



Deliverable 5.5

QualDeEPC results and impacts report

QualDeEPC H2020 project

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Public report

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Accelerating Deep Energy Renovation”

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Table 3: Document History



ABBREVIATIONS

DNRP: Deep Network Renovation Platform

EC: European Commission

EP: European Parliament

EPBD: Energy Performance of Buildings Directive

EPC: Energy Performance Certificate

ITRE: Committee on Industry, Research and Energy

KPI: Key Performance Indicator

MS: Member States

nZEB/ZEB: (nearly) Zero Energy Building

WP: Work Package

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'énergie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

BME: Budapest University of Technology and Economics



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PUBLISHABLE SUMMARY

This Deliverable 5.5, the QualDeEPC results and impacts report, presents the results of Task 5.6: Monitoring of Results and KPIs. This task has collected information on actual implementation results and impacts achieved by the QualDeEPC project. These are mainly the outcomes from Tasks 5.2 and 5.3, but also from the policy dialogues and dissemination in WPs 5 to 7. They may concern national or regional implementation of consensus elements during the project duration, or plans for future implementation. To the extent possible, the project partners have also quantified KPIs of impact. This has been based on inputs from the partners and the respective task leaders.

The Key Performance Indicators (KPIs) have been defined in several parts:

1. KPIs as agreed in the Grant Agreement, section 2.1. These KPIs have partly been met. While the primary energy savings and investment, as well as the convergence of enhanced elements of EPC schemes have been overachieved, the KPI for independent control systems has only partly been achieved, and the one for the use of EPC databases not at all. This is due to the course of the project, during which we have shortlisted and finalised the priorities for improvement for the project. As the project priorities in the Grant Agreement are rather broad, we have finalised them also in consolidation with other sister projects working on EPCs, including the use of databases. Therefore, we have developed additional KPIs for the seven development priorities during the project duration that better reflect their achievement, as specified in point 3 here below.
2. In addition, more operational indicators, which were adopted, during Task 1.4 of the project (progress monitoring and reporting), as KPIs expected to be achieved within project duration. There are two such indicators, and both have been met.
3. Specific KPIs for the seven development priorities of the QualDeEPC project; these KPIs were also identified during the Task 1.4. We have defined minimum and bonus KPIs for the seven development priorities. The minimum KPIs, in general are to develop the priorities to a stage that they could be implemented in practice, adapted to ease their implementation, tested and discussed with all stakeholders. Generally, minimum KPIs have been achieved. Bonus KPIs have been achieved for some priorities, through adoption of policy proposals by Member States or in the EPBD recast or implementation of tools.
4. Operational performance indicators for the numbers of buildings, in which the enhanced EPC proposals and tools have been tested, as defined in WP 4 of the Grant Agreement. We have developed enhanced and standard EPCs for 98 pilot buildings in total and tested the enhanced EPCs for their effectiveness. The KPIs for operational performance of WP 4 have been met.
5. Dissemination performance indicators as agreed in the Grant Agreement, section 2.2.1. They have been divided into online dissemination, dissemination events, and publications. For online dissemination and events, the KPIs have been fully achieved. However, the KPIs for publications have partly not been met.



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1 INTRODUCTION

This Deliverable 5.5, the QualDeEPC results and impacts report, presents the results of Task 5.6: Monitoring of Results and KPIs. This task has collected information on actual implementation results and impacts achieved by the QualDeEPC project. These are mainly the outcomes from Tasks 5.2 and 5.3, but also from the policy dialogues and dissemination in WPs 5 to 7. They may concern national or regional implementation of consensus elements during the project duration, or plans for future implementation. To the extent possible, the project partners have also quantified KPIs of impact to the extent possible. This has been based on inputs from the partners and the respective task leaders.

The Key Performance Indicators (KPIs) have been defined in several parts:

1. KPIs as agreed in the Grant Agreement, section 2.1
2. Further, more operational indicators, which were adopted during Task 1.4 of the project (Progress monitoring and reporting) as KPIs expected to be achieved within project duration
3. Specific KPIs for the 7 development priorities of the QualDeEPC project; these KPIs were also identified during the Task 1.4
4. Operational performance indicators for the numbers of buildings, in which the enhanced EPC proposals and tools have been tested, as defined in WP 4 of the Grant Agreement
5. Dissemination performance indicators as agreed in the Grant Agreement, section 2.2.1

In the following chapters, these KPIs and other indicators are presented in detail, along with the respective targets, methods for assessing whether the targets have been achieved, data sources, and finally the results.



2 KPIS AS AGREED IN THE GRANT AGREEMENT

2.1 Overview Table

In this section, we report on the mandatory KPIs from the call for proposals. In the Grant Agreement, the calculation of the energy savings and investment targets during the project duration has been based on the following assumptions:

- 7 QualDeEPC partner countries and an average of 1,000 dwellings, homes, or buildings refurbished per country
- for each dwelling undergoing deep energy renovation in this project, energy consumption for heating or air-conditioning will be reduced by 6,000 kWh/year
- average incremental investment of 15,000 Euros per dwelling

Continued operation of the tools and legislative changes in the 7 QualDeEPC partner countries, and potential adoption in other EU Member States may increase these impacts by a factor of 10 within five years after the project end.

Project Performance Indicator	Quantification		Measurement unit	Monitoring
	Within project duration	5 years after project ends		
Primary energy savings triggered by the project	42	420	GWh/year	1. Pilot buildings implementing investments: <i>Partners asked pilot building owners, which measures are implemented or have concrete plans to implement</i> => <i>Partners added up the savings estimated for these measures and report to Wuppertal Institute</i> 2. <i>plus investments influenced by</i> B) Online Tool and C) Deep Renovation Network Platforms <i>Partners counted the number of visitors to the DRNP platform and the number of users of the online tool, and reported to Wuppertal Institute.</i>
Investments in sustainable energy triggered by the project	105	1,050	million EUR	Same as for energy savings/derived from them. 1. <i>For pilot buildings, this information was taken from investments or actions implemented. Partners were asked to provide the totals for the actions they included in the</i>



Project Performance Indicator	Quantification		Measurement unit	Monitoring
	Within project duration	5 years after project ends		
				<p><i>calculation of savings above.</i></p> <p>2. For the online tool/DRNP: <i>Investment numbers in the Annex I were estimated from the energy savings (previous KPI) by an average investment (EUR/(kWh/yr)). Partners were asked to provide estimates.</i></p>
Increased convergence of good quality and reliable energy performance assessment and certification and uptake and compliance with EU Directives and related standards	7	30	Enhanced elements of EPC schemes converging in the 7 countries and other EU MS altogether	Through operational KPIs evaluated in chapter 4
Increased rate of application and compliance of EPCs and independent control systems with the provisions of EU and national legislation, in a defined region	7	up to 14	EPC schemes with increased compliance and control systems: 7 countries participating in the project	Through relevant operational KPIs evaluated in chapters 4.5, 4.7, and 4.8
Increase of EPC databases for compliance checking and verification, linking with financing schemes and building stock characteristics research etc.	up to 7	up to 14	<p>Use of EPCs databases for one type of purpose in the 7 countries and other EU MS altogether: Based on the potential for national adaption.</p> <p>What has been implemented in 7 countries based on QualDeEPC policy proposals.</p> <p>And what has been the status of implementation of these policy proposals in other EU MS.</p>	Through relevant operational KPIs evaluated in chapters 4.3, 4.4, 4.5, 4.7, and 4.8

Table 4: Overview of KPIs agreed in the Grant Agreement



2.2 Results by KPI and country

In the following subsections, individual KPIs as agreed in the Grant Agreement are discussed. The KPIs and other indicators are presented in detail, along with the respective targets, methods for assessing whether the targets have been achieved, data sources, and finally the results.

2.2.1 Primary energy savings triggered by the project

The quantification for this Project Performance Indicator as agreed in the Grant Agreement and presented in Table 4 of the Grant Agreement is:

- 42 GWh/yr achieved within the project duration;
- 420 GWh/yr within 5 years after the project ends.

This was estimated based on the implementation of actions in the pilot buildings, but also actions triggered through the online tool and other elements of enhanced EPC schemes that would be implemented based on the results of the project. The primary energy savings achieved within the project duration were estimated in the following two ways, as described in the following subsections, 2.2.1.1 and 2.2.1.2.

2.2.1.1 Savings from the investments implemented in the pilot buildings from WP4

Partners consulted the building owners of the pilot buildings for which enhanced EPCs were prepared by QualDeEPC project in WP4, which renovation measures from the enhanced EPCs were implemented or have concrete plans to implement. These estimated savings are included in the primary energy savings.

2.2.1.2 Savings from the investments influenced by the tools developed by QualDeEPC

These are the priorities B) Online Tool and C) Deep Renovation Network Platforms. First, the partners counted the number of visitors to the DRNP platform and the number of users of the online tool. Then, the potential energy savings were calculated with the number of users and an estimate of how many actions (recommendations) and corresponding savings were induced by the use of the online tool. This estimate was based on evaluation reports for similar tools operated by the platform co2online in Germany. There are evaluation reports for these platforms; the 2021 edition was used as a basis (co2online, n.d.). For the purpose of this report, the ModernisierungsCheck (renovation check) and HeizCheck (heating check) were considered. Of these two, the ModernisierungsCheck is comparable to the QualDeEPC online tool. The HeizCheck is somewhat simpler and starts with a simple benchmarking of the heating energy needs of a dwelling with comparable homes. The data the user has to input on the dwelling are more limited than for the ModernisierungsCheck.

The evaluation in the report (co2online, 2021) used the data on the recommended renovations and the corresponding calculated savings and estimated investments from the number of users of the tools, which are more than 40,000 for the ModernisierungsCheck and almost 80,000 for the HeizCheck in 2021. The company also asks users if they are willing to fill an online survey three months later, which was done by few hundred users. Of these, a certain percentage said they will implement the recommendations. The corresponding savings and investments are added up to the potential savings. However, there are also other policies and measures influencing the implementation of the investments, not the least the financial incentive programmes. Therefore, co2online has estimated an attribution factor for the share of the implementation that was dominated by the use of the tools. This is



around one third of the implemented investments and savings, or 17 % of the recommended savings. As a result, the ModernisierungsCheck triggered energy savings of ca. 0.9 GWh/yr per 1,000 users, while the HeizCheck achieved ca. 0.6 GWh/yr per 1,000 users. However, these are final energy savings, not primary energy. Considering that the ModernisierungsCheck is comparable to the QualDeEPC online tool, but aiming for a conservative estimate, we apply the factor of 0.9 GWh/yr of primary energy savings per 1,000 users of the online tool. The other components of the DRNP are mostly information tools without calculations specific for the user. We did not have evaluation reports for information only platforms. As a rough estimate, we will use a savings factor equivalent to half of the above factor for the online tool, i.e., 0.45 GWh/yr per 1,000 users.

2.2.1.3 Total primary energy savings achieved during the project

The total primary energy savings achieved during the project are calculated as the sum of savings from the investments implemented in the pilot buildings and savings from the investments influenced by the tools developed by QualDeEPC as show in the Table 5.

