D4.5 Summary evaluation report

QualDeEPC H2020 project

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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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

BME: Budapest University of Technology and Economics

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PUBLISHABLE SUMMARY

To achieve the EU's energy efficiency targets, both the rate of building energy renovation and its depth, i.e. the amount of energy savings post renovation need to be improved. QualDeEPC, funded under the EU's Horizon 2020 programme, aims to develop high-quality energy performance assessment and certification in Europe that accelerates deep energy renovation.

Following EU-wide review of existing EPC schemes, and extensive stakeholder discussions in the seven partner countries, QualDeEPC developed an enhanced EPC scheme by improving seven elements of existing EPC schemes and tested their applicability and convergence potential for their EU-wide uptake. A detailed analysis of the EPC schemes in the partner countries and the EU was conducted (Gokarakonda, Venjakob, et al., 2020) and gaps, shortcomings (Gokarakonda, Thomas, et al., 2020) and best practices (Kostova, Gokarakonda, et al., 2020) were identified, and also based on the national stakeholder workshops, QualDeEPC chose seven priorities for improvement in the proposed enhanced EPC scheme (Kostova, Thomas, et al., 2020; Thomas et al., 2021).

A.	Improving the recommendations for renovation, which are provided on the EPCs, towards deep energy renovation.
B.	An online tool for comparing EPC recommendations with deep energy renovation recommendations.
C.	Creating Deep Renovation Network Platforms (One-Stop Shops plus networking and joint communication of supply-side actors).
D.	Regular mandatory EPC assessor training (on assessment and renovation recommendations) required for certification/ accreditation and registry.
E.	Achieving a high user-friendliness of the EPC.
F.	Voluntary/mandatory advertising guidelines for EPCs.
G.	Improving compliance with the mandatory use of EPCs in real estate advertisements.

Table 4: Seven priorities for improvement in the proposed enhanced EPC scheme

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. Three further priorities – Online tool, Deep Renovation Network Platforms, and Advertisement Guidelines – were tested by means of a questionnaire to building owners and other stakeholders.

The results show significant potential for improvement in the existing EPCs and convergence between various member states. In most countries, the number of recommendations and their ambition increased in the enhanced EPCs that provide a clear list of options, and almost 50% of energy savings potential were suggested in the enhanced EPCs. The total energy savings potential in the 98 pilot buildings was found to be 18,3 GWh per year. The building representatives found a proposed feature called 'traffic light system' that classified the efficiency of building envelope and technical systems, and the information on energy and cost savings to be informative. Key barriers for EU-wide convergence include the differences between the minimum legal requirements, and the inputs, outputs and calculation procedure in the national calculation tools that make it difficult to present comparable information between various countries.

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INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in all 7 project partner countries where WP4 was performed:

1. Bulgaria;
2. Germany;
3. Greece;
4. Hungary;
5. Latvia;
6. Spain;
7. Sweden.

For each country a separate report on National summary evaluation on WP4 has been created. These reports are considered as a part of this Summary evaluation report.

A part of this report is the Transnational comparison of pilot cases (D4.4). In the Transnational comparison of pilot cases a more detailed comparison of pilot cases can be found.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report presents some main characteristics of the selected pilot projects.

Pilot cases were identified based on consultations with facility managers/building owners and through well-established project partners' local networks.

Pilot cases were selected on the basis of fair and transparent criteria:

- Commitment – pilot cases stakeholders have to commit to complete a feedback questionnaire on the assessment and certification scheme and to publish project data (confidentiality issues are considered)
- Availability – of input data (energy consumption data, technical drawings, information about building system, etc.)
- Coverage – in general the pilot cases cover different building uses and types in each target country (with different climates). For each country, a total of 10 to 15 buildings were to be selected for testing as pilot cases. Of these, 5 to 8 have to be residential buildings and 4 to 7 non-residential buildings (such as offices, education buildings, supermarkets and shopping centers).
- Interest from public institutions/stakeholders and public visibility of the building.

A list of pilot building selection criteria was developed and is shown in the table below.

Table 5: Pilot building selection criteria

Parameter	Description
Aim	Choose pilot buildings where a standard EPC and Enhanced EPC will be issued
Amount of residential buildings to be chosen as pilot buildings	Optimal amount – 8 Minimal amount – 5
Amount of non-residential buildings to be chosen as pilot buildings	Optimal amount – 7 Minimal amount – 4
Size of pilot buildings – heated area of the buildings	• Preferably more than 50 m^2 for single family buildings • Preferably more than 400 m^2 for apartments buildings • Preferably more than 250 m^2 for non-residential buildings
Commitment of the pilot buildings	Pilot building stakeholders (owners/building managers or other involved persons) have to commit (1) to complete a feedback questionnaire on the assessment and certification scheme and (2) to publish project data
Availability of input data	Pilot buildings should have metered energy consumption data according to national specifics of how often data are gathered.
Building inspection	Pilot building has to agree to perform building inspection
State of the pilot buildings	Pilot buildings should be buildings which can undergo deep renovation
Interest from public institutions/stakeholders	The pilot building in ideal case should be as close as possible to areas with large amount of people going by
Who to inform about possibility to apply as a pilot building	Anyone who you feel is needed
Time frame for choosing Pilot buildings	February 2020

Parameter	Description
Time frame for issuing EPCs	• Standard EPC – till August 2020 • Enhanced EPC – till December 2020

More information on pilot building selection can be found in report D4.1 Pilot project selection report.

During the pilot building selection process, all of the project partner countries used their own methods to communicate to potential pilot building representatives.

In the end, in the 7 project partner countries 98 pilot buildings were chosen.

Table 6: Amount of selected pilot buildings

Country	Pilot buildings		
	Total	Residential	Non-residential
Bulgaria	8	3	5
Germany	20	17	3
Greece	12	7	5
Hungary	17	9	8
Latvia	15	8	7
Spain	15	10	5
Sweden	11	7	4
Total	**98**	**61**	**37**

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.

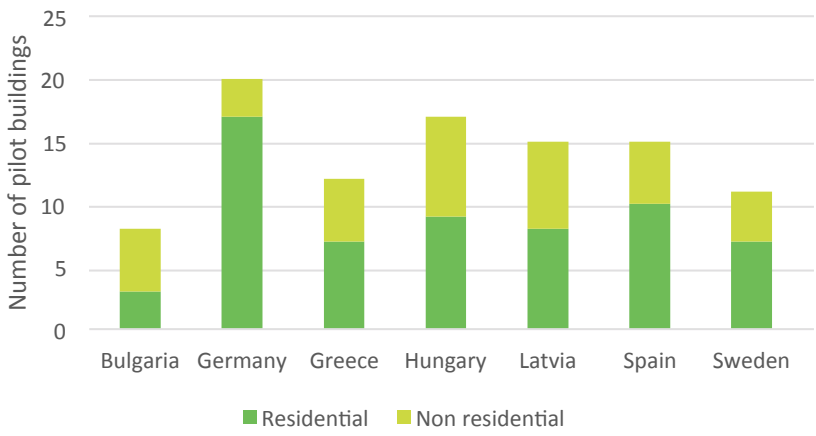

Figure 1: Selected pilot building by country and by type (amount)

Most of the pilot buildings were residential (61), and the others were non-residential (37). 62% of all pilot buildings were residential and 38% were made up of different types of non residential buildings.

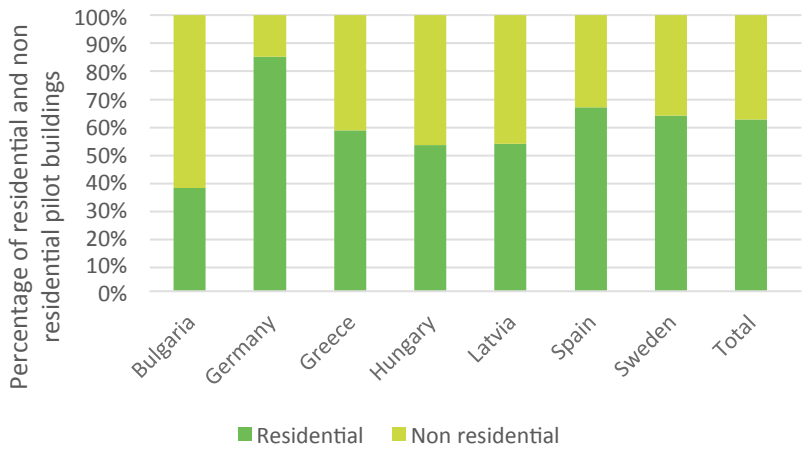

Figure 2: Selected pilot building by country and by type (percentage)

The year of construction of the chosen pilot buildings can be seen in histogram shown in Figure 3.

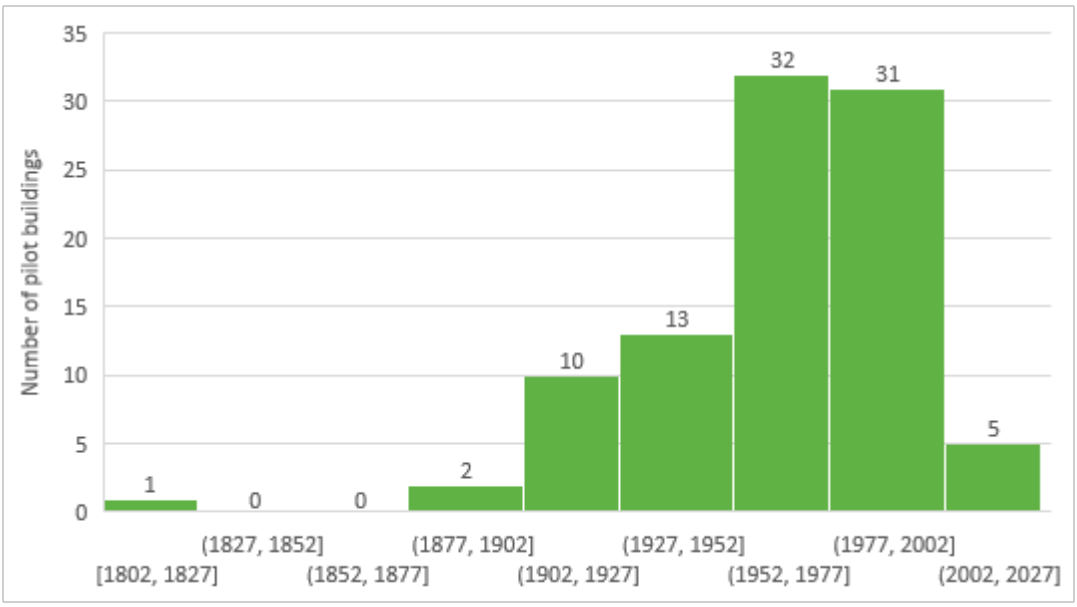

Figure 3: Number of pilot buildings by year of construction

As can be seen in the histogram, most of the pilot buildings were built between 1952 and 2002 (63 pilot buildings). Other periods of building construction have been represented less often. An outlier can be seen where one of the pilot buildings was built in 1802. This is a non-residential building situated in Latvia. This building was primarily chosen as pilot building in order to test the applicability of project results for non-standard buildings.

The total area of chosen pilot buildings was 176’348 m^2. This means that the average area of a pilot building is 1799 m^2.

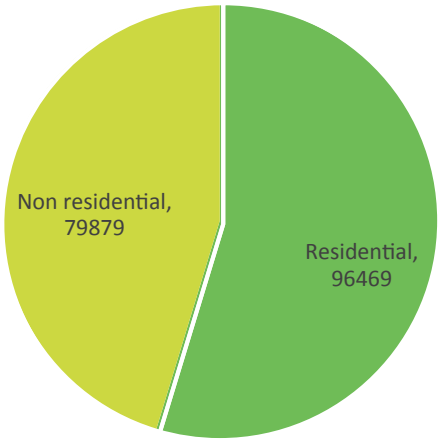

Figure 4: Area [m^2] of selected pilot buildings

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 m^2, for residential buildings – 1581 m^2.

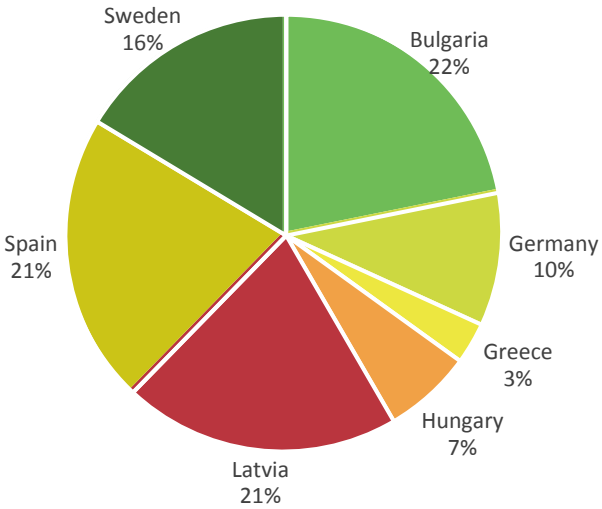

Figure 5: Percentage of area of selected pilot buildings by country

The smallest area in pilot buildings was seen in Greece, Hungary and Germany. The largest amount of pilot building area was in Bulgaria, Spain and Latvia.

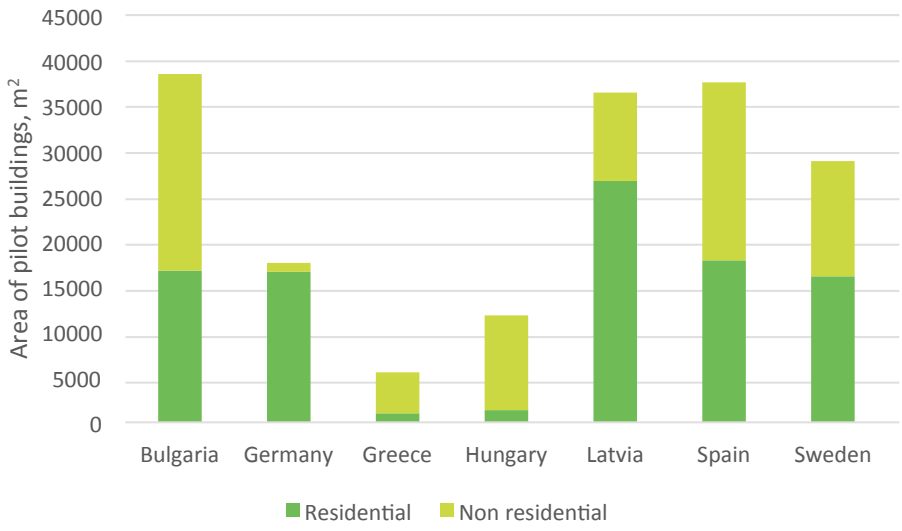

Figure 6: Area of selected pilot buildings by country

The selected pilot buildings allowed to compare the existing EPC practices in each of the project partner countries to the improved EPC practices and schemes developed in this project.

2 DEVELOPMENT OF STANDARD EPCS (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

In WP4, Task 4.2, the existing national legislation/methodology was used to issue an EPC for all pilot buildings. In the QualDeEPC project, this is called a ”Standard EPC”. Examples can be found in the national summary reports that are Annexes to this report.

The Standard EPCs in each pilot building were made in order to have a baseline/benchmark for evaluating improvements to the EPC practices and schemes suggested in the QualDeEPC project.

In some of the pilot buildings, there were no prior existing EPCs issued for these buildings. In some pilot buildings there were already issued existing EPCs. In total, 50 pilot buildings did have an existing EPC and 48 pilot buildings did not have an existing EPC.

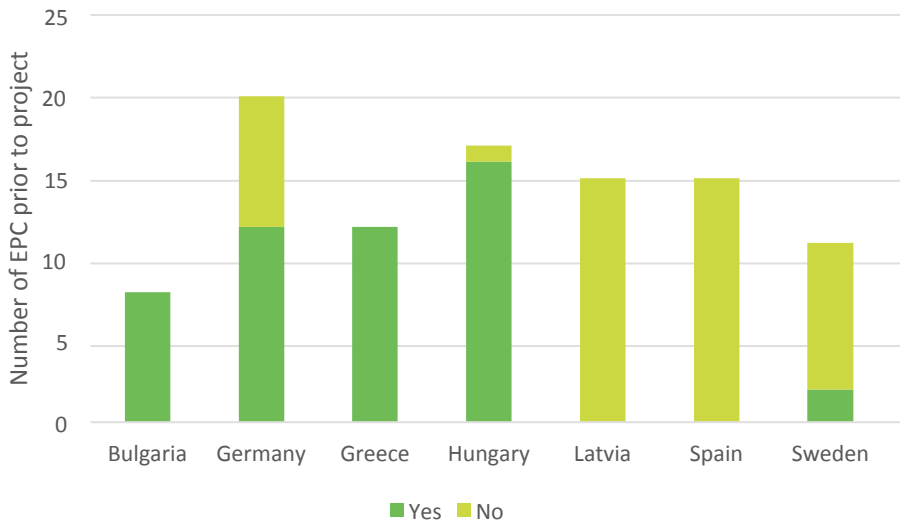

Figure 7: Number of pilot buildings with existing EPCs prior to the project

Latvian and Spanish pilot buildings did not have issued existing EPCs prior to the project. In Bulgaria and Greece all pilot buildings did have an existing EPC. Other project partners had a mix of pilot buildings with existing EPC and with no existing EPC.

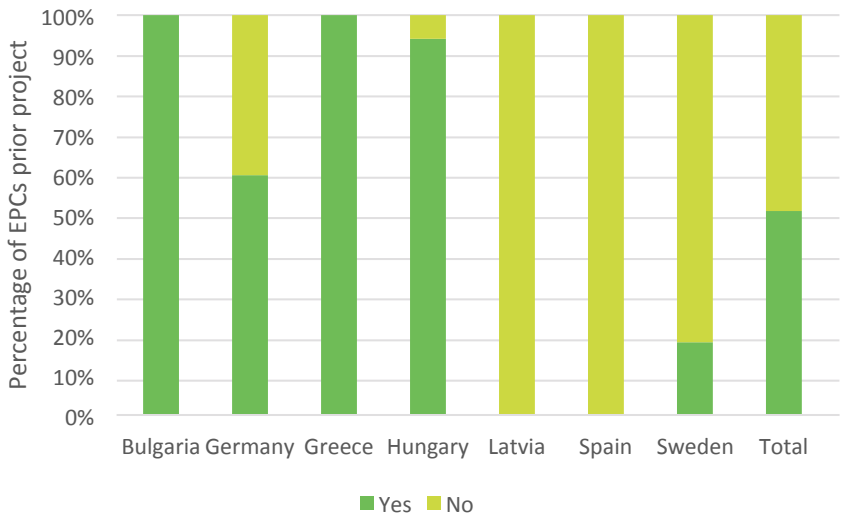

Figure 8: Percentage of pilot buildings with existing EPCs prior to the project

Looking at all pilot buildings we see that half of them had an existing EPC and the other half did not have an existing EPC issued prior to the project.

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

After all pilot buildings had Standard EPCs issued (in Task 4.2 of the QualDeEPC project), the next step was to test the improvements to EPC schemes developed in WP3 of QualDeEPC project. During this task it was clarified that the suggested improvement that can be tested "on site" or in real life in pilot buildings are:

1. Improving the recommendations for renovation, provided on the EPCs, towards deep energy renovation;
2. High user friendliness of the EPC, through the enhanced EPC template developed by QualDeEPC;
3. Online tool for comparing EPC recommendations to deep energy renovation recommendations;
4. Creating deep renovation network platforms;
5. Voluntary/mandatory advertising guidelines for EPCs.

In order to test the suggested improvements, the Enhanced EPC template was filled in (the first version of Enhanced EPC template was developed in WP3 and translated to the national languages) for each building. Again, examples can be found in the national summary reports that are Annexes to this report. Then the Standard EPC and Enhanced EPC were given to pilot building representatives in order to compare these two EPCs issued for their building. In some project partner countries, these Standard and Enhanced EPCs were also given to other stakeholders for comparison and evaluation. This mainly resulted in field testing high user friendliness of the enhanced EPC. The enhanced EPC also has a presentation of the renovation recommendations that is more informative than in the standard EPCs of most countries. In addition, partners or their subcontractors were advised to be more ambitious with the renovation recommendations. However, due to the overlapping of tasks, not all partners have used the enhanced renovation recommendations when filling in the enhanced EPCs; so potential savings reported in next chapter may become even higher in some countries, if the EPC form is used in connection with QualDeEPC's enhanced renovation recommendations.

In summary, it can be said that there were no major difficulties in developing the Enhanced EPCs for pilot buildings. The difficulties with developing Enhanced EPCs mostly are connected to the Standard EPC in each country – if the information asked in Enhanced EPC is not present in the Standard EPC then there were difficulties to include these data in Enhanced EPCs. But this type of difficulty is not avoidable when any type of changes to the existing system are suggested. It also seems that these difficulties in developing the Enhanced EPCs can be tackled by introduction of guidance on filling in the Enhanced EPCs and the energy efficiency recommendations towards deep energy renovation.

Together with the developed Standard EPC and Enhanced EPC, a questionnaire was given to pilot building representatives. This questionnaire also contained information on (1) the online tool for comparing EPC recommendations to deep energy renovation recommendations, (2) creating deep renovation network platforms and (3) voluntary/mandatory advertising guidelines for EPCs. The results of field testing these suggested improvements are described in the next section of this report.

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter. A part of this report are annexes with more detailed country level analysis:

- Annex D4.4. Transnational comparison of pilot cases contains more information on the results by country in comparison
- Annexes for National summary evaluation reports in Bulgaria, Germany, Greece, Hungary, Latvia, Spain and Sweden contain information regarding each of the countries.

4.1 Improving the recommendations for renovation provided on the EPCs towards deep energy renovation

4.1.1 Results from enhanced EPCs for pilot buildings

In many countries, the main parts of the EPCs do not include renovation recommendations with energy efficiency suggestions and the potential energy savings, but only contain the information on existing energy consumption in the building. This means that in these EPCs you cannot see what is your energy savings potential and what could be your building's energy consumption after the building has undergone energy efficiency renovation. In some countries, only a few energy efficiency improvement recommendations are included in EPCs. The Enhanced EPCs developed in the QualDeEPC project contain more energy efficiency measures that can be done in a building and what is the total energy savings potential from a suggested combination of actions called 'main option', and this helps to come a step closer to a deep energy renovation in these buildings. In almost 30 % of the pilot buildings, this main option would be in line with national nZEB standards for renovation (sometimes unofficially derived by project partners based on QualDeEPC's draft suggestion for defining deep renovation, as in the Green Paper, Deliverable D3.1).

During the development of Enhanced EPCs in the pilot buildings, a total energy savings potential of 18,330.3 MWh was shown. This means that on average, potential energy savings of 187.0 MWh in each pilot building were shown.

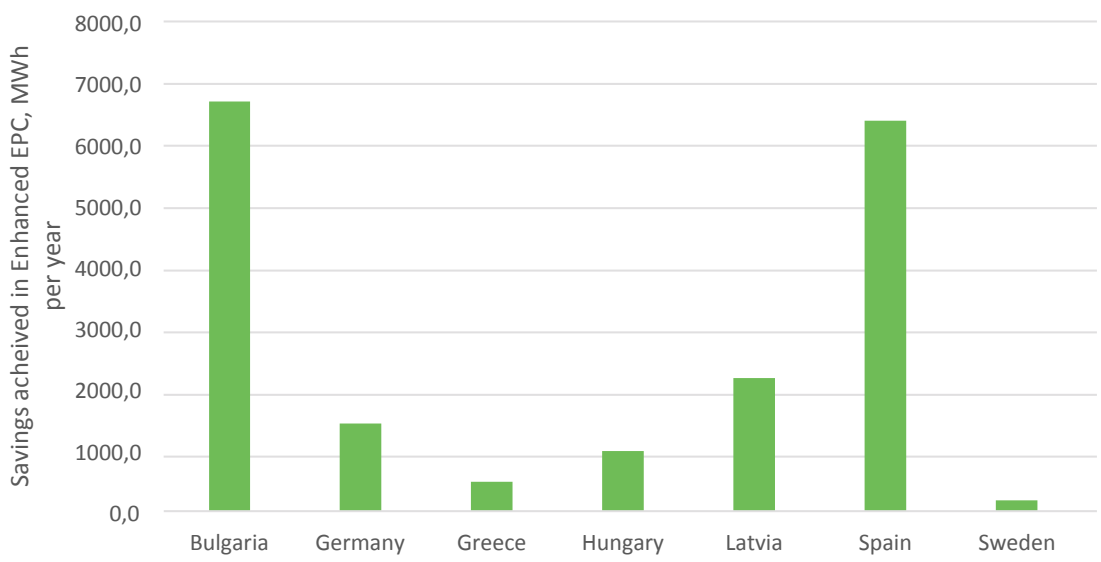

Figure 9: Potential energy savings shown in Enhanced EPCs

The largest amount of energy savings was shown in Bulgaria (36% of total energy savings in all pilot buildings) and Spain (35% of total energy savings in all pilot buildings). All other 5 project partner countries together made up only 29% of total energy savings in all pilot buildings.

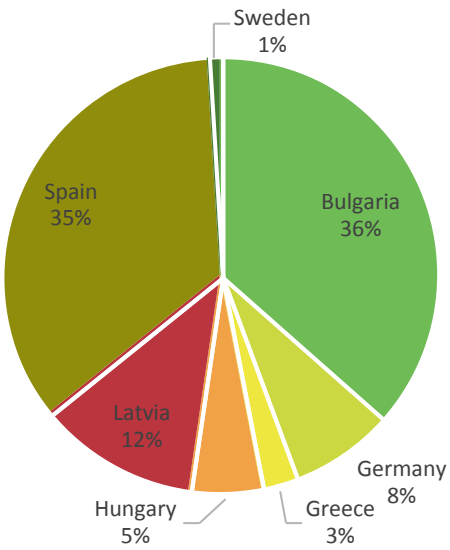

Figure 10: Potential energy saving distribution between 7 project partner countries

It is also important to show not only the potential energy savings in MWh but also the potential energy savings as a percentage of the current energy consumption of the buildings.

Figure 11 shows the potential energy savings in pilot buildings from the Enhanced EPCs.

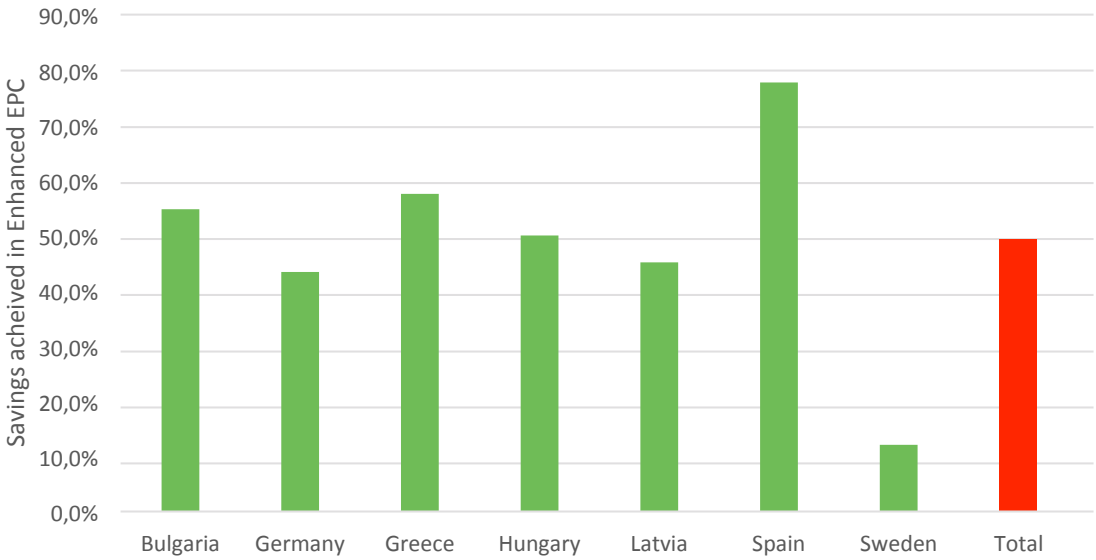

Figure 11: Potential energy savings in percentage shown in Enhanced EPCs

As can be seen on average the Enhanced EPCs showed an average energy savings potential of 49.4%. This means that improving energy efficiency makes it possible to lower energy consumption in buildings by half. The largest energy saving potential was shown in Spain (savings of 77,7%), but the smallest energy savings potential was shown to be in Sweden (12.1%). This can be partly explained by the existing situation in buildings. Sweden has historically had more strict energy efficiency standards

dictated by the harsh Northern climate, while in Spain the energy efficiency standards are lower due to the warm climate. In addition, a weakness of the testing process was that it started in parallel to QualDeEPC's evolving suggestions on the enhanced renovation recommendations. Therefore, some uncertainty on the level of ambition and the cost-effectiveness criteria to use may have contributed to these differences between countries in energy savings potential identified. As a consequence, potential savings shown in future EPCs may become even higher in some countries, if the EPC form is used in connection with QualDeEPC's enhanced renovation recommendations.

4.1.2 Feedback from stakeholder roundtable discussions

After the completion of enhanced EPCs, country partners conducted stakeholder roundtables and discussed the outcomes from the enhanced EPCs, such as the perceived improvements, challenges and suggestions for improvements. The following table summarizes the outcomes for the recommendations section from roundtable discussion with stakeholder workshops from each partner country.

QualDeEPC partner country	Remarks on the presentation of recommendations in enhanced EPC compared with standard EPC in a way that they become the roadmap towards nZEB
Bulgaria	• **Improvements**: Additional space to describe the recommendations, and the new field for description of the combination of the suggested renovations that is cost effective. • **Challenges:** Include the savings from renewable energy sources (RES) for electricity, or heating or hot water. They are completely missing in the Enhanced EPC, but they are very important part for the country and EU objectives and the homeowners are very sensitive to this kind of information, as they see it as part of their electricity bills.
Germany	• **Overall**: The recommendations should be established in regulations. It appears that enhanced EPC encouraged the EPC assessors to provide more ambitious or more detailed renovation recommendations. Providing the energy rating of the recommended building components and systems is advantageous.
Greece	• **Overall**: The enhanced EPC provides more information than the standard EPC and in a comprehensive manner. • **Improvements:** The recommendations in the enhanced EPC are more easily understood than the standard EPC, especially, as the technical specifications are also provided. • **Challenges**: The lack of information on actual costs of the proposed measures. The identification of the cost-effective renovation measures requires the introduction of specific economic indicators on the EPC, which are not available on both EPC templates.
Hungary	• **Challenges**: when a PV system is recommended in the renovation option, in some cases the savings can be over 100% for electricity, which is due to the fact that in the EPC the electricity demand excludes the consumption of appliances, office equipment and in case of residential buildings lighting. This can be mitigated by excluding the PV electricity generation from the final energy savings and is only accounted in case of the primary energy savings.
Latvia	• **Overall**: The Standard and Enhanced EPC recommendations are the same and they are those which would be implemented in real life if the building would undergo renovation • **Improvements**: It was suggested to add some monetary information regarding the costs of energy and potential savings. This would make the EPC easier to use by regular persons who do not use EPC every day and who are not familiar with energy units of measurement. There were some suggestions in making the important things larger in the EPC. For instance it was suggested to enlarge the energy classification (A, B, C, e.t.c.). It was suggested to make one simple page of Enhanced EPC template, which would contain only few of the most important numbers. This pages should be made with non-experts (regular persons) in mind. Otherwise non-experts could find it hard to understand all the numbers in the EPC.

	• **Challenges**: Stakeholders also pointed out that in Latvia we have changed the Standard EPC on April 2021. And now the existing Standard EPC is worse than the previous Standard EPC. This also was justified by the fact that the previous Standard EPC (according to which in this project Standard EPCs were issued to pilot buildings) was very near to the Enhanced EPC template developed in the QualDeEPC project
Spain	• **Overall**: Changes proposed in the enhanced EPC are found to be positive compared with the standard EPC. The rationale for selecting the recommendations should be first, compliance with national legislations as per CTE that establishes measures of coefficients of primary energy consumption per m^2, and then, according to cost effectiveness. • **Improvements:** Energy savings and new energy rating when the recommendations are implemented, short description of further renovation options are found to be interesting improvements for end users. Links that provide further information on financial assistance programmes to implement recommendations are found to be useful for non-experts. Specifications of component/system wise recommendations, and the assessment of energy savings and improved energy class when these recommendations are implemented are also well taken. The recommendations in the Enhanced EPC come with the energy class that the building could potentially achieve. • **Challenges**: Elimination of the CO_2 emissions classification and indicator is seen as a step backwards. The basis for the traffic light indicators for existing building components/systems should be thoroughly established. Lastly, the standard EPC offers several sets (combinations) of recommendations, while the enhanced EPC includes only one set of recommendations.
Sweden	• **Overall**: EPC assessors found the suggestion of useful combinations of measures encouraging. • **Improvements:** The enhanced EPC gives a clearer overview of the energy efficiency measures that should be implemented in the building. The table that summarizes the renovation recommendations was appreciated, and that some key figures (cost, savings, profitability) need to be filled in. This gives a better overview of the recommended measures than the standard EPC. • **Challenges**: The EPC assessor did not see the possibility to include recommendations of measures that would be considered deep energy renovation. Since no guidance is given on what measures to include in the main option, and what aspects to consider in the profitability calculations (future renovation, maintenance needs etc.), few additional recommendations were included compared to the standard EPC. However, with such guidance, in combination with the evaluation of building components and systems, the EPC assessor thinks that the template has a potential to encourage more renovation recommendations and further energy savings.

Table 7:Remarks on the comparison of key features for presenting recommendations between enhanced and standard EPCs

Summary of feedback on recommendations from the stakeholders

Overall

- The recommendations and their presentation in the enhanced EPC are seen as an improvement when compared with standard EPCs.

Improvements

- Main option, which includes a set of cost-effective recommendations
- Energy rating with 'traffic light system' for individual recommendations for building envelope and technical systems

Challenges

Key challenges especially include those features that are either missing from or better represented in standard EPCs. These include:

- Lack of energy savings by end-use and fuel source, and this information in monetary terms
- Lack of initial investment costs for individual recommendations for building envelope and technical systems
- Additionally, lack of guidance for providing the recommendations and traffic light system, and initial cost and payback information for individual recommendations

4.1.3 Potential for EU-wide convergence

The potential for convergence is based on three aspects of the proposed features in the enhanced EPC:

- Whether they are already present in the standard EPC (see section 2.1.1 in D4.4)
- Whether they are seen as improvement over the standard EPC (see section 2.1.1 in D4.4), and
- Whether they are classified as primary features (see section 2.1.1 in D4.4)

The potential for convergence of each feature is rated as low, medium and high, if a combination of these aspects is true in at least two or less, three to four, five or more QualDeEPC partner countries, respectively. However, the ease of their incorporation into enhanced EPC depends on the factors such as, collection of information and the flexibility of the national calculation tools to use this information and produce the necessary results. These aspects will be further explored in WP5, which deals with the national adaptation of enhanced EPC schemes.

It can be seen from the following table that out of 9 primary features, 4 have high, 4 have medium and 3 have low potential for convergence. Therefore, the overall potential for convergence of recommendations can be rated as **Medium-high**.

Table 8: Potential for EU wide convergence

Primary feature-ENHANCED EPC	Combination count	Potential for convergence Low/medium/high
Building component and system wise recommendations	6	High
Main option, which includes a set of cost-effective recommendations	6	High
Cost effectiveness (pay back years) of component and system wise recommendations	5	High
Improved energy consumption or energy savings if the main option is implemented	6	High
Check box if the main option meets requirements for minimum 50% renewable energy source (RES) or equivalent measures	4	Medium
Further information and links to financial assistance programmes to implement recommendations	4	Medium
Check box if the main option meets requirements for reduced thermal bridging	3	Medium
Check box if the main option meets requirements for air-tightness	3	Medium

Energy rating with a traffic light system for component and system wise recommendations	7	High

4.2 High user friendliness of the EPC

4.2.1 Results from the questionnaire for pilot building representatives

In order to evaluate the user friendliness of the Enhanced EPC template (developed in WP3) and get their interest in other tools (see the following chapters), a questionnaire was sent out to pilot building representatives together with the Standard EPC and Enhanced EPC of their pilot building. The questionnaire can be seen in Annex 6.1. of this report. Pilot building representatives answered to the 17 questions user friendliness of the Enhanced EPC template given in the questionnaire. They had to answer these questions both regarding Standard EPC and Enhanced EPC.

Table 9: Questions regarding user friendliness of Standard EPC and Enhanced EPC

No.	Question	Score		Improvement
		Standard EPC	Enhanced EPC	
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	57.5%	87.3%	29.9%
2	The information in the EPC is presented in understandable language and figures	53.6%	77.9%	24.4%
3	From the EPC, I can understand if my building is already energy efficient or not	75.6%	85.1%	9.4%
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	65.3%	67.9%	2.6%
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	49.0%	47.1%	-1.9%
6	The energy efficiency potential of my building is clearly shown in the EPC	52.9%	81.2%	28.2%
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO2, e.t.c.] used in EPC	61.0%	67.2%	6.2%
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	77.6%	81.5%	3.9%
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	53.2%	47.4%	-5.8%
10	The energy demand/ consumption values shown in EPC help me to estimate future energy consumption	59.7%	71.1%	11.4%
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	53.9%	64.0%	10.1%
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	67.9%	90.9%	23.1%
13	The EPC helps me to decide on energy-efficient renovation measures	65.3%	85.1%	19.8%
14	The EPC helps me to decide on cost-effective	60.4%	75.3%	14.9%

	renovation measures			
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	47.4%	64.0%	16.6%
16	The EPC contains all information that I expected to see in the EPC	53.9%	71.4%	17.5%
17	It is clear what is the EPC validity period	73.7%	79.2%	5.5%

Exact answers given by pilot building representatives and other experts for each country have been shown in the National summary evaluation reports of each country, and a comparison graph is found in D4.4. Both are Annexes to this report in separate documents

Figure 12 shows the average answers on each of the 17 questions. The higher the value for the answer, the higher user friendliness of a given specific part of EPC. In total, 77 questionnaires were filled in and included in this analysis.

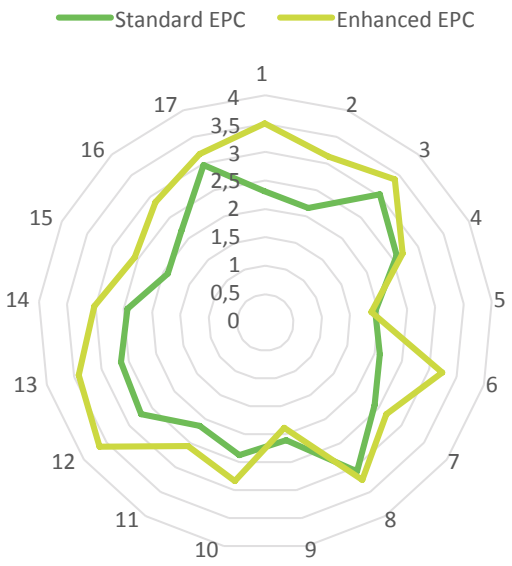

Figure 12: Enhanced vs Standard EPC templates compared by questions

As can be seen from the figure 12, practically all questions had higher evaluations for the Enhanced EPC than the for Standard EPC (except question 9 "The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types" and question 5" From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings").

Analysis for high user friendliness of the EPC template by country but on the average of the 17 questions is shown in Figure 13.

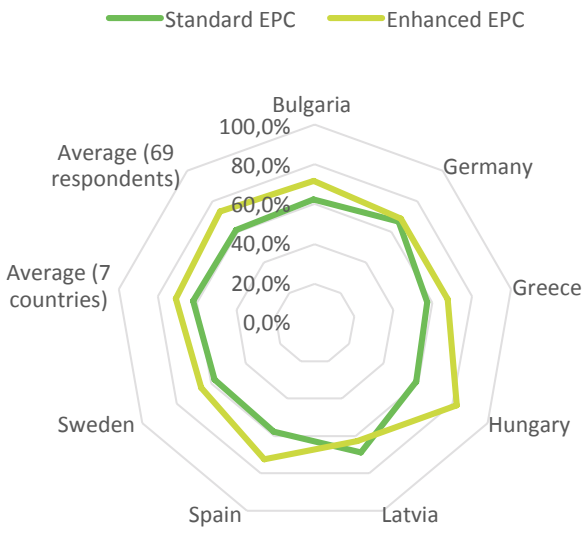

Figure 13: Enhanced vs Standard EPC templates compared by country

As can be seen in figure 13, in all countries except of Latvia the Enhanced EPC template was evaluated higher (i.e., more user friendly) than Standard EPC.

In Latvia, the Standard EPC was evaluated higher than Enhanced EPC. This can be explained by the fact that in Latvia the Standard EPC basically already contains all the information showed in the Enhanced EPC. Only the Enhanced EPC *template* looks different from the Standard EPC. And in cases where you have to choose between familiar and non-familiar things, you perceive the familiar things easier to comprehend (more user friendly because you are used to it).

Table 10 contains the quantified results of user friendliness of Standard and Enhanced EPCs.

Table 10: Enhanced vs Standard EPC template evaluation results

Country	Standard EPC	Enhanced EPC
Bulgaria	61.6%	71.3%
Germany	66.2%	68.1%
Greece	57.9%	68.2%
Hungary	59.4%	82.8%
Latvia	69.5%	63.2%
Spain	58.3%	73.1%
Sweden	57.5%	65.4%
Average (7 countries)	**61.5%**	**70.3%**
Average (69 respondents)	**60.5%**	**73.1%**

As can be seen from the table, the Enhanced EPC template received a 70.3% score (averaged over the averages for the 7 countries) and 73.1% score (averaged over 77 respondents), while user friendliness of Standard EPC received 61.5%(averaged over 7 countries) and 60.5% (averaged over 77 respondents). So on average of both averages, the Enhanced EPC template has improved the Standard EPC by 10.7%.

4.2.2 Feedback from stakeholder roundtable discussions

In their national summary reports, partners also included suggestions for improvements. These are summarized below. It should be noted that these statements are based on the testing of the draft original enhanced EPC template from the Green Paper (D3.1). Some of the feedback has been use to update the template and explanations in the White Paper (D3.2), and WP 5 is working on making the national values for the recommendations and the energy rating (traffic light scheme) of existing components, systems, and recommendations more transparent and consistent, and further improving guidance for assessors.

QualDeEPC partner country	Suggestions for improvements of Enhanced EPC template
Bulgaria	• Similar to standard EPC, NZEB check mark should be presented on the first page of the EPC • The energy rating part is absolutely not clear. It should be more clearly specified (some legend, rating, note) or completely removed. • The table with the energy consumption and the graphics included in the Bulgarian EPC should be part of the enhanced EPC. • Clarity is needed for presenting the energy rating field in existing building components and systems and their recommendations
Germany	• Include image that shows typical energy demand/ consumption of different building types • Check marks for regulatory obligations
Greece	• Indicative cost and payback period of the main option should be clearly stated • More cost - related data are needed • The NZEB level achieved by the main option should be noted/highlighted on the first page (if achieved) of the Enhanced EPC, perhaps using a dotted line on the energy classification table (p.1)

Hungary	• Energy consumption should be part of the Enhanced EPC, difference between the measured and calculated values should be added. There is a protocol developed in parallel by the Hungarian Chamber of Engineers. There will be a meeting between the Hungarian Chamber of Engineers and BME to discuss the methodology and the best practices.
	• The actual energy consumption table is not appropriate as it is, because in many cases it is impossible to fill in a reliable way (e.g. if only annual utility bills are available, separation of heating and DHW is impossible). It is recommended to include total consumption per energy source; distribution per domain (end use) should be optional. Furthermore, in the current format domains and sources are mixed up, which is confusing. In the enhanced EPC template version adapted to Hungary, we have upgraded this part accordingly (cf – national summary, Hungary).
	• A filling tutorial is recommended for experts. Examples:
	  ○ Which fields are mandatory, which are optional? What are mandatory contents? (E.g. links for further information are mandatory or optional?)
	  ○ What is expected/mandatory in the "Further information" field? (E.g. monumental protection must be indicated)
	  ○ Energy saving table: in case of PV, how to calculate % (what is the reference value: total electricity consumption? – it is not calculated in EPBD)
	  ○ What kind of U-value should be indicated? (with or without the impact of thermal bridges?)
	  ○ A clear indication is needed on what should be considered (energy, comfort, cost) to recommend a renovation measure or not.
	  ○ Guidelines for the renovation passports recommended.
	• It should be clearer what is presented in final and what in primary energy on the Enhanced EPC template.

	• Links to EPC statistics might be useful. • Energy consumption values by fuel source should be provided • Achievable energy saving on first page should be better highlighted. • Glossary is recommended (e.g. primary energy is not understandable for end users). • Boundary and internal conditions should be indicated (e.g. savings are calculated for 20° C indoor air temperature) • How to interpret recommendations: is it the only recommended solution? or just one of the many options? if something is not recommended to change what does it mean? from comfort / cost / technical aspects?
Latvia	• It would be good to view a possibility to add to the Enhanced EPC template voluntary annexes which can explain the process of issuing the Enhanced EPC in each country. These annexes then could be different in each country (based on specifics of each country) but the EPC itself should be kept as uniform as possible between al project partner countries or even al EU countries
Spain	• The enhanced EPC is more appealing and useful for general users, while the standard EPC is useful for experts. Issuing two sets of EPCs can be considered. • Or include an annex to the enhanced with the missing information from the standard EPC, such as CO_2 emission, energy ratings for DHW; energy classification for cooling, energy classification for heating and energy classification for lighting • The basis for traffic light indicator should be clearly explained • For the page 3 in the recommendations table, it is necessary to include more possibilities; for example in recommendations for walls, two different typologies of insulation with different U-Values and costs could be provided.

Sweden	• Further explanations may be needed to better explain the terminology used in the EPC. A couple of comments regarding this:
	  ○ Easier language and/or explanations in footnotes are needed.
	  ○ It would be good with a reference for those who want to know more about how the numbers were calculated.
	• Nearly all of the attendees thought that a reference for comparison with similar buildings should be added to the new template.
	• Most of them also thought that energy renovation measures implemented since the previous EPC should be included in the template. This is important in order to enable follow-up.
	• A majority of the attendees also thought that it would be advantageous to include a checklist of possible renovation recommendations. (As the one included in the Swedish standard EPC.)
	• Some of the attendees thought that it would be good to include measured energy use for more than one year, e.g., the last three years. The others were neutral to this suggestion.
	• Moreover, some considered it to a good idea to also include CO2 emissions, and possibly CO2 savings, in the EPC.
	• It would be good if the energy performance requirement for a new building as well as the base for energy classes could be more clearly presented. Perhaps it could be highlighted which energy class means fulfilling the new building requirement.

Table 11: Suggestions for improvements in user-friendliness in the enhanced EPCs

4.2.3 Potential for EU-wide convergence

In general, the results from the questionnaire for building representatives and the discussions with stakeholders showed that the enhanced EPC template proposed by QualDeEPC has high potential for convergence between EU Member States, for its 4 pages. Because, most of the key features already exist in the standard EPCs, and where they are non-existing, they are perceived as at least partial improvement. If a Member State has different legal requirements or thinks more information e.g. on the current energy status of the building is still important and necessary to inform building owners

and users, this can be added in one or more additional pages to the enhanced EPC. Space for important simple additional check boxes may also be found on the four pages of the common enhanced EPC template.

The results of the testing also showed that more guidance to EPC assessors is needed, e.g. on how to select recommendations based on cost-effectiveness, how to assess their energy rating and cost-effectiveness, and how to combine them to the Main option.

For more detailed information see section 3 in D4.4.

4.3 Online tool for comparing EPC recommendations to deep energy renovation recommendations

4.3.1 Results from the questionnaire for pilot building representatives

In order to test the idea of an online tool for comparing EPC recommendations to deep energy renovation recommendations, the questionnaire sent out to pilot building representatives contained 10 questions on this tool. The respondents had to answer whether they wanted to test specific options or receive specific information from the tool (should the tool contain these specific 10 features as given in Table 6).

Table 12: Questions and scores regarding online tool

No	Score	Would you like to receive this information from such a tool?
1	72.5%	**Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool**
2	72.5%	**Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]**
3	69.6%	**Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]**
4	78.3%	**Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]**
5	75.4%	**Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]**
6	56.5%	**The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period**
7	75.4%	**The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains**
8	55.1%	**The tool estimates costs of my building energy renovation**
9	76.8%	**The tool shows if my building's current energy consumption meets legal requirements**
10	69.6%	**Other things that I would like to see in the tool (write in comments part)**
11	70.1%	**Total**

Country specific results are given in National summary evaluation reports of each country and compared in D4.4. In Figure 14, the total results for all 7 project partner countries on each question (see Table 6) are shown.

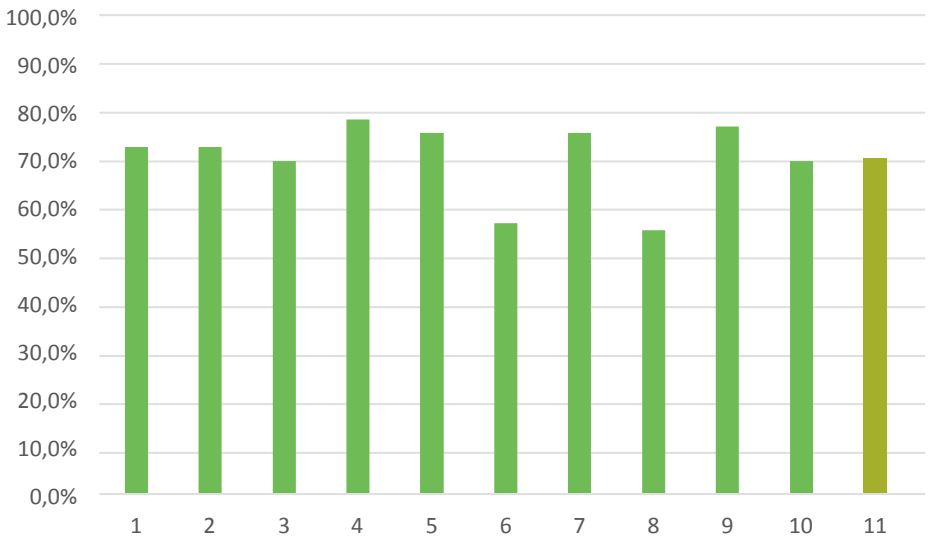

Figure 14: Results of questionnaire regarding Online tool to receive first proposals for energy efficiency renovation

As can be seen from the figure, answers were quite positive. The total score was 70.1%, while individual features of the tool were scored from 55.1% up to 78.3%.

It can be concluded that there is a strong need for such a tool.

4.3.2 Feedback from stakeholder roundtable discussions

Stakeholder feedback on online tool from the national summary reports (D4.5), based on the interviews/roundtables, is provided in the following table.

QualDeEPC partner country	Feedback
Bulgaria	• The feedback about the online tool is very positive and the participants think that it should be part of the Deep renovation Network Platform (DRNP) as proposed by QualDeEPC. Some participants think that on the national level, these platforms should be operated by the Energy Agencies, which will give the possibility to consult them not only online, but also physically and receive the needed support by the energy agencies' experts.
Greece	• Estimation of CO_2 emissions after renovation could be useful to be presented by the tool for awareness raising purposes.
Germany	• For the online tool, there was positive feedback from the building representatives as well as stakeholders was received
Hungary	• Some participants said that cost related information is too unreliable due to the dynamically fluctuating market environment. However, representative of Engineering Chamber supported the idea of cost related information offering their annually updated database.
Latvia	• It was agreed that an online tool that can be used by non-experts should be developed. This tool should be made in such way that the user can see what are the direct benefits after the building is renovated. • Also an online tool that is intended to be used by energy auditors should be developed. This would enable the unification of calculation approaches.

Spain	• Regarding the tool, the recommendations proposed by the current national tool in Spain, CE3X, are not always feasible and it is not completely well done. However, in the current national tool, the investment calculation module is very well achieved, and it can be used in the online tool proposed by QualDeEPC, as prices can be adjusted according to the cost of energy.
Sweden	• Proposals concerning an online tool, Deep Renovation Network Platform and Advertisement guidelines were shortly mentioned, but not discussed in the roundtable meeting.

Table 13: Summary of stakeholder feedback on online tool from the national summary reports

4.3.3 Potential for EU-wide convergence

The potential for convergence for such an online tool is high. As shown in figure 5, most stakeholders have expressed interest in the information provided in such an online tool and in many of its features, suggesting that stakeholders in most countries have similar needs. Some MS already have such tools, sometimes more than one, others don't: implementing it in more countries will increase convergence.

4.4 Creating deep renovation network platforms

4.4.1 Results from the questionnaire for pilot building representatives

In order to test the idea on creating deep renovation network platforms, the questionnaire sent out to pilot building representatives contained 10 questions on these platforms. The respondents had to answer whether they wanted to receive specific types of information from the deep renovation network platform, cf. Table 7.

Table 14: Questions and scores regarding deep renovation network platforms

No	Score	Type if information to be included in the deep renovation network platform
1	71.0%	**Information on renovation actions, General information**
2	73.9%	**Information on potential savings and costs**
3	62.3%	**Linking with renovation tools**
4	53.6%	**Linking with Energy Performance Certificates**
5	46.4%	**Linking with building deep renovation roadmap and possibly a passport**
6	75.4%	**Information on building contractors/ technicians and energy-efficient-experts; Support with finding experts and building contractors/ technicians**
7	68.1%	**Information on material or product manufacturers/ suppliers**
8	75.4%	**Information on financing opportunities for deep renovation**
9	43.5%	**Active provision of information of deep renovation and its benefits and costs**
10	68.1%	**Personal advice and guidance through the renovation project**
11	63.8%	**Total**

Country specific results are given in National summary evaluation reports of each country and compared in D4.4. In Figure 15 the total results for all 7 project partner countries are shown.

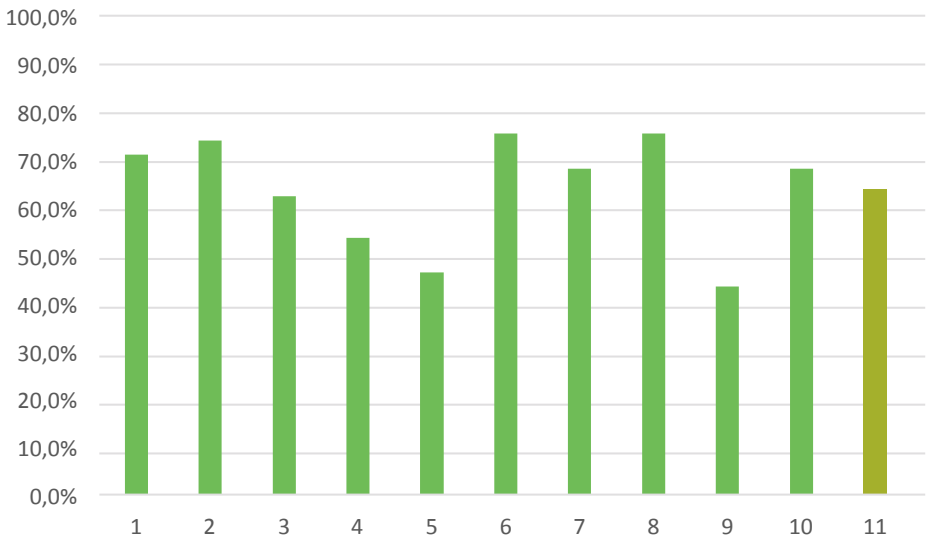

Figure 15: Results of questionnaire regarding Deep Renovation Network Platform

As can be seen from the figure , answers regarding such deep renovation network platforms were quite positive. The total score was 63.8%, while individual features of the tool were scored from 43.5% up to 75.4%.

It can be concluded that there is a strong need for such deep renovation network platforms.

4.4.2 Feedback from stakeholder roundtable discussions

Stakeholder feedback on Deep Renovation Network Platform from the national summary reports, based on the interviews/roundtables, is provided in the following table.

QualDeEPC partner country	Feedback
Bulgaria	• All the participants liked the idea behind the Deep Renovation platform. They shared the opinion that this tool will be very useful for the citizens and that this could help them taking the decision to undertake deep renovation of their homes. However, it was mentioned that we should be very careful about the prices we put in the tool as they vary and at some point, if they are not updated often enough, they might become misleading.
Greece	• Include national case studies/ best practices with technical & financial information • Link to certified technicians databases
Germany	• Mostly positive feedback on the idea on Deep Renovation Network Platform
Hungary	• All respondents would prefer to have a contact for an energy consultant, who can give personal advice and guidance through a renovation project. It would be useful for most of the respondents if they could find general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy, and cost savings on the platform. The respondents were least interested in

	having a link with building deep renovation roadmap and a renovation passport.
Latvia	• It was discussed whether an online Deep renovation network platform should be made. It was unclear who would be responsible for running the platform and keeping it up to date. It was said that internet already contains a lot of information and it can be easily found by using different search engines on the web. It was also agreed that the information is scattered between different sources and many times the information is quite contradictory. • A physical renovation platform which acts more or less as a one stop shop was suggested. At the moment the procedure of building renovation is made up of many steps and it is hard for non-experts to follow through all of these steps. Also it is not clear who could be the responsible for such physical hub.
Spain	• For both EPC certifiers and end users, providing as much relevant information as possible would be useful • A good definition of the recommendations about improvement measures, and characteristics of the construction systems and equipment (prices, transmittances, or the relevant data according to the improvement) are required. • Catalogues with ideas and standard equipment to guide the EPC certifier. • Investment planning for end consumers.
Sweden	• Proposals concerning an online tool, Deep Renovation Network Platform and Advertisement guidelines were shortly mentioned, but not discussed in the roundtable meeting.

