



Policy proposals and  
concepts for tools of the  
**Green paper on good practice  
in EPC assessment, certifica-  
tion, and use  
for stakeholders**

**QualDeEPC H2020 project**

MAIN AUTHORS: DENA, WI, CRES

DATE: 05/01/2021

For Stakeholders only

---

Project **QualDeEPC**

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

Grant Agreement no. 847100

H2020-LC-SC3-EE-2018

## ABBREVIATIONS

**DHW:** Domestic hot water

**EBPD:** Energy performance of buildings directive

**EPC:** Energy performance certificate

**HVAC:** Heating, ventilation, and air conditioning

**nZEB:** nearly zero energy building

**RES:** Renewable energy sources

## 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 agencies et des regions pour l'energie et l'environnement

**ESCAN:** Escan SL

**CIT ENERGY MANAGEMENT AB**

**BME:** Budapest University of Technology and Economics



## DISCLAIMER OF WARRANTIES

*“This project has received funding from the European Union’s Horizon 2020, research and innovation programme, under Grant Agreement No 847100”*

This document has been prepared by QualDeEPC project partners as an account of work carried out within the framework of the EC-GA contract no 847100.

Neither Project Coordinator, nor any signatory party of QualDeEPC Project Consortium Agreement, nor any person acting on behalf of any of them:

- (a) makes any warranty or representation whatsoever, express or implied,
  - (i). concerning the use of any information, apparatus, method, process, or similar item disclosed in this document, including merchantability and fitness for a particular purpose, or
  - (ii). that such use does not infringe on or interfere with privately owned rights, including any party's intellectual property, or
  - (iii). that this document is suitable to any particular user's circumstance; or
- (b) assumes responsibility for any damages or other liability whatsoever (including any consequential damages, even if Project Coordinator or any representative of a signatory party of the QualDeEPC Project Consortium Agreement, has been advised of the possibility of such damages) resulting from your selection or use of this document or any information, apparatus, method, process, or similar item disclosed in this document.



## PUBLISHABLE SUMMARY

This document presents the policy proposals and concepts for tools from the Green paper on good practice in EPC assessment, certification, and use. It provides draft policy proposals and draft descriptions of tools on the seven areas that the QualDeEPC project has identified as its priorities for the development of enhanced EPC schemes:

- Improving the recommendations for renovation, provided on the EPCs, towards deep energy renovation
- Online tool for comparing EPC recommendations to deep energy renovation recommendations
- Creating Deep Renovation Network Platforms
- Regular mandatory EPC assessor training (on assessment and renovation recommendations) required for certification/accreditation 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

For each topic, the situations in the partner countries are evaluated, best practice examples are described and cross-national proposals for measures for improvements are suggested. The major outcomes at this stage are:

- A text-based list of deep energy renovation recommendations,
- The concept for the online tool development,
- The concept for a Deep Renovation Network Platform,
- A universal, enhanced user-friendly EPC form template and background on the proposed content
- A general policy proposal for regular mandatory EPC assessor training, and
- A general policy proposal for advertisement guidelines and for actions to improve the compliance with the mandatory use of EPCs in real estate advertisements.

These suggested enhancements are intended to be the basis for both a discussion with stakeholders at national workshops and for their testing in WP4. For example, the Green paper provides a universal EPC form template, including deep energy renovation recommendations, to be evaluated by the building representatives of the pilot buildings in WP 4. The feedback of the stakeholders will be processed in a feedback report on the national workshops (D3.4), and the results and feedback from the testing will be documented in a transnational comparison report (D4.4) and a summary evaluation report (D4.5). In addition, with testing results and the feedback by the building representatives and stakeholders, and with further developments by the project partners, the Green paper will be enhanced to deliverable D3.2, the *White paper on good practice in EPC assessment, certification, and use*.

Moreover, the Green paper and the White paper will be the basis for the country-specific adaptation, discussion, and to the extent possible, implementation of the developed policy proposals in WP5.



## TABLE OF CONTENTS

<b>ABBREVIATIONS .....</b>	<b>2</b>
<b>1 INTRODUCTION.....</b>	<b>8</b>
<b>2 DEFINING ‘DEEP ENERGY RENOVATION’ – A PROPOSAL FROM QUALDEEPC.....</b>	<b>9</b>
<b>3 Proposal for the recommendations for renovation provided on the EPCs towards deep energy renovation.....</b>	<b>10</b>
<b>4 Online tool for comparing EPC recommendations to deep energy renovation recommendations.....</b>	<b>14</b>
4.1 Master tool structure	14
4.2 Input parameters	15
4.2.1 List of building types (screen 1)	15
4.2.2 Geographical area/climate zone and floor area of the building (screen 2)	16
4.2.3 Selection of building components and technical systems (screen 3)	16
4.3 Results	17
4.3.1 Renovation recommendations	18
4.3.2 Comparison between existing and renovation case; and deep energy renovation checkmark	18
<b>5 Creating Deep Renovation Network Platforms .....</b>	<b>20</b>
5.1 Objectives for developing concepts for deep renovation network platforms	20
5.2 Deep renovation network platforms: versions and subtypes	20
5.2.1 Basic platform	20
5.2.2 Extended platform	21
5.2.3 Typology of platforms	21
5.2.4 QualDeEPC policy recommendations	22



<b>6</b>	<b>Regular mandatory EPC assessor training.....</b>	<b>27</b>
6.1	General policy proposal	27
6.1.1	General framework	27
6.1.2	Training content for regular training workshops or seminars	27
6.1.3	Development strategy	27
<b>7</b>	<b>High user-friendliness of the EPC .....</b>	<b>28</b>
7.1	Summary of the analysis of EPC forms	28
7.2	Template for EPC form	29
7.2.1	Resulting template for an enhanced and more user-friendly EPC form	30
<b>8</b>	<b>Voluntary/mandatory advertising guidelines for EPCs .....</b>	<b>34</b>
8.1	QualDeEPC proposal for concrete advertising guidelines for presenting EPCs in real-estate advertisements during the sale and rental of buildings	34
8.1.1	Proposal for voluntary advertising guidelines and their use	34
8.1.2	Proposal for legislation making their use mandatory	34
<b>9</b>	<b>Improving compliance with the mandatory use of EPCs in real estate advertisements ....</b>	<b>35</b>
9.1	Direct measures for ensuring compliance with the mandatory use of EPCs in real estate advertisements by effectively controlling and enforcing: Policy proposal and Good practice examples	35
9.2	Controlling and enforcing the mandatory use EPCs in real estate advertisements in QualDePC partner countries: indirect compliance measures	36
<b>10</b>	<b>CONCLUSIONS.....</b>	<b>37</b>
<b>11</b>	<b>REFERENCES.....</b>	<b>38</b>



## INDEX OF TABLES

Table 1	Deep energy renovation recommendations by QualDeEPC .....	12
Table 2	Greek HEC Building types .....	15
Table 3	Basic part of the DRNP .....	23
Table 4	Extended part of the DRNP .....	26
Table 5	Proposal for guidelines for displaying EPCs (or its contents) in real estate advertisements .....	34
Table 6	Ways to improve compliance with the mandatory use of EPCs in real estate advertisements by an effective controlling and enforcing.....	35
Table 7	Controlling and enforcing the mandatory use EPCs in real estate advertisements in QualDeEPC partner countries: indirect compliance measures .....	36

## INDEX OF FIGURES

Figure 1	Information about the building envelope and installed equipment.....	16
Figure 2	Current house energy consumption.....	17
Figure 3	Improvements selection.....	17
Figure 4	Comparison of results.....	18
Figure 5	Tool results report layout (upgraded version) .....	19
Figure 6	First page of the enhanced EPC form template .....	30
Figure 7	Second page of the enhanced EPC form template.....	31
Figure 8	Third page of the enhanced EPC form template.....	32
Figure 9	Fourth page of the enhanced EPC form template.....	33



# 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 3 of the QualDeEPC project aims to develop practical concepts, proposals, and tools for an enhanced EPC scheme linked to deep renovation based on the selected priorities of the Development Strategy Plan (D2.4). The seven priorities selected in D2.4 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

Generally, the Green paper summarizes the analyses and assembles the results for each priority. Since the priorities A), B), C) and E) depend on the definition of “deep energy renovation”, chapter 2 assesses the proposals by the European Commission and develops a refined proposal that would take specific national situations into account and could therefore be more universally applied.