Primary energy savings achieved during the project				
Country	Savings from investments in pilot buildings (GWh/yr)	Numbers of visitors for online tool and Deep Renovation Network Platform	Savings from tool and platform (GWh/yr)	Total Savings (GWh/yr)
Bulgaria	Zero. No renovation activities were implemented in any of the pilot buildings.	Tool and platform: 522	0.235	0.235
Germany	1.08	Tool: ca. 22,500 (Sanierungskonfigurator) Platform: 71,452 (Gebäudeforum (09.2021-02.2023), ca.48,400 (energiewechsel, 11.2022-02.2023)	64.058	65.138
Greece	Zero. No actions have been implemented during the project duration (until 15.02.2023)	Tool: 284 (counting from the release date (01.12.2021) of the upgraded version of the Home Energy Check tool) Platform: 386 (counting from the release date (10.2022) of the upgraded version of energyhubforall platform)	0.429	0.429
Hungary	0.270 GWh/yr (From renovations in 3 pilot buildings)	Tool: 650 Platform: 63,000	28.935	29.205
Latvia	0.085 GWh/yr	The website has been available online since November 2022,	-	0.085



	(One building undergoing reconstruction)	but the information on the number of visitors/users is unavailable.		
Spain	2.37 GWh/yr	Tool and platform: 1,824	0.82	3.19
Sweden	0.161 GWh/yr (Renovation and energy efficiency measures in 7 pilot buildings)	Tool: Approximately, 100 local energy advisors. Platform: The platform was recently opened.	0.09	0.251
Total	3.966		94.568	98.534

Table 5: Primary energy savings achieved during the project

Comparing these results with the quantification estimated for the Grant Agreement, we find the project realised an estimated 56.534 GWh/year more of savings than the amount quantified in the Grant Agreement during the project period.

However, almost all of these savings are calculated based on the number of visitors to the Deep Renovation Network Platform and the tool. Although our estimate for the savings per visitor are based on evidence from evaluations, their uncertainty is probably quite high. In addition, around 65 GWh/year stem from already existing platforms and tool in Germany, which were improved by the German partner dena, but only to a small extent.

Regarding possibilities for an updated quantification of this indicator for the period within 5 years after the project ends, this can't be performed now for obvious reasons. Regarding methods for assessing it in 5 years from now, it will be increasingly difficult for the pilot buildings, as the contact persons may change, and partners have no budget for doing another survey. For the savings due to the online tool and Deep Renovation Network Platform, it will be easy to collect numbers of visitors and recalculate the estimate provided in the table. Given that the savings during the project period stem from the last three to six months only, and that most of the platforms are new and may only develop their full potential in the future, it may be a conservative estimate that the savings triggered in the five years to come could be at least ten-fold those achieved during the project. These would be much more than 420 GWh/yr. However, the uncertainty around these estimates is very high.

2.2.2 Investments achieved during the project

The quantification for this Project Performance Indicator as agreed in the Grant Agreement and presented in Table 4 of the Grant Agreement is:

- 105 million EUR invested within the project duration;
- 1,050 million EUR invested within 5 years after the project ends.

This was derived from the quantification of primary energy savings using an estimate for the average incremental investment per annual kWh savings of 2.5 EUR/(kWh/yr), based on values found in literature and case studies at the time of writing the project proposal.

The investments achieved during the project duration were estimated as described in the following subsections, 2.2.2.1 and 2.2.2.2



2.2.2.1 Investments implemented in the pilot buildings from WP

For pilot buildings, investments were calculated from the measures or actions implemented based on the recommendations in the enhanced EPCs. Partners provided the totals for the actions they include in the calculation of savings.

2.2.2.2 Investments influenced by the tools developed by QualDeEPC

For online tool/DRNP, the incremental energy efficiency from tool and platform were calculated by multiplying the energy savings from tool and platform from Table 6 with a value of 3 Euro/kWh of energy saved. This value was increased from the original estimate of 2.5 Euro/kWh in the project proposal due to inflation.

2.2.2.3 Total investments achieved during the project

The total investments achieved during the project are calculated as the sum of investments implemented in the pilot buildings and the investments influenced by the tools developed by QualDeEPC as show in the Table 6.

Country	Incremental energy efficiency investments in pilot buildings (million EUR)	Incremental energy efficiency investments from tool and platform (million EUR)	Total Incremental energy efficiency Investments (million EUR)
Bulgaria	0	0.7047	0.704
Germany	2.7	192.1752	161.8
Greece	0	1.2879	0.904
Hungary	0.0682	86.805	86.805
Latvia	0.255	0	0.255
Spain	1.53	2.4624	9.572
Sweden	0.2	0.27	0.818
Total	4.753	283.705	288.458

Table 6: Investments achieved during the project

Comparing these results with the quantification estimated for the Grant Agreement, we find that the actual investment triggered in the project duration is ca. 180 million EUR higher. However, the same caveats apply as for the primary energy savings.

An updated quantification of this indicator for the period within 5 years after the project ends could use an update for the primary energy savings, and the average investment factor, adjusted by the building cost inflation index.

2.2.3 Increased convergence, uptake and compliance with EU Directives and related standards

The quantification for this Project Performance Indicator as agreed in the Grant Agreement and presented in Table 4 is:



- Seven enhanced elements of EPC schemes developed during the project converging in the seven countries and other EU MS altogether, within the project duration;
- 30 enhanced elements of EPC schemes converging in the 7 countries and other EU MS altogether, within 5 years after the project ends.

This KPI measures the increased convergence of good quality and reliable energy performance assessment and certification and uptake and compliance with EU Directives and related standards. The measure is the extent of convergence, uptake and compliance of the elements of the enhanced EPC scheme converging in the seven countries and other EU MS altogether, based on the project deliverables D5.3 and D7.1 Sustainable strategy plan (Pej & Thomas, 2022). This is related to the uptake of the seven development priorities of the QualDeEPC project, which is further discussed in Chapter 4.

All priorities were first developed in general in D3.2, and later they were adapted to the requirements in the seven countries in D5.3. In all the seven countries, the minimum KPIs for the seven development priorities have been achieved during the project duration. The minimum KPIs, in general are to develop the priorities to a stage that they could be implemented in practice in general, adapted to ease their implementation, tested and discussed with all stakeholders. For example, online tools (priority B)) and Deep Renovation Network Platforms (priority C)) were developed in all seven countries. These alone are 14 enhanced elements of EPC schemes. In some countries, partners have been able to include some priorities in the draft regulations, which will be considered for adoption and implementation in the subsequent revisions. For example, in Hungary and Germany, elements of high user-friendliness of the EPCs will be discussed in the context of the amendments to the regulations (see section 4.6). In some countries, existing tools or platforms have been upgraded. For example, Greece has upgraded their existing online tool <https://www.energyhubforall.eu/home-energy-check/>. These are further discussed in detail in chapter 4. Comparing these results with the quantification estimated for the Grant Agreement, we find that the project has been **successful** in converging some of the seven priorities of the EPC schemes developed during the project.

An updated quantification of this indicator for the period within 5 years after the project ends would need to monitor the EPC schemes of EU Member States to see if further elements have been adopted.

2.2.4 Increased rate of application, compliance and independent control systems

The quantification for this Project Performance Indicator as agreed in the Grant Agreement and presented in Table 4 is:

- Seven EPC schemes with increased compliance and control systems: seven countries participating in the project, within the project duration;
- Up to 14 EPC schemes with increased compliance and control systems in the seven countries and other EU MS altogether, within 5 years after the project ends.

This KPI measures the increased rate of application and compliance of EPCs and independent control systems with the provisions of EU and national legislation, in a defined region. The measure is the EPC schemes with increased compliance and control systems in the seven partner countries and other EU MS. This is based on the implementation of the priorities D), F) and G) of the QualDeEPC project, which are further discussed in Chapter 4. Priority D) will improve the quality of EPCs issued and thus indirectly ease the control. Priorities F) and G) aim to improve the compliance with the obligation to include energy data from the EPCs in real estate advertisements.



Similar to the section 2.2.3, all minimum KPIs, to develop the priorities to a stage that they could be implemented in practice in general, adapted to ease their implementation, tested and discussed with all stakeholders, for the priorities D), F) and G) of the QualDeEPC project were achieved during the project duration. The guidance for regular mandatory EPC assessor training on assessment and recommendations (priority D)) is presentation in the deliverable D3.2 in general and in D5.1 for the seven partner countries. This feature was already present in two countries, Latvia and Sweden. Furthermore, in Hungary the certification and regular further training of assessors is included in the draft regulation and in Germany, it will be discussed in the context of the amendment of the building regulations this year (see section 4.5). Regarding priorities F) and G), in Germany, efforts are underway to develop a website with the relevant information. In Spain, guidance in the form of leaflets was provided and brought to the attention of representatives of the regional governments. Comparing these results with the quantification estimated for the Grant Agreement, we find that the project has been **successful to some extent, but not completely** in achieving the increased compliance and control systems developed during the project. The project was dependent on implementation by national governments or administrations regarding this indicator, and this implementation could not (yet) be achieved in further cases.

An updated quantification of this indicator for the period within 5 years after the project ends would need to monitor the EPC schemes of EU Member States to see if further elements have been adopted.

2.2.5 *Increase of EPC databases for compliance checking and verification, linking with financing schemes and building stock characteristics research etc.*

The quantification for this Project Performance Indicator as agreed in the Grant Agreement and presented in Table 4 is:

- Up to seven uses of EPCs databases for one type of purpose in the seven countries and other EU MS altogether, within the project duration;
- Up to 14 uses of EPCs databases for one type of purpose in the seven countries and other EU MS altogether, within 5 years after the project ends.

This KPI is measured by the following:

1. Use of EPCs databases for one type of purpose in the seven partner countries and other EU MS altogether, based on the potential for national adaptation.
2. What has been implemented in the seven partner countries based on QualDeEPC policy proposals.
3. What has been the status of implementation of these policy proposals in other EU MS.

This could be based on the implementation of the priorities B), C), D), F) and G) of the QualDeEPC project, which are further discussed in Chapter 4. However, none of these has made a direct link or use of EPC databases in our concepts or implementation. One exception is priority D), where we recommend to examine EPCs issued by the assessors during the training, to discuss potential mistakes. However, since the project did not specifically address the use of EPC databases, we have to consider that **this KPI has not been achieved**.

An updated quantification of this indicator for the period within 5 years after the project ends would need to monitor the EPC schemes of EU Member States to see if further elements have been adopted.



3 MORE OPERATIONAL INDICATORS, WHICH COULD BE ADOPTED AS KPIS ACHIEVED WITHIN PROJECT DURATION

3.1 Overview table

The first of these two indicators has also been mentioned in the Grant Agreement (see chapter 9 ANNEX I). The second one is an additional element that emerged as a need during the work on the project.

Project Performance Indicator	Quantification (Within project duration)	Measurement unit	Monitoring
Number of elements of enhanced EPC schemes, from Table 3 (Annex I, Part B) or others identified in WP2, for which the project has developed and tested concrete proposals, routines, and tools as far as they are needed	At least 5 elements including 2 related tools	Element developed and tested (see D3.2 White Paper on good practice in EPC assessment, certification, and use (Veselá et al., 2021) and D4.5 Summary evaluation report (of testing the applicability through pilot cases) (Žogla & Gokarakonda, 2022), plus D5.3 Guidebook (Korma & Thomas, 2022))	Through operational KPIS listed in Chapter 4 (for development)
Element: Definition of deep ‘energy’ renovation	Definition proposal	Element as a policy taxonomy to be considered for adoption in part or full by the EC, and in parallel or subsequently by the MS	Definition of deep renovation in the EPBD recast and subsequent adoption of the definition by MS

Table 7: Overview of the operational indicators, which could be adopted as KPIS achieved within the project duration

3.2 Number of elements of enhanced EPC schemes

3.2.1 Definition of KPIS

This KPI is based on the number of elements of enhanced EPC schemes, from Table 3 (Annex I, Part B) of the Grant Agreement (repeated in Section 9.1 of this document) or others identified in WP2, for which the project has developed and tested concrete proposals, routines, and tools as far as they were needed. The actual measure for this KPI is the number of elements developed and tested.