Table 15: Summary of stakeholder feedback DNRP from the national summary reports

4.4.3 Potential for EU-wide convergence

The potential for convergence for such an online tool is high. As shown in figure 6, most stakeholders have expressed interest in the information provided in a Deep Renovation Network Platform and in many of its features, suggesting that stakeholders in most countries have similar needs.

4.5 Voluntary/mandatory advertising guidelines for EPCs

4.5.1 Results from the questionnaire for pilot building representatives

In order to test the need for voluntary/mandatory advertising guidelines for EPCs, the questionnaire sent out to pilot building representatives contained 10 questions on these platforms. The respondents had to answer if they are familiar with such guidelines in the first question, while in all other questions they had to answer if stated information in such guidelines would be useful for them.

Table 15: Questions and scores regarding deep renovation network platforms

No	Score	Statement
1	31.9%	**I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements**
2	58.0%	**Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]**
3	55.1%	**Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]**
4	65.2%	**How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] if this is not required or usual, a note should say it is voluntary**
5	53.6%	**How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] if this is not required or usual, a note should say it is voluntary**
6	44.9%	**Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry**
7	50.7%	**The EPC class of this building as a graphical element to include in advertisements**
8	53.6%	When was the EPC of this building issued
9	47.8%	It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements
10	34.8%	The year of issue of the EPC, if that needs to be shown in the advertisements
11	51.5%	**Total**

Country specific results are given in National summary evaluation reports of each country and compared in D4.4. In Figure 16, the total results for all 7 project partner countries are shown.

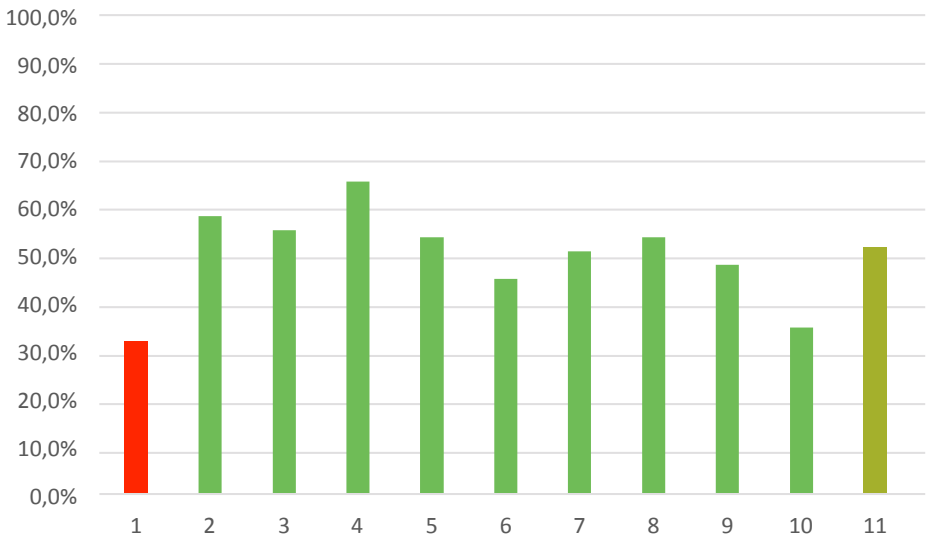

Figure 16: Results of questionnaire regarding Advertising guidelines for EPCs

As can be seen from the figure only about 1/3 of respondents were familiar with such guidelines. Actually, we have to admit that the term 'guidelines' may be ambiguous here. All countries, by regulation of the EPBD, should have a legal requirement to include specific energy data from the EPC in real estate advertisements. But it is left to building owners how they will comply with it. Among the seven countries represented in QualDeEPC, only Sween has additional practical guidelines for how to comply with the legal requirement. This may explain the low share of 'yes' (31.9%) for this question: It should be expected that respondents from the other six countries simply never heard of such guidelines. On the other hand, the low number of 'yes' may also indicate that they are not even aware of the legal requirement, or they are not aware of how they could comply with it.

As can be seen from the figure, there is a need for such guidelines. The total score was 51.5%, while types of individual information that may be provided in the guidelines scored from 34.8% up to 65.2%.

4.5.2 Feedback from stakeholder roundtable discussions

Stakeholder feedback on the offer of advertisement guidelines to ease compliance with mandatory advertising guidelines in the national summary reports (D4.5), based on the interviews/roundtables, is provided in the following table.

QualDeEPC partner country	Feedback
Bulgaria	• Regarding the advertisement guidelines there were no particular comments. It is clear that there are legal national documents that say the data regarding the energy efficiency of the advertised flat or house should be mentioned. What was mentioned is that the control on the application of these rules should be strengthened.
Greece	• The provision of guidelines on "how to" find or calculate different values, is a task that the EPC assessors should undertake when handing in the EPC to the building owner/representative • Provide general/indicative guidelines for buildings owners-users related to the legal requirements when advertising to media.

Germany	• The suggested content of the advertising guidelines was seen more critically. In fact, the stakeholders pointed out that the building market is very tight and hence, energy performance is often not a priority of the buyers.
Hungary	• Not much interest was expressed towards the advertising guidelines
Latvia	• It was agreed that we should start to actually issue EPCs when selling/renting buildings/apartments. Until then these advertising guidelines would not give much added value. • There was an opinion that issuing EPCs for selling/renting purposes only is a waste of money. • So the opinions on this question were split between different stakeholders.
Spain	• The new Royal Decree 390/2021 establishes that there is already an obligation to show the classification and the certificate by the real estate companies. • In the advertisements, the classification letter and scale of energy consumption of energy and CO2 emissions should be the minimum to show. • Generally, most stakeholders think guidelines will be very useful for compliance, although the legislation includes it and also the penalties in case of non-compliance.
Sweden	• N/a

Table 16: Summary of stakeholder feedback on potential content of voluntary/mandatory advertising guidelines for EPCs from the national summary reports

4.5.3 Potential for EU-wide convergence

The potential for convergence is high for the existence of such guidelines, and moderate for their content (depends on the legal requirements for which information to show, which may differ between Member States).

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

The results of WP4 were successful. In this WP we covered 98 pilot buildings, whereas the target was 70 to 105. It created a lot of useful information.

This WP showed that the concepts and tools developed by QualDeEPC are considered improvements and highly welcomed by representatives of pilot buildings and stakeholders: enhancing the user-friendliness of the EPC (template), providing essential information (online tool, DRNP), and guidance for complying with the legal requirements for real estate advertisements (advertising guidelines).

Enhanced EPCs and the energy efficiency recommendations included in these EPCs showed that there is almost 50% of energy savings potential in the evaluated buildings. This is an important step towards deep energy renovation and Building Renovation Passports.

The whole process of WP4 showed that there is the need for detailed guidance to EPC assessors on how to fill in the Enhanced EPC template and particularly how to deal with the renovation recommendations, to ensure comparability and quality of all data, and ambition of the renovation recommendations.

Based on the analysis done in this WP we can conclude that there is a medium to high potential for EU convergence for the 5 priorities tested during implementation of this work package of the project.

6 ANNEXES

6.1 Annex A: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;
- Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in EPC	Standard EPC						
		Enhanced EPC						
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	building compares to other buildings/ building types							
10	The energy demand/ consumption values shown in EPC help me to estimate future energy consumption	Standard EPC						
		Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	Standard EPC						
		Enhanced EPC						
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions, General information	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	energy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts; Support with finding experts and building contractors/ technicians	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	saving“			
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. Advertising guidelines for EPCs

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements			
• The year of issue of the EPC, if that needs to be shown in the advertisements			

6.2 Annex B: D4.4. Transnational comparison of pilot cases

D4.4 Transnational comparison of pilot cases

QualDeEPC H2020 project

MAIN AUTHOR: Sriraj Gokarakonda, Stefan Thomas, Maike Venjakob (Wuppertal Institute)

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Accelerating Deep Energy Renovation"
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Table 3: Document History

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

BME: Budapest University of Technology and Economics

DISCLAIMER OF WARRANTIES

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PUBLISHABLE SUMMARY

To achieve the EU's energy efficiency targets, both the rate of building energy renovation and its depth, i.e. the amount of energy savings post renovation need to be improved. QualDeEPC, funded under the EU's Horizon 2020 programme, aims to develop high-quality energy performance assessment and certification in Europe that accelerates deep energy renovation.

Following EU-wide review of existing EPC schemes, and extensive stakeholder discussions in the seven partner countries, QualDeEPC developed an enhanced EPC scheme by improving seven elements of existing EPC schemes and tested their applicability and convergence potential for their EU-wide uptake. A detailed analysis of the EPC schemes in the partner countries and the EU was conducted (Gokarakonda, Venjakob, et al., 2020) and gaps, shortcomings (Gokarakonda, Thomas, et al., 2020) and best practices (Kostova, Gokarakonda, et al., 2020) were identified, and also based on the national stakeholder workshops, QualDeEPC chose seven priorities for improvement in the proposed enhanced EPC scheme (Kostova, Thomas, et al., 2020; Thomas et al., 2021).

A.	Improving the recommendations for renovation, which are provided on the EPCs, towards deep energy renovation.
B.	An online tool for comparing EPC recommendations with deep energy renovation recommendations.
C.	Creating Deep Renovation Network Platforms (One-Stop Shops plus networking and joint communication of supply-side actors).
D.	Regular mandatory EPC assessor training (on assessment and renovation recommendations) required for certification/ accreditation and registry.
E.	Achieving a high user-friendliness of the EPC.
F.	Voluntary/mandatory advertising guidelines for EPCs.
G.	Improving compliance with the mandatory use of EPCs in real estate advertisements.

Table 4: Seven priorities for improvement in the proposed enhanced EPC scheme

For testing the priorities on renovation recommendations and user-friendliness in the enhanced EPC, 98 pilot buildings 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. Three further priorities – Online tool, Deep Renovation Network Platforms, and Advertisement Guidelines – were tested by means of a questionnaire to building owners and other stakeholders.

The results show significant potential for improvement in the existing EPCs and convergence between various member states. In most countries, the number of recommendations and their ambition increased in the enhanced EPCs that provide a clear list of options, and almost 50% of energy savings potential were suggested in the enhanced EPCs. The building representatives found a proposed feature called 'traffic light system' that classified the efficiency of building envelope and technical systems, and the information on energy and cost savings to be informative. Key barriers for EU-wide convergence include the differences between the minimum legal requirements, and the inputs, outputs and calculation procedure in the national calculation tools that make it difficult to present comparable information between various countries.

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1 INTRODUCTION

The objective of the Task 4.4 is to assess in comparison between countries and pilot cases, what worked well or less well from the five elements of an enhanced ECP scheme that the QualDeEPC project has identified as its priorities for the development of enhanced EPC schemes, which were tested in the pilot cases. Based on these findings, this Task also analysed the possibility and potential for EU-wide convergence on enhanced EPC schemes, at least regarding these five elements, and based on the results from assessment in QualDeEPC partner countries. The results were fed back to Task 3.5 for the revision of Deliverable D3.1 to D3.2 and are presented in the form of this report (D4.4). It is one basis for Task 4.5, summary of testing results and recommendations.

For assessing two of the seven priorities, 'Improving the recommendations for renovation, which are provided on the EPCs, towards deep energy renovation' and 'High user-friendliness of the EPC', 98 pilot buildings have been selected from seven QualDeEPC partner countries. For all the pilot buildings, standard EPCs were prepared as per current practice to reflect the status quo (D4.2), and enhanced EPCs (D4.3) were prepared using these two priorities. Three further priorities - Online tool, Deep Renovation Network Platforms, and Advertisement Guidelines – were tested by means of a questionnaire to building representatives or stakeholders. The standard EPCs and enhanced EPCs, the survey results, as well as supplementary data and relevant information from their pilot cases, and the feedback collected in other work packages were analysed along well-defined criteria, with particular focus on similarities and differences between the QualDeEPC partner countries to demonstrate the potential of enhanced EPCs for convergence and an EU-wide uptake.

Inputs for transnational comparison

The inputs for the transnational comparison include the following:

- Tasks 4.2 and 4.3: Preparation of Energy Performance Certificates according both to current practice and to the experimental enhanced assessment and certification schemes for the buildings pilot cases, which includes the following activities:
    - Applying enhanced Energy Performance Certificate assessment and certification procedures and tools
    - Producing experimental enhanced Energy Performance Certificates for the pilot cases
    - Documenting differences, experiences, and what worked well or not during the preparation of the enhanced Energy Performance Certificate, in comparison to the existing national EPC scheme; based also on feedback from EPC auditors
    - Collecting feedback from facility managers/building representatives(s) on the enhanced Energy Performance Certificate, improved renovation recommendations, and by means of a questionnaire, on the usefulness of Online tool, Deep Renovation Network Platforms, and Advertisement Guidelines
- Feedback from QualDeEPC country partners on the proposed features of the enhanced EPC certificate and feasibility of developing improved renovation recommendations, in draft form and later by the national summary report in Task 4.5, also taking into account:
- Task 3.4, national workshops and questionnaires, which are based on the draft concepts, assembled in the Green paper, collected feedback and responses from stakeholders (EPC professionals) and building representatives

Further sections of the report are organised based on the five of seven identified priorities for improvement, as per the Green paper, that were tested in WP 4 either by enhanced EPCs and

questionnaires/discussions (enhanced EPC certificate form and improved renovation recommendations), or by the questionnaires only (Online tool, Deep Renovation Network Platforms, and Advertisement Guidelines).

2 IMPROVING THE RECOMMENDATIONS FOR RENOVATION PROVIDED ON THE EPCS TOWARDS DEEP ENERGY RENOVATION

Section 3.2 of 'D3.2 White paper on good practice in EPC assessment, certification, and use' (Veselá et al., 2021) suggests improved renovation recommendations that are consistent with, and guide towards 'deep energy renovation'. This would be a major enhancement compared to the recommendations currently provided in most (standard) EPCs, which usually only meet minimum legal requirements, and many possible recommendations may be completely omitted if deemed too costly by the EPC issuer. Furthermore, the enhanced EPC developed by QualDeEPC presents these improved recommendations in pages 3 and 4, and in a way that they can become the first step towards deep energy renovation (see chapter 3). The presentation of recommendations in enhanced EPCs differs from the standard EPCs in most QualDeEPC partner countries. Therefore, this chapter compares the recommendations from the enhanced EPCs with those from the standard EPCs to identify changes and improvements, or lack thereof, from the standard EPCs. The criteria for this comparison and analysis include, the comparative analysis of recommendations between enhanced and standard EPCs for pilot buildings and vice-versa; and feedback from QualDeEPC country partners, building representatives, stakeholders on the feasibility of issuing the enhanced EPCs with improved recommendations, as suggested in the white paper.

2.1 Comparative analysis of the standard and enhanced EPCs for the pilot buildings

2.1.1 Consistency and completeness of information

The enhanced EPC template contains specific features in the EPCs for presenting the recommendations that may or may not be present in the standard EPCs. This section contrasts 14 key features for presenting the recommendations between enhanced and standard EPCs in various QualDeEPC partner countries, and vice-versa.

First, the enhanced EPC is compared with the standard EPC to identify the missing information in the enhanced EPC, as shown in figure 1. Of the 14 key features, 10 features are identified as primary features that require extensive or exclusive input data and calculation procedure, from which other secondary features can be calculated/derived with minimum effort (self-evaluation). Furthermore, the results from 1) a comparison of the standard and enhanced EPCs by the QualDeEPC country partners (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings indicate that while certain features in the enhanced EPC are perceived to be an improvement, other features are perceived to be partial improvement over the standard EPC, or better represented in standard EPCs than enhanced EPC, or less relevant in their countries (See Annex 2 - Section 4.1 in national summary reports for more information).

Overall, the enhanced EPC presents many features that are not usually present in standard EPCs. Standard EPCs of Spain and Bulgaria already contain at least half of the proposed features in the enhanced EPC. Most QualDeEPC partner countries present recommendations grouped as building components and technical systems. However, the quality and level of information provided in the recommendations widely differs between the partner countries.

Five primary features in the enhanced EPCs are present in at least four partner countries and few of them have been considered as improvements over the standard EPC. The feature related to presenting energy rating with a 'traffic light system' for recommendations is seen as an improvement in the majority of the partner countries, although this information is not present in any of their standard EPCs. In addition, features related to the description of useful combination of recommendations and their stepwise implementation, and further information and links that provide financial assistance programmes to implement recommendations are seen as improvements.

In general, Germany, Hungary and Latvia perceive most the proposed features in the enhanced EPCs as improvement over the standard EPCs, while Sweden perceives that most features in the enhanced EPCs are better represented in the standard EPCs.

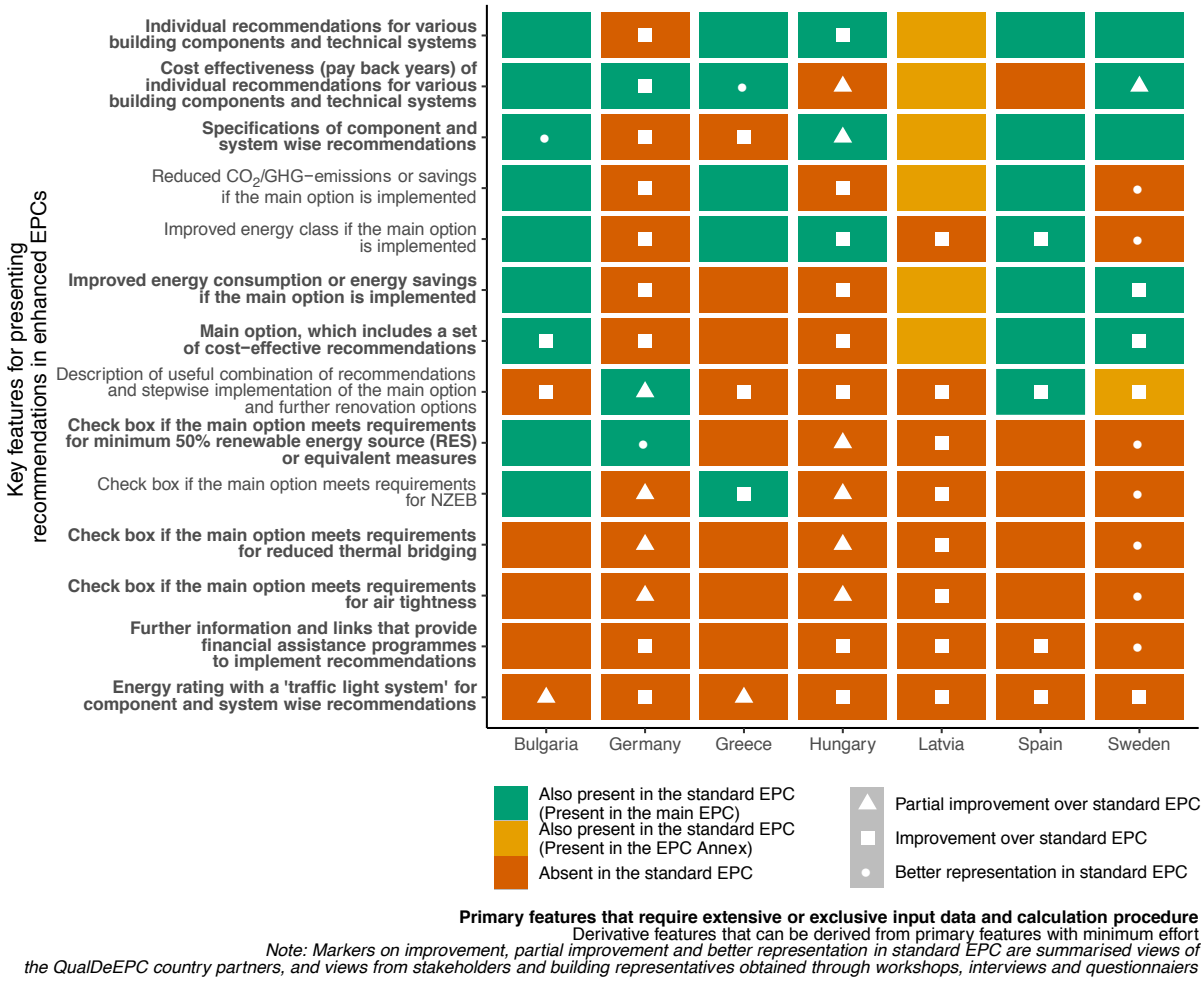


Figure 1: Comparison of key features between enhanced and standard EPCs for presenting recommendations

In addition to comparing enhanced EPCs with standard EPCs, there are also some key features in the standard EPCs that are absent in the enhanced EPCs, although they are sometimes perceived as important features, as shown in figure 2. Especially in Bulgaria, Greece, Spain and Sweden, many features from the standard EPCs are not present in the enhanced EPC, making their transfer to enhanced EPC incomplete. Features related to CO_2 emissions and information on cost of renovation for individual recommendations for various building components and technical systems, and their presentation are perceived as key missing features, based stakeholder feedback (See Annex 2 - Section 4.1 in national summary reports for more information).

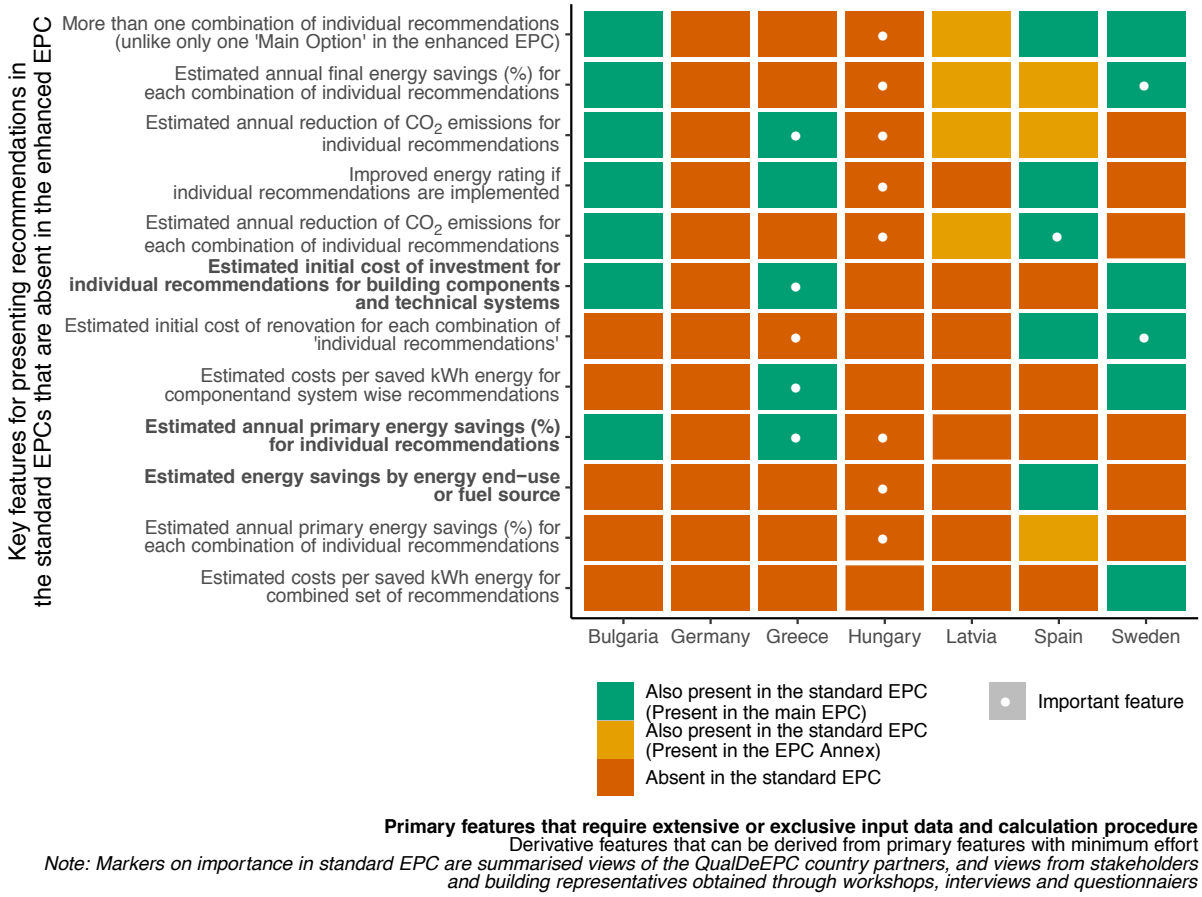


Figure 2: Key features that are absent in the enhanced EPCs but present in the standard EPCs of some countries

2.1.2 Are recommendations in the enhanced EPC in line with a roadmap towards nZEB?

2.1.2.1 Basis for recommendations

The enhanced EPC presents recommendations in two categories - first, improvements in the building envelope, and second, improvements in technical (and renewable energy) systems. Furthermore, a description of useful combination of recommendations and their stepwise implementation, 'renovation recommendations – renovation concepts' are presented in two separate boxes. The first box contains recommendations that are included in the 'Main Option', which lists a set of cost-effective recommendations (i.e., cost-effective at least in case of major renovation scheduled anyway). The second box lists further recommendations that are not included in Main Option e.g. due to high investment cost and long payback period, but maybe be feasible if further funding is available, e.g., under improved national incentive programmes. The information in both these boxes, together individual recommendations for building components and technical systems, should provide a roadmap towards nZEB. Moreover, a separate box presents 'Further information' that provides information on energy performance certification, use of EPCs and renovations to improve energy performance including financial assistance programmes. The following table shows the calculation methodology and basis for providing recommendations in standard and enhanced EPCs.

QualDeEPC partner country	Calculation tool	Basis for recommendations that are included in the standard EPC	Basis for recommendations that are included in the main option in the enhanced EPC

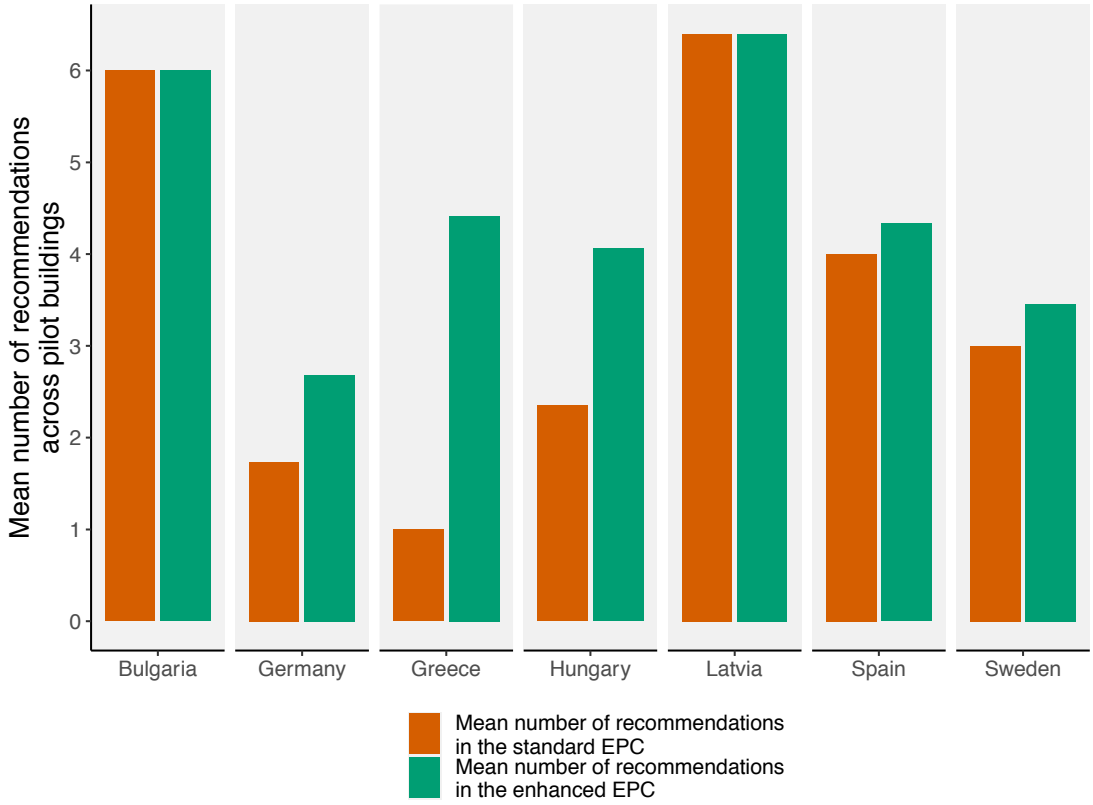
Bulgaria	Official software of the Sustainable Energy Development Agency (SEDA), but it is not a mandatory one, the assessors can use any type of calculation tool as long as it complies with the approved calculation methodology of Ordinance No 7 "Energy efficiency in buildings"	As per the national regulations and legislations of Bulgaria for energy efficiency in buildings	As per the national regulations and legislations of Bulgaria for energy efficiency in buildings
Greece	National official software tool TEE-KENAK	Based on the requirements set out in the national 'Regulation for the Energy Performance of Buildings', as amended in 2017	Based on the requirements set out in the national 'Regulation for the Energy Performance of Buildings' and further enriched in terms of number of recommendations, towards deep energy renovation
Germany	Calculations are based on DIN V 18599 or a combination of DIN V 4108-06 and DIN V 4701-10 in case of residential buildings without cooling.	The EPC issuer can choose freely, but may consider current funding programs.	The EPC issuer can choose freely, but may consider current funding programs. The main should be to improve the energy rating.
Hungary	Winwatt commercial tool was used for the calculations, which is based on the 7/2006 (24 May) TNM decree "Methodology for calculation and requirements on energy performance of buildings"	According to existing approach and energy efficiency measures for full building renovation in Hungary	According to new approach proposed by the enhanced EPC template. It is in accordance with a proposed enhanced methodology to revise 7/2006 (24 May) TNM decree.
Latvia	Calculation tool (based in MS Excel) developed by energy assessor (who made the EPC for pilot buildings) according to National regulation No. 348 "Methodology for calculating the Energy Performance of a Building"	According to existing approach and energy efficiency measures for full building renovation in Latvia	According to existing approach and energy efficiency measures for full building renovation in Latvia
Spain	Official software of CE3X	According to existing approach and energy efficiency measures for full building renovation in Spain	According to existing approach and energy efficiency measures for Deep energy renovation towards NZEB
Sweden	N/A	Cost-effective measures (what should be considered cost-effective, and what to consider in the profitability	Few additional measures compared to Standard EPC were added because of lack of guidance on what is cost effectiveness

		analysis, is not clearly defined)	

Table 1: Basis for recommendations in standard and enhanced EPCs

2.1.2.2 Comparison of total number of recommendations between standard EPCs and enhanced EPCs

Figure 3 presents the comparison between the number of recommendations presented in the standard and enhanced EPCs of all pilot buildings in various QualDeEPC partner countries. There is a significant improvement in the number of recommendations in the enhanced EPC then the standard EPCs in Germany, Greece and Hungary, while there is marginal improvement in Spain and Sweden. In Bulgaria and Latvia, the EPCs are based on a detailed energy audit and the recommendations in the standard EPCs are usually exhaustive, and therefore, the number remains same in both the standard and enhanced EPCs.



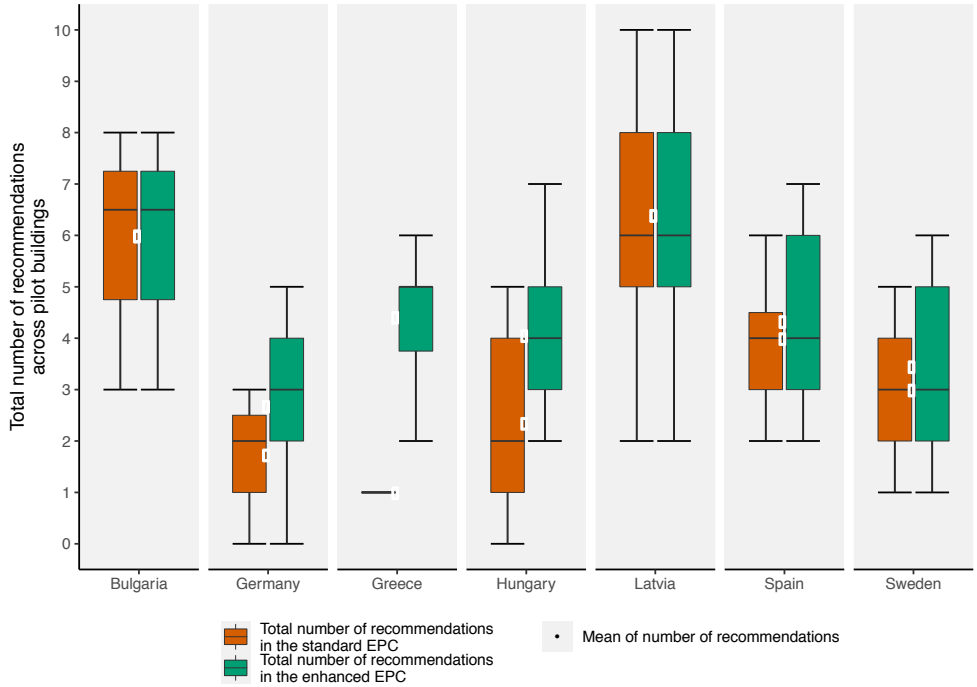


Figure 3: Box plot of total number of recommendations provided in standard and enhanced EPCs of pilot buildings

2.1.2.3 Comparison of potential energy savings between standard EPCs and enhanced EPCs

The following figure shows comparison of potential energy savings between the standard EPCs and the enhanced EPCs if their recommendations are implemented. Compared to the recommendations in the standard EPCs, the enhanced EPCs show significantly higher potential for energy savings in Greece and Spain, and a low to marginal additional potential in Sweden. In Greece, the reason for this result is that the standard EPC allows for a maximum number of three recommendations to be included in the field dedicated to recommendations. In Bulgaria and Latvia, the reason for this result seems to be that the standard EPC is already based on a detailed energy audit, and the EPC comes with detailed information on the recommendations. For Sweden, Table 6 in chapter 3.2 below mentions challenges that the EPC assessors had in selecting recommendations for the enhanced EPC. This feedback has been reflected in updating QualDeEPC's proposal for the renovation recommendations in the White Paper (D3.2).

In Germany and Hungary, potential energy savings are not provided in the standard EPC, but the energy savings that could be achieved when implementing the recommendations in the enhanced EPC are quite high, in the range of 40 to 50 percent on average.

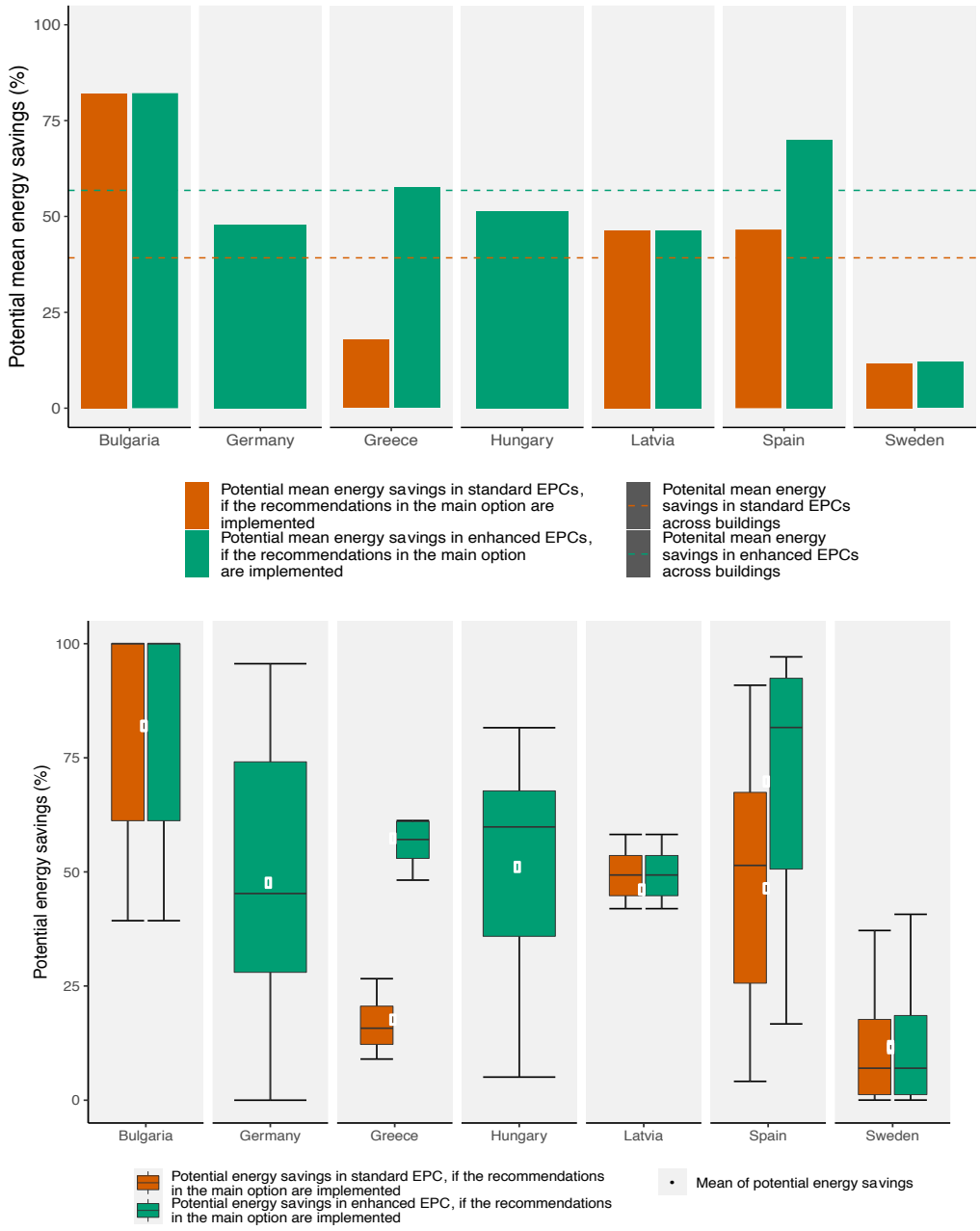


Figure 4: Box plot of energy savings achieved in standard and enhanced EPCs of pilot buildings. Notes: In Bulgaria, Spain and Sweden, energy savings in standard EPC are provided for more than one measure/set of measures. Recommendation/s with the highest savings are taken for the purpose of comparison. In standard EPCs from Greece, usually only one recommendation is provided, which is taken as the basis for energy savings achieved in standard EPC (the common approach of energy assessors is to select and include recommendations with a reasonable payback period which can also improve the energy classification of the building). In Germany and Hungary, potential energy savings are not provided in the standard EPC.

Further to the potential energy savings, the following table shows the number of buildings in which the main option in the enhanced EPCs meet requirements for NZEB, air-tightness, reduced thermal bridging and minimum 50% renewable energy source (RES) or equivalent measures. At least, 50 percent pilot buildings in Bulgaria, Greece, Hungary and Spain have the potential to meet the requirements for NZEB, post renovation. NZEB in the enhanced EPCs, met requirements for air tightness and reduced thermal bridging levels, and a minimum 50% renewable energy source (RES) or equivalent measures. In Greece, Hungary and Spain, at least half of the pilot buildings achieved NZEB status. In Hungary and Latvia, almost all buildings achieved the required levels of air tightness and reduced

thermal bridging (although to a lesser extent in Hungary). The highest potential for renewable energy is seen in Hungary and Spain.

		Number of buildings in which main option in the enhanced EPCs meets requirements for			
QualDeEPC partner country	Total buildings	NZEB	Air tightness	Reduced thermal bridging	Minimum 50% renewable energy source (RES) or equivalent measures
Bulgaria	8	5	0	0	0
Germany	19	1	0	0	4
Greece	12	6	0	0	0
Hungary	17	10	16	10	13
Latvia	15	0	15	15	0
Spain	15	11	0	15	9
Sweden	11	1	0	0	0

Table 2: Summary of pilot buildings that ticked the check boxes for meeting the requirements for NEB; air tightness, reduced thermal bridging and RES

2.2 Experiences of partners or their subcontractors when developing the recommendations

In the table below we have summarized experiences form project partners or their subcontractors when developing the Enhanced EPCs.

QualDeEPC partner country	Experiences of partners or their subcontractors when developing the Enhanced EPCs
Bulgaria	Selection of the main option requirements as well as to the energy savings achieved by implementing it and the energy rating which is for the moment not defined.
Germany	The nationally adapted, enhanced EPCs in Germany were very well accepted by the EPC issuer (subcontractor). The supplied short guideline provided enough information on how to fill in the enhanced EPC in general, as well as the traffic light system and deep energy renovation recommendations in particular. The feedback of the EPC issuer was mostly positive
Greece	In general, the development of the enhanced EPCs has proven to be smooth and without major difficulties. The few problems/difficulties encountered can be summarized as follows: - real energy consumption data acquisition: a) regarding the residential pilot buildings, in almost all cases the building representatives / users do not keep records (bills) of previous years, hence these data were not filled-in in the relevant table of the enhanced EPCs. b) regarding the non-residential pilot cases, although such records are kept, under the circumstances and due to the Covid 19 work overload of the schools' building managers, it has not been possible for them to allocate any extra effort in order to gather the information requested in the frame of the project, therefore, such data have not been included in the enhanced EPCs of the non-residential pilot buildings. - in the traffic light system characterizing the energy renovation measures efficiency level, some difficulties were encountered in relation to the technical systems characterization, as there have not been given any instructions, at that time, on which efficiency specifications to be inserted in the relevant fields; hence these data were filled-in in an arbitrary way and missing in some cases (e.g. for solar systems).

	- in the recommendations section of the enhanced EPC, as there have not been given any instructions on a standardized approach on the description to be inserted, some internal consultations have taken place so as to make a decision on a standard approach, resulting in time delays and still without any satisfactory results on the final approach decided, as no any cost data were provided there (not including cost data in the recommendations was a common decision of the project partners).
Hungary	For the Enhanced EPC it was hard to calculate the potential savings since the actual values are not part of the Standard EPC recommendations in Hungary. Also, by aiming at deep renovation in some cases it was challenging to find the best solution, which is both fulfilling the deep renovation concept and cost efficient as well. In most cases the measured energy consumption was not filled due to the table provided in the Enhanced EPC template, which is not unambiguous and due to the fact, that in Hungary it is not compulsory to collect/provide consumption data for the EPCs the data was scarcely available. It was also hard to promote cost effectiveness for the solutions, since the fuel prices are relatively low in Hungary and all renovation options are costly, thus the payback times are long. In some cases, due to limiting building and economical characteristics it was impossible to reach the deep renovation of the building.
Latvia	Developing the Enhanced EPCs for the selected pilot buildings was rather simple task since almost all of the information needed in Enhanced EPCs was available in the Standard EPC. Standard EPC in Latvia does contain mandatory annexes which include the information on suggested energy efficiency improvement measures. During development of Enhanced EPC in some cases it was problematic to evaluate the rating (traffic light system) of a building envelope component or a technical system component. In Latvia building renovation usually is performed by implementing all suggested energy efficiency measures at once. Therefore, the main option in Enhanced EPC in Latvian case basically contains all suggested measures. It was theorized to included additional measures in Enhanced EPCs (which were not included in Standard EPC). These would be installation of solar collectors and solar photovoltaics. But this was not done since the practice of installing such RES solutions is quite limited in Latvia in residential apartment buildings and non-residential buildings which were chosen as pilot buildings in this project.
Spain	We had to do calculations for final energy consumption in order to calculate energy savings. We had to do the certification again for some of the pilot cases because the target was to produce recommendations in order to achieve one or several of the following: NZEB, air tightness, reduction thermal bridges, and the standard EPC of some of the buildings did not achieve that goal We also had to do the calculation for the recommendations about Cost effectiveness (e.g., payback time)
Sweden	• Overall, the EPC assessor preferred the enhanced EPC template to the standard EPC. • It was not possible to fill in the original table for measured energy consumption. Instead, this table was divided in two – one table including metered data for different energy sources, and a second table where the metered data was apportioned to different types of use (heating, cooling, DHW etc.) based on assumptions and calculations by the EPC assessor. • The EPC assessor thought that the part with evaluation of energy performance of building components and technical systems was a positive addition, but struggled a bit with the rating limits (choosing the appropriate traffic lights). Also, it was not clear whether a red or yellow light in the first table means that a recommendation of renovation measure is needed. • The EPC assessor also appreciated the table that summarizes the renovation recommendations, and that some key figures (cost, savings, profitability) need to be filled in. This gives a better overview of the recommended measures than the standard EPC. • Moreover, the EPC assessor was positive to the encouragement to suggest useful combinations of measures. • Despite the positive aspects described above, the EPC assessor did not see the possibility to include recommendations of measures that would be considered deep energy renovation.

	Since no guidance is given on what measures to include in the main option, and what aspects to consider in the profitability calculations (future renovation, maintenance needs etc.), few additional recommendations were included compared to the standard EPC. However, with such guidance, in combination with the evaluation of building components and systems, the EPC assessor thinks that the template has a potential to encourage more renovation recommendations and further energy savings.

Table 5: Remarks on the comparison of key features for presenting recommendations between enhanced and standard EPCs

In summary, it can be said that there were no major difficulties in developing the Enhanced EPCs for pilot buildings. The difficulties with developing Enhanced EPCs mostly are connected to the Standard EPC in each country – if the information asked in Enhanced EPC is not present in the Standard EPC, then there were difficulties to include these data in Enhanced EPCs. But this type of difficulty is not avoidable when any type of changes to the existing system are suggested. It also seems that these difficulties in developing the Enhanced EPCs can be tackled by introduction of guidance on filling in the Enhanced EPCs and the energy efficiency recommendations towards deep energy renovation.

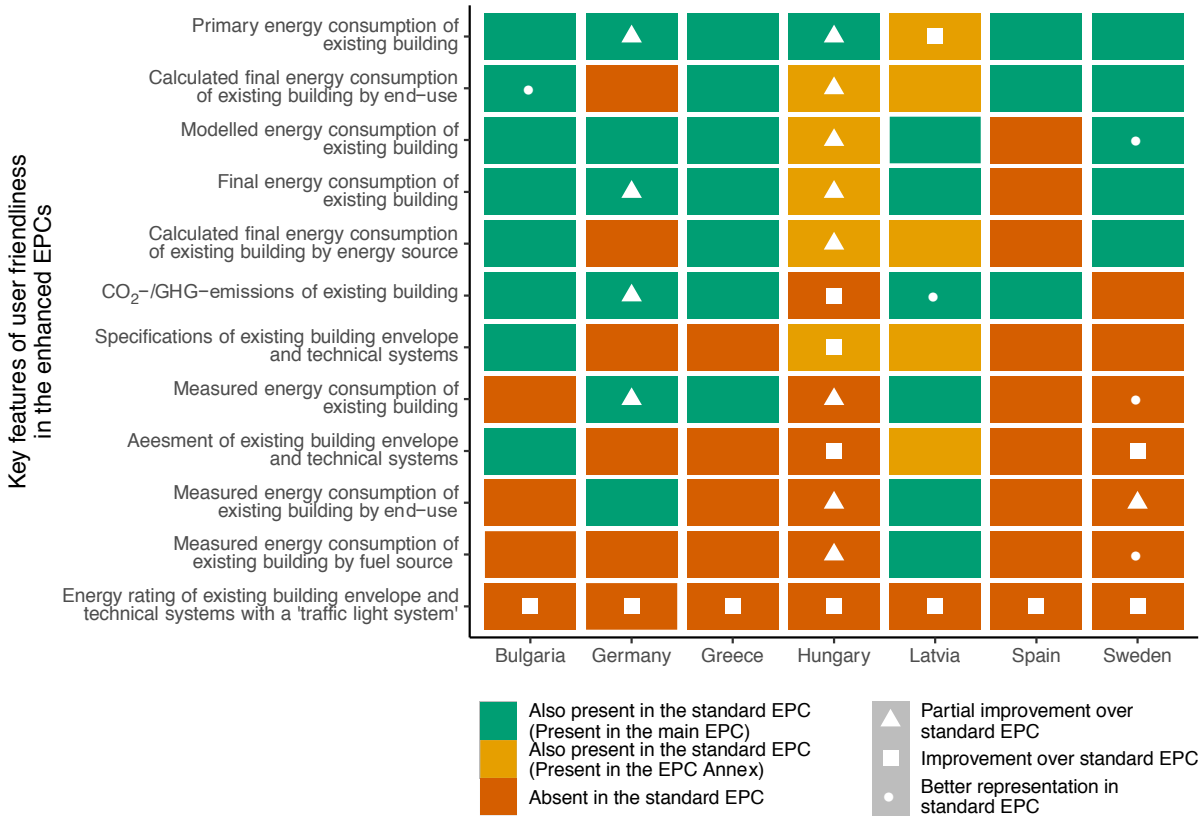
3 HIGH USER-FRIENDLINESS OF THE EPC: THE ENHANCED EPC TEMPLATE

3.1 Comparative analysis of the standard and enhanced EPCs for the pilot buildings

3.1.1 Consistency and completeness of information

Figure 5 shows consistency of information between enhanced and standard EPCs for the pilot buildings. It mainly covers pages 1 and 2 of the enhanced EPCs, along with features of pages 3 and 4 that are not discussed in the previous chapter.

It can be seen that most key features in the enhanced EPCs are already present in the standard EPCs of most countries, with a notable exception of Spain, and to an extent Sweden. However, in Hungary and Latvia, most of these features are presented in the Annex, rather than on the main EPC, where they are prominently visible. The QualDeEPC team considered that information on the renovation recommendations is more important than on the current energy status of the building. If a Member State has different legal requirements or thinks more information on the current energy status of the building is still important and necessary to inform building representatives and users, this can be added in one or more additional pages to the enhanced EPC.



Note: Markers on better representation in standard EPCs and perception of importance are summarised views of the QualDeEPC country partners, and views from stakeholders and building representatives obtained through workshops, interviews and questionnaiers

Figure 5: Comparison of key features of user friendliness between enhanced and standard EPCs

3.1.2 Feedback from stakeholder roundtable discussion on completeness of information

The following table shows the feedback form QualDeEPC country partners as presented in their national summary reports on the features of user friendliness in the enhanced EPCs.

QualDeEPC partner country	Completeness of information
Bulgaria	**Overall**: The enhanced EPC is seen as an improvement as it presents most of the information present in the standard EPC and has a potential for convergence between different QualDeEPC countries. **Improvements:** Key positive aspects include the design and colour scheme, additional space provided for description of recommendations, and the new field for description of combination of suggested recommendations. **Challenges**: The absence of the following standard EPC features from the enhanced EPC are considered as major challenge: • Distribution of annual energy consumption of existing building by end-use • RES share in the total energy consumption • Specification of Efficiency of technical systems • A single and comparative table presented comparison of specifications, energy performance of building components and systems before and after the implementation of recommendations
Germany	**Overall**: Generally positive impression of the enhanced EPC, e.g. "enhanced" EPC shows weakness of the building in more detail. **Improvements:** Information on the energy efficiency potential of the building is seen as an improvement. Also, the rating of the building components and renovation recommendations are advantageous. The different display of the energy classes is mostly neutral for residential buildings, since the boundaries are defined and visible in both EPCs. For non-residential buildings the "new" display proved more difficult, because of the missing energy classes and their defined boundaries in the German Building Energy Act. Due to the cross-country approach of the template, some details on the HVAC systems, renewable energy sources and the glossary are missing. The HVAC systems and renewable energy sources might, however, be described at the technical systems. **Challenges**: The missing information of CO_2-emissions, the missing reference scale, the fewer annotations and missing glossary, as well as the missing check marks for the achievement of certain aspects of the regulation requirements, and RES.
Greece	**Overall**: The respondents presented their preference for the Enhanced EPC in terms of the understandable language and figures and that the Enhanced EPC gives more information in a more comprehensive way. The separate assessments for the different envelope elements and systems, available in the Enhanced EPC is very useful and in a more user-friendly way. No additional work effort is required by the energy auditors in order to use it. **Improvements:** It is easy to understand if the minimal energy efficiency requirements of building set in the national legislation are met by the information provided on the proposed template mostly by the "traffic light systems". **Challenges**: In the existing standard Greek EPC the indicator is in kWh/m^2 provided by the current calculation methodology. Shifting to kW/y would not be possible to have such data outputs of the national calculation tool. Furthermore, without providing the indicator (kWh/m^2), comparison of EPCs of buildings of the same use or for statistical analysis purposes would not be feasible. Therefore, we use the indicator kWh/m^2 in the enhanced EPC, together with the information on potential total kWh/y savings with the implementation of the Main Option (in the relevant box of the enhanced EPC form).

	The information on calculated energy consumption by end use is missing in the enhanced EPC. In the energy consumption table of the enhanced EPC, the contribution (%) of energy sources to the building energy balance -which was provided in the standard Greek EPC- is missing. It looks non-feasible to add more columns in the energy consumption table as it is formatted in the proposed template. Some of the missing information has already been transferred to the enhanced form, such as CO_2 emissions, consumption comparison to reference building and comfort conditions. In the 'Renovation recommendations - component evaluation' of page 3, there is less information in the enhanced EPC than in the existing Greek Standard EPC - The only useful additional feature in the enhanced EPC is the technical characteristics of the various components (U values of envelope components and power provided by the recommended technical system). The EU energy label for the technical systems is not considered a technical data but rather a qualitative data. At the same time, the economics of the recommendation/s are limited to payback time, while in the existing standard EPC the information provided is of higher level of analysis.
Hungary	**Overall**: There is a significant improvement in presenting the information in the EPC in an understandable language, tables and figures. Also, the energy efficiency potential of the building is clearly shown. The units of measurements are not widely understood, the future energy costs are not well showcased and the recommendations are not encouraging to the respondents to perform deep energy renovation. **Improvements**: • Presentation and colour scheme • New information added (year of construction, additional specification) • Assessment of building envelope and technical systems by energy rating helps a non-expert user to better understand the efficiency of their building elements • Cost effectiveness can be useful for end user, especially when calculated accurately • Energy class names in standard EPC are removed as they were misleading and for lowest classes derogatory **Challenges**: • Enhanced EPC requires additional expert hours and entails additional costs to the sellers as most of the EPCs are produced during sale of the building • Both standard and enhanced EPCs do not compare the building to other buildings, as end users are not aware of the average consumption levels of similar buildings • Few key indicators are missing • Presenting the measured energy consumption can be misleading/confusing for the end-users, when it is significantly different from the calculated values • The table for the presenting measured values is confusing, as different energy carriers are mixed and final energies are summed up, which is misleading. • Cost-effectiveness should be properly calculated, also considering both the price of the fuel and the installation material and labour cost, as the values presented using poor methodology can be misleading
Latvia	**Overall**: **Improvements**: • Energy rating system introduced for building envelope elements and technical systems of building helps a non-expert user to better understand the values given in the EPC • The Enhanced EPC form contains links with further information, which helps non-expert user to find further information on EPCs and how to carry on with renovation of their building **Challenges**:

	• The enhanced EPC provides less information. However, merging the enhanced EPC to standard EPC, while retaining the mandatory annexes from Standard EPC, can help the EPC to benefit from exemplar features from both EPCs.
Spain	**Overall**: The changes in the enhanced EPC are perceived as improvement over the standard EPC. The Enhanced EPC has additional data such as the energy consumption data of the building and the energy rating of the building envelope elements and technical systems. **Improvements**: • The traffic light indicator has been the most acclaimed change. It facilitates the understanding of the certifications and the quality or efficiency of the different systems for end consumers. • The potential final energy savings and the improved value for final energy consumption, which both have been recognized as great indicators for end consumers. • The Enhanced EPC contains links with further information if needed, which is quite useful for non-experts, and also a short description of further renovation options. • It can be seen whether the building meets minimum energy performance standards as set by the national legislation **Challenges**: • The elimination of the CO_2 emissions classification and indicator • Enhanced EPC provided only one combination of recommendations measures as 'main option', whereas standard EPC provides more than one combination of recommendations
Sweden	**Overall**: Key changes in the enhanced EPC, such as the energy saving potential of the building are seen as improvements, while the missing elements from standard EPC are seen as a drawback **Improvements**: • A picture of the building is included in the first page • Summary of potential energy savings, if suggested recommendations are implemented • Energy rating system for building envelope elements and technical systems of building **Challenges**: • Information of radon is missing, as buildings with radon-problem require high ventilation rate. • Ventilation airflow rate and control is missing. In Sweden, this is needed for determining the energy performance requirement for a new building, and thus also the resulting energy class. • Mandatory inspection of ventilation and heating system respectively is missing. In Sweden, this requirement in the EPBD directive is implemented within the EPC. • No part with measures carried out since the last EPC. • No reference value for comparison to "similar buildings". • Terminology difficult to understand, e.g., difference between primary energy demand, specific energy demand • Some of the stakeholders think that the classification scale is difficult to interpret • Indicating a new potential energy class might be associated with some difficulties, e.g., changes of energy class limits over time and uncertainties regarding savings. • Several of the building representatives find it discouraging that they probably won't be able to reach higher than C or D, also with major renovation. Also, it is confusing that energy class D or E could be rather good for an existing building, since it sounds quite bad (far from A). • It would be useful if it were made clear if presented values were based on estimations, measurements or standard values. • Potential energy savings might have the opposite effect that the building representatives thinks that potential savings are limited to the value stated in the report, especially when the recommendations are unambitious and not up to their full potential.