These suggested enhancements are intended to be the basis for both a discussion with stakeholders at national workshops and for their testing in WP 4. For example, the Green paper provides a universal EPC form template, including deep energy renovation recommendations, to be evaluated by the building representatives of the pilot buildings in WP 4. The feedback of the stakeholders will be processed in a feedback report on the national workshops (D3.4), and the results and feedback from the testing will be documented in a transnational comparison report (D4.4) and a summary evaluation report (D4.5). In addition, with testing results and the feedback by the building representatives and stakeholders, and with further developments by the project partners, the Green paper will be enhanced to deliverable D3.2, the *White paper on good practice in EPC assessment, certification, and use*.

Moreover, the Green paper and the White paper will be the basis for the country-specific adaptation, discussion, and to the extent possible, implementation of the developed policy proposals in WP5.



## 2 DEFINING ‘DEEP ENERGY RENOVATION’ – A PROPOSAL FROM QUALDEEPC

Based on an analysis of existing documents, QualDeEPC proposes a modified nZEB-based approach for defining deep energy renovation, based on the following four staged criteria:

1. For those member states that have their objective or legal *nZEB definitions/ standards for existing buildings*, QualDeEPC proposes to link deep energy renovation with these definitions of nZEB; and define deep energy renovation as ‘renovation achieving *component energy standards* equal to at least those that are usually required to meet nZEB requirements for existing buildings’.
2. For countries that only have nZEB definitions for new build but not existing buildings, and in which the *nZEB requirements for new build* are not so ambitious and *would be achievable through renovation*, QualDeEPC proposes to define deep energy renovation as ‘renovation achieving *component energy standards* close to those that are usually required to meet nZEB requirements for new buildings’.
3. In countries that only have nZEB definitions for new build but not existing buildings, and in which the *nZEB requirements for new build* are *too ambitious to reach through renovation*, QualDeEPC proposes to define deep energy renovation as ‘renovation achieving component energy standards close to nZEB requirements for new buildings, when possible’. QualDeEPC partners have been asked to present values for improved component energy standards that are better than the legal requirements in case of a major renovation, and are often proposed in practice by energy consultants. It can be assumed that these are somewhat accepted and available in the market, and not considered too far outside of cost-effectiveness considerations. They could be adopted as component energy standards for deep renovation.
4. In countries *without* current availability of such improved component energy standards or *with very lax nZEB definitions*, QualDeEPC recommends adopting best practices and component improvements in deep energy renovation from other member states with similar climates, and where such standards exist.

As additional guidance, a definition of deep energy renovation could *recommend* aiming for values for *non-renewable primary energy savings*<sup>1</sup> above 60%, if the original building energy performance of existing buildings is at levels achieved before building energy standards or with early historic building energy standards (which would be worse than e.g. most buildings in Sweden). Such savings can usually only be achieved through a full renovation of all parts of a building and its technical systems (**whole-building renovation**). For a **staged approach** according to a deep energy renovation roadmap for a building, the **component energy efficiency levels** that are legally required or usually necessary to achieve deep energy renovation in the above nZEB-based definition would apply.

In any case, where this is feasible for a building, it is always recommendable to install renewable energy systems in addition to deep energy renovation.

---

<sup>1</sup> A more precise definition of this metric will be needed, since primary energy factors e.g. for district heat or electricity already take renewable energy shares into account.



### 3 PROPOSAL FOR THE RECOMMENDATIONS FOR RENOVATION PROVIDED ON THE EPCS TOWARDS DEEP ENERGY RENOVATION

Currently, the renovation recommendations in EPCs in most European countries are oriented towards the minimum legal requirements. Additionally, these measures are often low-cost options, but not necessarily the most cost-effective ones. In this project, we aim to improve the renovation recommendations to be compatible with deep energy renovation or, at least, a first step towards a building deep renovation roadmap. The derived options are oriented towards the proposal for defining deep energy renovation presented above.

We can conclude that there is an important need to create guidance on (1) which renovation actions should usually be recommended on EPCs, and (2) what should then be their energy efficiency or rating levels, so that the renovations will be consistent with ‘deep energy renovation’, even when implemented step by step according to an individual renovation roadmap. The project team, therefore, developed a proposal for such a set of renovation recommendations, based on the definition of ‘deep energy renovation’ developed in chapter 2.

Table 1 summarizes the proposed deep energy renovation recommendations. Since the specific values differ by country and climate zone, it was decided to use text-based recommendations in WP 3 for this Green paper and then provide country-specific values in WP 5. For illustration purposes, country-specific values are exemplarily shown for Germany in the rightmost column of Table 1.

In the cases of added insulation at the external walls and roof as well as for the replacement of windows and doors, two categories for deep energy renovation options are proposed. Firstly, “enhanced” insulation, which should be more energy-efficient than the legal option. Secondly, “exceptional” insulation, which might also be described as the “best reasonable option available”. Here, ‘reasonable’ means that the measure is still cost-effective, but may be less profitable. For the insulation of the ground floor, the project partners agreed on “reinforced” insulation, because it is mostly only used if no insulation was present. For windows, the best available options, depending on country, are either double glazed low-emissivity windows with sun films, triple glazed windows, etc and PVC or aluminium framed windows with reduced thermal bridges for the windows frames.

In more and more countries, also the use of shading is or becomes important to reduce the cooling load during summer. Here, the most efficient option is to add shading externally, either using Venetian blinds, shutters or awnings or to add fixed horizontal/vertical shading devices, such as overhangs or louvers. Another option is the use of vegetation for shading.

Mechanical ventilation systems help to supply the needed air exchange efficiently, especially in otherwise airtight buildings. Hence, these systems should either be newly installed or replaced by energy-efficient options. An exemption could be made if natural ventilation works sufficiently well. For deep energy renovation, it is proposed to either use an exhaust fan system with an exceptionally low need for electrical power or a ventilation system with at least 80 or 90% heat recovery and very low or low electrical power consumption of the fans, respectively.

For the heating, cooling and DHW systems, a large variety of options is available on the market. Moreover, the specific choice depends on the system that was already installed and environmental conditions (i.e. climate zone). Hence, it was found difficult to list the best options for deep energy renovation. However, for all of these technical systems, an EU energy label is available. This label provides



detailed requirements and calculation methods. Thus, a category A or above of this label is suggested for deep energy renovation.

For some partner countries, the lighting is also evaluated in residential buildings. LED lighting and the installation of dimmers are chosen as deep energy renovation options.

It also should be mentioned that some renovation recommendations rely on, or are a consequence of other recommendations. This observation is especially true for the options “reducing thermal bridging”, “air tightness”, “integration of renewable energy sources”, and “insulation of pipes”. The first two options rely mainly on the external wall, roof and ground floor insulation as well as on the window replacement. The integration of renewable energy sources, as well as the insulation of pipes, might already be covered by installing or replacing HVAC systems. Nevertheless, these elements should be listed as criteria for deep energy renovation, since also stand-alone options are available.

Even though the recommendations should be generally applicable in all partner countries and climate zones, there might be specific conflicting requirements. For example, the “wall with exceptional thermal properties” is not recommended in Bulgaria, because of the requirement for night cooling in summer. Moreover, in most partner countries, lighting is not relevant to residential buildings. These elements will be evaluated further for country-specific purposes in WP5.



Table 1 Deep energy renovation recommendations by QualDeEPC

	Specific recommendation	Example value (Germany)
<b>External wall insulation</b>	Wall with enhanced thermal insulation properties (nZEB for renovation standard or similar)	U=0.2 W/(m <sup>2</sup> K) [funding program]
	Wall with exceptional thermal insulation properties (nZEB for new buildings standard or similar)	U=0.15 W/(m <sup>2</sup> K) [quality requirement passive house]
<b>Roof insulation</b>	Roof with enhanced insulation	U=0.2 W/(m <sup>2</sup> K) [Reference building]
	Roof with exceptional thermal insulation properties	U=0.14 W/(m <sup>2</sup> K) [funding program]
<b>Insulation of ceiling of an unheated basement/ ground floor</b>	Floor connected to the unheated basement or ground floor with reinforced insulation	U=0.25 W/(m <sup>2</sup> K) [funding program]
<b>Window replacement</b>	Window with enhanced insulation properties: e.g. Double glazed window equipped with thick argon or krypton thermal break and low-emissivity glass	U <sub>w</sub> =1.3 W/(m <sup>2</sup> K) (g=0.6) [new building]
	Window with exceptional insulation properties, e.g. triple glazed window	U <sub>w</sub> =0.95 W/(m <sup>2</sup> K) (g=0.6) [funding program]
<b>Door replacement</b>	Door with enhanced insulation properties	U = 1.8 W/(m <sup>2</sup> K) [new building]
	Door with exceptional insulation properties	U=1.3 W/(m <sup>2</sup> K) [funding program]
<b>Replacement/ Installation of shading</b>	External blinds (Venetian, shutters or awning)	Funded in combination with the exchange of windows
	Fixed horizontal/vertical shading devices, such as overhangs, louvers	
<b>Replacement/ installation of the mechanical ventilation system</b>	Ventilation system (no heat recovery) with an exceptionally low electrical power requirement	P <sub>el</sub> <0.2W/(m <sup>3</sup> /h)
	Ventilation system with heat recovery of min. 80% and very low electrical power consumption	η>80%, P <sub>el</sub> <0.45W/(m <sup>3</sup> /h)
	Ventilation system with heat recovery of min. 90% and low electrical power consumption	
<b>Replacement/ modernization of the heating system</b>	Generally: heating systems with EU energy label Cat. A or above, for example:	
	Condensing gas boiler in combination with solar thermal collectors	
	Geothermal heat pump	



