis on which EPC elements out of an original list of almost 50 options for enhanced EPC schemes is already implemented in which form in which country, covering all 28 countries that were EU member states until 31 January 2020.
- The D2.2 report presents the results of Task 2.2 on success factors for implementing these almost 50 options, good practice examples for successful EPC schemes, and derives an overall vision of a good practice EPC scheme.
- Task 2.3 analysed shortcomings in national EPC schemes, based on the findings of Task 2.1, and used stakeholder interviews and dialogues to derive a longlist of 16 enhancement options as well as 5 to 9 national priorities for enhancing EPCs, EPC schemes, and their link to deep renovation.

3.1.1 *Priorities selected in the Shortlist from National workshops*

As described in the D2.3 report, a two-step approach has been followed to identify priorities for improvement of existing EPC practices in the partner countries.

First, priorities have been sought from stakeholders and implementing country partners in QualDeEPC partner countries through a structured questionnaire. This has resulted in the preparation of a longlist of options identifying priorities for improvement of existing EPC practices.

Second, stakeholder workshops have been organized in each QualDeEPC partner country to discuss the shortcomings of the existing practices and brainstorm improvement options, with special emphasis on the elements and specific improvement measures outlined in the longlist of options. Country partners have then presented a revised list of priorities based on stakeholder workshops.

Detailed reports from National Workshops are presented in the D2.3 report. An overview of EPC elements chosen as priorities for further development, mainly based on the long list as a result from the workshops, is presented in the following chart:



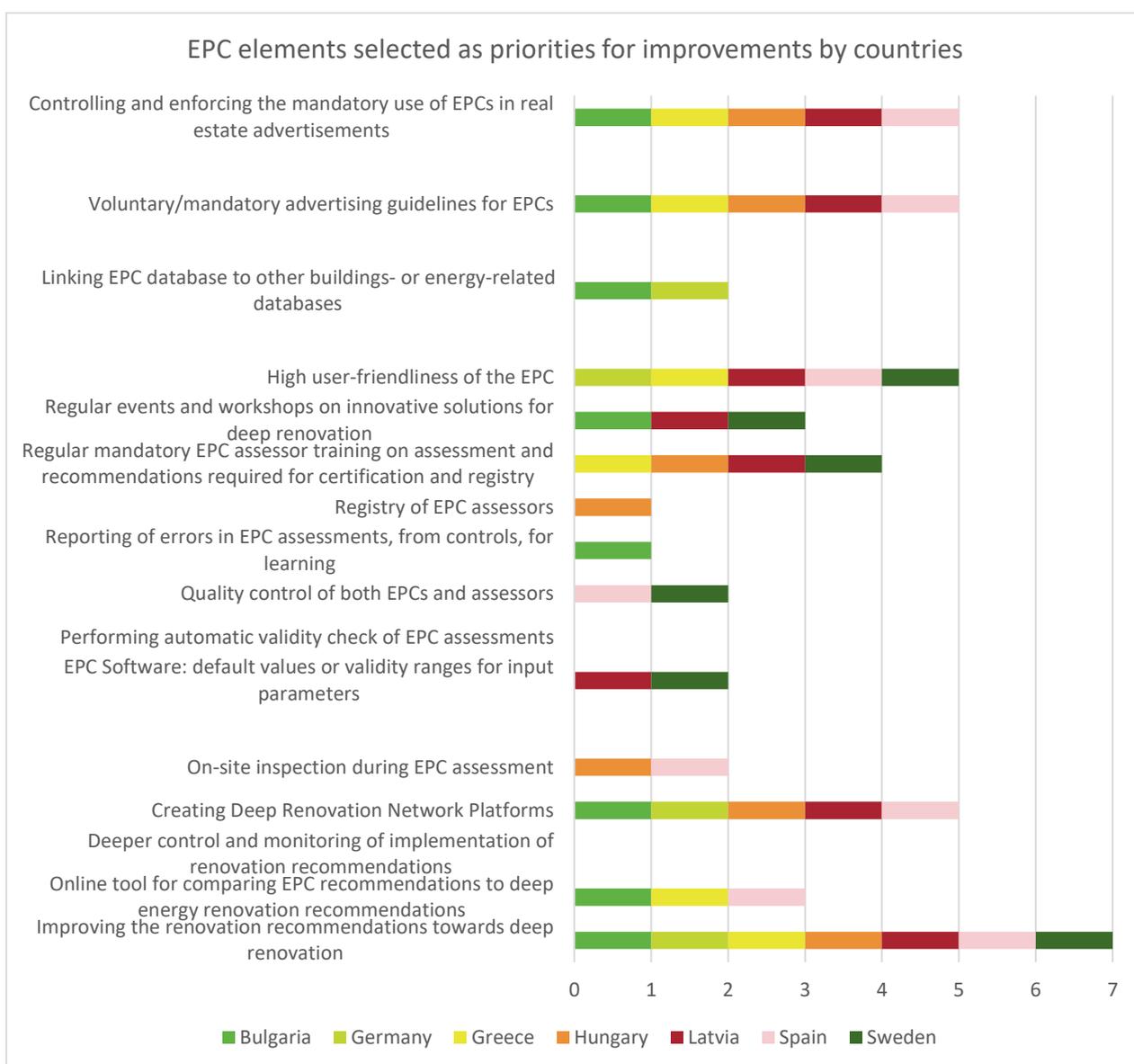


Figure 3 EPC elements selected as priorities for improvements by countries

3.1.2 What can we develop and implement, and what will other projects do?

The nature of each potential element determines what exactly a H2020 project such as QualDeEPC will be able to develop and implement. This can be assessed in a qualitative way. This assessment was already included in the project proposal for many potential elements and has been updated for this report. Table 2 presents the results.



Element for improvement	What can be developed	What can be implemented
Improving the usefulness and use of EPCs for supporting deep renovation		
Improving the renovation recommendations towards deep renovation	<ul style="list-style-type: none"> Develop improved set of recommendations, also for the online tool Probably limited to residential buildings 	<ul style="list-style-type: none"> Implement in online tool Include in stakeholder debate Work with assessment software suppliers Include recommendations in trainings (partners, other training providers) Communicate recommendations to experts, stakeholders, and public (WP 6)
Online tool for comparing EPC recommendations to deep energy renovation recommendations	<ul style="list-style-type: none"> Develop tool (probably limited to residential buildings) 	<ul style="list-style-type: none"> Adapt and provide the tool or work with authorities who are willing to provide the tool
Deeper control and monitoring of implementation of renovation recommendations	<ul style="list-style-type: none"> Develop concrete national proposals for such monitoring 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate
Creating Deep Renovation Network Platforms	<ul style="list-style-type: none"> Develop general concept and adaptation to MS circumstances and partners' possibilities; minimum = online platform providing one-stop-shop for information 	<ul style="list-style-type: none"> Implement to the extent possible with the limited resources of the project (cf. WP 3 and 5 texts), and continue to operate thereafter according to sustainability strategy Include other elements of the concept in stakeholder discussion process / policy debate
Improving the quality and precision of EPCs in general		
On-site inspection during EPC assessment	<ul style="list-style-type: none"> Develop pragmatic but effective proposal for on-site inspection, and whether it should be mandatory 	<ul style="list-style-type: none"> Include project's proposal in the stakeholder discussion process organised by the project (WP 5) / policy debate
EPC Software: default values or validity ranges for input parameters	<ul style="list-style-type: none"> Tbd in Task 2.4/WP3 which defaults or validity ranges may be needed and can be developed by the project 	<ul style="list-style-type: none"> Organise stakeholder discussion process on project's proposals; work with certification bodies and software providers to include consensus data in software
Performing automatic validity check of EPC assessments	<ul style="list-style-type: none"> Develop a concrete proposal how this could be done in general and in each of the 7 Member States 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate
Quality control of both EPCs and assessors	<ul style="list-style-type: none"> Development needs to be assessed in Task 2.4/WP3, e.g. what should be quality criteria, how to control quality of EPCs and experts 	<ul style="list-style-type: none"> Work with verification bodies
Reporting of errors in EPC assessments, from controls, for learning	<ul style="list-style-type: none"> Develop a concrete proposal for the content and processes of such a database 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate



Element for improvement	What can be developed	What can be implemented
Certification and training of EPC assessors/issuers		
Registry of EPC assessors	<ul style="list-style-type: none"> Develop pragmatic but effective proposal for an official registry of EPC assessors, including qualification requirements 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate
Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry	Develop pragmatic but effective proposal for policy but also for training content and improved recommendations	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate Include content in trainings as far as possible (partners, other training providers)
Regular events and workshops on innovative solutions for deep renovation	<ul style="list-style-type: none"> Develop pragmatic but effective proposal for policy but also for training content 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate Include content in trainings as far as possible (partners, other training providers)
Usefulness and use of EPCs in building markets		
High user-friendliness of the EPC	<ul style="list-style-type: none"> Develop enhanced EPC design 	<ul style="list-style-type: none"> Test enhanced design with market actors (Task 4.3, Tasks 5.2, 5.5) Policy debate and marketing
Linking EPC database to other buildings- or energy-related databases	<ul style="list-style-type: none"> Develop concrete national proposals for such linking 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate
Voluntary/mandatory advertising guidelines for EPCs	<ul style="list-style-type: none"> Develop proposal for guidelines and their use; develop towards actual set of voluntary guidelines Develop proposal for legislation making the use mandatory Develop a concrete proposal for routines of control and enforcement, including sanctions, building on existing good practice 	<ul style="list-style-type: none"> Publish and advertise as voluntary guidelines Include proposal in stakeholder discussion process / policy debate
Controlling and enforcing the mandatory use of EPCs in real estate advertisements	<ul style="list-style-type: none"> Develop a concrete proposal for routines of control and enforcement, including sanctions, building on existing good practice 	<ul style="list-style-type: none"> Include proposal in stakeholder discussion process / policy debate

Table 4 What can we develop and implement in the project

Activities of X-tendo and U-Cert

The ‘sister projects’ of QualDeEPC under Horizon 2020, X-tendo and U-Cert, will also develop enhancements for EPCs and EPC schemes. The following table lists activities related to respective elements in QualDeEPC’s longlist that were identified in publicly available information.



QualDeEPC Element for improvement	X-tendo	U-Cert
Improving the usefulness and use of EPCs for supporting deep renovation		
Improving the renovation recommendations towards deep renovation	<ul style="list-style-type: none"> Feature 8: Goal of developing a workflow and software solution to automatically provide enhanced recommendations based on input data required for EPCs; => deliver tailored renovation recommendations, in step 1: energy and CO₂ savings; in step 2: with cost and cost-effectiveness data; in particular in the form of individual building renovation roadmaps? Feature 9: link EPC renovation recommendations and financing options/incentives; Revise the inclusion of financing information on EPCs recommendations 	<ul style="list-style-type: none"> No activities found (n.a.)
Online tool for comparing EPC recommendations to deep energy renovation recommendations	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
Deeper control and monitoring of implementation of renovation recommendations	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> Monitoring implementation of recommendations seems part of the 'Building Operational Rating' (see below); probably voluntary?
Creating Deep Renovation Network Platforms	<ul style="list-style-type: none"> Feature 10: One-stop shop The expected outcomes to include in the X-tendo toolbox are guidelines on how to set up or upgrade OSS and link EPC data into it in order to boost the market. 	<ul style="list-style-type: none"> n.a.
Improving the quality and precision of EPCs in general		
On-site inspection during EPC assessment	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
EPC Software: default values or validity ranges for input parameters	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
Performing automatic validity check of EPC assessments	<ul style="list-style-type: none"> Feature 6: EPC databases 	<ul style="list-style-type: none"> n.a.
Quality control of both EPCs and assessors	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
Reporting of errors in EPC assessments, from controls, for learning	<ul style="list-style-type: none"> Feature 6: EPC databases 	<ul style="list-style-type: none"> n.a.
Certification and training of EPC assessors/issuers		
Registry of EPC assessors	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.
Regular events and workshops on innovative solutions for deep renovation	<ul style="list-style-type: none"> n.a. 	<ul style="list-style-type: none"> n.a.



QualDeEPC Element for improvement	X-tendo	U-Cert
Usefulness and use of EPCs in building markets		
High user-friendliness of the EPC	<ul style="list-style-type: none"> • Feature 9: Will describe possible approaches and mechanisms to link data on available financing (for renovation) with EPC systems and how to communicate this to building owners 	<ul style="list-style-type: none"> • n.a.
Linking EPC database to other buildings- or energy-related databases	<ul style="list-style-type: none"> • Feature 7: Develop concept for building logbooks and examine how the EPC data could be linked to building logbooks • Develop components for quality assurance and compliance and identify possible links to other databases such as building registry, policy support databases (eg renovation programmes) or databases from research institutes • Feature 9: link EPC data and financing options/incentives 	<ul style="list-style-type: none"> • “Building operational rating” database may be linked to other databases
Voluntary/mandatory advertising guidelines for EPCs	<ul style="list-style-type: none"> • n.a. 	<ul style="list-style-type: none"> • n.a.
Controlling and enforcing the mandatory use of EPCs in real estate advertisements	<ul style="list-style-type: none"> • n.a. 	<ul style="list-style-type: none"> • n.a.

Table 5 What other projects do

Source: <https://x-tendo.eu/> and <https://u-certproject.eu>

In addition, according to their websites and additional information received, X-tendo and U-Cert may focus on a number of other priorities that are not directly related to elements in QualDeEPC’s longlist, although some may also improve user-friendliness of the EPC:

X-tendo:

- Feature 1: Include smart readiness indicator (*corresponds to QualDeEPC element in original list: Including Smart readiness indicator on EPC*)
- Feature 2: Assess and report comfort (thermal comfort, indoor air quality)
- Feature 3: Assess and report emissions related to outdoor air pollution
- Feature 4: Analyse if and how to include and communicate real energy use (*may correspond to QualDeEPC element in original list: Compliance between EPC rating and operational rating*)
- Feature 5: Assess and report future performance and potential savings from District energy

U-Cert:

- Develop EPCs based on new CEN OAS EPB standard developed under the M/480 mandate (*corresponds to QualDeEPC element in original list: EPC calculation procedure in adherence with new CEN OAS standard*)
- “Building operational rating” database solution (*may correspond to QualDeEPC element in original list: Compliance between EPC rating and operational rating*), including
 - smart readiness indicator (*corresponds to QualDeEPC element in original list: Including Smart readiness indicator on EPC*)



- tracking of implementation of recommendations (and consequent changes in EPC rating) (*may correspond to QualDeEPC element in longlist: Deeper control and monitoring of implementation of renovation recommendations*)
- link to/feeding building renovation passports
- „making visible added (building) value“; this may be related to:
- including indoor environmental quality in the EPC

3.1.3 Success factors assessment

The country-specific success factor scores for all the elements, which are normalized to the country-specific weightage for the six success factors, were averaged in order to rank the elements in terms of their impact to the success of the EPC scheme. In Deliverable D2.2, it was defined that elements with an average score not lower than 2.5 could be considered as elements with high importance for the success of an EPC scheme. Figure 4 shows the results. All elements that were maintained in the longlist of potential priorities for development of an enhanced EPC scheme fulfil this criterion.

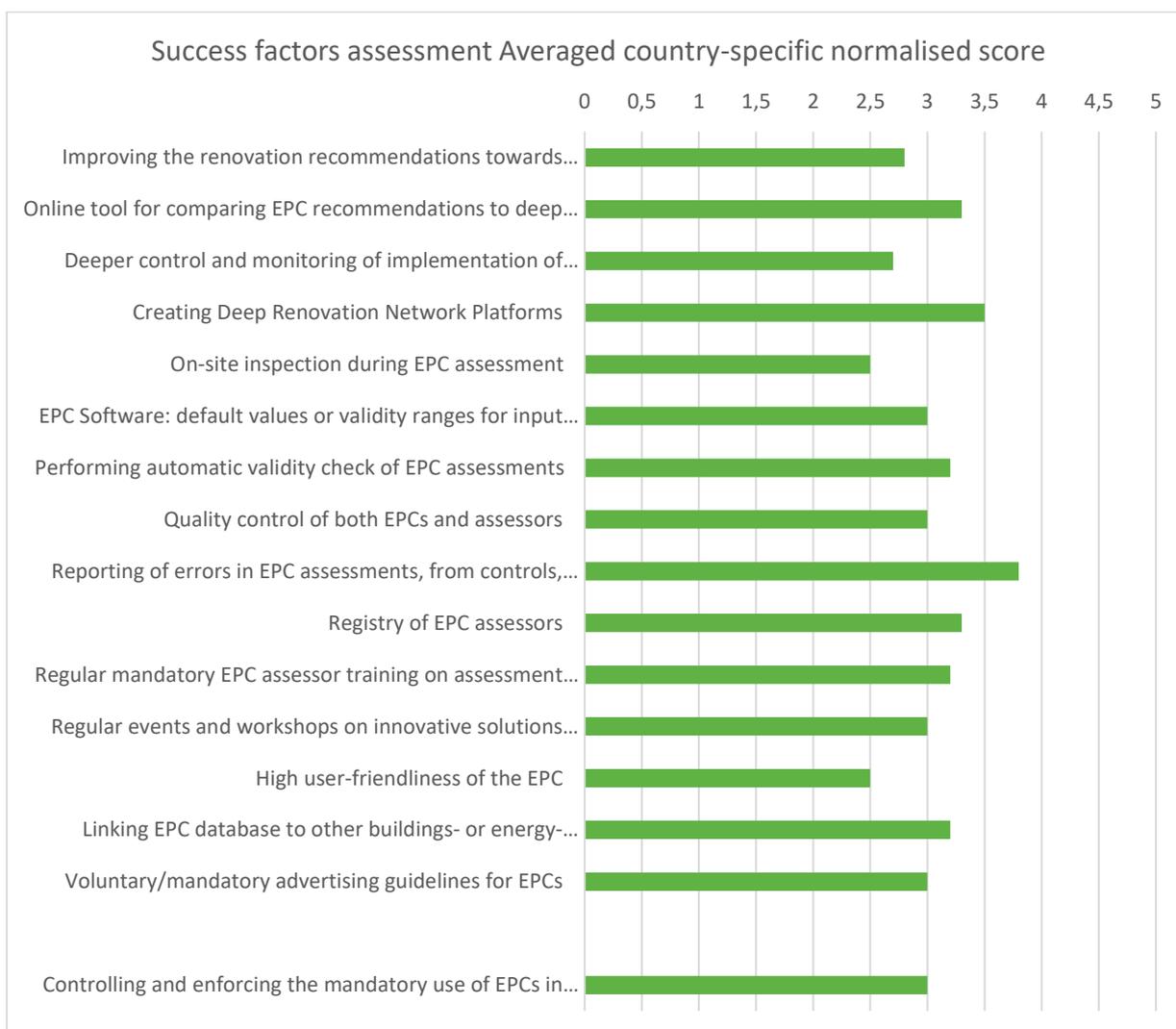


Figure 4 Success factors assessment - Averaged country-specific normalized score for options in the longlist



3.1.4 Ease of implementation, Chances to achieve political consensus and Need to change national legislation

During the implementation of Tasks 2.1 and 2.3, the partners collected feedback from stakeholders to assess the local situation in the partner countries and their assessment on priority needs for improvement of various EPC elements in the existing EPC schemes. For this purpose, the country partners conducted bilateral interviews with various stakeholder groups and filled in special questionnaires. With these questionnaires, they assessed the priority for improvements, ease of implementation, and the importance of various EPC elements, addressing all the 50 potential options for enhancing the existing EPC schemes. The ease of implementation is based on the stakeholder interviews; when interpreting it is necessary to keep in mind that the opinions may relate to implementation either in legislation or by stakeholders themselves.

Chances to achieve political consensus and Need to change national legislation are based on project partners' assessment. The table and figure below summarize the results.

Element for improvement	Chances to achieve political consensus	Does the option require a change in the national legislation	Ease of implementation
	<i>Level</i>	<i>Yes/No</i>	<i>Scoring</i>
Improving the usefulness and use of EPCs for supporting deep renovation			
Improving the renovation recommendations towards deep renovation	medium	maybe, if "cost-effectiveness" requirement needs redefinition	2,7
Online tool for comparing EPC recommendations to deep energy renovation recommendations	high	no	3,6
Deeper control and monitoring of implementation of renovation recommendations	medium	maybe	4
Creating Deep Renovation Network Platforms	high (medium for funding)	no	3,8
Improving the quality and precision of EPCs in general			
On-site inspection during EPC assessment	medium	yes	2,1
EPC Software: default values or validity ranges for input parameters	high	maybe	2,8
Performing automatic validity check of EPC assessments	high	no	3,5
Quality control of both EPCs and assessors	medium	no, if already included/defined in legislation; maybe, if not yet required by law or definition in law needs change	3
Reporting of errors in EPC assessments, from controls, for learning	high	maybe but unlikely	3,1



Element for improvement	Chances to achieve political consensus	Does the option require a change in the national legislation	Ease of implementation
	<i>Level</i>	<i>Yes/No</i>	<i>Scoring</i>
Certification and training of EPC assessors/issuers			
Registry of EPC assessors	medium to high	maybe	1,8
Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry	medium	maybe (yes, if requirements for certification and registry are part of the law)	2,6
Regular events and workshops on innovative solutions for deep renovation	high	no	2,2
Usefulness and use of EPCs in building markets			
High user-friendliness of the EPC	high	yes, if EPC template requires changes and is included in law	2,8
Linking EPC database to other buildings- or energy-related databases	medium to high	maybe	3,4
Voluntary/mandatory advertising guidelines for EPCs	voluntary: high mandatory: low to medium	voluntary: no mandatory: likely yes	2,95
Controlling and enforcing the mandatory use of EPCs in real estate advertisements	medium to high	no (should be included in law already)	3,9

Table 6 Ease of implementation, Chances to achieve political consensus and Need to change national legislation



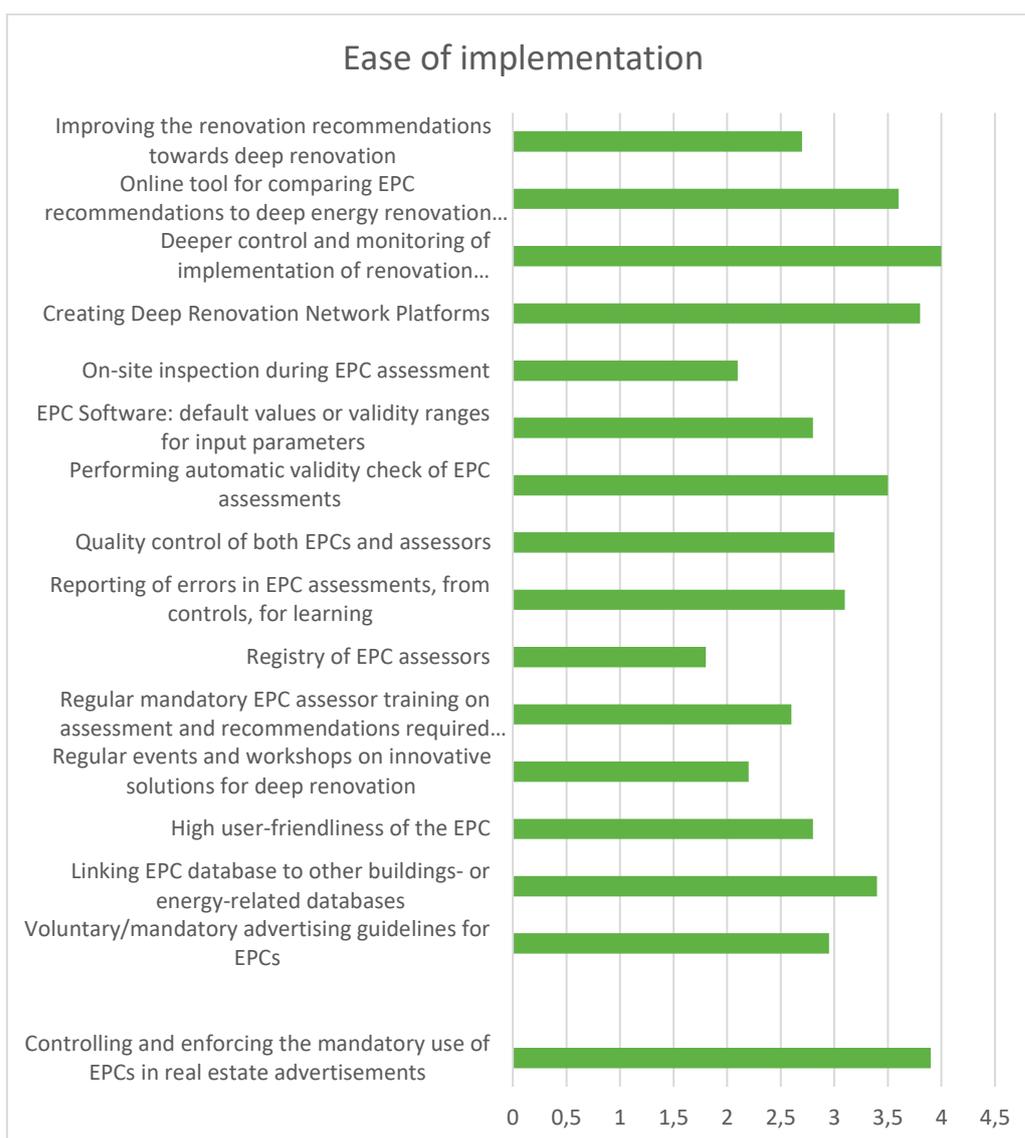


Figure 5 Assessment of ease of implementation

3.2 Final selection of priorities

Based on the assessments and analysis of Chapter 3.1, the following seven priorities for improvement of EPCs and EPC schemes, as well as their use for stimulating deep renovation, were selected. For each of the priorities, the results of the assessment motivating their selection are summarized very briefly below the title of the priority. Each of the priorities will be presented in more detail in chapter 4.

A) Improving the EPC recommendations towards deep energy renovation

(note: this means to improve the recommendations for renovation that have to be provided on the EPCs, so that they are consistent with deep energy renovation)

- + **This is a precondition for priority B - the Online tool**
- ++ **Priority: for all 7 countries in QualDeEPC**
- + QualDeEPC can develop it and implement it at least in simple form, but needs policy for general adoption
- -/+ Overlap with an X-tendo feature: aim to cooperate



- 0 Medium success factor score (2.8)
- 0/+ Medium chance for consensus; may require change in national legislation, if “cost-effectiveness” requirement needs redefinition; relatively easy to implement (score 2.7)

B) Online tool for comparing EPC recommendations to deep energy renovation recommendations

(note: this could be a new tool or improving a tool that may already exist in a country)

- + **Predetermined from the grant agreement/Annex I**
- 0 Priority: 3 countries
- + QualDeEPC can develop and implement it at least in simple form
- + No overlap with X-tendo or U-Cert
- + High success factor score (3.3)
- +/- High chance for consensus; no change in national legislation needed; but not very easy to implement (score 3.6)

C) Creating Deep Renovation Network Platforms

(note: this could be a new Platform or improving a service that may already exist in a country)

- + **Predetermined from the grant agreement/Annex I**
- + Priority: 5 countries
- + QualDeEPC can develop and implement it at least in simple form
- +/- Overlap with X-tendo feature on One-stop shops (OSS): aim to cooperate on the concept of OSS and how to integrate EPC data
- + High success factor score (3.3)
- +/- High chance for consensus; no change in national legislation needed; not very easy to implement (score 3.8)

D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry

(note: 1) this could be adapted to the needs for training in a country and will focus on the improved recommendations, priority A): 2) this priority was slightly renamed to take into account the wording of Art. 17 EPBD of “accredited” experts)

- 0 Priority: 4 countries
- +/- QualDeEPC can develop it and some partners may be able to implement content in their trainings, but needs policy to implement it as mandatory and on broad scale
- + No overlap with X-tendo or U-Cert
- + High success factor score (3.2)
- + Medium chance for consensus; change in national legislation may be needed for making it mandatory; relatively easy to implement (score 2.6)

E) High user-friendliness of the EPC

- + Priority: 5 countries
- +/- QualDeEPC can develop and test it but depends on policy for implementation
- +/- No direct overlap with X-tendo or U-Cert, but they also work on new features: aim to exchange on draft improved designs and new features
- 0 Medium success factor score (2.5)
- +/- High chance for consensus; change in national legislation may be needed; relatively easy to implement (score 2.8)

F) Voluntary/mandatory advertising guidelines for EPCs



- + Priority: 5 countries
- + QualDeEPC can develop and publish voluntary guidelines, and propose to make them mandatory
- + No overlap with X-tendo or U-Cert
- + Relatively high/ high success factor score (3.0/3.3 for voluntary/mandatory respectively)
- + High chance for consensus for voluntary; no change in national legislation needed for voluntary; relatively easy to implement (score 2.9/3.0)

G) Improving compliance with the mandatory use of EPCs in real estate advertisements

(note: this priority was slightly renamed to reflect that actions to improve compliance could be more diverse than control and enforcement)

- + Priority: 5 countries
- +/0 QualDeEPC can develop it but depends on policy for implementation
- + No overlap with X-tendo or U-Cert
- + Relatively high success factor score (3.0)
- +/0 Medium to high chance for consensus; no change in national legislation needed; but not so easy to implement (score 3.9)

Other potential priorities

Several partners have expressed wishes for further priorities, such as inclusion of the Smart Readiness Indicator or a facility for networking and exchange of EPC assessors. The project will analyse possibilities during WP 3, also whether they could be included in policy recommendations. Several further priorities, including the Smart Readiness Indicator, are also in the work plan of the two 'sister projects' of QualDeEPC under Horizon 2020, X-tendo and U-Cert (see above). QualDeEPC partners may analyse adopting results of the two other projects for their work with national authorities, if they wish to do this.