Table 6: Differences in user-friendliness in enhanced EPCs between various building types

Overall
• Enhanced EPC has been considered as an improvement over the standard EPCs in the way it presents key information about the building energy performance.
Improvements
• Energy rating of existing building envelope and technical systems with a 'traffic light system'.
Challenges
• Fraction of energy from renewable energy sources is not clearly identified. • Energy consumption of the building by end-use and fuel source is not clearly identified. • Features in the standard EPC that are country specific and are not present in the enhanced EPC. These missing features in the enhanced EPC are perceived as important because of their familiarity or requirements of national legislation. E.g., the standard EPC in Sweden presents information on radon and ventilation rate.

3.2 Feedback from building representatives

The user friendliness of Standard EPC and Enhanced EPC was quantified based on feedback from questionnaires filled in by building representatives. The results were quantified by giving values to the possible answer options in questionnaires. The questionnaires contained 5 possible answers for each of the 17 questions. The possible answers to questions and the values given to each of the answers were:

- Agree – 100%;
- Somewhat agree – 75%;
- Neutral – 50%;
- Somewhat disagree – 25%;
- Disagree – 0%.

The questions were formed in such way that this type of answer value is possible for each of the 17 questions. The 17 questions in the questionnaire were asked about Standard EPC and Enhanced EPC. To get a score in a particular question all answers from questionnaires were summarized and the average value of a particular question was calculated.

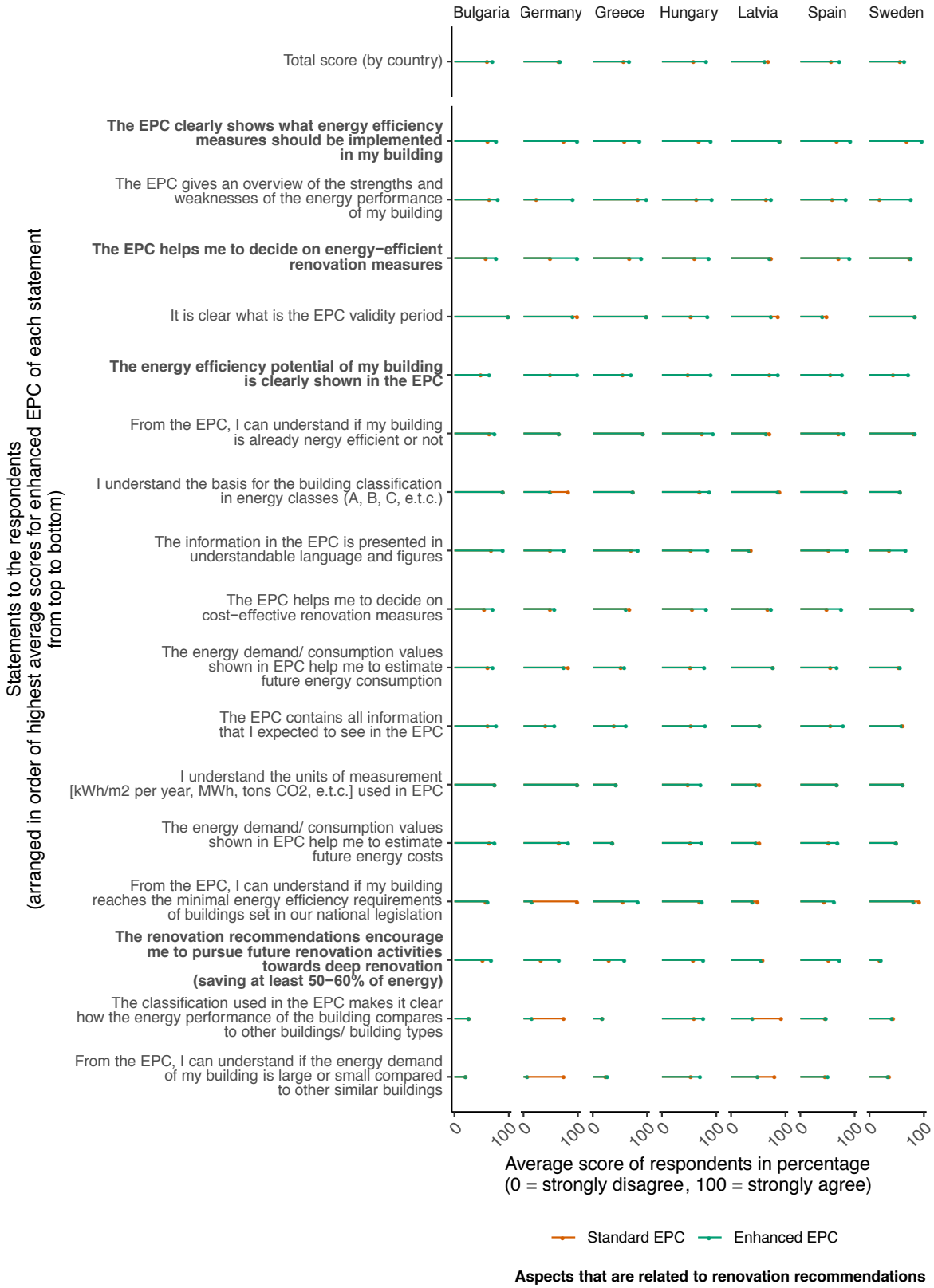


Figure 6: Feedback from the building representatives on user friendliness

The enhanced EPC scored high (and higher than the standard EPC) in all countries for most of the statements related to renovation and renovation recommendations. For example, clearly shows what energy efficiency measures should be implemented, helps in decision making to actually implement these measures by showing the full potential (energy saving potential) of these measures.

However, an exception is Latvia, which had a very good presentation before. In Germany and Latvia, standard EPC has additional scale of comparison to other buildings, but enhanced EPC does not, so enhanced EPC scores worse for the two questions relating those questions, e.g., the last two questions in the above figure.

4 ONLINE TOOL FOR RECEIVING FIRST DEEP ENERGY RENOVATION RECOMMENDATIONS

4.1 Feedback from building representatives

The following figure shows the feedback from building representatives to the structured questionnaire regarding a simple online calculation tool that can be used for estimating the potential energy efficiency measures and savings in buildings, and the information contained in such a tool. This has been developed and proposed as another priority by QualDeEPC. Building representatives could use such a tool to better inform themselves prior to consulting an energy consultant or an EPC issuer. The question to the building representatives was: "Would you like to receive the following information from such a tool?" and the responses were recorded as 'yes' or 'not interested'.

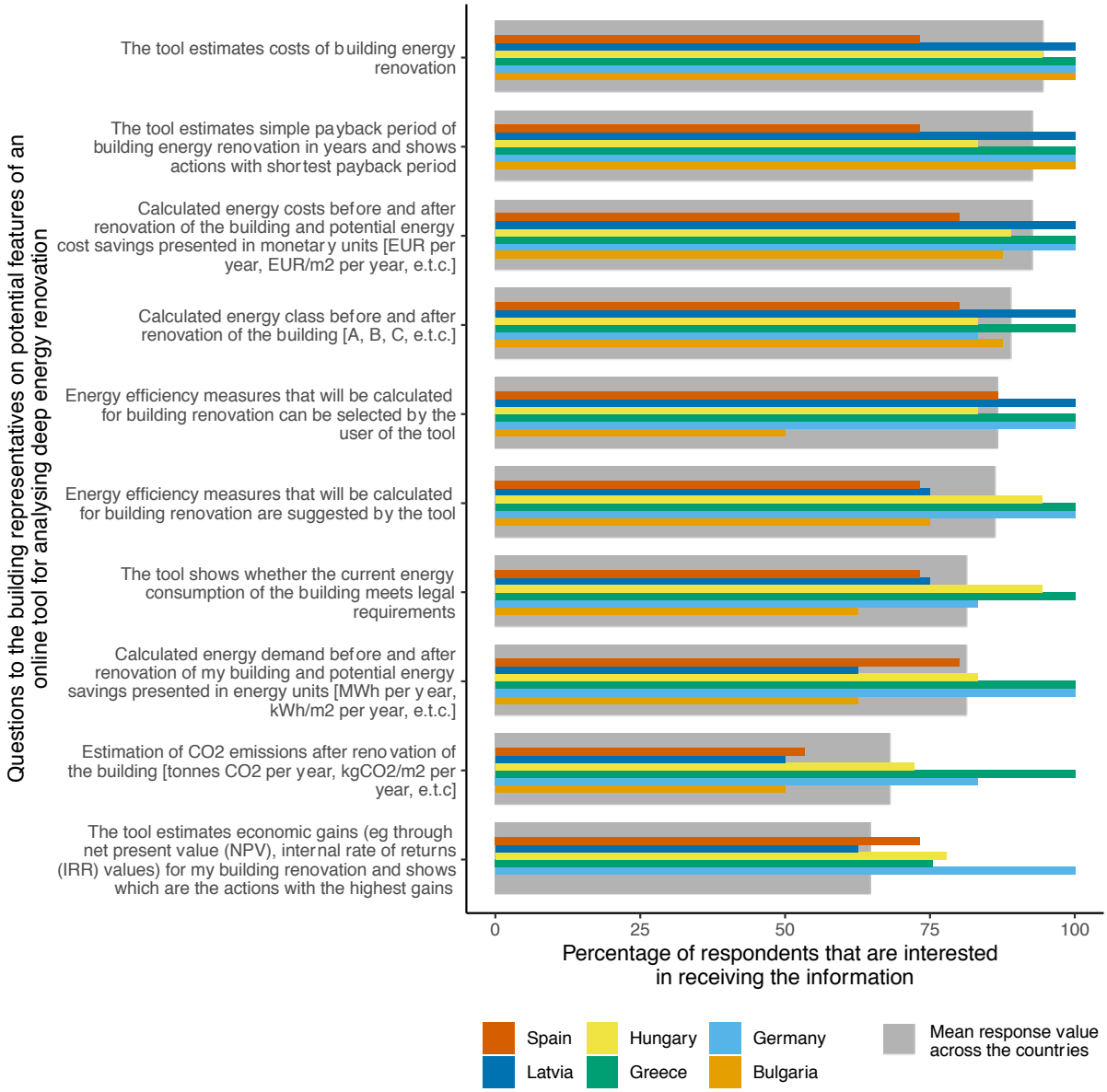


Figure 7: Feedback from building representatives on potential features of an online tool for analysing deep energy renovation. Note: Responses from Sweden are only in the form of descriptive feedback and the filled in questionnaires are unavailable.

It can be seen from the above figure that most questions received an average interest of above 75%. Across countries, building representatives are interested in understanding total costs for renovation, simple payback period, and energy cost savings and improvement in energy class when renovation recommendations are implemented. Comparatively, CO_2 emissions savings and economic gains (if expressed in the metrics net present value or internal rate of return, which are more accurate but less understood by most people than simple payback period) received the lowest interest.

5 DEEP RENOVATION NETWORK PLATFORMS

5.1 Feedback from building representatives

The following figure shows the feedback from building representatives to the structured questionnaire on which aspects of the comprehensive website (Deep Renovation Network Platform) proposed by QualDeEPC and containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be interesting to them. The question asked to the building representatives was whether they would use a type of information or not. Most questions received an average response ("I would use it") of above 75%. For building representatives, finding general information on costs of and financing opportunities for renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings; and a platform for finding and receiving offers/quotes from energy efficient experts, contractors, technicians, and vendors to implement recommendations appeared to be most interesting features; while linking EPCs and deep renovation passports with such a platform did not generate much interest; for the latter, we do not know how many of the respondents are familiar with this relatively new concept.

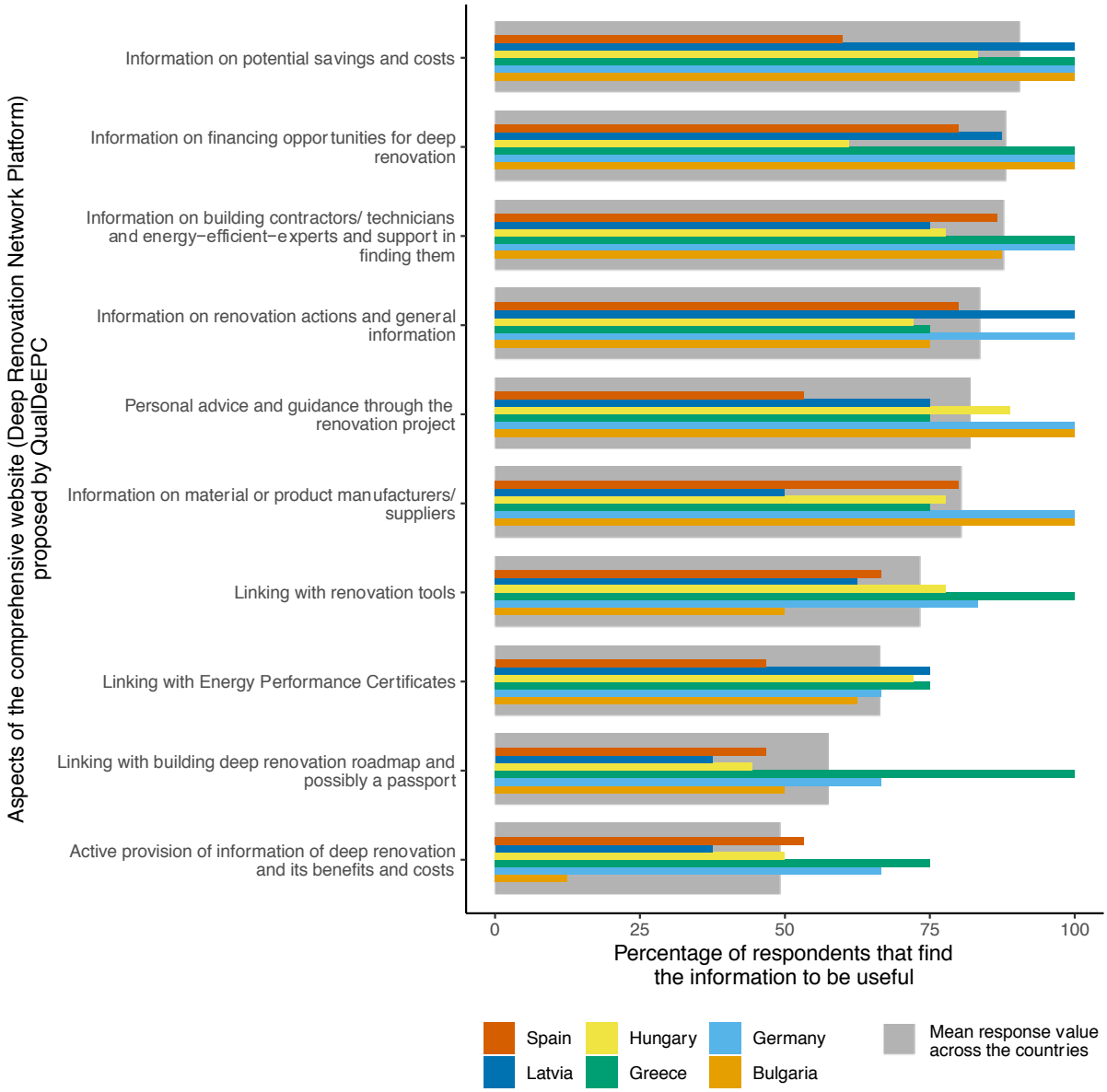


Figure 8: Feedback from building representatives on potential features of a deep renovation network platform. Note: Responses from Sweden are only in the form of descriptive feedback and the filled in questionnaires are unavailable.

6 VOLUNTARY/MANDATORY ADVERTISING GUIDELINES FOR EPCS

6.1 Feedback from building representatives

As per EPBD, it is mandatory to show the energy class and energy data from the building's EPC in advertisements when selling or offering for renting a building. However, anecdotal evidence suggests that often compliance with this regulation may be low. QualDeEPC has, therefore, proposed that Member States offer advertisement guidelines to ease compliance with this requirement, following the example e.g. of Sweden. A question regarding this proposal was also included in the questionnaire to building representatives in six of the seven EU Member States represented in the QualDeEPC project, but not in Sweden, since such guidelines already exist in Sweden.

The following figure shows the feedback from building representatives to the structured questionnaire aspects that would be useful in such guidelines and to comply with this regulation. The first question was, whether building representatives are familiar with the legal requirement to show the energy class/data in the advertisements. Most of the respondents mentioned that they are not familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements. Then, a number of features were presented under the general question: "Which guidance would be useful for you to comply with this regulation when selling/letting a building?", with the options to select either "It would be useful for me" or "I don't need it" as the reply. Among the aspects that received interest are ways to find out the current energy demand/consumption and energy costs of the building, energy class and date of issue of the EPC.

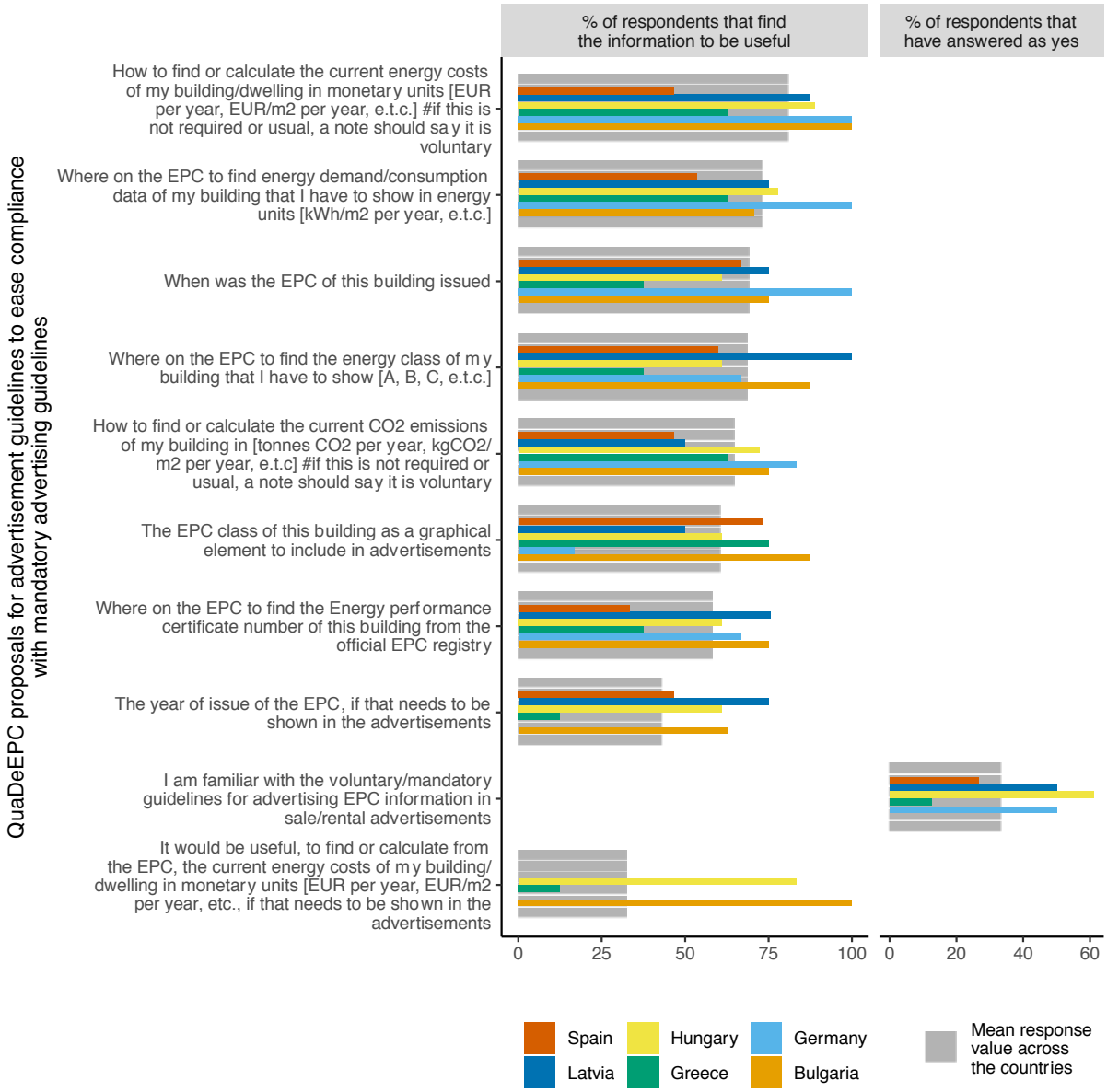


Figure 9: Feedback from building representatives on potential content of voluntary/mandatory advertising guidelines for EPCs

7 CONCLUSIONS

In general, various aspects of Energy performance certificates (EPCs) differ between various Member States. However, there exists a high potential for convergence of EPCs between them. Evidence from testing the enhanced EPC scheme developed by QualDeEPC clearly shows that improved renovation recommendations and their presentation on the EPCs in a user-friendly manner is an important first step towards deep energy renovation.

Some of the improvements proposed by QualDeEPC for recommendations for renovation on the EPCs are already present in some QualDeEPC partner countries and in the partner countries where these features are not present, most of these features are perceived as improvement over the standard EPC. Key similarities for presenting the recommendations in the standard EPCs include presenting the individual recommendations for various building components and technical systems, their cost effectiveness and technical specifications and improvement in energy class if they are implemented. In countries that do not require a detailed energy audit for preparing the EPCs, there is a higher potential for improvement in the quality and number of recommendations and consequently, higher potential for energy savings.

In terms of user-friendliness, at least half of the proposed features in the enhanced EPCs are present in most QualDeEPC partner countries. The enhanced EPC has been considered as an improvement over the standard EPCs in the way it presents key information about the building energy performance. The energy rating of the existing building envelope and technical systems with a 'traffic light system' was perceived as a key improvement. Key challenges include unclear identification of renewable energy fraction, energy consumption by end-use and fuel source, and other country specific requirements. Most of these challenged could be overcome through national adaptation.

Overall, the online tool received wide acceptance from the stakeholders. On national level, these platforms should be operated by the energy agencies, which will give the possibility to consult them not only online, but also physically and receive the required support from them. The cost related information is perceived too unreliable due to the dynamically fluctuating market environment. However, this could be overcome by annually updating the cost database. Instead of a standalone online tool, few participants proposed that this should be part of the DRNPs (see point C.).

Furthermore, the concepts and tools developed by QualDeEPC are considered improvements and highly welcomed by representatives of pilot buildings and stakeholders: enhancing the user-friendliness of the EPC (template), providing essential information (online tool, DRNP), and guidance for complying with the legal requirements for real estate advertisements (advertising guidelines). Enhanced EPCs and the energy efficiency recommendations included in these EPCs showed that there is almost 50% of energy savings potential in the evaluated buildings. This is an important step towards deep energy renovation and Building Renovation Passports. The whole process of WP4 showed that there is the need for detailed guidance to EPC assessors on how to fill in the Enhanced EPC template and particularly how to deal with the renovation recommendations, to ensure comparability and quality of all data, and ambition of the renovation recommendations.

6.3 Annex C: National summary evaluation report for Bulgaria

D4.5 National summary evaluation report for Bulgaria

QualDeEPC H2020 project

MAIN AUTHOR: Ekodoma, EAP

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Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

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TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Bulgaria.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report describes the pilot project selection process.

In order to have different categories of buildings the selection was based on the criteria of residential- non-residential and private and public buildings. Other criteria were the location of the buildings. They are mainly located in regions where the heating is done by means of wood and coil, which is not very efficient and is also source of pollution. As it is obvious in the Table below, all of the selected pilot buildings year of construction is around 40 years ago, which implies the need of deep renovation to achieve the actual requirements for energy efficiency, CO_2 emissions levels and also standard and comfort of life. The main difficulty in the selection process was the willingness of the owners to participate and cooperate with the project.

More detailed information on this can be found in report named "Pilot building selection report" which was developed for Task 4.1.

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	4 "Dunav" str., Plovdiv	R	Multi-family	1988	7888,4	Yes
2	57 "Bulgaria" blvd. , Smolyan	R	Multi-family	1981	6760,24	Yes
3	2 "Sv.Kiril" str., Vidin	R	Multi-family	1983	2 119,15	Yes
4	23 "Gorazd" str., Vidin	N	school	1971	8175,8	Yes
5	36 "Gorazd" str., Vidin	N	Kinder gartden	1973	1413,58	Yes
6	67 "Gorazd" str., Vidin	N	Kinder garten	1972	1688,89	Yes
7	26 "Slaveikov" str., Vidin	N	school	1975	7985,91	Yes
8	28 "Slaveikov" str., Vidin	N	dormitory	1982	2458	Yes

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

The standard EPCs for the selected pilot buildings were already done prior to the beginning of the project. However, many of the owners of these buildings (private or public) were not able to provide the document itself. They have lost it or just were not able to find it and provided us only with the study for the energy efficiency performance of the building on the basis of which is issued the EPC. This document contains all the information to fill the standard EPC.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (kWh/m^2)	Energy efficiency improvement recommendations included in Standard EPC
1	4 “Dunav” str., Plovdiv	E	325,0	Insulation of roof, walls and floor; replacement of windows; reconstruction of the heating system; new LED lighting; elevators energy efficiency improvment
2	57 “Bulgaria” blvd. , Smolyan	G	551,87	Insulation of roof, walls and floor; replacement of windows; reconstruction of the heating system; new LED lighting;
3	2 “Sv.Kiril” str., Vidin	G	462,59	Insulation of walls and floor; replacement of windows;
4	23 “Gorazd” str., Vidin	E	221,5	Insulation of roof and walls; replacement of windows; reconstruction of the heating system; new LED lighting;
5	36 “Gorazd” str., Vidin	E	219,9	Insulation of roof and walls; replacement of windows; use of the heating system
6	67 “Gorazd” str., Vidin	F	243,7	Insulation of roof and walls; replacement of windows; use of the heating system
7	26 “Slaveikov” str., Vidin	E	170	Insulation of roof, walls and floor; replacement of windows; new LED lighting;
8	28 “Slaveikov” str., Vidin	F	394,9	Insulation of roof and walls; replacement of windows; new heating system

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

The main difficulty in this part of the project was related to selection of the main option requirements as well as to the energy savings achieved by implementing it and the energy rating which is for the moment not defined.

Table 3. Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
1	4 “Dunav” str., Plovdiv	C		197,2	Insulation of roof, walls and floor; replacement of windows; reconstruction of the heating system; new LED lighting; elevators energy efficiency				x	

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					improvment					
2	57 “Bulgaria” blvd. , Smolyan	C		201,74	Insulation of roof, walls and floor; replacement of windows; reconstruction of the heating system; new LED lighting;				x	
3	2 “Sv.Kiril” str., Vidin	C		210,22	Insulation of walls and floor; replacement of windows;				x	
4	23 “Gorazd” str., Vidin	B		81,3	Insulation of roof and walls; replacement of windows; reconstruction of the heating system; new LED lighting;				x	

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
5	36 “Gorazd” str., Vidin	C		104	Insulation of roof and walls; replacement of windows; use of the heating system				x	
6	67 “Gorazd” str., Vidin	C		104,4	Insulation of roof and walls; replacement of windows; use of the heating system				x	
7	26 “Slaveikov” str., Vidin	B		84	Insulation of roof, walls and floor; replacement of windows; new LED lighting;				x	
8	28 “Slaveikov” str., Vidin	B		170,3	Insulation of roof and walls; replacement of windows; new				x	

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					heating system					

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
1	Simplified and shortened EPC template	Neutral	It is relative to how useful it would be to reduce the information in the certificate - for some it is useful information, and for others it is complex or confusing
2	Chaned color of the overall design	Positive	Better vision of the template with more pleasant color scheme
3	Energy performance indicators moved on second page	Neutral	
4	DISTRIBUTION OF THE ANNUAL ENERGY CONSUMPTION removed	Negative	It gives useful information about the energy distribution by sectors (heating, cooling, ventilation, DHW, etc.)
5	RES share removed	Negative	Very important information about the RES share in the total energy consumption is removed
6	Information about the Term of exemption from building tax is moved on the last page	Neutral	
7	Assessment of building envelope by energy rating	Negative	We should specify and present in the EPC concrete values for the different colors limits. At present we are working with summary value of the heat transfer coefficient through the respective enclosing element
8	Assessment of the technical system by energy rating	Positive	This will help a non-expert user to better understand the efficiency of their systems
9	Information about the values of the Heat generator and cool generator efficiency,% is removed	Negative	Transformation coefficient in heat generation, Coefficient of transformation in the generation of cooling energy. Exept the rating system by colors we should provide specific values for the efficiency.
10	The information about energy performance before and after is shown separately - in two different tables and pages	Negative	In the standart EPC the information about energy performance is structured as folows: one table for building envelope - before and after recommendations and one table for the technical systems - before and after the recommendations.
11	Distribution of annual energy consumption by systems in kWh is removed	Negative	This gives a realistic view of the energy consumption of the household
12	Total annual specific energy consumption for heating and ventilation and heating degrees	Neutral	Not very useful for the non-expert user
13	the figure with visualisation of the annual distribution of specific energy consumption is removed	Negative	This gives a realistic view of the energy consumption of the household
14	the figure with visualisation of the baseline and consumption is removed	Neutral	Not very useful for the non-expert user
15	More space for description of the recommendations is dedicated	Positive	
16	Description of useful combination of renovations and stepwise implementation for further renovation options is included	Positive	

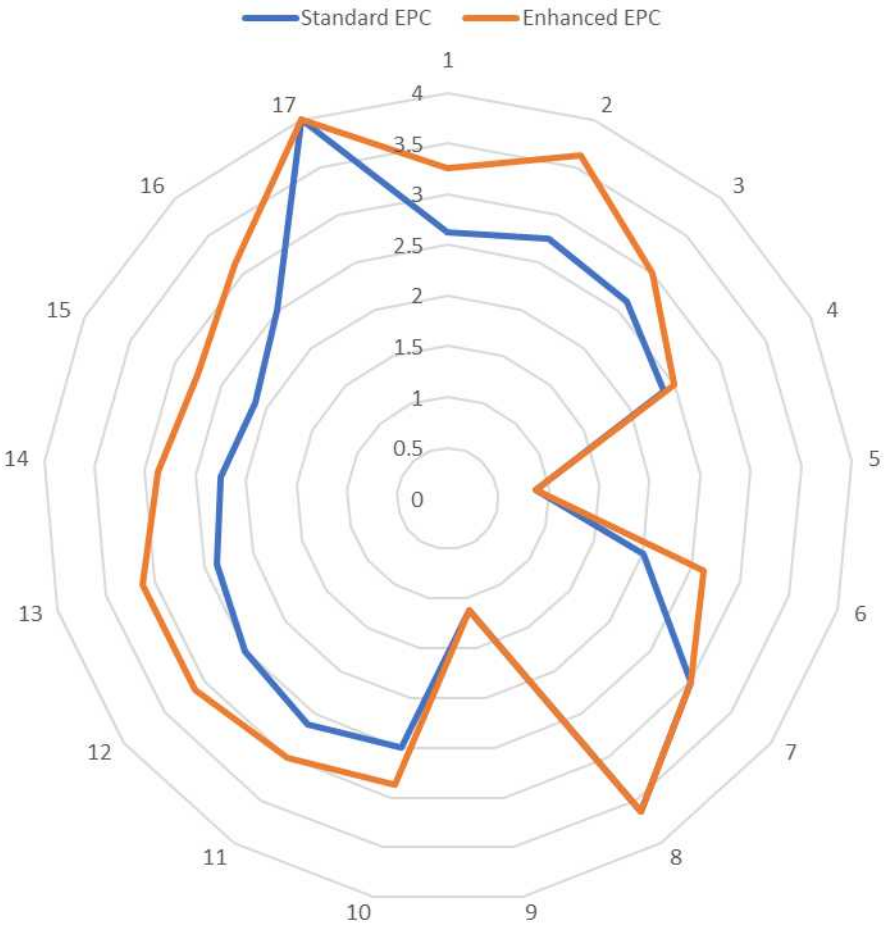
The general feedback on the enhanced EPC is positive and it would be considered as an improvement. It contains almost the same information as the standard EPC but presented in uniform way for the different countries which is a huge asset. The main positive points are related to the design and the colour scheme of the document, more space to describe the recommendations, the new field for description of the combination of the suggested renovations. The negative feedback is related to the missing tables and figures in comparison to the standard EPC, the not defined energy rating, the missing information about the RES. There were also points on which the feedback is neutral such as the different location of some pieces of information in the enhanced EPC vs the standard EPC.

In general, the enhanced EPC covers all the national requirements but have the asset to be uniform for different countries and presented in user-friendly template. From national perspective we would recommend to keep the information regarding the RES, to remove the energy rating from the document as for each country it will reflect different values and this will be misleading information. The recommendations have become more ambitious which is in line with the national and EU goals for energy efficiency and climate.

4.2 Results of building representative questionnaires

4.2.1 Enhanced EPC template

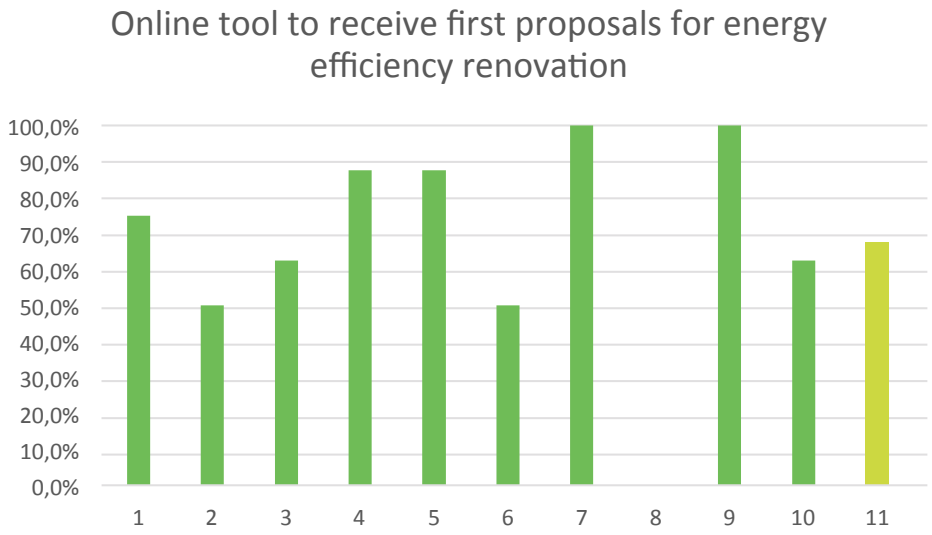
This Figure summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).



From the chart above we can see that on many points the standard and the enhanced EPC give the same quantity and quality of information to the users. However, the enhanced EPC fares much better on topics such as the help to decide on energy-efficient renovation measures, the energy class of the building and the way of presentation of the information in the document.

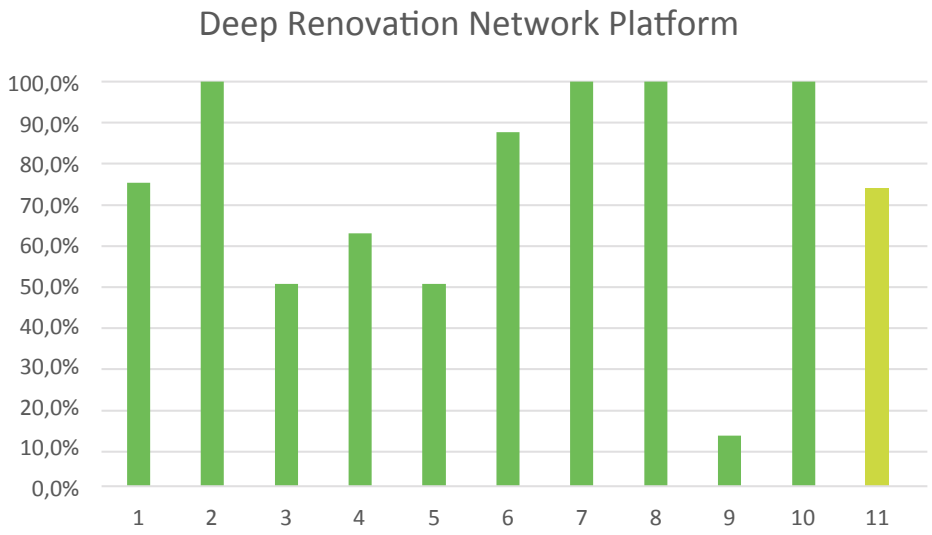
Type of EPC	Total score
Standard EPC	61.6%
Enhanced EPC	71.3%

4.2.2 Online tool to receive first proposals for energy efficiency renovation



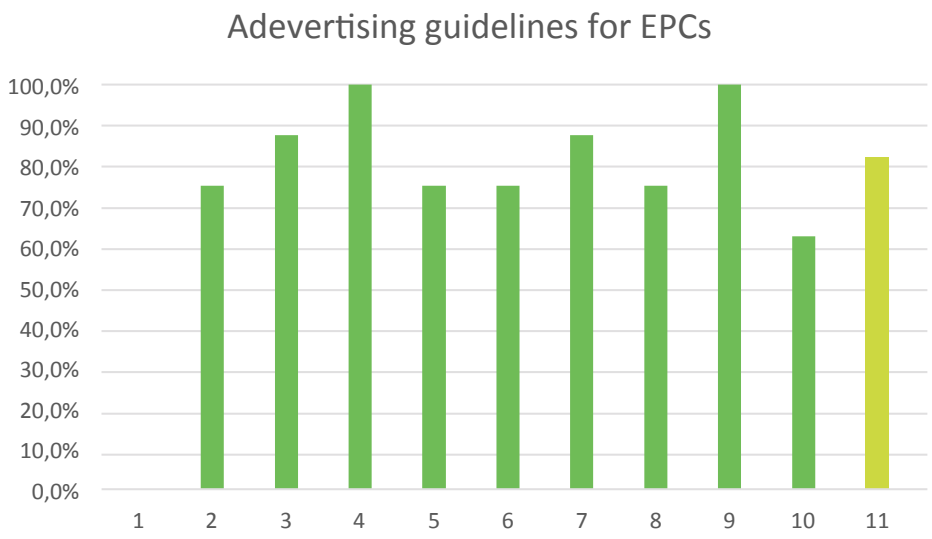
From the chart above, it is clear that the feedback on the first proposal of the online tool is positive. People are mainly interested in the financial aspect of the renovation of their home and the payback period. Then they think that any information related to costs savings, the energy class before and after the renovation as well as suggestions for the renovation are also estimated as useful. The homeowners are less interested in selection of energy efficiency measures by themselves and the CO_2 emissions and the economic gains.

4.2.3 Deep Renovation Network Platform



Regarding the DRNP, the homeowners are very positive to the possibility to have a platform which could estimate the potential savings and costs of their renovation, any information related to material or product manufacturers or suppliers, information on financing opportunities for deep renovation and active provision of information of deep renovation and its benefits and costs. On the other hand, they are almost not interested in the possibility to receive information from the media regarding the deep renovation.

4.2.4 Advertising guidelines for EPCs



The answers of the homeowners are an evidence to the fact that people are not aware of the guidelines related to the advertising and EPC, but they are very likely to receive in the advertisements information on how to calculate the energy costs of the building in monetary units.

4.3 Feedback from stakeholder roundtable discussions

4.3.1 Enhanced energy efficiency recommendations

- Include the savings from RES- for electricity, or heating or hot water. They are completely missing in the Enhanced EPC, but they are very important part for the country and EU objectives and also the homeowners are very sensitive to this kind of information, as they see it as part of their electricity bills.

4.3.2 Suggestions for improvements of Enhanced EPC template

- It was suggested that the NZEB mark is on the first page as it is actually in the Standard EPC for Bulgaria.
- The energy rating part is absolutely not clear. It should be whether specified (some legend, rating, note) or completely removed.
- Some participants think that the table with the energy consumption and the graphics included in the Bulgarian EPC should be part of the enhanced EPC.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

- The energy rating is not existing in the national legislation and it will require a lot of different resources to be defined. On the other hand, it will create some extra work for the energy auditors and the participant were more likely to not include it in the EPC.
- There should be link to the Sustainable Energy Development Agency which regulates the EPCs and on which's page there are links with all the actual documents and normative acts related to the energy efficiency and the renewable energy sources.
  www.seea.government.bg

Include the share of the energy coming from RES

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelines)

- All the participants liked the idea behind the Deep Renovation platform. They shared the opinion that this tool will be very useful for the citizens and that this could help them taking the decision to undertake deep renovation of their homes. However, it was mentioned that we should be very careful about the prices we put in the tool as they vary and at some point, if they are not updated often enough, they might become misleading.
- The feedback about the online tool is very positive and the participant think that it should be part of the DRNP. Some participants think that on national level these platforms should be operated by the Energy Agencies, which will give the possibility to consult them not only online, but also physically and receive the needed support by the energy agencies experts.
- Regarding the advertisement guidelines there were no particular comments. It is clear that there are legal national documents that say the data regarding the energy efficiency of the advertised flat or house should be mentioned. What was mentioned is that the control on the application on these rules should be strengthen.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

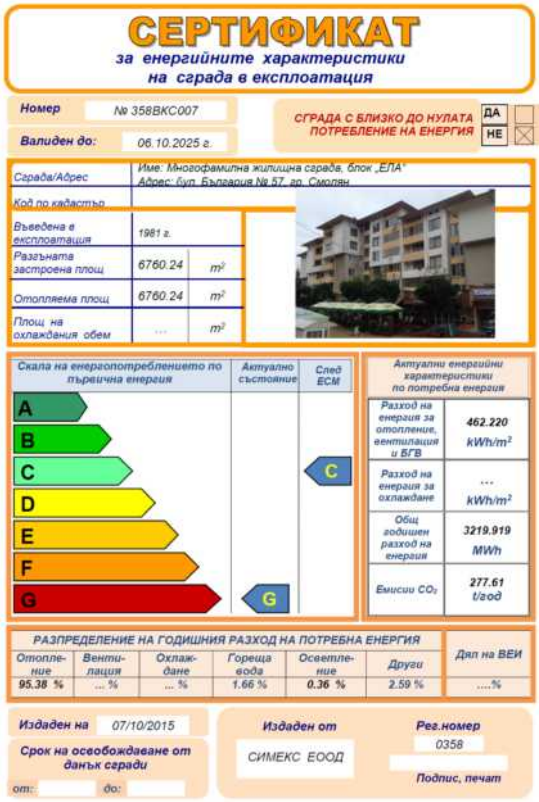
The Enhanced EPC is one very good example of uniform document that can help professionals and non-professionals in the different EU countries. The information that it collects and presents is very similar to the one that contains the national EPC document and that is the reason the enhanced EPC proposal in very well accepted by the stakeholders in Bulgaria. The EPC scheme presents the information in easy and readable way with good color scheme.

As an improvement we will suggest to remove the energy rating from the document as this information will be specific for each country and could create misunderstandings. On national level we would like as well to have the information related to the RES as it is part of the national and EU goals and is very important.

6 ANNEXES

ANNEX B: STANDARD EPCS

Residential building



СЕРТИФИКАТ
за енергийните характеристики
на сграда в експлоатация

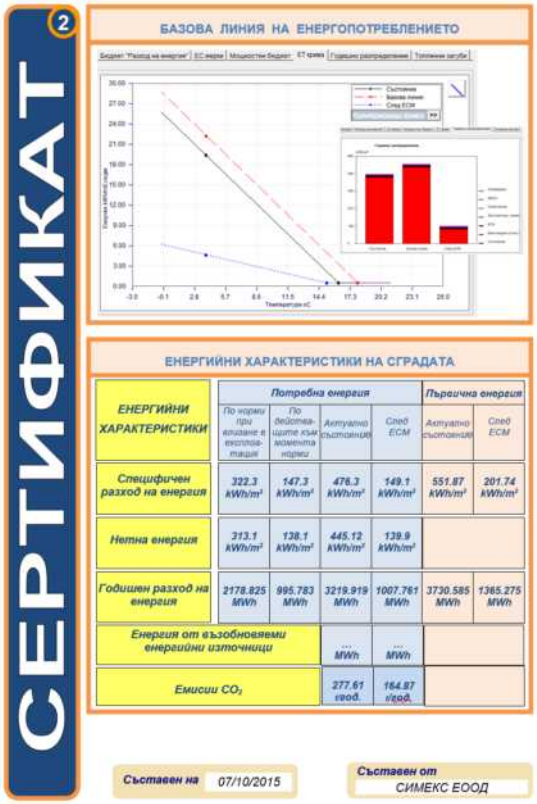
Номер	№ 358ВКС007
Валиден до:	06.10.2025 г.
СГРАДА С БЛИЗКО ДО НУЛАТА ПОТРЕБЛЕНИЕ НА ЕНЕРГИЯ	ДА ☐ НЕ ☒
Сграда/Адрес	Име: Многофамилна жилищна сграда, блок „ЕЛА“ Адрес: бул. България № 57, гр. Смолян
Код по кадастър	
Въведена в експлоатация	1981 г.
Разгънатата застроена площ	6760.24 m^2
Отопляема площ	6760.24 m^2
Площ на охлаждания обем	... m^2

Скала на енергопотреблението по първична енергия	Актуално състояние	След ЕСМ
A		
B		
C		C
D		
E		
F		
G	G	

Актуални енергийни характеристики по потребна енергия	
Разход на енергия за отопление, вентилация и БГВ	462.220 kWh/m^2
Разход на енергия за охлаждане	... kWh/m^2
Общ годишен разход на енергия	3219.919 MWh
Емисии CO_2	277.61 t/год

РАЗПРЕДЕЛЕНИЕ НА ГОДИШНИЯ РАЗХОД НА ПОТРЕБНА ЕНЕРГИЯ						Дял на ВЕИ
Отопление	Вентилация	Охлаждане	Гореща вода	Осветление	Други	
95.38 %	... %	... %	1.66 %	0.36 %	2.59 %	....%

Издаден на 07/10/2015	Издаден от СИМЕКС ЕООД	Рег.номер 0358
Срок на освобождаване от данък сгради от: до:		Подпис, печат



СЕРТИФИКАТ 2

БАЗОВА ЛИНИЯ НА ЕНЕРГОПОТРЕБЛЕНИЕТО

ЕНЕРГИЙНИ ХАРАКТЕРИСТИКИ НА СГРАДАТА

ЕНЕРГИЙНИ ХАРАКТЕРИСТИКИ	Потребна енергия				Първична енергия	
	По норми при влизане в експлоатация	По действащите към момента норми	Актуално състояние	След ЕСМ	Актуално състояние	След ЕСМ
Специфичен разход на енергия	322.3 kWh/m^2	147.3 kWh/m^2	476.3 kWh/m^2	149.1 kWh/m^2	551.87 kWh/m^2	201.74 kWh/m^2
Нетна енергия	313.1 kWh/m^2	138.1 kWh/m^2	445.12 kWh/m^2	139.9 kWh/m^2		
Годишен разход на енергия	2178.825 MWh	995.783 MWh	3219.919 MWh	1007.761 MWh	3730.585 MWh	1365.275 MWh
Енергия от възобновяеми енергийни източници			... MWh	... MWh		
Емисии CO_2			277.61 t/год.	164.87 t/год.		

Съставен на 07/10/2015	Съставен от СИМЕКС ЕООД

СЕРТИФИКАТ 3

Ограждащи конструкции и елементи

Наименование	Площ, m^2	Коефициент на топлопреминаване: Действителен, W/m^2K	Коефициент на топлопреминаване: Референтен W/m^2K
Стени	2886	1.39	0.28
Прозорци на фасадите	1203	2.96	1.40
Прозорци на покрива	...	...	...
Покрив	1900	2.58	0.25
Под	1858	1.01	0.33

Оценка на състоянието:

Прозорци
Дограмата на сградата е дървена единична, двукатна и метална единична и PVC (U=1.7 W/m²K) и дървена плътна на гаражните врати. Съгласно новите изисквания, цялата дограма трябва да бъде с норма U = 1.4 W/m²K за външни прозорци с PVC профил и U = 1.7 W/m²K за външни врати с алуминиев профил и U = 2.20 W/m²K за метални гаражни врати.
Външни стени
От извършения оглед на обекта се установи, че състоянието на външните стени не е задоволително. На отделни места мазилките са силно увредени до бетон, което променя характеристиките на съответния тип стена. Отделно те трябва да се топлоизолират.
Покрив
Покривната конструкция на сградата е изпълнена като „топъл скатен покрив".
Покривът е от стоманобетонна конструкция и покрит с керамични керемиди.
Покривът е с нарушена хидроизолация, която също трябва да се подмени – констатирани са течове. Има висок коефициент на топлопреминаване, вследствие на което през него се реализират големи загуби на топлина.
Под
Подът на сградата основно е под над неотоплаем сутерен (тип 1) и една малка част е под, граничещ с външен въздух – еркер (тип 2). Техническото състояние на пода е добро. Топлотехническите характеристики на пода не са добри.

Съставен на 07/10/2015

Съставен от СИМЕКС ЕООД

СЕРТИФИКАТ 4

Системи за отопление, вентилация, охлаждане и гореща вода

Система	Енергиен ресурс/ вид на генератора		Годишен разход на потребна енергия: Специфичен, kWh/m^2	Годишен разход на потребна енергия: Общ, kWh
Отопление	Електроенергия Дърва	4.543 449.777	454.3	3071314
Вентилация			...	...
Охлаждане			...	...
Гореща вода	Електроенергия		7.9	53594
Отоплителни денградуси			2593.8	
Общ годишен специфичен разход на енергия за отопление и вентилация			0.0649 kWh/m³DD	

Оценка на състоянието:

Отоплението на сградата се извършва чрез локални електрически уреди и печки на дърва. Уредите за БГВ в сградата са електрически бойлери. В сградата не е изграждана отоплителна инсталация. Топлоснабдяването на обследваната сграда е локално.

Съставен на 07/10/2015

Съставен от СИМЕКС ЕООД

СЕРТИФИКАТ 5

ЕНЕРГОСПЕСТЯВАЩИ МЕРКИ

Енергоспестяващи мерки	Инвестиции, лева	Спестена потребна енергия, kWh/год.	Спестени емисии CO_2, t/год.	Срок на откупуване, год.
Мерки по огр.елементи				
В1 – външни стени	320599.0	616873	31.31	7.72
В2 – покрив	422858.4	835403	42.41	7.52
В3 – под	123690.0	250380	12.71	7.34
В4 – дограма	346104.8	509519	25.86	10.09
Мерки по системите				
С1 – осветление	5886.0	555	0.45	5
С2.....				
.....				
Пакети от мерки				
П1 – Пакет от горе посочените мерки	1219137.2	2212730	112.75	8.2

ПРЕПОРЪКИ:
/други технически осъществими мерки, оценка на диапазона на възвращаемост на инвестициите и/или разходи-ползи през жизнения цикъл на сградата/

Съставен на 07/10/2015

Съставен от СИМЕКС ЕООД

Подпис, печат

Non-residential building

СЕРТИФИКАТ

за енергийните характеристики на сграда

Номер 115МОТ003 | **Категория** Б | **Валиден до:** 20.04.2013

Сграда	СОУ „Св. Св. Кирил и Методий"
Адрес	Видин 3700, ул. „Горазд" № 23
Въведена в експлоатация	1971
Разгънатата застроена площ	8175.8 m²
Отоплявема площ	8175.8 m²
Площ на охлаждания обем	m³

Скала на енергопотреблението по първична енергия	Актуално състояние	След ЕСМ
A		
B		B
C		
D	D	
E		
F		
G		

Актуални енергийни характеристики по потребна енергия	
Разход на енергия за отопление, вентилация и БГВ	167.9 kWh/m²
Разход на енергия за охлаждане	... kWh/m²
Общ годишен разход на енергия	1 373 MWh
Емисии CO_2	740 t/год

РАЗПРЕДЕЛЕНИЕ НА ГОДИШНИЯ РАЗХОД НА ПОТРЕБНА ЕНЕРГИЯ					ДЯЛ на ВЕИ
Отопление	Вентилация	Охлаждане	Гореща вода	Осветление	
88 %	0 %	0 %	3 %	3 %	0%

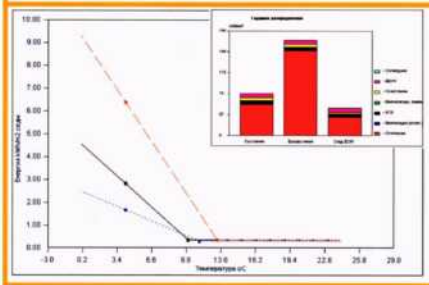
Издаден на 20.04.2010 г. | **Издаден от** Мотива ЕООД Хасково | **Рег.номер** 000115

Срок на освобождаване от данък сгради от: 20.04.2010 до: 20.04.2013

Подпис, печат

СЕРТИФИКАТ 2

БАЗОВА ЛИНИЯ НА ЕНЕРГОПОТРЕБЛЕНИЕТО



ЕНЕРГИЙНИ ХАРАКТЕРИСТИКИ НА СГРАДАТА

ЕНЕРГИЙНИ ХАРАКТЕРИС-ТИКИ	Потребна енергия				Първична енергия	
	По норми при влизане в експлоатация	По действащите към момента норми	Актуално състояние	След ЕСМ	Актуално състояние	След ЕСМ
Специфичен разход на енергия	167.8 kWh/m²	66.5 kWh/m²	167.9 kWh/m²	46.7 kWh/m²	221.5 kWh/m²	81.3 kWh/m²
Нетна енергия	115.8 kWh/m²	45.9 kWh/m²	115.9 kWh/m²	32.2 kWh/m²		
Годишен разход на енергия	1372 MWh	543.5 MWh	1373 MWh	381.5 MWh	1811 MWh	665 MWh
Емисии CO_2					740 т/год.	452 т/год.

Съставен на 20.04.2010 г. | **Съставен от** Мотива ЕООД Хасково

СЕРТИФИКАТ 3

Ограждащи конструкции и елементи

Наименование	Площ, m²	Коефициент на топлопреминаване: Действителен, W/m²K	Коефициент на топлопреминаване: Референтен W/m²K
Стени	4406.16	1.54	0.35
Прозорци	1912.87	2.57	1.70
Покрив	2182.17	0.88	0.30
Под	2182.17	0.23	0.40

Оценка на състоянието:

Сградата на училището е монолитна. Външните стени са тухлена зидария, обработени с външна варо-пясъчна и циментова мазилка с цел предпазване на фасадите от влиянието на атмосферните условия.

Установени са ерозирали участъци по външната мазилка, предимно на местата където липсва част или цялата водосточна тръба.

Покривната конструкция на учебните корпуси е студен (двоен) плоськ покрив. Въздушния слой между таванския панел и покривния панел на сградната конструкция е вентилируем. Покривната конструкция на административния блок е топъл (единичен) плоськ покрив.

Съществуващия под е под на отопляем етаж над земя. Върху подовата плоча са поставени замазка, мозайка, балатум и паркет с оглед характера на помещенията, и целта на тяхното предназначение.

Значителна част от прозорците са подменени с PVC дограма с двоен стъклопакет. Останалата неподменена дограма е дървена слепена, а входните врати са метални еднинично остъклени, са в лошо състояние.

Съставен на 20.04.2010 г. | **Съставен от** Мотива ЕООД Хасково

СЕРТИФИКАТ 4

Системи за отопление, вентилация, охлаждане и гореща вода

Система	Енергиен източник	Годишен разход на потребна енергия: Специфичен, kWh/m²	Годишен разход на потребна енергия: Общ, kWh
Отопление	Нафта	199.3	828 212
Вентилация			
Охлаждане			
Гореща вода	Ел. енергия	2.3	9 443
Отоплителни/охладителни денградуси		2987 /....	
Общ годишен специфичен разход на енергия за отопление и вентилация		0.02 kWh/m³DD	
Общ годишен специфичен разход на енергия за охлаждане		kWh/m³DD	

Оценка на състоянието:

В котелната централа са монтирани: водогреен котел ОН 550 с мощност 639 kW и нов водогреен котел тип Искър. Тръбите при монтажа на новия котел не са изолирани. Контрола на температурата се осъществява с термостат на изходящата температура. Циркулацията на топлоносителя е принудителна с помпен възел от който едната помпа липсва (няма аварийна помпа). Помпите са 12 ЕГЕ 8, установени са течове на топлоносител от салника. Това води до редовно доливане на флуида. Разширителния съд е отворен и изолиран в таванското помещение.

Съставен на 20.04.2010 г. | **Съставен от** Мотива ЕООД Хасково

СЕРТИФИКАТ 5

ЕНЕРГОСПЕСТЯВАЩИ МЕРКИ

Енергоспестяващи мерки	Инвести-ции, лева	Спестена потребна енергия, kWh/год.	Спестени емисии CO_2, t/год.	Срок на откупу-ване, год.
Мерки по огр. елементи				
В1 Замяна на прозорци	148 180	296 513	101.4	2.4
В2 Топлоизолация на стени	361 292	319 089	109.2	5.4
В3 Топлоизолция на покрив	237 324	78 650	26.9	14.4
Мерки по системите				
А1 Въвеждане на ен. ефект. осветление	43 560	18 116	37.0	12.7
С1 Реконструкция на котелна централа и ВОИ	307 500	279 278	22.0	5.3
Пакети от мерки				
П1 Мерки по сградна конструкция	746 796	694 252	136	5.1
П2 Мерки по енергийни системи	351 060	297 394	151.0	5.7

ПРЕПОРЪКИ:

Изпълнението на предписаните мерки ще доведе до по-малко загуби през ограждащите елементи, подобряване работата на отоплителната сиситема и повишаване на нейната ефективност.