	Specific recommendation	Example value (Germany)
	Reversible inverter air-air heat pump	
	District heating	Hydraulic balance required
<b>Replacement/ modernization of the cooling system</b>	Generally: cooling system with EU energy label Cat. A or above	
	Geothermal heat pump	
	Reversible inverter air-air heat pump	
<b>Replacement/ modernization of the DHW system</b>	Generally: DHW system with EU energy label Cat. A or above	
	Combination with the heating system through storage	
	Energy-efficient boiler with solar thermal collectors	
<b>Integration of renewable energy sources</b>	significant extent of energy demand/ consumption should be covered by renewable energy sources; <i>alternatively</i> , all external walls, the roof and ground floor should be insulated with exceptional thermal insulation	
	photovoltaic system (including for self-use)	
<b>Lighting</b>	LED	
	Dimmers	
<b>Reduction of thermal bridging</b>	Reduced thermal bridging for non-structural building elements, such as balconies, terraces, dormers, and fixed shading devices	
<b>Increased air tightness</b>	Air exchange rate of 1.5 h <sup>-1</sup> or lower at 50 Pa pressure difference	n <sub>50</sub> ≤ 1.5 h <sup>-1</sup>
	OR	
	Air tightness according to new building standard	
<b>Others</b>	Insulation of all pipes	
	Building automation system	
	Replacement of circulation pumps that meet minimum requirement of ErP label	
	Hydraulic balance optimisation for water-based heating systems	



## 4 ONLINE TOOL FOR COMPARING EPC RECOMMENDATIONS TO DEEP ENERGY RENOVATION RECOMMENDATIONS

The Master<sup>2</sup> tool is the general version of a friendly platform for all users, who want to be informed about the energy demand, rating and CO<sub>2</sub> emissions of their residential building. It is easy to use allowing the homeowners mainly, to simulate their dwellings, by input of the necessary characteristics of them (typology, geographical area, floor area, characteristics of heating/ cooling systems, etc.) in a few (13) steps only. In addition, the user can receive recommendations for improving the energy efficiency of their home to high levels (equivalent to deep renovation) and see the results and the indicative cost of the potential renovation activities. These recommendations could be compared to those of an EPC, or be used to prepare discussion with an energy consultant or EPC issuer. The tool will clearly state that its results are only indicative and will recommend to obtain an energy audit.

### 4.1 Master tool structure

The Master tool structure was designed to use the necessary information in order to run an appropriate software for energy building calculations and building energy classification, and is adapted for the purpose of QualDeEPC. Special care was given, however, to provide a general result in order not to be regarded as an official Energy Performance Certificate. Compared to the existing Greek Home Energy Check tool, on which it is based, the Master version of the tool for the QualDeEPC project introduces additional building typologies and selection options for other building components and systems.

Another feature will be a statement that informs whether the deep renovation criteria have been met or not<sup>3</sup>. Finally, a recommendations list will be prepared and proposed for every case and presented in a hierarchical list.

---

<sup>2</sup>The master tool is based on the Greek Home Energy Check tool - <http://www.cres.gr/energyhubforall/HEC.html>

<sup>3</sup> Based on the concept of QualDEPC definition of deep energy renovation, and its variants for the partner countries

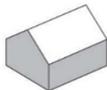
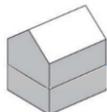
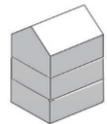
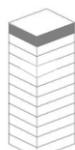


## 4.2 Input parameters

### 4.2.1 List of building types (screen 1)

The master tool provides a list of building types that can be used as input by the user. They are all residential buildings, from fully detached houses to multifamily buildings. Table 2 shows the building types.

Table 2 Greek HEC Building types

Building Type			
a/a	Existing Greek HEC tool		
	Type	Vicinity	Shape
1	1 storey single house	detached	
2	2 storey single house	detached	
3	3 storey single house	detached	
4	Flat in multifamily building	In touch with the ground	
5	Flat in multifamily building	Intermediate floor	
6	Flat in multifamily building	Upper floor	
Additional types to be selected for Master tool for QualDeEPC <sup>4</sup>			
7	Multifamily building	Whole building	

<sup>4</sup> Further building types can be developed by March 2021



#### 4.2.2 Geographical area/climate zone and floor area of the building (screen 2)

In the second screen, the climatic conditions are determined by the selection of the geographical area where the building is located. The selection comprises data from representative cities from QualDeEPC partner countries. Another selection whether the building is located at an altitude higher than 500 meters may be made. Also, the floor area of the house must be given, either by stating the exact floor area or by selecting the area from 3 choices: < 100 m<sup>2</sup>, between 100 and 150 m<sup>2</sup>, between 150 and 200 m<sup>2</sup>, and above 200 m<sup>2</sup>. In the latter case, the exact value must be stated.

Note. Climatic data/zones/maps of partner countries may be added, after the consortium decision on how and by which partner the tool will be finally used.

#### 4.2.3 Selection of building components and technical systems (screen 3)

Then the user has to provide information about the building envelope, and technical systems installed. Ten categories are available (see Figure 1).

1. Walls
2. Roof
3. Floor
4. Windows
5. Shading
6. Heating systems
7. Cooling systems
8. Ventilation
9. Hot water equipment
10. Renewable energy sources



Figure 1 Information about the building envelope and installed equipment.

Based on the inputs from the partners, the master tool in English provides various choices for input parameters for various building components and technologies.



The user also has the choice not to provide any information and proceed to the calculations of the current situation. In that case, default values for all building systems are taken which, however, are the worst-case scenarios.

### 4.3 Results

Then all inputs are used to run the software, which calculates the current energy situation of the house in energy figures and energy category. It provides the results for the yearly final energy consumption for heating, cooling and hot water production.

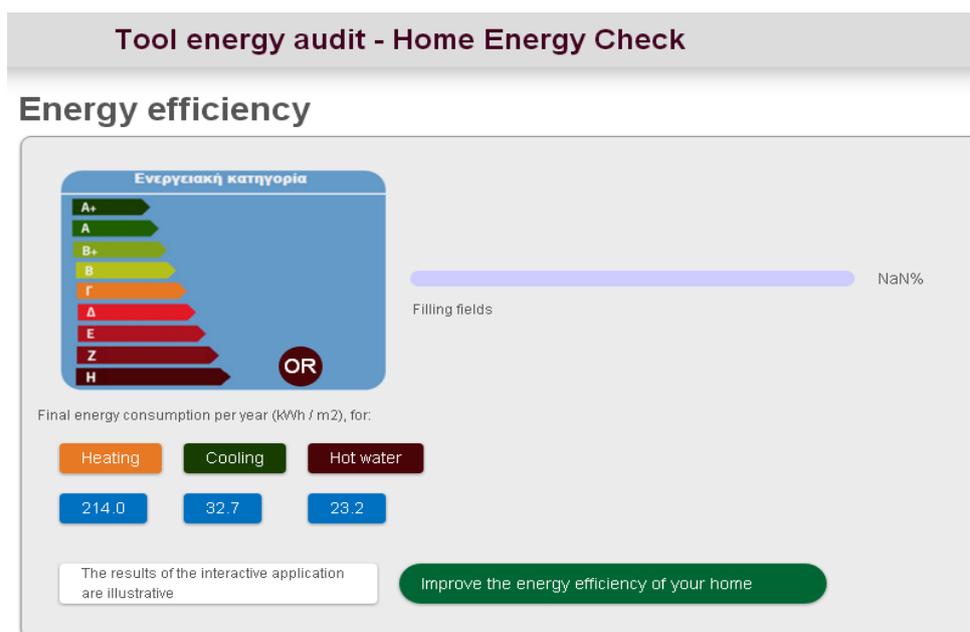


Figure 2 Current house energy consumption.

Then, improvements can be performed for the ten main fields of building systems (see Figure 3).