4 THE DEVELOPMENT STRATEGY PLAN: CONCRETE DEVELOPMENT NEEDS FOR THE PRIORITIES

The development strategy plan consist of three sub-chapters related to the three types of elements for improvement: EPCs and EPC scheme elements (priorities A) and D) to G), chapter 4.1), Deep Renovation Network Platforms (priority C), chapter 4.2), and the Online tool on recommendations (priority B)) plus other possible tools (chapter 4.3).

For each group, a **general development needs** section is dedicated, which includes:

- Basic concept of the improvement options;
- Development needs, based on Deliverable D2.3 and analysis for Task 2.4;
- Development Strategy Plan, including: a first review of existing and proposed (e.g., on-going Horizon projects) examples for implementation of the elements; Identifying the general development needs and possibilities during the QualDeEPC project; Identifying the possibilities of testing the proposed improvements in WP 4; Discussing the possibilities for implementation during the QualDeEPC project (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)

Country-specific needs are also analysed for each element, by asking all the partners to answer pre-defined questions in order to identify the specific needs of improvement.

4.1 EPCs and EPC schemes

4.1.1 General development needs and strategy plan

On the basis of the previous tasks and the analysis in chapter 2, the following elements that would improve EPC design, quality, and use for an enhanced EPC scheme converging between EU Member States, were finally selected as priorities for development in the QualDeEPC project:

- Improving the EPC recommendations towards deep energy renovation
- Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry
- High user-friendliness of the EPC
- Voluntary/mandatory advertising guidelines for EPCs
- Improving compliance with the mandatory use of EPCs in real estate advertisements

4.1.1.1 Basic concept of the improvement options

A) Improving the EPC recommendations towards deep energy renovation

What is deep renovation?

In relation to the EE-5-2018 Call, EE5: Increasing energy performance of existing buildings through process and organisation innovations and creating a market for deep renovation, EASME (2015: 6) clarified that “a 'deep renovation' in accordance with the Energy Efficiency Directive (see recital 16), is a cost-effective renovation which leads to a refurbishment that reduces both the delivered and final energy consumption of a building by a significant percentage compared with the pre-renovation levels leading to a very high energy performance. Such deep renovations could also be carried out in stages. The European Commission Staff Working Document (SWD(2013) 143 final) indicates that the significant efficiency improvements resulting from deep renovation are typically of more than 60%



energy savings.” For example, in Bulgaria deep renovation or major renovation of a building should encompass more than 25 percent of the area of the external fencing structures and components of the building and which alter the building’s energy performance (EE Act) and in the “Building Strategy”: ‘deep renovation’ should upgrade the energy performance to at least energy class B and lead to 60% energy savings.

QualDeEPC’s approach to deep renovation

It is clear from above that the ‘significant percentage’ is not strictly defined and only provides an indication of a statistical percentage of resulting savings. Neither, the QualDeEPC project intends to define any strict number/percentage other than the above that deep renovation should ‘typically’ lead to more than 60% energy savings. Respecting this condition, QualDeEPC proposes an nZEB approach for deep renovation. As all member states have their own objective nZEB definitions (standard), QualDeEPC proposes to link deep renovation with definitions of nZEB; and define deep renovation as ‘renovation achieving energy performance and/or component energy standards equal or close to nZEB requirements for new buildings’. For example, in Greece, the nZEB requirement for existing buildings, after deep renovation, is to upgrade their energy performance to energy class B+. I.e., ‘deep renovation’ is the extent of renovation required for an existing building to achieve an energy class of B+, which is equivalent to nZEB for existing buildings. In Germany, for example, this could be the stipulation from the funding program "Energy-efficient refurbishment for residential buildings", the option of comprehensive renovation to a ‘KfW Efficiency house’ standard. The minimum level for a deep renovation would be therefore an Efficiency house 115, i.e. needing 15% more primary energy than the standard for new buildings (nZEB). Adopting the Efficiency house 100 standard, which is equivalent to nZEB for new buildings, as the target level would be more in line with the approach taken by QualDeEPC.

Improving the renovation recommendations provided on the EPC is important so that it becomes the first step towards an individual buildings ‘deep renovation passport/roadmap’. For this purpose, the recommendations should focus on high-energy-efficiency options consistent with deep renovation. Assessment software tools should provide such high-energy-efficiency options in high quality as their output for the renovation recommendations. Furthermore, an improvement would be that the first pages of the EPC would present an overview of such recommendations and (if possible) energy savings, together with links for further information and financial support for implementing the recommendations.

In most Member States, EPCs provide links to financial support, such as incentives or subsidy schemes that are helpful in carrying out the renovations. The quality of EPC software and input data also plays a crucial role for conducting detailed analysis required for deep renovation passports/roadmaps, such as investments costs, savings and payback periods, for example, EPC in UK.

D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry

EPC assessors should undergo mandatory training on EPC assessment and providing recommendations for being certified as an EPC assessor and included in the registry. Such training should also enable them to avoid common mistakes. Mandatory training on assessment and recommendations is required for initial certification and registration in some countries, while in others there are no such



requirements. However, in many countries without the requirements for mandatory training, there are opportunities for voluntary training, and candidates should pass an examination for certification.

The duration and contents of the course varies in different Member States. In some countries, the qualifications of the candidates and their professional experience determines the amount of training required, while in other countries all candidates must take the requisite courses. Primarily, the mandatory training covers aspects, such as obtaining input data, performing calculations, providing cost-effective recommendations, using the databases of registries for EPCs and EPC assessors, EPC assessor obligations etc. Training is provided by various organizations, such as Universities, Energy Agencies, Professional chambers, or accredited third parties.

E) High user-friendliness of the EPC

For its effectiveness and market acceptance, very high user-friendliness of various aspects of EPCs, such as presentation of energy consumption and rating, and recommendations for renovation, potential energy (and cost) savings and other benefits is essential. It would be optimal if it was the first step to the development of an individual deep renovation passport/roadmap for a building.

Recommendations are usually based on their potential of technical and economic feasibility for implementation and are presented in EPCs of all Member States, in compliance with the EPBD. A list of possible recommendations is often available to the EPC assessors, from which they are able to choose the ones that are cost effective to implement. However, in most cases they are free to suggest other recommendations, based on justification. In some EPCs recommendations are classified and bundled under categories, such as:

- Improvements in building components and technologies, e.g., building envelope, technical systems etc.
- Short-term improvements and long-term improvements, i.e., improvements that are immediately required and improvements that could take place when the building components or systems are repaired or replaced in the near future.
- Major and minor improvements, based on the amount of their energy and cost savings.

G) Improving compliance with the mandatory use of EPCs in real estate advertisements and F) establishing Voluntary or mandatory advertising guidelines for EPCs

The requirement to present the EPC or at least the EPC rating and key values in real estate advertisements is given in most EU Member States. However, the level of compliance with this requirement is varying, and data available to us are inconclusive on how many countries are actively controlling and enforcing this legal requirement. This is also the case for the QualDeEPC partner countries.

In most EU Member States it is mandatory to display the energy class of the EPC in selling or renting advertisements (see next chapter) but the compliance varies. A potential way to improve compliance is to make it easier for sellers or landlords of buildings by providing them with concrete guidelines for the use and presentation of EPCs and the legally required data in advertisements of sales/rentals or buildings/dwellings. In some countries, such guidelines issued by energy agencies/public authorities are already available.

Among QualDeEPC partner countries, it appears that advertising guidelines for presenting EPCs in real-estate ads during sale or rental are still unavailable.



4.1.1.2 Development Needs

- Improving the EPC recommendations towards deep energy renovation
- Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry
- High user-friendliness of the EPC
- Voluntary/mandatory advertising guidelines for EPCs
- Improving compliance with the mandatory use of EPCs in real estate advertisements

Element for improvement	Development needs
<p>A) Improving the EPC recommendations towards deep energy renovation</p>	<p>On the basis of the D2.3 analysis, it could be seen that progress towards producing the renovation recommendations in a way to become the first step towards individual buildings deep renovation passports/roadmaps varies highly among different member states, and in general different aspects pertaining to this EPC element are absent in the majority of the QualDeEPC countries. This had already been identified as a gap and a potential contribution by the QualDeEPC project. Moreover this element has received the highest number of votes for priority for improvement in the category “Assessment and Certification” from both stakeholders and QualDeEPC country partners.</p> <p>The overarching development need for this element is a concrete set of recommendations. Due to constraints in staff months available for this task, it may be limited to residential building. The set of recommendations would also be an important input for the <i>Online tool for comparing EPC recommendations to deep energy renovation recommendations</i> (chapter 4.3) and would therefore need to fit the needs of this tool (and the tool would have to be adapted to the recommendations).</p> <p>The set of recommendations would need to distinguish between recommendations valid across all EU member states and recommendations specific to climate zones and/or countries. The latter can be expected since our definition of deep renovation is linked to nZEB, which are country-specific.</p> <p>In addition, the requirement that recommended measures must be cost-effective should be reviewed during the development.</p> <p>The concrete development needs for the QualDeEPC project should be coordinated with the development of tailored recommendations planned by the H2020 ‘sister project’ X-tendo.</p>
<p>D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/</p>	<p>A mandatory training requirement for EPC assessors is available in 14 member states, including three QualDeEPC partner countries – Bulgaria, Hungary and Latvia. Besides, mandatory periodic training for maintaining certification and registration as EPC assessor after the validity period of current certification is required only in eight member states, none of which are QualDeEPC partner countries. However, in many countries without the</p>



<p>accreditation and registry</p>	<p>requirements for mandatory training, there are opportunities for voluntary training, and most often candidates should pass an examination for certification, undergoing mandatory training on EPC assessment and providing recommendations for being certified as an EPC assessor and included in the registry, which also enables EPC assessors to avoid common mistakes.</p> <p>A concrete proposal should be developed, which includes the following elements:</p> <ol style="list-style-type: none"> 1) a policy proposal on the mandatory periodic training for obtaining or maintaining certification and registration as an EPC assessor. The proposal should be based on an analysis of the benefits of regular training, of the pros and cons of making it mandatory for certification and registration as an EPC assessor, and of requiring to pass an examination for certification as an alternative (combined with either voluntary or mandatory training). 2) a curriculum for regular mandatory training including educational topics and programme. 3) Concrete training content presenting the improved renovation recommendations developed by QualDeEPC. WP 3 should examine in addition to this, whether it would be useful and feasible to also develop further concrete content that would be applicable in all or most of the countries represented in QualDeEPC.
<p>E) High user-friendliness of the EPC</p>	<p>High user-friendliness of the EPC is valued highly important by stakeholders and QualDeEPC country partners. Although the user-friendliness of EPCs is identified as a not significant gap in D2.3, it is still considered a priority by three QualDeEPC country partners (Germany, Hungary, Latvia).</p> <p>A comparable analysis of existing EPC among QualDeEPC partners should be implemented to identify what is the information most important for users (depending on the purpose of issuing an EPC) and how it should best be presented. Based on this analysis, concrete enhanced EPC features and design are to be proposed, for example: the first pages of the EPC should present an overview of improved recommendations and (if possible) energy savings, together with links for further information and financial support.</p>
<p>F) Voluntary/mandatory advertising guidelines for EPCs</p>	<p>This element is identified as a significant gap and considered as a priority by many stakeholders and two QualDeEPC country partners (Hungary and Spain). Advertising guidelines are available in most EU member states, but none of the QualDeEPC partner countries has them. The advertising guidelines could be one of the actions to improve compliance with the mandatory use of EPCs in real estate advertisements (i.e. the following element), but at the same time, they are also meant to improve the usefulness of the EPC data for the target group of the advertisements. For example, the guideline could suggest to add voluntary information, such as energy costs.</p>



	<p>Developing this element implies the need to create</p> <ol style="list-style-type: none"> 1) such advertising guidelines that can be promoted for voluntary use and 2) a concrete proposal to the authorities how to integrate them in the national regulations, if they wish to make their use mandatory. This would also include a proposal for routines of control and enforcement, including sanctions, building on existing good practice.
<p>G) Improving compliance with the mandatory use of EPCs in real estate advertisements</p>	<p>This element is Identified as a significant gap in three QualDeEPC partner countries and considered a priority by many stakeholders and two QualDeEPC country partners. It received the highest number of votes from the stakeholders in the category ‘Use of EPCs and their data, including in wider building-related databases’. Partners in three QualDeEPC partner countries (Greece, Latvia and Hungary) seem to have doubts about the effectiveness of the controls and enforcements, and these countries may wish to improve them.</p> <p>A concrete proposal for routines of control and enforcement, including sanctions, building on existing good practice will need to be developed. This may include various instruments for ensuring compliance with the mandatory use of EPCs in real estate advertisements.</p>

Table 7 Development needs



4.1.1.3 Development strategy plan

Along with the development steps and what could be implemented that have been already presented above, specific actions and actors involved are included in the Development strategy plan to present the actions that will be implemented in WP3.

The development strategy plan for the five elements analysed here, involves four main steps:

- Reviewing existing and proposed (e.g., on-going Horizon projects) examples for implementation of the elements, including the ones identified in deliverable D2.1 of QualDeEPC
- Identifying the general development needs and possibilities during the QualDeEPC project
- Identifying the possibilities of testing the proposed improvements in WP 4
- Discussing the possibilities for implementation during the QualDeEPC project (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)

Reviewing existing and proposed (e.g., on-going Horizon projects) examples for implementation of the elements, including the ones identified in deliverable D2.1 of QualDeEPC

- **A) Improving the EPC recommendations towards deep energy renovation** - the recommendations should focus on high-energy-efficiency options consistent with deep renovation. Assessment software tools should provide such high-energy-efficiency options in high quality as their output for the renovation recommendations. Furthermore, an improvement would be that the first pages of the EPC would present an overview of such recommendations and (if possible) energy savings, together with links for further information and financial support for implementing the recommendations. Among non-QualDeEPC project partner countries, when most of these features are present in an EPC, then it is regarded as “requirements in force/guidance available to produce the renovation recommendations in a way to become the first step towards individual buildings deep renovation passports/roadmaps”. Belgium, Denmark, Ireland, Portugal and UK, along with QualDeEPC project partners Germany, Greece, and Latvia, have progressive EPCs, to motivate and facilitate the building owners towards deep renovation, and with the potential of becoming deep renovation passports/roadmaps. In Slovenia recommendations are provided on page 3 of the EPC report. The energy performance certificate lists sources for more detailed information on the cost-effectiveness of the recommendations. It also provides information on the measures to be taken to implement the recommendations, as well as information on energy audits and other incentives and funding options. Among QualDeEPC project partner countries, Hungary, and Spain do not have any of the features that improve the renovation recommendations towards deep renovation. In Sweden, cost-effective recommendations should be presented in the first few pages of EPC. In Germany, recommendations are presented in the first few pages of EPC (not necessarily the front page). Greece, and Latvia also indicate that there are requirements/guidance available to produce the renovation recommendations that lead to individual buildings deep renovation passports/roadmaps. In Italy the EPC provides information on opportunities; also, in terms of national or local support tools, related to the execution of energy audits and energy redevelopment interventions, including major renovations. In Bulgaria the EPC software tool include high quality and high-energy efficiency options for renovation recommendations.
- **D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry** - Mandatory training on assessment and recommendations is required for initial certification and registration in some countries, while



in others there are no such requirements. However, in many countries without the requirements for mandatory training, there are opportunities for voluntary training, and most often candidates should pass an examination for certification. Primarily, the mandatory training covers aspects, such as obtaining input data, performing calculations, providing cost-effective recommendations, using the databases of registries for EPCs and EPC assessors, EPC assessor obligations etc. Training is provided by various organizations, such as Universities, Energy Agencies, Professional chambers, or accredited third parties. After initial certification (with or without mandatory training), undergoing periodic training is mandatory in some countries. This is to ensure that EPC assessors update their skills regarding technical advancements, and legislative or regulatory changes in their field.

EU countries that apply a regular mandatory training are for example Croatia where authorized natural persons who carry out energy certification, energy audits of buildings and regular inspections of heating systems and cooling or air-conditioning systems in buildings are obliged to attend once a year the training programme.; Latvia, Romania and Estonia - EPC assessor must undertake an additional training and pass an examination every 5 years .

Among QualDeEPC partner countries, in four countries, Germany, Greece, Spain and Sweden, certification is not linked with mandatory training (in Germany, there are alternatives to it, which however may also require training). In Bulgaria, Latvia and Hungary, mandatory training is required for obtaining certification and registration as an EPC assessor for the first time. In Sweden, it is mandatory to pass an examination before being certified, which means that nearly all assessors are doing training provided by academia or commercial education bodies before obtaining certification as an EPC assessor for the first time.

- **E) High user-friendliness of the EPC** – the analysis of Deliverable 2.1. shows that in all member states, energy rating on EPC is presented in classes, except in Malta and Poland, where a sliding scale is used; and in Slovenia, where both classes and sliding scale are used for new buildings, and only a sliding scale is used for existing buildings. EPCs also often provide detailed information on the existing construction and building systems, and describe the calculation methodology. A clear presentation of potential energy (and cost) savings and benefits (e.g., increased comfort levels) that could be obtained by implementing the recommendations are provided in 17 countries. In few countries, such as Greece, Italy and Luxembourg, recommendations are presented along with clear evidence of payback periods, and class achievable through implementing the renovations either individually or cumulatively. In Ireland for example an advisory report is accompanied to the BER certificate, identifying potential improvements that could lead to better comfort levels, reduced energy use and costs. This advisory report shows in detail for each building component possible improvement measures. These measures are rated with Costs: low to high, and with Impact: low to high. Among QualDeEPC project partners, EPC rating and recommendations are provided in Spain and Hungary, while in the other countries, potential energy and cost savings and benefits by implementing the recommendations are also presented (in Germany, this is voluntary). In Sweden recommendations and indicative potential of energy (and cost) savings should be reported if they are cost-effective. This means that recommendations may differ dependent on available input data for investment costs.

As a conclusion from D2.1 it could be said that the ‘high user-friendliness’ of EPC should be the first step to the development of an individual deep renovation passport/roadmap and to present the potential energy (and cost) savings, benefits for comfort and wellbeing, payback periods, prominent display and explanation of recommendations and links to financial support.



- **F) Voluntary or mandatory advertising guidelines for EPCs** – As it can be seen in Deliverable 2.1 in most EU member states it is mandatory to display the energy class of the EPC in selling or renting advertisements, but the compliance varies. A potential way to improve compliance is to make it easier for sellers or landlords of buildings is to provide them with concrete guidelines for the use and presentation of EPCs and the legally required data in advertisements of sales/rentals or buildings/dwellings. In some countries, such guidelines issued by energy agencies/public authorities are already available. For example in Ireland, a detailed guideline plus the respective energy class artwork files are available for download and use (SEAI, 2013). In France, examples of adverts are available; at least, the energy class label should be presented (Ministère de la Transition écologique et solidaire, 2018). Among QualDeEPC partner countries, it appears that advertising guidelines for presenting EPCs in real-estate ads during sale or rental are still unavailable.

- **G) Improving compliance with the mandatory use of EPCs in real estate advertisements** - the requirement to present the EPC or at least the EPC rating and key values in real estate advertisements is given in most EU member states. However, the level of compliance with this requirement is varying, and data available are inconclusive on how many countries are actively controlling and enforcing this legal requirement, or implementing other activities to improve compliance. For example, the Netherlands have been sending each household a preliminary EPC. Slovenia is comparing EPC and real estate transactions databases, to check if an EPC has existed at the time of transition (Deliverable D2.2). This lack of data is also the case for the QualDeEPC partner countries. In some countries available information suggests that they have concrete control or enforcement responsibilities in place: for example in Bulgaria when a new building, for which an energy performance certificate has been issued or a stand-alone unit therein is announced for sale or rent, the parameter "specific annual expenditure of primary energy" in kWh/m², stated in the certificate, *shall be noted in all announcements*. Prior to the conclusion of a contract for sale or lease, the seller or the lessor respectively shall provide to the purchaser or lessee respectively the certificate in order for them to acquaint themselves with it. In Sweden the National Board of Housing, Building and Planning gives the regulations for presenting the EPC and its result and is in charge for control checks.

General development needs and possibilities during the QualDeEPC project, possibilities of testing the proposed improvements in WP 4 and possibilities for implementation during the QualDeEPC project (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)

Results on these aspects are presented in the following table. Potential specific tools that may support implementation of a priority are highlighted in bold fonts in the second columns.

Priority for improvement	What could be developed, and how (WP 3)?	What could be tested (WP4)?	What could be implemented, and by whom (WP 5)?
Which tools may be needed?			
A) Improving the EPC recommendations towards deep energy renovation	Analysis of the most commonly used recommendations in the partner countries Actors: QualDeEPC partners	n.a.	n.a.
	Discussion among the partners about possible ambitious recommendations	n.a.	n.a.



Priority for improvement	What could be developed, and how (WP 3)? Which tools may be needed?	What could be tested (WP4)?	What could be implemented, and by whom (WP 5)?
	Actors: QualDeEPC partners		
	Review the requirement that recommended measures must be cost-effective Actors: WP 3 / Task 3.1 leaders	n.a. (maybe discuss with owners of pilot buildings?) Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners	Discuss the results with National EPC body and possibly with legislators Actors: WP 5 / Task 5.1/5.2, QualDeEPC country partners; National EPC body, legislators
	Provide a list of improved recommendations Actors: WP 3 / Task 3.1 leaders, QualDeEPC country partners	Test improved recommendations for the pilot buildings Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners	Present and discuss the list with National EPC body and software providers, including in stakeholders debate Actors: QualDeEPC partners, National EPC Body, EPC Software providers
	Develop interfaces and concept for implementing the improved recommendations in online tool (and other software) Actors: WP 3 / Task 3.1 and Task 3.3 leaders, QualDeEPC country partners	If online tool is ready for testing, this may be tested too, with owners of pilot buildings Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners	Implement the improved recommendations in online tool Actors: WP 5 / Task 5.1/5.2 and Task 3.3 leaders, QualDeEPC country partners
	Plan and concept for including the improved recommendations to trainings Actors: WP 3 / Task 3.1 leaders, QualDeEPC country partners	n.a.	Include the improved recommendations to trainings Actors: QualDeEPC country partners National EPC Body EPC Software providers Training organisations



Priority for improvement	What could be developed, and how (WP 3)? Which tools may be needed?	What could be tested (WP4)?	What could be implemented, and by whom (WP 5)?
D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/ accreditation and registry	Analysis of the training structure in countries with mandatory training Actors: QualDeEPC partners	n.a.	n.a.
	Discussion about possible curriculum with specific content and timetable Actors: QualDeEPC partners Tool: possible curriculum with specific content and timetable	n.a.	Present and discuss possible curriculum with specific content and timetable Actors: National EPC Body EPC Software providers Training organisations
	Establishing a common training structure and possible educational materials, particularly presenting the improved renovation recommendations developed by QualDeEPC and the online tool Actors: WP 3 / Task 3.1 and Task 3.3 leaders, QualDeEPC country partners Tool: possible educational materials	n.a.	1) Include proposal in stakeholder discussion process / policy debate Actors: QualDeEPC partners National EPC Body EPC Software providers Training organisations. 2) Include content in trainings Actors: National EPC Body EPC Software providers Training organisations, including some QualDeEPC partners
	Developing a policy proposal on the mandatory periodic training for obtaining or maintaining certification and registration as an EPC assessor or on requiring to pass an examination for certification as an alternative	n.a.	Include proposal in stakeholder discussion process / policy debate Actors: QualDeEPC partners National EPC Body
E) High user-friendliness of the EPC	Each partner to present the existing EPC certificate in their country Actors: QualDeEPC partners Actors: WP 3 / Task 3.1 leaders	n.a.	n.a.
	Comparative analysis and identification of good examples and possible improvements Actors: WP 3 / Task 3.1 leaders	n.a.	n.a.
	Provide a list with proposals for improvement of the user-	1) Test assessment for enhanced content and design in the Pilot	1) Test enhanced design with further market actors (Tasks 5.2, 5.5)



Priority for improvement	What could be developed, and how (WP 3)? Which tools may be needed?	What could be tested (WP4)?	What could be implemented, and by whom (WP 5)?
	<p>friendliness of the EPC (content/features, design)</p> <p>Actors: WP 3 / Task 3.1 and Task 3.3 leaders; all partners</p> <p>Tool: Enhanced EPC template with user-friendly features and design possibly, Tools needed for the assessment of enhanced features or for graphical presentation</p>	<p>Cases of real buildings (Task 4.3)</p> <p>Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners</p> <p>2) Collect feedback from facility managers/ building owner(s) on the enhanced Energy Performance Certificate (Task 4.3)</p> <p>Actors: WP4/ Task.4.3 Leaders, QualDeEPC country partners</p>	<p>Actors: WP5/ Tasks 5.2, 5.5 Leaders, QualDeEPC country partners</p> <p>2) Present the enhanced design and organise discussion with the national authorities and EPC Body and energy assessors</p> <p>Actors: WP5/ Tasks 5.2, 5.5 Leaders, QualDeEPC country partners National EPC Body Organisations of building owners Organisations of EPC assessors EPC Software providers Training organisations</p>
	<p>Brief overview of the National legislation in regards to mandatory use of EPCs in real estate advertisements</p> <p>Actors: WP 3 / Task 3.1 leaders; all partners</p>	n.a.	<p>Discuss the results with National EPC body and possibly with legislators</p> <p>Actors: WP 5 / Task 5.1/5.2, QualDeEPC country partners; National EPC body, legislators</p>
F) Establishing Voluntary or mandatory advertising guidelines for EPCs and	<p>Analysis of the level of control</p> <p>Actors: WP 3 / Task 3.1 leaders; all partners</p>	n.a.	<p>Discuss the results with National EPC body and possibly with legislators</p> <p>Actors: WP 5 / Task 5.1/5.2, QualDeEPC country partners; National EPC body, legislators</p>
G) Improving compliance with the mandatory use of EPCs in real estate advertisements	<p>Identifying the gaps of the legislations and control</p> <p>Actors: WP 3 / Task 3.1 leaders;</p>	n.a.	<p>Discuss the results with National EPC body and possibly with legislators</p> <p>Actors: WP 5 / Task 5.1/5.2, QualDeEPC country partners; National EPC body, legislators</p>
	<p>Research on good practice and innovative proposals to improve control, compliance, and enforcement</p> <p>Actors: WP 3 / Task 3.1 leaders; all partners</p>	n.a.	n.a.
	<p>Discussion among the partners and development of concrete proposals</p>	n.a.	<p>Discussion with National authorities; National EPC Body;</p>



Priority for improvement	What could be developed, and how (WP 3)? Which tools may be needed?	What could be tested (WP4)?	What could be implemented, and by whom (WP 5)?
	for improved routines and control / instruments to improve compliance Actors: WP3/ Task 3.1 and Task 3.3 leaders; All partners		Building market actors; Building owners (Tasks 5.2, 5.5) Actors: WP5/ Tasks 5.2, 5.5 Leaders; QualDeEPC country partners National EPC Body National authorities Market actors, particularly Organisations of building owners
	Develop voluntary advertising guidelines for EPCs Actors: WP3/ Task 3.1 and Task 3.3 leaders; All partners	Collect feedback from facility managers/ building owner(s) on the advertising guidelines for EPCs (Task 4.3) Actors: WP4/ Task.4.3 Leaders, QualDeEPC country partners	Discussion with National authorities; National EPC Body; Building market actors; Building owners (Tasks 5.2, 5.5) Actors: WP5/ Tasks 5.2, 5.5 Leaders; QualDeEPC country partners National EPC Body National authorities Market actors, particularly Organisations of building owners
	Develop tool for the use of advertisement guidelines for EPCs. The tool could be as graphical templates (e-brochure); hints on where to find the data in the EPC; a calculator for energy costs and cost savings vs. an E-rated building Actors: WP 3 / Task 3.1 and Task 3.3 leaders;	Collect feedback from facility managers/ building owner(s) on the tool for the use of advertising guidelines for EPCs (Task 4.3) Actors: WP4/ Task.4.3 Leaders, QualDeEPC country partners	Discussion with National authorities; National EPC Body; Building market actors; Building owners (Tasks 5.2, 5.5) Actors: WP5/ Tasks 5.2, 5.5 Leaders; QualDeEPC country partners National EPC Body National authorities Market actors, particularly Organisations of building owners
	Develop proposal for legislation making the use of the guidelines mandatory Actors: WP 3 / Task 3.1 and Task 3.3 leaders;	n.a.	Political discussion on concrete proposal how to include the guidelines in legislations to become mandatory Actors: WP5/ Tasks 5.2, 5.5 Leaders; QualDeEPC country partners National EPC Body National authorities

Table 8 General development needs



4.1.2 Country-specific development needs

The following general development needs have been identified on the basis of stakeholders' feedback during the National workshops and the analyses the extent of gaps in the existing EPC schemes presented in D2.3.