Съставен на 20.04.2010 г.

Съставен от
Мотива ЕООД Хасково

Подпис, печат

6.1 Annex C: Enhanced EPCs

Residential building

Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Номер: 35ВЯСD07	Валиден до: 06.10.2025	Тип на сградата: Жилищна сграда
Идентификатор:		

Данни за сградата	*Жилищна сграда «Ела» на бул. „България" № 57 - гр.Смолян*
Тип	*Многофамилна жилищна сграда*
Адрес	бул. „България" № 57 - гр.Смолян
Допълнителна информация	
Година на въвеждане в експлоатация	*1981г.*
Разгънатата застроена площ, m2	*6760,24*
Отоплявана площ, m2	*6760,24*
Площ на охлаждания обем, m2	

Енергиен клас и енергийни характеристики на сградата

Скала [kWh/m²/y]	Скала [kWh/m²/y]	Скала	Преди ECM kWh/m²	След ECM kWh/m²
<	48	A		
48	95	B		
96	190	C		201,74
191	240	D		
241	290	E		
291	363	F		
364	435	G	551,87	
>	435	H		

Очакваме енергийно спестяване от избрания пакет ECM

2 212 730 kWh/год.

Издаден от:

Адрес, телефон, регистрационен номер

Дата

Подпис

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

Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Енергийни характеристики на сградата – съществуващо положение

Потребление на енергия

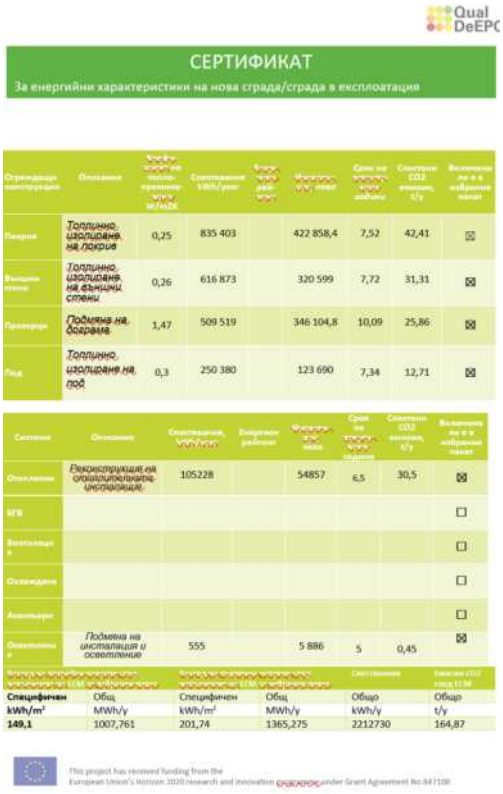
No.	Специфичен разход на потребена енергия	Специфичен разход на потребена енергия за отопление, вентилация и БГВ	Специфичен разход на първична енергия	Общ годишен разход на първична енергия	Генерирани емисии CO2
	kWh/m²	kWh/m²	kWh/m²	MWh	t/y.
1	476,3	462,22	551,87	3730,585	277,61

Ограждащи конструкции и системи

Ограждащи конструкции	Площ [m²]	Коефициент на топлопреминаване, W/m²K	Енергиен рейтинг
Покриви	1900	2,58	
Външни стени	2886	1,39	
Прозорци	1203	2,96	
Врати			
Под	1858	1,01	

Системи	Генератор	Енергиен ресурс	Годишен разход на потребена енергия		Енергиен рейтинг
			Специфичен kWh/m²	Общ, kWh	
Отопление	Печки на дърва и електроенергия	Електроенергия дърва	454,3	3 071 314	
БГВ	Бойлери	електроенергия	7,9	53 594	
Вентилация					
Охлаждане					
ВЕИ					
Осветление					

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



Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Ограждащи конструкции	Описание	Коефициент на топло-преминаване W/m2K	Спестяване kWh/year	Енергиен рейтинг	Инвестиция лева	Срок на възвръщане, години	Спестени CO2 емисии, t/y	Включен ли е в избрания пакет
Покриви	Топлинно изолиране на покрив	0,25	835 403		422 858,4	7,52	42,41	☒
Външни стени	Топлинно изолиране на външни стени	0,26	616 873		320 599	7,72	31,31	☒
Прозорци	Подмяна на дограма	1,47	509 519		346 104,8	10,09	25,86	☒
Под	Топлинно изолиране на под	0,3	250 380		123 690	7,34	12,71	☒

Системи	Описание	Спестяване, kWh/year	Енергиен рейтинг	Инвестиция лева	Срок на възвръщане, години	Спестени CO2 емисии, t/y	Включен ли е в избрания пакет
Отопление	Реконструкция на отоплителната инсталация.	105228		54857	6,5	30,5	☒
БГВ							☐
Вентилация							☐
Охлаждане							☐
Асансьори							☐
Осветление	Подмяна на инсталация и осветление	555		5 886	5	0,45	☒

Специфичен kWh/m²	Общ MWh/y	Специфичен kWh/m²	Общ MWh/y	Общо kWh/y	Общо t/y
149,1	1007,761	201,74	1365,275	2212730	164,87

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Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Енергоспестяващи мерки – описание на пакетите и избор на 1 от тях

Описание на избрания пакет от мерки и възможност за поетапно изпълнение на мерките

Избраний пакет от мерки води до: *Сграда с близко до нулевото енергийно потребление:* ☐

Внедряването на сградата ☐

Намаляване на топлинните мостове: ☒

Минимум 50% оползотворяване на ВЕИ ☐

Описание на полезна комбинация и поетапно изпълнение на мерки, които не са включени в избраний пакет ECM.

Срок на освобождаване от данък сгради по ЗМДТ

От: 00.00.00 до: 00.00.00

Допълнителна информация

Следният(ите) линк(ове) предоставя допълнителна информация относно сертификатите за енергийни характеристики на сгради и тяхното издаване, както и програми и механизми за финансиране:

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

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

Non-residential building

Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Номер: 11SMOT003	Валиден до: 30.04.2033	Тип на сградата: Училище
Идентификатор:		

Данни за сградата	Училище на ул. Горазд 23 - гр.Видин
Тип	Училище
Адрес	Ул. Горазд 23 - гр.Видин
Допълнителна информация	
Година на въвеждане в експлоатация	1971г.
Разгънатата застроена площ, m2	8175,8
Отоплявана площ, m2	8175,8
Площ на охлаждания обем, m2	

Енергиен клас и енергийни характеристики на сградата

Долна [kWh/m²/y]	Горна [kWh/m²/y]	Скала	Преди ECM, kWh/m²	След ECM, kWh/m²
<	48	A		
48	95	B		81,3
96	190	C		
191	240	D		
241	290	E	221,5	
291	363	F		
364	435	G		
>	435	H		

Очаквани енергийни спестявания от избрания пакет ECM

991 646 kWh/год.

Издаден от:

Адрес, телефон, регистрационен номер

Дата

Подпис

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

Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Енергийни характеристики на сградата – съществуващо положение

Потребление на енергия

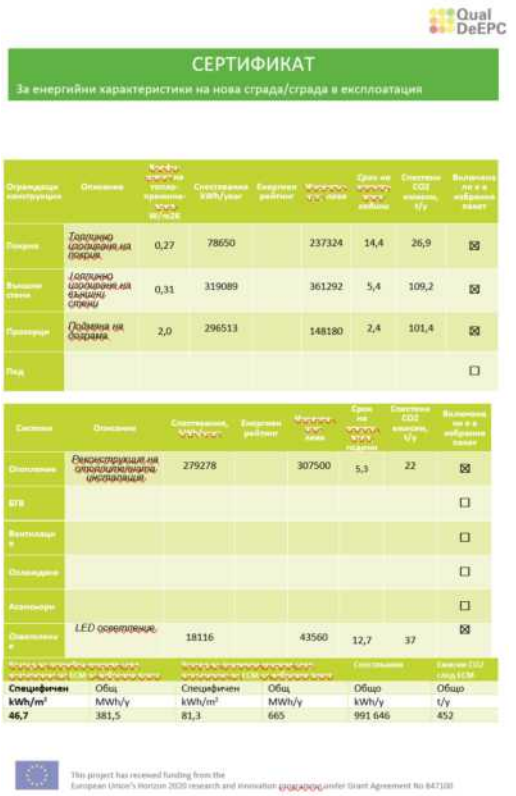
No.	Специфичен разход на потребена енергия	Специфичен разход на потребена енергия за отопление, вентилация и БГВ	Специфичен разход на първична енергия	Общ годишен разход на първична енергия	Генерирани емисии CO2
	kWh/m²	kWh/m²	kWh/m²	MWh	t/y.
1	167,9	167,9	221,5	1811	740

Ограждащи конструкции и системи

Ограждащи конструкции	Площ [m²]	Коефициент на топлопреминаване, W/m²K	Енергиен рейтинг
Покриви	2182,17	0,88	
Външни стени	4406,16	1,54	
Прозорци	1912,87	2,57	
Врати			
Под	2182,17	0,23	

Системи	Генератор	Енергиен ресурс	Годишен разход на потребена енергия: Специфичен kWh/m²	Общ kWh	Енергиен рейтинг
Отопление	Котел	нафта	148,6	1214942	
БГВ	Бойлери	електроенергия	5,2	42219	
Вентилация					
Охлаждане					
ВЕИ					
Осветление					

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



Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Ограждащи конструкции	Описание	Коефициент на топлопреминаване W/m²K	Спестявания kWh/year	Енергиен рейтинг	Разходи, евро	Срок на изплащане, години	Спестени CO2 емисии, t/y	Включени ли е в избрания пакет
Покриви	Топлинно изолиране на покрив	0,27	78650		237324	14,4	26,9	☒
Външни стени	Топлинно изолиране на външни стени	0,31	319089		361292	5,4	109,2	☒
Прозорци	Подмяна на дограма	2,0	296513		148180	2,4	101,4	☒
Под								☐

Системи	Описание	Спестявания, kWh/year	Енергиен рейтинг	Разходи, евро	Срок на изплащане, години	Спестени CO2 емисии, t/y	Включени ли е в избрания пакет
Отопление	Реконструкция на отоплителната инсталация	279278		307500	5,3	22	☒
БГВ							☐
Вентилация							☐
Охлаждане							☐
Асансьори							☐
Осветление	LED осветление	18116		43560	12,7	37	☒

Специфичен	Общ	Специфичен	Общ	Общо	Общо
kWh/m²	MWh/y	kWh/m²	MWh/y	kWh/y	t/y
46,7	381,5	81,3	665	991 646	452

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Qual DeEPC

СЕРТИФИКАТ

За енергийни характеристики на нова сграда/сграда в експлоатация

Енергоспестяващи мерки – описание на пакетите и избор на 1 от тях

Описание на избрания пакет от мерки и възможност за поетапно изпълнение на мерките

Избраният пакет от мерки води до: Сграда с близко до нулевото енергийно потребление: ☐

Въдъкоплителите на сградата ☐

Намаляване на топлинните мостове: ☒

Минимум 50% отопляване на ВЕИ ☐

Описание на полезна комбинация и поетапно изпълнение на мерки, които не са включени в избрания пакет ECM.

Срок на освобождаване от данък сгради по ЗМДТ

От: [illegible] до [illegible]

Допълнителна информация

Следният(ите) линк(ове) предоставя допълнителна информация относно сертификатите за енергийни характеристики на сгради и тяхното издаване, както и програми и механизми за финансиране:

- Website A
- Website B
- Website C

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6.2 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;
- Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in EPC	Standard EPC						
		Enhanced EPC						
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consump-	Standard EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	tion values shown in EPC help me to estimate future energy consumption	Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	Standard EPC						
		Enhanced EPC						
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-saving“			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. Advertising guidelines for EPCs

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements			
• The year of issue of the EPC, if that needs to be shown in the advertisements			

6.3 Annex F: Results of questionnaire of Bulgaria

Address	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4 “Dunav” blvd., Plovdiv	Standard EPC	2	3	3	1	1	2	4	4	1	2	3	2	2	2	2	2	4
	Enhanced EPC	2	4	3	1	1	3	4	4	1	2	3	3	3	3	3	3	4
57 “Bulgaria” blvd. , Smolyan	Standard EPC	2	2	3	4	1	2	2	3	2	3	3	2	2	3	2	2	4
	Enhanced EPC	3	3	3	4	1	3	2	3	2	3	3	3	3	3	2	2	4
2 “Sv.Kiril” str., Vidin	Standard EPC	3	3	2	3	1	2	3	4	2	3	3	2	2	2	2	2	4
	Enhanced EPC	3	4	3	3	1	2	3	4	2	3	3	3	3	3	3	4	4
23 “Gorazd” str., Vidin	Standard EPC	3	3	2	2	1	2	3	4	0	3	3	3	2	2	2	3	4
	Enhanced EPC	4	3	3	3	1	3	3	4	0	3	3	3	3	3	2	3	4
23 “Gorazd” str., Vidin/ 67“Gorazd” str., Vidin	Standard EPC	2	3	3	2	1	2	3	3	1	2	2	3	3	2	2	3	4
	Enhanced EPC	3	4	3	2	1	2	3	3	1	3	3	3	3	2	3	3	4
23 “Gorazd” str., Vidin/ 67“Gorazd” str., Vidin	Standard EPC	2	3	3	2	1	2	3	3	1	2	2	3	3	2	2	3	4
	Enhanced EPC	3	4	3	2	1	2	3	3	1	3	3	3	3	2	3	3	4
26 “P.R.Slaveikov” str., Vidin	Standard EPC	4	2	2	2	0	2	3	4	1	2	2	2	2	2	2	2	4
	Enhanced EPC	4	3	2	2	0	3	3	4	1	3	3	3	3	3	3	3	4
28 “P.R.Slaveikov” str., Vidin	Standard EPC	3	3	3	3	1	2	3	4	1	3	3	3	3	3	3	3	4
	Enhanced EPC	4	4	4	3	1	3	3	4	1	3	3	4	4	4	3	4	4

6.4 Annex D: National summary evaluation report for Germany

D4.5 National summary evaluation report for Germany

QualDeEPC H2020 project

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- Table 2: Title

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- Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

DISCLAIMER OF WARRANTIES

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TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Germany.

1 PILOT PROJECT SELECTION (TASK 4.1)

The selection of pilot buildings in Germany proved to be very difficult. As written in the Grant Agreement Annex 1 4.3.2, dena is meant to acquire subcontractors for the issuance of EPCs. A total of 4 tenders were published from May 2020 to October 2020. Only one subcontractor could be acquired. This contractor provides the EPCs of 20 buildings, where 17 are residential and 3 are non-residential buildings. There are nine buildings owners, because one owner holds 12 buildings. The details of the buildings are given in Table 4.

Table 4: Selected pilot buildings

No	Address (or code) of pilot building[1]	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	Andershofer Dorfst. 94 18439 Stralsund	R	One family row end building	1913	224.0	No information
2	Lindenallee 17 16816 Neuruppin	R	Single family house	1969	96.6	No information
3	03226	R	Two family row end building	1950	208.5	No information
4	06667	R	Single family house	1969	163.1	No information
5	14547	R	Single family house	2003	128.1	No information
6	10553	R	Multi family building (5)	1988 (renovation)	440.0	26.11.2018
7	10553	R	Multi family building (15)	1988 (renovation)	1403.0	26.11.2018
8	10829	R	Multi family building (37)	1905	3265.0	11.01.2019
9	10439	N	Mixed use building - non-residential part	1905	512.7	21.06.2018
10	10439	R	Mixed use building – residential part (shops, doctors)	1905	5001.3	21.06.2018

[1] The full address is only provided for building owners that have agreed its use for this study. Otherwise only the post code is provided.

No	Address (or code) of pilot building[1]	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
11	10961	R	Multi family building (10)	1900	1018.0	21.03.2019
12	10557	N	Non-residential building (restaurant)	1975	281.1	06.08.2019
13	12167	N	Non-residential (doctors, offices)	1955	178.8	14.01.2020
14	10713	R	Multi family building	1923	885.7	08.12.2020
15	10713	R	Multi family building	1923	888.5	08.12.2020
16	10713	R	Multi family building	1923	851.3	08.12.2020
17	10967	R	Multi family building	1900	244.6	30.07.2019
18	Rückertstraße 2 14469 Potsdam	R	Multi family building	1925	981.7	No information
19	Bredower Str 126 14612 Falkensee	R	Multi family building	1930	442.4	No information
20	14476	R	Two family row middle house	1947	401.5	No information

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries. Table 5 summarized the most important information on the Standard EPCs.

In Germany, the Standard EPCs were issued by the subcontractor. According to the subcontractor, for some buildings the acquisition of the input data proved difficult, because of low response times of the building owners. Otherwise, there were no other problems.

Table 5: Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Final energy demand for residential; primary energy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recommendations included in Standard EPC
1	Andershofer Dorfst. 94 18439 Stralsund	F	196.3	• Replacement of heating system by Air-Water-Heat pump • Hydraulic balance • DHW supply be new heating system (heat pump)
2	Lindenallee 17 16816 Neuruppin	D	114.1	• Replacement of windows by triple glazed windows with PVC frame • Added roof insulation (14 cm, WLG 035)
3	03226	F	181.3	• DHW: installation of 3 additional solar collectors to be connected to heating/ DHW system
4	06667	D	123.9	• Heating: reduction of supply temperature 55/45°C • Hydraulic balance • DHW: 2 additional solar collectors
5	14547	D	107.4	none
6	10553	E	154.0	• Heating: implementation of centralized/ decentralized gas boiler • Change of windows (no details)
7	10553	D	124.8	• Heating: implementation of centralized/ decentralized gas boiler • Change of windows (no details)
8	10829	G	219.6	none
9	10439	*In orange area of scale*	300.8	• Insulation of basement ceiling according to minimum regulation requirement
10	10439	D	129.7	• Insulation of ceiling to attic according to minimum regulation requirement • Heating: modernization of centralized heating system (no details)
11	10961	G	208.5	• Insulation of outer walls according to minimum regulation requirement • Hydraulic balance
12	10557	*Light green*	169.5	• Insulation of basement ceiling according to minimum regulation require-

No	Address (or code) of pilot building	Energy class of the building	Final energy demand for residential; primary energy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recommendations included in Standard EPC
		area of scale		ment • Heating: Insulation of pipes according to minimum regulation requirement • Heating: Installation of high efficiency water pump
13	12167	*Red area of scale*	797.2	• Insulation of upper most ceiling (roof) according to minimum regulation requirement • Insulation of basement ceiling
14	10713	F	188.7	• Insulation of upper most ceiling (roof) according to minimum regulation requirement
15	10713	F	187.4	• Insulation of upper most ceiling (roof) according to minimum regulation requirement
16	10713	F	198.9	• Insulation of upper most ceiling (roof) according to minimum regulation requirement
17	10967	G	230.5	• Insulation of upper most ceiling (roof) according to minimum regulation requirement
18	Rückertstraße 2 14469 Potsdam	D	119.6	• Heating/ DHW: connection to district heating system • Windows: replacement by triple glazed windows with PVC frame • Replacement of main entrance door
19	Bredower Str 126 14612 Falkensee	C	90.4	• Insulation of roof by 10 cm WLS 035 • DHW: centralized gas boiler + solar collector
20	No consent form (14476)	D	121.7	• Heating/ DHW: centralized air-water heat pump + electrical heater

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

The most relevant information of the enhanced EPCs is summarized in Table 6. The nationally adapted, enhanced EPCs in Germany were very well accepted by the EPC issuer (subcontractor). The supplied short guideline provided enough information on how to fill in the enhanced EPC in general, as well as the traffic light system and deep energy renovation recommendations in particular. The feedback of the EPC issuer was mostly positive, but also draw attention to some national requirements (see section 0).

Table 6: Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Final energy demand for residential; primary energy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							nZEB buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent
1	Andershofer Dorfst. 94 18439 Stralsund	D	43.3	111.4	• Replacement of windows by triple glazed windows with PVC frame • Added roof insulation (14 cm, WLG 035)	• Replacement of heating system by Air-Water-Heat pump • Hydraulic balance • DHW supply be new heating system (heat pump)				X
2	Lindenallee 17 16816 Neuruppin	A+	75.0	28.5	• Added roof insulation (14 cm, WLG 035) • Heating/ DHW: Replacement of system by Air-Water-Heat pump					X
3	03226	D	31.2	124.8	• Outer walls: added insulation of 14 cm WLG 035	• DHW: biomass (pellets) boiler				

No	Address (or code) of pilot building	Energy class after imple-menting the main option	Energy savings achieved by imple-menting the main option, %	Final energy demand for residential; primary ener-gy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recom-mendations included in main option of Enhanced EPC	Other energy effi-ciency improvement recommendations included in En-hanced EPC	Main option meets requirements for			
							nZEB build-ings in case of renova-tion	Air tight-ness	Re-duced thermal bridging	Min 50% RES or equiva-lent
4	06667	C	25.5	92,3	• DHW: 2 additional solar collectors					
5	14547	-	-	-	none					
6	10553	C	35.6	99,1	• Heating: implementation of central-ized/ decentralized gas boiler • Change of windows (no details) • Insulation of ceiling to attic (20 cm WLG 035) • Insulation of outer walls (14 cm WLG 35)					X
7	10553	B	48.9	63.8	• Heating: implementation of central-ized/ decentralized gas boiler • Change of windows (no details) • Insulation of ceiling to attic (20 cm WLG 035) • Insulation of outer walls (14 cm WLG 35)					
8	10829	C	57.4	93.6	• Change of windows (no details) • Insulation of ceiling to attic (20 cm WLG 035) • Insulation of outer walls (14 cm WLG 35) • Heating/ DHW: block heat and power plant					
9	10439	*Green area*	27.9	202.7	• Change of windows (no details)	• New high effi-				

No	Address (or code) of pilot building	Energy class after imple-menting the main option	Energy savings achieved by imple-menting the main option, %	Final energy demand for residential; primary ener-gy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recom-mendations included in main option of Enhanced EPC	Other energy effi-ciency improvement recommendations included in En-hanced EPC	Main option meets requirements for			
							nZEB build-ings in case of renova-tion	Air tight-ness	Re-duced thermal bridging	Min 50% RES or equiva-lent
		of scale			• Insulation of outer walls (12 cm WLG 35)	ciency boiler				
10	10439	D	16.4	108.4	• Insulation of ceiling to attic (20 cm WLG 035) • Heating/ DHW: block heat and power plant					
11	10961	F	11.4	184.7	• Insulation of ceiling to attic (14 cm, WLG 035) • Change of windows • Gas fuel cell					
12	10557	*Light green area of scale*	18.2	283.1	• Insulation of ceiling to attic (14 cm, WLG 035)					
13	12167	Yellow area on the scale	32.0	534.1	• Installation of high efficiency boiler (gas)					
14	10713	D	41.9	109.7	• Insulation of upper most ceiling (roof) (14 cm WLG 035) • Insertion of insulation between walls (4-6 cm WLG 035) • Heating/ DHW: Replacement of boiler by high efficiency boiler (gas)					
15	10713	E	44.8	103,4	• Insulation of upper most ceiling (roof) (14 cm WLG 035)					

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Final energy demand for residential; primary energy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							nZEB buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent
					• Insertion of insulation between walls (4-6 cm WLG 035) • Heating/ DHW: Replacement of boiler by high efficiency boiler (gas) • Insulation of heating pipes					
16	10713	C	53.6	92.3	• Insulation of upper most ceiling (roof) (14 cm WLG 035 • Outer walls: additional insulation (16 cm WLG 035) • Replacement of windows • Insulation of ceiling to unheated basement • Heating/ DHW: biomass boiler, insulation of pipes		X			X
17	10967	D	45.3	126.1	• Insulation of upper most ceiling (roof) (12 cm, WLG 035) • Outer walls: inner insulation (6cm WLG 035) • Heating/ DHW: fuel cell and insulation of pipes					
18	Rückertstraße 2 14469 Potsdam	A	59.4	48.6	• Renew of insulation between common rafter (24 cm, WLG 035) • Outer walls: 16 cm insulation WLG 035 • Windows: replacement by triple					

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Final energy demand for residential; primary energy demand for non-residential [kWh/m²yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							nZEB buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent
					glazed windows with PVC frame • Ground floor: new construction • Heating/ DHW: connection to district heating system					
19	Bredower Str 126 14612 Falkensee	B	25.2	67.6	• Insulation of roof by 14 cm WLG 035 • Replacement of windows (U-value 0,95 W/(m²K)) • DHW: thermal solar system					
20	14476	A+	78.9	25.7	• Renew of insulation between common rafter • Additional outer wall insulation (14 cm WLG 035) • For two wall outer wall: introduction of insulation (12 cm WLG 035) • Replacement of windows • Heating/ DHW: centralized air-water heat pump					

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

The nationally adapted, enhanced EPC differs in some aspects from the standard EPC in Germany. These differences are summarized in Table 7. The most positive changes are the provided information on the energy efficiency potential of the building. Also, the rating of the building components and renovation recommendations are advantageous. The different display of the energy classes are mostly neutral for residential buildings, since the boundaries are defined and visible in both EPCs. For non-residential buildings the "new" display proofed more difficult, because of the missing energy classes and their defined boundaries in the German Building Energy Act. Due to the cross-country approach of the template, some details on the HVAC systems, renewable energy sources and the glossary are missing. The HVAC systems and renewable energy sources might, however, be described at the technical systems. On the negative side are the missing information of CO_2-emissions, the missing reference scale, the fewer annotations and missing glossary, as well as the missing check marks for the achievement of certain aspects of the regulation requirements.

Table 7: Evaluation of differences between the standard and enhanced EPCs

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are:	Comments
1	Less information on HVAC system of the building on the first page	Neutral	This information does not necessarily have to be provided on the first page, but should be integrated in the table of the technical systems on the 2nd page.
2	Different classification scale	Neutral	Non-residential buildings: difficult because no classes are defined in German Building Energy Act
3	No CO2 emissions	Negative	Should be integrated on first page
4	No reference scales	Negative	Would be enough to show on last page
5	Information on potential energy class	Positive	
6	Information on potential energy savings	Positive	
7	Energy rating of current state of the building envelope and technical systems	Positive	
8	Energy rating of renovation recommendations	Positive	
9	Less details on achievement of national regulation re-	Negative	Could be included in an additional check box

	quirements		
10	Less details of the use of renewable energy sources	Neutral	Could be included in the description of the technical systems
11	No glossary, less annotations	Negative	Excluded because of links to DRNP

For the practical application of the enhanced EPC template, it was adjusted to some German specifications and a short guide was provided to the EPC assessor. The EPC form template had to be filled in by hand by the EPC assessor. Even though some normally provided information was missing, the enhanced EPC provided more detailed information on the energy saving potential of the buildings. Also, it seems that it encouraged the EPC assessor to provide more ambitious or more detailed renovation recommendations (Table 5 vs. Table 6). The detailed feedback by the building representatives and EPC assessors is provided in the next sections.

4.2 Results of building representative questionnaires

At the current stage, six building representatives provided feedback to the received standard and enhanced EPC.

4.2.1 Enhanced EPC template

This Figure summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).

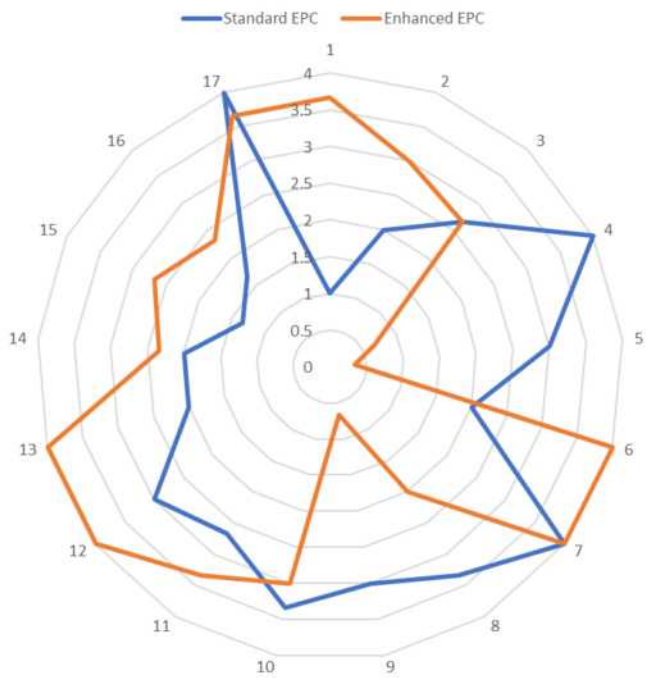


Figure 1: Comparison of average feedback score on the Standard and enhanced EPC (0:= disagree, 1:= somewhat disagree, 2:= neutral, 3:= somewhat agree, 4:= agree)

The results of Figure 1 show that the Standard and enhanced EPC have different strengths and weaknesses. The Standard EPC scores better for the questions regarding the achievement of minimal re-

quirements defined by the Germany Energy Performance Act (question 4), and the comparison to other buildings (question 5 and 9). Moreover, the original classification scale seems to convey a better understanding of the energy classes (question 8). The strong points of the enhanced EPC are the ones concerning the strengths and weaknesses of the current energy performance of the building (questions 1, 3), the information conveyed by the renovation recommendation (questions 11, 12, 13, 14, 15), and the identification of the potential (reduced) energy performance of the building (question 6). Also, the used language is better understandable (question 2). All in all, the enhanced EPC received a higher overall score than the standard EPC (Table 8). It could be improved by also suppling information of the national requirements and a graphic that compares the energy performance of different building types as a reference.

Table 8: Total score of the Standard and Enhanced EPC

Type of EPC	Total score
Standard EPC	66.2%
Enhanced EPC	68.1%

4.2.2 Online tool to receive first proposals for energy efficiency renovation

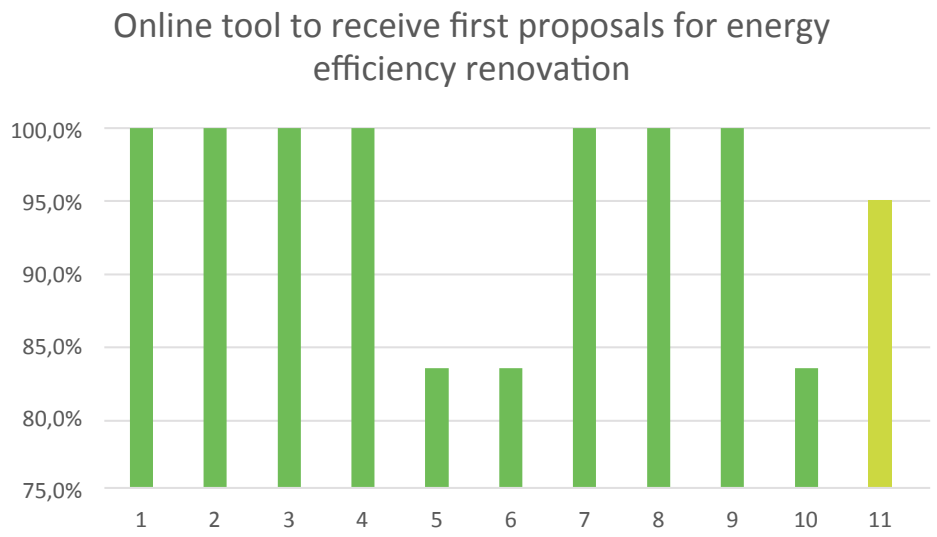


Figure 2: Comparison of received average scores of the suggested content of an online tool (building owners either agree (100%) or disagree (0%))

The proposed content for the online tool all received high ratings of above 75% by the building representatives. The lowest scores of 83% were for the energy class (content no. 5), CO_2- emissions after a renovation (content no. 6), and the information if the current building adheres to the current energy requirement of the German Building Performance Act (content no. 10). No further suggestions were delivered by the building representatives.

4.2.3 Deep Renovation Network Platform

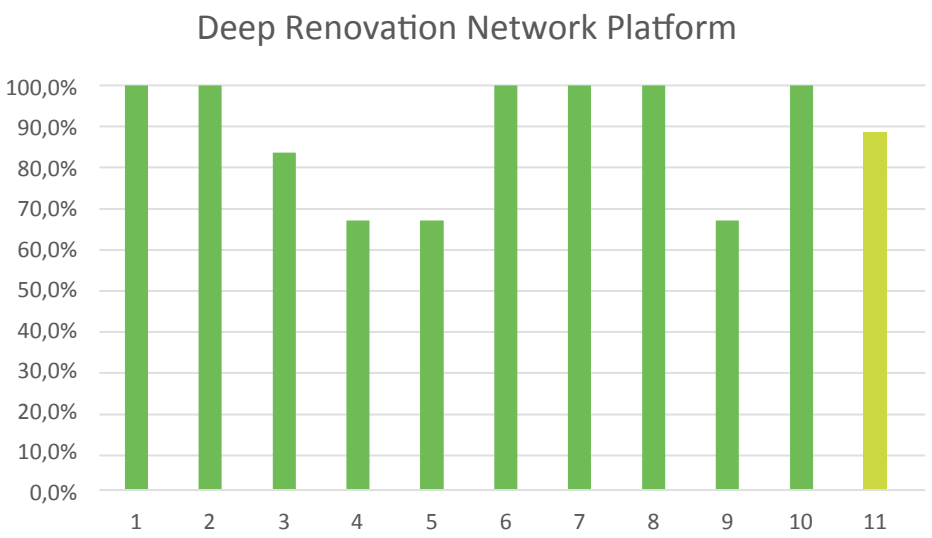


Figure 3: Results from building owner questionnaire on content of DRNP (building owners either agree (100%) or disagree (0%))

For the Deep Renovation Network Platform also all proposed content received high ratings on whether the building representatives would use the information (100%) or not (0%). The three lowest averaged scores of 66.7 % were the linking with the energy performance certificate (content no.4), the linking with the deep renovation roadmap or passport (content no. 5), and information on financial incentives (content no. 9). The link to renovation tools received 83.3% of support. All building representatives agree on the content regarding information on renovation actions (content no.1), potential savings (content no. 2), contractors or energy efficiency experts (content no. 6 and 7), material or product suppliers (content no. 8), and active provision of deep energy renovation (content no. 10). No further suggestions were submitted.

4.2.4 Advertising guidelines for EPCs

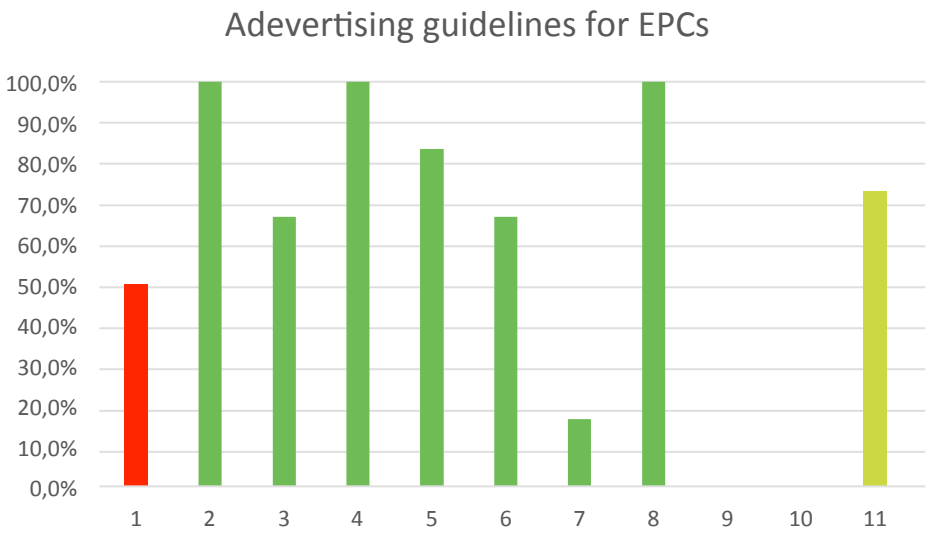


Figure 4: Results from building owner questionnaire on content of advertising guidelines (building owners either agree (100%) or disagree (0%))

Figure 4 shows whether the building representatives find the suggested content (content no. 2-8) for advertising guidelines useful or not. Also, an initial question (no. 1) was asked to see if the building representatives were familiar with already existing guidelines. In our case, 50 % of the building owner were aware of the existing guidelines. Full or very high scores were given for information in the guidelines on where to find energy demand or consumption data (content no. 2), on how to calculate current energy costs (content no. 4), on how to calculate CO_2-emissions (content no. 5), and on when the EPC of the building was issued (content no. 8). Less important was the information on where to find the energy class (content no. 3), and the availability of a graphical element for the energy class (content no. 7).

4.3 Feedback from stakeholder roundtable discussions

4.3.1 Standard EPC vs Enhanced EPC

- Generally positive impression, e.g. “enhanced” EPC shows weakness of the building in more detail; details on U-values of general building components
- Image for comparison of typical energy demand/ consumption of different building types is missing
- Traffic light systems needs minimum standard for data acquisition (on-site visit)

4.3.2 Enhanced energy efficiency recommendations

- Suggestions are good
- Should be established in regulations

4.3.3 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelines

- EPC/ Energy class is not a big criterion on the real estate market

4.3.4 Suggestions for improvements of the Enhanced EPC scheme

- Include image that shows typical energy demand/ consumption of different building types
- Check marks for regulatory obligations

4.3.5 Suggestions for national adaption of the Enhanced EPC scheme

- No consumption based EPCs
- Enhanced EPC would have to be integrated in software

4.3.6 Other

- The Profession of “Energieberater” (energy consultant) needs to be defined and officially recognised to avoid unqualified consultations and “cheap” EPCs
- Problems to find young, qualified employees
- Big differences in the quality of work of consultants - quality assurance is urgently need
- Vocational training and continuous professional development are urgently needed

- Regulations/ funding programs need to be more ambitious (long term strategy towards climate neutrality)

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

In Germany, the EPC issuers, stakeholders and building representatives agreed that the enhanced EPC form has features that are useful to understand the current energy performance of the building and to estimate the potential performance improvement of the building. However, some specific elements were missing such as a reference scale for the energy performance of typical buildings, and check marks for the compliance with minimum energy standards according to the German Building Performance Act.

For the online tool and DRNP, received positive feedback from the building representatives as well as stakeholders. The suggested content of the advertising guidelines was seen more critically. In fact, the stakeholders pointed out that the building market is very tight and hence, energy performance is often not a priority of the buyers.

6 ANNEXES

6.1 Annex B: Standard EPCs

ENERGIEAUSWEIS für Wohngebäude

gemäß den §§ 79 ff. Gebäudeenergiegesetz (GEG) vom [1] 8. August 2020

Gültig bis: **28.04.2031**

Vorschau
(Ausweis rechtlich nicht gültig)

1

Gebäude

Gebäudetyp	freistehendes Mehrfamilienhaus	
Adresse	Rückertstraße 2 14469 Potsdam	
Gebäudeteil [2]	Gesamtes Gebäude	
Baujahr Gebäude [3]	1925	
Baujahr Wärmeerzeuger [3, 4]		
Anzahl der Wohnungen	10	
Gebäudenutzfläche (A_N)	981,7 m² ☐ nach § 82 GEG aus der Wohnfläche ermittelt	
Wesentliche Energieträger für Heizung [3]	Erdgas E	
Wesentliche Energieträger für Warmwasser [3]	Erdgas E	
Erneuerbare Energien	Art:	Verwendung:
Art der Lüftung [3]	☒ Fensterlüftung ☐ Schachtlüftung	☐ Lüftungsanlage mit Wärmerückgewinnung ☐ Lüftungsanlage ohne Wärmerückgewinnung
Art der Kühlung [3]	☐ Passive Kühlung ☐ Gelieferte Kälte	☐ Kühlung aus Strom ☐ Kühlung aus Wärme
Inspektionspflichtige Klimaanlagen [5]	Anzahl:	Nächstes Fälligkeitsdatum der Inspektion:
Anlass der Ausstellung des Energieausweises	☐ Neubau ☐ Vermietung / Verkauf	☒ Modernisierung (Änderung / Erweiterung) ☐ Sonstiges (freiwillig)

Hinweise zu den Angaben über die energetische Qualität des Gebäudes

Die energetische Qualität eines Gebäudes kann durch die Berechnung des **Energiebedarfs** unter Annahme von standardisierten Randbedingungen oder durch die Auswertung des **Energieverbrauchs** ermittelt werden. Als Bezugsfläche dient die energetische Gebäudenutzfläche nach dem GEG, die sich in der Regel von den allgemeinen Wohnflächenangaben unterscheidet. Die angegebenen Vergleichswerte sollen überschlägige Vergleiche ermöglichen (**Erläuterungen – siehe Seite 5**). Teil des Energieausweises sind die Modernisierungsempfehlungen (Seite 4).

☒ Der Energieausweis wurde auf der Grundlage von Berechnungen des **Energiebedarfs** erstellt (Energiebedarfsausweis). Die Ergebnisse sind auf **Seite 2** dargestellt. Zusätzliche Informationen zum Verbrauch sind freiwillig.

☐ Der Energieausweis wurde auf der Grundlage von Auswertungen des **Energieverbrauchs** erstellt (Energieverbrauchsausweis). Die Ergebnisse sind auf **Seite 3** dargestellt.

Datenerhebung Bedarf/Verbrauch durch ☐ Eigentümer ☒ Aussteller

☐ Dem Energieausweis sind zusätzliche Informationen zur energetischen Qualität beigefügt (freiwillige Angabe).

Hinweise zur Verwendung des Energieausweises

Energieausweise dienen ausschließlich der Information. Die Angaben im Energieausweis beziehen sich auf das gesamte Gebäude oder den oben bezeichneten Gebäudeteil. Der Energieausweis ist lediglich dafür gedacht, einen überschlägigen Vergleich von Gebäuden zu ermöglichen.

Aussteller (mit Anschrift und Berufsbezeichnung)

Energieberater im Land Brandenburg GmbH
Steffen Engler
Dennis-Gabor-Straße 2
14469 Potsdam

Unterschrift des Ausstellers

Ausstellungsdatum 29.04.2021

[1] Datum des angewendeten GEG, gegebenenfalls des angewendeten Änderungsgesetzes zum GEG
[2] nur im Falle des § 79 Absatz 2 Satz 2 GEG einzutragen
[3] Mehrfachangaben möglich
[4] bei Wärmenetzen Baujahr der Übergabestation
[5] Klimaanlagen oder kombinierte Lüftungs- und Klimaanlagen im Sinne des § 74 GEG

Hottgenroth Software, Energieberater 18599 3D PLUS 11.1.8

ENERGIEAUSWEIS für Wohngebäude

gemäß den §§ 79 ff. Gebäudeenergiegesetz (GEG) vom [1] 8. August 2020

Berechneter Energiebedarf des Gebäudes — Vorschau (Ausweis rechtlich nicht gültig) — 2

Energiebedarf

Treibhausgasemissionen 29,5 kg CO_2-Äquivalent /(m²·a)

Endenergiebedarf dieses Gebäudes 119,6 kWh/(m²·a)

132,2 kWh/(m²·a) Primärenergiebedarf dieses Gebäudes

Anforderungen gemäß GEG [2]

Primärenergiebedarf

Ist-Wert 132,2 kWh/(m²·a) Anforderungswert 71,3 kWh/(m²·a)

Energetische Qualität der Gebäudehülle H_T'

Ist-Wert 0,88 W/(m²·K) Anforderungswert 0,70 W/(m²·K)

Sommerlicher Wärmeschutz (bei Neubau) ☐ eingehalten

Für Energiebedarfsberechnungen verwendetes Verfahren

- ☒ Verfahren nach DIN V 4108-6 und DIN V 4701-10
- ☐ Verfahren nach DIN V 18599
- ☐ Regelung nach § 31 GEG ("Modellgebäudeverfahren")
- ☐ Vereinfachungen nach § 50 Absatz 4 GEG

Endenergiebedarf dieses Gebäudes [Pflichtangabe in Immobilienanzeigen] 119,6 kWh/(m²·a)

Angaben zur Nutzung erneuerbarer Energien [3]

Nutzung erneuerbarer Energien zur Deckung des Wärme- und Kälteenergiebedarfs auf Grund des § 10 Absatz 2 Nummer 3 GEG

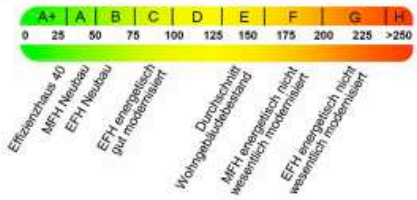
Art:	Deckungsanteil:	Anteil der Pflichterfüllung:
	%	%
	%	%
Summe:	%	%

Maßnahmen zur Einsparung [3]

Die Anforderungen zur Nutzung erneuerbarer Energien zur Deckung des Wärme- und Kälteenergiebedarfs werden durch eine Maßnahme nach § 45 GEG oder als Kombination gemäß § 34 Absatz 2 GEG erfüllt.

- ☐ Die Anforderungen nach § 45 GEG in Verbindung mit § 16 GEG sind eingehalten.
- ☐ Maßnahme nach § 45 GEG in Kombination gemäß § 34 Absatz 2 GEG: Die Anforderungen nach § 16 GEG werden um % unterschritten. Anteil der Pflichterfüllung: %

Vergleichswerte Endenergie [4]



Erläuterungen zum Berechnungsverfahren

Das GEG lässt für die Berechnung des Energiebedarfs unterschiedliche Verfahren zu, die im Einzelfall zu unterschiedlichen Ergebnissen führen können. Insbesondere wegen standardisierter Randbedingungen erlauben die angegebenen Werte keine Rückschlüsse auf den tatsächlichen Energieverbrauch. Die ausgewiesenen Bedarfswerte der Skala sind spezifische Werte nach dem GEG pro Quadratmeter Gebäudenutzfläche (A_N), die im Allgemeinen größer ist als die Wohnfläche des Gebäudes.

[1] siehe Fußnote 1 auf Seite 1 des Energieausweises
[2] nur bei Neubau sowie bei Modernisierung im Fall § 80 Absatz 2 GEG
[3] nur bei Neubau
[4] EFH: Einfamilienhaus, MFH: Mehrfamilienhaus

Hottgenroth Software, Energieberater 18599 3D PLUS 11.1.8

ENERGIEAUSWEIS für Wohngebäude

gemäß den §§ 79 ff. Gebäudeenergiegesetz (GEG) vom [1] 8. August 2020

Erfasster Energieverbrauch des Gebäudes — Vorschau (Ausweis rechtlich nicht gültig) — 3

Energieverbrauch

Treibhausgasemissionen kg CO_2-Äquivalent /(m²·a)

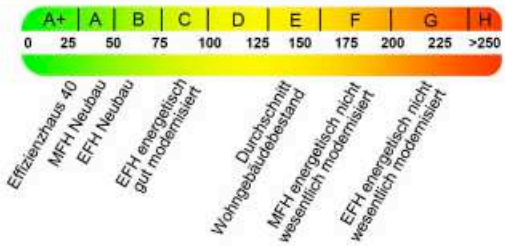
Endenergieverbrauch dieses Gebäudes [Pflichtangabe in Immobilienanzeigen]

Verbrauchserfassung - Heizung und Warmwasser

Zeitraum von	Zeitraum bis	Energieträger [2]	Primär-energie-faktor-	Energie-verbrauch [kWh]	Anteil Warmwasser [kWh]	Anteil Heizung [kWh]	Klima-faktor

☐ weitere Einträge in Anlage

Vergleichswerte Endenergie [3]



Die modellhaft ermittelten Vergleichswerte beziehen sich auf Gebäude, in denen Wärme für Heizung und Warmwasser durch Heizkessel im Gebäude bereitgestellt wird.
Soll ein Energieverbrauch eines mit Fern- oder Nahwärme beheizten Gebäudes verglichen werden, ist zu beachten, dass hier normalerweise ein um 15 bis 30 % geringerer Energieverbrauch als bei vergleichbaren Gebäuden mit Kesselheizung zu erwarten ist.

Erläuterungen zum Verfahren

Das Verfahren zur Ermittlung des Energieverbrauchs ist durch das GEG vorgegeben. Die Werte der Skala sind spezifische Werte pro Quadratmeter Gebäudenutzfläche (A_N) nach dem GEG, die im Allgemeinen größer ist als die Wohnfläche des Gebäudes. Der tatsächliche Energieverbrauch eines Gebäudes weicht insbesondere wegen des Witterungseinflusses und sich ändernden Nutzerverhaltens vom angegebenen Energieverbrauch ab.

[1] siehe Fußnote 1 auf Seite 1 des Energieausweises
[2] gegebenenfalls auch Leerstandszuschläge, Warmwasser- oder Kühlpauschale in kWh
[3] EFH: Einfamilienhaus, MFH: Mehrfamilienhaus

Hottgenroth Software, Energieberater 18599 3D PLUS 11.1.8

ENERGIEAUSWEIS für Wohngebäude

gemäß den §§ 79 ff. Gebäudeenergiegesetz (GEG) vom [1] 8. August 2020

Empfehlungen des Ausstellers Vorschau (Ausweis rechtlich nicht gültig) 4

Empfehlungen zur kostengünstigen Modernisierung

Maßnahmen zur kostengünstigen Verbesserung der Energieeffizienz sind ☒ möglich ☐ nicht möglich

Empfohlene Modernisierungsmaßnahmen

Nr.	Bau- oder Anlagenteile	Maßnahmenbeschreibung in einzelnen Schritten	empfohlen: in Zusammenhang mit größerer Modernisierung	empfohlen: als Einzelmaßnahme	(freiwillige Angaben): geschätzte Amortisationszeit	(freiwillige Angaben): geschätzte Kosten pro eingesparte Kilowattstunde Endenergie
1	Heizung	Anschluss an Fernwärmenetz	☐	☒		
2	Warmwasser	Anschluss an Fernwärmenetz	☐	☒		
3	Fenster	Ersatz der Fenster: 3-fach-WS-Verglasung (Ug: 0,60) - Kunststoffrahmen (Uf: 1,1) - warme Kante Ersatz der Außentüren: U = 1,1 W/m²K	☒	☐		

☐ weitere Einträge im Anhang

Hinweis: Modernisierungsempfehlungen für das Gebäude dienen lediglich der Information. Sie sind kurz gefasste Hinweise und kein Ersatz für eine Energieberatung.

Genauere Angaben zu den Empfehlungen sind erhältlich bei/unter: Energieberater im Land Brandenburg GmbH, Steffen Engler, Dennis-Gabor-Straße 2, 14469 Potsdam

Ergänzende Erläuterungen zu den Angaben im Energieausweis (Angaben freiwillig)

[1] siehe Fußnote 1 auf Seite 1 des Energieausweises

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ENERGIEAUSWEIS für Wohngebäude

gemäß den §§ 79 ff. Gebäudeenergiegesetz (GEG) vom [1] 8. August 2020

Erläuterungen

5

Angabe Gebäudeteil – Seite 1
Bei Wohngebäuden, die zu einem nicht unerheblichen Anteil zu anderen als Wohnzwecken genutzt werden, ist die Ausstellung des Energieausweises gemäß § 79 Absatz 2 Satz 2 GEG auf den Gebäudeteil zu beschränken, der getrennt als Wohngebäude zu behandeln ist (siehe im Einzelnen § 106 GEG). Dies wird im Energieausweis durch die Angabe „Gebäudeteil" deutlich gemacht.

Erneuerbare Energien – Seite 1
Hier wird darüber informiert, wofür und in welcher Art erneuerbare Energien genutzt werden. Bei Neubauten enthält Seite 2 (Angaben zur Nutzung erneuerbarer Energien) dazu weitere Angaben.

Energiebedarf – Seite 2
Der Energiebedarf wird hier durch den Jahres-Primärenergiebedarf und den Endenergiebedarf dargestellt. Diese Angaben werden rechnerisch ermittelt. Die angegebenen Werte werden auf der Grundlage der Bauunterlagen bzw. gebäudebezogener Daten und unter Annahme von standardisierten Randbedingungen (z.B. standardisierte Klimadaten, definiertes Nutzerverhalten, standardisierte Innentemperatur und innere Wärmegewinne usw.) berechnet. So lässt sich die energetische Qualität des Gebäudes unabhängig vom Nutzerverhalten und von der Wetterlage beurteilen. Insbesondere wegen der standardisierten Randbedingungen erlauben die angegebenen Werte keine Rückschlüsse auf den tatsächlichen Energieverbrauch.

Primärenergiebedarf – Seite 2
Der Primärenergiebedarf bildet die Energieeffizienz des Gebäudes ab. Er berücksichtigt neben der Endenergie mithilfe von Primärenergiefaktoren auch die sogenannte „Vorkette" (Erkundung, Gewinnung, Verteilung, Umwandlung) der jeweils eingesetzten Energieträger (z.B. Heizöl, Gas, Strom, erneuerbare Energien etc.). Ein kleiner Wert signalisiert einen geringen Bedarf und damit eine hohe Energieeffizienz sowie eine die Ressourcen und die Umwelt schonende Energienutzung.

Energetische Qualität der Gebäudehülle –Seite 2
Angegeben ist der spezifische, auf die wärmeübertragende Umfassungsfläche bezogene Transmissionswärmeverlust. Er beschreibt die durchschnittliche energetische Qualität aller wärmeübertragenden Umfassungsflächen (Außenwände, Decken, Fenster etc.) eines Gebäudes. Ein kleiner Wert signalisiert einen guten baulichen Wärmeschutz. Außerdem stellt das GEG bei Neubauten Anforderungen an den sommerlichen Wärmeschutz (Schutz vor Überhitzung) eines Gebäudes.

Endenergiebedarf – Seite 2
Der Endenergiebedarf gibt die nach technischen Regeln berechnete, jährlich benötigte Energiemenge für Heizung, Lüftung und Warmwasserbereitung an. Er wird unter Standardklima- und Standardnutzungsbedingungen errechnet und ist ein Indikator für die Energieeffizienz eines Gebäudes und seiner Anlagentechnik. Der Endenergiebedarf ist die Energiemenge die dem Gebäude unter der Annahme von standardisierten Bedingungen und unter Berücksichtigung der Energieverluste zugeführt werden muss, damit die standardisierte Innentemperatur, der Warmwasserbedarf und die notwendige Lüftung sichergestellt werden können. Ein kleiner Wert signalisiert einen geringen Bedarf und damit eine hohe Energieeffizienz.

Angaben zur Nutzung erneuerbarer Energien – Seite 2
Nach dem GEG müssen Neubauten in bestimmtem Umfang erneuerbare Energien zur Deckung des Wärme- und Kältebedarfs nutzen. In dem Feld „Angaben zur Nutzung erneuerbarer Energien" sind die Art der eingesetzten erneuerbaren Energien, der prozentuale Deckungsanteil am Wärme- und Kälteenergiebedarf und der prozentuale Anteil der Pflichterfüllung abzulesen. Das Feld „Maßnahmen zur Einsparung" wird ausgefüllt, wenn die Anforderungen des GEG teilweise oder vollständig durch Unterschreitung der Anforderungen an den baulichen Wärmeschutz gemäß § 45 GEG erfüllt werden.

Endenergieverbrauch – Seite 3
Der Endenergieverbrauch wird für das Gebäude auf der Basis der Abrechnungen von Heiz- und Warmwasserkosten nach der Heizkostenverordnung oder auf Grund anderer geeigneter Verbrauchsdaten ermittelt. Dabei werden die Energieverbrauchsdaten des gesamten Gebäudes und nicht der einzelnen Wohneinheiten zugrunde gelegt. Der erfasste Energieverbrauch für die Heizung wird anhand der konkreten örtlichen Wetterdaten und mithilfe von Klimafaktoren auf einen deutschlandweiten Mittelwert umgerechnet. So führt beispielsweise ein hoher Verbrauch in einem einzelnen harten Winter nicht zu einer schlechteren Beurteilung des Gebäudes. Der Endenergieverbrauch gibt Hinweise auf die energetische Qualität des Gebäudes und seiner Heizungsanlage. Ein kleiner Wert signalisiert einen geringen Verbrauch. Ein Rückschluss auf den künftig zu erwartenden Verbrauch ist jedoch nicht möglich; insbesondere können die Verbrauchsdaten einzelner Wohneinheiten stark differieren, weil sie von der Lage der Wohneinheiten im Gebäude, von der jeweiligen Nutzung und dem individuellen Verhalten der Bewohner abhängen.
Im Fall längerer Leerstände wird hierfür ein pauschaler Zuschlag rechnerisch bestimmt und in die Verbrauchserfassung einbezogen. Im Interesse der Vergleichbarkeit wird bei dezentralen, in der Regel elektrisch betriebenen Warmwasseranlagen der typische Verbrauch über eine Pauschale berücksichtigt. Gleiches gilt für den Verbrauch von eventuell vorhandenen Anlagen zur Raumkühlung. Ob und inwieweit die genannten Pauschalen in die Erfassung eingegangen sind, ist der Tabelle „Verbrauchserfassung" zu entnehmen.

Primärenergieverbrauch – Seite 3
Der Primärenergieverbrauch geht aus dem für das Gebäude ermittelten Endenergieverbrauch hervor. Wie der Primärenergiebedarf wird er mithilfe von Umrechnungsfaktoren ermittelt, die die Vorkette der jeweils eingesetzten Energieträger berücksichtigen.