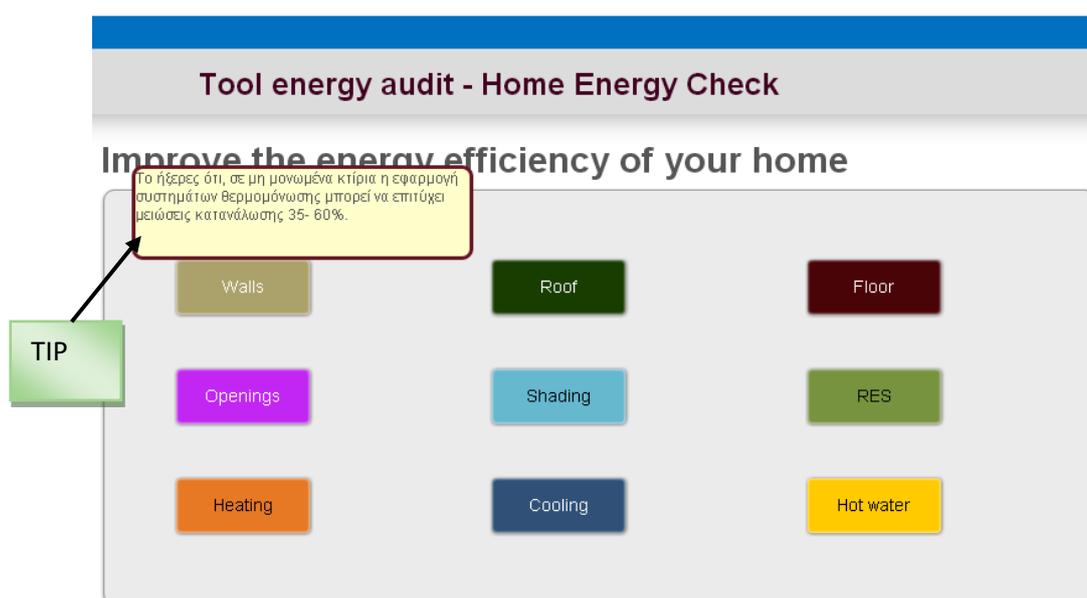


Figure 3 Improvements selection



Note however, that in the existing Greek tool, which is the basis for the master tool, the improvement measure or measures can be compared with the current energy figures of the house only once. In case someone wishes to check more options, he or she has to repeat the input values.

#### 4.3.1 Renovation recommendations

The recommendations are mainly attributed to the various selections the user is free to use according to the energy measure. The renovation recommendations will be based on the list provided by Table 1 on page 12. The detailed values for each measure are currently based on Greek tool, but may be adjusted to country specific needs in WP5.

#### 4.3.2 Comparison between existing and renovation case; and deep energy renovation checkmark

Finally, the results from the comparison between the current and energy improved case are given. Additionally, the new energy class of the house is given together with the achieved energy conservation (in %), the CO<sub>2</sub> emissions reduction (in %) and an estimation of the cost for the improvement measures tested (refer to Figure 4).

From the moment the input data are completed, an .xlm file is produced and run by the software for the energy efficiency of buildings. The software is used again to test the selected energy improvements and all results are shown in the last screen of the tool (Figure 4 and **Fehler! Verweisquelle konnte nicht gefunden werden.**).

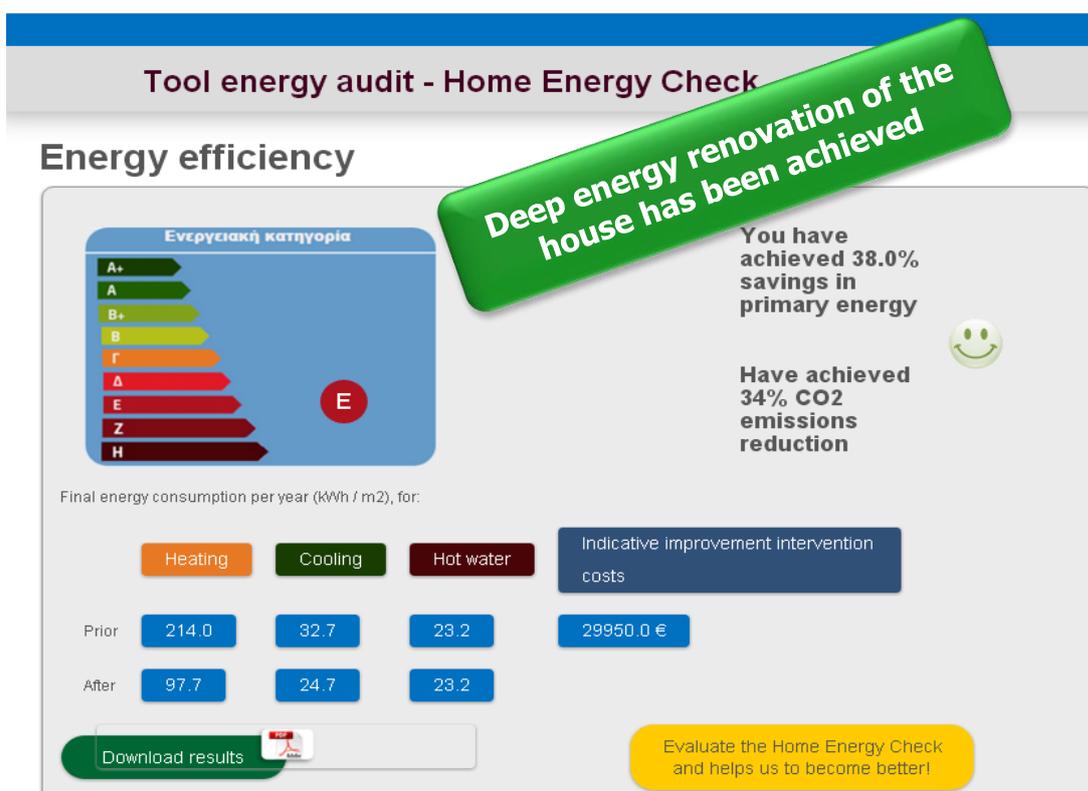


Figure 4 Comparison of results

An extra message states if Deep energy Renovation criteria have been reached (see Figure 4).



Deep energy renovation of the house/building will be achieved when fully implementing the recommendations. Or

Deep energy renovation of the house/building will not be achieved when fully implementing the recommendations. Or

Deep energy renovation of the house/building is lacking by XX%.

### Output of recommendations

In the report for the test conducted by the user, recommendations will be available regarding which energy efficiency technology should take place first and in what order (see Figure 5). The layout may be enhanced further.

The hierarchy of recommendations hierarchy will be based on construction restrictions, energy savings achieved, cost, and payback period.