EPC element	Bulgaria	Germany	Greece	Hungary	Latvia	Spain	Sweden
A) Improving the EPC recommendations towards deep energy renovation	With regard to the possibility of introducing a step-by-step renovation, an energy renewal passport could be developed as an integral part of the energy	Improvement needed	EPC's recommendations need to be linked to a "Deep Renovation Roadmap" with the specification that 'Deep Renovation' takes place 'gradually' over time	Improvement needed. Minimum requirements on recommendations should be required. EPC quality control should cover recommendations (currently not checked).	Improvement needed. It has not been defined what exactly is deep energy renovation. After this definition has been finalized the improvement recommendations in EPCs should ensure that building can reach the status of a deeply renovated building after implementing renovation measures suggested in EPC.	A mandatory establishment of a deep renovation report as an Annex to the EPC rather than simply providing a list of energy efficiency recommendations on the EPC is recommended, including a version of the use of the property and dealing with qualitative aspects.	The requirement that recommended measures must be cost-effective should be reviewed.
D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/			Regular EPC assessors training should be mandatory in Greece. Open discussion whether the certification process and inclusion in the registry should be linked to exams or to be based	Improvement needed. Regular legal and technical trainings are mandatory (once in 5 years for both)	Improvement needed. It seems that from April 2021 regular EPC assessor training in some way will be introduced. It still is not clear how exactly this will be done. Therefore, it is necessary to	There is a need for training EPC assessors to increase the quality of both assessors and EPCs.	Measures to increase the quality of EPC assessor education/training are required, including increased knowledge of how to consider and calculate savings due to decreased ancillary

EPC element	Bulgaria	Germany	Greece	Hungary	Latvia	Spain	Sweden
accreditation and registry			on the training certificates received. Regular renewal of the certification (e.g. every 3 years)		develop recommendation on this during the QualDeEPC project.		costs. But the training should be voluntary.
E) High user-friendliness of the EPC	Consideration may be given to proposing an energy certificate supplement that summarizes the technical parameters in “understandable language” and which gives an idea of some additional benefits of implementing energy efficiency measures. EPC should be a market mechanism measure also.	Content and wording of EPCs is not easy to understand for final consumers. There is often confusion regarding the two types of EPCs (consumption-based vs, calculated, also known as operational vs. asset rating) and legal revisions. Therefore, additional information structures (QR-Code, online platform) and easy language explanation of terminology might be useful. Comparability of information is also important, e.g. CO ₂ emissions	High user-friendliness will motivate owners/users to read and understand the data & information presented on the EPC. EPC recommendations to be linked to “Deep Renovation Roadmap”.	Currently only overall performance indicators (total primary energy) are presented. Indicators per energy source and usage type should be added. More useful and reliable renovation recommendations should be added, such as explanation of terminology.	Improvement needed. The main thing for improvements should be aimed at making the EPC understandable to general public.	The contents of the EPC are not easy to understand by the general public, for example, including monetary units for energy consumption, comparison with similar buildings, including QR codes with links to further information etc. <i>(comment: QR codes have been included in other databases of energy related products)</i>	It is important to make sure that the EPCs and recommended measures are actually a benefit for the property owners (reduced energy use, reduced costs, improved indoor environment). Especially, there is a need for clearer and also traceable figures. Energy and hot water use should be demonstrated both before and after normalization.



EPC element	Bulgaria	Germany	Greece	Hungary	Latvia	Spain	Sweden
F) Establishing Voluntary or mandatory advertising guidelines for EPCs and G) Controlling and enforcing the mandatory use of EPCs in real estate advertisements	Improvement needed		<p>Improvement needed.</p> <p>Legislation improvement is needed in order to enforce the legal requirement to present EPC:</p> <p>1. Before placing an advertisement for sale/rent of a building</p>	<p>Improvement needed.</p> <p>Practically not working.</p> <p>Controlling bodies should be nominated and mandatory advertising guidelines should be developed. Same for displaying EPCs.</p>	<p>Improvement needed.</p> <p>In the legislation the mandatory EPCs in real estate advertisements are included. But in real life this system does not work at all.</p>	<p>Design of mandatory advertisement guidelines; two guidelines for EPCs are needed; one by the real state agencies and the other for private building sellers, owners.</p> <p>Controlling and enforcing the mandatory use of EPCs in real estate advertisements is needed and this will be included in the next review of the legislation.</p>	

Table 9 Country-specific development needs, stated by the stakeholders

Along with the stakeholders' feedback about development needs, further details have been assessed by the partners. The following section present the current state of knowledge, which will be advanced during the development work in WP 3.

A) Improving the EPC recommendations towards deep energy renovation

➤ Bulgaria

- *What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?*

In the Building Strategy document, different cost-effective packages of measures for different levels / stages of energy renovation are proposed

The possible recommendations are grouped in packages depending on the technical possibilities for achieving different levels of renovation for single-family houses and multifamily buildings:

- achieving a light or medium degree of renovation - up to the legally required class C for buildings in operation or energy savings below 60%;
- Achieving a major degree of renovation - reaching class "B" and higher, incl. utilization of RES (if technically possible), energy savings over 60%

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings		Improved recommendations towards deep energy renovation			
<i>All climate zones</i>							
Energy saving action	Value	Energy saving action	Value	Energy saving action	Are there national proposals for improved recommendations YES/NO	Value	
Windows/doors replacement, W/m²K	1,4	Windows/doors replacement, W/m ² K	1,4	Windows/doors replacement, W/m ² K	Yes	1,1	
Multifamily residential building		Multifamily residential building		Residential building			
External walls insulation, W/m²K	0,28	External walls insulation, W/m ² K	0,28	External walls insulation, W/m ² K	Yes	0,22	



Residential building		Residential building		Residential building		
Roof or attic insulation, W/m ² K Residential building	0,25	Roof or attic insulation, W/m ² K Residential building	0,25	Roof insulation, W/m ² K Residential building	Yes	0,22
Insulation of ceiling of an unheated basement, W/m ² K Residential building	0,5	Insulation of ceiling of an unheated basement, W/m ² K Residential building	0,5	Insulation of ceiling of an unheated basement, W/m ² K Residential building		0,5
Energy efficient lighting, % efficiency	70	Energy efficient lighting, % efficiency	70	Energy efficient lighting, % efficiency		70
		Other		Heating substation modernisation, %		100
				Measures for improvement of heating installation, % efficiency		100
				DHW solar installation, % efficiency		75
				Effective shading, % efficiency		
				Other		

Table 10 Minimal regulatory requirements for energy efficiency vs. improved recommendations

- **Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?**

Legal requirements for whole buildings or for components are not connected to EPCs or EPC classes. Some financial incentive programmes are linked to the achievement of EPC class C or better (see below).

EPC recommendations are linked to EPC classes (see previous question).



- **How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?**

Ordinance 7 for Energy Efficiency of Buildings determines that “during the energy efficiency audit of a building in operation, a technical and economic assessment of the measures for increasing the energy efficiency of the building is prepared, including grouping / combining the measures in different packages. The evaluation of the investment for energy saving is performed on the ratio of "cost-benefit", and for the building is determined the most cost-effective package of energy saving measures to achieve the minimum required class of energy consumption.”

ORDINANCE № E-ПД-04-1 OF JANUARY 22, 2016 ON ENERGY EFFICIENCY SURVEY, CERTIFICATION AND EVALUATION OF ENERGY SAVINGS OF BUILDINGS states that:

“The certificate for energy performance of a building in operation may be issued on the basis of: 1. the results of the assessment of the economically feasible package of energy saving measures, which achieves the minimum required energy consumption class on the scale of energy consumption classes for the respective category of buildings, to which the building belongs as intended, or 2. the results of an economically feasible package of measures chosen by the owner among the packages proposed in the survey, requiring greater investment than investment to achieve a minimum energy efficiency class, but leading to greater energy savings and to a higher class of energy consumption.”

- **Does the assessment software provide high-energy-efficiency options?**

The official (non mandatory) software provides possibility to assess energy efficient measures, such as:

- Measures for heating: insulation of the building envelope; heating system replacement
- Measures for cooling – replacement of cooling system
- Measures for ventilation – savings from heating/cooling recovery
- Measures for lighting
- Pump and fans
- DHW – with possibility for solar installations assessment

- **Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?**

The **Energy Efficiency of Multi-Family Residential Buildings National Programme** has been oriented to the renovation of multi-family residential buildings with a main objective to secure better living conditions for the residents in the multi-family residential buildings, heat comfort and higher quality of living environment through implementation of energy efficiency measures.

The program finances the most cost-effective package of energy saving measures for the building, which achieves energy consumption **class "C"** in accordance with Ordinance № 7 of 2004 on energy efficiency in buildings.

- **Are there any financial mechanisms that finance more ambitious measures?**

Financial instrument "Urban Development Fund", financed by the Operational Program "Growing Regions" 2014-2020, co-financed by the European Structural and Investment Funds (ESIF). " - covers



eligible investment projects in 39 cities, as one of the focuses of funding is to increase the energy efficiency of single-family residential buildings and student dormitories throughout the city, with confirmed compliance with the Integrated Urban Reconstruction and Development Plans (IPGVR) of the city. Investments should achieve a minimum standard of energy efficiency in existing buildings, corresponding to class "C" for energy consumption. Deep renovation projects can be financed when a reduction of energy consumption by more than 60% is envisaged, and for residential buildings the requirement is to be designed before 1999. The expected contribution of the financial instrument at the level of Operational Program is an annual reduction of greenhouse gas emissions of 12 812 tons of CO₂ eq. and number of households upgraded to 2 284.

REECL Household Energy Efficiency Credit Line - The Credit Line is a financial mechanism for financing energy efficiency in the housing sector, amounting to EUR 20 million. These funds are provided to established Bulgarian commercial banks for granting loans to individuals, associations of apartment owners and private service providers related to energy efficiency projects in the housing sector. Funded energy saving improvements (equipment and materials) must be new, not recycled or refurbished. The implementation of the following energy saving projects in existing residential buildings may be eligible for subsidized funding under this program:

- Energy efficient joinery
- Insulation of walls, floors and roofs
- Energy efficient biomass stoves and boilers and systems
- Solar collectors for hot water and systems
- Energy efficient gas boilers and systems and gasification systems
- Heat pump systems for heating and air conditioning
- Building photovoltaic systems
- Subscriber stations and building installations
- Elevators
- Recuperative ventilation systems

National Program for Improving Air Quality (2018 - 2024) - The National Program for Improving Air Quality 2018 - 2024. was developed on the basis of an Agreement on the provision of consulting services concluded between the Ministry of Environment and Water and the International Bank for Reconstruction and Development in support of air quality management. The program aims to assist municipalities in implementing measures to achieve sustainable compliance with the fine particulate matter indicator. The document does not lead to the state's seizure of competencies and obligations of local authorities to ensure clean air, but proposes the implementation of policies and measures at the national level, which municipal authorities are not able to implement independently. The national program includes measures as replacing heating devices of solid fuel in households (wood and coal) with: - other type of heating devices: gas; using electricity (except electric resistance heating devices and systems); of pellets or other wood biomass / fossil solid fuel, when the new devices meet the technical parameters for ecodesign; - with alternative heat sources - connection or reconnection of the connection to the district heating system or gas distribution network.

- *When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?*



Yes, the Energy Efficiency of Multi-Family Residential Buildings National Programme included measures for structural renovation / reinforcement / overhaul activities depending on the damages that occurred during the operation of the multi-family residential buildings, which are prescribed as mandatory for the building in the technical inspection.

- *What are the main barriers for recommendation of more ambitious measures? What are the measures to overcome them?*

The following barriers and measures to overcome them are identified in the National Building Strategy:

Aspect	Barriers	Measures
Legislative and regulatory aspect	<ul style="list-style-type: none"> • Insufficiently requirements for deep renovation of buildings – the requirements should be increased • Dynamic development and complex structure of energy efficiency legislation • High intensity of the provided financial aid (100%) (grant), which create unrealistic expectations and represent a barrier for development and implementation of market mechanisms. • No restrictions on the use of non-environmentally friendly solid fuels. The lack of measures to promote the consumption of heating from economically efficient and environmentally friendly sources - district heating and gas. 	<ul style="list-style-type: none"> • Introduction of high requirements regarding major renovation of buildings when financing projects with a grant component. • National review and harmonization of technical standards for energy efficiency of buildings under the procedure "cost optimality algorithm" of Delegated Regulation (EU) № 244/2012. Verification of the possibility of raising the minimum requirements for all buildings up to class B. • Introduction of special provisions to ensure optimal characteristics of technical building installations. • Introduction of the optional general scheme of the Union for determining the readiness of the buildings for intelligent management and adaptation of the European methodology established by the EC for its calculation in accordance with the national peculiarities.
Financial aspect	<ul style="list-style-type: none"> • Low energy prices make Deep renovation investments less attractive from a financial point of view. • Limited access to finance: insufficient market mechanisms to fund deep renovation measures. • Risk perception by funding institutions: Energy efficiency projects usually do not meet the generally accepted risk assessment criteria for financing a project. Commercial banks choose to finance safe investment projects with a medium return on investment, while investing in energy saving measures in residential buildings is considered too risky and uncertain for them. • Financial inability of homeowners to undertake energy efficiency renovations themselves due to low incomes, in general, compared to the level of initial investment required for a Deep renovation. The phenomenon of "poor owner" presupposes the impossibility of a large-scale renewal process without the presence of a grant. • High cost of innovative technologies 	<ul style="list-style-type: none"> • Linking financial measures to improve energy efficiency in building renovation with targeted or achieved energy savings • Development of financial instruments to facilitate access to credit for all residential buildings, including collective loans • Development of different programs for renovation taking into account the specifics of the different types of residential buildings / introduction of separate measures with different intensity of the grant, depending on the goals of the specific program and the social tolerance.
Expert capacity	<ul style="list-style-type: none"> • Insufficient awareness among the general public about the benefits of deep renovations. 	<ul style="list-style-type: none"> • Conducting training campaigns for capacity building at the local level - for municipal



Aspect	Barriers	Measures
	<ul style="list-style-type: none"> • There is a lack of accessible and quality consultations for measures and steps in the deep renovation of buildings and the additional benefits of them. • Insufficiently qualified and experienced staff in the supply chain - the participants in the process of design, implementation and financing of energy efficiency projects who do not have the necessary training and knowledge on the subject. 	<p>experts, energy consultants, designers and construction specialists.</p> <ul style="list-style-type: none"> • Communication and rising awareness campaign to explain the benefits of deep renovations at National and local level, including conducting national information campaigns to inform the public about the problem, to promote alternatives of clean heating and to support regulatory reforms. • One-stop shop (including providing personalized advice to building owners and investors) for advice on the overall renovation process, to obtain comprehensive information and assurance that the proposed measures, including monitoring and control mechanisms, ensure the expected results.
Technical aspect	<ul style="list-style-type: none"> • Lack of an unified building database: creates difficulties for planning major renovations and grouping projects for larger investments. • The lack of systematic maintenance of residential buildings leads to more expensive renovation for EE, due to the need for accompanying measures, non-implementation of which would compromise the implemented ESM, respectively increases the cost of investment, reduces its profitability and limits opportunities to participate in programs financing only EE measures. • Insufficient preparation of the construction sector 	<ul style="list-style-type: none"> • Establishing of an unified digital system for collecting information and database for the existing building stock in the different categories of buildings at municipal level. • Support for pilot projects at local level as an example for the benefits and effects of deep renovation projects, including the dissemination of best practices from Bulgaria and European countries • At the stage of financial planning of future programs, the overall condition of the buildings intended for Energy efficiency renovation, respectively the provision of financial resources for the necessary accompanying measures must be taken into account. • Encourage the use of better quality materials and new technologies in EE upgrades. • Encourage the use of RES for own consumption where technically possible and economically justified. • Digitization of technical passports for buildings and creation of databases of municipalities with connected systems. • Development of package solutions that are easily replicable in similar types of buildings. Creating a database of technical solutions that serves as a tool for future projects / investments. A good knowledge of different renovation solutions will encourage their multiplication. • Extension of the technical passport with a part for planning the energy renovation.
Social aspect	<ul style="list-style-type: none"> • Ownership structure in residential buildings: different social, financial, age and psychological profile of the occupants, which leads to a poorly functioning mechanism for managing the buildings in condominium regime. • A large percentage of unoccupied dwellings in a building, respectively the presence of a small number of owners - makes the investment 	<ul style="list-style-type: none"> • Financial instruments financing single measures • Differentiated financial participation, tailored to the different needs and capabilities of the owners of multifamily buildings, to ensure the inclusion of all, with optimal use of financial resources • Improving the legal framework in which owners' association operate - incl.



Aspect	Barriers	Measures
	inefficient in terms of EE and / or inefficient in terms of financing, regardless of the source.	increasing the requirements to the owners regarding the maintenance and renovation of the buildings, including to the owners of uninhabited apartments, strengthening the powers of the local authorities

➤ **Germany**

- **What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?**

In the case of renovation of buildings, the current Energy Saving Ordinance (EnEV) sets requirements. These requirements apply in case of major renovation or changes done by the owner. In addition, there are in a few cases change-independent retrofitting requirements. Furthermore, the regulation places requirements on the building services systems (heating, hot water, ventilation, air conditioning) in existing buildings.

Major renovation is defined in this way: If changes are made to parts of the building and these are greater than 10% of the total component area of the building, there are requirements for the heat transfer coefficients of the affected areas that must not be exceeded.

e.g. External walls:

0.24 W/(m²K) Residential buildings and zones of non-residential buildings with internal temperatures > 19°C

0.35 W/(m²K) Zones of non-residential buildings with internal temperatures from 12 to <19°C
When installing a new heat generator, the product of the expenditure factor for heat generation (e_g) and the primary energy factor (f_p) shall not exceed 1.30. These values can be achieved e.g. with high efficient condensing boilers, heat pumps, or biomass boilers.

Requirements regarding recommendations for cost-efficient renovation measures in the EPC arise from the EnEV. The recommendations are intended to inform the building owner, but their implementation is not compulsory. The EPC issuer specifies whether and to what extent these measures are recommendable as part of a deeper renovation or as individual measures.

In addition to the component U-values or other component requirements, the EnEV specifies a reference building approach. In major renovation of the complete building, an energy performance value of 140 % of that of the reference building must be achieved. There are also improved energy performance levels eligible for increase levels of funding through the KfW financial incentive programmes (see below), but no proposals or guidance on improved renovation recommendations on the EPC.

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>	Recommendations that reach the regulatory requirements for energy efficiency of buildings	Improved recommendations towards deep energy renovation
<i>If there are different values for the different Climate zones, please select the most important Climate zone</i>		



In the calculation process for 'demand-based' (asset rating) certificates, the reference climate zone for Potsdam is used for all issued EPCs. Values do not differ by climate. Climates typically vary between 3,200 to 4,000 HDD and 10 to 50 CDD.

In case of 'consumption-based' (operational rating) EPCs, the metered consumption for heat for the underlying time period have to be corrected to eliminate the influence of individual climate conditions. The climate correction factors of German Weather Service (DWD) should be used for the issuance of EPCs.

Values given are for buildings heated to at least 19°C

Energy saving action	Value	Energy saving action	Value	Energy saving action	Are there national proposals for improved recommendations?	Value
					NO, not for EPC; but EPC issuers may take the KfW component values given below as an orientation	
Windows/doors replacement	unknown (up to the EPC issuer)	Windows/doors replacement, W/m ² K all buildings	1.3 for roof windows: 1.4 different for other special cases	Windows/doors replacement, W/m ² K Residential building (Non-residential building may differ)	KfW: 0.95 for roof windows: 1.0	
External walls insulation	unknown (up to the EPC issuer)	External walls insulation, W/m ² K all buildings	0.24	External walls insulation, W/m ² K Residential building Non-residential building	0.20	
Roof or attic insulation	unknown (up to the EPC issuer)	Roof or attic insulation, W/m ² K insulation towards the attic all buildings	0.20 0.24	Roof insulation, W/m ² K insulation towards the attic Residential building Non-residential building	0.14 0.14	
Insulation of ceiling of an unheated basement	unknown (up to the EPC issuer)	Insulation of ceiling of an unheated basement, W/m ² K	0.30		0.25	



		Residential building Non-residential building				
Mechanical ventilation with heat/cold recovery	unknown (up to the EPC issuer)	Mechanical ventilation with/without heat/cold recovery, % efficiency				
	unknown (up to the EPC issuer)	Energy efficient lighting, % efficiency		Energy efficient lighting, %		
		Other		Heating substation modernisation, %		
				Measures for improvement of heating installation, %		
				DHW solar installation, %		
				Effective shading, %		
				Other		

Table 11 Minimal regulatory requirements for energy efficiency vs. improved recommendations

- **Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?**

Neither legal requirements for components or energy performance, nor financial incentive programmes are connected to EPCs or EPC classes. EPC recommendations are not linked to EPC classes either.

- **How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?**

The economic data of the proposed measures are not mandatory to provide. It is possible to estimate the payback period or the cost per kilowatt-hour of final energy saved (equivalent energy price). This allows builders to get a first impression of whether the proposed measures are advantageous in an economic sense.

The payback can be calculated both statically (i.e., with 0% interest rate) and dynamically. The determination of the costs for a saved kilowatt-hour of final energy is based on the annuity method.



The economic efficiency is assessed by comparing the costs per kilowatt-hour of final energy consumed with the costs per kilowatt-hour of final energy saved. If these costs are lower, the measure is advantageous.

- ***Does the assessment software provide high-energy-efficiency options?***

No, the software just calculates the energy demands of primary, final, and useful energy.

- ***Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?***

Funding will only be possible if the requirements of the legal standard are exceeded (see table for KfW component requirements).

- ***Are there any financial mechanisms that finance more ambitious measures***

The KfW promotes refurbishments of houses if after refurbishment they do not exceed a specific energy requirement for comparable new houses. KfW has defined six levels of support for a KfW Efficiency House, with increasing levels of grants/grant components in loans. (KfW Efficiency House 55 / 70 / 85 / 100 / 115 / Monument). The best standard (55) receives the highest support.

In order to meet the high-energy standard of a KfW Efficiency House, extensive investments such as the renewal of heating systems, thermal insulation and replacement of windows, are usually required. Promotional funds are available either as grants or as loans. Single measures can also be funded with the lowest grant level; see table above for efficiency requirements.

A KfW Efficiency House 100 complies with the requirements of the Energy Saving Ordinance (EnEV) for the reference building. The statutory new building standard is 75% and in the case of a complete renovation of an existing building 140% of the level of the reference building.

- ***When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?***

No, there are other funding programs for this, e.g. for barrier reduction, burglary protection or smart home.

- ***What are the main barriers for recommendation of more ambitious measures?***

Possible legal problems with regard to liability for the EPC issuer, if the calculated savings do not materialise, the customer wishes or the profitability and cost-effectiveness of the measures is too low.

- ***What are the measures to overcome them?***

Streamlining building law, training energy consultants in legal matters and in better customers advice, improving funding conditions.



➤ Greece

- *What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?*

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings		Improved recommendations towards deep energy renovation			
<i>If there are different values for the different Climate zones, please select the most important Climate zone</i>							
<i>Climate zone B / HDD: 1186 and CDD: 5534</i>							
Energy saving action	Value	Energy saving action	Value	Energy saving action	Are there national proposals for improved recommendations YES/NO	Value	
Windows /doors replacement - Uvalue w/m ² K	2.6 for new buildings 3.0 for existing buildings (as per Regulation)	Windows/doors replacement, Uvalue W/m ² K Residential building Non-residential building	2.6 for new buildings 3.0 for existing buildings	Windows/doors replacement, W/m ² K Residential building Non-residential building	NO		
		External walls Uvalue, W/m ² K Residential building Non-residential building	0.45 for new buildings 0.50 for existing buildings	External walls insulation, W/m ² K Residential building Non-residential building	NO		
Roof insulation - U value w/m ² K	0.4 for new buildings 0.45 for existing buildings (as per Regulation)	Roof or attic insulation, Uvalue W/m ² K Residential building Non-residential building		Roof insulation, W/m ² K Residential building Non-residential building	NO		



		Insulation of ceiling of an unheated basement, W/m ² K			NO	
		Residential building				
		Non-residential building				
		Mechanical ventilation with/without heat/cold recovery, efficiency %			NO	
Replacement of light bulbs with LED technology		Energy efficient lighting, efficiency %	Min luminous efficacy 60lm/W	Energy efficient lighting, %	NO	
For non-residential		For non-residential				
Lighting automatic controls		Other		Heating substation modernisation, %	NO	
For non-residential						
				Measures for improvement of heating installation, %	NO	
Installation of solar collectors for DHW for existing residential buildings	To the max possible cover of demand, if technically and economically feasible	Installation of solar collectors for DHW	60% cover of demand	DHW solar installation, %	NO	
		For new buildings				
				Effective shading, %		
				Other		



- *Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?*

Legal requirements for major renovation are linked to at least EPC class B (see below).

Neither are financial incentive programmes linked to EPC recommendations, nor are the latter linked to EPC classes.

- *How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?*

The approved Technical Guides accompanying the Regulation on the Energy Performance of Buildings, currently in force, include sets of recommendations for the improvement of the energy performance, both for building envelope and for the technical systems

Furthermore, the recommendations included in the EPC are prioritized by level of energy savings and payback periods

- *Does the assessment software provide high-energy-efficiency options?*

No, the software tool provides the possibility to the energy expert to calculate the impact of various improvement options and decide which to include in the EPC. The energy expert is using in his trials the recommendations included in the Technical Guides with the relevant efficiency indicators

- *Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?*

In the frame of national incentive programmes, subsidies with low interest rate are provided for the improvement of the energy performance at least by one energy class. In the case of major renovation of existing buildings, there is the obligation to achieve at least class B (no financial mechanism is in place for such cases of major renovation)

- *Are there any financial mechanisms that finance more ambitious measures*

No

- *When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?*

Eligible costs are: the cost of technology and the cost of works directly related to the installation of the technology (e.g. replacement of roof ceramic tiles when installing roof insulation)

- *What are the main barriers for recommendation of more ambitious measures?*

Mainly, the high costs but also the lack of official ranges of values of indicators of more efficient and - at the same time cost effective- technologies/measures. However, in buildings of the tertiary sector, building owners may assign a detailed feasibility study to engineers/energy consultants and proceed to interventions of high efficiency on own funding.

- *What are the measures to overcome them?*



Indicatively: a) incentive (subsidy) programmes addressing high energy consumers (probably buildings of the tertiary sector or large residential complexes developed by R/E contracting companies) and providing funding for ‘ambitious’ renovations, b) other incentive programmes promoting the social profile of big companies in the frame of their Corporate Social Responsibility, when upgrading their building premises at a high efficiency level, c) Update of Technical Guides to include high impact measures and related indicators, above the obligations deriving from the Regulation in force.