Treibhausgasemissionen – Seite 2 und 3
Die mit dem Primärenergiebedarf oder dem Primärenergieverbrauch verbundenen Treibhausgasemissionen des Gebäudes werden als äquivalente Kohlendioxidemissionen ausgewiesen.

Pflichtangaben für Immobilienanzeigen – Seite 2 und 3
Nach dem GEG besteht die Pflicht, in Immobilienanzeigen die in § 87 Absatz 1 GEG genannten Angaben zu machen. Die dafür erforderlichen Angaben sind dem Energieausweis zu entnehmen, je nach Ausweisart der Seite 2 oder 3.

Vergleichswerte – Seite 2 und 3
Die Vergleichswerte auf Endenergieebene sind modellhaft ermittelte Werte und sollen lediglich Anhaltspunkte für grobe Vergleiche der Werte dieses Gebäudes mit den Vergleichswerten anderer Gebäude sein. Es sind Bereiche angegeben, innerhalb derer ungefähr die Werte für die einzelnen Vergleichskategorien liegen.

[1] siehe Fußnote 1 auf Seite 1 des Energieausweises

Hottgenroth Software, Energieberater 18599 3D PLUS 11.1.8

6.2 Annex C: Enhanced EPCs

Qual DeEPC

Energieausweis *für Wohngebäude*

gemäß (Gebäudeenergiegesetz oder Energieeinsparverordnung)

Registriernummer: *123456789*	Gültig bis: *DD/MM/YYYY*	EA-Typ: *Bedarf/ Verbrauch*
Berechnungsmethode: **DIN V 4108-6**	Gemäß: *Gesetz/Verordnung GEG*	Anlass der Ausstellung: Sonstiges

Gebäudedaten

Gebäudetyp	*Freistehendes Mehrfamilienhaus*	*Gebäudefoto*
Adresse	Rückertstr. 2a 14469 Potsdam	
Gebäudeteil	*Gesamtes Gebäude*	
Baujahr Gebäude	1925	
Gebäudenutzfläche	981,7	
Baujahr Wärmeerzeuger		

Energiebedarf/ -verbrauch und Klassifizierung

Min. End-energie [kWh/m²a]	Max. End-energie [kWh/m²a]	Energieklasse	Endenergiebedarf/ -verbrauch [kWh/m²a]	Primärenergiebe-darf/ -verbrauch [kWh/m²a]	Endenergiebedarf /-ver-brauch nach Umsetzung der Hauptrenovie-rungsoption* [kWh/m²a]
	≤ 30	A+			
> 30	≤ 50	A			48,6
> 50	≤ 75	B			
> 75	≤ 100	C			
> 100	≤ 130	D	119,6	132,2	
> 130	≤ 160	E			
> 160	≤ 200	F			
> 200	≤ 250	G			
> 250		H			

* Die maßgeblichen Modernisierungsmaßnahmen und der Umsetzungsplan der Hauptrenovierungsoption sind auf Seite 3 und 4 angegeben.

Ca. **Endenergieeinsparung** bei Umsetzung der Hauptsanierungsoption (see S. 3 & 4): **69.700 kWh/a**

Energieausweisaussteller *e.g. Adresse, Telefonnr.*	Datum Unterschrift

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

Energieausweis *für Wohngebäude*

gemäß (Gebäudeenergiegesetz oder Energieeinsparverordnung)

Details zum aktuellen energetischen Zustand des Gebäudes

Energieverbrauch** gemessen: simuliert:

Nr.	Zeitraum (von - bis)	Energieträger	Primär-energie-faktor	Energieverbrauch [kWh/a]			Klima-faktor
				Gesamt	Heizung	Warmwasser	
1							
2							
3							

**Der gemessene Energieverbrauch ist abhängig vom energetischen Benutzerverhalten, der Anzahl der Gebäudenutzer und der Wetterverhältnisse des betrachteten Zeitraums. Modellierter Energieverbrauch kann von gemessenen Verbräuchen abweichen.

Bewertung der Gebäudehülle und der technischen Systeme

Gebäudehülle	Fläche [m²]	*Beschreibung oder mittl. U-Wert [W/m²K]*	Bewertung
Dach oder oberste Geschossdecke	420	*0,45*	
Außenwände	466	1,32	
Fenster/ Türen	106 / 21	2,00 / 2,50	
Boden zu Erdboden oder unbeheizten Keller	385	1,38	

Technische Systeme	Baujahr oder Einbaujahr	Beschreibung des Systems	Energiequelle, installierte Leistung, EU Energielabel	Bewertung
Heizung		Heizkessel	Erdgas, 52 kW, C	
Warmwasserbereitung		Heizkessel	Erdgas, 52 kW, C	
Lüftung				/
Kühlung				/
Erneuerbare Energien				/
Sonstiges				/

This project has received funding from the
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Energieausweis *für Wohngebäude*

gemäß (Gebäudeenergiegesetz oder Energieeinsparverordnung)

Modernisierungsmaßnahmen nach Gebäudekomponenten

Gebäude-hülle	Modernisierungsmaß-nahme	"neuer" mittlerer U-Wert [W/m²K]	Neue Be-wertung	Ungefähre Amortisations-zeit	In Hauptsa-nierungsop-tion?
Dach oder oberste Ge-schossdecke	Erneuerung Zwischenspar-rendämmung, 24 cm WLG 035	*0,17*			☒
Außenwände	Anbringen eines WDVS, 16 cm WLG 035	0,19			☒
Fenster/ Türen	Ersatz der Fenster	0,85			☒
Boden zu Erdbo-den oder unbe-heizten Keller	Erneuerung Fußbodenauf-bau	0,26			☒

Technische Systeme	Modernisierungsmaß-nahme	Energiequelle, in-stallierte Leis-tung, EU Energie-label	Neue Be-wertung	Ungefähre Amortisati-onszeit	In Hauptsa-nierungsop-tion?
Heizung	Anschluss Fernwärme-netz				☒
Warmwasser-bereitung	Anschluss Fernwärme-netz				☒
Lüftung			/		☐
Kühlung			/		☐
Erneuerbare Energien			/		☐
Sonstiges			/		☐

Ca. Endenergieeinsparung bei Umsetzung der Hauptsanierungsoption: 69.700 kWh/a

This project has received funding from the
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Energieausweis *für Wohngebäude*

gemäß (Gebäudeenergiegesetz oder Energieeinsparverordnung)

Modernisierungsmaßnahmen - Konzepte

Beschreibung von Modernisierungsmaßnahmen der Hauptsanierungsoption:

Dieses Objekt soll umfassend saniert werden, dazu wird die Zwischensparrendämmung im Dach erneuert, der Fußbodenaufbau wird erneuert und die Außenwände mit einem 16 cm starken WDVS versehen, sowie die Fenster ausgetauscht. Außerdem wird das Objekt an das Fernwärmenetz angeschlossen.

Hauptsanierungsoption erreicht folgende Anforderungen:

Niedrigstenergiegebäude-Standard:	☐
Dichtheit des Gebäudes (n_{50}<0.5):	☐
Reduzierung von Wärmebrücken:	☐
Min. 50% EE oder Alternativmaßnahmen:	☐

Beschreibung von sinnvollen Kombinationen von Modernisierungsmaßnahmen und von einer schrittweisen Umsetzung weiterer Optionen:

Weitere Informationen

Die folgenden Internetseiten enthalten weiterführende Informationen zum Energieausweis, dessen Anwendung sowie Details zu den Modernisierungsmaßnahmen mit entsprechenden Hinweisen zu Förderprogrammen:

- *https://www.zukunft-haus.info/beratung-planung/energieausweis/*
- *https://www.deutschland-machts-effizient.de/KAENEF/Navigation/DE/Home/home.html*

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

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- *Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;*
- *Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.*

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	EPC							
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consumption values shown in EPC help me to estimate future energy consumption	Standard EPC						
		Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	building							
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	saving“			
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. *Advertising guidelines for EPCs*

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• *It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements*			
• *The year of issue of the EPC, if that needs to be shown in the advertisements*			

6.4 Annex F: Results of questionnaire of Germany

Address	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Christa Muller (1 building)	Standard EPC	1	2	3	4	3	3	4	3	3	4	4	3	2	2	1	2	4
	Enhanced EPC	4	3	3	1	1	4	4	2	1	4	4	4	4	2	3	2	4
Akelius GmbH (12 buildings)	Standard EPC	1	2	3	4	3	0	4	4	3	2	2	3	2	2	2	1	4
	Enhanced EPC	3	3	2	0	0	4	4	2	0	2	2	4	4	2	2	3	4
Stephan Pommerening (1 building)	Standard EPC	1	2	2	4	3	3	4	3	3	4	2	3	2	2	1	2	4
	Enhanced EPC	4	3	3	1	0	4	4	2	1	3	4	4	4	3	3	2	3

6.5 Annex E: National summary evaluation report for Greece

D4.5 National summary evaluation report for Greece

QualDeEPC H2020 project

MAIN AUTHOR: Ekodoma, CRES

Author: CRES

DATE: [28/06/2021]

DISSEMINATION LEVEL: PUBLIC

Project **QualDeEPC**
"High-quality Energy Performance Assessment and Certification in Europe
Accelerating Deep Energy Renovation"
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Table 2: Title

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Draft 3	28/06/2021	Third (final) draft	Ekodoma, CRES

Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

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TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Greece.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report describes the pilot project selection process.

The Greek pilot cases were identified based on consultations with facility managers / building owners and through well-established local networks. The final selection was based on specific criteria, namely:

- Stakeholders commitment: the building owners contacted agreed on completing a feedback questionnaire on the assessment and certification scheme and to publish project data (confidentiality issues were considered and consent forms were provided),
- Data availability and access permissions to building premises,
- Coverage: the aim was to have a good representation in terms of building use as well as building typology. 12 pilot cases were selected out of which 7 residential and 5 non-residential. The group of residential buildings included single apartments in 2-storey and 3-storey apartment buildings as well as a whole building case. The pilot cases selected were constructed in different construction periods (early '50s to 2000) and hence of various typologies and construction practices. The group of non-residential included pilot buildings of educational use and of a surface area ranging from 300 to 1500 m2.
- Interest of stakeholders and public visibility of the non-residential buildings. Furthermore, the selection was also based on the criteria presented in D4.5 – 'Report on pilot buildings selection criteria', developed under Task 4.1.

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	RP1	R	Apartment	1976	75,0	Y
2	RP2	R	Apartment	1976	75,0	Y
3	RP3	R	Whole building	1998	423,83	Y
4	RP4	R	Apartment	2001	101,13	Y
5	RP5	R	Apartment	1997	78,05	Y
6	RP6	R	Apartment	1961	68,0	Y
7	RP7	R	Apartment	1950	166,37	Y
8	PP1	N	Educational	1981	1170,0	Y
9	PP2	N	Educational	1981	685,0	Y
10	PP3	N	Educational	1989	1508,49	Y
11	PP4	N	Educational	1970	845,02	Y
12	PP5	N	Educational	1983	325,06	Y

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

The main difficulty encountered during the phase of development of standard EPCs was due to the Covid-19 curfew restrictions and repeated quarantine periods; this caused multiple reviews of the time plans for site visits and audits of the buildings.

Furthermore, some further difficulties were related to the comparison of existing standard EPCs of the buildings with the ones developed in the frame of the project, due to changes/upgrades of the national official calculation software; the investigation/identification of calculations parameters and understanding /justification of different calculation outputs caused some small delays in the finally delivered standard EPCs.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class	Energy efficiency improvement recommendations included in Standard EPC
1	RP1	D	239,6	Boiler replacement
2	RP2	C	197,6	Boiler replacement
3	RP3	D	191,6	Boiler replacement
4	RP4	E	223.4	Installation of SWH
5	RP5	B	55,8	Replacement of AC split units
6	RP6	G	251,8	Installation of SWH
7	RP7	E	217,3	Installation of SWH
8	PP1	D	129,8	Boiler replacement
9	PP2	D	127,6	Boiler replacement
10	PP3	D	121,8	Boiler replacement
11	PP4	E	169.9	Boiler replacement
12	PP5	E	182,2	Boiler replacement

Code of building: RP: Residential Pilot case, PP: Non-Residential Pilot case

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

In general, the development of the enhanced EPCs has proven to be smooth and without major difficulties. The few problems/difficulties encountered can be summarized as follows:

- real energy consumption data acquisition: a) regarding the residential pilot buildings, in almost all cases the building owners / users do not keep records (bills) of previous years, hence these data were not filled-in in the relevant table of the enhanced EPCs. b) regarding the non-residential pilot cases, although such records are kept, under the circumstances and due to the Covid 19 work overload of the schools' building managers, it has not been possible for them to allocate any extra effort in order to gather the information requested in the frame of the project, therefore, such data have not been included in the enhanced EPCs of the non-residential pilot buildings.

- in the traffic light system characterizing the energy renovation measures efficiency level, some difficulties were encountered in relation to the technical systems characterization, as there have not been given any instructions, at that time, on which efficiency specifications to be inserted in the relevant fields; hence these data were filled-in in an arbitrary way and missing in some cases (e.g. for solar systems).

- in the recommendations section of the enhanced EPC, as there have not been given any instructions on a standardized approach on the description to be inserted, some internal consultations have taken place so as to make a decision on a standard approach, resulting in time delays and still without any satisfactory results on the final approach decided, as no any cost data were provided there (not including cost data in the recommendations was a common decision of the project partners).

Table 3. Enhanced EPC summary

No	Address (or code) of pilot build-	Energy class after implementing	Energy savings achieved	Energy consumption determining	Energy efficiency improvement recommendations in-	Other energy efficiency improvement	Main option meets requirements for

	ing	the main option	by imple-menting the main option, %	the energy class after implement-ing the main option	cluded in main op-tion of Enhanced EPC	recommenda-tions included in Enhanced EPC	Nearly zero energy buildings in case of renovation	Air tight ness	Re-duced thermal bridging	Min 50% RES or equivalent measures
1	RP1	B+	60,9 %	93,5	Wall insulation, Boiler replacement, AC split units re-placement, Ther-mostatic valves		X			
2	RP2	B+	51,8%	91,2	Wall insulation, Boiler replacement	AC split units replacement	X			
3	RP3	B+	50,3%	95,2	Windows replace-ment, Boiler re-placement, AC split units replacement		X			
4	RP4	B	48,2%	115,7	Wall insulation, Windows replace-ment, AC split units replacement, SWH installation	Boiler re-placement				
5	RP5	B+	34,4%	36,6	AC split units re-placement	Windows replacement	X			
6	RP6	B	74,3%	64,7	Windows replace-ment, Wall insula-tion, AC split units replacement, SWH installation	Boiler re-placement				
7	RP7	A	79,47%	44.6	Wall insulation, AC split units replace-ment, SWH instal-lation, Thermostat-		X			

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Nearly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					ic valves					
8	PP1	B	57,5%	55,1	Roof insulation, Boiler replacement, AC split units replacement, PV installation	Windows replacement				
9	PP2	B	53,9%	58,7	Roof insulation, Boiler replacement, PV installation	Windows replacement				
10	PP3	B+	61,2%	47,2	Boiler replacement, lighting improvement, automatic controls, PV installation	Wall insulation	X			
11	PP4	B	59,4%	68,9	Roof insulation, Boiler replacement, lighting improvement, automatic controls, PV installation	Windows replacement				
12	PP5	B	56,6%	79,0	Boiler replacement, lighting improvement, automatic controls, PV instal-	Roof insulation, windows replacement				

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Nearly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					lation					

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
1	The Enhanced EPC template looks similar to the existing Standard EPC	Positive	This will allow for a rather smooth adoption of the enhanced form.
2	Energy rating with a 'traffic light system' is introduced in the enhanced EPC for building envelope elements and technical systems.	Positive	The 'traffic light system' provides information 'at a glance' on the energy performance level of the various components. However, ranges of values need to be defined for each one of the 3 levels of energy performance. It needs to be investigated if such ranges' definition is feasible.
3	Energy consumption is in kWh/y	Negative	In the existing standard Greek EPC the indicator is in kWh/m2 provided by the current calculation methodology. Shifting to kW/y would not be possible to have such data outputs of the national calculation tool. Furthermore, without providing the indicator (kWh/m2) comparison of EPCs of buildings of the same use or for statistical analysis purposes would not be feasible. Therefore, we use the indicator kWh/m2 in the enhanced EPC, together with the information on potential total kWh/y savings with the implementation of the Main Option (in the relevant box of the enhanced EPC form). .
4	There is less information in the Enhanced EPC than there is in Greek Standard EPC	Negative	The information on calculated energy consumption by end use is missing in the enhanced EPC. Some of the missing information has already been transferred to the enhanced form, such as CO2 emissions, consumption comparison to reference building and comfort conditions. In the energy consumption table of the enhanced EPC the contribution (%) of energy sources to the building energy balance -which was provided in the standard Greek EPC- is missing. It looks non-feasible to add more columns in the energy consumption table as it is formatted in the proposed template.
5	In the 'Renovation recommendations - component evaluation' of page 3, there is less information in the enhanced EPC than in the existing Greek Standard EPC	Negative	The only useful additional feature in the enhanced EPC is the technical characteristics of the various components (U values of envelope components and power provided by the recommended technical system). The EU energy label for the technical systems is not considered a technical data but rather a qualitative data. At the same time, the economics of the recommendation/s are limited to payback time, while in the existing standard EPC the information provided is of higher analysis

6	Renovation recommendations - renovation concepts' of page 4 is a new element of the enhanced EPC	**Positive**	There is a need for a standardised template of description, as a guide for the assessors, so as for the information inserted here to be concise, and clear enough for the end user. If such a template is not provided the boxes will probably end up in containing very limited information.
7	The Enhanced EPC form contains links with further information	**Neutral**	In the 1st National Stakeholders meeting the predominant opinion was that such an information is not of any interest to be included on the EPC, considering that the EPC is a static form valid for 10 years and hence the inclusion of such links will become obsolete after a couple of years. Instead, they expressed their interest for such information to be included in the DRNP which is a dynamic tool.

4.2 Results of building representative questionnaires

The questionnaires were sent out to the representatives of all 12 pilot buildings and CRES gathered 8 filled. Seven questionnaires were filled by the residential buildings representatives and 1 by the representative of the five selected public buildings (schools). The main results from the response collected are presented in the following sections.

4.2.1 Enhanced EPC template

The Figure 1 summarizes the results of questionnaire regarding Standard and the Enhanced EPCs adapted, in the national context, given to pilot building representatives in Greece (see Annex 6.4 part 1 of the questionnaire).

The representatives of the pilot buildings were called on to give their opinion and the level of understanding of the information presented on Standard EPC and the adapted Enhance EPC.

When comparing the Standard and Enhanced EPC templates the respondents presented their preference for the Enhanced EPC in terms of the understandable language and figures. The building representatives could understand if the minimal energy efficiency requirements of building set in the national legislation are met by the information provided on the proposed template mostly by the “traffic light systems” which is a welcomed improvement. Based on their answers, the proposed measures are clearly shown in a way that helps them to decide on what measures they could implement in the future. The Enhanced EPC has scored lowest for the question 14 (decide on cost-effective renovation measures) mainly due to the absence of the costs related to the proposed renovation actions.

Main comments by the building representatives related to Q14:

- It should be clearly stated an indicative cost of the main option as well as the payback period
- More cost - related data are needed

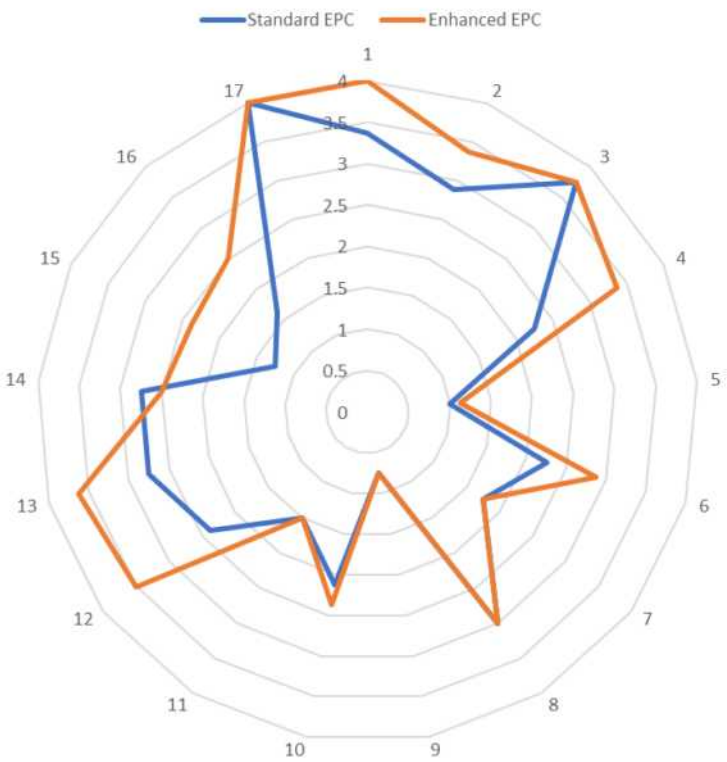

Figure 1

Type of EPC	Total score
Standard EPC	57.9%
Enhanced EPC	68.2%

4.2.2 Online tool to receive first proposals for energy efficiency renovation

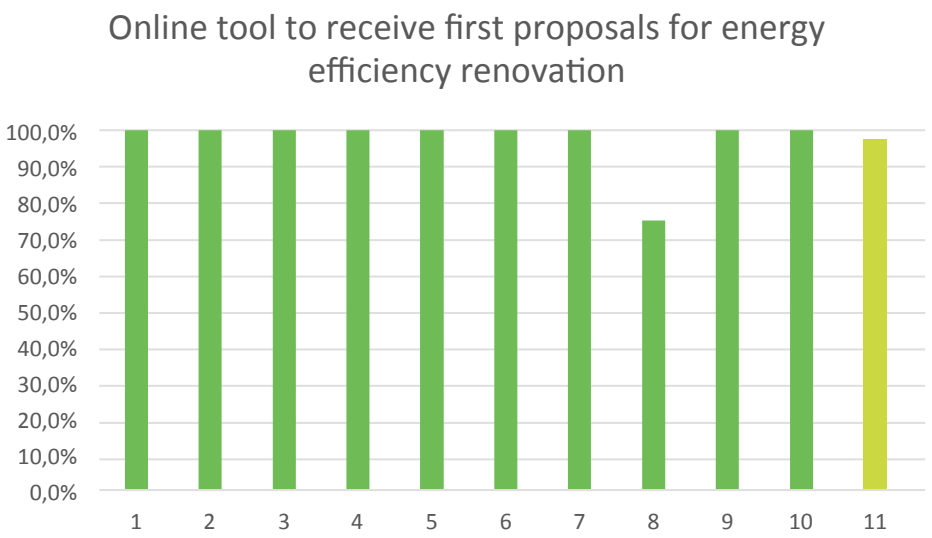

Figure 2

The building representatives would be interested to be able to select the energy efficiency measures from a predefined list but also to receive suggestions on this matter by the tool. The least interesting information would be the estimation of economic gains through net present value (NPV) and internal rate of returns (IRR) values.

4.2.3 Deep Renovation Network Platform

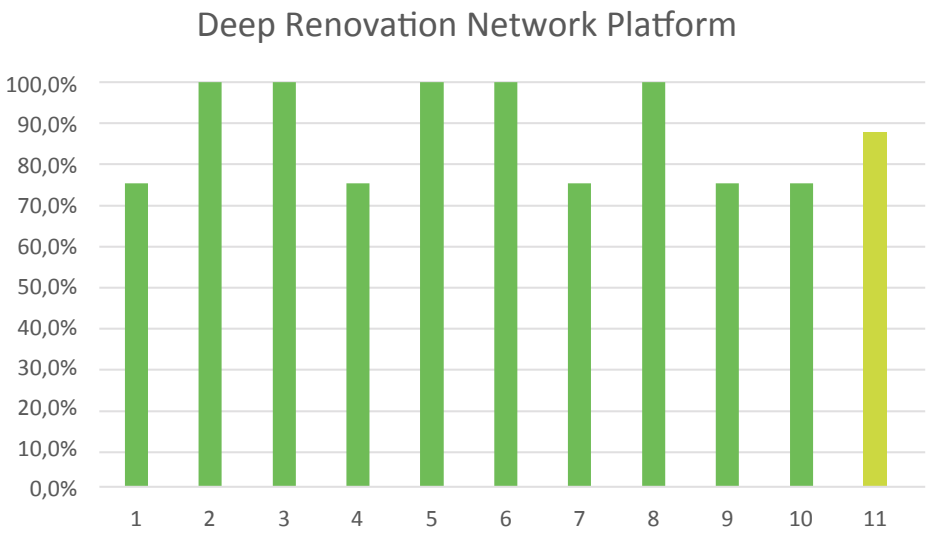

Figure 3

The respondents find very useful if they could find information about the potential energy and cost savings, but also they would be interested in finding information and support about building contrac-

tors/ technicians and energy-efficient-experts and financing opportunities for deep renovation on the platform.

4.2.4 Advertising guidelines for EPCs

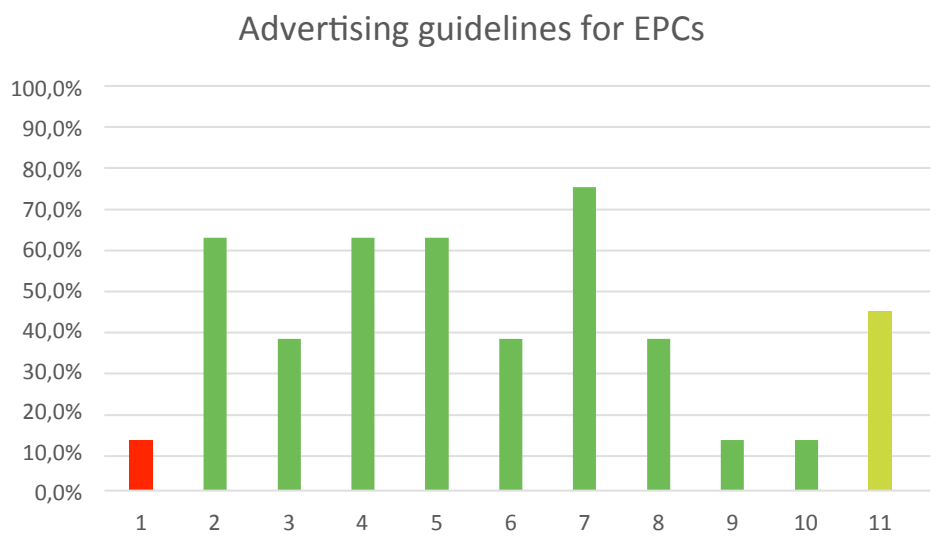

Figure 4

This part of the questionnaire raised the lowest interest from the Questionnaire from the respondents, but as shown in the Figure 4 the majority of the building representatives were not aware about the guidelines for advertising EPC information in sale/rental advertisements. They were mostly interested in finding energy demand/consumption data shown in energy units and finding or calculating the current energy costs of the building/dwelling in monetary units. Both of the previous mentioned interests are not mandatory in Greece. Furthermore they don't need any guidance to find the certificate number and the issuance date of the EPCs.

4.3 Feedback from stakeholder roundtable discussions

CRES organized 7 online meetings, formulated as interviews, with relevant stakeholders during mid-June and mid-July 2021. The participants were representatives from the Hellenic Energy Inspectorate, Ministry of Environment and Energy, Pan-Hellenic Association of Certified Energy Auditors - PACEI, energy auditors, energy experts and pilot buildings representatives. During the interviews the results of the task 4.3 questionnaire analysis were presented, while the discussion was focused on the comparison of the Standard and Enhanced EPCs adapted to national legal requirements. Taking into account that the adapted enhanced EPC was tested on the pilot buildings, as well as most of the elements included already exist in the Greek standard EPC, the comments and suggestions collected are rather few. In general, the interviewees' opinions can be summarized as follows:

- The Enhanced EPC gives more information in a more comprehensive way.
- The separate assessments for the different envelope elements and systems, available in the Enhanced EPC is very useful and in a more user-friendly way.
- No additional work effort is required by the energy auditors in order to use it.

4.3.1 Enhanced energy efficiency recommendations

- The identification of the cost-effective renovation measures requires the introduction of specific economic indicators on the EPC which are not available on both EPC templates.

4.3.2 Suggestions for improvements of Enhanced EPC template

- The nZEB level achieved by the main option should be noted/highlighted on the first page (if achieved) of the Enhanced EPC, perhaps using a dotted line on the energy classification table (p.1)
- All interviewees indicated that the investment costs information is missing in the enhanced EPC template, whereas it should be clearly stated an indicative cost of the main option as well as the payback period.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

- Taking into account that CRES tested the the adapted Enhance EPC, no further suggestions were identified by the stakeholders.

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelines)

Online Tool

- Estimation of CO2 emissions after renovation could be useful to be presented by the tool for awareness raising purposes.

DRNP:

- Include national case studies/ best practices with technical & financial information
- Link to certified technicians databases

Advertisement Guidelines:

- The provision of guidelines on “how to“ find or calculate different values, is a task that the EPC assessors should undertake when handing in the EPC to the building owner/representative
- Provide general/indicative guidelines for buildings owners-users related to the legal requirements when advertising to media.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

Regarding the EPC proposed enhanced template:

In comparison with the standard EPC template, in general the proposed template is well accepted by the interviewees (building owners and stakeholders).

The main strengths of the proposed template are: a) the traffic light system enables a fast understanding of existing weakness of the building shell components and technical systems and b) the improvement measures are presented in a more understandable way and with technical specifications.

The main weakness identified is the lack of information on actual costs of the measures proposed.

Regarding the Online tool:

For the purposes of the online tool to be used by building owner, it is suggested that the simple payback period to be used and no another more complex method.

Regarding the Deep Renovation Platform:

- Include national case studies/ best practices with technical & financial information
- Link to certified technicians databases

Regarding the Advertising Guidelines:

- The provision of guidelines on “how to“ find or calculate different values, is a task that the EPC assessors should undertake when handing in the EPC to the building owner/representative
- Provide general/indicative guidelines for buildings owners-users related to the legal requirements when advertising to media.

6 ANNEXES

6.1 Annex B: Standard EPCs

Example of a standard EPC for residential building in Greece (2 pages)

ENERGY PERFORMANCE CERTIFICATE (EPC)

Registration no:	00000/0000	Security no:	0000-0000-0000-0000
Date of issuance:	00/00/0000	Valid up to:	00/00/0000

• Check validity of the EPC: https://www.buildingcert.gr/checkCert.view

Building unit name:	
Use:	Educational
Climate zone:	B
Total area:	1508.49 m2
Useful area:	1508.49 m2

Energy class:	Current	Potential*
Nearly Zero Energy Building (nZEB)		
EP ≤ 0,33 R_e (A+)		
0,33 R_e < EP ≤ 0,50 R_e (A)		
0,50 R_e < EP ≤ 0,75 R_e (B+)		
0,75 R_e < EP ≤ 1,00 R_e (B)		
1,00 R_e < EP ≤ 1,41 R_e (C)		C
1,41 R_e < EP ≤ 1,82 R_e (D)	D	
1,82 R_e < EP ≤ 2,27 R_e (E)		
2,27 R_e < EP ≤ 2,73 R_e (F)		
2,73 R_e < EP (G)		

* After the implementation of improvement measure according to table of recommendations

Calculated annual primary energy consumption *	
Reference building [kWh/m²]:	75.1
Audited building [kWh/m²]:	121.8
Real annual energy consumption of audited building	
Electrical [kWh/m²]:	0.0
Thermal (fossil fuels) [kWh/m²]:	0.0
Total annual primary energy consumption [kWh/m²]:	0.0
Annual CO2 emissions of audited building	
Calculated annual emissions CO_2 [kg /m²]:	36.6
Real annual emissions CO_2 [kg /m²]:	0.0

Comfort conditions and quality of indoor air

Thermal comfort ☐	Visual comfort ☐	Acoustical comfort ☐	Indoor air quality ☐

* The energy performance of a building is defined on the basis of the calculated annual energy consumption required for covering the energy demand so as to achieve thermal and visual comfort conditions.

ENERGY PERFORMANCE CERTIFICATE (EPC)

Registration no:	00000/0000	Security no:	0000-0000-0000-0000

Calculated annual energy demand by end use [kWh/m²]				
	Heating	Cooling	DHW	Lighting
Reference building	4.5	6.1	0.0	0.0
Audited building	17.8	6.1	0.0	0.0

Calculated annual final energy consumption by energy source & end use [kWh/m²]						
Energy source	Heating	Cooling	DHW	Lighting	Total	Contribution to building energy balance [%]
Electricity	4.2	5.4	0.0	15.8	25.4	36.6
Fuel oil	44.0	0.0	0.0	0.0	44.0	63.4
Natural gas	0.0	0.0	0.0	0.0	0.0	0.0
Other fossil fuels	0.0	0.0	0.0	0.0	0.0	0.0
Solar	0.0	0.0	0.0	0.0	0.0	0.0
Biomass	0.0	0.0	0.0	0.0	0.0	0.0
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0
Other RES	0.0	0.0	0.0	0.0	0.0	0.0
Total	48.2	5.4	0.0	15.8	69.4	100.0

Use the EPC to:

- compare the energy performance of buildings of the same use on the basis of their energy performance classification,
- get information on energy and cost savings by implementing energy saving measures.

RECOMMENDATIONS FOR THE IMPROVEMENT OF THE ENERGY PERFORMANCE

1. Boiler replacement with new boiler-burner
2.
3.

Recommendation	Estimated initial cost of investment [€]	Estimated annual primary energy saving & unit cost			Estimated simple payback period*	Estimated annual reduction of CO_2 emissions	Energy class
		[kWh/m²]	[%]	[€/kWh]	[years]	[kg/m²]	-
1.	12147.0	16.8	13.8	0.5	5.3	4.0	C
2.							
3.							

The recommendations are prioritized on the basis of cost - energy savings. Energy saving and unit cost refer to each measure separately and cannot be added. The same is valid for the CO2 emissions and the payback period.

* Simple payback period is calculated taking into account the final energy consumption and not the primary energy consumption.

Name of energy assessor Registration no of energy assessor: 00000	Stamp Signature

6.2 Annex C: Enhanced EPCs

Example of an enhanced EPC for residential building in Greece (4 pages)

Qual DeEPC

ENERGY PERFORMANCE CERTIFICATE

in accordance with *Building Energy ACT XZY*

Registration no.: 00000/0000	Security no: 0000-0000-0000-0000	Valid until: *DD/MM/YYYY*

Building ☒ / Building unit ☐/no	
Use of building/building unit	
Address	
Postal Code, City	
Climate zone	B
Year of construction	1989
Total area	1508.49 m2
Useful area	1508.49 m2

Energy classification and performance

minValue	*maxValue*	Energy class	Primary energy consumption (kWh/m2)	"improved value" of Main Option* (kWh/m2)
EP ≤ 0.33 R_R		A+		
0.33 R_R < EP	EP ≤ 0.50 R_R	A		
0.50 R_R < EP	EP ≤ 0.75 R_R	B+		B+ 47.2
0.75 R_R < EP	EP ≤ 1.00 R_R	B		
1.00 R_R < EP	EP ≤ 1.41 R_R	C		
1.41 R_R < EP	EP ≤ 1.82 R_R	D	D 121.8	
1.82 R_R < EP	EP ≤ 2.27 R_R	E		
2.27 R_R < EP	EP ≤ 2.73 R_R	F		
2.73 R_R < EP	EP ≤ 0.33 R_R	G		

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

Potential primary energy savings of renovation according to Main Option* (see p. 3 and 4):

112533.3 kWh/y

Calculated annual primary energy consumption	
Calculated primary energy consumption of reference building	75.1kWh/m2
Calculated primary energy consumption of audited building	121.8kWh/m2

Annual CO2 emissions of audited building	
Calculated annual CO2 emissions	36.6Kg/m2
Real annual CO2 emissions	n/a

Comfort conditions and quality of indoor air			
Thermal comfort ☐	*Visual comfort* ☐	*Acoustic comfort* ☐	*IAQ* ☐

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

ENERGY PERFORMANCE CERTIFICATE

in accordance with *Building Energy ACT XZY*

Details on the current energy performance of the building

Energy consumption** measured: modelled:

No.	Period of measurement (from – to)	Energy source: Electricity [kWh/yr]	Fossil fuel [kWh/yr]	Other	Energy consumption for heating/cooling/lighting/DHW [kWh/yr]		
					Total	Thermal	Electrical
1	n/a				104538.3	66373.56	38164.79
2	n/a						
3	n/a						

**measured energy consumption depends on occupants' behaviour, the number of occupants and weather conditions during the period of measurement; modelled energy consumption may differ from actual consumption

Assessment of building envelope and technical system

Building envelope	Area [m²]	*Description or Avg. U-value*	Energy rating
Roof or ceiling to attic	906.19	1.51	
External walls	733.59	3.16, 0.41	
Windows	231.52	4.8 & 6.1	
Doors	2.1	6.0	
Ground floor or floor to unheated basement	882.74	0.53	
Floor in contact with air (on pilotis)	13.32	2.9	

Technical systems	Year of construction/ installation	Energy source, power, EU energy label	Energy rating
Heating system	1992	Fuel oil-197.71kW COP: 0.62	
Domestic hot water			
Ventilation system			
Cooling system			
Renewable energy systems			
Lighting	n/a	Electricity-15.24kW	

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

ENERGY PERFORMANCE CERTIFICATE

in accordance with *Building Energy ACT XZY*

Renovation recommendations – component evaluation

Building envelope	Recommendation	"new" avg. U-value	New Energy rating	Cost effective-ness (e.g. pay-back time)	Included in Main option
Roof or attic					☐
External walls					☐
Windows	Replacement of single glazed windows	2.6		29.5y	☐
Doors					☐
Ground floor or floor to un-heated basement					☐
Floor in contact with air (on pilotis)					☐

Technical systems	Recommendation	Energy source, pro-vided power, EU energy label	New Energy rating	*Cost effec-tiveness (e.g. payback time)*	Included in main op-tion?
Heating system	Boiler replacement	Fuel oil-98.7kW COP: 0.95		5.3y	☒
Domestic hot water					☐
Lighting system	Replacement of bulbs	Electricity – 11.39kW		12.6y	☒
Cooling system					☐
Renewable energy systems	Installation of PVs	Solar – 10kWp 110m2		15.9y	☒
Other:	Installation of ther-mostatic valves & lighting controls			7.2y	☒

Potential thermal energy savings when Main option is implemented: 29566.4 kWh/yr

Potential electrical energy savings when Main option is implemented: 31527.4 kWh/yr

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ENERGY PERFORMANCE CERTIFICATE

in accordance with *Building Energy ACT XZY*

Renovation recommendations – renovation concepts

Description of useful combination of renovation measures and stepwise implementation of Main Option:

It is recommended that the proposed renovation measures are implemented in the following steps:

1. Replacement of boiler, 2. Replacement light bulbs with more efficient ones, 3. Installation of automation for lighting & heating, 4. Installation of PVs.

These measures if implemented can improve the energy performance to class B+ (meeting the requirement of deep renovation target)

Main option meets requirements for:	*nearly zero energy buildings in case of renovation:*	☐
	Air tightness:	☐
	Reduced thermal bridging:	☐
	Min. 50% RES or equivalent measures:	☐

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

Further to the above recommended measures it is suggested to:

5. Install insulation on external walls. By implementing this measure the energy class still remains at the B+ class, however the energy savings are further increased.

The measure is not included in the Main option due to high investment cost and long payback period; it would be feasible if funded under national incentive programme.

Further information

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

http://www.cres.gr/energyhubforall/

https://exoikonomisi.ypen.gr/

Issuer	**Date**
Registration no.	Signature / Stamp

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

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;
- Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in EPC	Standard EPC						
		Enhanced EPC						
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consump-	Standard EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	tion values shown in EPC help me to estimate future energy consumption	Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	Standard EPC						
		Enhanced EPC						
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-saving“			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. Advertising guidelines for EPCs

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements			
• The year of issue of the EPC, if that needs to be shown in the advertisements			

6.4 Annex F: Results of questionnaire of Greece

Address (or code) of pilot building	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	Standard EPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
RP3	Standard EPC	4	3	4	1	3	1	1	1	1	1	0	4	2	2	2	1	4
	Enhanced EPC	4	4	4	4	4	3	1	1	1	1	0	4	4	2	2	3	4
RP4	Standard EPC	3	3	3	1	3	1	1	3	0	3	0	1	2	2	2	2	4
	Enhanced EPC	4	3	3	3	3	2	1	3	0	3	0	3	3	2	3	3	4
RP6	Standard EPC	4	2	4	1	1	1	0	3	2	0	0	1	3	3	0	0	4
	Enhanced EPC	4	3	4	3	1	1	0	3	2	1	0	3	4	1	1	2	4
RP5	Standard EPC	4	2	4	1	1	1	0	3	2	0	0	1	3	3	0	0	4
	Enhanced EPC	4	3	4	3	1	1	0	3	2	1	0	3	4	1	1	2	4
RP1	Standard EPC	3	1	3	2	0	3	0	2	0	3	2	2	2	2	0	2	4
	Enhanced EPC	4	2	3	2	0	4	0	2	0	3	2	3	2	2	1	2	4
RP2	Standard EPC	3	4	4	4	0	4	4	4	1	3	4	3	3	3	3	3	4
	Enhanced EPC	4	4	4	4	0	4	4	4	1	3	4	4	4	4	4	3	4
PP1, PP2, PP3, PP4, PP5	Standard EPC	3	4	4	4	0	4	4	4	0	3	4	3	3	3	3	3	4
	Enhanced EPC	4	4	4	4	0	4	4	4	0	3	4	4	4	4	4	3	4
RP7	Standard EPC	3	4	4	4	0	3	4	4	0	4	2	4	4	4	0	2	4
	Enhanced EPC	4	4	4	4	0	4	4	4	0	4	2	4	4	4	3	2	4

6.6 Annex F: National summary evaluation report for Hungary

D4.5 National summary evaluation report for Hungary

QualDeEPC H2020 project

MAIN AUTHOR: Ekodoma, BME

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Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

BME: Budapest University of Technology and Economics

DISCLAIMER OF WARRANTIES

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TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Hungary.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report describes the pilot project selection process.

The building selection was made according to the QualDeEPC building selection guidelines targeting the optimal amount of both residential (8) and non-residential (7) buildings. In the selection process we have managed to find enough buildings 9 and 8 respectively. During the selection process several buildings have been discarded due to previous renovations and monumental protection. Also, we experienced serious difficulties in finding buildings with willingness from the building representatives to participate in the project. For the selected residential buildings, newer and older buildings were included as well, which were beneficial for the later stages of the project, e.g. to evaluate deep renovation options for different building age.

More detailed information on this can be found in report named "Pilot building selection report" which was developed for Task 4.1.

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	Budapest_Kalvaria	**R**	Apartment	2005	43	yes
2	Budapest_Narancsvirag	**R**	Single family building	1982	295	yes
3	Budapest_Szigony	**R**	Apartment	1981	51	yes
4	Edeleny_Finkei	**R**	Single family building	1979	147	no
5	Edeleny_Istvan_kir	**R**	Single family building	1955	117	yes
6	Taksony_Beke	**R**	Single family building	1953	61	yes
7	Taksony_DozsaGy	**R**	Single family building	1950	238	yes
8	Taksony_KonyvesK15	**R**	Single family building	2001	174	yes
9	Taksony_KonyvesK40	**R**	Single family building	1973	208	yes
10	Budapest_Budai_Rajziskola	**N**	School	1910	956	yes
11	Budapest_Normafa	**N**	Kindergarten	-	793	yes
12	Budapest_Orbanhegyi_kindergarten	**N**	Kindergarten	1970	686	yes
13	Budapest_PMH	**N**	Office building	1940	3407	yes
14	Edeleny_kindergarten	**N**	Kindergarten	1960	733	yes
15	Taksony_cultural	**N**	Cultural	1951	769	yes
16	Taksony_office	**N**	Office building	1960	151	yes
17	Taksony_school	**N**	School	1952	2977	yes

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

When searching for pilot buildings there have been an issue to find buildings without previously made EPCs, since in case of buildings, where there were already existing EPCs there were better contact with the building representatives. In the Standard EPCs in most buildings the recommendations were mostly for "*Business As Usual*" options, which in some cases resulted in no recommendations at all due to the building's overall satisfactory quality. In case of the non-residential buildings' Standard EPC recommendations the lighting system renovation was not recommended because the current calculation method underestimates its impact, however there is a potential for energy saving by installing LED lights instead of the currently installed halogen/neon lights.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in Standard EPC
1	Budapest_Kalvaria	**DD**	142.5	There were no recommendations included due to the building's limitations.
2	Budapest_Narancsvirag	**GG**	262.7	Replacement of windows. The old gas boiler should be changed as well for a new condensing boiler which can supply both the heating and the DHW demand of the building.
3	Budapest_Szigony	**CC**	105.6	Replacement of windows.
4	Edeleny_Finkei	**FF**	147.0	10 cm external heat insulation on the building envelope. Replacement of windows. Installation of a PV system to reduce the electricity demand from the grid.
5	Edeleny_Istvan_kir	**GG**	286.1	10 cm external heat insulation on the building envelope. Replacement of windows. Replacement of the old gas fired boiler with a condensing boiler. Installation of a PV system to reduce the electricity demand from the grid.
6	Taksony_Beke	**FF**	205.8	25 cm of insulation on the attic slab. Installation of thermostatic valves on the radiators.
7	Taksony_DozsaGy	**FF**	219.8	10 cm external heat insulation on the building envelope. Replacement of windows. Installation of a PV system to reduce the electricity demand from the grid.

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in Standard EPC
8	Taksony_KonyvesK15	**GG**	263.1	10 cm external heat insulation on the building envelope. Replacement of windows. Replacement of boilers with a condensing boiler.
9	Taksony_KonyvesK40	**DD**	140.1	Replacement of the old gas fired boiler with a condensing boiler.
10	Budapest_Budai_Rajziskola	**FF**	202.8	10 cm external heat insulation on the building envelope where possible (the street façade is under monumental protection and can't be insulated). Changing of the windows. The boilers should be changed for condensing boilers.
11	Budapest_Normafa	**FF**	211.0	Replacement of windows and insulation of the flat roof.
12	Budapest_Orbanhegyi_kindergarten	**GG**	244.2	10 cm external heat insulation on the building envelope. Replacement of windows. Replacement of boilers with a condensing boiler.
13	Budapest_PMH	**CC**	117.1	Replacement of boilers with a condensing boiler.
14	Edeleny_kindergarten	**II**	378.8	10 cm external heat insulation on the building envelope. Replacement of windows. Replacement of the old gas fired boiler with a condensing boiler. Installation of a PV system to reduce the electricity demand from the grid.
15	Taksony_cultural	**CC**	153.6	Installation of a new condensing boiler to provide heating and DHW demands.
16	Taksony_office	**DD**	127.6	There were no recommendations due to the good overall building quality.
17	Taksony_school	**DD**	133.9	Installation of a new condensing boiler to provide heating and DHW demands.

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

For the Enhanced EPC it was hard to calculate the potential savings since the actual values are not part of the Standard EPC recommendations in Hungary. Also by aiming at deep renovation in some cases it was challenging to find the best solution, which is both fulfilling the deep renovation concept and cost efficient as well. In most cases the measured energy consumption was not filled due to the table provided in the Enhanced EPC template, which is not unambiguous and due to the fact, that in Hungary it is not compulsory to collect/provide consumption data for the EPCs the data was scarcely available. It was also hard to promote cost effectiveness for the solutions, since the fuel prices are relatively low in Hungary and all renovation options are costly, thus the payback times are long. In some cases due to limiting building and economical characteristics it was impossible to reach the deep renovation of the building.

Table 3. Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (primary energy saving)	Energy consumption determining the energy class after implementing the main option Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Specific heat-loss coefficient	Min 25% RES
1	Budapest_Kalvaria	**DD**	5%	135.3	Replacement of windows. Installation of a central PV system for the building.	-	No	Yes	No	No
2	Budapest_Narancsvirag	**CC**	60%	94.5	Replacement of windows. Installation of a new condensing boiler to provide heating and DHW demand.	Installation of PV system.	No	Yes	No	No
3	Budapest_Szigony	**BB**	17%	87.6	Replacement of windows. Optimization of heating system operation.	-	Yes	Yes	No	Yes
4	Edeleny_Finkei	**BB**	61%	89.2	Replacement of windows. Insulation of the building envelope. Installation of a 1.5 kWp PV system.	-	Yes	Yes	Yes	Yes
5	Edeleny_Istvan_kir	**BB**	67%	94.1	Replacement of windows. Insulation of the building envelope. Renovation of the heating and DHW systems. Installation of an 1.2 kWp PV system.	-	Yes	Yes	Yes	Yes

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (primary energy saving)	Energy consumption determining the energy class after implementing the main option Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Specific heat-loss coefficient	Min 25% RES
6	Taksony_Beke	**BB**	60%	82.6	Replacement of windows. Insulation of the attic floor slab. Installing air source heat pump instead of the existing gas fired boiler to provide heating and DHW demand.	Installation of PV system.	Yes	Yes	No	Yes
7	Taksony_DozsaGy	**CC**	55%	99.3	Replacement of windows. Insulation of the building envelope. Replacement of the old biomass boiler for a new pellet fired boiler. Installation of a 3.2 kWp PV system.	-	No	Yes	No	Yes
8	Taksony_KonyvesK15	**BB**	71%	76.6	Replacement of windows. Insulation of the building envelope. Replacement of the old biomass boiler for a new pellet fired boiler. Replacement of the old gas fired DHW tank for a new condensing boiler. Installation of a 2 kWp PV system.	-	Yes	Yes	Yes	Yes

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (primary energy saving)	Energy consumption determining the energy class after implementing the main option Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Specific heat-loss coefficient	Min 25% RES
9	Taksony_KonyvesK40	**BB**	36%	89.8	Replacement of windows. Installing air source heat pump instead of the existing gas fired boiler to provide heating and DHW demand.	Installation of PV system.	Yes	Yes	Yes	Yes
10	Budapest_Budai_Rajziskola	**CC**	58%	84.4	Replacement of windows. Insulation of the attic floor slab. Replacement of the old gas fired boiler for a new condensing boiler. Installing LED lights instead of the current halogen/neon lights. Installation of a 10 kWp PV system.	-	No	Yes	No	No
11	Budapest_Normafa	**BB**	68%	65.4	Replacement of windows. Insulation of the flat roof. Installing LED lights instead of the current halogen/neon lights. Installation of a 10 kWp PV system.	-	Yes	Yes	Yes	Yes

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (primary energy saving)	Energy consumption determining the energy class after implementing the main option Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Specific heat-loss coefficient	Min 25% RES
12	Budapest_Orbanhegyi_kindergarten	**BB**	77%	57.3	Replacement of windows. Insulation of the building envelope. Replacement of the old gas fired boiler for a new condensing boiler. Installing LED lights instead of the current halogen/neon lights. Installation of an 8 kWp PV system.	-	Yes	Yes	Yes	Yes
13	Budapest_PMH	**CC**	10%	105.5	Replacement of the gas fired boiler for a new condensing boiler. Optimization of heating system operation. Installing LED lights instead of the current halogen/neon lights.	Replacement of windows.	No	No	No	Yes
14	Edeleny_kindergarten	**BB**	82%	69.8	Replacement of windows. Insulation of the building envelope. Replacement of the old gas fired boiler for a new condensing boiler and an air-to-water heat pump. Installing LED lights instead of the current halogen/neon lights. Installation of a 7.2 kWp PV system.	-	Yes	Yes	Yes	Yes

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (primary energy saving)	Energy consumption determining the energy class after implementing the main option Primary energy demand [kWh/m^{2}yr]	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Specific heat-loss coefficient	Min 25% RES
15	Taksony_cultural	**CC**	31%	105.7	Replacement of the old gas fired and electric boilers for a new condensing boiler to provide heating and DHW demand. Installing LED lights instead of the current halogen/neon lights. Installation of a 3 kWp PV system.	-	No	Yes	Yes	No
16	Taksony_office	**BB**	73%	34.5	Replacement of the old gas fired and electric boilers for a new condensing boiler to provide heating and DHW demand. Installing LED lights instead of the current halogen/neon lights. Installation of a 3 kWp PV system.	-	Yes	Yes	Yes	Yes
17	Taksony_school	**CC**	38%	83.7	Replacement of the old gas fired boiler for a new condensing boiler to provide heating demand. Installing LED lights instead of the current halogen/neon lights. Installation of a 26 kWp PV system.	-	No	Yes	Yes	No

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

In the national roundtable discussion held in the beginning of 2021 there were comments regarding the Standard and Enhanced EPC templates. The comparison can be found in the following table.

In most cases the Enhanced EPC was welcomed, since it is more detailed and user friendly. In the original EPC the details were understandable mostly for experts only and there was just a few information on the front page for the end-users. The assessment of the building envelope and building systems were appreciated, since the users could better see how the different components of the building are performing on a relative scale.

There were some negative comments as well. Presenting the measured energy consumption can be misleading/confusing for the end-users, when it is significantly different from the calculated values. Also the table, where the measured values have to be added is confusing, since it seems, that different energy carriers are mixed and final energies are summed up, which is misleading. Cost effectiveness was considered as both positive and negative change as well: it would be an appreciated information, however without a proper methodology it can be misleading and it also highly depends on both the price of the fuel and the installation material and labour cost.

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
1	More detailed EPC template	Positive	The Standard EPC is a single page document. Details are in the calculational annex for professional use only.
2	Changed colour of the overall design	Positive	Better vision of the template with more pleasant colour scheme
3	Changed colour of the overall design	Negative	In some boxes on pages 2 and 3 text colour is white which is not well visible when printed
4	New information added (year of construction, additional specification)	Positive	
5	Some information removed (monumental protection, purpose of issue, building function)	Negative	They can be added to the additional specification of building and remark section, however they should be mandatory
6	Assessment of building envelope by energy rating	Positive	This will help a non-expert user to better understand the efficiency of their building elements
7	Assessment of the technical system by energy rating	Positive	This will help a non-expert user to better understand the efficiency of their systems

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
8	Measured energy is presented	Negative	Can be confusing if it is significantly different from calculated values.
9	The information about potential final energy savings for renovation according to Option 1 is presented	Positive	
10	Cost effectiveness is presented	Positive	Can be useful for end user in case of accurate methodology
11	Cost effectiveness is presented	Negative	Can cause too much extra work for EPC expert if a reliable calculation method is required. If results are not accurate it can be misleading.
12	Energy class names removed	Positive	Names were misleading and for lowest classes derogatory
13	More space for description of the recommendations	Positive	
14	Description of useful combination of renovations and stepwise implementation for further renovation options (included in Option 1) is included	Positive	
15	Description of useful combination of renovations and stepwise implementation for further ren-ovation options (not included in Option 1) is included	Negative	Not important box, takes spaces from more important information, could be merged with previous field
16	New indicators presented (Air tightness, Reduced thermal bridging, Min. 50% RES or equivalent measures)	Negative	These indicators are not in line with Hungarian regulation. So it is confusing even for expert users.
17	"Further information" field included	Positive	Useful for the end user but more space should be given.

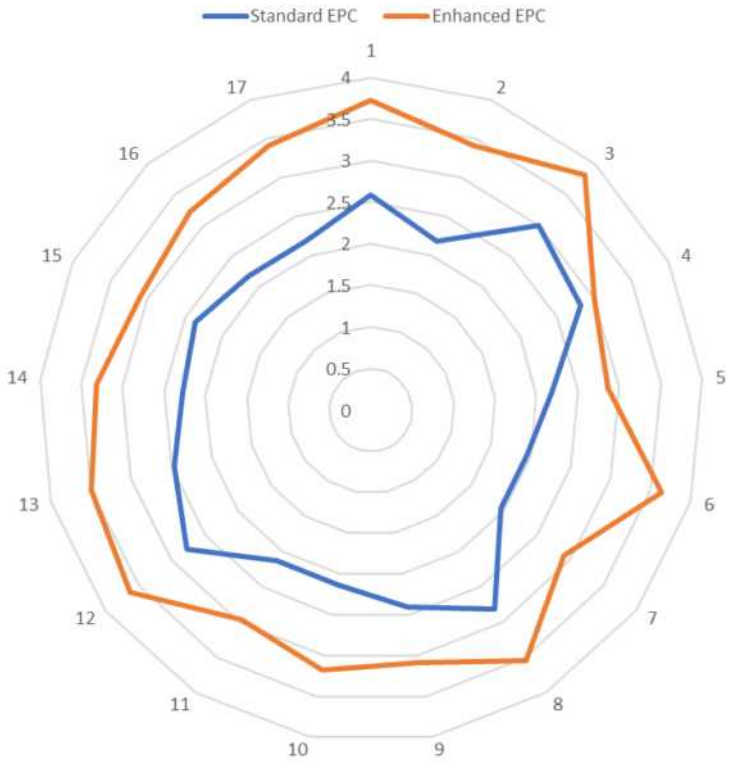
4.2 Results of building representative questionnaires

For all 17 pilot buildings the questionnaires have been sent out and so far 17+1 responses (there was one building from which 2 questionnaires were sent back) were gathered out of the 17 total. The main results are presented in the following parts.