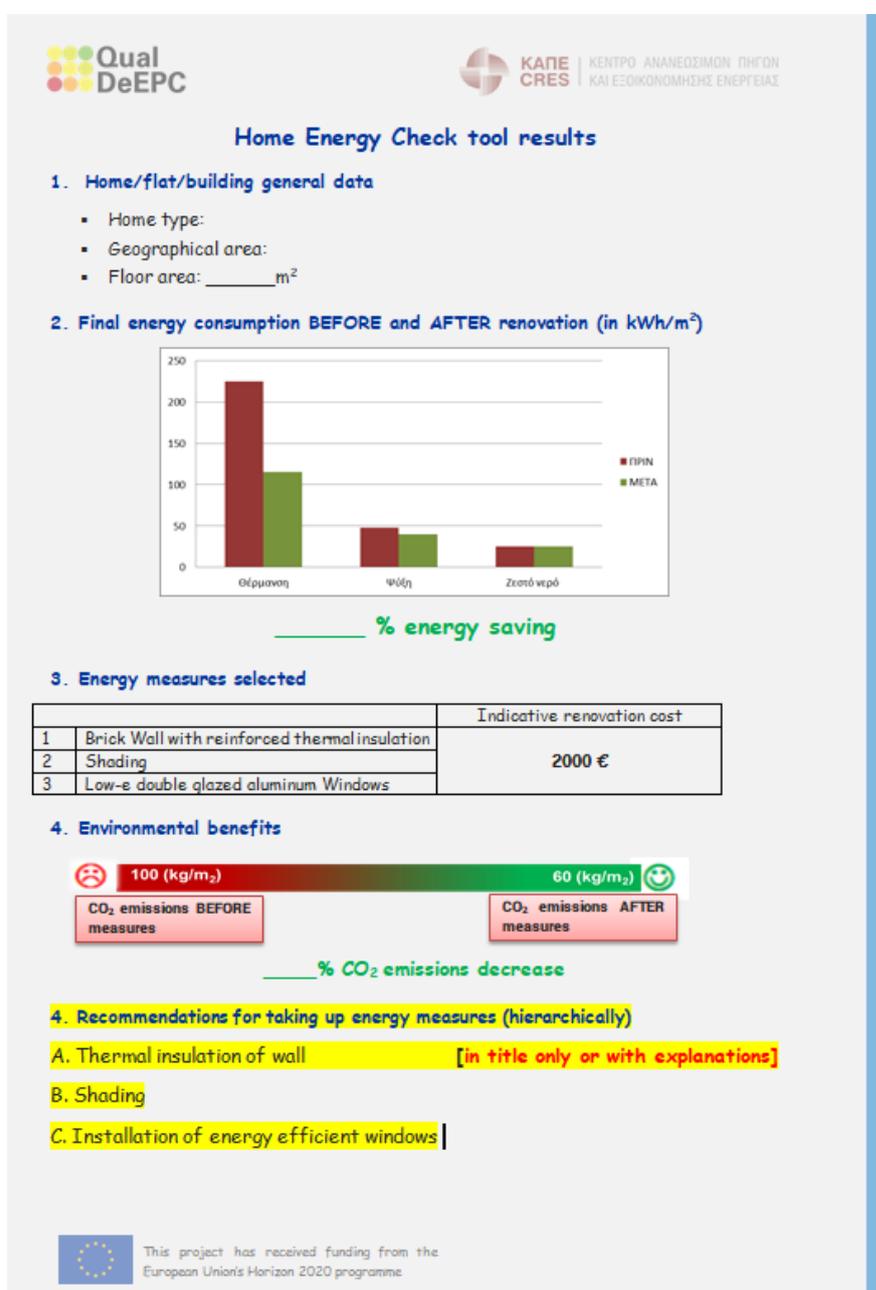


Figure 5 Tool results report layout (upgraded version)

## 5 CREATING DEEP RENOVATION NETWORK PLATFORMS

### 5.1 Objectives for developing concepts for deep renovation network platforms

The concept, or rather several differentiated concepts for Deep Renovation Network Platforms are part of the project structure within the four phases of the entire QUALDeEPC project. The basis for this task is the Development Strategy Plan created in WP2, which will be guiding the development of next-generation EPC schemes in WP3 of the QualDeEPC project.

The Development Strategy Plan sets priorities for which elements the project will develop further and towards which outcome, serving which purpose. One among seven selected priorities is the creation of Deep Renovation Network Platforms.

The main objective of Task 3.2 is creating concepts for Deep Renovation Network Platforms providing one-stop-shops (OSS) for deep renovation linked to EPCs, including administrative, energy advice, financial, and supply-side information to building owners, with active marketing of deep renovation and EPCs, and coordinating supply-side actors and supporting their marketing, training, and quality.

The developed concepts are adapted to project partner country circumstances and partners' possibilities. The basic version includes an online platform providing a one-stop-shop for information and other services for seven different topics.

Under this basic version, a minimal version is defined by the column "minimum version". It is the minimal concept that project partners would aim to implement in each of the seven countries of QualDeEPC.

The Development Strategy Plan outlined two versions – basic and extended, defined by the type of services offered, and five potential subtypes, with a combination of services and the organisation as a nation-wide online platform or a local/regional physical hub of Deep Renovation Network Platforms.

**NOTE:** A **One-Stop-Shop** should offer all the products and services that customers need. Depending on the initial situation in each sector and country, the product range for a complete solution can look very different.

In most cases, the task is to relieve the customer of research, design, or bureaucratic processes. In extended cases, the One-Stop-Shop may perform the implementation on behalf of the customer, or even provide the financing.

### 5.2 Deep renovation network platforms: versions and subtypes

#### 5.2.1 Basic platform

The basic platform will be a web platform that provides a one-stop-shop including all relevant information<sup>5</sup>. This will also either include an adaptation of the central tool to be developed in Task 3.3 or of similar existing tools, which will offer improved recommendations for residential buildings matching deep renovation standards, as a tool for both EPC assessors, building owners, and potential buyers and tenants.

If such a tool already exists in a country, it will be checked whether it can be extended to the full functionality that is required for the basic platform.

<sup>5</sup> This is equivalent to subtype 1) a. discussed in the Development Strategy Plan.



The basic platform consists of seven services/products shown and described in table Table 3 Basic part of the DRNP below. All services will be offered by the provider of the platform itself, but possibly often in co-operation with partners, particularly for the last four services. Besides, if an existing tool is connected to the service of an online renovation calculator and tool, it may be provided by a third party. The basic version of the services is shown in Table 3.

### 5.2.2 Extended platform

The project partners, supporters and other stakeholders could further enhance the basic platform depending on the current national situation and resources that can be committed. Which service elements are needed and feasible in each country will be discussed in Task 3.4 and will be analysed in detail in WP5. To the extent that partners can't be implemented in the course of the QualDeEPC project, this extended concept can be understood as a policy proposal, as outlined below.

The platform can be expanded to create a platform for suppliers to organize one-stop supply offers for renovation. Furthermore, the platform could be extended together with regional partners to become more than a website. A network of partners could provide a (virtual or even physical) hub for active marketing and connecting stakeholders, professional training and further necessary services.

The platforms can be adapted to country needs, and several services can be proposed or prepared and organised. Intended services are e.g. step-by-step guidance for deep renovation projects, or the use and linking or expansion of existing training and learning platforms to maintain specialist knowledge and sector capacities. The extended services can be found in Table 4.

### 5.2.3 Typology of platforms

A typology of such platforms could include the following **subtypes**:

#### 1. an online platform:

**1a)** an online platform including information only by a One-Stop-Shop (OSS) such as the Greek [www.energyhubforall.eu](http://www.energyhubforall.eu) .

**1b)** an online platform like the Danish BetterHome (including an OSS for information and implementation) <https://www.betterhome.today>

#### 2. a 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

**2a)** OSS hub for information only, or

**2b)** OSS hub for information and coordination (guiding/coaching through implementation), eg proKlima in Hannover (<https://www.proklima-hannover.de>) or

**2c)** OSS hub for information and implementation.

Subtypes could also be combined. For example, a combination of a 1a) national online platform and a network of several or many 2b) or even 2c) physical hubs may be best to advance deep renovation.



However, it should be noted that physical hubs involve higher costs than online-only solutions. Both types 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.

#### 5.2.4 QualDeEPC policy recommendations

Based on the above analysis and the detailed concepts presented in the following tables, QualDeEPC recommends the following actions to national and/or regional governments competent for implementing energy efficiency policies for buildings and particularly EPC schemes.

Each EU Member State should operate a combination of two types of Deep Renovation Network Platforms:

1. An online platform at the national level, including a One-Stop Shop at least for information (subtype 1a), i.e. all information services 1. to 5. of the basic version. It should also be endowed with sufficient resources to perform the two further services of the basic version: 6. Active marketing of deep renovation and its benefits and costs and 7. Network (platform) for learning, exchange and cooperation (local/regional/ national). The networking could also be expanded to interregional or international networking (service 8. of the extended platform concept).  
Out of the extended concept, services 9. Capacity building and training, 11. Monitoring the implementation of the renovation project(s), and 14. Carrying out a deep renovation demonstration project(s) could also be linked to this platform or be implemented by the operator of the platform, particularly if the operator is a national energy agency or similar.
2. A network of local or regional physical hubs with combined core funding from the national level and income from some of the services. These hubs could offer most of the services of an extended platform, including coordination of renovation projects (guiding/coaching through implementation, service 10.), which would be (subtype 2b), or even implementation (service 13.), which would be subtype 2c). They would be part of a national network within the central platform (see above) and receive technical and financial support from the national level for their information, active marketing, training, and other agreed activities.