➤ **Hungary**

- **What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?**

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings		Improved recommendations towards deep energy renovation			
<i>If there are different values for the different Climate zones, please select the most important Climate zone</i>							
<i>Climate zone/ HDD and CDD</i>							
Energy saving action	Value	Energy saving action	Value	Energy saving action	Are there national proposals for improved recommendations YES/NO	Value	
Windows/doors replacement, W/m²K Residential building Non-residential building	No difference between residential and non-residential requirements Windows: 1.15 (for wood and PVC frame), 1.4 (for metal frame) Door (between heated and non-heated area):	Windows/doors replacement, W/m ² K Residential building Non-residential building	No difference between residential and non-residential requirements Windows: 1.15 (for wood and PVC frame), 1.4 (for metal frame) Door (between heated and non-heated area): 1.45	Windows/doors replacement, W/m ² K Residential building Non-residential building	NO		



	1.45					
External walls insulation, W/m²K Residential building Non-residential building	No difference between residential and non-residential requirements 0.24	External walls insulation, W/m ² K Residential building Non-residential building	No difference between residential and non-residential requirements 0.24	External walls insulation, W/m ² K Residential building Non-residential building	NO	
Roof or attic insulation, W/m²K Residential building Non-residential building	No difference between residential and non-residential requirements 0.17	Roof or attic insulation, W/m ² K Residential building Non-residential building	No difference between residential and non-residential requirements 0.17	Roof insulation, W/m ² K Residential building Non-residential building	NO	
Insulation of ceiling of an unheated basement, W/m²K Residential building Non-residential building	No difference between residential and non-residential requirements 0.26	Insulation of ceiling of an unheated basement, W/m ² K Residential building Non-residential building	No difference between residential and non-residential requirements 0.26		NO	
Mechanical ventilation with/without heat/cold recovery, % efficiency	80-85% efficiency in HRV units in new office buildings residential: natural ventilation with	Mechanical ventilation with/without heat/cold recovery, % efficiency	No direct requirements heat recovery efficiency, but indirect overall requirements on building performance, choice is designer's competence. ErP directive		NO	



	improved air tightness		requirements drive the market.			
Technical building systems general		Technical building systems general	Light direct requirements on system elements, but indirect overall requirements on building performance. ErP directive requirements drive the market.		NO	
	LED lights	Energy efficient lighting, % efficiency		Energy efficient lighting, %		
		Other	No direct requirements on heat recovery efficiency, but indirect overall requirements on building performance. ErP directive requirements drive the market	Heating substation modernisation, %	NO	
	No		ErP directive requirements drive the market. Further requirements: - hydraulic balancing obligatory - system control requirements pump requirements	Measures for improvement of heating installation, %	NO	



	No		No direct requirements heat recovery efficiency, but indirect overall requirements on building performance, choice is designer's competence. ErP directive requirements drive the market. Further requirements: - hydraulic balancing obligatory - requirements on circulation pump's control	DHW solar installation, %	NO	
			For glazings with solar access g-value (including shading factor) should be below 0,3 in buildings with mechanical cooling	Effective shading, %		
				Other		

Table 12 Minimal regulatory requirements for energy efficiency vs. improved recommendations

- **Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes??**

Legal requirements for major renovation are connected to EPC values but not classes (see above). Existing financial incentives require the obligation to the legal requirements, but does not prescribe the EPC class to be achieved.

EPC recommendations should include the impact on the energy class (see next question).

- **How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?**



Government Regulation No. 176/2008 on EPC Annex 2 describes the corroborating work. It contains the section about recommendations on renovations. Recommendations should include the impact on the reduction of gross primary energy consumption and on the energy class of the building. The assessment methodology is based on a stocktaking of different technical solutions (e.g. window/door replacement, insulation, replacement of heating installations etc.) and their costs combined with the lifetime of the solutions; so it is basically a payback time calculation.

7/2006 TNM regulation Annex 4 requires an assessment of alternative energy supply systems in new builds. If the alternative solution proves to be technically and environmentally expedient, a cost effectiveness assessment is required.

- *Does the assessment software provide high-energy-efficiency options?*

There is no one particular official software. However, in the most commonly used software all options can be chosen, which can also be optimized (however, the optimization is not based on a very detailed assessment)

- *Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?*

The available incentives only oblige to reach the regulatory minimum requirements of the energy performance of the building (i.e. 7/2006 TNM regulation).

- *Are there any financial mechanisms that finance more ambitious measures*

There are no such measures.

- *When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?*

Mostly these are not affected; although in some cases safety related measures are included.

- *What are the main barriers for recommendation of more ambitious measures?*

One of the main barriers is that there are no clear requirements on including more ambitious measures. There is no control on what these recommendations contain and how they are elaborated. The inclusion of more ambitious measures often also fails because of the high costs of such measures; the payback time is too long in case of these solutions.

- *What are the measures to overcome them?*

The energy prices in Hungary, especially for the residential sector are kept artificially low by the government. If this energy price reduction would be abolished, and the true price would have been needed to pay for it, it would make energy efficiency measures much more attractive. Also, assessors' attitudes could be changed if there were clear obligations and guidance on how to elaborate the recommendations, and there would be sufficient control. These would be the measures to overcome the barriers, however these measures don't exist yet.



➤ Latvia

- *What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?*

The minimal regulatory requirements for energy efficiency for renovated buildings according to Regulations Regarding Energy Certification of Buildings (Cabinet Regulation No. 383 Adopted 9 July 2013):

Minimum permissible level of energy performance for buildings to be reconstructed or renovated:

- for multi-apartment residential house - energy performance indicator for heating does not exceed 90 kWh per square metre per year;
- for one-apartment and two-apartment residential buildings of different types - energy performance indicator for heating does not exceed 100 kWh per square metre per year;
- for non-residential buildings - energy performance indicator for heating does not exceed 110 kWh per square metre per year.

The actions that are typically suggested ensure that energy consumption for space heating will be lower than shown in the previous point where mandatory energy consumptions after building renovation are showed

There are no existing recommendations for deep energy renovation since there is no clear definition of what deep energy renovation is. There are some projects being carried out, where the idea of deep energy renovation is considered. Usually in these projects complete renovation of buildings is suggested. After such renovation energy consumption for space heating usually does not exceed 50-60 kWh/m² per year.

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings	Improved recommendations towards deep energy renovation		
<i>If there are different values for the different Climate zones, please select the most important Climate zone</i>					
<i>Climate zone/ HDD and CDD</i>					
Energy saving action	Value	Energy saving action	Value	Energy saving action	Value
				There are no national proposals for improved recommendations in order to achieve deep energy renovation because the definition of what is a deep energy renovation has not yet been set. NO	



<p>Window replacement and door replacement</p>	<p>U_{windows} around 1,1 W/m^2K</p> <p>U_{doors} around 1,6 W/m^2K</p>	<p>Windows/doors replacement, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		<p>Windows/doors replacement, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		
<p>External Wall insulation</p>	<p>Typically, 15 cm of Wall insulation is suggested. This reached a U value of around 0,22 W/m^2K</p>	<p>External walls insulation, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		<p>External walls insulation, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		
<p>Insulation of attic</p> <p>Insulation of roof (if there is no attic)</p>	<p>Typically, 30 cm of loose wool is suggested for attic insulation. The U value of attic then becomes around 0,11 W/m^2K.</p> <p>If there is no attic then roof is insulated with around 25 cm heat insulation. This ensures that U value of</p>	<p>Roof or attic insulation, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		<p>Roof insulation, W/m^2K</p> <p>Residential building</p> <p>Non-residential building</p>		



	roof reaches around 0.14 W/m ² K.					
Insulation of basement and plinth wall	Typical suggestion for renovation of basement is to insulate basement ceiling with 10 to 15 cm and insulate plinth Wall with 10 cm insulation. This reaches U value for basement of around 0,2 W/m²K.	Insulation of ceiling of an unheated basement, W/m ² K Residential building Non-residential building				
Mechanical ventilation typically is suggested only in non-residential buildings. In residential buildings cleaning of existing natural ventilation is suggested. As well as fresh air inlet valves in window frames are suggested.	In non-residential buildings mechanical ventilation system with heat recovery is suggested. Typically, the efficiency of heat recovery unit is around 70-85%.	Mechanical ventilation with/without heat/cold recovery, % efficiency				
LED lighting system in non-residential		Energy efficient lighting, % efficiency		Energy efficient lighting, %		



buildings usually is suggested. Changes to lighting system in residential buildings usually are not suggested in EPCs.						
Quite often new heating system (pipes and radiators with thermostatic valves) is suggested in apartment building energy audits		Other		Heating substation modernisation, %		
PV and solar collectors sometimes are suggested but not that often.				Measures for improvement of heating installation, %		
				DHW solar installation, %		
				Effective shading, %		
				Other		

Table 13 Minimal regulatory requirements for energy efficiency vs. improved recommendations

- **Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?**

Legal requirements for major renovation are connected to EPC values but not classes (see above). The same is the case for an important financial incentive programmes.

EPC recommendations are not linked to EPC classes (see previous question).

- **How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?**

When an EPC is issued, it comes together with a mandatory annex which is called “Report on economically justified measures improving energy performance, the implementation costs of which are cost-effective during the anticipated (planned) period of service”. The template of this annex is defined and given in Cabinet Regulation No. 383 9 July 2013 “Regulations Regarding Energy Certification of Buildings”. In real life there usually is one set of energy efficiency measures, which gets



proposed, and usually it is not cost-effective because the payback period is longer than 20-30 years (which is the planned period of service of these energy efficiency measures). This happens because there is a EU grant for apartment building renovation. This grant covers 50% of total energy efficiency measure costs.

- ***Does the assessment software provide high-energy-efficiency options?***

There is no official national software. Everybody does their own calculation.

- ***Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?***

Apartment buildings can apply to up to 50% ERAF grant (Cabinet Regulations 160 15 March 2016) if after renovation they achieve energy consumption for space heating under 90 kWh/m² per year. Usually apartment buildings in this program reach space heating energy consumption of around 60-70 kWh/m² per year. The available funding of 166 million EUR for this grant ended in the beginning of 2020.

- ***Are there any financial mechanisms that finance more ambitious measures***

From time to time there are different programs where buildings can apply if they achieve nearly zero energy building status (40-45 kWh/m² per year for space heating). There have been programs also for reaching passive building status. These programs mostly are meant for new buildings.

- ***When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?***

Eligible costs in these programs include activities that improve technical characteristics of buildings even if these measures do not contribute to energy savings.

- ***What are the main barriers for recommendation of more ambitious measures?***

- Cost effectiveness
- People know the standard measures and are not familiar to the more ambitious measures (mechanical ventilation, shading, PV and solar collectors, e.t.c.)
- Lack of experience implementing these more ambitious measures

The more ambitious measures usually affect the comfort of living not the energy consumption of buildings

- ***What are the measures to overcome them?***

- Pilot projects achieving deep renovation
- Information campaigns
- Changes in legislation regarding building energy performance and energy efficiency programs
- Giving more thought to how financial incentives for deep renovation projects could be improved



➤ Spain

- *What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?*

The data of next table includes values for D climate zone -Madrid and other cities of the Centre of Spain-. Source: Technical Building Code 2019, Annex B (*CTE Anexo B*).

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings		Improved recommendations towards deep energy renovation		
<i>D climate zone/ HDD and CDD</i>						
Energy saving action	Value	Energy saving action	Value	Energy saving action	is there a national proposals for improved recommendations? YES/NO	Value
Windows/doors replacement W/m²K		Windows/doors replacement, W/m ² K		Windows/doors replacement, W/m ² K	NO	
Residential building		Residential building	1.8	Residential building		
Non-residential building		Non-residential building	1.8	Non-residential building		
External walls insulation, W/m²K		External walls insulation, W/m ² K		External walls insulation, W/m ² K	NO	
Residential building		Residential building	0.41	Residential building		
Non-residential building		Non-residential building	0.41	Non-residential building		
Roof or attic insulation, W/m²K		Roof or attic insulation, W/m ² K		Roof insulation, W/m ² K	NO	
Residential building		Residential building	0.35	Residential building		
Non-residential building		Non-residential building	0.35	Non-residential building		



Insulation of ceiling, W/m ² K Residential building Non-residential building		Insulation of ceiling of an unheated basement, W/m ² K Residential building Non-residential building	0.65 0.65		NO	
		Mechanical ventilation with/without heat/cold recovery, % efficiency	Not % $Q_{100,lim} \leq 9 \text{ m}^3/\text{hm}^2$ (and 3-6 renovations per hour depend of V/A (m ³ /m ²) for new residential buildings with surface higher than 120m ²).		NO	
Energy efficient lighting, % efficiency		Energy efficient lighting, % efficiency	Not % No limit for residential buildings Depend on the use of the different areas for non-residential buildings i.e. VEEI limit =3 for rooms of administrative use; also include control system and regulation system for natural light use	Energy efficient lighting, %	NO	
		Other: Solar parameter, q solar, kWh/m ² month Residential building Non-residential	2 4	Heating substation modernisation, %	NO	



		building				
				Measures for improvement of heating installation, %	NO	
DHW solar installation, %		DHW solar installation, %	60%, DHW and pool demand <5000 l/day 70%, DHW and pool demand >=5000 l/day	DHW solar installation, %	NO	
				Effective shading, %	NO	
				Other	--	

- ***Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?***

Legal requirements for renovation are not connected to EPCs or EPC classes.

Some financial incentive programmes are linked to the achievement of one EPC class better, or even class A or B (see below).

EPC recommendations are not linked to EPC classes.

- ***How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?***

According to the RD235/2013 of April, 5th states that the certificate must include a “document of recommendations for improvement the optimum and performance levels of a building”; also includes that the certificate must include information of the cost effectiveness of the recommendations.

- ***Does the assessment software provide high-energy-efficiency options?***

The assessment software does not provide high-energy efficiency options

- ***Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?***

PAREER financial programme for improving at least 1 energy performance class for residential and hotel sectors; the funds are focused for envelope improvements, upgrading thermal and lighting installations, replacement of traditional fuel thermal installation by biomass new installation or geothermal installation. Applications with renovations for A or B class could receive more funds from this programme.



- **Are there any financial mechanisms that finance more ambitious measures?**

For some areas of Spain ERDF European Regional Development Fund. Applications with renovations for A or B class could receive more funds from the PAREER programme.

- **When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?**

The energy efficiency programs in residential buildings do not include improvements of the technical characteristics – maintenance, security, and other structural elements of the affected buildings.

- **What are the main barriers for recommendation of more ambitious measures?**

The main barriers for recommendation of more ambitious measures are high costs and few financing opportunities and the difficulty of owners' agreements in residential sector. The financing program required many bureaucratic phases and time and the credit rates of loans are high for this type of product.

- **What are the measures to overcome them?**

Different solutions could be decreasing loan rates for deep renovation measures, creation of more financing programs for this purpose and provide assistance-information to the owners of the buildings about the advantages of deep renovation.

➤ Sweden

- **What are the minimal regulatory requirements for energy efficiency, and is there a national proposal for improved recommendations?**

For new and renovated buildings, there are basic requirements related to maximum primary energy demand and maximum average heat transfer coefficient (for the whole building). If these are not fulfilled during a renovation, the alternative is to fulfil requirements specific for each part of the building that has been renovated.

Which actions are typically recommended? <i>/Please list the most common energy actions/</i>		Recommendations that reach the regulatory requirements for energy efficiency of buildings		Improved recommendations towards deep energy renovation			
<i>If there are different values for the different Climate zones, please select the most important Climate zone</i>							
<i>Climate zone/ HDD and CDD</i>							
Energy saving action	Value	Energy saving action	Value	Energy saving action	Are there national proposals for improved recommendations YES/NO	Value	



Adjustment measures for improvement of heating installation		Windows/doors replacement, W/m ² K Residential building Non-residential building	Building average 0,4 <i>or</i> Window/door 1,2 Average 0,5 <i>or</i> Window/door 1,2	Windows/doors replacement, W/m ² K Residential building Non-residential building	There is a long checklist of suggested measures in the EPC.	
New radiator valves		External walls insulation, W/m ² K Residential building Non-residential building	Building average 0,4 <i>or</i> Wall 0,18 Average 0,5 <i>or</i> Wall 0,18	External walls insulation, W/m ² K Residential building Non-residential building		
Measures to decrease domestic hot water consumption		Roof or attic insulation, W/m ² K Residential building Non-residential building	Building average 0,4 <i>or</i> Roof 0,13 Average 0,5 <i>or</i> Roof 0,13	Roof insulation, W/m ² K Residential building Non-residential building		
Various measures involving monitoring and control of the heating system		Insulation of ceiling of an unheated basement, W/m ² K Residential building				



		Non-residential building			
		Insulation of floor, W/m ² K			
		Residential building	Building average 0,4 or Floor 0,15		
		Non-residential building	Average 0, 5 or Floor 0,15		
Solar PV installation		Mechanical ventilation with/without heat/cold recovery, % efficiency			
Replacement or new installation of heat pump		Energy efficient lighting, % efficiency		Energy efficient lighting, %	
Limiting the indoor temperature		Other: Specific fan power (SFP) for fan or ventilation unit. Example: Mechanical supply and extract air with or without heat recovery	With heat recovery: 2 kW/(m3/s) Without: 1.5 kW/(m3/s)	Heating substation modernisation, %	
				Measures for improvement of heating installation, %	
				DHW solar installation, %	
				Effective shading, %	
				Other	

Table 14 Minimal regulatory requirements for energy efficiency vs. improved recommendations



- *Are legal requirements or financial incentive programmes connected to EPC recommendations or EPC classes? Are EPC recommendations linked to EPC classes?*

Legal requirements for renovation are not connected to EPCs or EPC classes.

Some financial incentive programmes are using EPC for verifying the performance linked to the achievement of improvements, but not linked to EPC classes.

EPC recommendations are not linked to EPC classes.

- *How is the requirement that recommended measures must be cost-effective specified in detail (please specify the source and the assessment methodology)?*

According to the Swedish law about EPCs for buildings (Lag 2006:985), the measures recommended in the EPC must be cost-effective. This limitation is also expressed in the EPC form itself, where the headline for renovation measures is "Recommendations of cost-effective measures".

It is not clear how cost-effectiveness should be evaluated since there is no clear definition of the term itself and there are not clear guidelines of how the profitability (or cost per kWh) should be calculated.

- *Does the assessment software provide high-energy-efficiency options?*

There is no assessment software.

- *Are there any financial mechanisms that finance only measures leading to the minimum required energy class (please specify)?*

See below.

- *Are there any financial mechanisms that finance more ambitious measures*

See below.

- *When implementing energy efficiency programs in residential buildings, is the inclusion of activities that improve the technical characteristics of buildings affected, although they do not directly lead to energy savings?*

Owners of single-family houses in Sweden may cover part of renovation measures costs with funding from the so-called "ROTprogramme", where ROT is a Swedish acronym for renovation, reconstruction and extension. It includes all measures that improve the building value.

For renovation of multi-family houses there has been a program for districts with socioeconomic challenges that includes energy efficiency in two levels.

For new construction of student homes and rental apartments there is a program that includes energy efficiency in two levels compared to the building regulation.

- *What are the main barriers for recommendation of more ambitious measures?*

That they are not cost-effective, requires evacuation and difficulties to find contractors specialized in renovation. Furthermore, at this point the most cost-effective measures has already been implemented.

- *What are the measures to overcome them?*



Business models that shows that the measures may be effective in long term with higher property value, considering long term maintenance, better indoor comfort, green label, etc.

Technology procurement programmes for development of new concepts adjusted for renovation that are more cost-effective.

D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry

➤ **Bulgaria**

- *What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?*

Regular training for certification and including in the official register is not mandatory in Bulgaria. The regulatory framework for the certified assessors training is defined in ORDINANCE № E-RD-04-1 of 3 January 2018 of circumstances subject to entry in the registers under the Energy Efficiency Act, listing and obtaining information from these records TERMS AND CONDITIONS FOR ACQUISITION OF QUALIFICATION OF CONSULTANTS IN ENERGY EFFICIENCY.

- *Who is responsible for the energy assessors training (the mandatory training)?*

Responsible for the energy assessors training are universities, training in specialties in the field of higher education 'Engineering' professional fields, "Energy", "Electronics and Automation" and "Architecture, Civil Engineering and Geodesy" accredited under the Higher Education Act.

- *Requirements for being allowed to issue EPCs*

Energy efficiency audits, certification of buildings, preparing an assessment of conformity of development-project designs and preparing energy savings evaluations are to be performed by persons, registered under Article 44 (1) of the Energy Efficiency Act, and meet the following requirements:

Are merchants within the meaning given by the Commerce Act or under the legislation of another Member State of the European Union, or of another State which is a Contracting Party to the Agreement on the European Economic Area, or of the Swiss Confederation;

Have at their disposal the requisite technical devices, specified in the ordinance referred to in Article 44 (9) of the Energy Efficiency Act;

Have at their disposal the requisite staff: energy efficiency consultants who meet the requirements of the ordinance referred to in Article 44 (9) of the Energy Efficiency Act:

Have secondary technical education, higher education or an acquired academic degree in field of Technical Sciences completed or recognized in the Republic of Bulgaria or secondary technical education, higher education or an acquired academic degree in the equivalent field of higher education in another member state of the European Union or in another state which is a party to the European Economic Area Agreements or in the Confederation of Switzerland;



Have acquired a length of service in the speciality after completion of the education - of not less than 6 years for holders of secondary technical education, not less than three years for holders of an educational qualification degree of Bachelor, and not less than two years for persons holding an educational qualification degree of Master or holding a science degree;

Hold a certificate of successfully passed exam for raising their qualification for performing the activities under this paragraph in higher education institutions teaching their students in specialities in the field of Technical Sciences, professional profiles of Energy, Electrical Equipment, Electronic Equipment and Automation and Architecture, Construction and Geodesy accredited under the Higher Education Act or in specialities in equivalent fields of higher education and professional profiles accredited under the applicable legislation in another member state of the European Union, in a state which is a party to the European Economic Area Agreement or in Switzerland.

Certified companies must have at least three energy experts (architect, civil engineer, HVAC engineer or electrical engineer) and all of them must be certified to conduct energy inspections.

- ***What kind of exam is implemented in the country?***

The exam is conducted in two steps: an exam test and defence of a course project. Only a candidate for an assessor who has passed the exam test is allowed to defend a course project. The exam test is uniform for the country. A methodical council, in which habilitated lecturers authorized by the rectors of all higher schools, conducting examinations under this ordinance, participates, prepares the examination test in variants.

- ***Is the exam test uniform for the country?***

The exam test is uniform for the country. A methodical council, in which habilitated lecturers authorized by the rectors of all higher schools, conducting examinations under this ordinance, participates, prepares the examination test in variants.

- ***What is the curriculum for the professional qualification of EPC issuers? (main topics)***

The curriculum has been developed in accordance with the requirement of Directive 2012/27 / EU on energy efficiency to provide end-users with high-quality energy audits that are cost-effective and performed by qualified experts, as well as to meet the requirement for Member States to encourage training programs for the qualification of energy auditors in order to facilitate the provision of a sufficient number of experts. The training is also based on the requirement of Directive 2010/31 / EU on the energy performance of buildings to provide high quality energy audits carried out by qualified experts, the registration of which takes into account their competence.

The curriculum is structured on a modular basis with a combination of teaching hours to ensure that the minimum qualification criteria are met. The technical and normative material is grouped into three theoretical modules with topics and subtopics. The curriculum includes a practical module - developing a course project.

The topics and subtopics refer to the specifics of the buildings, whose energy characteristics are subject to study and analysis in level 2, taking into account:

- the structural and operational features of the buildings in Bulgaria;
- climatic features for Bulgaria;
- the ways of energy supply and consumption by types of energy carriers, incl. renewable;
- the peculiarities of the installed systems for maintaining the microclimate;



- the type of hot water supply systems;
- technical rules and norms for the assessment of the annual energy consumption in buildings;
- Other normative features and policies for energy efficiency, environmental protection and sustainable development.

Detailed curriculum and structure are defined in ORDINANCE № E-RD-04-1 of 3 January 2018 of circumstances to be entered in the registers under the Energy Efficiency Act, listing and obtaining information from these records TERMS AND CONDITIONS FOR ACQUISITION OF QUALIFICATION OF CONSULTANTS IN ENERGY EFFICIENCY

- ***Are the recommendations included, and does the training content advise EPC assessors to formulate recommendations towards deep renovation?***

Yes, the following subtopics are included in the educational programme:

- Evaluation of the effect of single energy saving measures. An iterative process for evaluating the effectiveness of a package of energy saving measures. Compatibility of energy saving measures with the basic (essential) requirements for buildings.
- Assessment of the possibilities for energy efficiency of heating systems, implemented according to classical schemes. Efficient technologies of heating systems with conventional heat source. Evaluation of the efficiency of the systems in energy saving measures, providing different levels of thermal comfort in the buildings. Specific requirements in the relevant national legislation, European standards and norms.
- Unconventional energy source systems for heating, air conditioning or ventilation of buildings. Heat pumps. Modern air conditioning systems for public service buildings. Systems for specific purpose buildings. Requirements in the relevant national legislation, European standards and norms
- Solar energy systems.
- Energy efficiency of pumps and fans. Factors affecting efficiency.
- Cooling and freezing systems. Types by functional purpose. Indicators for evaluating the efficiency of the systems.
- Modern lighting systems. Evaluation of the efficiency and energy consumption in combined action of active artificial lighting systems and systems for increased use of daylight. Performance indicators of lighting systems in buildings. Specific requirements in the relevant national legislation, European standards and norms.
- Modern technologies and systems for monitoring, control and management of energy consumption in public service buildings. Requirements in the relevant national legislation, European standards and norms.
- Energy passive buildings and buildings with energy consumption close to zero. Connections and differences of concepts. National legislation, European standards and norms.
- Assessment of the economic feasibility of energy saving measures. Indicators of economic feasibility. Specialized software for economic evaluation of energy saving measures.

- ***List any other EPC related trainings – topic, periodicity, organizer***

Name of the event	Topic	Periodicity	Organizer	Is it paid
n.a.	n.a.			

Table 15 List of examples for not-mandatory trainings



- *What should be improved with regards to the (mandatory or not) training?*

The frequency of training for the certification of energy consultants needs to be increased, as it is currently extremely rare.

➤ **Germany**

- *What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?*

Not mandatory

- *Who is responsible for the energy assessors training (the mandatory training)?*

Training for first-time registration or voluntary training is provided by chambers of professionals or other accredited training organisations.

- *Requirements for issuing a Certificate of qualification*

University degree in relevant technical fields or German professional education entitling to own a company in the relevant fields of building works, plus either a mandatory training or other relevant qualification

- *What kind of exam is implemented in the country?*

Not relevant (no exam required)

- *Is the exam test uniform for the country?*

Not relevant

- *What is the curriculum for the professional qualification of EPC issuers? (main topics)*

Focus of the training on existing residential buildings:

- Inventory and documentation of the building, the construction and the technical systems,
- assessment of the building envelope, heating and water heating systems, ventilation and air conditioning systems,
- Provision of evidence,
 - basics of the assessment of modernisation recommendations including their technical feasibility and economy
- Focus of the training on existing non-residential buildings:
- In addition to the listed focal points for residential buildings, the training is intended to convey the following specialist knowledge of non-residential buildings:
- Inventory and documentation of the building, the construction and the technical systems,
- assessment of the building envelope, heating and water heating systems, ventilation and air conditioning systems and other systems for cooling, assessment of lighting and lighting systems,
- provision of evidence,
- basics of the assessment of modernisation recommendations including their technical feasibility and economy



- *Are the recommendations included, and does the training content advise EPC assessors to formulate recommendations towards deep renovation?*

Yes, see above

- *List any other EPC related trainings – topic, periodicity, organiser*

Not known.

➤ Greece

- *What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?*

There is no obligation for regular mandatory training at the moment

- *Who is responsible for the energy assessors training (the mandatory training)?*

In the first period of implementation of the EPBD in Greece, training was mandatory and was provided by Vocational centres and Academic Institutions as well as the Technical Chamber of Greece. After repeal of the law on mandatory training in 2016 and up to day, the same institutions continue to provide training for assessors but on a voluntary basis

- *Requirements for getting a licence to conduct energy audits*

University degree in Architecture/Engineering (Licenced engineers registered in the Hellenic Technical Chamber) or graduate engineers of technological institutes.

Registration in the national Energy assessors' database

According to academic background and proven experience in energy audits they are classified in 3 different assessors' categories and get the relative licence from the operators/owners of the database. More detailed information on assessors' categories are provided in 'D2.1 Report on local EPC situation and cross-country comparison matrix'

- *What kind of exam is implemented in the country?*

none

- *Is the exam test uniform for the country?*

No exams

- *What is the curriculum for the professional qualification of energy efficiency consultants? (main topics)*

In voluntary training, curricula differ by institution providing the training

- *Are the recommendations included, and does the training content advise EPC assessors to formulate recommendations towards deep renovation?*

n/a



- *What should be improved with regards to the (mandatory or not) training*

Currently, there is a discussion with the competent Ministry (Ministry of Environment and Energy) about recasting the regulation on training and make it mandatory again. Any recommendations regarding training curricula, focus on deep renovation recommendations, exams etc., that will be delivered by the project would be very useful in view of any positive outcome of the discussions on training

➤ Hungary

- *What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?*

From January 1, 2020 the obligation of regular mandatory trainings exists. It concerns both legal and technical trainings, and it is mandatory once in every five years. At the end of the training an exam must be taken. It is regulated in Government Regulation 266/2013.

- *Who is responsible for the energy assessors training (the mandatory training)?*

The Hungarian Chamber of Engineers is responsible for organizing energy assessors' trainings.

- *Requirements for issuing a Certificate of qualification*

It is regulated in Government Regulation 266/2013 who can be assessors. They must have a relevant expert background (listed by degree and qualification in the regulation) and they must fulfil a training for accreditation, as well as an exam. The minimum qualification should be one of the following: university degree (BSc or MSc) in architecture, civil engineering, mechanical engineering, energy engineering, electric engineering, municipal engineering, transportation engineering, water engineering

- *What kind of exam is implemented in the country?*

The thematics of the exam is determined by the responsible minister, the curriculum is developed by the national chamber (Hungarian Chamber of Engineers) and presented to the minister. The topics, system, method and evaluation of in-service training are established by the national chamber in their own competence and regulations. Educational materials are published electronically by the chamber. The eligibility exam and the report consist of a general and a specialist section. The eligibility exam is a written and an oral exam. An oral examination shall take place in the event of a successful written examination.