4.2.1 Enhanced EPC template

This Figure summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).

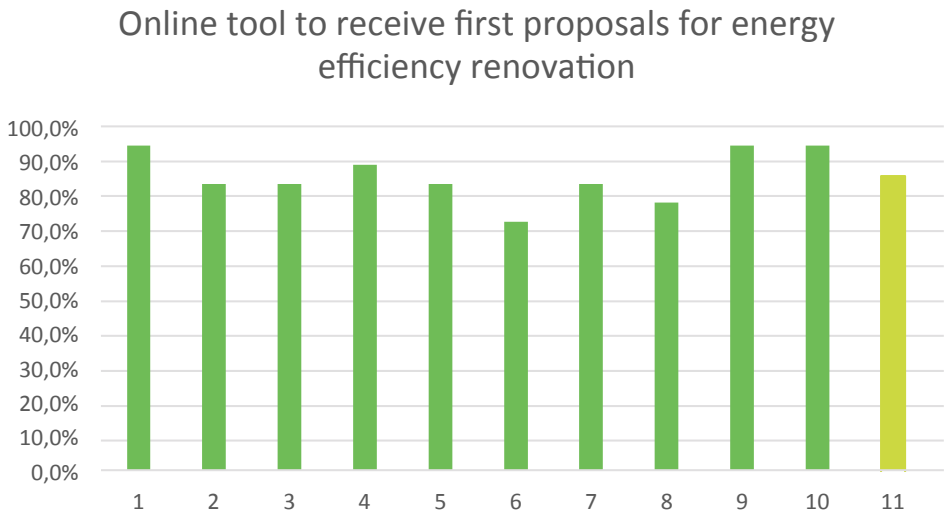
When comparing the Standard and Enhanced EPC templates it is clearly visible from the following graph, that the Enhanced EPC is outperforming the Standard one in all aspect. There is a significant improvement presenting the information in the EPC in an understandable language and the figures are better understood as well. Also the energy efficiency potential the building is clearly shown in the Enhanced EPC, which is a welcomed improvement. The Enhanced EPC has scored lowest for questions 7, 11 and 15, which means that the units of measurements are not widely understood, the future energy cost are not well showcased and the recommendations are not encouraging the respondents to perform deep energy renovation.



Type of EPC	Total score
Standard EPC	59.4%
Enhanced EPC	82.8%

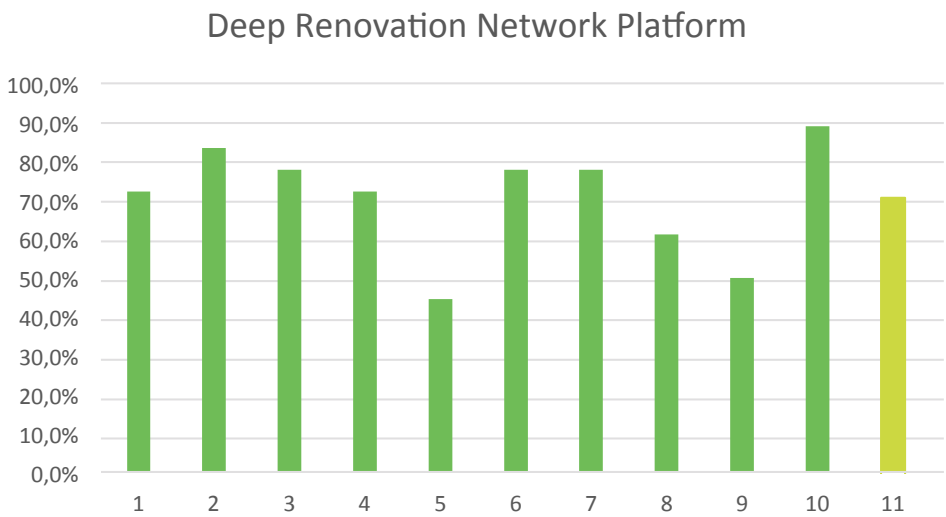
4.2.2 Online tool to receive first proposals for energy efficiency renovation

For the online tool the respondents would be most interested to know the suggested energy efficiency measures from the tool and the approximate investment cost of the energy efficiency measures. Also they would like to see if the building's current energy consumption meets legal requirements. The least interesting information would be the CO_2 emission of the building after renovation.



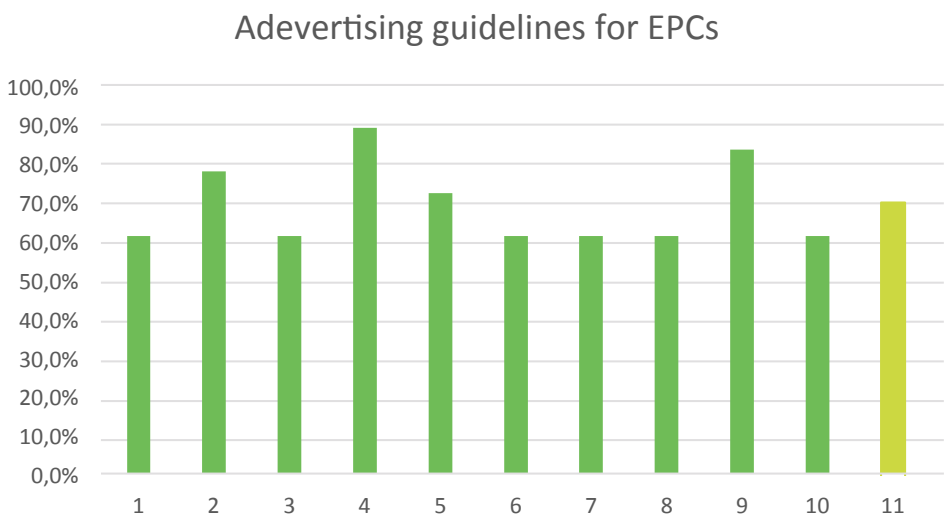
4.2.3 Deep Renovation Network Platform

All respondents would prefer to have a contact for an energy consultant, who can give personal advice and guidance through a renovation project. It would be useful for most of the respondents if they could find general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy, and cost savings on the platform. The respondents were least interested in having a link with building deep renovation roadmap and possibly a passport.



4.2.4 Advertising guidelines for EPCs

Overall the least interest from the building representatives was for the Advertising guidelines for EPCs based on the questionnaire and nearly half of them are not familiar with the current guidelines for advertisments. In this case they were mostly interested in finding or calculating the current energy costs of the building/dwelling in monetary units, which is currently not mandatory in Hungary. Nearly half of the respondents wouldn't be interested in having the EPC class of this building as a graphical element to include in advertisements. They don't need guidance to find the certificate number and the issuance date of the EPCs.



4.3 Feedback from stakeholder roundtable discussions

The meeting was held online on the 28th of June. There were 18 participants including energy agencies, energy auditors, environmental and energy auditor associations, governmental body, chamber of engineering and ministry members. In the following points the main comments and conclusions of the meeting are presented, including written responses from the questionnaires. There were a few comments regarding the comparison of the Standard and Enhanced EPC-s:

- There are more details in the Enhanced EPC template and the data is presented in a user-friendly manner.
- Energy consumption should be part of the Enhanced EPC, difference between the measured and calculated values should be added. There is a protocol developed in parallel by the Hungarian Chamber of Engineers. There will be a meeting between the Hungarian Chamber of Engineers and BME to discuss the methodology and the best practices.
- The energy consumption table is not appropriate as it is, because in many cases it is impossible to fill in a reliable way (e.g. if only annual utility bills are available separation of heating and DHW is impossible). It is recommended to include total consumption per energy source, distribution per domain should be optional. Furthermore in the current format domains and sources are mixed up, which is confusing. In the updated EPC template version we have upgraded this part accordingly as follows:

Measured consumption / production**						
Domain	**Period**	**Natural gas [kWh/yr]**	**Biomass [kWh/yr]**	**District heating [kWh/yr]**	***Electricity [kWh/yr]***	***Other _____***
TOTAL						
Heating						
DHW						
Other						
Generation						

** measured energy consumption depends on the number and habits of the building users, the weather during the measurement period, therefore measured and calculated energy consumption may be different.

- Enhanced EPC has a bigger need for expert labour. In Hungary most of the EPCs are made for selling and thus the extra expense would be on the seller. Promotion of EPCs, so the seller can have the benefits of the EPC as well as the buyer.
- Neither the old and the new EPC are able to show if the building is better or worse compared to other buildings as end users do not know what is the average level. For experts both are ok from this point of view. Links to EPC statistics might be useful.
- Some participants did not like that the new EPC does not indicate the requirement values of main indicators.
- One participant recommended to indicate energy values in natural dimensions as well (e.g. m3 for gas, kg for wood).
- Achievable energy saving on first page should be better highlighted.
- Terms and some details are not understandable for end users or easy to misinterpret:
    - Glossary is recommended (e.g. primary energy is not understandable for end users).
    - Boundary conditions should be indicated (e.g. savings are calculated for 20 C indoor air temperature)
    - How to interpret recommendations: is it the only recommended solution? or just one of the many options? if something is not recommended to change what does it mean? from comfort / cost / technical aspects?
- A filling tutorial is recommended for experts. Examples:
    - Which fields are mandatory, which are optional? What are mandatory contents? (e.g. links for further information are mandatory or optional?)
    - What is expected/mandatory in the "Further information" field? (e.g. monumental protection must be indicated)
    - Energy saving table: in case of PV how to calculate % (what is the reference value: total electricity consumption? – it is not calculated in EPBD)
    - What kind of U-value should be indicated? (with or without the impact of thermal bridges?)
    - A clear indication is needed on what should be considered (energy, comfort, cost) to recommend a renovation measure or not.
    - Guidelines for the renovation passports recommended.

4.3.1 Enhanced energy efficiency recommendations

- Savings – when PV system is recommended in the renovation option in some cases the savings can be over 100% for electricity, which is due to the fact that in the EPC the electricity

demand excludes the consumption appliances, office equipment and in case of residential buildings lighting. This can be mitigated by excluding the PV electricity generation from the final energy savings and is only accounted in case of the primary energy savings.

4.3.2 Suggestions for improvements of Enhanced EPC template

- Shading should be included or better represented – maybe added to the building envelope part as a retrofit recommendation.
- It should be clearer what is presented in final and what in primary energy on the Enhanced EPC template.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

- More data should be present on the Enhanced EPC template (than in the current official EPC), which could provide input for statistical analysis based on the EPCs in the future. The recommended template better supports this need.
- Additional links advised for the Enhanced EPC template (in the updated EPC template version we have upgraded this part accordingly):
    - e-epites.hu
    - renopont.hu
    - Hungarian Chamber of Engineers website - https://www.mmk.hu/tanacsadas/

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelins)

- Some participants said that cost related information is too unreliable due to the dynamically fluctuating market environment. However, representative of Engineering Chamber supported the idea of cost related information offering their annually updated database.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

- The selection of pilot buildings was challenging due to the COVID period and the lack of willingness of users to take part in the survey. However, the achieved number was higher than required.
- Both pilot building users and participants of the roundtable discussion clearly prefer the Enhanced EPC to the Standard EPC, due to it's user friendliness and additional information content.
- Some elements of the Enhanced EPC were criticised in particular:
    - The measured consumption table was appreciated by the users, roundtable experts criticised it:
        - It is not suitable in its current form. Collection of data needs extra efforts for the users and the experts.
        - It can be confusing if measured and calculated data are very different.
    - Although cost related information is welcome by users its reliability is questioned by roundtable experts. Also, it requires significantly higher efforts from the expert.
    - Some terms and parts of the Enhanced EPC is not evident for end users, clarifications and a glossary is recommended.
- Online tool: For the online tool the respondents would be most interested to know the suggested energy efficiency measures from the tool and the approximate investment cost of the energy efficiency measures. Also they would like to see if the building's current energy consumption meets legal requirements. The least interesting information would be the CO_2 emission of the building after renovation. Roundtable experts were sceptical about the reliability of such a tool without involving real experts.
- Deep Renovation Platform: All respondents would prefer to have a contact for an energy consultant, who can give personal advice and guidance through a renovation project. It would be useful for most of the respondents if they could find general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy, and cost savings on the platform. The respondents were least interested in having a link with building deep renovation roadmap and a renovation passport.
- Advertising guidelines: Not much interest was expressed towards the advertising guidelines.

6 ANNEXES

6.1 Annex B: Standard EPCs

Residential building:

Energetikai minőségtanúsítvány 1

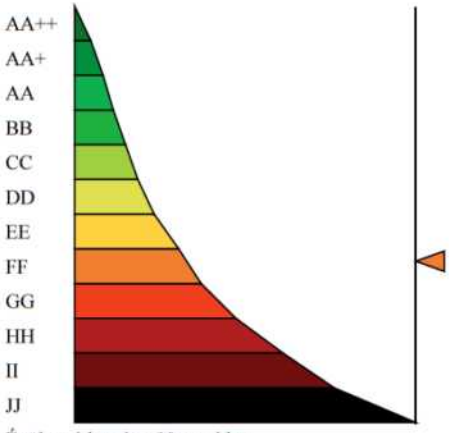
Energetikai minőségtanúsítvány összesítő

Épület: Lakóépület
2335 Taksony
Dózsa György utca 63.
Hrsz: 276

Megrendelő:

Tanúsító:

Az épület(rész) fajlagos primer energiafogyasztása:	219.80 kWh/m^{2}a
Követelményérték (viszonyítási alap):	100.00 kWh/m^{2}a
Az épület(rész) energetikai jellemzője a követelményértékre vonatkoztatva:	219.80 %
Energetikai minőség szerinti besorolás:	**FF** (Átlagos)



Épület védettsége: Nem védett

Az épület építési ideje 1950.

Az épület utolsó jelentős felújításának ideje 2002.

Épület fűtött szintjeinek száma: 2

A tanúsítvány vegyes számítási módszerrel készült, a hőhidasság egyszerűsített, a sugárzási nyereség részletes, a hőfokhíd és fűtési idény hossz egyszerűsített számítással.

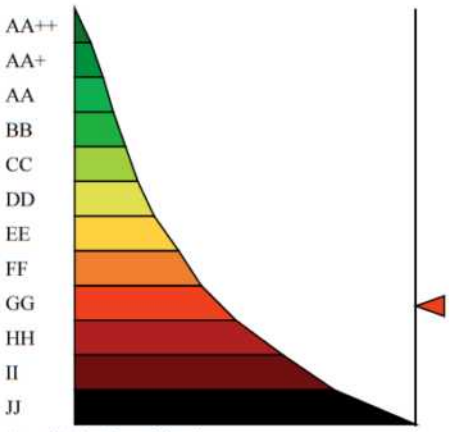
Tanúsítvány azonosítója a tanúsítónál:

WinWatt holló 8.32 (2021. 1. 9.) Copyright © Bausoft Pécsvárad Kft. http://www.bausoft.hu

Non-residential building:

Energetikai minőségtanúsítvány összesítő

Épület:	Orbánhegyi Óvoda 1126 Budapest Orbánhegyi út 3. A épület hrsz.: 8295/4
Megrendelő:	Budapest Főváros XII. ker. Hegyvidéki Önkormányzat
Tanúsító:	
Az épület(rész) fajlagos primer energiafogyasztása:	244.17 kWh/m^{2}a
Követelményérték (viszonyítási alap):	85.00 kWh/m^{2}a
Az épület(rész) energetikai jellemzője a követelményértékre vonatkoztatva:	287.30 %
Energetikai minőség szerinti besorolás:	**GG** (Átlagost megközelítő)



A tanúsítás oka: saját célra
Épület védettsége: Nem védett
Épület fűtött szintjeinek száma: 2

A tanúsítvány az egyszerűsített számítási módszerrel készült.

Tanúsítvány azonosítója a tanúsítónál:

Kelt: 2019.06.13. Aláírás

D:\Google Drive\Munka\2021_QualDeEPC\WP4\WP4.2\Hegyvidek\Orbánhegyi óvoda.wwp 2021. 06. 22.

WinWatt gólya 8.38 (2021. 5. 10.) Copyright © Bausoft Pécsvárad Kft. http://www.bausoft.hu

6.2 Annex C: Enhanced EPCs

Residential building:

Qual DeEPC

Energiatanúsítvány *lakóépületek számára*

176/2008. (VI. 30.) Kormányrendelet alapján

HET szám.: ----------	Érvényesség: *2031.06.15*	Tanúsítvány típusa: *értékelés*

Épület adatok		
Épület típusa	*Családi ház*	
Cím	2335 Taksony, Dózsa György utca 63.	
További információ	-	
Építés éve	1950	
Fűtött alapterület	238,0 m²	
Megjegyzés	QualDeEPC	

Energetikai értékelés

Minimum érték [kWh/m²év]	*Maximum érték [kWh/m²év]*	*Energetikai besorolás*	*Nem megújuló primerenergia igény – jelen állapot*	*Nem megújuló primerenergia igény – felújítás*	*Fajlagos hőveszteségtényező [W/m³K] (%)*	*Megújuló részarány [%]*
	<40	AA++			0,598 (256%)	26,8%
41	60	AA+				
61	80	AA				
81	100	BB				
101	130	CC		99,3		
131	160	DD				
161	200	EE				
201	250	FF	219,8			
251	310	GG				
311	400	HH				
401	500	II				
500<		JJ				

Elérhető energiamegtakarítás a felújítással (részletek a 3. és 4. oldalon):

	kWh/év	%
Földgáz	14340	49
Biomassza	7900	59
Távhő	0	0
Villamos-energia	3820	64
Egyéb	0	0

Tanúsító

Név, e-mail, cím, telefonszám, azonosító szám.

Dátum: 2021.06.16

Aláírás

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

Energiatanúsítvány *lakóépületek számára*

176/2008. (VI. 30.) Kormányrendelet alapján

Az épület jelenlegi állapotára vonatkozó részletes adatok

Energiafogyasztás** mért: számított:

Sor-szám	Mérési időszak	Energia-hordozó	Fűtési- és használati melegvíz (HMV) rendszerek energiaigénye [kWh/év]			*Villamos-energia [kWh/év]*	*Egyéb:* ———
			Összesen	Fűtés	HMV		
1							
2							
3							

**a mért energiafogyasztás függ az épülethasználók számától, szokásaitól, a mérési időszak időjárásától, emiatt a mért és számított energiafogyasztás eltérő lehet.

Az épületburok, valamint épületgépészeti rendszerek értékelése

Épületburok	Felület [m²]	*Leírás, vagy átlagos U érték*	Energetikai értékelés
Külső fal	166,3	Tégla és vályogfal, U=1,49 W/m²K	
Ablak	35,2	Részben cserélt nyílászárók, U=1,91 W/m²K	
Ajtó	5,3	Műanyag nyílászáró, U=1,40 W/m²K	
Tető / padlásfödém	139,8	Borított fagerendafödém szigetelve, U=0,23 W/m²K	
Talajon fekvő padló / pincefödém	127,1	Beton aljzat, 0,42 W/m²K	

Épületgépészet	Leírás	Energiaforrás, teljesít-mény, EU energia-címke	Energetikai értékelés
Fűtési rendszer	Kondenzációs gázkazán és bio-massza kazán	Földgáz, biomassza	
HMV rendszer	Villanybojler	Elektromos áram	
Légtechnikai rendszer	-	-	-
Hűtési rendszer	-	-	-
Világítás	-	-	-
Energiatermelő	-	-	-

rossz | gyenge | közepes/átlagos | jó | kiváló

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

Energiatanúsítvány *lakóépületek számára*

176/2008. (VI. 30.) Kormányrendelet alapján

Felújítási javaslat – részletezés elemei

Épületburok	Javaslat leírása	U érték	Új energetikai értékelés	*Költséghaté-konyság*	Benne van a javasolt fel-újításban?
Külső fal	Külső oldali szigetelés elhelyezése (15 cm)	0,24 W/m²K			✓
Ablak	Ablakok cseréje korszerű műanyag/fa nyí-lászárókra	1,0 W/m²K			✓
Ajtó	Ajtó cseréje korszerű műanyag/fa nyílászáróra	1,2 W/m²K			✓
Tető / padlásfö-dém	Nem javasolt a kor-szerűsítés.	-	-	-	×
Talajon fekvő padló / pincefödém	Nem javasolt a kor-szerűsítés.	-	-	-	×

Épületgépé-szet	Javaslat leírása	Energiaforrás, teljesítmény, EU energiacímke	Új energetikai értékelés	*Költséghaté-konyság*	Benne van a javasolt fel-újításban?
Fűtési rendszer	Biomassza kazán cseréje korszerű pel-lettüzelésű kazánra	Biomassza és földgáz			✓
HMV rendszer	Nem javasolt a kor-szerűsítése	-	-	-	×
Légtechnikai rendszer	Nem javasolt a kiépítése	-	-	-	×
Hűtési rendszer	Nem javasolt a kiépítése	-	-	-	×
Világítás	-	-	-	-	×
Energiatermelő	Napelemes rendszer	Napenergia, 3,2 kWp			✓

rossz | gyenge | közepes/átlagos | jó | kiváló

Elérhető nem megújuló primerenergia megtakarítás a felújítással: 28620 kWh/év (55%)

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Energiatanúsítvány *lakóépületek számára*

176/2008. (VI. 30.) Kormányrendelet alapján

Felújítási javaslat – koncepció

A felújítási javaslatban megfogalmazott intézkedések végrehajtásának javasolt sorrendje:

1. Napelemes rendszer telepítése.
2. Meglévő szilárd tüzelésű kazán cseréje korszerű pellet tüzelésű kazánra, napi tárolóval, behordó rendszerrel, hozzá tartozó égéstermék-elvezető rendszer korszerűsítéssel.
3. Épület homlokzatának hőszigetelése, egyidejű nyílászáró cserével.

A javasolt felújítással az alábbi követelmények teljesülnek:

nem megújuló primerenergia-igény követelménye:	✓
CO_2 kibocsátás követelménye:	✓
közel nulla energiaigényű épület követelménye:	×
fajlagos hőveszteségtényező követelménye:	×
légtömörség:	✓
nyári hővédelmi követelmény	✓
minimum 25%-os megújuló részarány követelménye:	✓

A felújítási javaslatban nem alkalmazott további intézkedések végrehajtásának javasolt sorrendje:

1. -

További információ

Az alábbi linken további információt talál a tanúsítványokkal kapcsolatban:

- *https://www.e-epites.hu/e-tanusitas*

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Non-residential:

Energiatanúsítvány

176/2008. (VI. 30.) Kormányrendelet alapján

HET szám.: ----------	Érvényesség: *2031.06.15*	Tanúsítvány típusa: *értékelés*

Épület adatok

Épület típusa	*Óvoda*
Cím	1126 Budapest, Orbánhegyi út 3.
További információ	A épület
Építés éve	1970
Fűtött alapterület	582,8 m^2
Megjegyzés	QualDeEPC

Energetikai értékelés

Minimum érték [%]	*Maximum érték [%]*	*Energetikai besorolás*	*Nem megújuló primerenergia igény – jelen állapot*	*Nem megújuló primerenergia igény – felújítás*	*Fajlagos hőveszteségtényező [W/m^{2}K] (%)*	*Megújuló részarány [%]*
	<40	AA++			0,947 (342%)	0,4%
41	60	AA+				
61	80	AA				
81	100	BB		57,3 (67,4%)		
101	130	CC				
131	160	DD				
161	200	EE				
201	250	FF				
251	**310**	GG	244,2 (287,3%)			
311	400	HH				
401	500	II				
500<		JJ				

Elérhető energiamegtakarítás a felújítással (részletek a 3. és 4. oldalon):

	kWh/év	%
Földgáz	83930	66
Biomassza	0	0
Távhő	0	0
Villamos-energia	10000	170
Egyéb	0	0

Tanúsító

Név, e-mail, cím, telefonszám, azonosító szám.

Dátum: 2021.06.16

Aláírás

This project has received funding from the
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Energiatanúsítvány

176/2008. (VI. 30.) Kormányrendelet alapján

Az épület jelenlegi állapotára vonatkozó részletes adatok

Energiafogyasztás** mért: számított:

Sor-szám	Mérési időszak	Energia-hordozó	Fűtési- és használati melegvíz (HMV) rendszerek energiaigénye [kWh/év]			*Villamos-energia [kWh/év]*	*Egyéb:* ____
			Összesen	Fűtés	HMV		
1							
2							
3							

**a mért energiafogyasztás függ az épülethasználók számától, szokásaitól, a mérési időszak időjárásától, emiatt a mért és számított energiafogyasztás eltérő lehet.

Az épületburok, valamint épületgépészeti rendszerek értékelése

Épületburok	Felület [m²]	*Leírás, vagy átlagos U érték*	Energetikai értékelés
Külső fal	427,2	Tégla falazat U=1,46 W/m²K	
Ablak	89,4	Műanyag nyílászárók, U=1,8 W/m²K	
Ajtó	20,7	Üvegezett ajtó, U=1,8 W/m²K	
Tető / padlásfödém	356,6	Tetőszerkezet U=1,87 W/m²K	
Talajjal vagy fűtetlen pincé-vel határos szerkezet	331,8	Beton aljzat U=0,45 W/m²K	

Épületgépészet	Leírás	Energiaforrás, teljesít-mény, EU energia-címke	Energetikai értékelés
Fűtési rendszer	Állandóhőmérsékletű kazán	Földgáz	
HMV rendszer	Állandóhőmérsékletű kazán és átfolyós vízmelegítő	Földgáz, elektromos áram	
Légtechnikai rendszer	-	-	-
Hűtési rendszer	-	-	-
Világítás	Kompakt fénycső, neon	Elektromos áram	
Energiatermelő	-	-	-

rossz | gyenge | közepes/átlagos | jó | kiváló

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European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100

Energiatanúsítvány

176/2008. (VI. 30.) Kormányrendelet alapján

Felújítási javaslat – részletezés elemei

Épületburok	Javaslat leírása	U érték	Új energetikai értékelés	*Költséghatékonyság*	Benne van a javasolt felújításban?
Külső fal	Külső oldali szigetelés elhelyezése (15 cm)	0,21 W/m²K			✓
Ablak	Ablakok cseréje korszerű műanyag/fa nyílászárókra	1,0 W/m²K			✓
Ajtó	Ajtó cseréje korszerű műanyag/fa nyílászáróra	1,2 W/m²K			✓
Tető / padlásfödém	Lapostetőre 25 cm szigetelés elhelyezése	0,14 W/m²K			✓
Talajon fekvő padló / pincefödém	Nem javasolt a korszerűsítés.	-	-	-	✗

Épületgépészet	Javaslat leírása	Energiaforrás, teljesítmény, EU energiacímke	Új energetikai értékelés	*Költséghatékonyság*	Benne van a javasolt felújításban?
Fűtési rendszer	Kazán cseréje kondenzációs gázkazánra	Földgáz			✓
HMV rendszer	Kazán cseréje kondenzációs gázkazánra, villanybojelrek cseréje	Földgáz, elektromos áram			✓
Légtechnikai rendszer	Nem javasolt a kiépítése	-	-	-	✗
Hűtési rendszer	Nem javasolt a kiépítése	-	-	-	✗
Világítás	LED fényforrások elhelyezése	Elektromos áram			✓
Energiatermelő	Napelemes rendszer	Napenergia, 8 kWp			✓

rossz | gyenge | közepes/átlagos | jó | kiváló

Elérhető nem megújuló primerenergia megtakarítás a felújítással: 108931 kWh/év (77%)

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

Energiatanúsítvány

176/2008. (VI. 30.) Kormányrendelet alapján

Felújítási javaslat – koncepció

A felújítási javaslatban megfogalmazott intézkedések végrehajtásának javasolt sorrendje:

1. Kondenzációs kazán kiépítése a hozzátartozó égéstermék-elvezető rendszerrel együtt.
2. Villanybojlerek cseréje korszerű energiatakarékos készülékekre.
3. Épületburok szigetelése, nyílászárók cseréje.
4. Napelemes rendszer kiépítése.
5. LED fényforrások beépítése folyamatosan az elhasználódott fényforrások cseréjével egyidőben.

A javasolt felújítással az alábbi követelmények teljesülnek:

nem megújuló primerenergia-igény követelménye:	✓
CO_2 kibocsátás követelménye:	✓
közel nulla energiaigényű épület követelménye:	✓
fajlagos hőveszteségtényező követelménye:	✓
légtömörség:	✓
nyári hővédelmi követelmény	✓
minimum 25%-os megújuló részarány követelménye:	✓

A felújítási javaslatban nem alkalmazott további intézkedések végrehajtásának javasolt sorrendje:

1. Hőszivattyús és biomassza alapú fűtés kiépítése az épület adottságai miatt nem javasolt.

További információ

Az alábbi linken további információt talál a tanúsítványokkal kapcsolatban:

- *https://www.e-epites.hu/e-tanusitas*

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European Union's Horizon 2020 research and innovation programme under Grant Agreement No 847100

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- *Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;*
- *Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.*

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	EPC							
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consumption values shown in EPC help me to estimate future energy consumption	Standard EPC						
		Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	building							
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	saving“			
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. *Advertising guidelines for EPCs*

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• *It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements*			
• *The year of issue of the EPC, if that needs to be shown in the advertisements*			

6.4 Annex F: Results of questionnaire of Hungary

Pilot building representatives:

Address	Comparison of Standard and Enhanced EPC form																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Budapest_Kalvaria	Standard EPC	1	2	4	3	2	2	1	2	2	2	2	3	3	3	1	3	4
	Enhanced EPC	3	1	4	4	3	3	2	2	3	3	3	3	4	3	2	3	4
Budapest_Narancsvirag	Standard EPC	3	2	2	3	2	3	2	2	2	2	2	3	2	2	2	3	4
	Enhanced EPC	4	4	4	4	3	4	4	3	3	3	2	4	3	2	2	4	4
Budapest_Szigony	Standard EPC	2	1	1	2	1	2	1	1	2	2	3	4	3	3	3	3	0
	Enhanced EPC	4	4	4	4	4	4	3	4	4	3	3	4	4	4	4	4	4
Taksony_Beke	Standard EPC	4	2	4	1	4	1	2	4	4	2	2	4	2	2	3	4	0
	Enhanced EPC	4	4	4	2	4	4	3	4	4	4	4	4	4	4	4	4	4
Taksony_DozsaGy	Standard EPC	3	3	4	4	3	4	3	4	3	3	3	4	4	3	3	4	4
	Enhanced EPC	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Taksony_KonyvesK15	Standard EPC	2	2	3	3	2	1	0	2	2	1	1	3	3	3	0	3	4
	Enhanced EPC	3	2	3	3	3	3	0	2	3	3	3	3	4	3	0	3	4
Taksony_KonyvesK40	Standard EPC	1	2	2	1	2	1	3	3	2	1	1	1	1	1	2	1	1
	Enhanced EPC	3	3	3	3	2	3	3	3	2	3	3	3	3	3	2	3	3
Taksony_cultural	Standard EPC	3	2	3	3	2	1	1	2	1	2	2	3	2	2	4	2	3
	Enhanced EPC	4	3	4	3	3	3	2	2	3	4	3	3	3	2	4	4	3
Taksony_office	Standard EPC	2	3	2	3	3	2	2	3	2	3	3	3	3	3	2	2	3
	Enhanced EPC	3	3	4	4	3	3	3	4	3	3	3	4	3	3	3	3	4
Taksony_school	Standard EPC	3	2	3	3	3	2	1	3	2	3	3	3	3	2	4	3	2

	Enhanced EPC	3	3	4	4	3	3	3	4	3	4	3	3	3	3	4	4	3
Edeleny_Finkei	Standard EPC	2	1	3	2	1	1	4	3	3	1	1	2	2	1	2	1	2
	Enhanced EPC	4	3	3	2	3	4	4	4	3	3	3	4	4	4	4	3	4
Edeleny_Istvan_kir	Standard EPC	3	3	3	2	2	3	1	3	2	2	1	3	3	2	3	2	4
	Enhanced EPC	4	4	4	2	3	4	4	4	3	3	3	4	4	4	4	4	4
Edeleny_kindergarten 1	Standard EPC	3	2	4	3	4	2	4	4	4	4	3	2	3	4	4	0	2
	Enhanced EPC	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4
Edeleny_kindergarten 2	Standard EPC	4	4	4	2	2	4	2	3	2	4	4	4	3	3	3	4	4
	Enhanced EPC	4	4	4	2	3	4	3	4	3	4	4	4	4	4	4	4	4
Budapest_Budai_Rajziskola	Standard EPC	4	2	4	4	4	2	4	4	4	2	2	3	2	2	2	4	4
	Enhanced EPC	4	4	4	4	4	4	4	4	4	2	2	4	2	2	2	4	4
Budapest_Normafa	Standard EPC	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	1
	Enhanced EPC	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	4	1
Budapest_Orbanhegyi_kindergarten	Standard EPC	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	1
	Enhanced EPC	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	4	1
Budapest_PMH	Standard EPC	4	3	4	3	3	2	2	3	2	2	2	3	3	3	2	2	4
	Enhanced EPC	4	3	4	3	3	3	3	3	2	2	2	3	3	3	2	2	4

Workshop experts:

Expert WS 1 (NG)	Comparison of Standard and Enhanced EPC form																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Expert WS 1 (SF)	Standard EPC	3	2	4	4	1	2	0	2	1	1	2	2	2	2	2	1	0
	Enhanced EPC	4	3	3	1	1	3	1	4	1	2	2	3	3	3	3	1	0
Expert WS 1 (SzI)	Standard EPC	3	1	2	4	0	1	3	2	4	1	1	2	1	2	2	0	1
	Enhanced EPC	4	4	4	4	0	4	3	4	4	4	3	4	3	3	2	3	4
Expert WS 1 (HM)	Standard EPC	2	2	2	4	0	0	0	2	0	2	3	2	2	0	2	0	0
	Enhanced EPC	3	3	4	0	0	4	0	3	0	0	0	3	3	3	2	0	4

6.7 Annex G: National summary evaluation report for Latvia

D4.5 National summary evaluation report for Latvia

QualDeEPC H2020 project

MAIN AUTHOR: Gatis Žogla (Ekodoma)

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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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

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INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Latvia.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report describes the pilot project selection process.

In order to select pilot buildings in Latvia a wide range of persons were informed about the possibility to become a pilot building in QualDeEPC project. Mostly building management companies and municipalities were addressed. The selection process did not pose any problems – the willingness of becoming a pilot building was rather high.

More detailed information on this can be found in report named "Pilot building selection report" which was developed for Task 4.1.

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	Maskavas street 213, Riga	R	Apartment building	1982	2137,43	No
2	Rupnicas street 8, Liepa	N	Library building	1968	629,1	No
3	Kr. Valdemara street 2, Rezekne	R	Apartment building	1989	4219,5	No
4	Kr. Valdemara street 8, Rezekne	R	Apartment building	1986	4290,65	No
5	Seminara street 2a, Valmiera	N	Office building	1981	527,03	No
6	Liela street 18, Tukums	N	School	1953	1353,7	No
7	Eksporta street 14, Riga	R	Apartment building	1958	3567,7	No
8	Skolas street 7, Ogre	R	Apartment building	1965	2341,72	No
9	Skolas street 10, Ogre	R	Apartment building	1973	3261,93	No
10	Rigas street 13, Livani	N	Kindergaden building	1983	1888,8	No
11	Pils street 1, Mezotne	N	Museum/ hotel / cultural events	1802	2117,8	No
12	"Sapņi", Irlava	N	Social house for children	1974	2023,8	No
13	Pavila Rozisa street 4, Liepa	R	Apartment building	n/a	4432,8	No
14	Pavila Rozisa street 7, Liepa	R	Apartment building	n/a	2426,9	No
15	Darza street 1, Vilkene	N	Library /			No

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
			offices / cultural events			

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

Al standard EPC were performed by using the national methodology described in Cabinet regulations No. 348 "Methodology for Calculating the Energy Performance of a Building". All of the developed Standard EPC were also registered in national EPC register. In order to develop the Standard EPCs all buildings were inspected on site.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – space heating energy consumption, kWh/m^2 year	Energy efficiency improvement recommendations included in Standard EPC
1	Maskavas street 213, Riga	E	111,6	• Wall insulation with 150 mm (U=0,22 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Attic insulation with 300 mm (U=0,11 W/m^{2}K) • Roof insulation with 200 mm (U=0,17 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • Change outdoors to 1,6 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
2	Rupnicas street 8, Liepa	F	235,0	• Wall insulation with 200 mm (U=0,18 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,24 W/m^{2}K) • Attic additional insulation with 150 mm (U=0,14 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • Change outdoors to 1,6 W/m^{2}K • Insulationg heating distribution pipes in building • Mechanical ventilation system with heat recoveryCleaning ventialtion shafts and chimneys
3	Kr. Valdemara street 2, Rezekne	E	123,4	• Wall insulation with 150 mm (U=0,22 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Attic insulation with 300 mm (U=0,12 W/m^{2}K)

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – space heating energy consumption, kWh/m^2 year	Energy efficiency improvement recommendations included in Standard EPC
				• Roof insulation with 150-250 mm (U=0,15-0,23 W/m^{2}K) · Change of old windows to 1,1 – 1,3 W/m^{2}K • Change outdoors to 1,8 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
4	Kr. Valdemara street 8, Rezekne	E	132,0	• Wall insulation with 150 mm (U=0,22 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Attic insulation with 300 mm (U=0,12 W/m^{2}K) • Roof insulation with 150-250 mm (U=0,15-0,23 W/m^{2}K) · Change of old windows to 1,1 – 1,3 W/m^{2}K • Change outdoors to 1,8 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
5	Seminara street 2a, Valmiera	F	182,2	• Wall insulation with 200 mm (U=0,18 W/m^{2}K) • Plinth insulation with 100 mm (U=0,21 W/m^{2}K) • Change outdoors to 1,8 W/m^{2}K • New mechanical ventilation system with heat recovery
6	Liela street 18, Tukums	E	147,9	• Wall insulation with 150 mm (U=0,21 W/m^{2}K) • Attic insulation with 300 mm (U=0,12 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,32 W/m^{2}K) • Change outdoors to 1,6 W/m^{2}K • New mechanical ventilation system with heat recovery
7	Eksporta street 14, Riga	E	124,7	• Wall insulation with 150 mm (U=0,23 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) · Change of old windows to 1,1 – 1,3 W/m^{2}K • Change outdoors to 1,6 W/m^{2}K • New heating distribution system in building • Cleaning ventialtion shafts and chimneys

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – space heating energy consumption, kWh/m^2 year	Energy efficiency improvement recommendations included in Standard EPC
8	Skolas street 7, Ogre	E	141,1	• Wall insulation with 200 mm (U=0,18 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
9	Skolas street 10, Ogre	D	95,4	• Wall insulation with 150 mm (U=0,22 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Attic insulation with 300 mm (U=0,12 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • Change outdoors to 1,8 W/m^{2}K • Cleaning ventialtion shafts and chimneys
10	Rigas street 13, Livani	E	130,5	• Basement insulation with 100 mm (U=0,24 W/m^{2}K) • Renew insulation for heating pipes in basement • New mechanical ventilation system with heat recovery
11	Pils street 1, Mezotne	D	102,8	• Repairs on window frames • New heating substation in building
12	"Sapņi", Irlava	E	147,9	• Wall insulation with 200 mm (U=0,18 W/m^{2}K) • Plinth insulation with 100 mm (U=0,35 W/m^{2}K) • Roof insulation with 250 mm (U=0,14 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • Thermostatic valves on radiators • Install heat meter in building
13	Pavila Rozisa street 4, Liepa	E	115,1	• Wall insulation with 150 mm (U=0,22 W/m^{2}K) • Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Roof insulation with 250 mm (U=0,14 W/m^{2}K) · Change of old windows to 1,1 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
14	Pavila Rozisa	E	138,0	• Wall insulation with 150 mm (U=0,22 W/m^{2}K)

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class – space heating energy consumption, kWh/m^2 year	Energy efficiency improvement recommendations included in Standard EPC
	street 7, Liepa			• Basement and plinth insulation with 100 mm (U=0,22 W/m^{2}K) • Attic insulation with 300 mm (U=0,12 W/m^{2}K) • Roof insulation with 250 mm (U=0,15 W/m^{2}K) · Change of old windows to 1,1- 1,2 W/m^{2}K • Change outdoors to 1,6 W/m^{2}K • New heating distribution system in building • Renovation of hot water system in building • Cleaning ventialtion shafts and chimneys
15	Darza street 1, Vilkene	F	192,0	• Wall insulation with 200 mm (U=0,17 W/m^{2}K) • Basement insulation with 150mm and plinth insulation with 100 mm (U=0,19-0,2 W/m^{2}K) • Roof insulation with 250 mm (U=0,14 W/m^{2}K) · Change of old windows to 0,95 W/m^{2}K • Change outdoors to 1,4 W/m^{2}K • New heating distribution system in building • New pellet boiler instalation • New mechanical ventilation system with heat recovery

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

Developing the Enhanced EPCs for the selected pilot buildings was rather simple task since almost all of the information needed in Enhanced EPCs was available in the Standard EPC. Standard EPC in Latvia does contain mandatory annexes which include the information on suggested energy efficiency improvement measures. During development of Enhanced EPC in some cases it was problematic to evaluate the rating (traffic light system) of a building envelope component or a technical system component.

In Latvia building renovation usually is performed by implementing all suggested energy efficiency measures at once. Therefore the main option in Enhanced EPC in Latvian case basically contains all suggested measures. It was theorized to included additional measures in Enhanced EPCs (which were not included in Standard EPC). These would be installation of solar collectors and solar photovoltaics. But this was not done since the practice of installing such RES solutions is quite limited in Latvia in residential apartment buildings and non residential buildings which were chosen as pilot buildings in this project.

Table 3. Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option – space heating, kWh/m^2 year	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
1	Maskavas street 213, Riga	B	54.7%	50.5	The same as in Table 2	n/a	No	Yes	Yes	No

2	Rupnicas street 8, Liepa	E	44.8%	129.8	The same as in Table 2	n/a	No	Yes	Yes	No
3	Kr. Valdemara street 2, Rezekne	B	52.4%	58.7	The same as in Table 2	n/a	No	Yes	Yes	No
4	Kr. Valdemara street 8, Rezekne	C	49.8%	66.3	The same as in Table 2	n/a	No	Yes	Yes	No
5	Seminara street 2a, Valmiera	D	45.8%	98.8	The same as in Table 2	n/a	No	Yes	Yes	No
6	Liela street 18, Tukums	B	58.2%	61.8	The same as in Table 2	n/a	No	Yes	Yes	No
7	Eksporta street 14, Riga	C	41.9%	72.4	The same as in Table 2	n/a	No	Yes	Yes	No
8	Skolas street 7, Ogre	C	49.3%	71.5	The same as in Table 2	n/a	No	Yes	Yes	No
9	Skolas street 10, Ogre	C	22.5%	73.9	The same as in Table 2	n/a	No	Yes	Yes	No
10	Rigas street 13, Livani	D	29.7%	91.8	The same as in Table 2	n/a	No	Yes	Yes	No
11	Pils street 1, Mezotne	D	2.0%	100.7	The same as in Table 2	n/a	No	Yes	Yes	No
12	“Sapņi”, Irlava	C	44.8%	81.6	The same as in Table 2	n/a	No	Yes	Yes	No
13	Pavila Rozisa street 4, Liepa	B	55.3%	51.5	The same as in Table 2	n/a	No	Yes	Yes	No
14	Pavila Rozisa street 7, Liepa	B	57.9%	58.1	The same as in Table 2	n/a	No	Yes	Yes	No
15	Darza street 1, Vilkene	B	67.1%	63.2	The same as in Table 2	n/a	No	Yes	Yes	Yes

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
1	Energy rating system is introduced for building envelope elements and technical systems of building	Positive	This will help a non-expert user to better understand the values given in the EPC
2	The Enhanced EPC template looks different than the existing Standard EPC	Neutral	It will take time for people to adjust to the new template. The Enhanced EPC contains almost the same information as the Latvian Standard EPC.
3	There is less information in the Enhanced EPC than there is in Latvian Standard EPC	Negative	We are planning to merge the Enhanced EPC to Standard EPC in order to keep the mandatory annexes that are made in Standerd EPC. By making this it will be possible to keep the good things form Standard EPC and Enhanced EPC
4	The Enhanced EPC form contains links with further information	Positive	By adding useful links to the EPC it is easier to a non-expert user to find further information on EPCs and how to carry on with renovation of their building

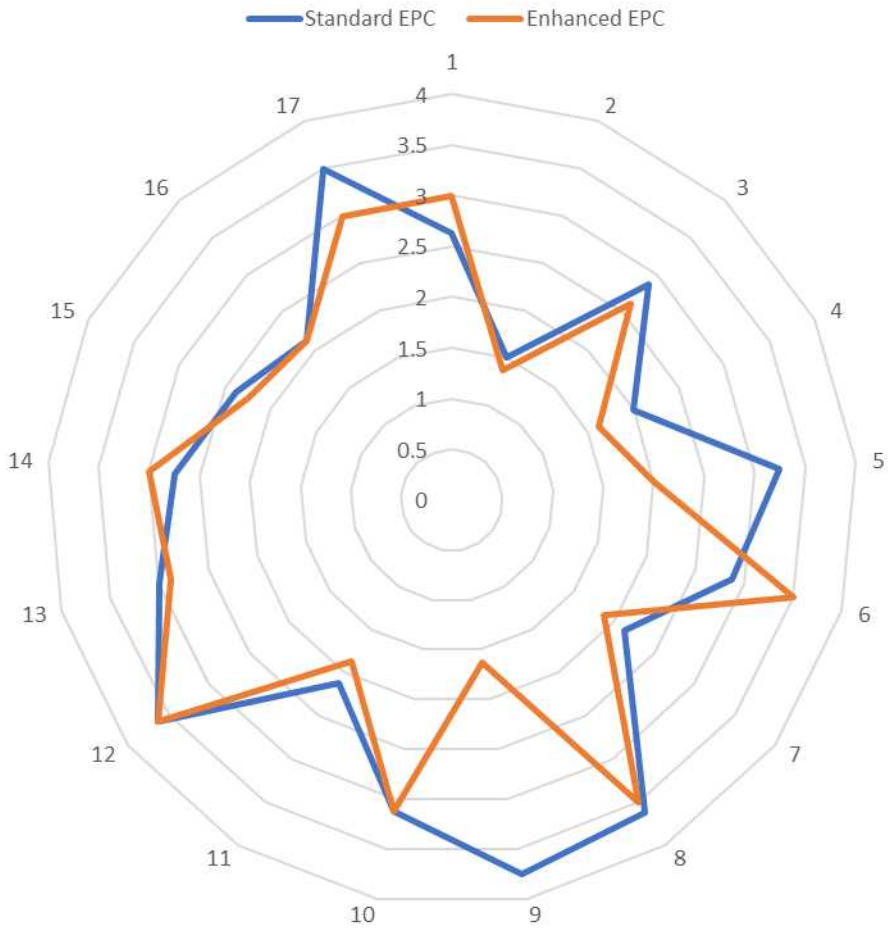
When comparing Standard EPC to Enhanced EPC in Latvian case it can be seen that these two EPCs are very similar with small differences. The main positive difference is that energy rating (traffic light system) has been introduced in Enhanced EPC. The negative change in the proposed Enhanced EPC is that it contains less information than Latvian Standard EPC. The Latvian standard EPC contains 2 mandatory annexes. In one of these annexes we have to include quite detailed information on suggested energy efficiency measures. The other annex contains information on used input data for creating standard EPC. Basically the standard EPC in Latvia can be seen as a detailed energy audit of a building. On average the Standard EPC with its mandatory annexes is about 30 pages long.

It would be good to view a possibility to add to the Enhanced EPC template voluntary annexes which can explain the process of issuing the Enhanced EPC in each country. These annexes then could be different in each country (based on specifics of each country) but the EPC itself should be kept as uniform as possible between al project partner countries or even al EU countries.

4.2 Results of building representative questionnaires

4.2.1 Enhanced EPC template

This Figure summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).



In Latvia the results of stakeholder feedback contain information from 8 questionnaires. The results of the feedback show that most of the questions regarding the Standard and Enhanced EPC got quite similar results. Based on the feedback of the questionnaires it can be concluded that Latvian Standard EPC better shows how my buildings energy demand compares to other similar buildings (question 5). This can be explained due to fact that in Latvian Standard EPC we have to show average consumption of typical residential, educational and office buildings (this information is prepared by State Construction Control Bureau of Latvia; the information on average energy demand is updated each year). Also according to results from questionnaires the Standard EPC is better at making it clear how the energy performance of the building compares to other buildings/ building types (question 9).

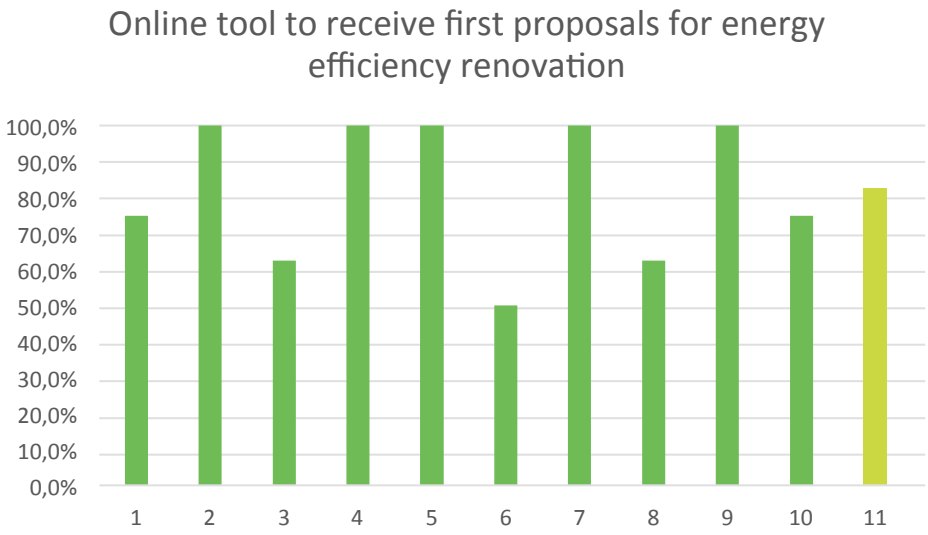
The Enhanced EPC was deemed to be better than Standard EPC in showing the energy potential of the building (question 6). This can be explained by the fact that the Enhanced EPC does contain this information in the EPC but in the Latvian Standard EPC this information is shown only in the mandatory annexes of the EPC.

Type of EPC	Total score
Standard EPC	69.5%

Enhanced EPC	63.2%

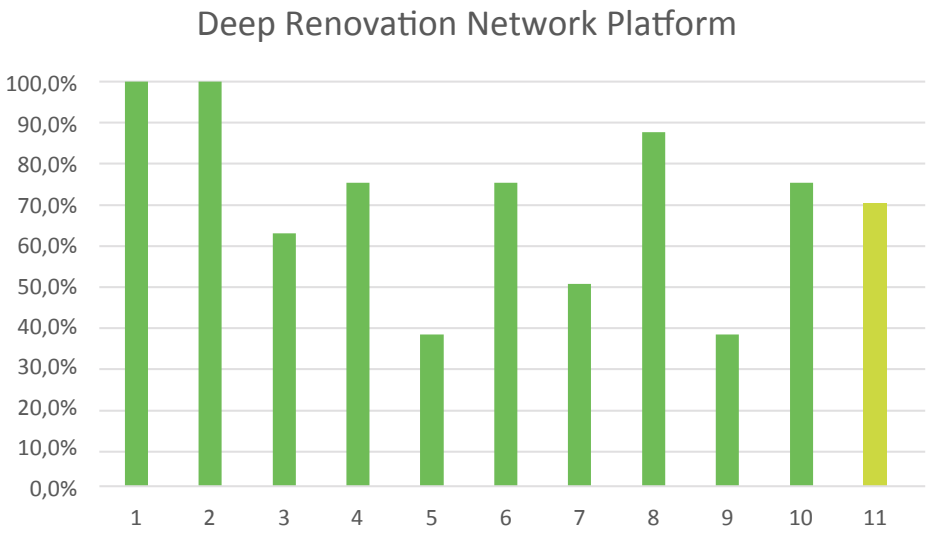
In total the feedback from stakeholders showed that the Standard EPC is slightly better than the Enhanced EPC. Most likely this result can be explained by the type of stakeholders which we addressed. The main type of stakeholder were people who already have seen and used Standard EPCs in their everyday life (building managers and energy experts). Therefore it means that the Standard EPC and its template already is familiar to these stakeholders. In cases where you have to compare something known to you to something that you have not seen before, usually the known thing will be chosen as the most convenient and understandable.

4.2.2 Online tool to receive first proposals for energy efficiency renovation



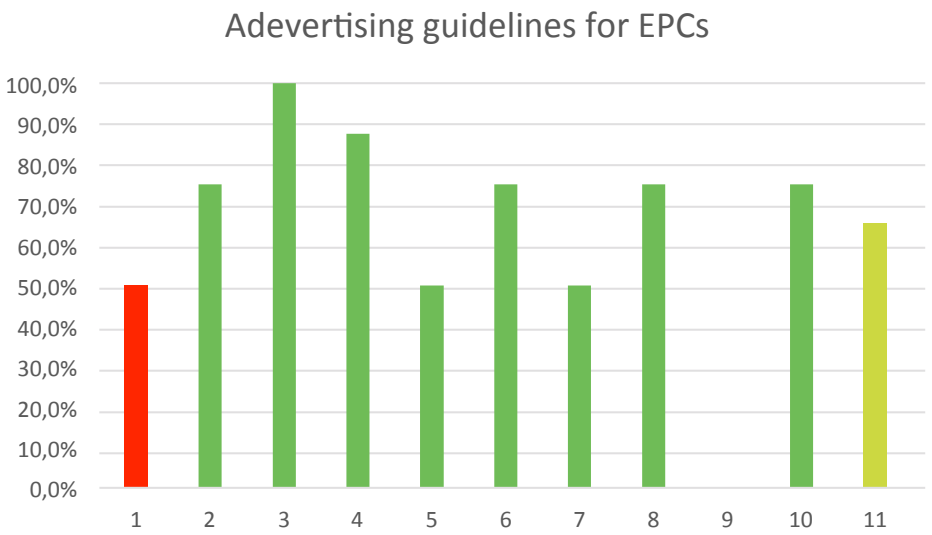
The results from the stakeholder questionnaires regarding an online tool show that the tool should allow you to choose which energy efficiency measures to be implemented in the building (question 2). The tool should be able to calculate energy costs and energy class before and after renovation of the building (question 4 and 5). The tool should also be able to estimate the simple payback period and costs of building renovation (question 7 and 9). Other things such as estimated CO_2 emissions (question 6), energy consumption data (question 3), automatic renovation suggestions (question 1), fulfillment of legal requirements (question 10) and complicated economic gains (IRR and NPV) of building renovation (question 8) were said to be useful but less than 100% of time. In total an average estimation of around 83% for the tool was given. It means that people are strongly interested in such tool.

4.2.3 Deep Renovation Network Platform



The results from the stakeholder questionnaires regarding Deep Renovation Network Platform showed that people are most interested in general information (question 1), information on potential savings and costs (question 2). Also information on financing opportunities (question 8) should be included in such platform. In total the idea of Deep Renovation Network Platform got the result of 70%. This means that there is a strong need for such a platform.

4.2.4 Advertising guidelines for EPCs



The results from the stakeholder questionnaires regarding advertising guidelines for EPCs showed that only 50% of stakeholders were familiar with these guidelines (question 1). The stakeholders mentioned that for them it would be useful to include information where on the EPC to find the energy class of my building (question 3). Also it would be very useful to have information where on the EPC to find energy demand/consumption data (question 2) and how to find or calculate energy costs (question 4).

In total advertising guidelines received a score of 65%. This means that there is need for such guidelines.

4.3 Feedback from stakeholder roundtable discussions

In order to get feedback from stakeholders regarding the suggestions round table discussions were carried out. Also couple eye to eye meetings were held to gather the feedback.

4.3.1 Enhanced energy efficiency recommendations

It was suggested by the stakeholders that the energy efficiency improvements could include not only the standard solutions but also more advanced solutions which are not addressed in Standard EPCs. These measures would include solar thermal and solar electrical power generation. Also it was suggested to include mechanical ventilation with heat recovery in more EPCs (especially in apartment building case).

It was also suggested to evaluate all energy efficiency measures purely on economical feasibility of the measure. In Latvian case this would mean that no measures are done because the payback times (analyzed only from energy savings point of view) exceed the lifespan of the energy efficiency measures (is longer than 30 years).

4.3.2 Suggestions for improvements of Enhanced EPC template

It was suggested to add some monetary information regarding the costs of energy and potential savings. This would make the EPC easier to use by regular persons who do not use EPC every day and who are not familiar with energy units of measurement.

There were some suggestions in making the important things larger in the EPC. For instance it was suggested to enlarge the energy classification (A, B, C, e.t.c.).

It was suggested to make one simple page of Enhanced EPC template, which would contain only few of the most important numbers. This pages should be made with non-experts (regular persons) in mind. Otherwise non-experts could find it hard to understand all the numbers in the EPC.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

It was suggested to develop country specific annexes to the Enhanced EPC in order to add more technical information about the EPC. It also would give possibility to unify the Enhanced EPC throughout EU countries.