Table 3 Basic part of the DRNP

Services/products	Description of services	Users addressed (examples)	Minimum version
<b>1. Information on renovation actions</b> <b>1.1 General information</b>	<ul style="list-style-type: none"> <li>• Providing general information and other benefits due to renovation</li> <li>• Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energies</li> <li>• descriptive texts and graphics on the website with information</li> <li>• text and graphic documents downloadable as pdf-documents</li> </ul>	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Prospective buyers</li> <li>• Tenants</li> <li>• Possibly EPC assessors</li> </ul>	General information on: <ul style="list-style-type: none"> <li>• building insulation</li> <li>• windows</li> <li>• ventilation</li> <li>• heating system</li> <li>• renewables</li> <li>• deep renovation</li> </ul>
<b>1.2 Information on potential savings and costs</b>	Providing general information on costs of renovation for deep renovations, building components, building services, renewable energy, potential energy and cost savings	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Prospective buyers</li> <li>• Tenants</li> <li>• Possibly EPC assessors</li> </ul>	Information on renovation typical costs and savings for: <ul style="list-style-type: none"> <li>• building insulation</li> <li>• windows</li> <li>• ventilation</li> <li>• heating system</li> <li>• renewables</li> </ul>
<b>1.3 Linking with renovation tools</b>	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation ( <b>QualDeEPC priority B</b> )	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Prospective buyers</li> <li>• Tenants</li> <li>• EPC assessors</li> </ul>	Integration to renovation tools or linking of existing tools in QualDeEPC partner countries.  This would be the online tool for comparing EPC recommendations to deep energy renovation recommendations developed in Task 3.3
<b>2.1 Linking with Energy Performance Certificates</b>	<ul style="list-style-type: none"> <li>• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors</li> </ul>	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Prospective buyers or tenants</li> <li>• EPC assessors</li> </ul>	Detailed information on: <ul style="list-style-type: none"> <li>• EPC in general and purposes/uses/duties</li> </ul>



Services/products	Description of services	Users addressed (examples)	Minimum version
	<ul style="list-style-type: none"> <li>Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national energy targets</li> </ul>	<ul style="list-style-type: none"> <li>Citizens</li> <li>Public authorities</li> </ul>	<ul style="list-style-type: none"> <li>EPC assessment procedure</li> <li>EPC forms and types</li> <li>Renovation recommendations</li> <li>issue energy certificates and where this is regulated</li> <li>Links to               <ul style="list-style-type: none"> <li>The online renovation calculator tool (1.3)</li> <li>The deep renovation recommendations (1.1)</li> <li>Advertising guidelines for EPCs</li> </ul> </li> </ul>
<b>2.2 Linking with building deep renovation roadmap and possibly a passport</b>	<ul style="list-style-type: none"> <li>Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap</li> <li>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)</li> </ul>	<ul style="list-style-type: none"> <li>Building owners</li> <li>Prospective buyers or tenants</li> <li>EPC assessors</li> <li>Public authorities</li> </ul>	<p>Information on building renovation roadmap and passport</p> <ul style="list-style-type: none"> <li>What is it?</li> <li>How can the EPC be a starting point?</li> <li>Benefit of the renovation roadmap and passport: why is it useful?</li> <li>Methodology of the building renovation roadmap and passport</li> <li>Links to further information about the roadmap/passport</li> <li>Energy efficiency of buildings (link to 1.1)</li> </ul> <p>Links to</p> <ul style="list-style-type: none"> <li>Links to subsidy programmes</li> <li>The online renovation calculator tool (1.3)</li> </ul>



Services/products	Description of services	Users addressed (examples)	Minimum version
<b>3. Information on building contractors/ technicians and energy-efficient-experts</b> <b>Support with finding experts and building contractors/ technicians</b>	<ul style="list-style-type: none"> <li>• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers</li> <li>• Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers</li> <li>• Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice</li> </ul>	<ul style="list-style-type: none"> <li>• Building owners</li> </ul>	<ul style="list-style-type: none"> <li>• Information regarding energy-efficient-experts, building contractors/ technicians/ installers</li> <li>• Instructions on how to find and recognise reputable and well-qualified companies (contractors/ craftsman) and what to watch out for.</li> </ul>
<b>4. Information on material or product manufacturers/ suppliers</b>	<ul style="list-style-type: none"> <li>• Provides information on product manufacturers /suppliers required for deep renovation</li> </ul>	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Building contractors/ technicians/ installer</li> </ul>	
<b>5. Information on financing opportunities for deep renovation</b>	<ul style="list-style-type: none"> <li>• Provide information about financial incentives, loans, and subsidies or third party financing</li> </ul>	Building owners	Information on existing support programs for energy-efficient buildings <ul style="list-style-type: none"> <li>• Links to subsidy programme</li> </ul>
<b>6. Active marketing of deep renovation and its benefits and costs</b>	<ul style="list-style-type: none"> <li>• 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</li> <li>• Using demonstration projects to show enhanced „quality of life through insulation and energy-saving“ by bringing together various stakeholders listed in the next column</li> </ul>	<ul style="list-style-type: none"> <li>• Building owners</li> <li>• Citizens</li> <li>• Building contractors/ technicians/ installers</li> <li>• City/Municipality</li> <li>• local housing companies</li> <li>• the social credit agencies</li> <li>• Professional buildings and developers</li> <li>• Architects</li> </ul>	<ul style="list-style-type: none"> <li>• Showing advantages of energy renovation measures and co-benefits</li> <li>• Promotion of deep renovation network platform</li> </ul> through media releases and in own events (which may be organised anyway for other purposes)



Services/products	Description of services	Users addressed (examples)	Minimum version
<b>7. Network (platform) for learning, exchange and co-operation (local/regional/ national)</b>	<ul style="list-style-type: none"> <li>• Discussing active marketing activities and involving supply-side actors, city administration, energy companies, financial institutions etc, in the media work, events, and funding</li> <li>• Discussing training needs and the organizing of training</li> </ul>	<ul style="list-style-type: none"> <li>• Building contractors/ technicians/ installers</li> <li>• City/Municipality</li> <li>• local housing companies</li> <li>• the social credit agencies</li> <li>• Professional buildings and developers</li> <li>• Architects</li> <li>• Financial institutions</li> <li>• Energy companies</li> </ul>	<ul style="list-style-type: none"> <li>• List of existing renovation platforms, involving supply-side actors, city administration, energy companies, financial institutions etc,</li> <li>• List of training providers for EPC assessors</li> <li>• Link to lists of workshops and seminars</li> </ul>

Table 4 Extended part of the DRNP

Services/products
<b>8. Network (platform) for learning, exchange and cooperation (interregional/ transnational)</b>
<b>9. Capacity building and training</b>
<b>10. Step-by-step guidance for renovation project from start to end</b>
<b>11. Monitoring the implementation of the renovation project(s)</b>
<b>12. Operating a physical network hub and information centre</b>
<b>13. Carrying out renovation project(s)</b>
<b>14. Initiation and coordinating deep renovation demonstration project(s)</b>
<b>15. Aggregation of building renovation projects</b>



## 6 REGULAR MANDATORY EPC ASSESSOR TRAINING

QualDeEPC proposes that 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. In this way, the quality of the EPCs and their renovation recommendations can be maintained and improved. Therefore, this chapter summarises the policy proposal, which will be the base for the national workshops, where more specific content can be discussed.

### 6.1 General policy proposal

#### 6.1.1 General framework

The project QualDeEPC proposes a regular, mandatory training for EPC assessors to maintain a high quality of issued EPCs. The regular training can be based on initial training, which should have a larger workload than the regular training sessions. Moreover, the workload and content of the initial training should depend on the previous qualification (University degree or secondary technical education).

The regular mandatory training might be a combination of training courses, visits to workshops or seminars, and the verification of issued EPCs. In each category, the workload for the EPC assessors should be specified on a national level.

#### 6.1.2 Training content for regular training workshops or seminars

In contrast to the initial training of the EPC issuers, the training content for regular training workshops or seminars should not contain basics on EPC issuance (this should be covered by the initial training), unless there are major changes in the basics. The regular training should rather focus on information on changes relevant to national or European Building Performance Acts, state-of-the-art technologies and particularly on deep renovation recommendations. Moreover, topics on consumer information, contract design or common mistakes, as well as errors, might be possible. Also, a regular training for specific funding programs for renovation and their technical requirements could be conducted.

#### 6.1.3 Development strategy

The general framework of a mandatory regular training and the specific training content (e.g., a possible curriculum with specific content and timetable) will be discussed in more detail with the country partners and the national stakeholders. For the white paper, the aim is to provide specific details on both topics.



## 7 HIGH USER-FRIENDLINESS OF THE EPC

EPC forms are implemented to meet the requirements set by the EPBD. On one hand, the EPCs have to include all technical aspects to show the energy performance of a building. On the other hand, the “user” of the EPC, i.e. building owners or representatives, potential buyers, and tenants, need to understand the information given on the EPC forms. Moreover, third parties such as financial advisors or real estate agents may also require specific information on the energy efficiency of a building. Hence, the EPC forms need to be highly user-friendly to successfully convey the given information to all users. In this objective, QualDeEPC puts a special focus again on the renovation recommendations and the energy savings that could be achieved.

To achieve a user-friendly EPC form, QualDeEPC firstly analysed the current forms by interviewing building owners and representatives as well as professional stakeholders. Also, the current forms were screened for best practice examples. Secondly, a long list of potential improvements was analysed considering, e.g. the availability of the specific information, implementation possibilities, and importance for different groups of users. Thirdly, an enhanced general template for the EPC form was developed as a policy proposal.