3.2.2 Achievement of KPIS

Achievement: Yes

The QualDeEPC project has developed, tested, and discussed a total of seven development priorities A) to G) (see deliverables D3.2 and D4.5, plus D5.3 Guidebook). This is further discussed in the Chapter 4 Specific KPIS for the 7 development priorities of the project. Of these, the priorities B) Online Tool



and C) Deep Renovation Network Platforms are tools by themselves. In addition, there are several further related tools for the other five priorities. **This KPI has, therefore, been successfully achieved.**

3.3 Element: Definition of deep 'energy' renovation

3.3.1 Definition of KPIs

This KPI is the definition of deep energy renovation based on the experiences from the outcomes of the QualDeEPC project. The measurement is based on the element as a policy taxonomy to be considered for adoption in part or full by the EC, and in parallel or subsequently by the MS. This can be monitored by the definition of deep renovation in the EPBD recast and subsequent adoption of the definition by MS. The content for the monitoring is covered in the deliverable D3.2 White paper on good practice in EPC assessment, certification, and use.

3.3.2 Achievement of KPIs

Achievement: Yes

QualDeEPC has proposed a definition of deep energy renovation based on the country-specific definitions of nearly zero-energy buildings. The European Commission has included a proposal for the definition of deep renovation based on nearly zero-energy buildings until 1 January 2030; EPBD recast is not yet completed. **This KPI has, therefore, been successfully achieved at least at present.**



4 SPECIFIC KPIS FOR THE 7 DEVELOPMENT PRIORITIES OF THE PROJECT

These KPIS were defined by the QualDeEPC project team to enable a more specific monitoring of success in achieving outputs and outcomes (in terms of adoption of elements for enhanced EPC schemes developed by the project). Therefore, they are tailored to the seven development priorities A) to G) of the project. Table 4 provides an overview of the seven development priorities A) to G) of the project, their related KPIS, measurement units and the ways to monitor the achievement of the KPIS.

4.1 Overview table

QualDeEPC Development Priority	Related KPI	Measurement unit	Monitoring
A) Improving the EPC recommendations towards deep energy renovation	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries; tested and discussed with all stakeholders in all partner countries	Minimum target: Priority developed, tested and discussed	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries; D4.5 for testing and discussion
	Bonus 1: additional tool(s) for aiding implementation has/have been developed	Bonus 1: number of additional tools	Bonus 1: counting additional tools (partners to report to Wuppertal Institute for their countries)
	Bonus 2: requirement for EPC recommendations towards deep energy renovation adopted in at least one of the seven countries or beyond	Bonus 2: number of countries who adopted the policy proposal of EPC recommendations towards deep energy renovation	Bonus 2: checking MS legislation (processes) and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 3: principle of EPC recommendations towards deep energy renovation included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for principle of EPC recommendations towards deep energy renovation included EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast
B) Online tool for comparing EPC recommendations to deep energy	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in	Minimum target: Online tool implemented yes/no;	Minimum target: partners will provide URLs for the tool



renovation recommendations	each of the seven countries; and either new tool implemented or existing one improved		
	Bonus 1: Tool has been used by at least 1 in 100,000 inhabitants in the respective Member State by February 2023	Bonus 1: Number of users of the online tool by February 2023	Bonus 1: Partners will need to count the number of visitors to the DRNP platform and the number of users of the online tool, and report to Wuppertal Institute
	Bonus 2: adopted in at least one other country beyond QualDeEPC	Bonus 2: number of countries who adopted the online tool in a similar form	Bonus 2: Wuppertal Institute to check for other MS
	Bonus 3: recommendation for MS to operate such tools or to provide the respective contents included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for inclusion in EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast
C) Creating Deep Renovation Network Platforms (DNRPs)	Minimum target: Priority developed to a stage that it could be implemented in practice, both in general and in each of the seven countries	Minimum target: DRNP online platform developed yes/no;	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries
	Bonus 1: Deep Renovation Network Platform implemented in each of the seven countries (new Platform or improvement of existing one)	Bonus 1: DRNP online platform implemented yes/no;	Bonus 1: partners will provide URLs for the tool
	Bonus 2: policy proposal to support network of physical DRNP hubs adopted in at least one of the seven countries or beyond	Bonus 2: number of countries who adopted the policy proposal in a similar form	Bonus 2: checking MS legislation (processes) and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 3: policy proposal included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for inclusion EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast



D) Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries	Minimum target: Priority developed yes/no	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries
	Bonus 1: additional tool(s) for aiding implementation has/have been developed	Bonus 1: number of additional tools	Bonus 1: counting additional tools (partners to report to Wuppertal Institute for their countries)
	Bonus 2: training content implemented or improved by partners or others in at least one of the seven countries or beyond	Bonus 2: number of countries, in which training content is used to develop training sessions for EPC assessors	Bonus 2: checking training programmes and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 3: policy proposal adopted in at least one of the 7 countries or beyond	Bonus 3: number of countries who adopted the policy proposal in a similar form	Bonus 3: checking MS legislation (processes) and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 4: requirement for MS to mandate regular EPC assessor training or exams included in EP decision or Council general approach for EPBD recast	Bonus 4: yes/no for inclusion in EP decision or Council general approach for EPBD recast	Bonus 4: Wuppertal Institute to check EP decision or Council general approach for EPBD recast
E) High user-friendliness of the EPC	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries; tested and discussed with stakeholders in all partner countries.	Minimum target: Template for enhanced EPC was developed yes/no	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries; D4.5 for testing and discussion
	Bonus 1: additional tool(s) for aiding implementation has/have been developed	Bonus 1: number of additional tools	Bonus 1: counting additional tools (partners to report to Wuppertal Institute for their countries)
	Bonus 2: enhanced template or elements thereof has/have been adopted in at	Bonus 2: Adoption of the template or its key elements by the	Bonus 2: checking MS legislation (processes) and counting yes or no (partners to check and report to



	least one of the seven countries or beyond	partner's states or other MS: yes/no	Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 3: enhanced template or elements thereof has/have been included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for inclusion in EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast
F) Voluntary/mandatory advertising guidelines for EPCs	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries	Minimum target: Guidelines for developing or adopting good practice advertising guidelines were presented yes/no	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries
	Bonus 1: additional tool(s) for aiding implementation has/have been developed	Bonus 1: number of additional tools	Bonus 1: counting additional tools (partners to report to Wuppertal Institute for their countries)
	Bonus 2: adopted (voluntary or mandatory) in at least one more of the seven countries (Sweden already had it before) or beyond	Bonus 2: Adoption (voluntary or mandatory) of the guidelines by the partner's states or other MS: yes/no	Bonus 2: checking MS legislation (processes) and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
	Bonus 3: requirement for MS to offer voluntary or mandate the use of such advertising guidelines included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for inclusion in EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast
G) Controlling and enforcing the mandatory use of EPCs in real estate advertisements	Minimum target: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries	Minimum target: Priority developed (Guidelines to improve compliance with the mandatory use of EPCs in real estate advertisements by an effective controlling and enforcing were presented) yes/no	Minimum target: presentation in D3.2 for general; D5.1 for the seven countries



Bonus 1: additional tool(s) for aiding implementation has/have been developed	Bonus 1: number of additional tools	Bonus 1: counting additional tools (partners to report to Wuppertal Institute for their countries)
Bonus 2: one or more or elements of the scheme proposed has/have been adopted in at least one of the seven countries or beyond	Bonus 2: Adoption of one or more or elements of the scheme proposed by the partner's states or other MS: yes/no	Bonus 2: checking MS legislation (processes) and counting yes or no (partners to check and report to Wuppertal Institute for their countries; Wuppertal Institute to check for other MS)
Bonus 3: one or more or elements of the scheme proposed has/have been included in EP decision or Council general approach for EPBD recast	Bonus 3: yes/no for inclusion in EP decision or Council general approach for EPBD recast	Bonus 3: Wuppertal Institute to check EP decision or Council general approach for EPBD recast

Table 8: Overview of the KPIs for the seven development priorities of the project

4.2 Priority A) Improving the EPC recommendations towards deep energy renovation

4.2.1 Definitions of KPIs

For priority A) Improving the EPC recommendations towards deep energy renovation, a minimum target and three additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice in general, is adapted to its ease of implementation, tested and discussed with all stakeholders in the seven partner countries.
2. Bonus 1 will be achieved if additional tool(s) are developed for aiding the implementation of the priority
3. Bonus 2 will be achieved if the requirement that EPC recommendations should guide towards deep energy renovation in the enhanced EPC scheme has been adopted in at least one of the seven partner countries or beyond
4. Bonus 3 will be achieved if the principle that EPC recommendations should guide towards deep energy renovation is included in the EP decision or Council general approach for the EPBD recast

4.2.2 Achievement of the KPIs

4.2.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice in general, is adapted to its ease of implementation, tested and discussed with all stakeholders in the seven partner countries.

Achievement: Yes



The minimum target was achieved during the project duration. The EPC recommendations towards deep energy renovation and the basis for their selection based on the enhanced EPC scheme for their implementation in practice in general are presented in the deliverable D3.2. Furthermore, the general recommendations were adapted in the seven partner countries as described in the deliverable D5.3 and discussed in two rounds of workshops. Moreover, all the recommendations according to the enhanced EPC scheme were tested for their effectiveness in comparison with the recommendations according to the existing EPCs in the seven partners countries, as described in D4.5.

4.2.2.2 Bonus 1

KPI: Bonus 1 will be achieved if additional tool(s) are developed for aiding the implementation of the priority

Achievement: Yes for Spain, No for the other 6 countries.

The additional tools by the partners are listed in the Table 9 below.

Country	Additional tools developed for aiding the implementation
Spain	The recommendations include data of several potential improvements at two different levels and most data has been updated in Spain; the partner also included information of estimated cost and energy savings for the recommendations.

Table 9: KPI priority A) Bonus 1

4.2.2.3 Bonus 2

KPI: Bonus 2 will be achieved if the requirement that EPC recommendations should guide towards deep energy renovation in the enhanced EPC scheme has been adopted in at least one of the seven partner countries or beyond

Achievement: Yes

In Hungary, deep renovation recommendations have been implemented in the new draft regulation. In Sweden the building regulations are planned to be revised in 2025. After that, an adoption may be possible. In Germany, the building regulations are being revised, the contents of the developed enhanced scheme have been presented to the responsible ministries, and it will be decided in the course of this year whether parts of it will be included in the new regulation.

Beyond QualDeEPC partner countries, substantial changes have been made to EPC assessment process in the Netherlands. From 1 January 2021, EPCs will be issued based on the NTA 8800. The new process requires much more input data and provides an improved energy assessment and the building owner receives concrete and targeted recommendations to improve energy performance and comfort (RVO.nl, n.d.; Timmerman, 2020). However, we cannot claim that this was inspired or adopted entirely based on the policy recommendations developed by QualDeEPC. Nevertheless, such development in the other MS indicates that such measures are extremely useful and motivate users to take steps towards deep energy renovations. And that this priority A) of QualDeEPC is a right step in that direction.