Stakeholders also pointed out that in Latvia we have changed the Standard EPC on April 2021. And now the existing Standard EPC is worse than the previous Standard EPC. This also was justified by the fact that the previous Standard EPC (according to which in this project Standard EPCs were issued to pilot buildings) was very near to the Enhanced EPC template developed in the QualDeEPC project.

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelins)

Online tool:

It was agreed that an online tool that can be used by non-experts should be developed. This tool should be made in such way that the user can see what are the direct benefits after the building is renovated.

Also an online tool that is intended to be used by energy auditors should be developed. This would enable the unification of calculation approaches.

Deep renovation network platforms

It was discussed whether an online Deep renovation network platform should be made. It was unclear who would be responsible for running the platform and keeping it up to date. It was said that internet already contains a lot of information and it can be easily found by using different search engines on the web. It was also agreed that the information is scattered between different sources and many times the information is quite contradictory.

A physical renovation platform which acts more or less as a one stop shop was suggested. At the moment the procedure of building renovation is made up of many steps and it is hard for non-experts to follow through all of these steps. Also it is not clear who could be the responsible for such physical hub.

Advertisement guidelines

It was agreed that we should start to actually issue EPCs when selling/renting buildings/apartments. Until then these advertising guidelines would not give much added value.

There was opinion that issuing EPCs for selling/renting purposes only is a waste of money.

So the opinion on this question were split between different stakeholders.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

The main conclusion is that in Latvia the Standard and the Enhanced EPCs are very similar. But the situation was made less clear when in April 2021 the EPC template in Latvia was completely changed.

Anyway, it is important to work at simplifying the EPC for the non-experts (regular persons) so that they can actually understand what has been shown in the EPC of a building and how this information can benefit them. Otherwise, the EPCs are used by a narrow range of experts. This also has led to fact that EPCs are issued only when buildings can apply to subsidies for building renovation.

6 ANNEXES

6.1 Annex B: Standard EPCs

Residential building Standard EPC

1. lapa

ĒKAS
ENERGOSERTIFIKĀTS

REĢISTRĀCIJAS NUMURS **BIS/ĒED-1-2020-575**

DERĪGS LĪDZ **15.10.2030.**

1. ĒKAS VEIDS *Daudzdzīvokļu māja*
2. ADRESE *Maskavas iela 213, Rīga, LV-1019*
3. ĒKAS DAĻA *Audits veikts visai ēkai*
4. ĒKAS VAI TĀS DAĻAS (TELPU GRUPAS) KADASTRA APZĪMĒJUMS *01000470111001*

5. ĒKAS ENERGOSERTIFICĒŠANAS NOLŪKS [ ] pārdošana, [ ] izīrēšana/iznomāšana, [X] brīvprātīgi, [ ] valsts/pašvaldības publiska ēka

6. ĒKAS RAKSTUROJUMS

Pirmreizējās ekspluatācijā pieņemšanas gads: 1982.
Pēdējās pārbūves/atjaunošanas gads: -
Stāvu skaits: 9 virszemes, 1 pazemes, [-] mansards, [-] jumta stāvs

Kopējā platība: 2257,97 m² Aprēķina platība: 2137.43 m²

7. ĒKAS ENERGOEFEKTIVITĀTES NOVĒRTĒJUMS

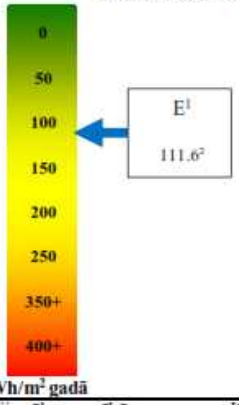
ATSAUCES VĒRTĪBAS

Gandrīz nulles enerģijas ēkas apkures rādītājs (40.0)

Normatīviem atbilstoša ēka (90.0)

Ēkas veidam atbilstošs ēkas vidējais patēriņš (125.59)

ĒKAS ENERGOEFEKTIVITĀTES KLASE UN RĀDĪTĀJS



ĒKAS ENERGOEFEKTIVITĀTES RĀDĪTĀJI

Enerģijas patēriņa novērtējums:	kWh/m² gadā
- apkurei	111,6
- karstā ūdens sagatavošanai	67,7
- mehāniskajai ventilācijai	0
- apgaismojumam	n/a
- dzesēšanai	0
- papildu	4,4
Patēriņš kopā	183,8
No atjaunojamiem energoresursiem ēkā saražotā vai iegūtā enerģija	0
Koģenerācijā saražotā enerģija	0
Primārās enerģijas novērtējums	239,8
	kg CO_2/m² gadā
Oglekļa dioksīda emisijas novērtējums	47,84

Ēka atbilst gandrīz nulles enerģijas ēkas prasībām Jā [ ] Nē [X]

8. ĒKAS ENERGOSERTIFIKĀTA IZDEVĒJS

Neatkarīgs eksperts *Gatis Žogla*
Reģistrācijas numurs *EA3-0009*
Datums[3] Paraksts[3]

Piezīmes.
[1] Ēku energoefektivitātes klase saskaņā ar ēkas patēriņa novērtējumu apkurei.
[2] Ēkas patēriņa novērtējums apkurei, kWh/m² gadā.
[3] Dokumenta rekvizītus "Datums" un "Paraksts" neaizpilda, ja dokuments sagatavots atbilstoši normatīvajiem aktiem par elektronisko dokumentu noformēšanu.

9. ĒKAS NOROBEŽOJOŠO KONSTRUKCIJU ĪPATNĒJAIS SILTUMA ZUDUMU KOEFICIENTS

H_T/A_{apr} 1.23 W/(m²K)
H_{TA}/A_{apr} 0.52 W/(m²K)

H_T un H_{TA} – faktiskais un normatīvais ēkas norobežojošo konstrukciju siltuma zudumu koeficients, kas aprēķināts saskaņā ar normatīvajiem aktiem būvniecības jomā

10. ĒKAS VENTILĀCIJAS ĪPATNĒJAIS SILTUMA ZUDUMU KOEFICIENTS H_{Ve}/A_{apr} 0.44 W/(m²K)

H_{Ve} – ēkas ventilācijas siltuma zudumu koeficients, kas aprēķināts saskaņā ar ēkas energoefektivitātes aprēķina metodi

Ventilācijas siltuma zudumu atgūšana apkures periodā 0 %

11. ENERĢIJAS UZSKAITE UN SADALĪJUMS APKURES UN KARSTĀ ŪDENS SISTĒMĀS

Kalendāra gads	Energonesējs			Apkurei			Karstā ūdens apgādei	
	nosaukums	uzskaitītais daudzums MWh[4]	uzskaitītais daudzums kWh	kWh	Klimata korekcija, kWh[5]	kWh/m² gadā	kWh	kWh/m² gadā
2015	Siltumenerģija no pilsētas centralizētas siltumapgādes sistēmas	356.320	356320	209082.5	209082.5	97.8	147237.5	68.9
2016		370.200	370200	235260	235260	110.1	134940	63.1
2017		393.990	393990	231285	231285	108.2	162705	76.1
2018		396.110	396110	263087.5	263087.5	123.1	133022.5	62.2
2019		400.530	400530	254430	254430	119.0	146100	68.4

12. PIELIKUMI UN PIEVIENOTIE DOKUMENTI (dokumenta nosaukums, datums, numurs un lapu skaits):

1) pārskats par ekonomiski pamatotiem energoefektivitāti uzlabojošiem pasākumiem, kuru īstenošanas izmaksas ir rentablas paredzamajā (plānotajā) kalpošanas laikā;
2) pielikums, kurā ietvertas aprēķinos izmantotās ievaddatu vērtības, norādot datu iegūšanas veidu un datu avotu;

13. NEATKARĪGA EKSPERTA APLIECINĀJUMS

Apliecinu, ka ēkas energosertifikāts sastādīts, nepieļaujot rīcību, kas manis paša, pasūtītāja vai citas personas interesēs varētu mazināt iegūto rezultātu pareizību, novērtējuma objektivitāti un ticamību.

(datums[6]) (vārds, uzvārds) (paraksts[6])

Piezīmes.

[4] Dati par faktiski uzskaitītajiem energonesējiem par pēdējiem pieciem gadiem vai sezonām faktiski uzskaitītajās mērvienībās (t, m³, MJ, kcal vai cita).

[5] Klimata korekcijas koeficients attiecīgajai apkures sezonai patēriņa normalizēšanai uz normatīvo apkures grādu dienu skaitu.

[6] Dokumenta rekvizītus "datums" un "paraksts" neaizpilda, ja dokuments sagatavots atbilstoši normatīvajiem aktiem par elektronisko dokumentu noformēšanu.

Non residential building Standard EPC

1.lapa

ĒKAS ENERGOSERTIFIKĀTS

REĢISTRĀCIJAS NUMURS BIS-ĒED-1-2020-577
DERĪGS LĪDZ 15.10.2030.

1. ĒKAS VEIDS	*Biroju ēka*
2. ADRESE	*Rūpnīcas iela 8, Liepa, Liepas pagasts, Priekuļu novads, LV-4128*
3. ĒKAS DAĻA	*Novērtējums veikts visai ēkai*
4. ĒKAS VAI TĀS DAĻAS (TELPU GRUPAS) KADASTRA APZĪMĒJUMS	*42600030285001*
5. ĒKAS ENERGOSERTIFICĒŠANAS NOLŪKS	[ ] pārdošana, [ ] izīrēšana/iznomāšana, [ ] brīvprātīgi, [X] valsts/pašvaldības publiska ēka

6. ĒKAS RAKSTUROJUMS

Pirmreizējais ekspluatācijā pieņemšanas gads	1968		
Pēdējās pārbūves/atjaunošanas gads	-		
Stāvu skaits	2 virszemes, 1 pazemes, [NAV] mansards, [NAV] jumta stāvs		
Kopējā platība	769,1 m²	Aprēķina platība	629,1 m²

7. ĒKAS ENERGOEFEKTIVITĀTES NOVĒRTĒJUMS

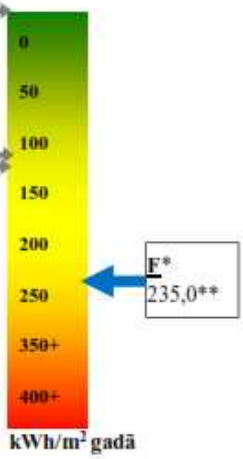
ATSAUCES VĒRTĪBAS

Gandrīz nulles enerģijas ēkas apkures rādītājs (45,0)

Normatīviem atbilstoša ēka (110,0)

Ēkas veidam atbilstošs ēkas vidējais patēriņš, (114,57)

ĒKAS ENERGOEFEKTIVITĀTES KLASE UN RĀDĪTĀJS



ĒKAS ENERGOEFEKTIVITĀTES RĀDĪTĀJI

Enerģijas patēriņa novērtējums:	kWh/m² gadā
- apkurei	235,0
- karstā ūdens sagatavošanai	3,4
- mehāniskajai ventilācijai	0
- apgaismojumam	7,4
- dzesēšanai	0
- papildu	2,0
Patēriņš kopā	247,8
No atjaunojamiem energoresursiem ēkā saražotā vai iegūtā enerģija	0,0
Koģenerācijā saražotā enerģija	0,0
Primārās enerģijas novērtējums	324,7
	kg CO_2/m² gadā
Oglekļa dioksīda emisijas novērtējums	63,44

Ēka izpilda gandrīz nulles enerģijas ēkas prasības Jā [ ] Nē [X]

8. ĒKAS ENERGOSERTIFIKĀTA IZDEVĒJS

Neatkarīgs eksperts	*Gatis Žogla*
Reģistrācijas numurs	*EA3 Nr.0009*
Datums	Paraksts

Piezīmes: * Ēku energoefektivitātes klase saskaņā ar ēkas patēriņa novērtējumu apkurei.
** Ēkas patēriņa novērtējums apkurei, kWh/m² gadā.

2.lapa

9. ĒKAS NOROBEŽOJOŠO KONSTRUKCIJU ĪPATNĒJAIS SILTUMA ZUDUMU KOEFICIENTS

H_T/A_{apr} 2,01 W/(m²K)
H_{TA}/A_{apr} 0,95 W/(m²K)

H_T un H_{TA} – faktiskais un normatīvais ēkas norobežojošo konstrukciju siltuma zudumu koeficients, kas aprēķināts saskaņā ar normatīvajiem aktiem būvniecības jomā

10. ĒKAS VENTILĀCIJAS ĪPATNĒJAIS SILTUMA ZUDUMU KOEFICIENTS

H_{Ve}/A_{apr} 0,48 W/(m²K)

H_{Ve} –ēkas ventilācijas siltuma zudumu koeficients, kas aprēķināts saskaņā ar ēkas energoefektivitātes aprēķina metodi

Ventilācijas siltuma zudumu atgūšana apkures periodā 0%

11. ENERĢIJAS UZSKAITE UN SADALĪJUMS APKURES UN KARSTĀ ŪDENS SISTĒMĀS

Kalendāra gads	Energonesējs		Apkure		Karstā ūdens apgādei	
	Nosaukums	uzskaitītais daudzums MWh	MWh	kWh/m² gadā	MWh	kWh/m² gadā
2015	Centralizētā siltumapgāde	139.049	139.049	221.0	n/a	n/a
2016	Centralizētā siltumapgāde	158.352	158.352	251.7	n/a	n/a
2017	Centralizētā siltumapgāde	164.918	164.918	262.1	n/a	n/a
2018	Centralizētā siltumapgāde	149.12	149.12	237.0	n/a	n/a
2019	Centralizētā siltumapgāde	128.181	128.181	203.8	n/a	n/a
Aprēķins	Elektroenrģija	n/a	n/a	n/a	2.160	3,4

12. PIELIKUMI UN PIEVIENOTIE DOKUMENTI:

1) Veikto pieņēmumu apraksts ēkas energosertifikātā, kas iekļauj arī pārskatu par ekonomiski pamatotiem energoefektivitātes pasākumiem

13. NEATKARĪGA EKSPERTA APLIECINĀJUMS

Apliecinu, ka ēkas energosertifikāts sastādīts, nepieļaujot rīcību, kas manis paša, pasūtītāja vai citas personas interesēs varētu mazināt iegūto rezultātu pareizību, novērtējuma objektivitāti un ticamību.

Gatis Žogla
(vārds, uzvārds)

_____
(paraksts) (datums)

*** Klimata korekcijas koeficients attiecīgajai apkures sezonai patēriņa normalizēšanai uz normatīvo apkures grādu dienu skaitu

6.2 Annex C: Enhanced EPCs

Residential building Enhanced EPC

Qual DeEPC

Energosertifikāts *(dzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Reģistrācijas Nr.: BIS/ĒED-1-2020-575	Derīgs līdz: 15/10/2030	Energosertifikāta veids: *izmērītais patēriņš*

Izmantotā aprēkinu metode – atbilstoši MK noteikumiem Nr. 348 "Ēkas energoefektivitātes aprēkina metode"

Ēkas raksturojums	
Ēkas veids	*Daudzdzīvoklu māja*
Adrese	Maskavas iela 213, Rīga, LV-1019
Stāvu skaits	*9*
Ekspluatācijā nodošanas gads	1982
Aprēkina laukums, m²	2137.43
Kopējais laukums, m²	2257.97

Energy classification and performance

Min apkures patēriņš [kWh/m²gadā]	Max apkures patēriņš [kWh/m²gadā]	Energoefektivitātes klase	Apkures patēriņš kWh/m² gadā	*Primārās enerģijas patēriņš kWh/m² gadā*	*Sasniedzamais apkures enerģijas patēriņš [kWh/m²gadā]*
0	<40	A			
>40	<60	B			50.5
>60	<80	C			
>80	<100	D			
>100	<150	E	111.6	239.8	
>150		F			

* The underlain renovation recommendations and implementation scheme for Main option are given on p. 3 & 4.

Enerģijas ietaupījuma potenciāls **143.727 MWh gadā**

Izdevējs	Datums
Gatis Žogla, EA3-0009, gatis@ekodoma.lv	Paraksts

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

Energosertifikāts *(dzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Enerģijas uzskaite ēkā

Izmērītias enerģijas patēriņš** Izmērītais:

No.	Periods	Enerģijas avots	Enerģijas patēriņš apkurei un karstā ūdens sagatavošanai [kWh gadā]			*Elektroenerģija [kWh gadā]*
			Kopā	Apkure	Karstais ūdens	*Koplietošana*
1	2017	Centralizētā siltumapgāde	393990	231285	162705	
2	2018		396110	263087.5	133022.5	10899
3	2019		400530	254430	146100	7905

**Izmērītais enerģijas patēriņš ir atkarīgs no klimatiskajiem apstākļiem un ēkas iedzīvotāju/apmeklētāju uzvedības. Aprēķinātais ēkas apkures patēriņš var atšķirties no izmērītā patēriņa

Ēkas norobežojošo konstrukciju un tehnisko sistēmu novērtējums

Norobežojošā konstrukcija	Laukums [m²]	*Apraksts vai U vērtība [W/m²K]*	Energoefektivitātes novērtējums
Ārsienas	1632.34	*0.89-1.02 (kermazītbetona sienas)*	
Bēniņi/jumts	365.8	0.57-1.2 (dobjie dzelzsbetona paneļi)	
Pagrabs/grīda uz grunts	319.0	0.56 (dobjie dzelzsbetoan paneļi)	
Logi	362.5	1.5-2.4 (koka un PVC rāmji)	
Durvis	7.6	3 (koka durvis)	

Tehniskās sistēmas	Uzstādīšanas gads	Sistēmas apraksts	Energoefektivitātes novērtējums
Apkure sistēma	Ar ēkas būvniecību	Radiatori	
Karstā ūdens sistēma	Ar ēkas būvniecību	Centralizēta ar cirkulāciju	
Ventilācijas sistēma	Ar ēkas būvniecību	Dabīgā	
Dzesēšanas sistēma	Ar ēkas būvniecību	Nav	
Apgaismojums	Daļēji atjaunots	Kvēlspuldzes/halogēna spuldzes/led	
Atjaunojamā enerģija	Ar ēkas būvniecību	Nav	

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

Energosertifikāts *(dzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Ēkas atjaunošanas priekšlikumi

Norobežojošās konstrukcijas	Pasākums	Jaunā U vērtība	Jaunais energoefektivitātes novērtējums	*Atmaksāšanās laiks, gadi*
Sienu siltināšana	150 mm akmens vate	*0.22*		*50.4*
Bēniņu siltināšana	300 mm beramā vate	0.11-0.17		*15.1*
Pagraba siltināšana	100 mm siltumizolācija	0.22		*64.9*
Logu nomaiņa	Trīsstiklu pakešu logi	1.10		*46.8*
Durvju nomaiņa	Jaunas siltinātas durvis	1.60		*124.9*

Tehniskās sistēmas	Pasākums	Jaunais energoefektivitātes novērtējums	*Atmaksāšanās laiks, gadi*
Apkures sistēma	Jauna apkures sistēma ar thermostat.		*195.8*
Karstā ūdens sistēma	Sistēmas cauruļvadu siltināšana		*62.4*
Ventilācijas sistēma	Ventilācijas šahtu un skursteņu tīrīšana		*n/a*
Dzesēšanas sistēma	n/a		*n/a*
Atjaunojamā enerģija	n/a		*n/a*

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

Energosertifikāts *(dzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Ēkas atjaunošanas priekšlikumi - apraksts

Galvenās opcijas renovācijas un pakāpeniskas ieviešanas kombinācijas apraksts: Paredzēts veikt visu ēkas norobežojošo konstrukciju siltināšanu, logiem un durvīm – nomaiņu. Paredzēts uzstādīt jaunu apkures sistēmu ēkā, kā arī veikt daļēju atjaunošanu karstā ūdens sistēmai, un veikt dabīgās ventilācijas sistēmas tīrīšanu.

Ēkas renovācijas priekšlikums sasniedz:	Minimālās prasības atjaunotām ēkām :	☒
	Gaisa caurlaidības prasības	☒
	Samazināti termiskie tilti:	☒
	Vismaz 50% atjaunojamās enerģijas:	☐

Citi energoefektivitātes pasākumu priekšlikumi: Ēkā papildus paredzētajiem energoefektivitātes risinājumiem būtu vēlams domāt par dzesēšanas sistēmu uzstādīšanu, kas ļautu samazināt telpu pārkaršanu vasarā. Tāpat nepieciešams domāt par piespiedu ventilācijas sistēmu uzstādīšanu, kas ļautu telpas nodrošināt ar nepieciešamo gaisa apjomu.

Vairāk informācijas

Šīs saites sniedz papildu informāciju par energoefektivitātes sertifikāciju, energosertifikātu izmantošanu un renovāciju, lai uzlabotu energoefektivitāti, ieskaitot finansiālās palīdzības programmas:

- *https://www.em.gov.lv/lv/eku-energoefektivitate*
- *https://likumi.lv/ta/id/258322-noteikumi-par-eku-energosertifikaciju*
- *https://likumi.lv/ta/id/258128-ekas-energoefektivitates-aprekina-metode*

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

Non residential building Enhanced EPC

Qual DeEPC

Energosertifikāts *(nedzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Reģistrācijas Nr.: BIS/ĒED-1-2020-577	Derīgs līdz: 15/10/2030	Energosertifikāta veids: *izmērītais patēriņš*

Izmantotā aprēķinu metode – atbilstoši MK noteikumiem Nr. 348 "Ēkas energoefektivitātes aprēķina metode"

Ēkas raksturojums

Ēkas veids	*Biroju ēka*
Adrese	Rūpnīcas iela 8, Liepa, Priekuļu novads, LV-4128
Stāvu skaits	*2*
Ekspluatācijā nodošanas gads	1968
Aprēķina laukums, m²	629.1
Kopējais laukums, m²	769.1

Energy classification and performance

Min apkures patēriņš [kWh/m²gadā]	Max apkures patēriņš [kWh/m²gadā]	Energoefektivitātes klase	Apkures patēriņš, kWh/m² gadā	*Primārās enerģijas patēriņš, kWh/m² gadā*	*Sasniedzamais apkures enerģijas patēriņš [kWh/m²gadā]*
0	<45	A			
>45	<65	B			
>65	<90	C			
>90	<110	D			
>110	<150	E			129.8
>150		F	235.0	247.8	

* The underlain renovation recommendations and implementation scheme for Main option are given on p. 3 & 4.

Enerģijas ietaupījuma potenciāls **66.177 MWh gadā**

Izdevējs

Gatis Žogla, EA3-0009, gatis@ekodoma.lv

Datums

Paraksts

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

Energosertifikāts *(nedzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Enerģijas uzskaite ēkā

Izmērītias enerģijas patēriņš** Izmērītais:

No.	Periods	Enerģijas avots	Enerģijas patēriņš apkurei un karstā ūdens sagatavošanai [kWh gadā]			*Elektroenerģija [kWh gadā]*
			Kopā	Apkure	Karstais ūdens	*Kopā*
1	2017	Centralizētā siltumapgāde	164918	164918	n/a	13.673
2	2018		14912	14912	n/a	11466
3	2019		128181	128181	n/a	11088

**Izmērītais enerģijas patēriņš ir atkarīgs no klimatiskajiem apstākļiem un ēkas iedzīvotāju/apmeklētāju uzvedības. Aprēķinātais ēkas apkures patēriņš var atšķirties no izmērītā patēriņa

Ēkas norobežojošo konstrukciju un tehnisko sistēmu novērtējums

Norobežojošā konstrukcija	Laukums [m²]	*Apraksts vai U vērtība [W/m²K]*	Energoefektivitātes novērtējums
Ārsienas	449.1	*1.22 (silkāta ķieģeļu sienas)*	
Bēniņi/jumts	402.7	0.29 (dobjie dzelzsbetona paneļi, vate 100 mm)	
Pagrabs/grīda uz grunts	409.0	0.37-0.69 (dobjie dzelzsbetoan paneļi)	
Logi	187.4	1.6-2.8 (koka un PVC rāmji)	
Durvis	18.7	2.0- 3.0 (koka durvis)	

Tehniskās sistēmas	Uzstādīšanas gads	Sistēmas apraksts	Energoefektivitātes novērtējums
Apkure sistēma	Ar ēkas būvniecību	Radiatori, daļēji mainīta	
Karstā ūdens sistēma	Ar ēkas būvniecību	Individuālā, elektriskā ar boileriem	
Ventilācijas sistēma	Ar ēkas būvniecību	Dabīgā	
Dzesēšanas sistēma	Ar ēkas būvniecību	Nav	
Apgaismojums	Daļēji atjaunots	Kvēlspuldzes/halogēna spuldzes/led	
Atjaunojamā enerģija	Ar ēkas būvniecību	Nav	

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

Energosertifikāts *(nedzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Ēkas atjaunošanas priekšlikumi

Norobežojošās konstrukcijas	Pasākums	Jaunā U vērtība	Jaunais energoefektivitātes novērtējums	*Atmaksāšanās laiks, gadi*
Sienu siltināšana	200 mm akmens vate	*0.18*		*21.5*
Bēniņu siltināšana	150 mm beramā vate	0.14		*17.0*
Pagraba siltināšana	100 mm siltumizolācija	0.22-0.32		*44.0*
Logu nomaiņa	Trīsstiklu pakešu logi	1.10		*21.7*
Durvju nomaiņa	Jaunas siltinātas durvis	1.60		*62.0*

Tehniskās sistēmas	Pasākums	Jaunais energoefektivitātes novērtējums	*Atmaksāšanās laiks, gadi*
Apkures sistēma	Apkures cauruļvadu siltināšana.		*5.5*
Karstā ūdens sistēma	n/a		*n/a*
Ventilācijas sistēma	Mehāniskā ventilācijas sistēma ar 85% siltuma rekuperācijas iekārtām		*72.8*
Dzesēšanas sistēma	n/a		*n/a*
Atjaunojamā enerģija	n/a		*n/a*

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

Energosertifikāts *(nedzīvojama ēka)*

Atbilstoši Ēku energoefektivitātes likuma prasībām un MK noteikumiem Nr. 383 "Noteikumi par ēku energosertifikāciju"

Ēkas atjaunošanas priekšlikumi - apraksts

Galvenās opcijas renovācijas un pakāpeniskas ieviešanas kombinācijas apraksts: Paredzēts veikt visu ēkas norobežojošo konstrukciju siltināšanu, logiem un durvīm – nomaiņu. Paredzēts siltināt esošās apkures sistēmas cauruļvadus, kā veikt mehāniskās ventilācijas sistēmas ar rekuperāciju uzstādīšanu.

Ēkas renovācijas priekšlikums sasniedz:	Minimālās prasības atjaunotām ēkām :	☒
	Gaisa caurlaidības prasības	☒
	Samazināti termiskie tilti:	☒
	Vismaz 50% atjaunojamās enerģijas:	☐

Citi energoefektivitātes pasākumu priekšlikumi: Ēkā papildus paredzētajiem energoefektivitātes risinājumiem būtu vēlams domāt par dzesēšanas sistēmu uzstādīšanu, kas ļautu samazināt telpu pārkaršanu vasarā.

Vairāk informācijas

Šīs saites sniedz papildu informāciju par energoefektivitātes sertifikāciju, energosertifikātu izmantošanu un renovāciju, lai uzlabotu energoefektivitāti, ieskaitot finansiālās palīdzības programmas:

- *https://www.em.gov.lv/lv/eku-energoefektivitate*
- *https://likumi.lv/ta/id/258322-noteikumi-par-eku-energosertifikaciju*
- *https://likumi.lv/ta/id/258128-ekas-energoefektivitates-aprekina-metode*

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

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;
- Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in EPC	Standard EPC						
		Enhanced EPC						
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consump-	Standard EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	tion values shown in EPC help me to estimate future energy consumption	Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	Standard EPC						
		Enhanced EPC						
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-saving“			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. Advertising guidelines for EPCs

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements			
• The year of issue of the EPC, if that needs to be shown in the advertisements			

6.4 Annex F: Results of questionnaire of Latvia

Address	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Building 1	Standard EPC	2	1	3	2	3	3	1	3	3	3	2	3	2	2	3	2	3
	Enhanced EPC	3	1	3	2	2	3	1	3	1	2	1	3	2	3	2	2	2
Building 2	Standard EPC	3	1	4	2	4	3	1	3	4	3	2	4	3	2	3	2	4
	Enhanced EPC	3	2	3	2	2	3	1	3	2	3	2	3	3	2	3	2	3
Building 3	Standard EPC	3	2	4	2	4	4	2	4	4	4	2	4	3	3	3	1	4
	Enhanced EPC	3	1	3	1	1	4	1	3	2	3	2	4	2	2	2	1	2
Building 4	Standard EPC	4	2	2	1	4	4	2	4	4	2	2	4	4	1	2	2	4
	Enhanced EPC	4	2	3	1	1	4	2	4	0	3	2	3	3	2	3	1	4
Building 5	Standard EPC	2	3	3	3	3	3	2	4	4	2	2	3	3	3	1	1	3
	Enhanced EPC	3	2	3	1	3	4	2	3	1	3	1	4	4	3	1	2	3
Building 6	Standard EPC	2	1	3	2	2	2	3	3	3	4	3	3	4	3	1	2	2
	Enhanced EPC	3	1	2	2	1	3	2	4	2	4	3	4	4	4	1	2	2
Expert 1	Standard EPC	2	1	2	2	3	2	3	4	4	4	2	4	3	4	3	3	4
	Enhanced EPC	2	1	2	2	3	3	3	4	3	4	2	4	3	4	3	3	4
Expert 2	Standard EPC	3	1	2	2	3	2	3	4	4	3	2	4	2	4	3	4	4
	Enhanced EPC	3	1	2	2	3	4	3	4	2	3	2	4	2	4	3	4	4

6.8 Annex H: National summary evaluation report for Spain

D4.5 National summary evaluation report for Spain

QualDeEPC H2020 project

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Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

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TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Spain.

1 PILOT PROJECT SELECTION (TASK 4.1)

This part of the report describes the pilot project selection process.

The first identification and selection of buildings of the pilot cases has been carried out with talks and discussions of the stakeholders in bilateral meetings; therefore Escan asked the participants professionals EPC assessors, public bodies and energy agencies about the possibility they propose potential pilot cases for QualdeEPC. Escan had in year 2020 and in year 2019 some bilateral meetings for Analysis of current practice and priorities, also 3 workshops organization and we asked the key stakeholders about potential buildings.

The potential buildings characteristics that we utilized have been:

- ✓ Building typology: residential of public buildings preferably, houses or block of building; schools, public offices and commercial shopping centers
- ✓ Also preferably construction year before 1995
- ✓ The buildings should have possibilities of deep renovation (this means with no rehabilitation works within the last 8 years).

Two of the participants, province government of Burgos and Regional government of Madrid proposed some interesting public buildings; the buildings of the household sector Escan with the subcontractors choose some schools and public buildings offices of 2 different climatic zones; this first selection has been carried out between end of 2019 and July 2020. Several visits, meetings and telephone conversations for the preparation of the fist table of identification of the building has been has been carried out by Escan and subcontractors. At that stage we identified 8 residential and 6 non-residential buildings ; also invitation to 2 more residential buildings

The standard EPC have been carried out by the subcontractors in 2020.

Due to COVID some of the buildings did not follow to prepare the enhanced EPC so Escan searched for more different buildings and lasting with 2 non public buildings of Burgos, 1 new building in Sevilla because this was placed in a different climatic area with high possibilities of renovation. Therefore at the end 15 pilot cases

We have elaborated 2 tables the first selection of buildings and the final selection.

Subcontractors and Escan have developed standard EPC of both tables and enhance EPC available in year 2021 have been developed in the 15 buildings of the final selection table 2

More detailed information on this can be found in report named “Pilot building selection report” which was developed for Task 4.1.

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	Cestona Street, MADRID	R	Multi-apartment building with 10 floors and 20 apartments	1978	2202	No
2	Garganchon 28042 Madrid	R	Residential building of 12 apartments in 3 floors. Building has no elevator	1960	675	No
3	José Ortega y Gasset Street, 64_28006 MADRID	R	Residential building with 19 apartments, in 5 floors.	1911	2179	No
4	Villabona 108, Orcasitas 28041 MADRID	R	Residential building Row house with two floors.	1980	95	No
5	Nuria, 28034 Madrid	R	Collective residential building of 20 apartments, distributed in 5 floors, a ground floor and four more floors.	1969	1432	No
6	CL ROGER 46780 OLIVA VALENCIA	R	Collective residential building of 8 apartments, distributed in 3 floors, a ground floor and two more floors. They do not have building underground.	1974	272	No
7	CERDEÑA 46780 OLIVA VALENCIA	R	Collective residential building of 6 houses, distributed in 3 floors, a ground floor and two more floors. They do not have building underground	1974	301	No
8	Asamblea Madrid PABLO NERUDA 142(G) 28028 MADRID,	P	Office building with several climatization unit	1998	9600	No

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
	SPAIN					
9	Romeo y Julieta 3B 28028 MADRID, SPAIN	P	Non-Residential	1998	4000	No
10	Fuentes Blancas School LG Fuente Sordo, 70 09007 Burgos	P	School of primary education Facades with many surface of simple glasing tat requires renovation. The heating is supplied by a biomass district heating net.	1971	2875	Yes
11	"SAN AGUSTÍN" Nursing Home C/San Agustín, 4 09001 Burgos	P	Non - residential building	1998	3217.6	Yes
12	F Blancas Nurshing Home, Burgos	P	Non - residential building	1970		Yes
13	Burgos	P	Non - residential building	1970		Yes

Table 1.- Spain First selection of pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1,2,3,4, 5,6,7,8	The same of previous table					
9	Valencia Street 36, Sedavi	R	Block of flats	1977	4380	No
10	Mortera-El Rodil , Piélagos, Cantabria	R	This is a row house of a group of 8. C1, Climatic area of Canta-	2005	75	No

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
			bria- North Spain			
…11	PABLO NERUDA 142(G) 28028 Madrid	P	Public office buiding	1998		No
12	Calle Romeo y Julieta 3B 28028 Madrid	P	Public building	1998	4000	No
13	Lugar Fuente Sordo, 70	P	Primary School	1974	2876	No
14	Calle San Agustín 4, 09001 Burgos	P	Pubic nurshery buidling	1999	3218	No
15	Calle Afrodita 6, Sevilla	R	Block of flats. South Spain	2009	6300	No

Table 2.- Final list of pilot buildings

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

The standard EPC have been carried out using the official software of CE3X. Subcontracting has been carried out to 3 architects.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (1)	Energy efficiency improvement recommendations included in Standard EPC
1	Cestona, MADRID	E	146.9	Replacement of boilers Insulation 8cm in envelope Insulation 10cm for the roof
2	Garganchón, 28042 Madrid	G	382.9	APLICACION DE AISLAMIENTO TERMICO POR EL EXTERIOR DE 8cm DE EPS EN FACHADA Y RENOVACION DE LA CUBIERTA CON 12cm DE LANA DE ROCA Y PANEL SANDWICH DE POLIURETANO, SE COMPLETA LA INTERVENCION CON LA RENOVACION DE LA CARPINTERIA EN ALUMINIO CON RTP Application of thermal insulation with on the outside of walls 8cm *EPS* foam insulation boards; renovation of the cover with 12cm of rock wool and SANDWICH PANEL oOF POLYURETHANE; Renovation of the ALUMINUM CARPENTRY WITH RTP
3	José Ortega y Gasset Street, 64, 28006 Madrid	E	227.1	Insulation in envelope and in cover; condensing boiler and windows replacement
4	Villabona 108, Orcasitas 28041 MADRID	G	492.9	Replacement of windows, condensing boiler and new installation of thermal solar for DHW
5	Nuria, 28034 Madrid	E	262.4	Exterior Insulation SATE Windows replacement 1 central condensing boiler 70kw Solar Thermal
6	Roger 46780 Oliva, Valencia	G	278.5	• Exterior insulation SATE in the building envelope; • Windows replacement • Heating pumps for cooling and heating production for air

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (1)	Energy efficiency improvement recommendations included in Standard EPC
				conditioning and heating demand
7	Cercedeña 46780 Oliva VALENCIA	G	195.4	Exterior Insulation SATE; Replacement windows; condensing mixed boiler and solar thermal for DHW
8	Calle Carboneres 5, Asturias	A	280.0	Exterior thermal insulation (SATE) on the facades that eliminates all thermal bridges; also isolation interior cladding on the roof. The windows are replaced by high-performance double-glazed windows and PVC joineryheating and DHW system by means of a mixed condensing boiler that uses natural gas as fuel. Installation of solar thermal energy with a contribution of 60% of the DWH energy consumption.
9	Valencia 36, Sedavi	B	78.84	8 cm of insulation with conductivity 0.04 W / m2K to the walls and continuous insulation for thermal bridges on the facade. Windows with double glazing U = 3.3 W/m2K and metal frame with thermal bridge break U=4.0W/m2K
10	Mortera-El Rodil, Cantabria	A	283.3	Windows replacement and new condesing boiler for heating and domestic water heating.
11	Asamblea Madrid Avda. Pablo Neruda 142, Madrid	C	213.9	Improvement of air conditioning installations (high-efficiency heat pumps) and replacement of windows with better glazing properties
12	Romeo y Julieta 3B 28028 Madrid	C	306.7	Replacement of the 2 Carrier Model 30GH-145-0043-EE chillers with 5 compressors each one and 455kW thermal operating with R-407C.
13	“FUENTES BLANCAS” School LG Fuente Sordo, 70 09007 Burgos	A	28.1	Replacement of the current carpentry with ones with thermal break, double glass and with the blind drawer well isolated and watertight *Sustitución de las carpinterías*

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (1)	Energy efficiency improvement recommendations included in Standard EPC
				actuales por unas con rotura de puente térmico, vidrio doble y con el cajón de la persiana bien aislado y estanco.
14	San Agustín, 4 bajo 09001 Burgos	C	347.9	Changes in current lighting systems for others with lower consumption. Changing the boiler system and placing thermostatic radiator valves.
15	Calle Afrodita 6, Sevilla	B	71.54	Incorporate 8 cm of insulation to the roof of the building with conductivity 0.04 W/m^2K

(1) Nonrenewable primary energy consumption kWh/m^2 annum

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

Escan analyzed the draft of the Enhanced EPC templated that was proposed and discussed in several meeting with the consortium.

After the version was approved Escan did translate the template and studied the different parameters and information that was required

The enhanced EPC has been explained to each of the subcontractors in meeting with Escan professional.

The enhanced EPC describes the recommendations per each system in order to be able to complete the data.

1. We have to do calculations for final energy consumption in order to calculate energy savings.
2. We have to do the certification again for some of the pilot cases because the target was to produce recommendations in order to achieve one or several of the following: NZEB, air tightness, reduction thermal bridges, and the standard EPC of some of the buildings did not achieved that goal
3. We also have to do the calculation for the recommendations about Cost effectiveness (e.g. payback time)

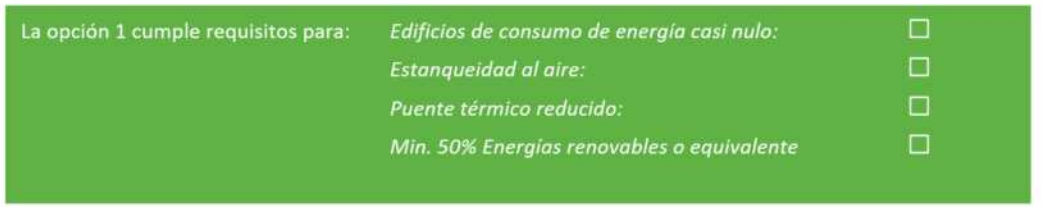


Table 3. Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
1	Cestona Street, MADRID	B	86.47%	39.40	Insulation of building envelope, windows, new heating and DHW systems with natual gas and solar thermal	Heating, Cooling and DHWn system with air waer heat pumps	x		x	x
2	Garganchon 28042 Madrid	E	51.30%	153.42	Insultion of the building envelope, replacement of windows	Insulation on the building ground floor			x	
3	José Ortega y Gasset Street, 64_28006 MADRID	A	92.67%	13.69	Building envelope, windows, heating, DHW, solar thermal, cooling	Ventilation system and solar PV	x		x	x

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
4	Villabona 108, Orcasitas 28041 MADRID	B	97.10%	11.85	Insulation of building envelope, replacement of windows, heating, DHW, solar thermal	Solar PV	x		x	x
5	Nuria, 28034 Madrid	B	81.63%	39.86	Building envelope, windows, heating, DHW, solar thermal	Solar PV and Heat pump for cooling	x		x	x
6	Roger 46780 Oliva, Valencia	A	92.17%	13.88	Building envelope, windows, heating pumps for cooling and DHW	Ventilation system and solar PV	x		x	
7	Cerdeña 46780 Oliva, Valencia	B	83.92%	21.91	Building envelope, windows, DHW, cooling and solar thermal	Ventilation system and solar PV	x		x	

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
8	Calle Carboneres 5, Asturias	A	95.16%	12.25	Building envelope, windows, heating, DHW, solar thermal, aerothermal	Solar PV	x		x	x
9	Valencia 36, Sedavi	B	30.72%	37.18	Building envelope (without floors), windows	Heating system and additional insulation			x	
10	Mortera-El Rodil, Cantabria	A	94.60%	12.86	Insulation of building envelope, windows, air water heat pump por heating and , DHW	Ventilation system and solar thermal	x		x	
11	Avda. Pablo Neruda 142, Madrid	A	66.87%	38.3	External walls, windows, heating system, solar FV, lighting	none	x	x	x	x
12	Romeo y Julieta	A	63.10%	34.6	External walls,	lighting	x	x	x	x

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, %	Energy consumption determining the energy class after implementing the main option	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
	3B, 28028 Madrid				windows, chillers with different technologies enfriadoras					
13	Lugar Fuente Sordo, 70, Burgos	B	49.90%	87.75	External walls, windows	Insulation in and Cover	x		x	x
14	Calle San Agustín 4, Burgos	C	47.50%	120.42	External walls, heating, DHW, and Solar thermal	none			x	x
15	Calle Afrodita 6, Sevilla	B	16.71%	42.21	Insultion of building envelope	none		x	x	

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

No.	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
1	In Enhanced EPC energy consumption data of the building is introduced	Neutral	For a non expert user it could be positive to know consumptions
2	Energy rating system is introduced for building envelope elements and technical systems of building	Positive	This will help a non-expert user to better understand the values given in the EPC
3	The structure of Enhanced EPC template looks different than the existing Standard EPC	Neutral	It will take time for people to adjust to the new template. The Enhanced EPC contains 4 pages and the Spanish EPC includes 2 pages and 4 annexes
4	The Enhaced EPC standard does contains information about the energy class aftem Recomendations are implemented	Positive	For non expert user is usefull to know energy class after recomendations are implemented
5	The Enhanced EPC form contains links with further information	Positive	Adding useful links with EPC information it is easier to a non-expert user to find further information on EPCs and how to carry on with renovation of their building
6	Description of useful combination of renovations and stepwise implementation for further renovation options is included	Positive	Adding useful combination of recommnendations is positive because will help for the renovation

4.1 Comparison of the standard and enhanced EPCs

Comparing the changes in the Enhanced EPC to the Standard EPC, we find out more positive changes than negative ones. The Enhanced EPC has additional data such as the energy consumption data of the building and the energy rating of the building envelope elements and technical systems. The recommendations in the Enhanced EPC come with the energy class that the building could potentially achieve. Furthermore, the Enhanced EPC contains links with further information if needed, which is quite useful for non-experts and also a short description of further renovation options.

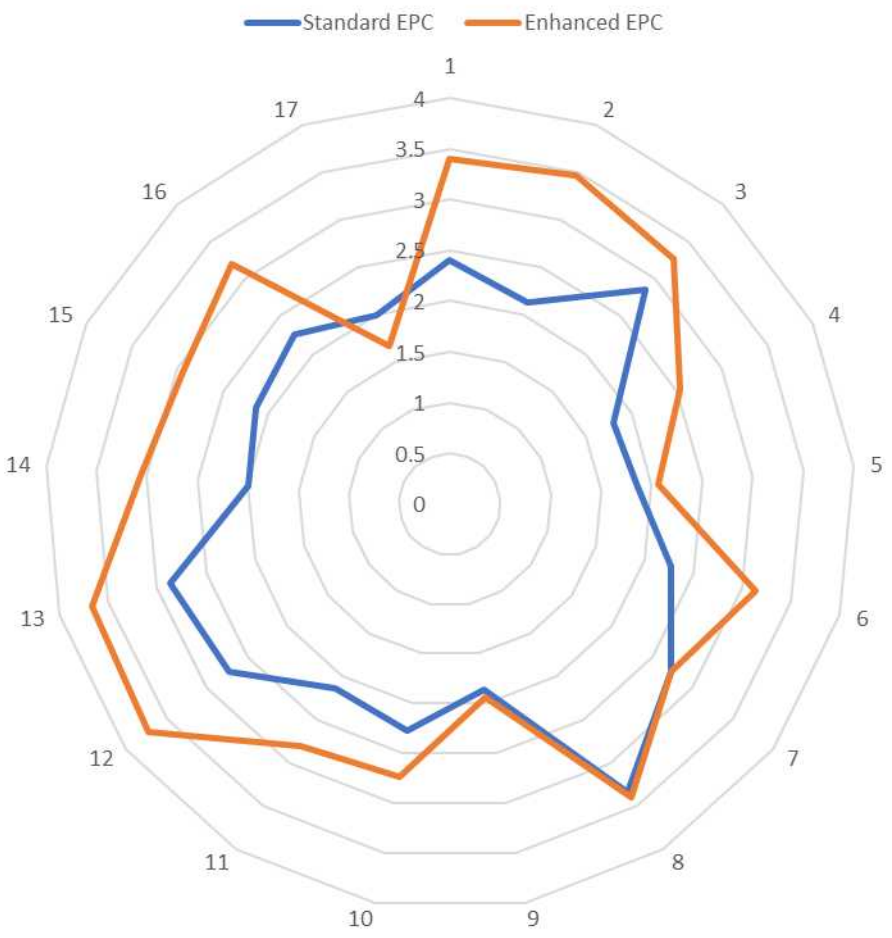
Overall, the Enhanced EPCs have been an improvement over the standard certificates, although some stakeholders have raised their concerns about some changes included which are a step back in their opinion. First of all, the traffic light indicator has been the most acclaimed change. It facilitates the understanding of the certifications and the quality or efficiency of the different systems for end consumers. Another positive is the introduction of the potential final energy savings and the improved value for final energy consumption, which both have been recognized as great indicators for end consumers. Among many other smaller positive changes, the assessment of the renovation recommendations individually is a good improvement over the standard EPC where recommendations were included in packs of several.

Few changes perceived as negative: for example the elimination of the CO2 emissions classification and indicator. Regarding the values of the traffic light indicator, they were obtained by means of a study and there needs to be a place where anybody can check these set of values to avoid misunderstandings. Lastly, the standard EPC offered a explanation of several sets of recommendations and enhance EPC only includes 1 set of recommendations

4.2 Results of building representative questionnaires.

4.2.1 Enhanced EPC template

This Figure summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).



Escan did the questionnaire to the building representatives, most of them by telephone calls and 5 of them in informal meetings. Escan visited Sevilla, Valencia, Asturias, Cantabria and Valencia with sub-contractors for finalisation enhanced EPC and for questionnaire. In Valencia Region there are three block of buildings as pilot cases so 2 visits have been necessary one was in March 2021 and one in May 2021.

Most of the representatives of the buildings stated that enhanced EPC gives an overview of the strengths and weaknesses of the building's energy performance.

Both EPCs format are presented in understandable language and figures.

Most of the agree that the energy efficiency potential of the building is clearly shown in the enhanced EPC.

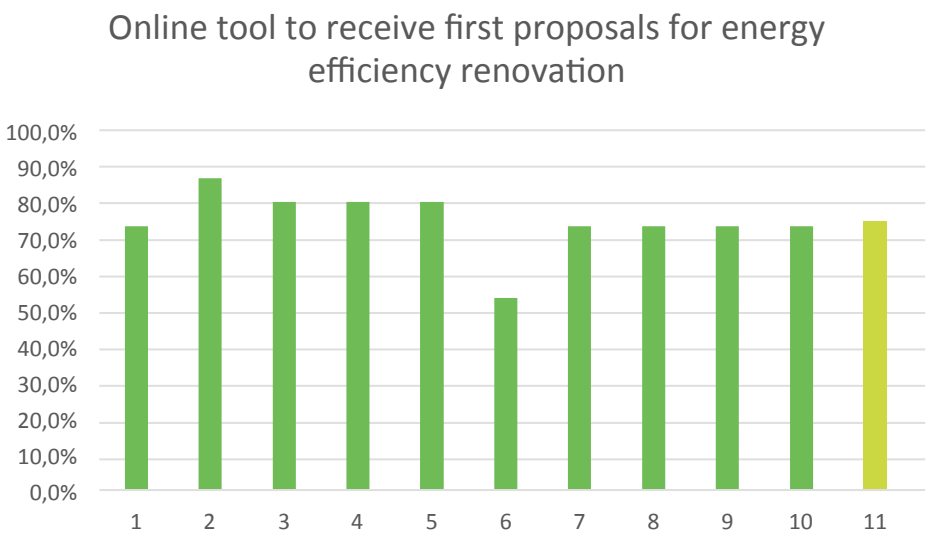
Most of participant agree that the enhanced EPC model clearly shows what energy efficiency measures should be implemented in the building and the other standard EPC not so clearly.. because sometimes standard EPC only provides one sentence for example boiler replacement; or insulation SATE 8 cm and the enhanced EPC includes more information example the efficiency of the boiler the costs the pay back and also the energy rating.

From the enhanced EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation.

So the enhanced EPC helps the buildings representatives to decide on energy-efficient renovation measures better that the standard EPC.

Type of EPC	Total score
Standard EPC	58.3%
Enhanced EPC	73.1%

4.2.2 Online tool to receive first proposals for energy efficiency renovation

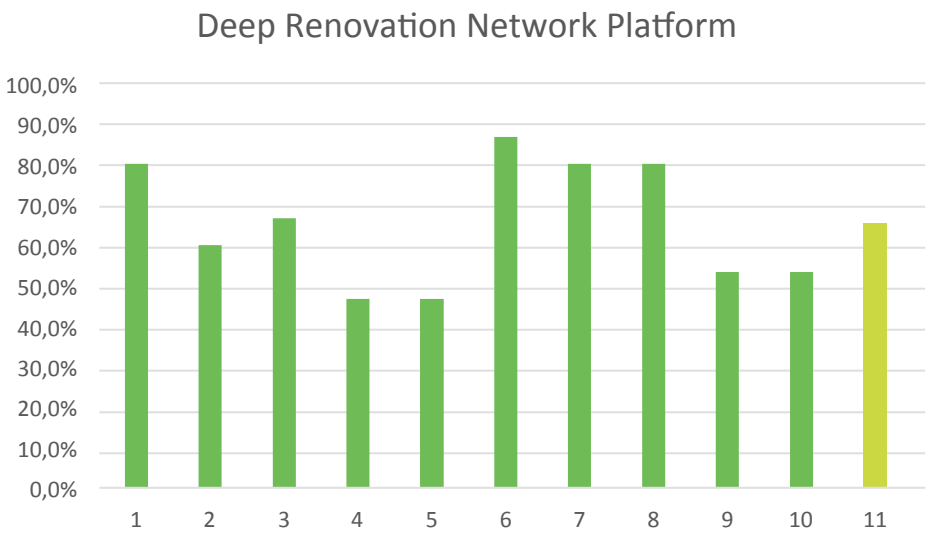


More that 70 percent of the 15 people said that they will use this tool and more than 85 per cent confirm they like that the energy efficiency measures that will be calculated for building renovation that could be selected by themselves.

Some did say to the question about useful the "calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m2 per year, e.t.c.] that they prefer monetary units for energy savings.

Most of the people says that for them is important the type of measures for renovation, the cost and the pay back.

4.2.3 Deep Renovation Network Platform



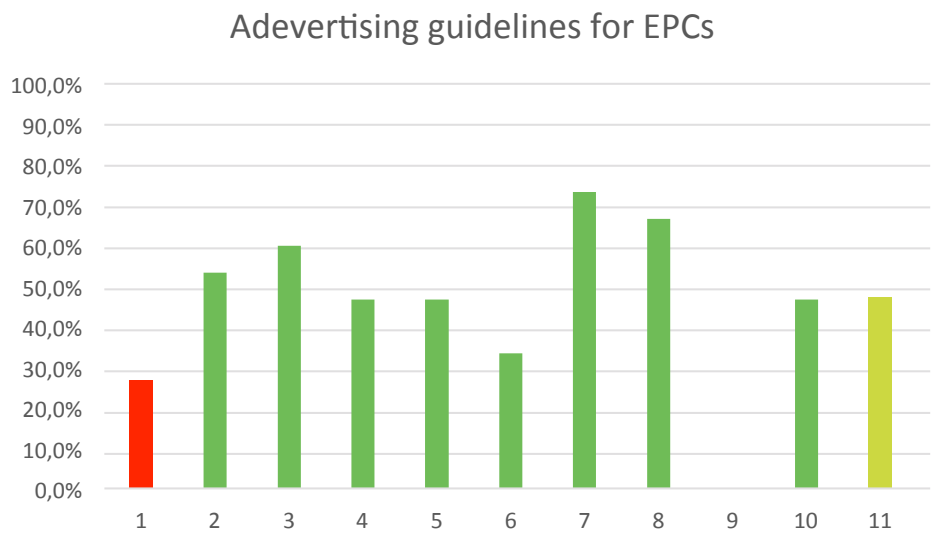
This platform will provide information to the citizen about deep renovation.

80 percent of the participants said they would use the platform for general information, to find ou building contractors/ technicians and energy-efficient-experts, also for information about material or product manufacturers/ suppliers and Information on financing opportunities for deep renovation

More than 60 per cent stated that this platform will be useful for providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings; they also stated that they would use the active provision of information of deep renovation and its benefits and costs

As a general commentaries the information is disperse and the citizen most of the times does not know where to find it;

4.2.4 Advertising guidelines for EPCs



Only 25 per cent of the people are familiar with the advertisement guidelines and sais they would the need it;

They thought it is important guidelines about where on the EPC to find: the energy demand and consumption, also interesting to know where to find the energy class of the building

4.3 Feedback from stakeholder roundtable discussions

4.3.1 Enhanced energy efficiency recommendations

Some stakeholders said the energy efficiency recommendations should be carried out according first for legislation compliance (here in Spain it is the CTE that establishes measures of coefficients of primary energy consumption by m2) and then according to the cost effectiveness.

4.3.2 Suggestions for improvements of Enhanced EPC template

- ✓ The enhanced model is simple and it is perfect for normal user of the building, and the Official EPC model for professionals; a possibility will be 2 models one as the enhanced for user and one as the official for the professionals
- ✓ Or including an annex of enhanced with the missing information of the official: CO2 emission, energy ratings for DHW; energy classification for cooling, energy classification for heating and energy classification for lighting)
- ✓ Improvements could be done if including more explanations about the traffic lights system.

For the page 3 in the Recomendations table is necesary to include more possibilities; for example in Recomendations for walls, I suggest to provide 2 different typologies of insulations with 2 different U values and two costs.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

In general the two models of EPC should be in the market one for citizens and one for professionals ; the model that is elaborated in this project Enhanced EPC would be for the first group with some commentaries and suggestions, mainly explaining the traffic light values

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelins)

Online tool:

Planification's of the investments for the users this means for example 4 recommendations and according to the budget of the user (may be this could be included the user)n the system choose a combination with a order

For example 1 building of 60 apartments with 100 m2 total area, construction year 1975, that requires improvements in heating system, windows and independent water heating systems for 60 families (this is already in the Standard EPC)

Recommendation 1…central heating boiler with very high efficiency 71000 Euros

Recommendation 2 Windows change 143000 Euro

Recommendation 3 Solar thermal for water heating XXXX euro

Deep renovation network platforms

Suggestion about the information that should be included in the national platforms, DRNP:
-As a general comment as more information the better. For both certifiers and end users.
-A good definition of the recommendations about improvement measures. Characteristics of the construction systems and equipment (Prices, transmittances, or the relevant data according to the improvement) is required.
o Catalogues with ideas and standard equipment to guide the certifier.
o Investment planning for end consumers.
o Regarding the tool, he comments that while the measures proposed by the CE3X are not always feasible and it is not completely well done. The investment calculation module is very well achieved, and I would recommend it for use in the other tool since prices can be adjusted according to the cost of energy and.

Advertisement guidelines

o The new Royal Decree 390/2021 establishes that there is already an obligation to show the classification and the certificate by the real estate companies.

o In the advertisements the classification letter and scale of energy consumption of energy and CO2 emissions should be the minimum to show.

Generally most stakeholder think guidelines will be very useful for the compliance although the legislation includes it and also the penalties if not compliance.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

The main conclusion is that the enhanced EPC has been welcomed. The building owners are not very familiar with standard EPC so for us it was necessary to explain both standard and enhanced EPCs

The could understand the energy classification, of the building and the data of the first page of the enhanced EPC, the rest had to be explained by Escan consultants

The owners pointed out the relevance of the recommendations and costs; they liked very much the energy rating.