### 7.1 Summary of the analysis of EPC forms

The EPC forms in the partner countries consist of 1 to 5 pages. The shorter EPCs usually provide a 1 -2 page(s) summary and a supplementary annex with the detailed data on the building and the renovation recommendations. Other countries have a modular approach, i.e. each page is dedicated to a topic such as general building data, energy performance, renovation recommendations, etc. However, this design approach does not necessarily correspond to the amount of content provided.

The general data of the EPC itself (e.g. registry number, date of validity) and the provided building data is mostly the same in all partner countries. Two differences can be found: 1) a checkmark for achieving nearly zero energy building standard and 2) the building area used for calculations and reference. A checkmark for nZEB standard is already provided in the Bulgarian, Hungarian, and Latvian EPC form, but missing in the German, Greek, Swedish and Spanish one. For Greece and Sweden, the nZEB is indirectly conveyed with an energy class that relates to the nZEB standard. The area of the building is given as total, floor, heated/ cooled or net used area.

The energy classification of a building is provided in all EPCs with colored bars or scales, which have 6 to 12 classes. All countries provide energy usage in kWh/m<sup>2</sup>yr. However, the basis for the classification is different in every country. The energy usage is given as the final or primary energy demand or consumption or in percent of a reference building. In addition, region and climate-specific correction factors are used in some cases. Some EPCs provide reference values of typical building types. Furthermore, the classification chart in some partner countries shows a possible improved class, if a specific set of renovation recommendations are implemented.

The description of the building’s envelope and HVAC system varies among the partner countries. Only the main energy source and information on the usage of renewable energies is provided in all EPCs. Detailed information is given in EPC form itself in Spain and Sweden, in an annex in Bulgaria, Greece, Latvia and Hungary. However, the latter might not be generally understandable by the building representatives.



Renovation recommendations are stated in all EPC forms, but with differences in detail. In Germany, Hungary and Sweden the required recommendations consist of a brief description and a cost estimation, which is optional in the German and Hungarian EPC. More detail is provided in the other partner countries. Here, the approach is more systematic.

The stakeholder feedback on the current EPC forms is diverse and in some cases contradictory. The feedback represents the usage of the EPCs and their requirements. For example, financial advisors often would like more details on the renovations needed including costs without having to engage an external advisor. On the other hand, building associations prefer a simple EPC form to fulfil legal requirements. In some countries, the issue arises that there might be a competition between the EPC issuers and energy consultants.

The building representatives mostly state that the language used and presentation of the energy performance of the building is clearly shown in the EPC form. Some building owners would like some explanations on the specific terms used in the EPC form. Moreover, in most countries, there is a need for further explanation or details on the renovation recommendations.

## 7.2 Template for EPC form

Based on the analysis in section 7.1 and **Fehler! Verweisquelle konnte nicht gefunden werden.** in the complete Green paper, a template for an enhanced and more user-friendly EPC form has been developed. This form contains the following elements:

1. General data and building specification (standard requirement)
2. Energy performance and classification (standard requirement)
3. Past metered or modelled yearly total energy consumption
4. Details on building envelope and building HVAC system
5. Display of improved classifications and energy performance
6. Potential energy savings (in kWh/yr)
7. Detailed renovation recommendations by component
8. Useful combination of renovations and stepwise implementation
9. Link to Deep Renovation Network Platform including:
  - a. General information about EPC
  - b. Glossary of most important terms
  - c. Link/ information on funding programs

This proposal for a more user-friendly EPC form was developed with a view to include both the data required by the EPBD (nos. 1 and 2) and the additional data that we selected in our analysis (nos. 3 to 9). It is thus meant to be universally applicable, but will still need to be adapted to county-specific requirements and needs in WP 5. The information that either needs to be adjusted to the country-specific requirements or needs further input by the EPC issuer is marked with writing in italics.



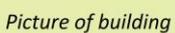
### 7.2.1 Resulting template for an enhanced and more user-friendly EPC form

## EPC form *for residential buildings*

in accordance with *Building Energy ACT XYZ*

Registry no.: 123456789	Valid until: DD/MM/YYYY	EPC type: e.g. asset rating
<i>other requirement(s), e.g nZEB standard, calculation method</i>		

Building data	
<b>Type of building</b>	<i>e.g. multi-family home,</i>
<b>Address</b>	
<b>Additional specification of building</b>	<i>e.g. nine apartments;</i>
<b>Year of construction</b>	
<b>Area</b>	
<b>Additional value</b>	



Energy classification and performance					
minValue [kWh/m <sup>2</sup> yr]	maxValue [kWh/m <sup>2</sup> yr]	Energy class	1 <sup>st</sup> value, e.g. Primary en- ergy [kWh/m <sup>2</sup> yr]	2 <sup>nd</sup> value, e.g. final energy [kWh/m <sup>2</sup> yr]	"improved value" of Main Option* [kWh/m <sup>2</sup> yr]
		A+			
		A			
		B			
		C			
		D			
		E			
		F			
		G			
		H			

\* The underlain renovation recommendations and implementation scheme for Option 1 are given on p. 3 & 4.

**Issuer**

*e.g. address, telephone no., registry no.*

**Date**

**Signature**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100



Figure 6 First page of the enhanced EPC form template



## EPC form *for residential buildings*

in accordance with *Building Energy ACT XZY*

### Details on the current energy performance of the building

Energy consumption**		measured:			modelled:		
No.	Period of measurement (from – to)	Energy source	Energy consumption for space-heating and domestic hot water (DHW) [kWh/yr]			Electricity [kWh/yr]	Other: _____
			Total	Heating	DHW		
1							
2							
3							

\*\*measured energy consumption depends on the energetic profile of building occupant, the number of occupants and weather conditions during the period of measurement; modelled energy consumption may differ from actual use

### Assessment of building envelope and technical system

Building envelope	Area [m <sup>2</sup> ]	Description or Avg. U-value [W/m <sup>2</sup> K]	Energy rating
Roof or ceiling to attic			
External walls			
Windows			
Doors/Gates			
Ground floor or floor to unheated basement			

Technical systems	Year of construction/ installation	Energy source, provided power, EU energy label	Energy rating
Heating system			
Domestic hot water			
Ventilation system			
Cooling system			
Renewable energies			
Lighting			



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100



Figure 7 Second page of the enhanced EPC form template



## EPC form *for residential buildings*

in accordance with *Building Energy ACT XYZ*

### Renovation recommendations – component evaluation

Building envelope	Recommendation	"new" avg. U-value [W/m <sup>2</sup> K]	New Energy rating	Cost effectiveness (e.g. pay-back time)	Included in Main option?
Roof or attic					<input type="checkbox"/>
External walls					<input type="checkbox"/>
Windows					<input type="checkbox"/>
Doors/Gates					<input type="checkbox"/>
Ground floor or floor to unheated basement					<input type="checkbox"/>

Technical systems	Recommendation	Energy source, provided power, EU energy label	New Energy rating	Cost effectiveness (e.g. pay-back time)	Included in Main option?
Heating system					<input type="checkbox"/>
Domestic hot water					<input type="checkbox"/>
Ventilation system					<input type="checkbox"/>
Cooling system					<input type="checkbox"/>
Renewable energies (outside of other systems)					<input type="checkbox"/>
<i>Other: e.g. Lighting</i>					<input type="checkbox"/>

Potential energy savings when the Main option is implemented:      XYZ      kWh/yr



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100



Figure 8 Third page of the enhanced EPC form template



## EPC form *for residential buildings*

in accordance with *Building Energy ACT XYZ*

### Renovation recommendations – renovation concepts

Description of useful combination of renovations and stepwise implementation for the Main option:

Option 1 meets requirements for:

Nearly zero energy buildings in case of renovation:	<input type="checkbox"/>
Air tightness:	<input type="checkbox"/>
Reduced thermal bridging:	<input type="checkbox"/>
Min. 50% RES or equivalent measures:	<input type="checkbox"/>

Description of useful combination of renovations and stepwise implementation for further renovation options not included in the Main option:

### Further information

The following link(s) provide further information on energy performance certification, use of EPCs and renovations to improve energy performance including financial assistance programmes:

- *Website A*
- *Website B*
- *Website C*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100



Figure 9 Fourth page of the enhanced EPC form template



## 8 VOLUNTARY/MANDATORY ADVERTISING GUIDELINES FOR EPCS

In all EU member states, it should be mandatory to display the energy class of the EPC and/or the energy performance included in the EPC in selling or renting advertisements, since this is required in the EPBD. However, the compliance in the markets varies (see Chapter 9 Improving compliance with the mandatory use of EPCs in real estate advertisements).