The status of adoption of this element of the enhanced EPC scheme in the seven partner countries is described in detail in the Table 10 below.



Country	Status of adoption of the enhanced EPC scheme
Bulgaria	Information is not available
Germany	Currently, the building regulations are being revised, the contents of the developed enhanced scheme have been presented to the responsible ministries, and it will be decided in the course of this year whether parts of it will be included in the new regulation.
Greece	No further developments until the end of the project duration.
Hungary	In the new regulation draft, the deep renovation recommendations have been implemented.
Latvia	None of the developed priorities have been included in the building energy efficiency regulations.
Spain	Not yet adopted by regulation.
Sweden	The enhanced EPC scheme has not been adopted. The building regulations are planned to be revised in 2025. After that, an adoption may be possible.

Table 10: KPI priority A) Bonus 2

4.2.2.4 Bonus 3

KPI: Bonus 3 will be achieved if the principle that EPC recommendations should guide towards deep energy renovation is included in the EP decision or Council general approach for the EPBD recast

Achievement: Partly yes

The conclusive policy recommendation from D7.2 regarding the priority A) and our interpretation of its achievement, i.e., is the principle that EPC recommendations should guide towards deep energy renovation included in the EP decision or Council general approach for the EPBD recast, are described in the following.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority A) Improving the EPC recommendations towards deep energy renovation

- In Article 16 (4) or a new paragraph in Art. 16: Require Member States 1) to adapt the definition for ‘deep renovation’ and 2) to specify the renovation recommendations that must be provided on EPCs in the following way:
 - Specify that the energy efficiency levels to be recommended for different types of actions must be consistent with deep (energy) renovation leading to nZEB or ZEB standards for existing buildings, even when implemented step by step in a staged deep renovation, e.g., using the proposal for enhanced renovation recommendations (chapter 2.4.1) and traffic light system (on the enhanced EPC template presented in chapter 2.4.5) provided by QualDeEPC;
 - Clarify that in the EPC itself - 1) the EPC assessor should include all potential recommendations needed to achieve nZEB or ZEB standards for existing buildings (i.e., deep renovation according to the proposal for the EPBD recast), and 2) that the EPC assessor should clarify i) whether the recommendations are cost-effective on their own or only with financial incentives existing at the time of issuance of the EPC, and ii) whether the measures and their costs are independent of, or carried out in connection to, a major renovation of the building envelope or technical building system or systems that is scheduled anyway (meaning that cost-effectiveness of renovation will always be based on energy-related costs only, as it is already specified in the EPBD).



- Require Member States to develop a set of methods and data to assess co-benefits of building renovation and require their use in the assessment and in the presentation of cost-effectiveness or as direct co-benefits data (if not possible to monetise) on the EPC.
- In Art. 22 on independent experts: Require Member States to include all of the former into the training or examination of EPC assessors. Note: Such training or examination should be regular and mandatory (see chapter 2.4.4).

The Council general approach for EPBD recast has accepted the definition of deep energy renovation as included in the proposal by the Commission. This is based on the definition nearly zero energy buildings, which is broadly in line with the definition of deep renovation proposed by the QualDeEPC project (see texts from the Council general approach below). However, the Council did not explicitly add the principle proposed by QualDeEPC that EPC recommendations should guide towards deep energy renovation to the proposed Art. 16 (4). This may only very indirectly be concluded from the requirement to member states to report on the promotion of deep energy renovation. Recitals and articles from the Council’s general approach that are relevant to QualDeEPC proposals are shown in the Table 11 below.

Recitals, Articles or Annexes from the council general approach for EPBD	QualDeEPC interpretations
Recital 33 – “deep renovation should be defined as a renovation that transforms buildings into zero-emission buildings; in a first step, as a renovation that transforms buildings into nearly zero-energy buildings”.	These proposals are in line with QualDeEPC proposal for the ‘definition of deep energy renovation’ (Veselá et al., 2021, p. 17).
Article 2 Definitions (19) defines deep renovation as one which „transforms a building or building unit (a) before 1 January 2030, into a nearly zero-energy building; (b) as of 1 January 2030, into a zero-emission building;	
Recital 58 – “In order to ensure an effective implementation of the provisions laid down in this Directive, the Commission supports Member States through various tools, such as the Technical Support Instrument providing tailor-made technical expertise to design and implement reforms, including those aimed at increasing the annual energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations”.	QualDeEPC adopted and proposed this principle for developing EPC recommendations towards deep energy renovation (Veselá et al., 2021, p. 18).
Annex II Template for the national building renovation plans (a)	The promotion of deep energy renovation and the definition of nearly zero energy buildings for new and existing buildings are included as mandatory indicators in the template for the national building renovation plans referred to in Article 3.

Table 11: KPI priority A) Bonus 3

We consider that this bonus has partly and preliminarily been achieved for the report of the European Parliament’s ITRE committee adopted on 9 February 2023. This report adds to the proposed Art. 16 (4)



on the renovation recommendations, that these shall be “recommendations for the cost-effective improvement of the energy performance **to cost optimal level**”. Since the definition of nearly zero energy buildings shall be based on the cost optimal level, and deep (energy) renovation is defined as transforming a building into a nearly zero-energy building, this can be seen as an indirect provision that the renovation recommendations shall guide towards deep (energy) renovation.

However, this bonus achievement is preliminary, since the EP plenary vote is only scheduled for March 2023, after the end of this project. The European Council has not explicitly adopted this policy recommendation from QualDeEPC.

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

4.3.1 Definition of KPIs

For priority B) Online tool for comparing EPC recommendations to deep energy renovation recommendations, a minimum target and three additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice in general, and in each of the seven countries; either as a new tool implemented or an existing one improved
2. Bonus 1 will be achieved if the tool has been used by at least 1 in 100,000 inhabitants in the respective Member State by February 2023.
3. Bonus 2 will be achieved if the priority is adopted in at least one other country beyond QualDeEPC
4. Bonus 3 will be achieved if the recommendation for MS to operate such tools or to provide the respective contents is included in EP decision or Council general approach for the EPBD recast

4.3.2 Achievement of the KPIs

4.3.2.1 Minimum target

KPI: Priority developed to a stage that it could be implemented in practice in general and in each of the seven countries; and either new tool implemented or existing one improved.

Achievement: Yes

The minimum target was achieved during the project duration. URLs for the online tools that were implemented or enhanced by the partners are listed in the Table 12 below.

Country	URLs for the online tool
Bulgaria	https://qualrenovate.eu/bg/services-products/deep-renovation-general-info/deep-renovation-recommendations2/
Germany	https://www.sanierungskonfigurator.de/
Greece	https://www.energyhubforall.eu/home-energy-check/ https://www.buildingcert.gr/qualdeepc_tools/master_tool/



Hungary	https://renopont.hu/kalkulator (available only after registration, to be able to save the data and make different scenarios)
Latvia	https://qualrenovate.eu/lv/services-products/deep-renovation-general-info/specific-renovation-tools-and-calculators/
Spain	https://qualrenovate.eu/es/services-products/deep-renovation-general-info/deep-renovation-recommendations
Sweden	https://www.energirenovera.se/exempel/ The tool for the local energy advisors has been placed on an internal platform for all energy advisors.

Table 12: KPI priority B) Minimum target

4.3.2.2 Bonus 1

KPI: Bonus 1 will be achieved if the tool has been used by at least 1 in 100,000 inhabitants in the respective Member State by February 2023

Achievement: Yes

The number of visitors to the online tool are presented in the Table 13 below. In seven partner countries, the tool was used at least by 1 in 100,000 inhabitants. Cumulatively, the tools were used at least by 1 in 100,000 inhabitants in all the partner countries. For Latvia, due to a technical problem, the number of visitors could not be monitored.

Country	Number of visitors to the online tool	Population, 1 January 2022 (thousands)	Whether tool has been used by at least 1 in 100,000 inhabitants
Bulgaria	522	6,838.9	Yes
Germany	22,500	83,237.1	Yes
Greece	284	10,603.8	Yes
Hungary	650	9,689	Yes
Latvia	Not available	1,875.8	Not available
Spain	1,824	47,432.8	Yes
Sweden	100	10,452.3	No
Total	3766	376,600	Yes

Table 13: KPI priority B) Bonus 1

4.3.2.3 Bonus 2

KPI: Bonus 2 will be achieved if the priority is adopted in at least one other country beyond QualDeEPC.

Achievement: Yes

On April 28, 2021 Efficient Romania launched the energy efficiency calculator that helps household consumers to calculate average energy consumption for heating, hot water and cooking. It further allows the users to estimate the energy savings in their energy bills by adopting various energy conservation measures (recommendations) for renovation (România Eficientă, 2021). However, we



cannot claim that this tool was inspired or adopted based on the master tool developed by QualDeEPC. Nevertheless, the development of such tools in other MS indicates that such tools are extremely useful and motivate users to take steps towards deep energy renovations. And that this priority B) of QualDeEPC is a right step in that direction.

4.3.2.4 Bonus 3

KPI: Bonus 3 will be achieved if the recommendation for MS to operate such tools or to provide the respective contents is included in EP decision or Council general approach for the EPBD recast

Achievement: No

The conclusive policy recommendation from D7.2 regarding the priority B) and our interpretation of the achievement of the bonus 3 are described below.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority B) Online tool for comparing EPC recommendations to deep energy renovation recommendations

In Art. 26 (2) of the draft recast: Recommend to Member States to provide a high-quality energy calculation and recommendations tool for self-use, and to ensure that it is kept updated and that the renovation recommendations provided are consistent with deep renovation

Although the requirement for MS to operate “accessible and transparent advisory tools”, which already was part of the 2018 amendment of the EPBD (2018/844), is included in both the report adopted by the EP’s ITRE committee and Council general approach for EPBD recast Article 26 (2) Information, it does not explicitly include a recommendation to provide an online calculation tool. For example, Article 26 (2) of the Council general approach states that “Member States shall in particular provide information to the owners or tenants of buildings on energy performance certificates, including their purpose and objectives, on cost-effective measures and, where appropriate, financial instruments, to improve the energy performance of the building, and on replacing fossil fuel boilers with more sustainable alternatives. Member States shall provide the information through accessible and transparent advisory tools such as renovation advice and one-stop-shops”. Therefore, we interpret that the bonus 3 was not achieved so far.

4.4 Priority C) Creating Deep Renovation Network Platforms (DNRPs)

4.4.1 Definition of KPIs

For priority C) Creating Deep Renovation Network Platforms (DNRPs), a minimum target and three additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries
2. Bonus 1 will be achieved by the actual implementation of DNRP in each of the seven partner countries (new Platform or improvement of existing one)
3. Bonus 2 will be achieved, if the policy proposal to support a network of local or regional physical DRNP hubs has been adopted in at least one of the seven partner countries or beyond
4. Bonus 3 will be achieved, if the policy proposal is included in the EP decision or Council general approach for the EPBD recast



4.4.2 Achievement of the KPIs

4.4.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries

Achievement: Yes

The minimum target was achieved during the project duration. The guidance for the implementation of DRNP is presentation in the deliverable D3.2 in general and in D5.2 for the seven partner countries.

4.4.2.2 Bonus 1

KPI: Bonus 1 will be achieved by the actual implementation of DNRP in each of the seven partner countries (new Platform or improvement of existing one)

Achievement: Yes

All partner countries have implemented the DNRP. The URLs for the DRNP that were implemented or enhanced by the partners as listed in the Table 12 below.