- *Is the exam test uniform for the country?*

Yes, it is uniform. The questions of the examination and the report are compiled by the examination organizing chamber (Hungarian Chamber of Engineers) - with the consent of the Minister - and published on its website and on the e-epites.hu portal. The exam questions are chosen from this list and are compiled by the exam's panel of experts.

- *What is the curriculum for the professional qualification of EPC assessors? (main topics)*

(a) the scope of the regulation on energy requirements and certification, (b) indoor environment criteria (thermal comfort, indoor air quality and ventilation, humidity, lighting), (c) methods for



calculating the energy demand of buildings, building envelopes and building services systems, (d) identification of building engineering systems (heating, ventilation, domestic hot water supply, cooling, lighting), their energy-conscious modernization, calculation of primary energy demand for each system, calculation of profit flows from the building's energy systems, operating advice, (e) energy quality certification system (method) of buildings, (f) thermal engineering identification of existing building boundary structures, energy-conscious renovation, (g) estimating the number of air exchanges for the building, determining the specific heat loss factor, (h) energy quality classes, classification rules, (i) certification documentation.

- ***Are the recommendations included, and does the training content advise EPC assessors to formulate recommendations towards deep renovation?***

No, this is not an issue today. This should be changed.

- ***List any other EPC related trainings – topic, periodicity, organizer***

There are other several courses or trainings organised by universities and companies related to energy efficiency in buildings, but not with EPC in the main focus. These courses are not mandatory, not linked with EPC licence and not targeted particularly to EPC experts, but to designers, auditors, building operators.

Name of the event	Topic	Periodicity	Organizer	Is it paid
	n.a.			

Table 16 List of examples for not-mandatory trainings

- ***What should be improved with regards to the (mandatory or not) training?***

Mandatory trainings are organised by the Hungarian Chamber of Engineers. EPC Experts must take a legal training every 5 years and a professional training every 5 years. Both are relatively short, less than one day which is not sufficient for a deep training. As the formulation of recommendations is not specifically addressed within the trainings, there is a need to add this topic to the trainings, putting emphasis on recommendations towards deep renovations.

➤ Latvia

- ***What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?***

There is no regular mandatory training of EPC assessors required.

If EPC assessor goes to a training (s)he has the obligation to register this training in Building Information System (BIS; this is the same system where EPCs are registered). Unfortunately, there is no way to do this in this Building Information system. It seems that by April 2021 there will be mandatory training requirement.

- ***Who is responsible for the energy assessors training (the mandatory training)?***

No mandatory training required. It seems that the responsible for the upcoming mandatory training requirement will be the same institution which certifies energy assessors.



- ***Requirements for issuing a Certificate of qualification***

Requirements for energy assessors in legislation (Cabinet Regulation No. 531 Adopted 21 August 2018 “Regulations Regarding Assessment of the Competence of Independent Experts and Monitoring of Professional Activity Thereof in the Field of Energy Performance of Buildings):

- higher vocational or academic education of the first or second level, provided the relevant educational programme provides acquiring knowledge of the following - heat engineering of building envelope, technical building systems (heating, cooling, ventilation, air conditioning, water supply, lighting), building climatology and the indoor climate, assessment of energy performance and calculation methodology
- has at least two years of practical work experience in assessing energy performance of buildings by working under supervision of an independent expert with a certified competence in the field of assessing energy performance of an existing building or its unit and issuing energy performance certificate of a building, as well as assessing the planned energy performance of new buildings to be designed, buildings or their units to be reconstructed, or renovated, and issuing a temporary energy performance certificate of a building;

In addition, an exam is required.

- ***What kind of exam is implemented in the country?***

To become an energy assessor (energy auditor) there is an exam consisting of two parts. First part – theory; second part – practical verbal part by meeting with examiner and answering question regarding 3 energy audits that have been carried out by the examinee (these 3 energy audits have to be sent to examiner prior to exam).

- ***Is the exam test uniform for the country?***

Yes. At the current moment there is only one organization providing these exams - <https://www.lsgutis.lv/>

- ***What is the curriculum for the professional qualification of EPC assessors? (main topics)***

To become an EPC assessor, a mandatory exam has to be taken, but before the exam the person applying to become EPC assessor has to acquire higher vocational or academic education of the first or second level, provided the relevant educational programme provides acquiring knowledge of the following - heat engineering of building envelope, technical building systems (heating, cooling, ventilation, air conditioning, water supply, lighting), building climatology and the indoor climate, assessment of energy performance and calculation methodology.

- ***Are the recommendations included, and does the training content advice EPC assessors to formulate recommendations towards deep renovation?***

No mandatory training

- ***List any other EPC related trainings – topic, periodicity, organizer***

There are different trainings organized by energy auditor companies, Universities and Ministry of Economics.



➤ **Spain**

- **What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?**

No national requirements regarding regular mandatory training. EPC assessor should have a university degree on Architecture or Engineering studies.

- **Who is responsible for the energy assessors training (the mandatory training)?**

Please see previous paragraph

- **Requirements for issuing a Certificate of qualification**

EPC assessor should have a university degree on architect or engineering studies

- **What kind of exam is implemented in the country?**

No exams are implemented

- **Is the exam test uniform for the country?**

No exams are implemented

- **What is the curriculum for the professional qualification of EPC assessors? (main topics)**

Please see previous answers

- **Are the recommendations included, and does the training content advice EPC assessors to formulate recommendations towards deep renovation?**

There is a need for training EPC assessors to increase the quality of both assessors and EPCs; also need of training about recommendations towards deep renovation

- **List any other EPC related trainings – topic, periodicity, organizer**

Name of the event	Topic	Periodicity	Organizer	Is it paid
CTE Building Technical Code: updating 2019	Updating national legislation for EPC	----	Association of companies for installation	Yes

Table 17 List of examples for not-mandatory trainings

➤ **Sweden**

- **What are the existing national requirements regarding regular mandatory training (or is it not mandatory)?**

For EPC assessors (certified energy expert), relevant technical education and documented experience of practical work (at least 5 years, of which 2 years should be related to energy and indoor climate in



the corresponding category of buildings) is needed. The certificate is valid for 5 years. After that it needs to be renewed with a new theoretical test. The test for recertification is a less comprehensive than the first certification test. Between certification and recertification, regular training is not required. However, the EPC assessor needs to report the number of performed assignments and any updating of skills and also send in assessed EPCs to the national certification body once a year.

- **Who is responsible for the energy assessors training (the mandatory training)?**

The national certification bodies are responsible for certification and recertification as well as collecting annual updates from the EPC assessors.

- **Requirements for issuing a Certificate of qualification**

In addition to relevant education and work experience (see information about training above), detailed knowledge requirements are listed in regulation CEX. There are two levels of certification: one for simple buildings and one that also includes complex buildings.

Knowledge requirements (main subjects) for the certification for *simple buildings*:

- Indoor climate parameters and their connection to health and comfort
- Construction technologies – building shells and framework
- Building materials
- HVAC and control systems
- Heat production units (heat pumps, solar etc.)
- Systems for household and building electricity
- Elements included in the energy balance of a building
- Measurements as well as interpretation and evaluation of measurement results regarding elements included in the energy balance. Also, approximate calculation/estimation of what the measured energy is actually used for.
- Possibilities, obstacles and risks in implementing energy efficiency measures with regard to indoor environment and moisture
- Calculation of energy savings and cost-effectiveness
- Knowledge about relevant tools for calculation of energy savings, and ability to use at least one of such programs
- Knowledge of how to upload EPC in the database
- Knowledge of how the cultural and historical value of buildings may be affected by energy efficiency measures
- The environmental impact of different energy sources
- Valid laws and regulations related to buildings and energy performance and EPC.

Additional knowledge requirements for the certification for *complex buildings* are related to the need of cooling and the function of cooling systems.

- **What kind of exam is implemented in the country?**

Written exam

- **Is the exam test uniform for the country?**

Yes

- **What is the curriculum for the professional qualification of EPC assessors? (main topics)**

See knowledge requirements above.



- *Are the recommendations included, and does the training content advice EPC assessors to formulate recommendations towards deep renovation?*

Knowledge about separate energy efficiency measures is required. However, the requirements of how to put different measures together into a deep renovation package is not sufficient.

- *List any other EPC related trainings – topic, periodicity, organizer*

Name of the event	Topic	Periodicity	Organizer	Is it paid
	n.a.			

Table 18 List of examples for not-mandatory trainings

E) High user-friendliness of the EPC

➤ **Bulgaria**

- *Is there more than one type of energy performance certificate?*

The certificates are issued to 1) design energy performance certificates of new buildings and 2) certificates for energy performance of buildings and parts of buildings in operation. The design of the two types of certificates is defined under ORDINANCE № E-РД-04-1 OF JANUARY 22, 2016 ON ENERGY EFFICIENCY SURVEY, CERTIFICATION AND EVALUATION OF ENERGY SAVINGS OF BUILDINGS

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

End users don't understand well the energy performance indicators of the buildings. The certificate is unknown to most users. Some of them say that this is the first time they have seen such a certificate. They do not understand the energy performance of buildings, when a certificate is issued and what its validity period is.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

Yes, the energy class and energy recommendations are presented well and easy to understand.

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

There is no QR code integrated in the national EPC template.

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

It could be considered in the certificate to be placed a brief description of the energy performance indicators in order to be easily understood by the users. Also, the design of the EPCs for households should be simplified.



➤ **Germany**

- *Is there more than one type of energy performance certificate?*

Two types of certificates exist side by side based either on demand (asset rating) or on consumption (operational rating). Provide the desired best possible description of the energetic performance of the building (demand-based) as well as to limit financial administrative burden to an affordable level (consumption-based).

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

The lack of comparability between the two types of EPCs. The EnEV sets requirements for primary energy, but the energy efficiency classes for residential buildings are related to final energy. Furthermore, there is no reference to possible energy costs, and the reference area chosen with the usable area is generally unknown and differs from the usually known living space area.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

The EPCs shows the final energy and the primary energy. There are energy efficiency classes for residential buildings that relate to final energy.

However, final energy does not impose any requirements on buildings, only primary energy. This might be confusing for end users.

In the EnEV, modernisation recommendations are to be given as brief technical information. The legislature has not made any further specifications here, so these recommendations can be very general, so that they are not very useful for the homeowner

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

No QR-Code integrated.

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

A more precise description of the content of the modernisation recommendations.

Closer reference to actual costs for the building owner in terms of energy consumption and modernisation.

➤ **Greece**

- *Is there more than one type of energy performance certificate?*

No, there is a unique type of EPC for all building uses

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*



- The term 'Useful area' is not clear to some users, however definitions of terms cannot be included in the EPC (or else, it will become too extensive and out of scope). It is on the assessor to explain the EPC document to the client.
 - 'EP' indicator: same comment as above
 - 'Reference building': same comment as above
 - In the recommendations part, it is stated that the calculations are based on 'final energy consumption'. However, final energy consumptions are not presented in the Recommendations columns. Maybe it would be feasible to improve this part.
 - Recommendations are limited to up to 3 measures. It does not help towards Deep Renovation. This part also can be considered for improvement.
 - In the 1st page, in the update version of the EPC (of 2017) the 'construction year' is not included anymore. We would suggest to re-include it together with 'Renovation year' (if any)
- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

(see comments above)

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

No

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

(see comments above)

➤ Hungary

- *Is there more than one type of energy performance certificate?*

The content requirements of the EPC are determined by the Government Regulation No. 176/2008. The certificate shall be drawn up in accordance with its Annex 1 and shall be elaborated and registered in accordance with Annex 2. However, the layout can be different.

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

EPCs in Hungary contain the calculations, with lots of formulas and numbers, which is usually non-comprehensible by the user.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

The energy class is presented together with the scale, which gives a sense of the quality to the user. The recommendations part, although compulsory, is not very well developed, it usually includes only broad suggestions of measures (such as: heat insulation of the facades is recommended).

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

No



- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

The Hungarian EPC contains only the minimum required data. It would be useful to add informative indicators such as CO₂ emission, specific delivered energy per usage type and energy source. The renovation recommendations should be more detailed and more useful (a template should be developed to be at the same level of detail for all EPCs), terms and abbreviations should be explained for the user, the graphic design should be improved by pictograms. Information on how to find further info and help should be added.

➤ Latvia

- *Is there more than one type of energy performance certificate?*

There are two types of EPCs

Energy performance certificate – issued to existing building with measured energy consumption data (valid 10 years)

Temporary energy performance certificate – issued to newly built buildings with no measured energy consumption data (Valid 3 years)

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

End users are not familiar with kWh/m² per year

Too much data shown in the first page of EPC.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

Energy class of building is based on space heating consumption in building (not on total primary energy or total energy consumption). Energy class (“A”, “B”) more or less should be understandable since the same approach is used for electrical appliances.

Energy recommendations are not included in main part of EPC. Energy recommendations are shown in a mandatory annex of EPC.

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

No

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

Less information in first main page of EPC

Information should be shown in understandable unit of measurement (kWh/m² per year is not the most user friendly unit of measurement).



➤ Spain

- *Is there more than one type of energy performance certificate?*

No, only one type of energy performance certificate, EPC

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

The end-user thinks the EPC is confusing in several contents mainly the units, they do not understand properly the meaning of kWh/m² year, tCO₂-equiv, etc.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

The end-user understands the colour and letters of the energy class but not very well all the recommendations; this mainly will depend on the owner or tenant skills.

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

There is not a QR Code integrated in the EPC in Spain. This will be an improvement and that scanning QR code will provide the label, recommendations, and costs.

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*

Both content and design could be improved, please see previous information.

➤ Sweden

- *Is there more than one type of energy performance certificate?*

No

- *Which, in your opinion, is the most confusing for the end-user part of the certificate?*

The energy performance is presented in primary energy and adjusted to a standard year and standard use. More information is needed to clearly understand the future operation costs for energy use.

- *Is the energy class and energy recommendations presented to the end-user in an easy-to-understand way?*

The energy class may be difficult to understand, since it is not clear how it was calculated. The adjustment to normal use is not traceable for the user.

The cost-effectiveness of recommendations is difficult to understand.

- *Is there a QR code integrated in the EPC national template, leading to further data and information, e.g. about financing options?*

No

- *What should be improved with regards to a higher user-friendliness of the EPCs (content, design)?*



There is mainly a need for improved clarity regarding the content. Both in terms of improved calculation guidelines (for energy and cost effectiveness) for the EPC assessor in order to make the EPCs comparable, and in terms of the information that is presented in the EPC. Regarding the latter, at a minimum the measured values of energy use should be displayed, not only the result after normalisation.

The design could probably also be improved, but this is not considered a priority.

F) Establishing Voluntary or mandatory advertising guidelines for EPCs and

G) Improving compliance with the mandatory use of EPCs in real estate advertisements

➤ **Bulgaria**

- *What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?*

In the EE Act it is defined:

- When a building in operation for which an energy performance certificate has been issued, or a separate site in it is announced for sale or for rent, the indicator specific annual primary energy consumption - kWh / m², specified in the certificate, shall be indicated in all advertisements. Before concluding the contract of sale or lease, the seller, respectively the landlord, provides for acquaintance the certificate to the buyer, respectively to the tenant.
- When selling a building in operation, the seller provides the buyer with the certificate for energy performance of the building, and when selling a separate object in a building - a certified copy of the certificate for energy performance of the building.
- When renting a building in operation or a separate site in a building, the landlord provides the tenant with a copy of the certificate of energy performance of the building.

- *What is the level, processes, and instruments of control of implementation of the national requirements?*

No available information

- *Are there developed voluntary advertising guidelines for EPCs?*

There are no existing voluntary guidelines in Bulgaria

- *Are such advertising guidelines for EPCs even mandatory?*

There are no existing advertising guidelines in Bulgaria

- *What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?*

Higher level of awareness to be considered regarding the requirement of the mandatory use of EPCs in real estate advertisement.



➤ **Germany**

- ***What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?***

Due to the implementation of a requirement from the EPBD, sellers and landlords are obliged to include certain information from the energy performance certificate in advertisements in commercial media in accordance with Section 16a of the EnEV 2014.

Mandatory information for real estate advertisements:

- the type of energy certificate ('demand'/asset rating or 'consumption'/operational rating certificate)
- the final energy demand / consumption in kWh/m²/year
- the essential energy source
- for residential buildings only: the year of construction of the building
- for residential buildings only: the efficiency class
- in the case of non-residential buildings, the energy parameter for electricity

In the new energy performance certificates based on the EnEV 2014, all this information is shown in the certificates.

- ***What is the level, processes, and instruments of control of implementation of the national requirements?***

If the mandatory information is not or not completely included in the real estate advertisement, this constitutes an administrative offense and can be punished under the EnEG with a fine of up to 15,000 Euros.

The EnEV is the responsibility of the federal states. The federal states regulate which authorities are responsible for administrative offenses. The competent authorities in the federal states are obliged to investigate any administrative offenses reported.

- ***Are there developed voluntary advertising guidelines for EPCs?***

No

- ***Are such advertising guidelines for EPCs even mandatory?***

Yes, if the detailed list of data mentioned above is considered a guideline; but no further mandatory guidance on how to present, templates etc. is provided.

- ***What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?***

This is generally difficult to answer at the current stage, since enforcement is handled differently in the individual federal states



➤ **Greece**

- *What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?*

According to the law in force, the EPC should be presented in real estate advertisements, when available. It is a recommendation of our stakeholders to modify the law and eliminate the condition 'if available'

- *What is the level, processes, and instruments of control of implementation of the national requirements?*

There is no control process/mechanism in place regarding the use of EPCs in adv.

- *Are there developed voluntary advertising guidelines for EPCs?*

No

- *Are such advertising guidelines for EPCs even mandatory?*

No

- *What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?*

1st step: provide guidelines and 2nd step make it mandatory to the real estate operators and establish the relevant control mechanism

➤ **Hungary**

- *What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?*

When a real estate is offered for sale or rent, the advertisement shall indicate the energy quality rating of the building or stand-alone unit, if a certificate is available.

- *What is the level, processes, and instruments of control of implementation of the national requirements?*

There is no control of implementation of this requirement.

- *Are there developed voluntary advertising guidelines for EPCs?*

No

- *Are such advertising guidelines for EPCs even mandatory?*

No

- *What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?*

First the regulatory requirement should be changed in a way that the "if available" term is deleted from the text. Then advertising guidelines should be developed, in parallel with the elaboration of controlling mechanisms.



➤ **Latvia**

- ***What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?***

If a building or apartment (if the apartment is above 50m² and has individual heat metering) is sold or rented you should have the EPC of this building or apartment.

- ***What is the level, processes, and instruments of control of implementation of the national requirements?***

Control of EPCs in real estate advertisements has to be done by Consumer Rights protection Centre (CRPC; <http://www.ptac.gov.lv/en>). In real life CRPC would only react if they would get a complaint about missing EPC. So far they have not received a single complaint.

- ***Are there developed voluntary advertising guidelines for EPCs?***

No

- ***Are such advertising guidelines for EPCs even mandatory?***

No

- ***What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?***

Regular people should be informed that they have the right of asking EPC during buying or renting building or apartment

There should be an active approach from CRPC instead of passive waiting for complaints

➤ **Spain**

- ***What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?***

RD235/2013 of April, 5th does not include mandatory use of EPCS in real estate advertisements, just to provide the EPC to new owner or tenant. The draft of new amendment of RD235/2013 includes that for sales and renting in walls, websites, catalogues or press with text, images or audio-visual format the real state must include the label in offer, promotion and publicity. But this is still a proposal of amendment 31th July 2019.

- ***What is the level, processes, and instruments of control of implementation of the national requirements?***

The control of implementation is managed by the Regional Governments and the levels are different in them; it is necessary improvement in the control.

- ***Are there developed voluntary advertising guidelines for EPCs?***

There are not voluntary advertising guidelines for EPCs.



- *Are such advertising guidelines for EPCs even mandatory?*

No advertisement guidelines. It is very advisable mandatory guidelines and they are included in the new draft amendment of RD235/2013, to be approved.

- *What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?*

Improvements in the budget and staff of most Regional Governments for advertisement control has been suggested in the first National Workshop by many participants

➤ Sweden

- *What are the requirements in the National legislation with regards to mandatory use of EPCs in real estate advertisements?*

Advertising guidelines for mandatory use exist. In advertisements, the energy performance of a building must be symbolised by a house with a color (green to red) and letter (A to G) that matches the energy classification. There are detailed guidelines of what this symbol should look like, e.g. regarding size, color, background and font. When advertising in commercial printed media, it is enough to use the letter only.

- *What is the level, processes, and instruments of control of implementation of the national requirements?*

The National board of Housing Building and Planning is the surveillance authority.

- *Are there developed voluntary advertising guidelines for EPCs?*

No, only mandatory (see above).

- *Are such advertising guidelines for EPCs even mandatory?*

Yes, for the level mentioned above.

- *What should be improved with regards to the improving compliance with the mandatory use of EPCs in real estate advertisements?*

No improvements needed; buyers are informed of the EPC by the brokers.



4.2 Deep Renovation Network Platforms

4.2.1 General development needs and strategy plan

4.2.1.1 Basic concept of the improvement option

Linking actors and information for deep renovation is crucial for achieving substantial energy efficiency improvements during building renovations. The QualDeEPC project aims to develop a Deep Renovation Network Platform that includes providing a one-stop shop for deep renovation linked to EPCs. In this context, it is prudent to have a common understanding of some key terminology, such as deep renovation, one-stop-shops, and Deep Renovation Network Platforms.

The term 'deep renovation' and QualDeEPC's approach to deep renovation have been described in chapter 4.1.1. The specific concepts of one-stop-shops and Deep Renovation Network Platforms are discussed here.

One-stop-shop for deep renovation

This term can have several meanings. Typically, a one-stop-shop offers their users/customers 'multiple services' that are required to meet a specific objective. These may be brick and mortar (physical) shops, or online platforms. In the context of one-stop-shop (OSS) for deep renovation, the end-users are often building owners. The H2020 call text speaks of a one-stop shop for **information**, including administrative, financial and supply side information (as one of the offered services), for example, the online platform such as the Greek EnergyHub4ALL, which is an information only one-stop-shop. On the other hand, there are one-stop-shops that also offer other services, such as **coordination** or even **implementation** of renovation works coordinated through one coordinator's hand/shop. For example, the online platform like the Danish BetterHome, which is an industry-driven one-stop-shop model, and has proven to be successful in boosting demand for holistic energy renovations in Denmark.

Coordination could mean guiding or coaching the building owner from the first advice, through the detailed audit, and the implementation and quality control, helping with selection of suppliers for all these steps. Implementation could mean coordination several suppliers and their works by actually providing a single offer and billing to the building owner.

Deep Renovation Network Platforms

A more comprehensive instrument towards deep renovation is Deep Renovation Network Platforms. Such platforms provide one-stop-shops for deep renovation but combine them with active marketing of deep renovation and EPCs, and the link between EPCs and deep renovation. A Deep Renovation Network Platform thus includes a one-stop-shop for providing advice and information on energy, costs and benefits, administrative, financial matters related to building energy renovation and EPCs, as well as supply-side information to building owners, and in addition to the one-stop shop is coordinating supply-side actors (service providers), such as EPC assessors, building contractors for effective implementation of renovation works, banks, and others.

Beyond pure online platforms, Deep Renovation Network Platforms, furthermore, could potentially be a local or regional 'physical hub' with a network of partners (supply side actors) for supporting their active marketing, networking, professional training, or whatever is needed, including a 'physical' OSS.



The basic, and the minimum to be achieved in each country represented in the consortium of QualDeEPC project, will thus be an online platform providing a one-stop-shop for information on deep renovation, providing recommendations from the tool to be developed in Task 3.3, information on costs and benefits, as well as links to support with administration, financing, and supply of works and equipment. This idea is based on the online platform CRES has developed (<http://www.energyhubforall.eu/HEC.html>) or similar platforms in other countries, which would probably need to be extended to the features listed above.

Depending on the situation and resources that can be committed by partners, supporters, and other stakeholders, this basic platform could be further enhanced into a more active Deep Renovation Network Platform. On the one hand, the basic platform could be enhanced to a platform for suppliers to organize one-stop supply offers for renovation, such as the BetterHome platform in Denmark (<https://sparenergi.dk/forbruger/vaerktoejer/bedrebolig>); the Latvian partner EKODOMA is working on a similar solution. On the other hand, the platform could be extended together with regional partners to become more than a website: this would be a network of partners providing a (virtual or even physical) hub for active marketing and connecting stakeholders, professional training, or whatever is needed. The overall concept will include all such options. Which elements are needed and feasible in each country will be discussed in Task 3.2 and will be analysed in detail in Task 5.3.

Note: the concept of an active, often “physical” hub has been implemented in a number of German cities or rural districts. They may also act as one-stop-shop for coordination, e.g. guiding the building owner from the first advice, through the detailed audit, and the implementation and quality control, helping with selection of suppliers for all these steps.

4.2.1.2 Structure of a Deep Renovation Network Platform

Typically, one-stop-shops feature an information platform for service providers and end-users. The facilitator of the platform is usually a government department (e.g., energy, infrastructure, housing etc.), an energy agency, or city administration. The service providers include energy auditors, EPC assessors, building and HVAC contractors and manufacturers, and banks. The end users are primarily building owners but also potential buyers of buildings, tenants, and other building market actors.

In the one-stop-shop setup, the facilitator plays a role as an information provider to the end users, regarding the benefits of deep renovation, various services and service providers. In a Deep Renovation Network Platform setup, the facilitator plays a more proactive role in active marketing as well as facilitating (and monitoring) deep renovation. For example, by:

- Active communication of deep renovation and its benefits and costs, EPCs, individual building deep renovation roadmaps, etc.
- Linking EPCs to deep renovation in general information as well as individual advice to users
- Ensuring the quality of the service providers and their services and products
- Enabling networking and marketing of/between various service providers (stakeholder groups)
- Training on best available technologies and their installation and maintenance
- Providing reliable information to end users on energy and cost savings due to deep renovation and available financial incentives for carrying out deep renovation
- Providing information not only to end users, but also to service providers (professionals/MSMEs/industries) on the benefits of deep renovation and available financial incentives for developing their business in the direction of facilitating deep renovation

In Deep Renovation Network Platforms, service providers could also become quasi-end users, along with building owners; while the facilitator could subsume the role of a ‘super’ service provider by



actually facilitating, coordinating, implementing and monitoring deep renovation. Deep Renovation Network Platforms essentially offer over the top (OTT) services to a new or an already existing (typical) one-stop-shop platform. The following figure provides a graphical representation of one-stop-shop and Deep Renovation Network Platform.

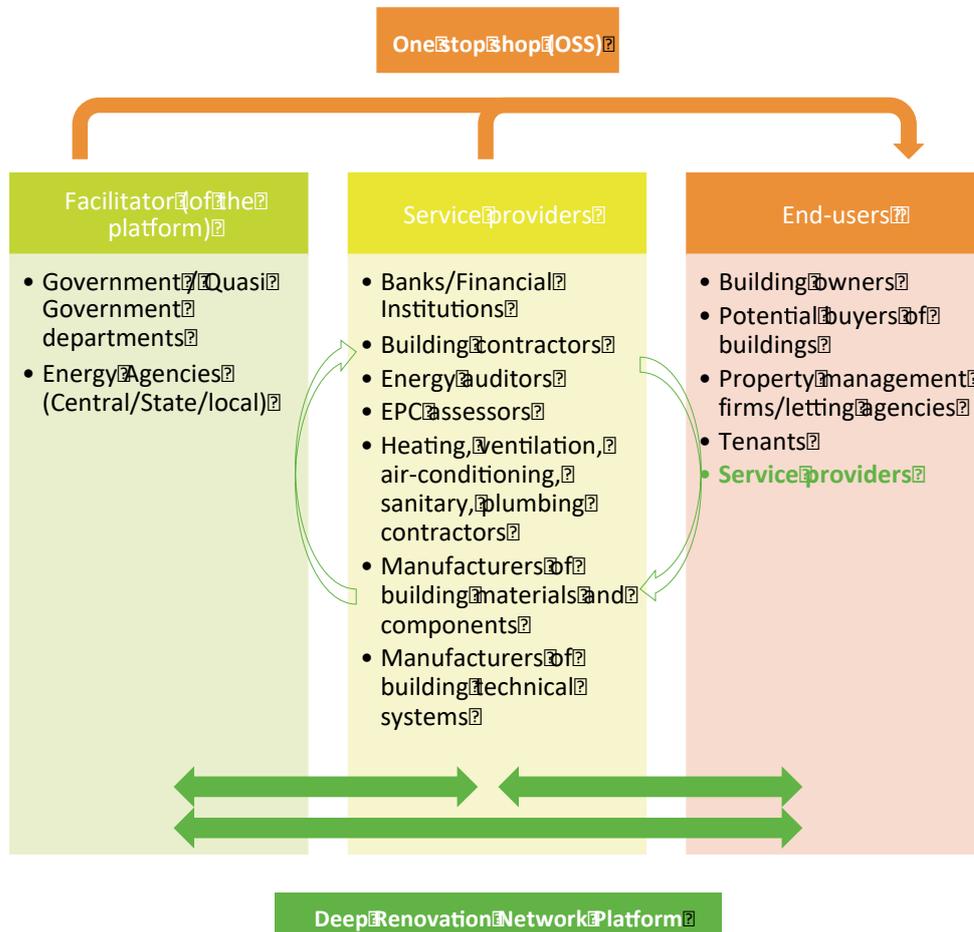


Figure 6: Structure of one-stop-shop and Deep Renovation Network Platform

4.2.1.3 Development Needs

The proposal for the QualDeEPC project (Annex I Part B, table 1) describes developing such Deep Renovation Network Platforms as an instrument to meet one of the project objectives, which is to ‘maximise impact of the enhanced EPCs through improved design and usability, and particularly through improved renovation recommendations coherent with optional individual buildings deep renovation passports as well as embedding the EPCs in Deep Renovation Network Platforms to be implemented or enhanced in parallel’ in relation to the EE-5-2018 Call. The results from D2.3 ‘EPC shortcomings and national priority approaches’ show that such a platform is absent in most EU member states, including QualDeEPC partner countries, and that stakeholders from a majority of QualDeEPC partner countries have identified developing such a platform as a priority for improvement to the existing EPC schemes.