### 8.1 QualDeEPC proposal for concrete advertising guidelines for presenting EPCs in real-estate advertisements during the sale and rental of buildings

To improve the use of EPCs and energy-related EPC data for presenting them in real-estate advertisements during sale and rental of buildings, QualDeEPC has developed a proposal for advertising guidelines, and for legislation for making their use mandatory if a country wishes to do this. The drafts for both proposals are presented in the following two subsections.

#### 8.1.1 Proposal for voluntary advertising guidelines and their use

The following table shows aspects that should be considered while framing advertising guidelines for all QualDeEPC partner countries. Depending on the discussion between partners and with stakeholders and building owners, the project team may develop further universally applicable detail or tools (such as graphical and text examples of advertisements for various media) for the upcoming White paper on enhanced EPC schemes.

Table 5 Proposal for guidelines for displaying EPCs (or its contents) in real estate advertisements

Content-related guidelines	Publication-related guidelines
Specify EPC content that should be displayed across all mediums, which includes at least energy classification class, colour, and specific energy consumption (primary or final as displayed on the EPC); in some countries also CO <sub>2</sub> emissions	Provide publication parameters for displaying the EPC content such as size, colours, background, pixels, and typography.
Specify medium-specific EPC content that should be displayed in various mediums, such as print (especially small text in newspapers and magazines), digital and internet, audio-visual.	Provide softcopies of the EPC content, especially for digital media
URL to the EPC or EPC number should be provided, when possible, especially if EPCs are in public domain	Provide graphical and text examples of advertisements for various media
The entire energy label that shows the building's energy class concerning the entire spectrum of energy classification should be shown, when possible, especially in digital media	

#### 8.1.2 Proposal for legislation making their use mandatory

The following text may be included in the national legislation for making the use of concrete guidelines for display of the legally required EPC content in real-estate advertisements during sale and rental of buildings *mandatory*:

“In order to comply with these requirements, the guidelines for advertisements that are provided by the *#name of the national certification body or other authority competent for this task#* must be followed.”



## 9 IMPROVING COMPLIANCE WITH THE MANDATORY USE OF EPCS IN REAL ESTATE ADVERTISEMENTS

The compliance with the mandatory use of EPCs varies largely across the partner countries of the project. Next to specific advertising guidelines (cf. previous chapter), other instruments could be used to improve this issue.

### 9.1 Direct measures for ensuring compliance with the mandatory use of EPCs in real estate advertisements by effectively controlling and enforcing: Policy proposal and Good practice examples

A direct way of ensuring compliance is to appoint an authority that is responsible for carrying out inspections and control checks of the real estate advertisements, such as in Croatia, Cyprus, Slovakia and Sweden, and provide them with sufficient resources. Further, guidelines for compliance checking and methods of enforcement should be laid out, including the measures necessary for raising awareness for compliance and imposing penal sanctions for non-compliance. The following table describes key ways to improve compliance.

Table 6 Ways to improve compliance with the mandatory use of EPCs in real estate advertisements by effective controlling and enforcing

Way to improve compliance	Description	Good practice examples
Appointment of nodal authorities	In all member states, EPCs are randomly checked for quality control. A pragmatic way could be to appoint the same nodal authorities for compliance verification with the mandatory use of EPCs in real estate advertisements.	Ministry of Economy - market inspectorate in Croatia The National Board of Housing, Building and Planning in Sweden Ministry of Energy, Commerce, Industry and Tourism (ME-CIT) in Cyprus
Resources and competences	Adequate financial resources and manpower should be provided.	
Check advertisements for compliance	A random checking mechanism, similar to quality control of EPCs, could be adopted. This includes conducting random checks in popular real-estate portals, real-estate advertising columns/sections/pages in registered newspapers and magazines.	
Methods of enforcement (passive): raising awareness	Awareness campaigns should be conducted targeting various stakeholder groups to sensitize them regarding the mandatory use of EPCs in real-estate advertisements and appraise them of the guidelines for advertising, and penal provisions for non-compliance, such as:  Marketing and advertising departments of real-estate portals, newspapers and magazines etc. to not accept advertisements that do not adhere to mandatory guidelines Housing finance companies, banks etc. Real-estate companies, letting agencies, property management firms etc. Building owner associations etc.	



Way to improve compliance	Description	Good practice examples
Methods of enforcement (active): penal provisions	<p>Levy staged penalties for non-compliance, starting from re-sensitizing, warning, and up to monetary penalties, depending on the relative importance of the stakeholder group and their reach.</p> <p>In most of the member states, including 5 QualDeEPC countries, there are sanctions for building owners missing to obtain/present an EPC during the sale and rental of the building.</p>	<p>In Croatia, penalties are imposed when owners/brokers fail to indicate the energy class in sale advertisements published in the media, in the range of 700 EUR to 4,000 EUR. This obligation is commonly followed and no fines have been issued so far</p> <p>In Cyprus, Non-compliance has led to penalties in 22 cases. This has led to a higher rate of EPC display in advertisements</p> <p>In Ireland, non-compliance of the regulations is liable on summary conviction to a class A fine</p>

## 9.2 Controlling and enforcing the mandatory use EPCs in real estate advertisements in QualDePC partner countries: indirect compliance measures<sup>6</sup>

In most of the EU member states, and all QualDeEPC partner countries, the EPBD has been transposed, so that national law mandates that EPC be displayed in the sale or rental process of a building. This requirement to *possess* an EPC and to *present it* to potential buyers or tenants of a building or parts of it can be seen as measures indirectly supporting the compliance with the requirement to *include EPC data in advertisements*. Furthermore, procedures for verification and sanctions for non-compliance are put in place to ensure the compliance of this provision. Sanctions for building owners missing to obtain/present an EPC are in place in most countries.

Table 7 Controlling and enforcing the mandatory use EPCs in real estate advertisements in QualDePC partner countries: indirect compliance measures

	Bulgaria	Germany	Greece	Hungary	Latvia	Spain	Sweden
Sanctions for building owners missing to obtain/present an EPC are in place	Available	Available	Available	Available	Available	Available	Available
Presentation of EPCs to official building sales bodies, such as notaries, is mandatory for sales of buildings	Available	Available	Available	Available	Available	Available	Available
Existence of a public database of EPCs	Available	Available	Available	Available	Available	Available	Available
Verification of the accuracy of EPCs (quality control of EPCs)	Available	Available	Available	Available	Available	Available	Available
	Available						
	Unavailable						

<sup>6</sup> Only direct compliance measures are in the scope for improvement under the QualDeEPC project. Indirect compliance measures are provided only for information purposes, as they are related to the direct measures, and for the attention of the relevant stakeholders. It is generally recommended to provide/improve the unavailable EPC elements and are not further discussed in sections 1.2.3 and 1.2.4.



## 10 CONCLUSIONS

The *Green paper on good practice in EPC assessment, certification and use* (D3.1) initiates the discussion with stakeholders and building representatives on specific requirements and tools for enhanced EPC schemes. For the priorities identified in the *D2.4 Development Strategy Plan*, the paper evaluates the country specific situation in all partner countries, shows best practice examples and suggests cross-national measures for improvements. The major outcome at this stage are:

- A text-based list of deep energy renovation recommendations,
- The concept for the online tool development,
- The concept for a Deep Renovation Network Platform,
- A universal, enhanced user-friendly EPC form template and background on the proposed content,
- A general policy proposal for regular mandatory training, and
- A general policy proposal for advertisement guidelines and for actions to improve the compliance with the mandatory use of EPCs in real estate advertisements.

These suggested enhancements are intended to be the basis for both a discussion with stakeholders at national workshops and for their testing in WP 4. For example, the Green paper provides a universal EPC form template, including deep energy renovation recommendations, to be evaluated by the building representatives of the pilot buildings in WP 4. The feedback of the stakeholders will be processed in a feedback report on the national workshops (D3.4), and the results and feedback from the testing will be documented in a transnational comparison report (D4.4) and a summary evaluation report (D4.5). In addition, with testing results and the feedback by the building representatives and stakeholders, and with further developments by the project partners, the Green paper will be enhanced to deliverable D3.2, the *White paper on good practice in EPC assessment, certification, and use*.

Moreover, the Green paper and the White paper will be the basis for the country-specific adaptation, discussion, and to the extent possible, implementation of the developed policy proposals in WP5.



## 11 REFERENCES

Kostova, D.; Dr. Thomas, S.; Gokarakonda, S. (2020) D2.4 Development Strategy Plan for the development of next generation EPC schemes, QualDeEPC, [https://qualdeepc.eu/wp-content/uploads/2020/07/QualDeEPC\\_D2.4-Development-Strategy-plan\\_200630\\_final.pdf](https://qualdeepc.eu/wp-content/uploads/2020/07/QualDeEPC_D2.4-Development-Strategy-plan_200630_final.pdf)