Country	URLs for the DRNP
Bulgaria	https://qualrenovate.eu/bg/
Germany	https://www.energiwechsel.de https://www.gebaeudeforum.de/
Greece	https://www.energyhubforall.eu/
Hungary	https://renopont.hu/
Latvia	https://qualrenovate.eu/lv/home/
Spain	https://qualrenovate.eu/es/
Sweden	https://www.energirenovera.se

Table 14: KPI priority C) Bonus 1

4.4.2.3 Bonus 2

KPI: Bonus 2 will be achieved, if the policy proposal to support a network of local or regional physical DRNP hubs has been adopted in at least one of the seven partner countries or beyond

Achievement: Partly Yes

In Hungary, Spain and in Sweden, the avenues for adopting the policy proposal or existing DRNP networks are shown in the Table 15 below. These are often not only the result of QualDeEPC's policy proposal, so we assess that the bonus has only partly been achieved, although these implementations cover more than one partner country.



Country	Yes or no
Bulgaria	Information is not available
Germany	The policy proposal as such has not been adopted to date. There is technical support for such a network in the State of North Rhine-Westphalia (AltBauNeu), but it does not cover the whole state, and has existed before the QualDeEPC project.
Greece	No
Hungary	The policy proposal to support a network of physical DRNP hubs has been adopted, financed by RenoHUB project, a network of physical offices (currently 7) supporting (deep)renovations has been set up (https://renopont.hu/kapcsolat/irodaink). Business models of their sustainable maintenance is developed, but the low interest in physical meetings makes unsure the long-term survival of the offices.
Latvia	No
Spain	The Region of Castilla La Mancha created an information hub (physical hub) that provides information on energy, energy efficiency and renewable energy sources to citizens https://oficinaenergeticaclm.es/
Sweden	In Sweden, physical hubs with energy advisors are today facilitated by Regional Energy Agencies. The National Board of Housing Building and Planning are currently working on a new national platform with information on energy renovation. Here, there might be a possibility to include additional content in line with the joint concept of the DRNPs developed within QualDeEPC.

Table 15: KPI priority C) Bonus 2

We have not been able to find evidence on whether besides the partners' countries, other countries have adopted the policy proposal in a similar form

4.4.2.4 Bonus 3

KPI: Bonus 3 will be achieved, if the policy proposal is included in the EP decision or Council general approach for the EPBD recast

Achievement: Yes

The conclusive policy recommendation from D7.2 regarding the priority C) and our interpretation of its achievement, i.e., if the policy proposal is included in EP or Council position for EPBD recast, are described below.

Policy Recommendation from 'D7.2 Conclusive Policy Recommendations Guide' regarding priority C) Creating Deep Renovation Network Platforms (DNRPs)

We suggest to add to the EPBD (Art 15 (6) of the draft recast) the following provision in slightly adapted form - "These technical assistance facilities, including one-stop-shops, shall be established in the forms of both an online platform at the national level and a network of local or regional physical hubs, and be endowed with sufficient resources to actively reach out to at least 5 % of building owners each year."

Based on the report adopted by the EP's ITRE committee, we consider that this bonus has been achieved. The report includes a whole new Art. 15 a on one-stop-shops, which are required to be made



available in a very similar way to the network of local or regional physical DRNP hubs proposed by QualDeEPC.

Art. 15a (1) includes the following provisions: “Member States shall ensure that the technical assistance facilities are equally available across their territory depending on population distribution by establishing at least one one-stop-shop per region and per 45 000 inhabitants. “

and

“The Commission shall cooperate with the European Investment Bank, Member States and regions to facilitate the functioning and continuity of funding of one-stop-shops for energy efficiency in buildings until at least 31 December 2029.”

The list of services provided in Art. 15a (2) is also quite similarly comprehensive as the services included in QualDeEPC’s policy proposal, partly even for the enhanced concept. Although there is no mention of a target share of buildings to be reached each year as in QualDeEPC’s policy proposal, this Article demonstrates the political will to achieve a high impact. An additional national online information platform is not mentioned either, the requirement for Member States to cooperate with relevant regional and local authorities in the establishment of one-stop-shops “at national, regional and local levels” would in practice need to include such a national platform.

The Council’s general approach, in comparison, has not changed the Commission proposal regarding the one-stop-shops. So, these are mentioned in Art. 15 (6) of the proposal as one option to provide “technical assistance facilities”, but not further specified as in QualDeEPC’s policy proposal, and without a mentioning of nationwide coverage and sustained existence.

4.5 Priority D) Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry

4.5.1 Definition of KPIs

For priority D) Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry, a minimum target and four additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries
2. Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority
3. Bonus 2 will be achieved by the improvement or implementation of the training content by the partners or others in at least one of the seven partner countries or beyond
4. Bonus 3 will be achieved, if the policy proposal for mandatory regular EPC assessor training or exams is adopted in at least one of the seven partner countries or beyond
5. Bonus 4 will be achieved, if the requirement for MS to mandate regular EPC assessor training or exams is included in the EP decision or Council general approach for the EPBD recast



4.5.2 Achievement of the KPIs

4.5.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries.

Achievement: Yes

The minimum target was achieved during the project duration. The guidance for regular mandatory EPC assessor training on assessment and recommendations is presentation in the deliverable D3.2 in general and in D5.1 for the seven partner countries.

4.5.2.2 Bonus 1

KPI: Bonus 1 will be achieved by the development of additional tool(s) for aiding the implementation of the priority

Achievement: Yes for Hungary; No for the other six countries

In Hungary, a guidebook has been developed, which can be used for the training as soon as the new proposed regulation will be accepted. Other partner countries have not developed any additional tools for aiding the implementation of this priority. Currently, regular training or examination of EPC assessors on assessment and recommendations required for certification and registry is already mandatory in Latvia and Sweden. In Germany, certification and regular further training of assessors will be discussed in the context of the amendment of the building regulations this year.

The number of additional tools by the partners for aiding implementation of this priority are listed in the Table 16 below.

Country	Additional tools developed for aiding the implementation
Hungary	A guidebook has been developed in Hungarian for EPC assessors, which can be used for the trainings as soon as the new proposed regulation will be accepted.

Table 16: KPI priority D) Bonus 1

4.5.2.3 Bonus 2

KPI: Bonus 2 will be achieved by the improvement or implementation of the training content by the partners or others in at least one of the seven partner countries or beyond

Achievement: Yes for Hungary; No for other six countries.

In Hungary, improvements have been made to the training content, however, their implementation is pending.

Table 17 shows the partner countries in which training content is used to develop training sessions for EPC assessors

Country	Yes or No
Hungary	It is not applicable at the moment, until the new regulation comes into force.

Table 17: KPI priority D) Bonus 2



4.5.2.4 Bonus 3

KPI: Bonus 3 will be achieved, if the policy proposal for mandatory regular EPC assessor training or exams is adopted in at least one of the seven partner countries or beyond

Achievement: Yes

In Hungary, parts of the policy proposal have been included in the draft regulation. Latvia has had mandatory training and Sweden has already had regular mandatory tests for EPC assessors, before QualDeEPC recommended it. Beyond QualDeEPC, the Netherlands has instituted a mandatory annual refresher course for EPC assessors since 1 January, 2021 (installQ, n.d.).

The number of partner countries who adopted the policy proposal in a similar form

Country	Yes or No
Bulgaria	Information is not applicable
Germany	The certification and regular further training of assessors will be discussed in the context of the amendment of the building regulations this year.
Greece	No
Hungary	Parts of the policy proposal has been included in the draft regulation.
Latvia	Regular training of EPC assessors on assessment and recommendations required for certification and registry is already mandatory in Latvia
Spain	No
Sweden	Sweden already has regular mandatory tests for EPC assessors.

Table 18: KPI priority D) Bonus 3

4.5.2.5 Bonus 4

KPI: Bonus 4 will be achieved, if the requirement for MS to mandate regular EPC assessor training or exams is included in the EP decision or Council general approach for the EPBD recast

Achievement: No

The conclusive policy recommendation from D7.2 regarding the priority B) and our interpretation of its achievement are described below.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority D) Regular mandatory EPC assessor training on assessment and recommendations required for certification and registry

In Art 22, require the Member States to require *either* an initial and regular training *or* an initial and regular examination of EPC assessors as the precondition to be certified or accredited and registered as an EPC assessor. Renovation recommendations consistent with deep energy renovation should be a special focus.

This bonus has not been achieved so far. Neither the EP’s ITRE Committee nor the Council included this policy proposal from QualDeEPC in Art. 22, compared to the Commission’s proposal, which states: “Member States shall ensure that the energy performance certification of buildings, ... are carried out



in an independent manner by qualified or certified experts, whether operating in a self-employed capacity or employed by public bodies or private enterprises.”

4.6 Priority E) High user-friendliness of the EPC

4.6.1 Definition of KPIs

For priority E) High user-friendliness of the EPC, a minimum target and three additional bonus levels were defined.

- The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries
- Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority
- Bonus 2 will be achieved by the adoption of the enhanced template or elements thereof in at least one of the seven partner countries or beyond
- Bonus 3 will be achieved by the inclusion of the enhanced template or elements thereof in the EP decision or Council general approach for the EPBD recast

4.6.2 Achievement of the KPIs

4.6.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries

Achievement: Yes

The minimum target was achieved during the project duration. The guidance for designing high user-friendly EPCs and the enhanced template form is presented in the deliverable D3.2 in general and in D5.1 for the seven partner countries.

4.6.2.2 Bonus 1

KPI: Bonus 1 will be achieved by the development of additional tool(s) for aiding the implementation of the priority

Achievement: No

No additional tools were developed in any of the partner countries for aiding the implementation of this priority. In Germany, high user-friendliness of the EPC will be discussed in the context of the amendment of the building regulations this year.

4.6.2.3 Bonus 2

KPI: Bonus 2 will be achieved by the adoption of the enhanced template or elements thereof in at least one of the seven partner countries or beyond

Achievement: Yes

In Hungary, a proposal has been developed with a more detailed and user-friendly EPC template based on the QualDeEPC template. The new EPC template and database are being developed by Lechner Knowledge Center (background institute of the relevant Ministry). In Germany, elements of high user-



friendliness of the EPCs will be discussed in the context of the amendment of the building regulations this year. We could not find evidence whether the enhanced template or elements thereof were adopted in other MS, besides the QualDeEPC partner countries.

The number of partner countries who adopted the EPC template or its key elements in a similar form is presented in the following KPI priority E) Bonus 2

Country	Yes or No
Bulgaria	Information is not applicable
Germany	Elements of high user-friendliness of the EPCs will be discussed in the context of the amendment of the building regulations this year.
Greece	All proposed EPC elements are already included in the standard EPC form except: <ol style="list-style-type: none"> 1. The energy classification based on final energy 2. Energy performance evaluation of the building envelope components and the technical systems 3. The “Energy rating” indicator (traffic light system) (http://portal.tee.gr/portal/page/portal/SCIENTIFIC_WORK/GR_ENERGEIAS/kenak/files/TOTEE_20701-4_2017_TEE_1st_Edition.pdf , pages 143-144)
Hungary	In the draft proposal a more detailed user-friendly EPC template has been developed based on the QualDeEPC template. The new EPC template and database are being developed by Lechner Knowledge Center (background institute of the relevant Ministry).
Latvia	No.
Spain	Most elements were included.
Sweden	No.