Task 3.2 and task 5.3 of the QualDeEPC project deal with the development and implementation of Deep Renovation Network Platforms. While Task 3.2 aims to develop the Deep Renovation Network Platform concept in general and discuss with each partner country, Task 5.3 aims to adapt the Deep



Renovation Network Platforms to the country situation and needs, and implementing consensus elements as far as feasible. The development needs and strategy, including testing in Task 4.3, are further explained in the subsequent paragraphs and sections.

Building on chapter 4.2.1.2 above, the following aspects of an overall concept for Deep Renovation Network Platforms, which can be flexibly adapted to a country's or region's context and needs will need to be analysed and developed:

Depending on the subtypes of Deep Renovation Network Platforms,

- What are the services offered, and how could they be offered?
- What are the roles of the facilitator, the service providers, and the end users in terms of these services?
- What are the resource needs – in terms of staff and funds – and the potential sources of funding these resource needs?

4.2.1.4 Development strategy plan

The development strategy plan for Deep Renovation Network Platforms involves four main steps:

- Reviewing existing and proposed (e.g., on-going Horizon projects) Deep Renovation Network Platforms, including the ones identified in deliverable D2.1 of QualDeEPC
- Identifying the general development needs and possibilities during the QualDeEPC project
- Identifying the possibilities of testing the concept of Deep Renovation Network Platforms and its details in WP 4
- Discussing the possibilities for implementation during the QualDeEPC project (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)

Review of Existing and proposed Deep Renovation Network Platforms

The following table provides a basic format for collecting information on some of the existing and proposed deep renovation network platforms, including one-stop-shops in various EU member states.



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
QualDeEPC partner countries					
Bulgaria	No existing Deep renovation platform or One-Stop-shop in Bulgaria				
Greece	The existing platform 'EnergyHUB forALL ¹ ' is intended to be improved/enriched so as to be 'a deep renovation platform'. By the time it was developed 'deep renovation' was not an issue	CRES	CRES	Residential building owners and any other individual interested to carry out a fast estimate of possible energy performance improvements	The existing platform 'EnergyHUB forALL' includes: Information and recent developments on the issue of Building Energy Performance Statistical and other data on building stock, energy consumption in buildings, Energy saving options and measures, National and European legislation on building energy performance and NZEB, Statistical data on EPCs (residential), database of energy efficient products providers, existing financing tools and a tool for a fast estimate of potential improvements of the energy performance (HEC tool). The aim is to upgrade and orient the information towards deep renovation.
Germany	Fachportal Energetisches Bauen und Sanieren (FEBS)	BAFA/dena	Dena	Energy efficient experts	The FEBS offers tailor-made specialist information for experts who work in the field of energy-efficient construction and renovation.

¹ <http://www.cres.gr/energyhubforall/> (available only in greek)



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
	proKlima - Der energy-Fonds	proKlima	ProKlima is financed by the cities of Hanover, Hemmingen, Laatzen, Langenhagen, Ronnenberg and Seelze (together the proKlima development area) and energy AG.	Private builders, companies, public institutions, energy experts	The climate protection fund proKlima primarily supports the saving of heating energy and electricity, a focus of the funding programs is energy-efficient construction and modernization.
Hungary	No existing OSS, but one currently under development, within H2020 RenoHUb project	Hungarian Energy Efficiency Institute	RenoHUb consortium, Building contractors, installers, energy assessors, municipalities	Residential building owners	The project delivers a RenoHUb system: a combination of an online platform and two physical offices called Information Hotspots. The online platform will serve as a collection of information related to energy renovation (with the following elements: general descriptions of steps of renovation, installer data base, energy savings calculator, financing opportunities).
Latvia	There are no one stop shops in Latvia in the usual understanding. There are some ESCO companies which ensure all process of building renovation. Apartment building goes to ESCO company and say that they want the building to be renovated and then all necessary things are done by ESCO company (energy audit, technical project, renovation, building management after renovation). For instance, the largest is Renesco -	Renesco		Residential building owners	The ESCO company manages the whole building renovation process starting from energy audit of the building and ending with managing the building for 10-15 years after building has been renovated.



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
	http://www.renesco.lv/en				
Spain	Not platforms neither one stop shop at National level. Starting the creation of 2 one-stop shops for providing technical and financing information for building renovation in Basque Country	Regional government of Basque Country, <i>Pais Vasco</i>	Regional government of Vasque country, Regional Energy Agency-EVE, two municipalities	Owners, neighborhood associations	These one-stop shops will provide information at two vulnerable areas of Basque Country. This is part of OPENGELA project of Horizon 2020 programme.
Sweden	ICHB	the National Board of Housing, Building and Planning	Svensk Byggtjänst	Building owners <ul style="list-style-type: none"> • Building contractors • Building professionals and installers • Municipalities • Educational, examination and training institutions • Researchers 	Dissemination of information about sustainable renovation and construction of new buildings
	Belok, BeBo, Besmå;	Swedish Energy Agency	CIT Energy Management, WSP, Anthesis together with network of building owners CIT Energy Management	Owners of non-residential buildings (Belok), multifamily buildings (BeBo), and single-family houses (Besmå)	Cooperation and experience exchange about development of energy efficiency measures, and dissemination of the results. Besmå has a webpage (Min husguide) with 50 detailed energy measures for one-family houses.
	Lågan	Swedish Energy Agency and the Swedish Construction Federation	CIT Energy Management, the Swedish Construction Federation and network of contractors and developers.	<ul style="list-style-type: none"> • Contractors • Developers • Building professionals and installers • Building owners 	Cooperation and experience exchange about development of energy efficiency measures, and dissemination of the results.



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
	EEF	Non-profit trade-organisation	Energy service providers: contractors, installers, consultants and manufacturers that offer energy efficiency improvements to real estate and industries.	<ul style="list-style-type: none"> • Building owners • Building professionals and installers 	Information of measures and services regarding energy efficiency to building owners and service providers.
	Regional Energy Agencies	Swedish Energy Agency and municipalities.	Energy and climate advisers	<ul style="list-style-type: none"> • Private persons • Building owners • Tenants • Companies <p>Organisations</p>	Energy and climate advisors give advice about energy efficiency and how to influence the environment as little as possible. The advices are impartial and helps to find the best technical solution that suits the circumstances.
	Nationally Renoveringscentrum	Lund University	Universities	Academia and industry	A cooperation between academia and industry to support actors in the construction sector with knowledge building and dissemination about an efficient renovation process to meet the demands of users and authorities.
Other EU member states					
Belgium	<p>BE REEL - Belgium renovates for energy efficient living</p> <p>(Note: The project is not a one-stop-shop, but a LIFE integrated project in which different partners work on several ambitious renovation subprojects. Nevertheless, several project ideas are suitable for development and implementation in one-stop-shops.</p>	Flemish Energy Agency	<ul style="list-style-type: none"> • Flemish Energy Agency • Service Public Wallonie • Department of Environment, Flemish government • The Scientific and Technical Centre for the Construction Company (BBRI) • Knowledge Centre for Flemish Cities (KVS) • Cities of Ghent, 	<ul style="list-style-type: none"> • Construction sector federations, contractors, professional builders, renovation consultants • Banks, financial institutions • Large and medium-sized and small cities and municipalities 	<p>“BE REEL is a LIFE integrated project in which different partners work on several ambitious subprojects”.</p> <p>“BE REEL! and its partners support Belgium to reach its climate goals through building renovation.”</p> <p>“The project aims to renovation rate increase for which they develop, test, evaluate, refine and demonstrate the most</p>



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
	<p>Therefore, they are presented in this chapter.)</p> <p>https://www.be-reel.be/</p>		<p>Antwerp, Mechelen, Mouscron, La Louvière</p>		<p>appropriate structural measures.”</p> <p>“Other objectives of the program include training sessions for building professionals, imparting knowledge via action stimulating communication for citizens and stakeholders, and monitor and evaluate all developed tools and actions.”</p>
	<p>BENOveren</p> <p>https://benoveren.fluvius.be/</p>	<p>Fluvius (grid operator)</p>	<ul style="list-style-type: none"> • Fluvius • BENOVatiecoach (an independent subject matter expert, recognized and paid (capped amount) by Fluvius) 	<ul style="list-style-type: none"> • Building owners • Prospective buyers 	<p>BENOveren is a ‘better’ renovation program offered by Fluvius, a grid operator, to makes homes as energy efficient as possible to achieve energy levels of 60 or 100 EPC.</p> <p>Under the BENOveren program, Fluvius appoints an independent subject matter expert, recognized by Fluvius. He/she guides the home owners/buyers with the entire renovation process including, “full inspection of home and proposal for a renovation plan (BENOVatieplan), drawing up a measurement report with overview of costs and energy savings, requesting various offers and comparing the offers, provide information about premiums and subsidies, follow-up of the works, help with</p>



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
					<p>applying for premiums and subsidies.”</p> <p>Fluvius pays 400 Euros per family towards the costs of BENOvatiecoach. Overheads above this amount, can be discussed in advance.</p>
	<p>Energiesparen.be</p> <p>https://www.energiesparen.be/</p>	<p>Flemish Energy Agency</p>	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Building owners • EPC/energy assessors • Building contractors • Cities and municipalities • Educational, examination and training institutions 	<p>Energiesparen.be is an official website of the Flemish government published by the Flemish Energy Agency. The Flemish government launched Renovatiepact, in which instruments including those necessary for energy-efficient renovation are developed in consultation with various stakeholders. EPC is one of the key instruments. The website provides information, such as:</p> <ul style="list-style-type: none"> • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors, links to registry of building contractors, understanding EPCs in terms of nZEB and energy targets for Flemish homes by 2050 etc. • Comprehensive information on energy-neutral buildings • Information on energy efficient building technologies • Tools and calculators required to calculate energy gains for various



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
					<p>energy-saving measures</p> <ul style="list-style-type: none"> • Information on loans and other financial instruments necessary for carrying out deep renovation, leading to energy-neutral buildings (NZEBS) • Information on avenues to obtain independent tailored energy advice necessary for deep renovation • Other related campaign, information and dissemination material • Information on training and continuing education for energy assessor
	<p>EnergieHUIS (physical hubs)</p> <p>https://www.mijnenergiehuis.be/</p>	<p>Flemish Energy Agency</p>	<ul style="list-style-type: none"> • Cities and municipalities 	<ul style="list-style-type: none"> • Building owners • Tenants 	<p>“An Energiehuis is a municipal institution or a collaboration between different municipalities.</p> <p>Via an Energiehuis you can take out an energy loan at a very advantageous interest rate. In some cases, they can also request quotes from contractors, supervise the works and guide you in applying for subsidies.”</p> <p>They conduct energy scan, which is a quick assessment of the energy consumption of your home to identify what energy saving measures can be implemented, such as addition of insulation.</p>



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
					Furthermore, they offer guidance and support for building renovation, request quotes from contractors and compare them, support for premium and loan applications, interpret the data from EPC and results of an energy scan
Denmark	BetterHome https://www.mijnenergiehuis.be/	Building material/product manufacturers – Danfoss, Grundfos, ROCKWOOL	<ul style="list-style-type: none"> • Building Contractors • Technicians 	<ul style="list-style-type: none"> • Building owners • Building contractors • Technicians • Financial institutions providing mortgages • Utility companies with energy saving obligations • Local governments • Real-estate agencies as well as • Building professionals and installers 	<p>BetterHome is a one-stop-shop initiative by an association of building material/product manufacturers - Danfoss, Grundfos, ROCKWOOL.</p> <p>BetterHome offers building owners a tailor-made renovation plan complete with a list of necessary renovation measures, timeline for the project, potential subsidies or financial incentives available for renovation and contacts of the building contractors required to carry out the chosen renovation measures.</p> <p>BetterHome also train the building contractors and technicians to ensure high quality renovation work.</p> <p>These services are offered free of cost to the building owner or building contractors and technicians. BetterHome is supported by the supporting manufacturers and</p>



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
					derives indirect revenue from the materials and products they supply for renovation, although owners or building contractors and technicians are free to choose and install, materials and products from other manufacturers.
France	Ile-de-France Energies (physical hubs) https://www.iledefranceenergies.fr/	Île-de-France Energies	Île-de-France Energies	<ul style="list-style-type: none"> • Owners • Trustees • Building professionals • Communities • Social landlords • Renewable energy professionals 	<p>Ile-de-France Energies (launched in cooperation with the Intelligent Energy Europe Programme of the European Commission) is an innovative public-private company. It leverages on innovative financial tools such as third-party financing for energy renovation. For building owners, it offers a turnkey energy renovation solutions encompassing all phases of the renovation project including:</p> <ul style="list-style-type: none"> • An architectural, energy and financial audit performed based on standard specifications issued by ADEME • Technical and financial design of the works project • Implementing and monitoring the works, enforcement of the financing plan at the collective and individual level



	Name of the platform or one-stop shop	Platform facilitator	Service providers/third parties	End-users addressed	Description
Ireland	Sustainable Energy Authority of Ireland https://www.seai.ie/	Sustainable Energy Authority of Ireland	<ul style="list-style-type: none"> Better Energy Homes contractor Building Energy Rating Assessor Renewable Energy Installer Energy Auditor Gas Installer 	<ul style="list-style-type: none"> Building owners 	Sustainable Energy Authority of Ireland's website contains information that is useful for understanding the benefits of energy renovation and the necessary technical information, and information that is necessary to find the relevant service providers, and available grants for home renovation
Luxembourg	myenergy https://www.myenergy.lu/	Supported by three Ministries of Energy and Regional Planning; Environment, Climate and Sustainable Development; and Ministry of Housing	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Building owners 	My energy is the national structure for promoting the national energy transition. The Homepage includes information for building owners, and provides a list of EPC assessors, shows funding avenues
	Energy Saving Trust https://energysavingtrust.org.uk/	Energy Saving Trust	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Building owners 	Services of the Energy Saving Trust include the Home Energy Check and the Home Energy Check Scotland. They include detailed information, tools and calculators, financial support, lists of registered handcrafts, database of energy efficient products

Table 19: Existing and proposed Deep Renovation Network Platforms and one-stop-shops



Development possibilities during the QualDeEPC project

Based on the review of existing and proposed Deep Renovation Network Platforms, a preliminary typology of such platforms could include:

- 1) an online platform, such as
 - a. an online information platform such as the Greek energyhubforall.eu (including an information only OSS)
 - b. an online platform like the Danish BetterHome (including OSS for information and implementation)
- 2) the local or regional 'physical hub', i.e. a network of partners providing a hub for active marketing and connecting stakeholders, professional training, or whatever is needed, and also a 'physical' OSS with energy advisors: this could take the forms of
 - a. OSS hub for information only, or
 - b. OSS hub for information and coordination (guiding/coaching through implementation), eg proKlima in Hannover, or
 - c. OSS hub for information and implementation.

However, it should be noted that such physical hubs involve higher costs than online only solutions. They may need funding from the national or regional government to local/regional agencies implementing the hub, and support and coordination from the national or regional energy agency.

This list of subtypes will first be updated and completed in Task 3.2, based on the review of existing and proposed Deep Renovation Network Platforms.

For each subtype of a Deep Renovation Network Platform, the respective concept will be analysed and presented in more detail, and in particular the development questions listed in chapter 4.2.1.3 above will be analysed and answered to the utmost extent possible.

As a result of the analysis, the services and products that can be offered by a converged Deep Renovation Network Platform could be summarized as shown in the table below. The table presents preliminary considerations and examples of services/products, service providers (which could be the platform providers themselves or third parties), and end-users addressed by each service or product. These results will be expanded and completed in WP 3, and further services or products may be analysed. Ongoing work of existing and other projects developing OSS will also be considered, and our concept will be shared with them. This will not only include the sister project X-tendo, but also projects from the H2020 topic on specific OSS development projects, such as EUROPA or ProRetro; the latter is also co-ordinated by Wuppertal Institute.

The services/products will also be attributed to the types of Deep Renovation Network Platforms according to the final typology.



S.No	Services/products	Service provider (examples)	Description of services	End-users addressed (examples)
1.	Information on renovation actions, potential savings and costs / Linking with Renovation tool	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency 	<ul style="list-style-type: none"> Providing general information and specific renovation tools and calculators, which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation 	<ul style="list-style-type: none"> Building owners Prospective buyers EPC assessors
2.	Linking with a) Energy Performance Certificate / b) Building deep renovation roadmap and possibly passport	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency 	<ul style="list-style-type: none"> a) Providing detailed information on EPC assessment procedure, tools and assessors a) Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors, links to registry of building contractors, explaining EPCs in terms of nZEB and national energy targets b) linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap b) possibly Development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works) 	<ul style="list-style-type: none"> Building owners Prospective buyers or tenants EPC assessors Citizens Public authorities
3.	Information on building contractors/technicians; support with finding building contractors/ technicians, e.g. through obtaining three competitive offers (this may also be part of service #10)	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Other third party 	<ul style="list-style-type: none"> Providing information regarding building contractors/ technicians/ installers Requesting various renovation offers/quotes from contractors/technicians and comparing them so that the end user can make an informed choice 	<ul style="list-style-type: none"> Building owners
4.	Information on material or product manufacturers/suppliers	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Other third party 	<ul style="list-style-type: none"> Provides information on product manufacturers/suppliers required for deep renovation 	<ul style="list-style-type: none"> Building owners Building contractors/ technicians/ installers
5.	Information on financing opportunities for deep renovation	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Financial institution Other third party 	<ul style="list-style-type: none"> Provide information about financial incentives, loans, and subsidies or third party financing Help with applying for about financial incentives, loans, and subsidies or third party financing 	<ul style="list-style-type: none"> Building owners
6.	Active marketing of deep renovation and its benefits and costs	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency City/ Municipality 	<ul style="list-style-type: none"> Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors, involving supply-side actors in the media work, events, and funding Using demonstration projects to show enhanced „quality of life through insulation and energy saving“ by bringing together 	<ul style="list-style-type: none"> Building owners Citizens Building contractors/ technicians/ installers City/Municipality local housing companies the social credit agencies Professional buildings and developers



S.No	Services/products	Service provider (examples)	Description of services	End-users addressed (examples)
			various stakeholders listed in the next column	<ul style="list-style-type: none"> Architects
7.	Network (platform) for learning, exchange and cooperation (local/regional/national)	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency City/Municipality Energy company, especially in case of local or regional platforms and energy companies 	<ul style="list-style-type: none"> Discussing active marketing activities (#6) and involving supply-side actors, city administration, energy companies, financial institutions etc, in the media work, events, and funding Discussing training needs and the organizing of trainings (#9) 	<ul style="list-style-type: none"> Building contractors/ technicians/ installers City/Municipality local housing companies the social credit agencies Professional buildings and developers Architects Financial institutions Energy companies
8.	Network (platform) for learning, exchange and cooperation (interregional/transnational)	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Professional associations/federations of energy assessors 	<ul style="list-style-type: none"> Establishing interregional/transnational learning networks between project partners, stakeholders and complementary EU projects for enhancing mutual learning, exchange platform for good practice, innovation and expertise, and stimulate future partnerships An exchange platform for EU member states' best practises and learning paths, including those of the projects like Life BE REEL! - via events and workshops on best practices and renovation expertise and via a digital platform. 	<ul style="list-style-type: none"> Construction and financial sector including sector federations, contractors, builders, renovation consultants, banks, financial institutions Large and medium-sized and small cities
9.	Capacity building and training	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Other third party 	<ul style="list-style-type: none"> Training and learning platform to obtain expertise and sector capacity Dissemination of expert-knowledge on specific promising retrofitting topics in order to assure that the knowledge, best practices and techniques can be picked up by a large number of professional actors 	<ul style="list-style-type: none"> Sector/professional federations Training organizations Professional buildings Architects Contractors
10.	Step-by-step guidance for renovation project from start to end	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency Third party 	<ul style="list-style-type: none"> Offering step-by-step guidance and monitoring of renovation project from start to end Possibly: Requesting various renovation offers/quotes from contractors/technicians and comparing them so that the end user can make an informed choice Full inspection of home and proposal for a renovation plan and for quality control after renovation works Possibly: Hotline in case of questions during decision-making and implementation of works 	<ul style="list-style-type: none"> Building owners Prospective buyers



S.No	Services/products	Service provider (examples)	Description of services	End-users addressed (examples)
			<ul style="list-style-type: none"> Drawing up a measurement report with overview of costs and energy savings Possibly: updating the Buildings renovation passport (#2) 	
11.	Monitoring the implementation of renovation project(s)	<ul style="list-style-type: none"> City/Municipality Platform facilitator itself Energy Agency Financial institution Third party 	<ul style="list-style-type: none"> Monitoring works including, editing of financing files, preparation of the renovation works, monitoring of the site during the renovation work through site meetings and visits and reception of the works and closing of the financing Follow-up of the renovation works Making the citizens aware of the energy saving potential of their property and to encourage them to renovate while becoming "energy" ambassador citizens among their peers. 	<ul style="list-style-type: none"> Owners Trustees Building professionals EPC assessors Communities Social landlords Third party investors Renewable energy professionals
12.	Operating a physical network hub and information centre	<ul style="list-style-type: none"> Platform facilitator itself 	<ul style="list-style-type: none"> A location that serves as an information centre and physical OSS for the public, and hosts the team facilitating the network platform for all services, including for supply-side actors 	<ul style="list-style-type: none"> Building owners and/or investors Building professionals All end-user groups
13.	Carrying out the renovation project(s)	<ul style="list-style-type: none"> Financial institution Third party Platform facilitator itself (if it is a construction company or similar) 	<ul style="list-style-type: none"> Implementation of the works Possibly providing the finance for the works 	<ul style="list-style-type: none"> Building owners and/or investors
14.	Carrying out deep renovation demonstration project(s)	<ul style="list-style-type: none"> City/ Municipality Platform facilitator itself Energy Agency Financial institution Third party 	<ul style="list-style-type: none"> Undertaking deep renovation demonstration projects (in their city): „Undertaking collective renovation demonstration projects in their city including renovation residences to nZEBs, including installing roof, façade and floor insulation and installing super insulating glazing in renovation demonstration projects“ 	<ul style="list-style-type: none"> Building professionals Building owners and/or investors Third party investors
= basic and minimum Deep Renovation Network Platform to be achieved in QualDeEPC project			= enhanced Deep Renovation Network Platform	

Table 20: Overview of potential services and products of a Deep Renovation Network Platform

Note: S.No = service number



Possibilities of testing the concept in WP 4

Task 3.2 will also analyse if, and how, the concept that it develops for the Deep Renovation Network Platforms and its subtypes can be tested in WP 4.

A priori, it is difficult to conceive that these concepts as such could be tested with the pilot building approach adopted by the QualDeEPC project for WP 4. However, the owners or facility managers and possibly also users of the pilot buildings could be asked if they would be interested in the services offered by the Deep Renovation Network Platforms during the collection of feedback from them through interviews or a survey questionnaire, as planned for Task 4.3.

Possibilities of Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)

- Implement to the extent possible with the limited resources of the project (cf. WP 3 and 5 texts), and continue to operate thereafter according to sustainability strategy
- Include other elements of the concept in stakeholder discussion process / policy debate

4.2.2 Country-specific development needs

The basic platform will be a web platform that provides a one-stop-shop to all relevant information (cf. Task 3.2), as shown in light green in the above table. This will either include an adaptation of the central tool to be developed in Task 3.3, which will offer improved recommendations for selected types of residential buildings matching deep renovation standards, as a tool for both EPC assessors, building owners, and potential buyers and tenants. Or, if such a tool already exists in a country, it will be augmented to the full functionality needed for the basic platform.

For example, in Greece, CRES intends to improve the energyhub4all platform developed in the Request2Action project. However, further action is also possible. The work in Task 3.2 and Task 5.3 will result in a matrix of which services/products from table 18, over the basic platform, are chosen by country partners to be developed/integrated as a part of Deep Renovation Network Platform(s) in their countries.

The following subsections provide first considerations for country specific requirements for modifications/additions for existing/new services/products in the Deep Network Renovation Platforms, in QualDeEPC partner countries. This will be analysed in some more detail in WP 3, and then mainly in Task 5.3. But the information available now will be very useful to guide the general development work in WP 3.

4.2.2.1 Bulgaria

- *Which kind of OSS or Deep Network Renovation Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

There are no existing OSS or Deep Renovation Network Platforms in Bulgaria.



We can give as example for similar to Deep Renovation Network Platform the The Home Energy Efficiency Credit Program (REECL) which provides households, condominium associations or service companies (professional house managers, ESCOs, entrepreneurs and builders) from all over the country with the opportunity to take advantage of energy efficiency benefits and receive targeted loans and grants. The programme is an online based platform (subtype 1a), which includes a catalogue of different technology suppliers, which are approved by the program to present their energy efficiency solutions energy efficient windows; insulation of walls, floors and roofs; efficient biomass stoves and boilers; solar water heaters; efficient gas boilers and gasification systems; heat pump air conditioning systems; photovoltaic systems integrated in the building; subscriber stations and building installations; recovery ventilation systems and energy efficient elevators.

Another similar example for OSS is the Operative manager of the National program for renovation of Bulgarian Homes – an organisation contracted by the Ministry of Regional Development to support citizens and owners' associations. The main activities of the Operative manager included:

- identification of buildings;
- assessment of the eligibility of buildings;
- supporting the creation of the owners' associations and assisting in the preparation of documentation to apply for renovation, preparation of all necessary documents;
- preparation of indicative budgets for renovation and determination of the part, which each owners' associations should assume;
- assisting the owners' associations in obtaining a loan and providing insurance of the general collateral;
- preparation of energy efficiency audits and measures to achieve
- regulatory standards for energy efficiency;
- assisting the implementation of control on behalf of the owners' associations over the implementation of Construction and installation work.

At the later stage of the programme, the municipalities took over the function of the Operative manager. Municipalities at local level accept documents for application, implement evaluation, approval, provision of financing and monitoring of the implementation of energy efficiency measures in buildings.

This example could be considered as subtype 2b.

- ***Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?***
 - Active communication for the main renovation, economic and financial evaluations of the measures, preparation of energy certificates, individual construction roadmaps for deep renovation, etc.
 - Linking the energy performance certificates of buildings to major renovations - general information and providing individual advice
 - Control and guarantee of the quality of the delivered materials, products and services
 - Networking of different service providers (stakeholders)
 - Training on the best available technologies; installation and maintenance
 - Providing reliable information to end users on energy savings and expected energy costs after the implementation of the measures; as well as available financial incentives for major renovations



- Providing information not only to end users but also to service providers (professionals / SMEs / industries) on the benefits of major refurbishment and the available financial incentives for their business development
- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

Municipalities could be facilitate such OSS, as they became an Operative manager of the Programme for renovation of Bulgarian homes.

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*

To be analysed in WP 3 and decided later.

4.2.2.2 Germany

- *Which kind of OSS or Deep Network Renovation Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

Subtype 1a) The Specialist portal for energy-efficient construction and renovation (FEBS) <https://www.febs.de/startseite/> offers tailor-made specialist information for experts who work in the field of energy-efficient construction and renovation. This includes energy saving law, energy advice, financing options as well as planning and implementation. The specialist portal serves as a reference work on all aspects of the energetic construction and renovation process and as a source for various work equipment.

In addition, the FEBS service center offers a contact point that provides reliable, quality-assured answers to technical questions by phone and in writing. In order to continuously optimise the offer, the FEBS team is looking for an exchange with specialists from the field. The overall package - web offer, service center, publications and dialogue - aims to improve the quality of energetic construction and renovation together with the experts.