Table 19: KPI priority E) Bonus 2

Besides the partners countries, we are not aware whether other MS have adopted the enhanced template or elements thereof in a similar form.

4.6.2.4 Bonus 3

KPI: Bonus 3 will be achieved by the inclusion of the enhanced template or elements thereof in the EP decision or Council general approach for the EPBD recast

Achievement: Partly Yes

The conclusive policy recommendation from D7.2 regarding the priority B) and our interpretation of its achievement are described below.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority E) High user-friendliness of the EPC

Recommendation by QualDeEPC on enhancing the European Commission proposal for the Recast of the EPBD further We recommend to add to the EPBD (Art 16 of the draft recast) the following provisions and add detail for Annex V:

- In Art. 16: Require



- additional content, including the content of the proposal on an enhanced EPC form template developed by QualDeEPC and the list of mandatory indicators and content for Annex V of the EPBD recommended here below,
- that the renovation recommendations be consistent with deep (energy) renovation in their selection and energy efficiency levels (chapter 2.4.1), and
- that possibilities for a stepwise implementation are indicated (enabling staged deep renovation).
- Particularly, add to Annex V the following mandatory indicators and content:
 - Improved classification(s), using the same scale as for the current energy class, and improved energy performance value(s) after implementing a recommended combination of renovation actions ('main option') on p. 1
 - Potential energy savings (in kWh/yr) after implementing the 'main option' on p.1
 - Details on building envelope and building HVAC system, illustrated by a traffic light system
 - Detailed renovation recommendations by component, consistent with deep (energy) renovation, illustrated by the same traffic light system
 - Useful combination of renovations and stepwise implementation – indicating possibilities for staged deep renovation
 - Link to an official online platform for further information, such as a Deep Renovation Network Platform

Based on the report adopted by the EP’s ITRE committee and the Council’s general approach, we consider that this bonus has only been achieved to a minor part.

Details of QualDeEPC proposal for priority E) High user-friendliness of the EPC	Draft from the ITRE committee or the Council’s general approach
Display of improved classification(s), using the same scale as for the current energy class, and improved energy performance value(s) after implementing a recommended combination of renovation actions ('main option') on p. 1	Neither the report adopted by the EP’s ITRE committee nor the Council’s general approach include this or a similar provision.
Potential energy savings (in kWh/yr) after implementing the 'main option' on p.1	Already the European Commission’s proposal for the EPBD recast introduced the provision to provide such an estimate, albeit not for p.1, and it is not mentioned in the template in Annex V: Article 16 Energy Performance Certificates § 5 – “The recommendations included in the energy performance certificate shall be technically feasible for the specific building and shall provide an estimate for the energy savings and the reduction of operational greenhouse gas emissions.” QualDeEPC has proposed to include potential energy savings as well as CO ₂ emission reductions in the EPC (Veselá et al., 2021, p. 61).
Potential energy savings (in kWh/yr) after implementing the 'main option' on p.1	The EP’s ITRE Committee and the Council did not change this provision in the direction of QualDeEPC’s proposal.
Details on building envelope and building HVAC system, illustrated by a traffic light system and Detailed renovation recommendations by component, consistent with deep	Neither the report adopted by the EP’s ITRE committee nor the Council’s general approach include this or a similar provision.



energy renovation, illustrated by the same traffic light system	
Useful combination of renovations and step-wise implementation – indicating possibilities for staged deep renovation	Neither the report adopted by the EP’s ITRE committee nor the Council’s general approach include this provision for all EPCs. However, in its general approach, the Council added to Art. 10 (2) on renovation passports: “Member States may decide to allow for the integration of the renovation passport into the energy performance certificate for selected purposes, including in relation to major renovation or to receiving financial support.” If Member States use this option, that will include step-wise renovation into this subset of EPCs issued.
Link to an official online platform for further information, such as a Deep Renovation Network Platform	Already the current EPBD includes a requirement for the EPC to provide an indication to further information. This would now be found in Art. 16 (7): “The energy performance certificate shall provide an indication as to where the owner or tenant can receive more detailed information, including as regards the cost-effectiveness of the recommendations made in the energy performance certificate.” Both the report adopted by the EP’s ITRE committee and the Council’s general approach retained this provision, but did not specify that there should be a link to an online platform. However, the EP’s ITRE committee report added the requirement to provide “contact details of the closest one-stop shop for renovation advice” both in Art. 16 (7) and Annex V. This is likely understood as a physical one-stop-shop, given the emphasis in the proposed new Art. 15 (a), but that is close to the physical DRNP hub proposed by QualDeEPC, as analysed above.
Include a checkmark to identify if the building achieved a nearly zero energy building standard	Article 16 (1) as amended by the Council would achieve this. “...and reference values such as minimum energy performance requirements, minimum energy performance standards, nearly zero-energy building requirements and zero-emission building requirements...”. In addition, Article 16 (2) as amended by the Council would achieve this: “...In addition Member States shall define A0 energy performance class that corresponds ⇔ ⇐ [...] ⇔ to zero-emission buildings as defined in Article 2, point (2)...”.

4.7 Priority F) Voluntary/mandatory advertising guidelines for EPCs

4.7.1 Definition of KPIs

For priority F) Voluntary/mandatory advertising guidelines for EPCs, a minimum target and three additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries



2. Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority
3. Bonus 2 will be achieved by the adoption of voluntary/mandatory advertising guidelines for EPCs in at least one of the seven partner countries or beyond
4. Bonus 3 will be achieved, if the requirement for MS to offer voluntary or mandate the use of such advertising guidelines has/have been included in the EP decision or Council general approach for the EPBD recast

4.7.2 Achievement of the KPIs

4.7.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries

Achievement: Yes

The minimum target was achieved during the project duration. The guidance for designing voluntary or mandatory advertising guidelines for EPCs is presented in the deliverable D3.2 in general and in D5.1 for the seven partner countries.

4.7.2.2 Bonus 1

KPI: Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority

Achievement: Yes

In Spain, Escan developed a guideline-leaflet and sent to the Regional Governments, and explained it at the National Workshops. Most stakeholders thought it was useful and even some leaflets were distributed to the real estate agencies. In Germany, a "step by step" assistant for real estate advertisements is currently under construction. (<https://www.bbsr-geg.bund.de/GEGPortal/DE/Energieausweise/Immobilienanzeigen/ImmoanzeigeAssistent/Assistent-node.html>).

The number of additional tools by the partners are listed in the Table 20 below.

Country	Additional tools developed for aiding the implementation
Germany	A "step by step" assistant for real estate advertisements is currently under construction. (https://www.bbsr-geg.bund.de/GEGPortal/DE/Energieausweise/Immobilienanzeigen/ImmoanzeigeAssistent/Assistent-node.html)
Spain	In Spain, Escan developed a guideline-leaflet and sent to the Regional Governments, and also explained it at the National Workshops. Some leaflets were distributed to the real estate agencies.

Table 20: KPI priority F) Bonus 1

4.7.2.3 Bonus 2

KPI: Bonus 2 will be achieved by the adoption of voluntary/mandatory advertising guidelines for EPCs in at least one of the seven partner countries or beyond

Achievement: Yes



In addition to in Sweden, where mandatory advertising guidelines are already implemented, Germany currently develops a voluntary advertising guideline for EPCs.

The following table presents the partner countries who adopted the (voluntary or mandatory) guidelines in a similar form.

Country	Yes or No
Germany	A "step by step" assistant for real estate advertisements is currently under construction. (https://www.bbsr-geg.bund.de/GEGPortal/DE/Energieausweise/Immobilienanzeigen/ImmoanzeigeAssistent/Assistent-node.html)
Sweden	Mandatory advertising guidelines are already implemented in Sweden.

Table 21: KPI priority F) Bonus 2

Besides the partners countries, we are not aware whether other MS have adopted the (voluntary or mandatory) guidelines in a similar form.

4.7.2.4 Bonus 3

KPI: Bonus 3 will be achieved, if the requirement for MS to offer voluntary or mandate the use of such advertising guidelines has/have been included in the EP decision or Council general approach for the EPBD recast

Achievement: No

The conclusive policy recommendation from D7.2 regarding the priority B) and our interpretation of its achievement are described below.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority F) Voluntary/mandatory advertising guidelines for EPCs

We suggest to add to the EPBD (Art 17 (4) of the draft recast) the following provisions:

- Require the Member States to create easy-to-use advertising guidelines, communicate the existence and usefulness of the guidelines widely and actively, and to consider making the use mandatory.

In the EPBD recast, Article 17 Issue of energy performance certificates §4 reads “Member States shall require that buildings or buildings units which are offered for sale or for rent have an energy performance certificate, and that the energy performance indicator and class of the energy performance certificate of the building or the building unit, as applicable, is stated in online and offline advertisements, including in property search portal websites.” This is the legal provision, for which the voluntary or mandatory advertising guidelines proposed by QualDeEPC would aim to support building owners in achieving compliance (Veselá et al., 2021, p. 74). However, such *additional* advertising guidelines have neither been included in the report adopted by the EP’s ITRE committee nor in the Council’s general approach. Therefore, we interpret that this bonus has not been achieved so far.



4.8 Priority G) Controlling and enforcing the mandatory use of EPCs in real estate advertisements

4.8.1 Definition of KPIs

For priority G) Controlling and enforcing the mandatory use of EPCs in real estate advertisements, a minimum target and three additional bonus levels were defined.

1. The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries
2. Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority
3. Bonus 2 will be achieved by the adoption of one or more or elements of the scheme proposed in at least one of the seven countries or beyond
4. Bonus 3 will be achieved, if one or more or elements of the scheme proposed has/have been included in the EP decision or Council general approach for the EPBD recast

4.8.2 Achievement of the KPIs

4.8.2.1 Minimum target

KPI: The minimum target is to develop the priority to a stage that it could be implemented in practice, both in general and in each of the seven partner countries

Achievement: Yes

The minimum target was achieved during the project duration. The guidance for the recommended measures to control and enforce the mandatory use of EPCs in real estate advertisements is presented in the deliverable D3.2 in general and in D5.1 for the seven partner countries.

4.8.2.2 Bonus 1

KPI: Bonus 1 will be achieved by the development of additional tool(s) for aiding implementation of the priority

Achievement: No

None of the partner countries have developed addition tools for aiding the implementation of the priority.

4.8.2.3 Bonus 2

KPI: Bonus 2 will be achieved by the adoption of one or more or elements of the scheme proposed in at least one of the seven countries or beyond

Achievement: Yes

In Greece, as of 01.01.2021, all real estate advertisements should include the energy efficiency index. A nodal authority is already appointed, a random checking mechanism, similar to quality control of EPCs and levy staged penalties for non-compliance are already in place. A body was already in place in Sweden. In Spain, the leaflets on advertising guidelines (See Table 20) were also presented to the regulators.

Table 22 shows the partner countries who adopted one or more or elements of the proposed scheme



Country	Yes or No
Greece	As of 01.01.2021, all real estate advertisements in Greece should include the energy efficiency index, nodal authority is already appointed, a random checking mechanism, similar to quality control of EPCs and levy staged penalties for non-compliance are already in place.
Spain	The leaflets were elaborated to inform about the data to be shown and included for selling and renting. These were been distributed and presented to several representatives from the regional government and real states agencies.
Sweden	Responsible body already appointed.

Table 22: KPI priority G) Bonus 2

Besides the partners countries, we are not aware whether other MS have adopted one of more of the elements of the scheme.