Subtype 2b) The climate protection fund proKlima Hannover <https://www.proklima-hannover.de> primarily supports the saving of heating energy and electricity, a focus of the funding programs is energy-efficient construction and modernisation.

In addition to offering comprehensive information, individual advice from experts also plays an important role. This is guiding building owners through all the renovation process; these facilitators or coaches are called “Energielotsen”. Equipping schools with teaching materials on climate protection and renewable energies is also one of the tasks of the enercity fund.

There are several other local physical hubs of the 2a) or 2b) subtypes.



- *Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?*

In principle, all the potential services listed in table 18 would be needed, with the probable exception of the actual implementation of renovation works. In addition, creating or linking the existing platforms to a database of products and manufacturers, as well as to trades people and experts. For subtype 1a), it may be useful to provide a meta-layer to existing information platforms (such as dena, KfW, CO₂Online, consumer protection agencies; FEBS) that connects the different information platforms to an OSS, and to suppliers; or to upgrade one of the existing platforms to a Deep Renovation Network Platform.

- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

For type 1, either the responsible national ministries, nationwide institutions or energy agencies. For type 2, regional or local energy agencies or consumer centers could be considered. In order to enable a wide implementation of such Deep Renovation Network Platforms, a national support programme for local or regional authorities or consumer centres that wish to create and maintain such Platforms has been proposed but not implemented.

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*

Due to the size of the country and the regional differences, both type 1 and type 2 platforms are useful in order to be able to offer a comprehensive and broad range of advice and information for experts, private builders and municipal actors.

4.2.2.3 Greece

- *Which kind of OSS or Deep Network Renovation Platforms already exists?*

Online platform 'energyHUB for ALL'. Relative information is included in Table 'Review of Existing and proposed Deep Renovation Network Platforms'.

- *How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

The 'EnergyHUB for ALL' can be classified as 1a) subtype

- *Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?*



No focus is given for the time being in ‘deep renovation’. The existing platform needs to be upgraded and focused on deep renovation.

- ***Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?***

CRES is experienced and fulfils the requirements of ‘facilitator’ of the existing platform and can undertake this role also in the upgraded one.

- ***Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.***

The existing online platform is well known in the country and has been considered a best practice example in the field. Although not funded for the time being, it is still in operation and visited by various market actors, almost on a daily basis. However, to keep it up to the quality level required, it is necessary to ensure some funding sources for the operators, so as to a) upgrade and focus on deep renovation and b) continuously update the information included on all fields, such as legislation developments, state of the art on renovation measures, best practices, funding mechanisms availability, and c) keep up communicating with the market actors and extend databases of the supply chain.

4.2.2.4 Hungary

- ***Which kind of OSS or Deep Network Renovation Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?***

Currently there are no operating OSSs or Deep Renovation Network Platforms in Hungary. As indicated in Table 10, there is currently one OSS platform under development within the H2020 funded RenoHUB project. It will be a combination of 1a) and 2b) subtypes, where visitors of the online platform wishing to renovate would be directed to the physical hubs.

- ***Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?***

Driving renovation needs towards deep renovation would be very much needed. Therefore “Linking with a) Energy Performance Certificate / b) Building deep renovation roadmap and possibly passport” could be one of the services within QualDeEPC, as it is not specifically tackled by RenoHUB. Also “Active marketing of deep renovation and its benefits and costs” would be beneficial. Further services that will be considered: Network (platform) for learning, exchange and cooperation (local/regional/national); Capacity building and training; Carrying out deep renovation demonstration project(s). One of the most useful services would be to offer information on financing opportunities for deep renovation specifically, however currently there are no such opportunities available.



- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

RenoHUB partner Hungarian Energy Efficiency Institute will facilitate the online platform within RenoHUB, with the cooperation of Energiaklub (consortium leader). The pilot physical hub will also be set up by Hungarian Energy Efficiency Institute in cooperation of a municipality (either Budapest Capital City or one of its districts).

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*

As subtypes 1a) and 2b) will be developed within RenoHUB, the priority work within QualDeEPC would be to have a special focus on how to supplement the services of RenoHUB with services to stimulate deep renovations in particular (see above). One of the most useful services would be to offer information on financing opportunities for deep renovation specifically, however currently there are no such opportunities available.

4.2.2.5 Latvia

- *Which kind of OSS or Deep Network Renovation Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

There are no OSS or Deep Network Renovation Platforms.

However, a part of a 1a subtype can be found in the webpage of Ministry of Economics (https://www.em.gov.lv/lv/es_fondi/dzivo_siltak/)

- *Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?*

Analysis on which types of buildings are more likely to achieve deep renovation in cost effective way

Real one stop shop, where you can say that you want your building to be renovated and then all the rest is done by the one stop shop (i.e., subtype 1b) or 2c))

- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

This will need further analysis in WP 3 and 5 to answer.

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*



This will need further analysis in WP 3 and 5 to answer.

4.2.2.6 Spain

- *Which kind of OSS or Deep Renovation Network Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

At National level there are not OSS neither Deep Renovation Network Platforms. Starting the creation of 2 one-stop shops for providing technical and financing information for building renovation in Basque Country. This is one of the activities of the OPENGELA project which looks to spread urban regeneration in the Basque Country using a novel instrument: the creation of neighbourhood offices which will act as one-stop-shops to provide advice and support to the neighbourhood community. This is a Horizon 2020 project of the European Commission. OSS with subtype 2a).

- *Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?*

The services that do not yet exist and would be needed to stimulate deep renovation: information on renovation actions, potential savings and costs / Linking with Renovation tool; Linking with a) Energy Performance Certificate / b) Building deep renovation roadmap and possibly passport, but not possibly Development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works); information on associations of companies that provide deep renovation, main building contractors /technicians; information on material or product manufacturers/suppliers; information on financing opportunities for deep renovation; suggestion that a public platform managed by an institution that will provide active marketing of deep renovation and its benefits and costs; suggest not required network (platform) for learning exchange and cooperation (local/regional/national) because these services are carried out by some federations and associations.

- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

In Spain the Ministry of Ecological Transition, the Ministry of Transport, Mobility and Urban Agenda or Regional Energy Agencies could be the facilitators of deep renovation network platform for any of the subtypes. At the very early stage Escan will be the facilitator.

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*

In Spain, an on-line information platform -subtype 1a)- will be particularly useful, similar to the Greek platform.



4.2.2.7 Sweden

- *Which kind of OSS or Deep Network Renovation Platforms already exists? How can they be classified using the subtypes 1a), 1b), 2a), 2b), 2c) outlined in chapter 4.2.1.4, or are they an example of a different subtype – if so, how could this subtype be characterised?*

Regarding the existing platforms presented in table # above, they belong to the following subtypes:

ICHB, subtype 1a)

BELOK, BeBo, Besmå, LÅGAN, subtype 2b) (information and coordination with dedicated projects, workshops, seminars, experience exchange etc.)

EEF, subtype 1b)

Regional Energy Agencies, subtype 1a)/2a) (both online platform and advisors)

Nationellt Renoveringscentrum, subtype 2a) (physical with dedicated workshops, seminars, experience exchange etc. between researchers and actors in the construction sector).

- *Which services (that do not yet at all or sufficiently exist in your country; or that exist but could be integrated in the work of the platform or promoted by them) would be needed to effectively stimulate deep renovation at broad scale, and which could be offered by the platforms?*

The online information platform ICHB of subtype 1a could be improved with more direct advice and guidelines for performing deep renovation.

The online information platform of subtype 1b, EEF could be improved with links to companies performing deep renovation.

A platform for interaction between EPC assessors is missing. This could increase the quality of suggested energy renovation measures.

- *Who could be a facilitator for each of these subtypes, and what would this organisation need to fulfil that role?*

An answer would need further analysis

- *Concluding from the previous: Which of these subtypes of Deep Network Renovation Platforms would be useful/not useful for your country, and why/why not? The answer would be based on which subtype already exists, perceived service needs for the deep renovation actors and markets, and potential facilitators (including project partners) and funding, and any other opportunities and barriers.*

See above.



4.3 Tools

In Task 3.3, the tools needed for the enhanced EPC schemes will be developed to the extent possible with the resources of the project. Table 6 in chapter 4.1 has presented first ideas of what these tools could be for the five priorities analysed in that chapter. However, it is currently too early to decide, which of these tools will be needed and then to more deeply analyse the needs and steps for their development. The same is true for concrete tools that may be needed for implementation of the concept for Deep Renovation Network Platforms (chapter 4.2).

Therefore, this chapter focuses on the **priority B)** that was selected, the **Online tool for comparing EPC recommendations to deep energy renovation recommendations.**

4.3.1 General development needs

4.3.1.1 Basic concept of the improvement option

An online tool for improved renovation recommendations on EPCs, similar to the existing energyhub4all tool by CRES will be developed by the project partners. The tool could be used both by EPC assessors when drafting the EPCs, and by building owners who wish to compare the renovation recommendations included in their EPC with a neutral source on improved recommendations, or who wish to inform themselves on which renovation actions they should discuss with their EPC assessor. In addition, the tool may allow building owners to compare the energy consumption as per their EPC with the market average or typical buildings. This tool or a similar one that may already exist will become a component of the Deep Renovation Network Platforms (priority 3.) that will refer the user to an in-depth personal advice.

4.3.1.2 Development strategy plan

The development strategy plan for the Online tool for comparing EPC recommendations to deep energy renovation recommendations involves the following steps:

- Reviewing existing Online tools
- Identifying the general development needs and possibilities during the QualDeEPC project
- Discussing the possibilities for developing, testing, and implementation during the QualDeEPC project

Reviewing existing Online tools

Online tools, such as those that provide specific deep energy renovation recommendations, which are consistent with typical elements of an individual “deep renovation passport/roadmap”, will promote deep renovation. During or even before an energy audit, such tools also act as a decision support mechanism for building owners to focus on specific measures while choosing between different deep energy efficiency renovation recommendations. Some indirect impact for renovation may also be achieved through tools that allow building owners to compare the energy consumption data (and the renovation recommendations) as per the EPC with market average/typical buildings.



In several member states, an online decision support tool/mechanism for building owners to focus on specific measures while choosing between different renovation recommendations is available. The Request2Action project, co-funded by the European Commission, has enabled enhancing existing tools and bringing together online resources for homeowners in its project partner countries. An example is EnergyHUB for ALL, created and operated by CRES (<http://www.energyhubforall.eu/>). Similarly, another European Commission funded project, called RentalCal (<http://www.rentalcal.eu/>)_has developed a profitability calculation tool that provides an open and objective comparison of the retrofit opportunities available to investors in the residential rental market. Another project co-financed by the European Regional Development Fund, called ‘Prioritise Energy Efficiency (EE) Measures In Public Buildings: A Decision Support Tool For Regional And Local Public Authorities’, developed a web-based application, called Decision Support Tool (<https://prioritee.interreg-med.eu/>). The tool helps local and regional authorities to quickly evaluate the possibility for energy (and financial) savings by applying various energy efficiency measures in public buildings.

Online tools for comparison of energy consumption as per EPC with market average/typical buildings are available in few countries, such as France (<http://www.rentalcal.eu/Default.aspx?ID=3379>), Ireland (<https://ndber.seai.ie/BERResearchTool/Register/Register.aspx> and <https://www.seai.ie/tools/>), and Italy (<https://www.ufficienzaenergetica.enea.it/vi-segnaliamo/condomini-4-0-l-app-enea-per-gli-edifici-condominiali.html>). This is enabled in the EPC itself in few other countries, such as Belgium and Sweden. France is a partner in the RentalCal project and has dedicated national pages on the rental market and a translated RentalCal tool in French. In Ireland, SEAI provides various tools for assessing energy savings by opting for efficient lighting and heating systems etc. However, most of the tools are available for download as spread sheets. Additionally, the National BER Research tool provides for searching dwellings based on their BER (EPC) rating, location, area, and year of construction. The results show main space heating fuel and efficiency, thermal transmission values of the building envelope etc. for buildings with similar search criteria. In Italy, a mobile application is available that compares the real consumption of the property with the reference energy requirement for condominium-type buildings, assigning each building a class of merit (good / sufficient / insufficient) for both heating and electrical consumption. It also includes a list of interventions to optimize its performance.

Overall, an online tool or decision support mechanism on energy efficient renovations for residential buildings is available in 15 member states, including three QualDeEPC project partner countries, Germany, Greece and Sweden. This reflects the absence of such tools in most QualDeEPC project partner countries. In addition, an online tool that compares energy consumption as per EPC with market average/typical buildings is available in only six member states, including two QualDeEPC partner countries, Sweden and Latvia.

General Development Needs

This element for improvement is identified as a significant gap (D2.3) and considered a priority by stakeholders and two QualDeEPC country partners.

A master version of the tool in English will be developed in WP3, Task 3.3, and adapted to the national situation, conditions, and language (or be used to improve existing tools) in WP 5. For relevant types of residential buildings and by climate zone, these recommendations (priority 1.) will be developed to stimulate deep renovation, and include information on costs and potential savings.



If a similar online tool already exists in a QualDeEPC partner’s country, this will be considered to decide whether a new online tool should be developed and implemented, or whether it would be better to cooperate with existing tools and their providers to improve them further.

Discussing the possibilities for developing, testing, and implementing the tool, based on the Greek HEC tool

The Greek Home Energy Check tool is a friendly and easy to use platform, for users who want to be informed about the energy demand, energy rating and CO₂ emissions of their home. It allows homeowners to simulate their dwellings, inputting the necessary characteristics of them (typology, geographical area, floor area, characteristics of heating/ cooling systems, etc.) in just a few steps. In addition, users can try to improve their dwelling’s energy efficiency, interactively changing characteristics and seeing the effects of their changes, as well as an indicative cost of retrofit activities.

There are two basic options for developing and implementation of the tool:

- The Greek HEC tool to be developed to suit the needs of QualDeEPC and adapted to the national context
- Enhancement of an existing national tool based on the blueprint developed by QualDeEPC.

Excursion: the structure of the Greek HEC tool

The Greek HEC tool consists of three layers depicted in the following figure and described in the following paragraphs.

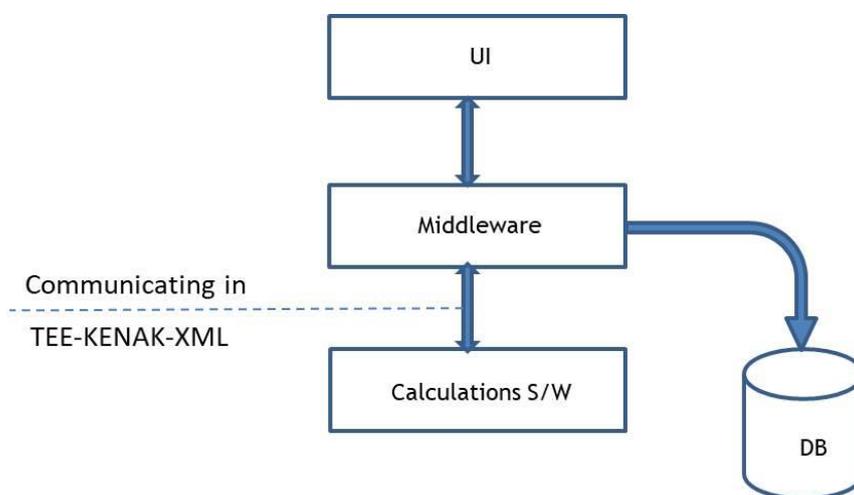


Figure 7: Structure of the Greek HEC tool

1. Layer 1 – Calculation tool

In the heart of the HEC tool lays the calculation software. This is the software that loads all input needed, performs the calculations and returns the results. For this purpose, the official Greek software for energy building calculations and building energy classification (TEE-KENAK) was used in the HEC tool. The input of TEE-KENAK is an xml file, in a schema (structure), defined by the TEE-KENAK developers and thereafter called TEE-KENAK-XML (not an official name). This file contains all the



building related information needed to calculate energy indicators. During the course of the calculations, a series of XML files containing 'library data' (e.g. climate data) are loaded, and finally, the software returns the results, again in the form of XML files.

The developers of the Greek HEC tool didn't develop the calculation software, but used the existing software as described above. Equivalent possibilities in the other QualDeEPC countries will need to be assessed in WP 3.

Layer 2 – Middleware

The HEC tool developers have developed a middle layer software in order to create the input xml files for the calculation tool and read the output xml files from it. The procedure to interact with the tool is the following.

First, they created some prototype TEE-KENAK-XML files that correspond to certain types of buildings (e.g., one storey house, building flat in the ground floor etc.).

For each run, they change programmatically specific parts of these xml files according to the specific characteristics of the building we examine. These characteristics are determined by the user through his options in the user interface (see below) and are translated by the middleware into something meaningful for the calculation tool. For example, if the user chooses 'Double glazed aluminium with low-e windows', the corresponding U-values for this type of windows are written in the right place of the TEE-KENAK-XML file.

At the same time, the corresponding values written to the input xml file according to the user choices, are stored in a Relational Database. This database could be said to form a fourth part in the HEC tool architecture.

When the TEE-KENAK-XML file is completed with all the user entered options, it is sent to the calculation tool, which makes the needed calculations and returns output xml files containing energy indicators and building energy classification.

Finally, the middleware reads the output xml files and populates the UI fields with them, in a user-friendly format.

If an existing calculation software (layer 1) with an API can be used in the other QualDeEPC countries, a similar middle layer can be programmed. If an existing tool shall be enhanced, its middle layer may need to be adapted to QualDeEPC requirements.

Layer 3 – User interface

The user interface of the Greek HEC tool is a small web application, designed to provide the users with all the options they need to choose the specific characteristics of the building they want to examine. These options include typology, geographical area, floor area, characteristics of heating/ cooling systems, etc.

After the middleware reads the calculation results as described above, the user interface presents them in an elegant way to the user

All the communications between the different parts of the tool are made through the HTTP protocol.



For national tools in the other QualDeEPC countries, a similar user interface in national language, carrying the building types and actions specified, will be needed.

➤ National adaptation of the tool

Having in mind the architecture described before, there are some prerequisites in order to adapt the HEC tool to the national needs of the partners, who wish to build up a new tool based on the master HEC tool that will be developed from the Greek tool.

First of all, a calculation software for building energy calculations and building energy classification must be selected for each participating country. Ideally, this software will be the official national software (assuming that there is one) or a certified private software. Alternatively, it could be a software specifically developed for the project.

Moreover, if a partner uses indeed a national calculation software, its Application Programming Interface (API)² must be described (at least in an informal way), so that the developers can develop a middle layer software, as described above, that translates the user entered options to the format needed by the calculation software, and reads the results returned from it.

4.3.2 Country-specific development needs

A number of questions need to be addressed. The preliminary answers can be found below. In addition, all the development questions for the improvement of the renovation recommendations discussed in chapter 4.1 are relevant for the tool. This concerns especially the EE actions, energy performance values recommended, and cost data.

4.3.2.1 Bulgaria

- ***Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question:***

Still under discussion, but priority is given to the solution of adapting the Greek HEC tool and integrating it to the Deep Renovation Network Platform, which will be hosted by some municipalities.

- ***Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?***

The possibility of improving an existing instrument by adapting it to the Greek instrument is still being explored, but it seems the existing instruments are locked for changes. Therefore, the adaptation of the Greek instrument to the national context is being considered as an optimal option.

² An Application Programming Interface (API) is the part of a software application that allows it to communicate with other applications.



- *Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.*

The Greek HEC tool will be used for layer 1 and adapted to the national context based on the national methodic for calculation of annual energy consumption.

- *Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?*

Under discussion.

- *Basically, the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).*

Under discussion.

4.3.2.2 Greece

- *Who is to host the tool? Is it our country partners or another organization?*

CRES will host the tool.

- *Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?*

CRES is going to upgrade the existing Greek HEC tool according to the QualDeEPC project approach.

- *Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.*

The official Greek software for energy building calculations and building energy classification (TEE-KENAK) was used in the HEC tool and will be used in the upgraded version.

- *Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?*

The Middleware is developed by CRES and will be upgraded based on the new features.



- *Basically, the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).*

CRES will improve the user interface in terms of user friendliness (aesthetical/presentation images, easiness of following the various steps etc.), and it will be adjusted to needs of the new features (i.e. additional building typologies, Improving the EPC recommendations towards deep energy renovation).

4.3.2.3 Germany

- *Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question?*

If possible, a combination of both the implementation partner within QualDeEPC and another organization that is the host of an existing tool; otherwise a link to the other organization is needed.

- *Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?*

No new tool is needed, since there are already several implemented tools. Currently, it is not known if a team up with one of the hosts of these tools to enhance it is possible. This will need to be analysed during WP 3.

- *Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.*

If it is possible to enhance an existing tool, this tool should already include a calculation tool (layer 1).

- *Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?*

If it is possible to enhance an existing tool, this tool should already include a middle layer. This may need adaptation to our tool structure.

- *Basically, the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).*

Same as for the middle layer.



4.3.2.4 Hungary

- ***Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question:***

The tool will be hosted by the new Hungarian partner BME (grant amendment procedure ongoing).

- ***Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?***

It is an excel tool that is easy to adapt to special needs. BME plans to integrate it with the Greek HEC tool.

- ***Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.***

It is an excel tool developed by BME ordered by Ministry for Technology and Innovation to test the new building code and develop training materials as a preparatory step for introducing the code at national level.

- ***Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?***

BME think adaptation of the Greek middle layer is possible (needs consultation with the Greek IT experts).

- ***Basically, the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).***

The Greek tool currently covers residential buildings only. BME thinks that other building types should be calculated by experts using detailed methods (particularly buildings with air conditioning, complicated mechanical ventilation systems and special net demands) and therefore don't plan to include non-residential buildings. However, BME's excel calculation tool enables to handle not complicated non-residential buildings as well if needed.

4.3.2.5 Latvia

- ***Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question:***

There is no real existing tool that is actively being used. It will need further analysis to decide who might host the tool.



- *Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?*

About 11-13 years ago, a staff member of Ekodoma developed an Excel tool similar to CRES tool. Maybe there is a possibility to update this tool and use in QualDeEPC project. This tool was aimed to typical apartment buildings built during 1960s till 1990s. It gathered data from previous energy audits and based on this data a regular user could predict existing energy consumption of a building, energy savings from different measures as well as understand whether these measures would be cost effective. This tool asked only such input data which can be understood by regular person – number of floors in building, number of staircases in building, approximate percentage of new windows in building, etc. .

- *Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.*

This could be the Excel tool mentioned under the previous question.

- *Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?*

This will need further analysis.

- *Basically the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).*

This will need further analysis.

4.3.2.6 Spain

- *Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question:*

No calculation tool with the requirements of the Greek tool (on-line tool, etc.) is available in Spain.

- *Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?*

There could be 2 options, and the simplest and more feasible option would be the second one, if the Greek calculation software (layer 1) were also applicable in Spain.

First option: ESCAN, software experts and EPC experts will analyse the possibility of adapting an excel tool that was previously used for certification, and is no longer used now. This excel sheet performs a simplified calculation procedure for the residential sector (Block, Single-



family), as the CRES tool. In other words, once ESCAN and the EPC expert define the possible adaptations (low cost), the software expert will program them (adapting excel), then the EPC expert and ESCAN will test them (comparing the results of the adapted excel with the results of one official software), and they will explain the reasons for the possible differences. When the EPC expert and ESCAN give the OK to the Excel, then Escan could send such an excel to CRES, so that it can be re-programmed to integrate into the CRES master web tool.

Second option: CRES does the improvements of the tool including the commentaries that we sent by email; CRES creates the tool in English; CRES elaborates a replication of the tool in Spanish. For this Escan does the translations of all the required information and prepares the necessary data.

The hosting of the replicated tool could be provided by Escan.

- ***Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.***

Please see previous information.

- ***Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?***

ESCAN will assess 2 options, as explained above. Maybe the Greek partner should adapt the Greek middle layer.

- ***Basically the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).***

ESCAN will assess 2 options, as explained above. Maybe the Greek partner should adapt the Greek user interface

4.3.2.7 Sweden

- ***Who is to host the tool? Is it our country partners or another organization? This will also depend on the answer to the next question.***

Sweden does not have any free to use official calculation tool. It needs analysis during WP 3 to see if it is possible to use the Greek tool at all in Sweden. One option could be to use the Latvian simplified calculation tool together with the Greek interface. In that case, CIT Energy Management could host the tool, but will still try to disseminate the tool from one of the national platforms.

- ***Shall it be a new tool (which would probably be a full national adaptation of the generic tool that you will develop in task 3.3 out of the Greek HEC tool), or can partners team up with an organization that already operates a similar tool, in order to improve that tool?***



The project budget does not allow development of a calculation tool (layer 1), which would be needed to host the tool by CIT Energy Management AB themselves. This development activity is not included in the adjustments of the master tool to Swedish conditions, which are foreseen in Annex I. That could be the change of for example definition of area, climate data, common U-values for renovation parts, costs etc. One option would be to use the Latvian calculation tool together with the Greek interface or to use some other existing similar tool, in order to improve that tool, or at least with the owner of a calculation software. It needs further analysis to see, whether this will be possible.

- ***Which calculation tool shall be used for layer 1? In many countries, there are several certified software tools. Partners will have to team up with a provider to offer the calculation layer.***

The most expensive part to take forward is the layer 1, the calculation tool. Sweden has no official calculation tool for layer 1. There are several commercial tools but they may not be willing to give their tool for free to an application, if they perceive that it will be a direct competitive product on the market. It needs further analysis to see, whether they may see a benefit of such a cooperation. Otherwise, the possibility to use the Latvian tool will be analysed.

- ***Does the middle layer have to be programmed from scratch? And in that case, will it be possible and easier to adapt the Greek middle layer, or build it from scratch? Or does such a middle layer exist for an existing online tool, and only needs adaptation to our (national) tool structure?***

Mainly the tools that exist do not have an API to connect with the middle layer and must likely also be developed. Considering that work together with the work on adapting the Greek interface to Swedish conditions it might require the same resources as developing a new tool with new middle layer and interface.

- ***Basically the same questions as for the middle layer apply for the user interface. If the partners intend to use an existing tool, it is crucial to know: which building types and EE actions are included in this tool? So that we can consider them in our tool (and the improved renovation recommendations).***

For the interface that we interpret from the Greek site, for Sweden no advice on single apartments will be needed. In multifamily-houses in Sweden, all renovations are done for the whole building.

4.4 Timetable and actors involved

Based on the activities listed in chapter 4 (table 6, chapters 4.2 and 4.3), the following table presents an overview of the specific development and testing actions needed in WP 3 and WP 4, and who would be the actors involved and the lead participants. The last column presents the period of implementation up to the White book on enhanced EPC schemes in month 18 (February 2021).