4.8.2.4 Bonus 3

KPI: Bonus 3 will be achieved, if one or more or elements of the scheme proposed has/have been included in the EP decision or Council general approach for the EPBD recast

Achievement: Partly Yes

The conclusive policy recommendation from D7.2 regarding the priority B) and our interpretation of its achievement are described below.

Policy Recommendation from ‘D7.2 Conclusive Policy Recommendations Guide’ regarding priority G) Controlling and enforcing the mandatory use of EPCs in real estate advertisements

Art. 17 on Issue of energy performance certificates includes a new provision in paragraph 4.: “Member States shall carry out sample checks or other controls to ensure compliance with these requirements.” Therefore, we recommend member states to add to the EPBD (Art 17 (4)) the following three further provisions:

- Explicitly **appoint a nodal authority** with sufficient resources and the mandate to perform the random checking and the following measure:
- **Raise awareness** of the duty to display EPC energy data/class in real estate advertisement, and of the advertisement guidelines (chapter 2.4.6)
- Define **staged penalties** for non-compliance.

Article 17 (4) Council general approach includes: “Member States shall carry out sample checks or other controls to ensure compliance with these requirements.”. This is in line with the second bullet point of the original QualDeEPC policy proposal. However, neither the report adopted by the EP’s ITRE committee nor the Council’s general approach include any of the other three bullet points of the QualDeEPC proposal explicitly. We consider that this bonus was achieved in minor part.



5 OPERATIONAL PERFORMANCE INDICATORS FOR THE NUMBER OF PILOT BUILDINGS

For testing the priorities on renovation recommendations and user-friendliness in the enhanced EPC, 98 pilot buildings (61 residential and 37 non-residential) were selected from seven partner countries. For all the pilot buildings, standard EPCs were prepared as per current practice, and enhanced EPCs were prepared using the enhanced EPC scheme. More details on the pilot cases and the testing results can be found in the deliverable D4.5 Summary evaluation report (Žogla & Gokarakonda, 2022).

5.1 Overview table

WP 4: Testing of pilot buildings	Related KPI	Measurement unit	Monitoring
Standard and enhanced EPCs issued for buildings	Minimum target: Standard and enhanced EPCs issued for 70 pilot buildings overall	Number of standard and enhanced EPCs issued for pilot buildings overall	Counting the number of standard and enhanced EPCs issued for pilot buildings overall
	Bonus 1: Standard and enhanced EPCs issued for 70-90 pilot buildings overall		
	Bonus 2: Standard and enhanced EPCs issued for 90-105 pilot buildings overall		
Standard and enhanced EPCs issued for buildings in each country, residential and non-residential	Minimum target: 10 standard and enhanced EPCs issued in each country, of which 5 residential and 4 non-residential	Number of standard and enhanced EPCs issued for pilot buildings in a country (total, residential, non-residential)	Counting the number of standard and enhanced EPCs issued for pilot buildings in a country (total, residential, non-residential)
	Bonus 1: 15 standard and enhanced EPCs issued in each country, of which 8 residential and seven non-residential		
	Bonus 2: more than 15 standard and enhanced EPCs issued in each country, of which more than 8 residential and more than seven non-residential		

Table 23: KPIs for the pilot buildings



5.2 Standard and enhanced EPCs issued for buildings in total

5.2.1 Definition of KPI

Minimum target for achievement of KPI is that the standard and enhanced EPCs are issued for at least 70 pilot buildings overall. Furthermore, bonus 1 and 2 are achieved if enhanced EPCs are issued for 70-90 pilot buildings overall and 90-105 pilot buildings overall, respectively.

5.2.2 Achievement of KPI

Achievement: Yes (including bonus 2)

Overall, standard and enhanced EPCs were issued for 98 pilot buildings, hence in the 90-105 pilot buildings range. This meets the requirements of achievement of KPI bonus 2.

5.3 Standard and enhanced EPCs issued for buildings in each country, residential and non-residential

5.3.1 Definition of KPI

Minimum target for achievement of KPI is that 10 standard and enhanced EPCs are issued in each country, of which five residential and four non-residential. Furthermore, bonus 1 and 2 are achieved if 15 standard and enhanced EPCs are issued in each country, of which 8 residential and 7 non-residential and if more than 15 standard and enhanced EPCs issued in each country, of which more than 8 residential and more than seven non-residential, respectively.

5.3.2 Achievement of KPI

Achievement: Yes for minimum target; partly Yes for bonus 1

The highest number of pilot buildings were selected in Germany (20). Hungary, Latvia and Spain had at least 15 pilot buildings. Bulgaria, Greece and Sweden had less than 15 pilot buildings (see Figure 1).

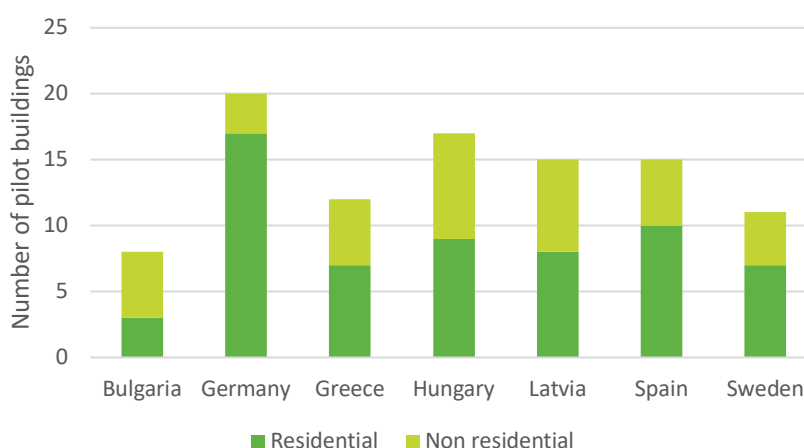


Figure 1: Pilot building selection by country and type



The total area of chosen pilot buildings was 176348 m². This means that the average area of a pilot building is 1799 m². Non-residential buildings make up 45.3% of the total pilot building area, while residential buildings make up 54.7% of the total pilot building area. The average area of non-residential pilot buildings was 2159 m², for residential buildings – 1581 m². The smallest area in pilot buildings was seen in Greece, Hungary and Germany and the largest amount of pilot building area was in Bulgaria, Spain and Latvia (see Figure 2). KPI for minimum target were achieved in five partner countries, Greece, Hungary, Latvia, Spain and Sweden. In Germany, the KPI was short of one non-residential building. Although, the KPI was not achieved in Bulgaria in terms of the number of residential and non-residential buildings, it has the largest amount of pilot building area as show in the figure below. **Overall, we consider that the minimum KPI was achieved in all the countries. Furthermore, bonus 1 was achieved in Hungary and Latvia.**

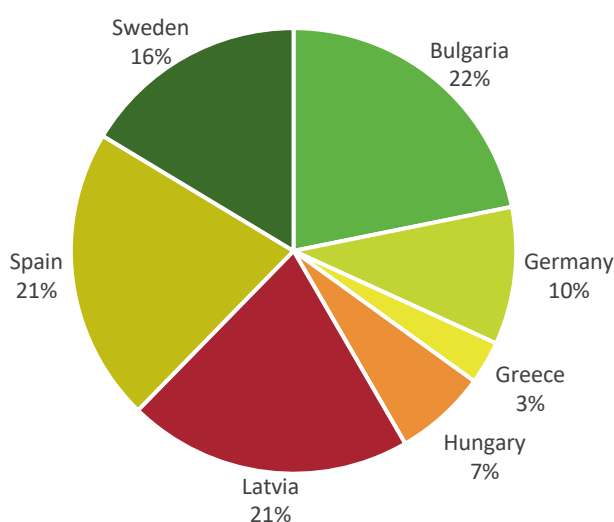


Figure 2: Percentage of area of selected pilot buildings by country



6 DISSEMINATION PERFORMANCE INDICATORS

The Grant Agreement also includes a number of dissemination performance indicators, along with respective targets. The numbers for these indicators have been tracked by the partner E-P-C and reported in Progress Reports, the Periodic Report, and will be reported in the Final Report. Table 24 below shows an overview of dissemination KPIs for the entire project, grouped under various WPs.

WP	Related KPI	Number achieved by the time of writing this report	Target achievement
WP6: Online Dissemination			
Project website visits	Poor impact: < 30,000 Good impact: 30,000 – 100,000 Excellent impact: > 100,000	57,673	Good impact
Social media followers	Poor impact: < 1,000 Good impact: 1,000 – 3,000 Excellent impact: > 3,000	1,996	Good impact
Material downloads	Poor impact: < 500 Good impact: 500 – 1,500 Excellent impact: > 1,500	1,227	Good impact
WP6: Dissemination events			
Number of participants national workshops in total	Target by M42: >350	594	Target achieved
Number of participants EU events in total	Target by M42: at least 105	295	Target achieved
Number of conference presentations	Target by M42: at least 10	23	Target achieved
WP6: Publications, journals			
Number of papers submitted (journals/conferences)	Target by M42: at least 4	2	Target not achieved
Number of articles in stakeholder journals	Target by M42: at least 10	37	Target achieved



Number of press releases	Target by M42: at least 9	12	Target achieved
Mail-outs & downloads of newsletters (per release)	Target by M42: > 200		
<ul style="list-style-type: none"> Newsletter Issue 1 	Target by M42: > 200	306	Target achieved
<ul style="list-style-type: none"> Newsletter Issue 2 	Target by M42: > 200	194	Target not achieved
<ul style="list-style-type: none"> Newsletter Issue 3 	Target by M42: > 200	220	Target achieved
<ul style="list-style-type: none"> Newsletter Issue 4 	Target by M42: > 200	113	Target not achieved
<ul style="list-style-type: none"> Newsletter Issue 5 	Target by M42: > 200	65	Target not achieved
<ul style="list-style-type: none"> Newsletter Issue 6 	Target by M42: > 200	NA	Target not achieved
Number of video channel visits	Target by M42: > 1,000	302	Target not achieved
Number of clicks (per video)	Target by M42: > 500		
Animation clip 1 – the project video	unavailable		
Animation clip 2 – QualDeEPC's 7 Priorities	unavailable		
Video – Joint EU webinar	Target by M42: > 500	183	Target not achieved
Video – EU workshop Next Generation EPCs	Target by M42: > 500	70	Target not achieved

Table 24: Dissemination KPIs for the project



7 CONCLUSIONS

This Deliverable 5.5, the QualDeEPC results and impacts report, presents the results of Task 5.6: Monitoring of Results and KPIs. This task has collected information on actual implementation results and impacts achieved by the QualDeEPC project. These are mainly the outcomes from Tasks 5.2 and 5.3, but also from the policy dialogues and dissemination in WPs 5 to 7. They may concern national or regional implementation of consensus elements during the project duration, or plans for future implementation. To the extent possible, the project partners have also quantified KPIs of impact to the extent possible.

The Key Performance Indicators (KPIs) have been defined in several parts:

1. KPIs as agreed in the Grant Agreement, section 2.1
2. Further, more operational indicators, which were adopted during Task 1.4 of the project (Progress monitoring and reporting) as KPIs expected to be achieved within project duration
3. Specific KPIs for the 7 development priorities of the QualDeEPC project; these KPIs were also identified during the Task 1.4
4. Operational performance indicators for the numbers of buildings, in which the enhanced EPC proposals and tools have been tested, as defined in WP 4 of the Grant Agreement
5. Dissemination performance indicators as agreed in the Grant Agreement, section 2.2.1

The KPIs as agreed in the Grant Agreement have been partly met. The operational indicators and operational performance indicators have been met. For specific KPIs we defined for the 7 development priorities, we have defined minimum and bonus KPIs. Minimum KPIs have been met and bonus KPIs have been partly met. Regarding dissemination performance indicators, online dissemination and events, the KPIs have been fully achieved. However, the KPIs for publications have partly not been met.



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9 ANNEX I

9.1 Table 3 Annex I, Part B: QualDeEPC’s preliminary vision of a good practice assessment and certification scheme, and what QualDeEPC could contribute to development and implementation

Assessment and Certification		
Element of EPC scheme	Development possibilities (WP 3)	Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)
<ul style="list-style-type: none"> ● Software quality and use, and input data: results should be comparable for the rating, but individual for the recommendations. ○ Comparable ratings for different assessors and buildings could be achieved either by a single, mandatory software or at least an official software (not mandatory, as in Greece) or by a certification of software solutions by multiple suppliers (as in Germany or Greece). The latter would ease linking the EPC to a full energy audit. ○ It may be possible to define realistic default values for input data (as e.g. in Hungary and Bulgaria; e.g. through building typologies by architecture, age, and sector; or for local climate, as e.g. in Germany); in other cases, rather than exact default values, certain validity ranges for input parameters would make EPCs more comparable. ● Online tool allowing to compare energy consumption and EPC recommendations to market average/typical buildings (like the tool developed in the Request2Action project by CRES, but now for all 7 countries and beyond); with recommendations pointing towards deep energy renovation and being consistent with typical elements of an individual deep renovation passport/roadmap; also a decision support tool for the owners to decide which measures to focus on when having their energy audit done. ● On-site inspection (including interview/consultation with the owner) for the assessment is very useful but entails a cost. It is mandatory in some countries (e.g., Hungary, Latvia and Sweden) but not in others. This needs analysis as to if and when a mandatory on-site inspection would be needed. ● High user-friendliness of the EPC (regarding presentation of rating and recommendations as well as potential savings and benefits) is a prerequisite for its effectiveness and market acceptance. In which aspects could it converge? 	<ul style="list-style-type: none"> ● See sub-points below ○ Tbd in WP 2 what the project could contribute in terms of enhancing assessment software to improve comparability of ratings ○ Tbd in WP 2 which defaults or validity ranges may be needed and can be developed by the project ● Develop tool (probably limited to residential buildings) ● Develop pragmatic but effective proposal for on-site inspection, and whether it should be mandatory ● Develop enhanced EPC design 	<ul style="list-style-type: none"> ● See sub-points below ○ Work with software suppliers to implement improvements developed by the project ○ Organise stakeholder discussion process on project’s proposals; ○ work with certification bodies to include consensus data in software ● Adapt and provide the tool or work with authorities who are willing to provide the tool ● Include project’s proposal in the stakeholder discussion process organised by the project (WP 5) / policy debate ● Test enhanced design with market actors (Task 4.3, Tasks 5.2, 5.5) ● Policy debate and marketing



- Advancing the renovation recommendations to become the first step towards individual buildings deep renovation passports/roadmaps, including by high quality and high energy efficiency options for recommendations included in the assessment software tools, and presenting an overview of recommendations and (if possible) savings on the first pages of the EPC, together with links for further information and financial support.
- For new buildings: evaluating and improving compliance rate with building energy performance requirements ,as built'; the enhanced scheme needs to be compatible with NZEB requirements from 2019/2021.
- Achieving a converging treatment of innovative technologies in the assessment, e.g. heat recovery ventilation, building automation and control systems, reversible heat pumps, advanced solar shading systems, as well as of renewable energy systems (cf. CA EPBD CCT 1 report) or smart readiness; only addressed in the project as far as possible)
- EPCs should be issued at a reasonable cost; e.g., can a link to BIM data reduce costs of input data generation, even without an on-site visit? Currently, costs seem to vary a lot; reasons for variation and possibilities for peer learning to be explored in the project (WP 2)
- *possibly*: generate updates of EPCs when scheme (e.g. labelling scale) is changed: best if done automatically online by the central database
- new CEN standards; EU to establish a common, modular calculation core leaving establishment of national user interfaces to MSs;
- Develop improved set of recommendations, also for the online tool
- Probably limited to residential buildings
- Develop pragmatic but effective proposal for evaluating and improving compliance rate through EPC assessment (if we find it is possible)
- Develop pragmatic but effective proposal/scheme for inclusion in enhanced assessment software
- Develop pragmatic but effective proposal for limiting EPC production cost while not compromising quality
- Develop pragmatic but effective proposal on when and how to update EPCs
- depending on progress, this will be taken into account when developing the enhanced assessment scheme, eg regarding assessment software, default values, innovative technologies etc.
- 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)
- Include project's proposal in the stakeholder discussion process organised by the project / policy debate
- Include proposal in stakeholder discussion process organised by the project (WP 5) / policy debate
- Work with software suppliers
- Include project's proposal in the stakeholder discussion process organised by the project / policy debate
- Include proposal in stakeholder discussion process / policy debate
- work with authorities involved in development of the common calculation core

Requirements for qualified experts

Element of EPC scheme	Development possibilities (WP 3)	Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)
<ul style="list-style-type: none"> • An official registry of EPC assessors is needed for credibility of the EPC scheme. 	<ul style="list-style-type: none"> • Develop pragmatic but effective proposal for an official registry of EPC assessors, including 	<ul style="list-style-type: none"> • Include proposal in stakeholder discussion process / policy debate



<ul style="list-style-type: none"> • A regular mandatory training on assessment and recommendations, including on how to avoid common mistakes, is required for being accredited and included in the registry. 	<p>qualification requirements</p> <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 (partners, other training providers)
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Independent control systems

Element of EPC scheme	Development possibilities (WP 3)	Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)
<ul style="list-style-type: none"> • Using common quality criteria 	<ul style="list-style-type: none"> • Develop pragmatic but effective proposal 	<ul style="list-style-type: none"> • Include proposal in stakeholder discussion process / policy debate
<ul style="list-style-type: none"> • Achieving sufficient sample size (cf. DG Energy guidance as reported in the publication of the CA EPBD “Compliance and Control. Overview and outcomes. August 2015”, p. 5) 	<ul style="list-style-type: none"> • <i>Presumably no need for enhancement of rules as to definition of sufficient sample size (issue has been clarified by DG Energy guidance on sample size, cf. table 1 on p. 5 of the CA EPBD publication referred to in the left column)</i> • Maybe develop guidance on how to sample and achieve sufficient size 	<ul style="list-style-type: none"> • Work with verification bodies
<ul style="list-style-type: none"> • Performing quality control of both EPCs (random sample – compliance with quality criteria overall) and experts 	<ul style="list-style-type: none"> • Development needs to be assessed in WP 2, 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
<ul style="list-style-type: none"> • <i>Further points, for which the project has the following possibilities:</i> 	<ul style="list-style-type: none"> • Develop pragmatic but effective proposal (cf. detail for each point) 	<ul style="list-style-type: none"> • Include proposal in stakeholder discussion process / policy debate
<ul style="list-style-type: none"> • Performing automatic validity/quality check during assessment and/or during upload to EPC database for all EPCs, e.g. through automatic online register to fill in the EPC characteristics and an integrated tool checking these => QualDeEPC could 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"> • Achieving combined with C or C* level control according to EPBD for the sample (C including full check of input data, calculation results, and recommendations; C* with additional check through on-site visit if C level has shown major deviations) => QualDeEPC could develop a concrete proposal on which level to aim for 		
<ul style="list-style-type: none"> • Reporting errors or faulty procedures in a central database to create statistics of common mistakes, and identify assessors with high error rates => QualDeEPC could develop a concrete proposal for the content and processes of such a database 		
<ul style="list-style-type: none"> • Creating staged sanctions for EPC issuers in case of poor quality assessments or recommendations: obligation to produce correct EPC (and control that it happens), fines, and withdrawal of accreditation; 		



distinguish between fraud and negligence

=> QualDeEPC could develop a concrete proposal for such staged sanctions, distinguishing between fraud and negligence

- Also, sanctions for building owners missing to obtain / present an EPC, or combined with rewards for compliance; and creating market demand/pressure for presenting an EPC (which should be of high quality)
=> QualDeEPC could develop a concrete proposal for such sanctions or rewards, and how to creating market demand/pressure for presenting an EPC

Use of EPC data, including in wider buildings-related databases

Element of EPC scheme	Development possibilities (WP 3)	Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)
<ul style="list-style-type: none"> • Advertisement guidelines issued by energy agencies/public authorities • <i>Further points, for which the project has the following possibilities (sometimes adapted to MS needs):</i> • How can the legal requirement to present EPC or at least the value in advertisements be controlled and enforced? Possibilities, also for peer learning, to be explored in the project => QualDeEPC could develop a concrete proposal for routines of control and enforcement, including sanctions (see above), building on existing good practice • Creating and maintaining a public database (protecting privacy) of EPC ratings and if possible, also including recommendations (extent of information depending on national legislative framework) => QualDeEPC could develop a concrete proposal of the contents, organisation/institutional setup, and processes for such a database), building on existing good practice • To be investigated: linking EPC database to other buildings- or energy-related databases, e.g. on green certificates => QualDeEPC could develop concrete national proposals for such linking • Make requesting the EPC by notaries mandatory for sales of buildings or parts thereof, as in Greece or Hungary (inclusion in sales contract) => QualDeEPC could develop a concrete proposal for this (however not legal text) 	<ul style="list-style-type: none"> • Develop proposal for guidelines and their use; develop towards actual set of voluntary guidelines • Develop pragmatic but effective proposal (cf. detail for each point) 	<ul style="list-style-type: none"> • Publish and advertise as voluntary guidelines • Include proposal in stakeholder discussion process / policy debate • Include proposal in stakeholder discussion process / policy debate

Linking Certification to energy audits, integrating individual buildings deep renovation roadmaps, financial incentives to implement recommendations from energy audits and/or deep renovation roadmaps

Element of EPC scheme	Development possibilities (WP 3)	Implementation (stimulating and enabling roll-out and convergence: WP 5, also WP 6 and 7)
<ul style="list-style-type: none"> • <i>Points, for which the project has the following possibilities (sometimes adapted to MS needs):</i> • Linking EPCs and renovation recommendations to detailed energy audits if possible, as is already the case e.g. in Latvia and Bulgaria; a problem can be ownership of the EPC data model => QualDeEPC could develop concrete national proposals for such linking • Monitoring implementation of recommendations given in the EPCs (easy if EPC is linked with financial incentive/financing schemes, see next point; needs investigation how it could be done without such schemes) => QualDeEPC could develop concrete national proposals for such monitoring • Making asset rating EPCs before and after renovation mandatory for financial incentive/financing schemes, as e.g. in Bulgaria, Greece, Hungary, and Latvia 	<ul style="list-style-type: none"> • Develop pragmatic but effective proposal (cf. detail for each point) 	<ul style="list-style-type: none"> • Include proposal in stakeholder discussion process / policy debate



=> QualDeEPC could develop concrete national proposals for such linking of EPCs to financing incentive/financing schemes

- Creating Deep Renovation Network Platforms providing one-stop-shops 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 EPC, and coordinating supply-side actors and supporting their marketing, training, and quality.
- Develop general concept and adaptation to MS circumstances and partners' possibilities; minimum = online platform providing one-stop-shop for information
- 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