Priority for improvement	Specific actions	Actors involved and lead participants	Period of implementation
A) Improving the EPC recommendations	Analysis of the most commonly used recommendations in the partner countries	QualDeEPC partners	July/August 2020



Priority for improvement	Specific actions	Actors involved and lead participants	Period of implementation
towards deep energy renovation	Discussion among the partners about possible ambitious recommendations, based on joint list of building types and actions to be developed	WP 3 / Task 3.1 leaders and QualDeEPC partners	July/August 2020
	Review the requirement that recommended measures must be cost-effective	WP 3 / Task 3.1 leaders	July/August 2020
	Provide a list of improved recommendations	WP 3 / Task 3.1 leaders, QualDeEPC country partners	August/September 2020
	Test improved recommendations for the pilot buildings	WP4/ Task 4.3 Leaders, QualDeEPC country partners	October to December 2020
	Discuss with owners of pilot buildings	WP4/ Task 4.3 Leaders, QualDeEPC country partners	October to December 2020
	Present and discuss the list with National EPC body and software providers, including in stakeholders debate and workshops (Task 3.4)	QualDeEPC partners, National EPC Body, EPC Software providers	October / November 2020
	Develop interfaces and concept for implementing the improved recommendations in online tool (and other software)	WP 3 / Task 3.1 and Task 3.3 leaders, QualDeEPC country partners	October 2020 to February 2021
	Plan and concept for including the improved recommendations to trainings Actors: WP 3 / Task 3.1 leaders, QualDeEPC country partners	WP 3 / Task 3.1 leaders, QualDeEPC country partners	October 2020 to February 2021
B) Online tool for comparing EPC recommendations to deep energy renovation recommendations	Identify existing tools in the seven countries represented in QualDeEPC	QualDeEPC country partners	May to August 2020
	Analyse, whether existing EPC calculation tools could be used for layer 1	QualDeEPC country partners, led by CRES	May to August 2020
	Analyse, whether an existing tool could be enhanced or a new tool would need to be created	QualDeEPC country partners	May to August 2020



Priority for improvement	Specific actions	Actors involved and lead participants	Period of implementation
	If possible, decide on who could be the host of the tool (host of an existing tool; project partner or another organisation for a new tool) (final decision needed during WP 5)	QualDeEPC country partners	May to September 2020
	Develop master tool, particularly layers 2 and 3, for joint list of building types and actions to be developed together with priority A) (see above)	CRES in interaction with QualDeEPC country partners	July 2020 to February 2020
	If online tool is ready for testing, this may be tested too, with owners of pilot buildings Otherwise, present concept to building owners and interview them on their needs and wishes	Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners	October to December 2020
	Implement the improved recommendations (priority A)) in master online tool	Task 3.3 leaders, QualDeEPC country partners	January/ February 2021
C) Creating Deep Renovation Action Platforms	Identify existing One-stop shops and services similar to Deep Renovation Action Platforms in the seven countries represented in QualDeEPC	QualDeEPC country partners	May to August 2020
	Analyse, whether an existing One-stop shop or service similar to Deep Renovation Action Platforms could be enhanced or a new Platform would need to be created	QualDeEPC country partners	May to August 2020
	If possible, decide on the subtype of Platform (cf. chapter 4.2) and who could be the host of the Platform (host of an existing One-stop shop or service; project partner or another organisation for a new Platform) (final decision needed during WP 5)	QualDeEPC country partners	May to September 2020
	Develop overall concept of Deep Renovation Action Platforms for all relevant subtypes, including potential sources of funding or revenue and concrete tools that may be needed for implementation	Task 3.2 and 3.3 leaders in interaction with country partners	July 2020 to February 2020
	Present concept (with national adaptations as far as can be decided by then) to owners of pilot buildings and interview them on their needs and wishes	Actors: WP4/ Task 4.3 Leaders, QualDeEPC country partners	October to December 2020
D) Regular mandatory EPC assessor training on assessment and	Analysis of the training structure in countries with mandatory training	QualDeEPC partners	July/August 2020



Priority for improvement	Specific actions	Actors involved and lead participants	Period of implementation
recommendations required for certification/ accreditation and registry	Discussion about possible curriculum with specific content and timetable <i>Tool that may be developed:</i> possible curriculum with specific content and timetable	QualDeEPC partners, Lead: WP 3 / Task 3.1 and Task 3.3 leaders	July/August 2020
	Establishing a common training structure and possible educational materials, particularly presenting the improved renovation recommendations developed by QualDeEPC and the online tool <i>Tool that may be developed:</i> possible educational materials	WP 3 / Task 3.1 Task 3.3 leaders, QualDeEPC country partners	August/ September 2020; further work during October 2020 to February 2021
	Developing a policy proposal on the mandatory periodic training for obtaining or maintaining certification and registration as an EPC assessor or on requiring to pass an examination for certification as an alternative	QualDeEPC partners	July to September 2020
E) High user-friendliness of the EPC	Each partner to present the existing EPC certificate in their country	QualDeEPC partners WP 3 / Task 3.1 leaders	May/June 2020
	Comparative analysis and identification of good examples and possible improvements	WP 3 / Task 3.1 leaders	July/August 2020
	Provide a list with proposals for improvement of the user-friendliness of the EPC (content/features, design) <i>Tool:</i> Enhanced EPC template with user-friendly features and design possibly, <i>Tools</i> needed for the assessment of enhanced features or for graphical presentation	WP 3 / Task 3.1 and Task 3.3 leaders; all partners	August/ September 2020
	1) Test assessment for enhanced content and design in the Pilot Cases of real buildings (Task 4.3) 2) Collect feedback from facility managers/ building owner(s) on the enhanced Energy Performance Certificate (Task 4.3)	WP4/ Task 4.3 Leaders, QualDeEPC country partners	October to December 2020
F) Establishing Voluntary or mandatory advertising guidelines for EPCs and G) Controlling and enforcing the	Brief overview of the National legislation in regards to mandatory use of EPCs in real estate advertisements	WP 3 / Task 3.1 leaders; all partners	July/August 2020
	Analysis of the level of control	WP 3 / Task 3.1 leaders; all partners	July/August 2020



Priority for improvement	Specific actions	Actors involved and lead participants	Period of implementation
mandatory use of EPCs in real estate advertisements	Identifying the gaps of the legislations and control	WP 3 / Task 3.1 leaders	August 2020
	Research on good practice and innovative proposals to improve control, compliance, and enforcement	WP 3 / Task 3.1 leaders; all partners	July/August 2020
	Discussion among the partners and development of concrete proposals for improved routines and control / instruments to improve compliance Actors: WP3/ Task 3.1 and Task 3.3 leaders; All partners	WP3/ Task 3.1 and Task 3.3 leaders; All partners	August/ September 2020
	Develop voluntary advertising guidelines for EPCs	WP3/ Task 3.1 and Task 3.3 leaders; All partners	August/ September 2020; further work during October 2020 to February 2021
	Collect feedback from facility managers/ building owner(s) on the advertising guidelines for EPCs (Task 4.3)	WP4/ Task.4.3 Leaders, QualDeEPC country partners	October to December 2020
	Develop <i>tool</i> for the use of advertisement guidelines for EPCs. The tool could be as graphical templates (e-brochure); hints on where to find the data in the EPC; a calculator for energy costs and cost savings vs. an E-rated building	WP 3 / Task 3.1 and Task 3.3 leaders;	October/ November 2020
	Collect feedback from facility managers/ building owner(s) on the tool for the use of advertising guidelines for EPCs (Task 4.3)	WP4/ Task.4.3 Leaders, QualDeEPC country partners	October to December 2020
	Develop proposal for legislation making the use of the guidelines mandatory	WP 3 / Task 3.1 and Task 3.3 leaders;	September 2020

Table 21: Timetable and actors involved for development and testing



5 INDICATORS FOR MONITORING

The monitoring of the implementation of the development strategy is intended to provide information on the achievement of the objectives and effectiveness of the actions taken.

Therefore, indicators for monitoring at project level have been identified in order to assess the success in development (WP 3), incl. testing (WP 4), of improvements for successful EPC schemes. They are displayed in Figure 7 and explained thereafter.

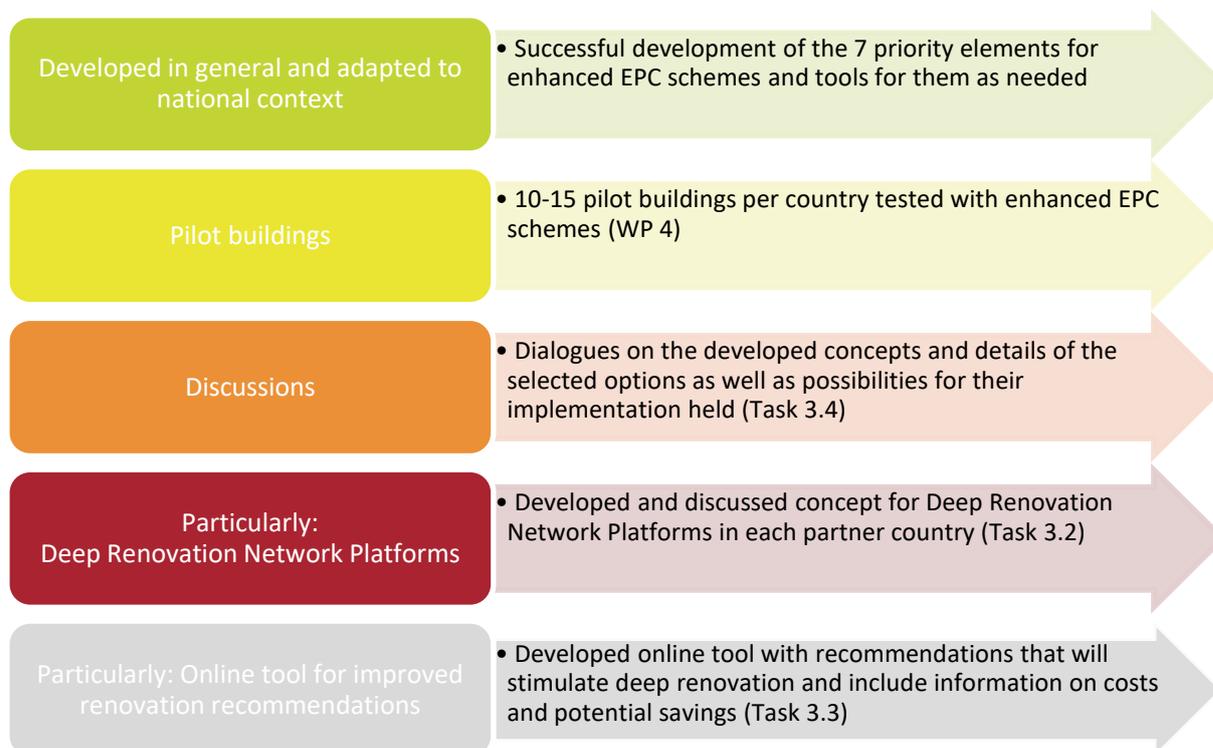


Figure 8 Indicators for monitoring

The following paragraphs provide brief explanations on these indicators.

Successful development - in general and adapted to national context – of the 7 priority elements for enhanced EPC schemes and tools for them as needed

In this Task 2.4, the project team has identified **seven priorities for improvement** (cf. chapters 3.2 and 4). The expected result of WP 3 is to have developed, updated if needed based on the testing (WP 4), and prepared adaptation to the national context (WP 5) for the following priorities:

- A) Improving the EPC recommendations towards deep energy renovation
- B) Online tool for comparing EPC recommendations to deep energy renovation recommendations
- C) Creating Deep Renovation Network Platforms
- D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry
- E) High user-friendliness of the EPC
- F) Voluntary/mandatory advertising guidelines for EPCs
- G) Improving compliance with the mandatory use of EPCs in real estate advertisements



The specific actions for implementation and testing of the elements are presented in *Table 6 General development needs*, and responsibilities as well as the period of implementation are specified in *Table 20 Period of implementation and actors involved*. Therefore, this indicator can be monitored by comparing achievements and results with the content of these two tables.

In addition, to report the implementation of these activities, the following deliverables should be prepared:

D3.1: Green paper on good practice in EPC assessment, certification, and use, including the drafts for the enhanced EPC assessment scheme and for the concept for the Deep Renovation Network Platforms as well as for the tools (month 12)

D3.2: White paper on good practice in EPC assessment, certification, and use, including the final draft version of the enhanced assessment, certification and verification methods, processes, of the concept for Deep Renovation Network Platforms (month 18)

D3.3: Collection of tools developed (month 18)

Pilot buildings - 10-15 pilot buildings per country tested with enhanced EPC schemes

According to the Grant Agreement, a total of **10 to 15 buildings** (per country partner) have to be selected and used for testing as pilot cases. Of these, 5 to 8 have to be residential buildings and 4 to 7 have to be non-residential buildings (such as offices, education buildings, supermarkets and shopping centers). For the seven participating countries, this will yield a total of 70 to 105 pilot cases.

In the framework of WP4, the partners have already selected 10-15 buildings per partner for field testing of the current EPC practices and for the experimental enhanced assessment and certification schemes. The objective is to test the draft enhanced assessment and certification schemes developed in WP3, and comparison between the countries and cases will be implemented in order the potential for convergence to be analysed. As a result, a **summary of testing results** and **recommendations** will be provided with the objective to provide inputs back to WP3, and to finalise the proposed enhanced Energy Performance Certificate scheme. This will also indirectly serve WP5, where the schemes will be adapted to national circumstances and first consensus elements will be implemented.

To report the implementation of these activities, the following deliverables should be prepared:

D4.1: Pilot project selection report (month 7 – delivered)

D4.2: EPC and documentation for all pilot cases based on current national EPC schemes (month 12)

D4.3: Experimental Enhanced Energy Performance Certificate and supplementary documentation for all pilot cases (month 16)

D4.4: Transnational comparison (report) (month 18)

D4.5: Summary evaluation report (month 20)

Dialogues on the developed concepts and details of the selected options as well as possibilities for their implementation held (Task 3.4)

7 workshops will be organised – one in each partner country, in parallel to the testing activities in WP 4. It will be presenting the outcomes of the previous work packages, especially the Green paper on good practice in EPC assessment, certification, and discuss them, as a measure to spur creativity, set



the ground and build trust for potential implementation. **Special meetings** will in addition be organized with one or two key stakeholders per country, who are relevant for the development of a national enhanced Energy Performance Certificate scheme. Wuppertal Institut and FEDARENE will organize a **workshop in Brussels** to discuss the Green paper, particularly proposals relevant at EU level; participation of the EU-level Technical Advisory Committee will be sought in particular. The results will inform the revision of the Green paper on good practice in EPC assessment, certification, and use to the White paper. The feedback will also provide input to Tasks 5.1 to 5.3 for the national adaptation.

To report the implementation of these activities, the following deliverable should be prepared:

D3.4: Report on feedback from Task 3.4 Workshops (month 18)

Deep Renovation Network Platforms

An overall **concept for Deep Renovation Network Platforms** is to be developed (Task 3.2) and discussed in each partner country (Task 3.4).

Basics for the concept have been outlined in chapter 4.2. The basis, and the minimum to be achieved in each country represented in the consortium, will be an online platform providing a one-stop-shop for information on deep renovation, providing recommendations from the tool to be developed in Task 3.3, information on costs and benefits, as well as links to support with administration, financing, and supply of works and equipment.

The implementation of these activities will also be reported in the following deliverables:

D3.1: Green paper on good practice in EPC assessment, certification, and use, including the drafts for the enhanced EPC assessment scheme and for the concept for the Deep Renovation Network Platforms as well as for the tools (month 12)

D3.2: White paper on good practice in EPC assessment, certification, and use, including the final draft version of the enhanced assessment, certification and verification methods, processes, of the concept for Deep Renovation Network Platforms (month 18)

D3.4: Report on feedback from Task 3.4 Workshops (month 18)

Any further concrete tools that may be developed to support implementation of the Deep Renovation Network Platforms would be reported in deliverable

D3.3: Collection of tools developed (month 18)

Online tool for improved renovation recommendations

Here, the indicator is **to have developed the online tool** with recommendations that will stimulate deep renovation and include information on costs and potential savings (Task 3.3). According to the Grant Agreement, the project intends to develop an online tool for improved renovation recommendations on EPCs, similar to the existing HEC tool by CRES. This task will develop the master version of the tool in English, which **will be adapted to the national situation and language** (or be used to improve existing tools) in WP 5. For relevant types of residential buildings and by climate zone, these recommendations will be developed to stimulate deep renovation, and include information on costs and potential savings.



In the framework of Task 2.4, some country-specific needs were already identified and discussions were raised to define the approach of development and required functionalities of the tools.

To report the implementation of these activities the following deliverable should be prepared:

D3.1 : Green paper on good practice in EPC assessment, certification, and use, including the drafts for the enhanced EPC assessment scheme and for the concept for the Deep Renovation Network Platforms as well as for the tools (month 12)

D3.2: White paper on good practice in EPC assessment, certification, and use, including the final draft version of the enhanced assessment, certification and verification methods, processes, of the concept for Deep Renovation Network Platforms (month 18)

D3.3 : Collection of tools developed (month 18).



6 CONCLUSIONS

This Task 2.4, *Defining the development targets and actions to be performed in WP 3*, concludes WP 2: *Analysis of current practice and priorities for next-generation EPCs of the QualDeEPC project*. The **first main result of this task** is probably the most important decision during the course of the project: The selection of which potential features of an enhanced and converging EPC scheme the further development, testing, dialogue, and implementation work of the project should concentrate on.

The seven priorities selected are:

- A) Improving the recommendations for renovation provided on the EPCs towards deep energy renovation
- B) Online tool for comparing EPC recommendations to deep energy renovation recommendations
- C) Creating Deep Renovation Network Platforms
- D) Regular mandatory EPC assessor training on assessment and recommendations required for certification/accreditation and registry
- E) High user-friendliness of the EPC
- F) Voluntary/mandatory advertising guidelines for EPCs
- G) Improving compliance with the mandatory use of EPCs in real estate advertisements

Although the selection process has been very extensive, based on the criteria discussed in this report and all the analysis, interviews and dialogue performed during WP 2, it is natural that not all of these priorities are equally important for each of the seven countries represented in the project. However, each of them finds the majority of these priorities important for enhancing their EPC schemes.

The second main result of this task is the Development Strategy Plan, which presents the basic concept for each of the priorities as well as the needs, possibilities, and steps for development of the seven priorities, and also for the testing. It puts special focus and detail on priorities A) to C), since these are both more complex than the others and are the core priorities for enabling the special focus of QualDeEPC – improving the link between EPCs and deep renovation. In developing the concepts, existing good practice will be taken into account; some examples have been identified in this report. In addition, a subconcept for monitoring the success of an eventual implementation of the priorities will also be a part of the concept for each of the priorities. The Development Strategy Plan also presents an adapted timeline and responsibilities for WP 3 and 4, and indicators for monitoring their performance.

The Development Strategy Plan furthermore encompasses the country situation and needs as found by the consortium partners in Task 2.3, where the gaps and shortcomings in the current EPC schemes in the QualDeEPC country partners, and national priority approaches to their resolution were analysed. The Development Strategy Plan thereby also addresses the country-specific development needs for the selected priorities.

The Development Strategy Plan will thus provide the guidance for WP 3 for the development phase and to draft an enhanced EPC scheme as well as the tools needed, and specifically the Deep Renovation Network Platforms, and also for the testing in WP 4.



7 REFERENCES

Ekodoma, (2017). D4.1 Pilot project selection report, QualDeEPC

Gokarakonda, S., Venjakob, M., Thomas S., & Kostova D. (2020). D2.3 Report on EPC short-comings and national priority approaches to their resolution, QualDeEPC, https://qualdeepc.eu/wp-content/uploads/2020/04/QualDeEPC_D2.3_EPC-shortcomings-and-national-priority-approaches_final-20200422.pdf

Gokarakonda, S., Venjakob, M., Thomas S., & Kostova D. (2020). D2.1 Report on local EPC situation and cross-country matrix, QualDeEPC, https://qualdeepc.eu/wp-content/uploads/2020/04/QualDeEPC_D2.1_Final_V2.pdf

IDAE – National Energy Agency, A. Dominguez (2016). EPBD implementation in Spain.

Kostova D. Gokarakonda, S., Venjakob, M., & Thomas S., (2020). D.2.2 Report on EPC best practices, QualDeEPC, https://qualdeepc.eu/wp-content/uploads/2020/06/QualDeEPC_D2.2-Report-on-EPC-best-practices_Final_28052020.pdf

Ministry of Regional Development and Public Works, (2017). LONG-TERM NATIONAL STRATEGY TO SUPPORT THE RENEWAL OF THE NATIONAL FUND OF RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS

Ministry of Transport, Mobility and Urban Agenda (2017). Strategy for energy renovations of buildings in Spain, ERESEE.

Web Pages:

OPENGELA project. <http://opengela.eus/en>



8 ANNEXES

8.1 Annex: some examples of services provided by existing and proposed Deep Renovation Network Platforms and One-stop shops for renovation

S.No	Services/products	Name of the platform or one-stop shop	Service provider	Role of Service providers	End-users addressed
1.	Information on renovation actions, potential savings and costs/ Linking with Renovation tool	BENOveren	Fluvius (grid operator)	<ul style="list-style-type: none"> • Calculator for optimizing wall and roof insulation 	<ul style="list-style-type: none"> • Building owners • Prospective buyers
		BEreel	Flemish Energy Agency	<ul style="list-style-type: none"> • „Develop a Renovation Advice Tool as a central tool in the renovation strategy for 2,7 million houses, together with the housing passport. It will be understandable and standardized, avoiding lock-in situations or suboptimal options for all segments in the population and for all the building typologies“ • The Renovation Advice Tool: <ul style="list-style-type: none"> • will give a rough idea of the general building quality; • will describe the steps and their logical order; • will give an indication of the costs of the renovation. 	<ul style="list-style-type: none"> • Home owners
			Service Public Wallonie (SPW)	<ul style="list-style-type: none"> • „The Quickscan tool will make it easier for the Walloon user to quickly assess the potential energy savings and housing quality without the intervention of a professional.“ 	<ul style="list-style-type: none"> • Home owners
2.	Linking with a) Energy Performance Certificate / b) Building deep renovation roadmap and possibly passport	BEreel	Service Public Wallonie (SPW)	<ul style="list-style-type: none"> • „Development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)“ 	<ul style="list-style-type: none"> • Citizens • Public authorities



		Energiesparen.be	Platform facilitator (Flemish Energy Agency)	<ul style="list-style-type: none"> • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors, links to registry of building contractors, understanding EPCs in terms of nZEB and energy targets for Flemish homes by 2050 etc. • Provides links to home passport (woningpas), which contains among other information: • Drafted EPCs of EPB declarations of the home and energy information • Renewed EPC with renovation step-by-step plan with cost estimate (if drawn up after 4/1/2019) 	<ul style="list-style-type: none"> • Building owners
		SEAI Ireland	Platform facilitator (SEAI Ireland)	<ul style="list-style-type: none"> • Provides detailed information on BER assessment procedure, tools and assessors 	<ul style="list-style-type: none"> • Building owners • BER assessors
3.	Information on building contractors/technicians; support with finding building contractors/technicians	BENOveren	Guidance coach	<ul style="list-style-type: none"> • Requesting various offers and comparing the offers 	<ul style="list-style-type: none"> • Building owners • Prospective buyers
		BetterHome	BetterHome	<ul style="list-style-type: none"> • Provides information on building contractors/technicians 	<ul style="list-style-type: none"> • Building owners
4.	Information on material or product manufacturers/suppliers	BetterHome	BetterHome	<ul style="list-style-type: none"> • Provides information product manufacturers/suppliers 	<ul style="list-style-type: none"> • Building owners
5.	Information on financing opportunities for deep renovation	BENOveren	Guidance coach	<ul style="list-style-type: none"> • Provide information about premiums and subsidies • Help with applying for premiums and subsidies 	<ul style="list-style-type: none"> • Building owners
		Energiesparen.be	Platform facilitator (Flemish Energy Agency)	<ul style="list-style-type: none"> • Provide information about premiums and subsidies 	<ul style="list-style-type: none"> • Building owners
		SEAI Ireland	SEAI Ireland	<ul style="list-style-type: none"> • Provides information about grants for home energy renovation 	<ul style="list-style-type: none"> • Building owners



		myenergy	myenergy	<ul style="list-style-type: none"> Provides information about grants for home energy renovation 	<ul style="list-style-type: none"> Building owners
6.	Active marketing of deep renovation and its benefits and costs	BEreel	City of Mouscron	<ul style="list-style-type: none"> Using demonstration projects to show enhanced „quality of life through insulation and energy saving“ by bringing together various stakeholders listed in the next column 	<ul style="list-style-type: none"> city of Mouscron's Energy Service the eco representative, the energy information centre of Service Public of Wallonia located in Mouscron, local housing companies and the social credit agency
			The Scientific and Technical Center for the Construction Company	<ul style="list-style-type: none"> „An exchange platform will inventory Belgium's and other EU member states' best practises and learning paths, including those of the Life BE REEL! Demonstrations, pilots and testing.“ „BE REEL shall exchange this platform in a double way: via events and workshops on best practises and renovation expertise and via a digital platform.“ 	<ul style="list-style-type: none"> Professional buildings and developers Architects
7.	Network (platform) for learning, exchange and cooperation (local/regional/national)	<ul style="list-style-type: none"> Platform facilitator itself Energy Agency City/Municipality Energy company, especially in case of local or regional platforms and energy companies 	<ul style="list-style-type: none"> Discussing active marketing activities (#6) and involving supply-side actors, city administration, energy companies, financial institutions etc, in the media work, events, 	<ul style="list-style-type: none"> Building contractors/ technicians/ installers City/Municipality local housing companies the social credit agencies Professional buildings and developers Architects Financial institutions Energy companies 	<ul style="list-style-type: none">



			and funding		
			Discussing training needs and the organisation of trainings (#9)		
8.	Network (platform) for learning, exchange and cooperation (interregional/transnational)	BEreel	Flemish Energy Agency	<ul style="list-style-type: none"> Establishing interregional/transnational learning networks between project partners, stakeholders and complementary EU projects for enhancing mutual learning, exchange platform for good practice, innovation and expertise, and stimulate future partnerships „The partnership commits itself explicitly to work towards a harmonisation of tools, guaranteeing the potential for replication of these tools.“ 	<ul style="list-style-type: none"> Construction and financial sector including sector federations, contractors, builders, renovation consultants, banks, financial institutions Large and medium-sized and small cities and municipalities
9.	Capacity building and training	BEreel	The Scientific and Technical Center for the Construction Company (BBRI)	<ul style="list-style-type: none"> Training and learning platform to obtain expertise and sector capacity Dissemination of expert-knowledge on specific promising retrofitting topics in order to assure that the knowledge, best practices and techniques can be picked up by a large number of professional actors 	<ul style="list-style-type: none"> Sector/professional federations Training organizations Professional buildings Architects Contractors
10.	Step-by-step guidance for renovation project from start to end	BENOveren	Guidance coach	<ul style="list-style-type: none"> Offering step-by-step guidance and monitoring of renovation project from start to end Full inspection of home and proposal for a renovation plan (BENOVatieplan) Drawing up a measurement report with overview of costs and energy savings 	<ul style="list-style-type: none"> Building owners Prospective buyers



		Energiehuis (physical)	Participating Municipalities	<ul style="list-style-type: none"> • “Via an Energiehuis you can take out an energy loan at a very advantageous interest rate. In some cases they can also request quotes from contractors, supervise the works and guide you in applying for subsidies.” 	<ul style="list-style-type: none"> • Building owners • Prospective buyers • Tenants
		BetterHome	Platform facilitator (BetterHome)	<ul style="list-style-type: none"> • BetterHome offers building owners a tailor-made renovation plan complete with a list of necessary renovation measures, timeline for the project, potential subsidies or financial incentives available for renovation and contacts of the building contractors required to carry out the chosen renovation measures. 	<ul style="list-style-type: none"> • Building owners • Building contractors • Technicians
		Ile-de-France Energies	Ile-de-France Energies	Offers support in five key stages including, design, financial plan, work and performance monitoring, global technical audit and diagnosis, project management assistance	<ul style="list-style-type: none"> • Owners • Trustees • Building professionals • Communities • Social landlords • Renewable energy professionals
11.	Monitoring the implementation of renovation project(s)	BENOveren	Guidance coach	<ul style="list-style-type: none"> • Follow-up of the renovation works 	<ul style="list-style-type: none"> • Building owners • Prospective buyers
		BEreel	Department of Environment, Flemish government (in consultation with the cities)	<ul style="list-style-type: none"> • Comprehensive renovation of 8.500 very diverse homes 	<ul style="list-style-type: none"> • Various stakeholders who receive the good practice information in the form of guidelines, playbooks, roadmaps, training courses
			City of Ghent	<ul style="list-style-type: none"> • Undertaking deep renovation demonstration projects in their city 	<ul style="list-style-type: none"> • Multiple stakeholders including citizens, public authorities



			City of Antwerp	<ul style="list-style-type: none"> • Undertaking collective renovation demonstration projects in their city including renovation residences to nZEBs. „‘Collective renovation’ includes installing roof, façade and floor insulation and installing super insulating glazing in renovation demonstration projects“ 	<ul style="list-style-type: none"> • Multiple stakeholders including citizens, public authorities
			City of Mechelen	<ul style="list-style-type: none"> • -ditto- 	<ul style="list-style-type: none"> • Multiple stakeholders including citizens, public authorities
			City of Mouscron	<ul style="list-style-type: none"> • The objective of this action will be to make the citizens of Picardy Wallonia aware of the energy saving potential of their property and to encourage them to renovate while becoming "energy" ambassador citizens among their peers. The aim will be to renovate 900 properties (180/year) to E90 	<ul style="list-style-type: none"> • Multiple stakeholders including citizens, public authorities
			City of La Louvière	<ul style="list-style-type: none"> • The renovation of 600 houses towards E90 via setting up an innovative financing system via third-party investment, loans at 0% interest etc. 	<ul style="list-style-type: none"> • Third party investors • Building owners
		BetterHome	BetterHome Floor team	<ul style="list-style-type: none"> • Follow-up of the renovation works 	<ul style="list-style-type: none"> • Building owners
		BetterHome	<ul style="list-style-type: none"> • Building contractors • Technicians 	<ul style="list-style-type: none"> • Carrying out the renovation works 	<ul style="list-style-type: none"> • Building owners
		Île-de-France Energies	Île-de-France Energies	<ul style="list-style-type: none"> • Monitoring works include, editing of financing files, preparation of the renovation works, monitoring of the site during the renovation work through site meetings and visits and reception of the works and closing of the financing 	<ul style="list-style-type: none"> • Owners • Trustees • Building professionals • Communities • Social landlords • Renewable energy professionals



12.	Operating a physical network hub and information centre				
13.	Carrying out the renovation project(s)				
14.	Carrying out deep renovation demonstration project(s)				
	= basic and minimum Deep Renovation Network Platform to be achieved in QualDeEPC project				=enhanced Deep Renovation Network Platform

Table 22: Examples of services provided by existing and proposed Deep Renovation Network Platforms and One-stop shops for renovation