Small improvements have arise:

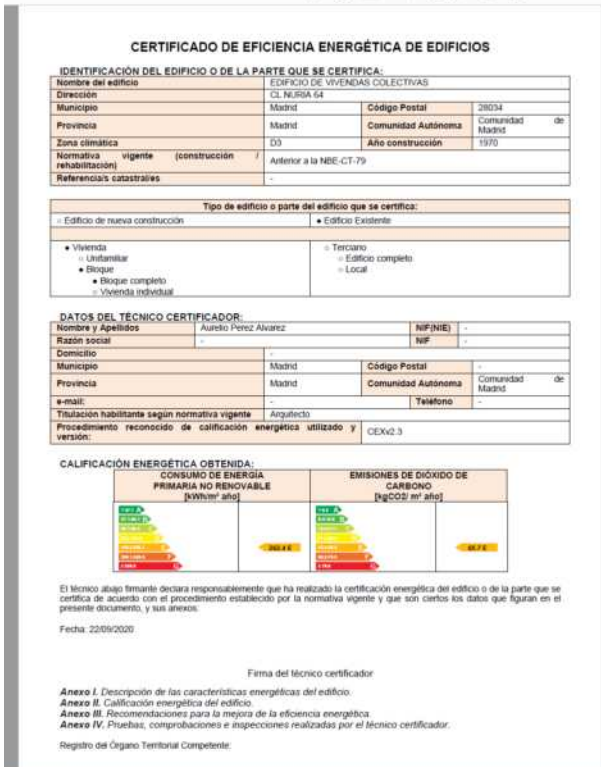
Include the data of the CO_2 emission of the building

Include an explanation in the energy ratings , the values of green, the values of yellow and the values of red colors of the Recommendations

6 ANNEXES

6.1 Annex B: Standard EPCs

One example of a residential and non-residential building each



CERTIFICADO DE EFICIENCIA ENERGÉTICA DE EDIFICIOS

IDENTIFICACIÓN DEL EDIFICIO O DE LA PARTE QUE SE CERTIFICA:

Nombre del edificio	EDIFICIO DE VIVENDAS COLECTIVAS		
Dirección	CL NURIA 64		
Municipio	Madrid	Código Postal	28034
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
Zona climática	D3	Año construcción	1970
Normativa vigente (construcción / rehabilitación)	Anterior a la NBE-CT-79		
Referencia/s catastrales	-		

Tipo de edificio o parte del edificio que se certifica:	
○ Edificio de nueva construcción	● Edificio Existente
● Vivienda ○ Unifamiliar ● Bloque ● Bloque completo ○ Vivienda individual	○ Terciario ○ Edificio completo ○ Local

DATOS DEL TÉCNICO CERTIFICADOR:

Nombre y Apellidos	Aurelio Perez Alvarez	NIF(NIE)	-
Razón social	-	NIF	-
Domicilio	-		
Municipio	Madrid	Código Postal	-
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
e-mail:	-	Teléfono	-
Titulación habilitante según normativa vigente	Arquitecto		
Procedimiento reconocido de calificación energética utilizado y versión:	CEXv2.3		

CALIFICACIÓN ENERGÉTICA OBTENIDA:

CONSUMO DE ENERGÍA PRIMARIA NO RENOVABLE [kWh/m² año]	EMISIONES DE DIÓXIDO DE CARBONO [kgCO2/ m² año]
262.4 E	65.7 E

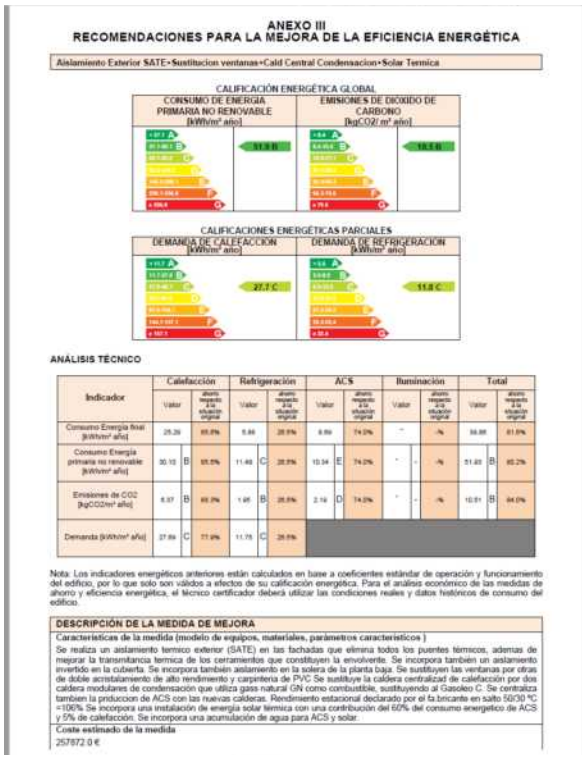
El técnico abajo firmante declara responsablemente que ha realizado la certificación energética del edificio o de la parte que se certifica de acuerdo con el procedimiento establecido por la normativa vigente y que son ciertos los datos que figuran en el presente documento, y sus anexos.

Fecha: 22/09/2020

Firma del técnico certificador

Anexo I. Descripción de las características energéticas del edificio.
Anexo II. Calificación energética del edificio.
Anexo III. Recomendaciones para la mejora de la eficiencia energética.
Anexo IV. Pruebas, comprobaciones e inspecciones realizadas por el técnico certificador.

Registro del Órgano Territorial Competente:



ANEXO III
RECOMENDACIONES PARA LA MEJORA DE LA EFICIENCIA ENERGÉTICA

Aislamiento Exterior SATE+Sustitucion ventanas+Cald Central Condensacion+Solar Termica

CALIFICACIÓN ENERGÉTICA GLOBAL

CONSUMO DE ENERGÍA PRIMARIA NO RENOVABLE [kWh/m² año]	EMISIONES DE DIÓXIDO DE CARBONO [kgCO2/ m² año]
51.9 B	10.6 B

CALIFICACIONES ENERGÉTICAS PARCIALES

DEMANDA DE CALEFACCIÓN [kWh/m² año]	DEMANDA DE REFRIGERACIÓN [kWh/m² año]
27.1 C	11.8 C

ANÁLISIS TÉCNICO

Indicador	Calefacción			Refrigeración			ACS			Iluminación			Total		
	Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original	
Consumo Energía final [kWh/m² año]	25.26	65.0%		5.86	28.5%		8.89	74.2%		-	-%		39.88	61.9%	
Consumo Energía primaria no renovable [kWh/m² año]	30.10	65.5%	B	11.46	28.5%	C	10.34	74.2%	E	-	-%		51.93	65.2%	B
Emisiones de CO2 [kgCO2/m² año]	6.07	65.3%	B	1.95	28.5%	B	2.14	74.2%	D	-	-%		10.01	64.0%	B
Demanda [kWh/m² año]	27.09	77.9%	C	11.75	28.5%	C									

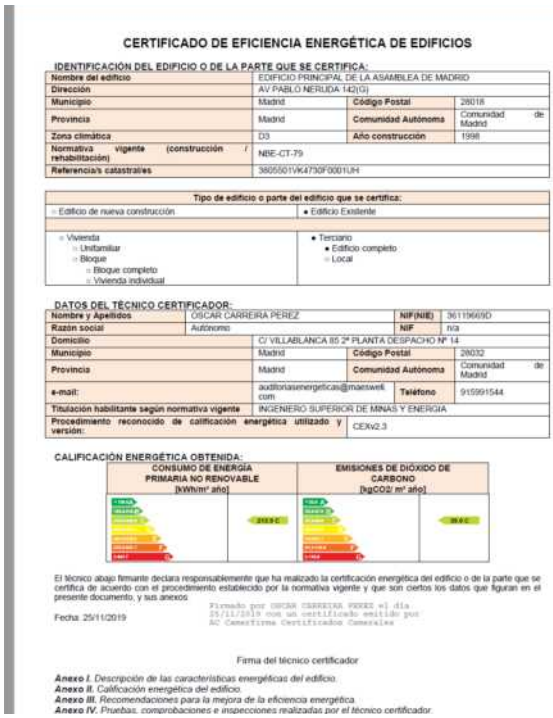
Nota: Los indicadores energéticos anteriores están calculados en base a coeficientes estándar de operación y funcionamiento del edificio, por lo que solo son válidos a efectos de su calificación energética. Para el análisis económico de las medidas de ahorro y eficiencia energética, el técnico certificador deberá utilizar las condiciones reales y datos históricos de consumo del edificio.

DESCRIPCIÓN DE LA MEDIDA DE MEJORA

Características de la medida (modelo de equipos, materiales, parámetros característicos)

Se realiza un aislamiento termico exterior (SATE) en las fachadas que elimina todos los puentes térmicos, ademas de mejorar la transmitancia termica de los cerramientos que constituyen la envolvente. Se incorpora también un aislamiento invertido en la cubierta. Se incorpora también aislamiento en la solera de la planta baja. Se sustituyen las ventanas por otras de doble acristalamiento de alto rendimiento y carpinteria de PVC Se sustituye la caldera centralizad de calefacción por dos caldera modulares de condensación que utiliza gass natural GN como combustible, sustituyendo al Gasoleo C. Se centraliza tambien la priducion de ACS con las nuevas calderas. Rendimiento estacional declarado por el fa.bricante en salto 50/30 ºC =106% Se incorpora una instalación de energía solar térmica con una contribución del 60% del consumo energetico de ACS y 5% de calefacción. Se incorpora una acumulación de agua para ACS y solar.

Coste estimado de la medida
257872.0 €



CERTIFICADO DE EFICIENCIA ENERGÉTICA DE EDIFICIOS

IDENTIFICACIÓN DEL EDIFICIO O DE LA PARTE QUE SE CERTIFICA:

Nombre del edificio	EDIFICIO PRINCIPAL DE LA ASAMBLEA DE MADRID		
Dirección	AV PABLO NERUDA 142(G)		
Municipio	Madrid	Código Postal	28018
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
Zona climática	D3	Año construcción	1998
Normativa vigente (construcción / rehabilitación)	NBE-CT-79		
Referencia/s catastrales	3805501VK4730F0001UH		

Tipo de edificio o parte del edificio que se certifica:	
○ Edificio de nueva construcción	● Edificio Existente
○ Vivienda ○ Unifamiliar ○ Bloque ○ Bloque completo ○ Vivienda individual	● Terciario ● Edificio completo ○ Local

DATOS DEL TÉCNICO CERTIFICADOR:

Nombre y Apellidos	OSCAR CARREIRA PEREZ	NIF(NIE)	36110669D
Razón social	Autónomo	NIF	n/a
Domicilio	C/ VILLABLANCA 85 2ª PLANTA DESPACHO Nº 14		
Municipio	Madrid	Código Postal	28032
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
e-mail:	auditoriasenergeticas@maerswek.com	Teléfono	915991544
Titulación habilitante según normativa vigente	INGENIERO SUPERIOR DE MINAS Y ENERGIA		
Procedimiento reconocido de calificación energética utilizado y versión:	CEXv2.3		

CALIFICACIÓN ENERGÉTICA OBTENIDA:

CONSUMO DE ENERGÍA PRIMARIA NO RENOVABLE [kWh/m² año]	EMISIONES DE DIÓXIDO DE CARBONO [kgCO2/ m² año]
213.9 C	39.6 C

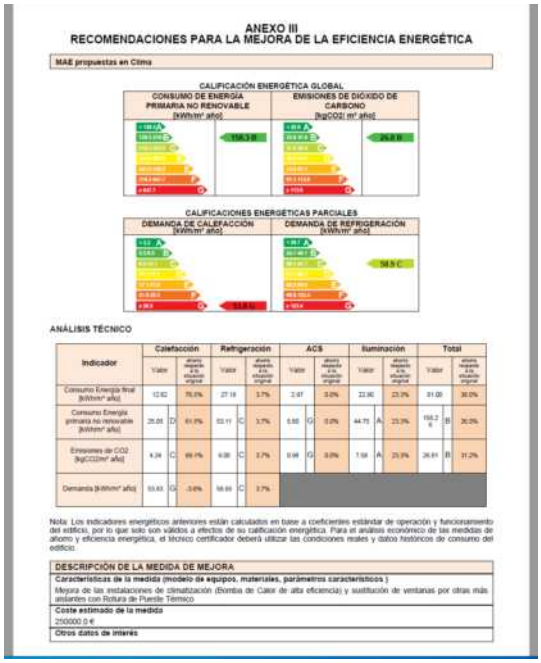
El técnico abajo firmante declara responsablemente que ha realizado la certificación energética del edificio o de la parte que se certifica de acuerdo con el procedimiento establecido por la normativa vigente y que son ciertos los datos que figuran en el presente documento, y sus anexos

Fecha: 25/11/2019

Firmado por OSCAR CARREIRA PEREZ el día 25/11/2019 con un certificado emitido por AC CamerFirma Certificados Camerales

Firma del técnico certificador

Anexo I. Descripción de las características energéticas del edificio.
Anexo II. Calificación energética del edificio.
Anexo III. Recomendaciones para la mejora de la eficiencia energética.
Anexo IV. Pruebas, comprobaciones e inspecciones realizadas por el técnico certificador.



ANEXO III
RECOMENDACIONES PARA LA MEJORA DE LA EFICIENCIA ENERGÉTICA

MAE propuestas en Cima

CALIFICACIÓN ENERGETICA GLOBAL

CONSUMO DE ENERGÍA PRIMARIA NO RENOVABLE [kWh/m² año]	EMISIONES DE DIÓXIDO DE CARBONO [kgCO2/ m² año]
156.3 B	24.8 B

CALIFICACIONES ENERGÉTICAS PARCIALES

DEMANDA DE CALEFACCIÓN [kWh/m² año]	DEMANDA DE REFRIGERACIÓN [kWh/m² año]
53.8 G	58.5 C

ANÁLISIS TÉCNICO

Indicador	Calefacción			Refrigeración			ACS			Iluminación			Total		
	Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original		Valor	ahorro respecto situación original	
Consumo Energía final [kWh/m² año]	12.62	75.0%		27.18	3.7%		2.47	0.0%		22.90	23.3%		61.00	30.0%	
Consumo Energía primaria no renovable [kWh/m² año]	25.05	61.9%	D	53.11	3.7%	C	6.85	0.0%	G	44.75	23.3%	A	129.2 6	30.0%	B
Emisiones de CO2 [kgCO2/m² año]	4.24	69.1%	C	9.90	3.7%	C	0.98	0.0%	G	7.58	23.3%	A	24.61	31.2%	B
Demanda [kWh/m² año]	53.83	-3.0%	G	58.69	3.7%	C									

Nota: Los indicadores energéticos anteriores están calculados en base a coeficientes estándar de operación y funcionamiento del edificio, por lo que solo son válidos a efectos de su calificación energética. Para el análisis económico de las medidas de ahorro y eficiencia energética, el técnico certificador deberá utilizar las condiciones reales y datos históricos de consumo del edificio.

DESCRIPCIÓN DE LA MEDIDA DE MEJORA

Características de la medida (modelo de equipos, materiales, parámetros característicos)

Mejora de las instalaciones de climatización (Bomba de Calor de alta eficiencia) y sustitución de ventanas por otras más aislantes con Rotura de Puente Termico

Coste estimado de la medida
250000.0 €

Otros datos de interés

6.2 Annex C: Enhanced EPCs

One example of a residential and non-residential building each, for the same buildings

Modelo Certificado Energético Edificios - residencial

Zona climática: D3 | Normativa (construcción/renovación): Anterior a NBE-CT-79/CTE | Número ref. catastro: 9992417VK3899B0008AO0

Datos del edificio

Nombre del edificio	5_Bloque de viviendas_SP
Dirección	Calle Nuria, 64
Ciudad/País	Madrid, España
Edificio nuevo/existente	Edificio existente
Residencial/No residencial	Residencial
Vivienda unifamiliar/Bloque viviendas/1 apartamento	Bloque de viviendas
Año de construcción	1970
Superficie habitable	1.800 m²

Clasificación energética y rendimiento

Consumo energético máximo primario	Consumo energético mínimo primario	Clasificación energética	Consumo energía primaria (kWh/m²a)	Consumo energía final (kWh/m²a)	Consumo energía final después "Mejor opción"
0	37.1	A			
37.1	60.1	B			39.86 (51.9 consum e prim)
60.1	93.2	C			
93.2	143.2	D			
143.2	298.1	E	262.45	217.00	
298.1	336.8	F			
>=336.8		G			

Ahorro de energía final potencial para renovaciones: 318.852 kWh/año

Certificado elaborado por: Aurelio Pérez Alvarez, Madrid, España

Firma

Fecha visita: Agosto 2020; Marzo 2021 → Fecha certificado: Enhanced 03/03/2021

Formulario EPC - para edificios residenciales

Datos del rendimiento energético del edificio

Consumo energético** medido/facturas: → modelado: X

No.	Periodo medida desde/hasta	Fuente de energía	Consumo energético energía primaria no renovable (kWh/m²año)			Comentario
			Calefacción	Aire Acondicionado	ACS	
1	Anual	Elec		15.63		
2	Anual	Gasóleo	206.98		-1	
3	Anual	GN	-1	-1	39.84	

**El consumo energético medido depende del perfil energético de los usuarios del edificio, número de ocupantes y condiciones meteorológicas durante el periodo de medida; el consumo energético modelado podría diferir del valor real.

Valoración de la envolvente del edificio y su sistema técnico

Envolventes	Área (m²)	Descripción o U-valor	Energy rating
Cubierta y ático	316	1,47 (W/m²·K) Plana/ Forjado sin aislante	
Fachada exterior	370	1,69 (W/m²·K) 1/2 pie ladrillo con cámara	
Ventanas	245	3,78 (W/m²·K)	
Puertas	0	2,2 (W/m²·K) Acceso interior, madera	
Solera y sótano	316	1,00 (W/m²·K) Forjado S; cámara aire	

Sistemas	Año de construcción/instalación	Fuente de energía, potencia, Etiquetado energético UE	Energy rating
Calefacción	1974	Caldera Gasóleo centralizada	
Agua caliente sanitaria	1974/2020	Calentadores individuales instantáneos a GN	
Ventilación	No existe/ventanas	Ventilación natural sin filtrar, por ventanas	
Aire acondicionado	Individual/Posterior 2010 Promedio	Electricidad; diferentes sistemas aprox 80% del año 2020 A+ (green) y otros más antiguos (yellow)	
Energías renovables		No existe	
Iluminación		No aplica	

EPC form for non-residential buildings

in accordance with Building Energy ACT XZY

Climatic area: D3	Normative CTE 2013	Number ref. cadastre 3805501VK4730F0001UM

(if this EPC form is available in website please include here website link)

Building data

Name of building	11_Asamblea_SP
Address	Avda. Pablo Neruda 142
City/Country	Madrid 28018, Spain
New/Existing Building	Existing building
Residential/Non residential	Non residential
School/Office/Other	Office building
Building construction year	1998
Heated area (m2)	9600

Energy classification and performance

Primary energy consumption (kWh/m²yr)		Primary energy class	Final energy consumption (kWh/m²yr)	Final energy consumption "Improved option"
0	129.5	A		38.5 (70.8 primary)
129.5	210.5	B		
210.5	323.9	C	213.9	115.7
86.1	128.2	D		
128.2	271.9	E		
271.9	318.1	F		
>=318.1		G		

Potential final energy savings for renovation according to best Option: 742784 kWh/yr

Issuer: EPC Oscar Correira Pérez, Villablanca 85, Madrid

Signature

Date of visit: No visit for enhanced EPC

Date of Certificate issued: Enhanced EPC 18/02/2021

EPC form for non-residential buildings

in accordance with Building Energy ACT XZY

Details on the current energy performance of the building

Energy consumption** measures: modelling: X

No.	Period (desde – hasta)	Energy source	Primary energy consumption (kWh/m2 año)				Comentaire
			Heating	Cooling	DHW	Lighting	
1		Electricity		55.14	5.80	58.36	
2		Gas natural	65.01				
3		LPG					

**El consumo energético medido depende del perfil energético de los usuarios del edificio, número de ocupantes y condiciones meteorológicas durante el periodo de medida; el consumo energético modelado podría diferir del valor real.

Building envelope	Area (m²)	Description or Avg. U-value (w/m2K)	Energy rating
Roof or ceiling to attic	3089.75	U=0.86 piedra artif; sellante PVC, mortero;	
External walls	2024.8	U=0.40 chapado de granito(30mm); cámara aire (5cm, 3cm poliestireno expand y prefabricado hormigo Romlana vidrio 5cm;doble capa yeso cartón de trasdosado	
Windows	762.75	9 different windows sizes, Uv1,v3,v4,v6, v7 =3.38; Uv2,v5,v8,v9 =3.78	
Doors	10.00	U= 3.3 Puerta vidrio sencillo	
Ground floor or floor to unheated basement	4005.0	U=0.98 forjado PB garaje	

Technical systems	Year of construction/ Year/ install	Energy source, provided power, EU energy label	Energy rating
Heating system	1998	2 Boilers, gas natural, Ygnis condenaszz 348 Rend estacional 95.2%; Bomba calor pumps rend estacional 165.4%; Daikin 203%; Carrier 203%; RITI Mitsubishi 203%	
Domestic hot water	1998	Calentadores termoeléctricos rend estacional 98%	
Ventilation system	1998	13 Climatizadora UTA, 156 fancoils techo, bombas frío, bombas calor	
Cooling system	1998	2 carrier refrigerating units enfriadoras Carrier 30GH-145-0043-EE; Bomba calor pumps rend estac 157.7 %; Daikin 197.1%; Carrier 197.1%; RITI Mitsubishi 197.1%	
Renewable energies			
Lighting	1998, 2010	Some the lighting system includes LED, sensors, etc	

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;
- Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in EPC	Standard EPC						
		Enhanced EPC						
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consump-	Standard EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Some-what agree	Neutral	Some-what dis-agree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	tion values shown in EPC help me to estimate future energy consumption	Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my building	Standard EPC						
		Enhanced EPC						
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-saving“			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. Advertising guidelines for EPCs

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements			
• The year of issue of the EPC, if that needs to be shown in the advertisements			

6.4 Annex F: Results of questionnaire of Spain

Address	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Cestona 86	Standard EPC	2	1	4	3	2	1	2	4	3	2	2	3	2	2	4	2	1
	Enhanced EPC	3	3	4	3	1	3	2	4	3	3	4	4	2	3	4	3	2
C/ Ortega y Gasset 64 Madrid	Standard EPC	3	2	1	1	1	1	2	2	0	3	1	1	3	1	1	1	4
	Enhanced EPC	4	4	4	4	4	4	2	2	0	4	4	4	4	4	4	4	4
Villabona 108	Standard EPC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Enhanced EPC	4	3	2	2	2	4	2	2	2	4	4	4	4	4	4	3	2
Nuria 64, Madrid	Standard EPC	3	1	4	1	1	0	1	3	0	0	0	4	3	2	2	2	0
	Enhanced EPC	4	4	4	2	1	0	1	3	0	0	0	4	3	1	0	2	0
Roger de Llauria, Oliva, Valencia	Standard EPC	3	3	3	3	3	3	3	3	3	4	3	3	3	3	3	3	1
	Enhanced EPC	3	3	3	4	3	4	3	3	3	4	3	3	3	3	3	3	1
Calle Isla de Cerdeña, Oliva, Valencia (Spain)	Standard EPC	2	4	3	1	1	4	3	2	1	3	3	3	3	1	2	1	0
	Enhanced EPC	2	4	3	1	1	4	3	3	1	3	3	4	3	3	2	2	0
Asturias	Standard EPC	0	2	2	2	2	2	2	4	4	2	2	4	4	2	1	2	4
	Enhanced EPC	3	2	2	2	2	2	2	4	4	2	2	4	4	4	4	4	4
Calle Valencia 36, Sedavi	Standard EPC	3	2	2	3	1	3	1	3	3	3	2	2	2	2	1	3	4
	Enhanced EPC	3	4	2	3	1	3	1	3	3	3	3	4	4	4	4	4	4
Barrio Rodil, 39120 Mortera de Piélagos	Standard EPC	1	2	3	0	3	3	2	3	3	3	3	3	1	1	2	0	0
	Enhanced EPC	4	3	4	0	4	4	2	3	3	4	4	4	4	4	3	3	0
Avenida Pablo Neruda 142	Standard EPC	0	2	4	0	1	2	4	4	1	2	2	2	3	2	2	2	2
	Enhanced EPC	3	4	4	3	1	4	4	4	1	2	2	4	4	2	2	2	2

Romeo y Julieta 3B, Madrid	Standard EPC	3	2	4	0	0	3	4	4	1	1	2	2	3	2	2	3	3
	Enhanced EPC	3	4	4	3	0	3	4	4	1	1	2	4	4	3	2	3	1
RESIDENCIA DE SAN AGUSTÍN (C/ San Agustín, 4)	Standard EPC	4	2	4	4	4	2	4	4	4	1	1	3	2	2	2	4	0
	Enhanced EPC	4	4	4	4	4	2	4	4	4	1	1	3	4	4	4	4	0
Calle Garganchon 214	Standard EPC	3	3	3	2	1	2	4	4	1	3	3	2	4	3	3	3	3
	Enhanced EPC	4	3	4	2	1	4	4	4	2	4	4	2	4	1	3	3	3
Calle Afrodita 6	Standard EPC	4	3	2	2	3	3	4	4	0	3	3	4	4	2	3	2	4
	Enhanced EPC	4	3	2	2	3	3	4	4	0	3	3	4	4	2	3	4	0
ARTEC ARQUITECTURA Y URBANISMO S.L.	Standard EPC	3	1	2	3	3	3	3	4	2	2	3	3	4	3	2	4	2
	Enhanced EPC	3	4	3	3	3	3	3	4	2	3	3	4	4	4	2	4	2

6.9 Annex I: National summary evaluation report for Sweden

D4.5 National summary evaluation report for Sweden

QualDeEPC H2020 project

MAIN AUTHOR: Ekodoma, CIT

DATE: [28/06/2021]

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Table 2: Title

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Draft 2	18/06/2021	Second draft	Ekodoma
Draft 3	28/06/2021	Third (final) draft	Ekodoma, CIT

Table 3: Title

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

ENERGIAKLUB: Energiaklub Szakpolitikai Intezet Modszertani Kozpont Egyesulet

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

FEDARENE: Federation euopeenne des agencies et des regions pour l'energie et l'environnement

ESCAN: Escan SL

CIT ENERGY MANAGEMENT AB

DISCLAIMER OF WARRANTIES

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PUBLISHABLE SUMMARY

In order to test the enhanced Energy Performance Certificate assessment developed within the project, different types of buildings were selected as pilot cases. In total, 11 Swedish pilot buildings – seven residential and four non-residential – were selected. For each of the buildings, a Swedish standard EPC was issued and compared to an assessment using the enhanced EPC template. All EPCs were based on a site visit (which is mandatory in Sweden) and metered energy consumption.

The results of the pilot building testing were presented in a stakeholder round table discussion. During this meeting it was discussed how to further improve the enhanced EPC template and how to adapt it to national conditions.

Overall, both the pilot building representatives and the EPC assessor who carried out the pilot building EPCs preferred the enhanced EPC template to the standard Swedish EPC. In general, the building owners found the enhanced EPC to be graphically nicer, better structured and therefore more appealing. Although parts of both the EPCs were difficult to understand without prior knowledge, several of the building representatives thought that the Enhanced EPC was easier to understand than the standard EPC. In particular, the following elements of the enhanced EPC (not included in the standard EPC) were appreciated by both EPC assessor and building representatives:

- The assessment of energy properties of building components and technical systems.
- The table that summarizes the renovation recommendations.

The building owners also appreciated the figures *total energy savings* and *energy performance, if suggested measures are implemented*, included only in the enhanced EPC. However, there is a small concern among other stakeholders that these figures will be seen as the limit for what may be achieved in the specific building.

Moreover, the attendees in the round table discussion all agreed that it is positive that values of measured energy use are presented in the enhanced EPC template. In the Swedish standard EPC only energy consumption after adjustment to normal use is included.

Taking into account the results from the pilot building testing, the pilot building representative questionnaire and the round table discussion, it is suggested to add the following elements and figures to the enhanced EPC template for further improvement:

- A description of the basis for this assessment of building components and technical systems. This is needed in order to make the assessment transparent and more useful.
- A reference value for comparison with similar buildings.
- A metric that considers the overall profitability (thus, taking into account the time value of money and factor in the value of additional cash flows beyond the payback period) of recommended renovation measures, e.g., IRR (Internal rate of Return).
- Energy renovation measures implemented since the previous EPC, not the least in order to enable follow-up.
- The aspect of power requirements, and power balancing, for heat and electricity. From the round table discussion. As a suggestion, by encouraging that it is considered in the renovation recommendations.
- A guide (addressed to EPC assessors) on how to fill in the EPC template. Regarding renovation recommendations, it is for example important to clarify whether to consider different aspects in the profitability calculation, such as reduced maintenance, reduced costs for tap water, reduced costs for power tariffs, potential subsidies), or other added values (eg., improved indoor climate).

Lastly, some of the elements and figures that are included in the Swedish EPC needs to be added to the enhanced EPCs in order for it to be suitable for national conditions, e.g., radon, ventilation air flow rate, mandatory inspection of ventilation and heating system, and adjustment to normal use and climatological normal. These elements may be implemented by national adaptation.

TABLE OF CONTENTS

INTRODUCTION

This is a report summarizing tasks done during WP4 in QualDeEPC project.

This report summarizes WP4 results in Sweden.

1 PILOT PROJECT SELECTION (TASK 4.1)

Different types of buildings were selected as pilot cases to test the enhanced Energy Performance Certificate assessment developed within the project. This part of the report describes the pilot project selection process for Sweden.

In the search for pilot buildings in Sweden, invitations for participation were:

- Sent directly to building owners
    - members of the national network for energy efficient non-residential buildings - Belok (financed by the Swedish Energy Agency)
    - members of the national network for energy efficient residential buildings – BeBo (financed by the Swedish Energy Agency)
    - other building owners (private and public)
- Advertised on
    - the website of CIT Energy Management
    - LinkedIn (https://www.linkedin.com/company/cit-energy-management-ab/)
    - the website of ICHB – A Swedish information center for sustainable buildings
    - a national seminar about the Swedish EPC system (https://www.teknologiskinstitut.se/energideklarationsdagen/k426200)

Selection of pilot buildings were made with the aim to include a variety of building categories. In order to be considered for participation, the building should not be recently built (not later than 2013), and not have recently undergone a major renovation. Also, the representative for the building (e.g., building owner or association board member) needed to commit to providing required information, accompany during a site visit, and fill in a feedback questionnaire. In the selection, buildings with high energy use and room for improvement by energy renovation measures, were prioritized. More detailed information on common selection criteria and the selection process can be found in report named "Pilot building selection report" which was developed for Task 4.1.

In Sweden, it turned out to be somewhat difficult to find non-residential pilot building candidates. Moreover, due to covid restrictions, a couple of the first selected buildings had to be excluded. Finally, in total 11 buildings in Sweden – seven residential and four non-residential – were included in the project (Table 1).

Table 1. Selected pilot buildings

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
1	Göteborg 1	R	Multi-family	1939	1 747	Yes (no longer valid)
2	Göteborg 2	R	Multi-family	1940	5 360	Yes (no longer valid)
3	Göteborg 3	R	Multi-family	1938	1 260	Yes (no longer valid)
4	Göteborg 4	R	Multi-family	1929	7 097	Yes (no longer valid)

No	Address (or code) of pilot building	Residential (R) or non-residential (N)	Building type	Year of construction	Conditioned area of building, m^2	Does the building have an existing EPC (prior to this project)
5	Göteborg 5	R	Single-family	2001	180	No
6	Göteborg 6	R	Single-family	1932	177	No
7	Mölndal 1	R	Small multi-family building (3 apartments)	1961	326	Yes
8	Mölndal 2	N	Office and workshop, storage	2003	1 600	No
9	Kungsbacka 1	N	Preschool	1979	1 080	
10	Kungsbacka 2	N	Preschool	1971	623	
11	Malmö	N	Office (mainly)	1990	9 407	Yes

2 DEVELOPMENT OF STANDARD EPC (TASK 4.2)

This part of the report describes the development of Standard EPCs in each of the project partner countries.

The main results of the standard EPCs for the Swedish pilot buildings are presented in Table 2.

For each of the buildings, the EPC assessment included a site visit (which is mandatory in Sweden). Based on information from the site visits, and information provided by the building owner (or other representative), such as drawings and data on measured energy consumption, it was possible for the EPC assessor to fill in all the information needed in the standard EPC template.

In the Swedish EPC, energy consumption values that are filled in, must already be corrected to normal use (eg., regarding energy for domestic hot water). For this calculation, the EPC assessor needs to make assumptions, which is more or less difficult depending on available information and type of building.

In general, the EPC assessor found it difficult to identify cost-effective energy renovation measures. On the other hand, what should be considered cost-effective, and what to consider in the profitability analysis, is not clearly defined. Moreover, apart from "reduction of energy use" and "cost per saved kWh", there is no requirement or guidance on what information to include regarding recommended measures. Instead, there is a blank space available for description of each renovation measure or a combination of measures. Although this enables the EPC assessor to freely describe suggested measures, which is positive to, some guidance would probably be good in order to ensure a minimum standard of this part of the EPC. Lastly, the EPC assessor does not consider "cost per saved kWh" to be very useful, and would prefer if it were replaced by other key figures for cost and profitability.

Table 2. Standard EPC summary

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (primary energy value in kWh/m2,yr)	Energy efficiency improvement recommendations included in Standard EPC
1	Göteborg 1	E	112	Additional insulation external wall Solar PV system Reduced temperature in stairwell
2	Göteborg 2	E	134	Door sealing Solar PV system Energy efficient lighting
3	Göteborg 3	E	137	Energy efficient lighting with presence detectors in storage rooms. Window sealing. Installation of electric DWH heaters and air-to-air heat pumps in seperate laudry

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (primary energy value in kWh/m2,yr)	Energy efficiency improvement recommendations included in Standard EPC
				building in order to reduce large heat losses from culvert pipes (today district heating distributed from from main building).
4	Göteborg 4	E	111	Door sealing. Energy efficient lighting with presence detectors in storage rooms. Potential need to balance heating system radiators (a review is already planned by building owner)
5	Göteborg 5	E	136	Energy efficient ventilation in the crawl space of the foundation.
6	Göteborg 6	D	113	Additional insulation external walls. Replacement of windows in poor condition. Insulation of attic knee walls. Door sealing.
7	Mölndal 1	E	128	Replace electric floor heating in laudry room with water radiators (heat from ground source heat pump). Solar PV system. Installation of air dryer in garage.
8	Mölndal 2	G	225	Replace sealing of workshop/storage doors. Solar PV system. Energy efficient lighting. Use ground source heatpump for night cooling in summer.
9	Kungsbacka 1	E	172	Replace door and window sealing. Replace pumps for heating and DHW circulation system. Replace thermostat valves. Demount DHW boiler. Solar PV system.
10	Kungsbacka 2	D	157	Door sealing. Solar PV system.
11	Malmö	G	174	Energy efficient lighting with presence detectors.

No	Address (or code) of pilot building	Energy class of the building	Energy consumption determining the energy class (primary energy value in kWh/m2,yr)	Energy efficiency improvement recommendations included in Standard EPC
				(Not possible to change facade due to protected values of the building). The building owner has already planned to complete renovate/replace AHU (air handling unites), district heating central and cooling machines. When the ventilation system is replaced, demand controlled ventilation should be installed in meeting rooms. Review need to replace radiator thermostat valves.

3 DEVELOPMENT OF ENHANCED EPC (TASK 4.3)

This part of the report describes development of Enhanced EPCs in each of the project partner countries. The results for the Swedish pilot buildings are summarized in table 3.

This part of report also includes the feedback regarding what worked well but also technical difficulties which were tackled during filling in of the Enhanced EPC templates in each of the project partner countries (e.g. regarding actual energy consumption values, choice of recommendations, selecting those to be included in main option, calculating cost-effectiveness, developing the useful combinations part).

Feedback from testing the Enhanced EPC on the Swedish pilot buildings:

- Overall, the EPC assessor preferred the enhanced EPC template to the standard EPC.
- It was not possible to fill in the original table for measured energy consumption. Instead, this table was divided in two – one table including metered data for different energy sources, and a second table where the metered data was apportioned to different types of use (heating, cooling, DHW etc.) based on assumptions and calculations by the EPC assessor.
- The EPC assessor thought that the part with evaluation of energy performance of building components and technical systems was a positive addition, but struggled a bit with the rating limits (choosing the appropriate traffic lights). Also, it was not clear whether a red or yellow light in the first table means that a recommendation of renovation measure is needed.
- The EPC assessor also appreciated the table that summarizes the renovation recommendations, and that some key figures (cost, savings, profitability) need to be filled in. This gives a better overview of the recommended measures than the standard EPC.
- Moreover, the EPC assessor was positive to the encouragement to suggest useful combinations of measures.
- Despite the positive aspects described above, the EPC assessor did not see the possibility to include recommendations of measures that would be considered deep energy renovation. Since no guidance is given on what measures to include in the main option, and what aspects to consider in the profitability calculations (future renovation, maintenance needs etc.), few additional recommendations were included compared to the standard EPC. However, with such guidance, in combination with the evaluation of building components and systems, the EPC assessor thinks that the template has a potential to encourage more renovation recommendations and further energy savings.

Table 3. Enhanced EPC summary

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (of primary energy value)	Energy consumption determining the energy class after implementing the main option (primary energy value)	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
1	Göteborg 1	D	17%	93	Additional insulation external walls. Solar PV system Reduced temperature in stairwell.		No	n/a	n/a	n/a
2	Göteborg 2	E	1%	132	Door sealing. Solar PV system. Energy efficient lighting in basement.	Alt. Energy efficient lighting with presence detectors.	No			
3	Göteborg 3	F	1%	136	Energy efficient lighting with presence detectors in storage rooms.	When facade renovation is needed, this should be combined with additional insulation. Window sealing. Installation of electric DWH heaters and air-to-air heat pumps in seperate laudry building in order to reduce large heat losses from culvert	No			

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (of primary energy value)	Energy consumption determining the energy class after implementing the main option (primary energy value)	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
						pipes (today district heating distributed from from main building).				
4	Göteborg 4	E	1%	110	Door sealing. Energy efficient lighting with presence detectors in storage rooms.	Potential need to balance heating system radiators.	No			
5	Göteborg 5	E	6%	128	Energy efficient ventilation in the crawl space of the foundation.	Solar PV was considered but not calculated due to the orientation and shading of the roof .	No			
6	Göteborg 6	B	41%	67	Additional insulation external walls. Replacement of windows in poor condition. Insulation of attic knee walls. Door sealing.	Energy efficient lighting. Move outdoor temperature sensor.	Yes			
7	Mölndal 1	D	22%	100	Replace electric floor heating in laudry room		No			

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (of primary energy value)	Energy consumption determining the energy class after implementing the main option (primary energy value)	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					with water radiators (heat from ground source heat pump). Solar PV system. Installation of air dryer in garage.					
8	Mölndal 2	G	17%	186	Replace sealing of workshop/storage doors. Solar PV system. Energy efficient lighting.		No			
9	Kungsbacka 1	D	20%	138	Replace door and window sealing. Replace pumps for heating and DHW circulation system. Replace thermostat valves. Demount DHW boiler. Solar PV system.	Review and fix valves and control for heating and DWH systems (maintenance).	No			
10	Kungsbacka 2	D	7%	146	Door sealing.					

No	Address (or code) of pilot building	Energy class after implementing the main option	Energy savings achieved by implementing the main option, % (of primary energy value)	Energy consumption determining the energy class after implementing the main option (primary energy value)	Energy efficiency improvement recommendations included in main option of Enhanced EPC	Other energy efficiency improvement recommendations included in Enhanced EPC	Main option meets requirements for			
							Neartly zero energy buildings in case of renovation	Air tightness	Reduced thermal bridging	Min 50% RES or equivalent measures
					Solar PV system.					
11	Malmö	G	0%	174	Energy efficient lighting. (Not possible to change the facade due to protected values of the building)	The building owner has already planned to complete renovate/replace AHU (air handling unites), district heating central and cooling machines. When the ventilation system is replaced, demand controlled ventilation should be installed in meeting rooms. Review need to replace radiator thermostat valves.				

4 RESULTS

This part of the report describes the results of this work package. Mainly the results from 1) a comparison of the standard and enhanced EPCs (general and for pilot buildings), 2) questionnaires answered by pilot building representatives, and 3) stakeholder roundtable meetings have been included in this chapter.

4.1 Comparison of the standard and enhanced EPCs

In a general comparison of the Swedish standard EPC and enhanced EPC, differences were identified and valued as positive, negative or neutral. Changes in the enhanced EPC compared to the Swedish standard EPC, and related comments, are listed table 4. This assessment is based on discussions and results from previous activities within the project, the testing on pilot buildings (chapter 3 and section 4.2), and a stakeholder roundtable meeting (section 4.3).

Additional figures in the enhanced EPC are the summary of potential energy savings and possible energy performance if suggested measures are implemented. Mainly, this is considered to be a positive change, and it would probably be appreciated by many current and future building owners. However, there is a small concern that these figures will be seen as the limit for what may be achieved in the specific building.

Another important addition is the assessment of building envelope elements and technical systems of building (energy rating system), which is considered both user friendly and a resource in the strive for more renovation recommendations and a higher degree of deep renovation.

Some of the elements that are included in the Swedish EPC needs to be added to the enhanced EPCs in order for it to be suitable for national conditions. See table 4 for details.

Table 4 Positive, neutral and negative changes in the Enhanced EPC

	Changes in Enhanced EPC compared to Standard EPC	**These changes are: Positive Negative Neutral**	**Comments**
1	A picture of the building is included in the first page.	Positive	
2	Visualization of the rating scale and energy rate differs from the current EPC.	Neutral	There is a risk that more information on the first page makes the result of the EPC less clear. Also, the table might be difficult to read therefore less user friendly for building owners (and other stakeholders) without prior knowledge. On the other hand, others might find the additional information useful.

	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
3	Energy class limits are presented.	Neutral	Although it makes sense to include this information, especially since the limits change over time, it might not be very useful to include it in the first page of the EPC. It is probably enough if this information can be found on a webpage referred to in the EPC (as it is in the standard EPC).
4	Summary of potential energy savings.	Positive	Positive, but with a warning. If it is an ambitious EPC assessor, this is good. If not, it might have the opposite effect- that the building owner thinks that potential savings are limited to the value stated in the report.
5	Possible energy performance if suggested measures are implemented.	Positive	This would probably be appreciated by many building owners. However, as for the previous element (no 4), it may either have an encouraging or discouraging effect. Also, indicating a new potential energy class might be associated with some difficulties, e.g., changes of energy class limits over time and uncertainties regarding savings.
6	Measured energy use is not corrected to normal use.	Neutral	It is good that the original measured data is shown (in the Swedish EPC it is not), but since the energy performance is based on normalized data, such figures should also be included. This is also important information for a potential buyer or new building owner (intended to carry out suggested renovation measures). Thus, it would be best to show both.
7	Three years of measurements is included.	Neutral	
8	Measured energy use is not adjusted to the climatological normal year.	Neutral	This adjustment is done automatically in the Swedish Standard EPC. This is generally positive for residential buildings, but more problematic for non-residential buildings.

	Changes in Enhanced EPC compared to Standard EPC	These changes are: Positive Negative Neutral	Comments
9	Energy rating system for building envelope elements and technical systems of building	Positive	In the current EPC, there is no need to include any information regarding the building envelope. With this additional information, it is easier to directly see where there is need for improvements. Some information regarding technical systems is stated also in the current EPC, but the enhanced EPC includes a nice overview of the systems and other data that might be useful for the building owner is requested.
10	The EPC assessor is encouraged to suggest and describe combinations of measures	Positive	This may lead to more measures being carried out, since some measures may be cost effective in combination with others but not on their own.
11	The renovation recommendations are summarized in one table, including key figures for cost, savings and profitability.	Positive	
12	No question regarding radon.	Negative	In a building with radon-problem high ventilation rate is needed.
13	No question regarding ventilation air flow rate.	Negative	In Sweden, this is needed for determining the energy performance requirement for a new building, and thus also the resulting energy class.
14	No question regarding mandatory ventilation control.	Negative	
15	No part regarding mandatory inspection of ventilation and heating system respectively (with exceptions).	Negative	In Sweden, this requirement in the EPBD directive is implemented within the EPC.
16	No checklist with suggestions of renovation recommendations.	Neutral	Both positive and negative aspects. A checklist might be helpful, but at the same time, there is a risk that the EPC assessor does not consider other options than the ones included in the list.
17	No part with measures carried out since the last EPC.	Negative	
18	No reference value for comparison to "similar buildings".	Negative	

4.2 Results of building representative questionnaires

4.2.1 Enhanced EPC template

Figure 1 and table 5 summarizes the results of questionnaire regarding Standard and Enhanced EPCs given to pilot building representatives (see Annex 6.4 part 1 of the questionnaire).

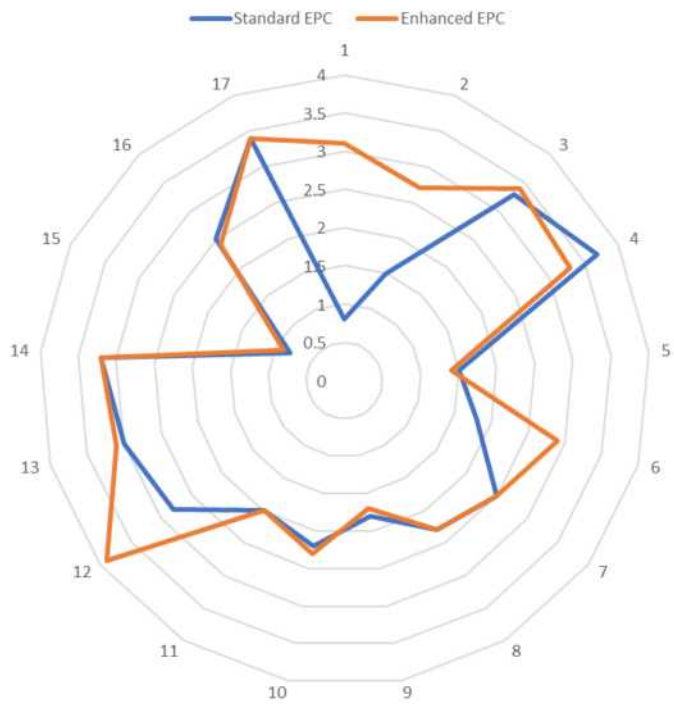


Figure 1. Results of questionnaire regarding Standard and Enhanced EPCs.

Table 5 Results of questionnaire regarding Standard and Enhanced EPCs

Type of EPC	Total score
Standard EPC	57.5%
Enhanced EPC	65.4%

The total score of the enhanced EPC is somewhat better than for the Swedish standard EPC (table 5). Figure 1 shows that the enhanced EPC was considered much better than the standard EPC regarding statement 1, i.e. “The EPC gives an overview of the strength and weaknesses of the building´s energy performance.”, as well as statement 2, i.e. “The information in the EPC is presented in understandable language and figures”. A summary of the survey results regarding the various statements is given below.

Statement 2 - The information in the EPC is presented in understandable language and figures

The previous knowledge of the participating building owners varies a lot, and so does the understanding of the EPC. Several of the respondents think that the Enhanced EPC is easier to understand than the standard EPC (while no one thinks the opposite). At the same time, they find both EPCs, or at least some of the figures, difficult to understand without prior knowledge.

More specifically:

- Some of the respondents did not understand the difference between energy performance (primary energy demand) and specific energy demand, and they found it confusing that these figures are presented in the same row in table 2 on page 1.
- A couple of respondents: Primary energy makes it even harder to understand.
- Further explanations may be needed. A couple of comments regarding this:
- Easier language and/or explanations in footnotes is needed.
- It would be good with a reference for those who want to know more about how the numbers were calculated.
- Regarding the front page, they see both pros and cons with the enhanced EPC.
- Some think table 2 includes too much information, while others appreciate the additional information regarding energy class limits and possibilities for improvement.
- One respondent: it is good that basic information about the building is included in the first page.
- Several respondents appreciate the picture of the building.

In general, the building owners find the enhanced EPC to be graphically nicer, better structured and therefore it is more appealing, easier to read and to find relevant information. The opinions regarding the level of improvement differs quite a lot.

Statement 3 - From the EPC, I can understand if my building is already energy efficient or not

The majority of the building owners agree or somewhat agree to the statement "I can understand whether the building is energy efficient or not". They base this primarily on the classification. Some of the respondents think that this is clearer in the enhanced EPC thanks to the additional information regarding energy class limits, while others prefer the standard EPC with a clearer focus on the scale and energy class label (house). For the enhanced EPC, one respondent suggested to present the limits for energy classes in kWh/m^2 instead of the percentages based on the requirement for a new building (which is how it is presented by the national Board of Housing, Building and Planning).

Some of the stakeholders think that the classification scale is difficult to interpret. Also, one respondent point out that the latest EPC it is not comparable to previous EPCs, which is considered a drawback.

Statement 8 - I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)

The answers differ a lot, but most of the respondents somewhat understand the basis for the classification, although not completely. "I understand that it is a scale, but I don´t know how the scale was constructed". A couple of respondents think that the enhanced EPC is more informative than the standard EPC on this point, while others find the table in the enhanced EPC too complicated for readers without prior knowledge. One of the later asks if the information could be presented in a more pedagogical way.

A comment on both the standard and enhanced EPC is that it could be clarified that energy class C corresponds to the energy efficiency requirements of new buildings.

Several of the building owners finds it discouraging that they probably won't be able to reach higher than C or D, also with major renovation. Also, it is confusing that energy class D or E could be rather good for an existing building, since it sounds quite bad (far from A).

Statement 4 - From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation

All of them understand if the building meets the requirement for a new building. This information is given in both the standard and enhanced EPC. In general, this is considered a bit clearer in the standard EPC.

Statement 5 – From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings

No, this is not understood and a couple of building owners ask us how this would be possible from the information given. In the standard EPC there is a reference value for similar buildings, but it is not helpful since no one knows the definition of "similar" in this context.

Statement 10 and 11 - The energy demand/ consumption values shown in EPC help me to estimate future energy consumption and costs

In general, they did not find neither the standard nor the enhanced EPC very helpful. A couple of respondents commented that it would be good to also include measured tap water consumption. Moreover, it would be useful if it was made clear if presented values are based on estimations, measurements or standard values.

Statement 1 - The EPC gives an overview of the strengths and weaknesses of the building's energy performance

Several described that the enhanced EPC gives a clearer overview of the strengths and weaknesses of the building's energy performance. It was described that the different colours made the assessment clear. However, it would be good with a comment that describes what the assessment depends on. E.g., low energy efficiency in relation to what? What is the basis for the assessment? It would also be good with some information about what it would mean to possibly switch to something more energy efficient. E.g., are there better doors? What would it mean to replace them? How important are the outer walls versus e.g., the windows? What affects the use of energy the most?

Comment: The dots at the bottom right of the document are misleading, can be interpreted as a 5-point scale.

Statement 12 - The EPC clearly show what energy efficiency measures should be implemented in the building

Several described that the enhanced EPC gives a clearer overview of the energy efficiency measures that should be implemented in the building. The proposals are therefore easier to absorb. One person mentioned that there´s a whole section about energy efficiency measures in the enhanced EPC, and that it feels carefully prepared. The person made a comparison with the standard EPC, which has only check boxes. The person described that it feels like you can easily do a quick job where some actions are just ticked in. The standard EPC does therefor not feel reliable. Another person mentioned that "The whole problem with EPC is not that you do not see proposed measures. The problem is that you do not care in the right way." The person suggested that it should be required of property owners to implement the profitable measures until next time (next EPC).

Statement 6 - The energy efficiency potential of the building is clearly shown in the EPC

Several considered that the energy efficiency potential of the building is clearly shown in the EPC. However, one person mentioned that it was hard to interpret the number. *"Is it how much we will save or is it how much we will achieve?"* It was mentioned that it would be clearer if potential reduction would be given in percent. Another person mentioned that;*" You see how much you have in total and how much you could reduce through various measures. But the total maximum energy savings is not clear. Where do you draw the line for what is cost-effective? This means that the level of ambition is set by the energy expert."*

Statement 13 and 14 - The EPC help you to decide on energy-efficient renovation/cost-effective measures

Several considered that the EPC helps them to decide on energy-efficient renovation measures. One person mentioned that a long pay off time have a deterrent effect (especially for larger investments). Another mentioned that it would be interesting to see the price of electricity assumed in the calculations. It was also described that it would have been interesting to see similar calculations/estimates for measures even if they are more expensive. It could e.g., be a value-adding measure. Another mentioned that the energy should be divided into electricity and heat so that the property owner can easily convert this into money.

Statement 15 - The renovation recommendations encourage you to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)

It is described that the EPC contributes to motivation but the template itself has no meaning in this case but rather the proposed measures. In some cases, there were not many proposals for measures and saving of at least 50-60% of the energy was thus not possible. One person mentioned that you only count on the measures that are profitable, which is problematic. The outcomes are often "no proposals for action".

4.2.2 Online tool to receive first proposals for energy efficiency renovation

Questionnaires for this part of the report were not filled for Sweden. However, it was generally discussed in interviews with the building representatives.

Some described that an online tool to receive first proposals for energy efficiency renovation would be interesting while some said that they would not use it. One person said that "*It does not feel relevant now that we have an EPC. Now that we have an EPC we will use what the expert has recommended for our building."* Another person said that *"I would not trust it. Then you would like to know how it gets to the result. Since we get this from the EPC, it is not needed. Possibly if it would help us to get some more information than what we get from the EPC."* Another person described that it would be interesting both before and after an EPC. *"Things can change after the EPC that makes you want updated proposals."*

Several described that the result depends highly on the quality of the input data. It is required that you have a lot of info about your house when you fill it in. One person mentioned; *"Guess property owners or similar is needed to fill it out then? It feels like it would simplify a bit."* Another person mentioned that; *"I wonder… would you be able to use it and fill in the necessary input data as an unexperienced building owner? Maybe if you have drawings where it is very clear what kind of wall and insulation it is etc. For my part, I would not use it. I would rather see more suggestions in the EPC."* Some people mentioned that it is important to treat the result in caution (since it depends on the quality of input data). One person mentioned that it would not be enough to support that e.g., decide to additionally insulate the facade. Another person mentioned that it could be used to see what you would save approximately for different measures. It should then be seen as an alarm clock.

4.2.3 Deep Renovation Network Platform

Questionnaires for this part of the report were not filled for Sweden. However, it was generally discussed in interviews with the building representatives.

Several considered that a deep renovation network platform would be useful. One person mentioned that the question of whether there are financial incentives is question No. 1 when considering e.g., installation of photovoltaic solar energy. It would make it easier if you could visit a website and get all the information you need. However, it was also mentioned that it is difficult for authority to maintain such information/network platform.

It was mentioned that the information needs to be kept fairly short and written in a way that it is easy to understand, also with no prior knowledge. It should not be necessary to go into too much detail. It was suggested that there would be two levels of information, and the possibility to read further for those who wants to know more.

It was suggested that there would be tips on how to move forward in the plans or implementation of an energy renovation measure. It is important that the information is kept simple and easy to understand for a home owner with no or little prior knowledge.

4.2.4 Advertising guidelines for EPCs

Questionnaires for this part of the report were not filled for Sweden. However, it was generally discussed in interviews with the building representatives.

Some were familiar with the requirement to show energy class in advertisement, while some did not know about this. One person mentioned that; *"I know that this is mandatory, but the agencies often use data from old EPCs in advertisements."*

4.3 Feedback from stakeholder roundtable discussions

Most of the meeting attendees think that the first page is better in the new template. Feedback on different parts of the first page in the enhanced EPC template, that are additional or different to the Swedish standard EPC:

- Most of them found it positive that a picture of the building is displayed.
- Most of them also like how the energy performance and energy class is presented (table).
- However, the display of energy class limits (in % of the requirement for a new construction) was not considered to add much value to the EPC report. It is enough that this information can be found by a reference link included in the template.
- Several of the attendees found it positive that the new template shows the resulting energy performance *if* suggested renovation measures are implemented.
- Total potential energy savings for suggested renovation measures was considered a good addition to the standard EPC by nearly all.
- Some of the attendees did not think that the energy performance requirement for a new construction is clearly shown in the template. (It is clearer in the Swedish standard EPC.)

Comments on additional elements in the second page of the new EPC template:

- Regarding the part on energy consumption, everyone agreed that it is good that measured energy use (before correction to normal use and climate normal) is included in the new template. However, it would be good to also show values after correction to normal use and climate.
- Regarding the assessment of energy properties for building components and technical systems ("traffic lights"), some of the attendees found this to be a good addition, while others had no, or mixed opinions. Some of the attendees raised a concern that it may be difficult, or legally questionable, to make this type of assessment in the EPC. See also 1.3.2.

4.3.1 Enhanced energy efficiency recommendations

Thoughts and suggestions for enhanced energy efficiency recommendations:

- Payback has its advantages and disadvantages. It is straight forward and easy for the property owner to understand, but at the same time, longer payback periods can be discouraging and hinder implementation of measures. Since measures with longer pay off-periods in fact may be as, or even more, profitable, it was proposed to introduce a metric that consider the overall profitability (thus, taking into account the time value of money and factor in the value of additional cash flows beyond the payback period), e.g., IRR (Internal rate of Return).
- One way to include more recommendations on energy efficiency measures, not least recommendations for deep energy renovation, is to evaluate and take into account renovation needs in the profitability calculation. When there are maintenance needs, part of the investment cost can be considered maintenance costs, and thereby be excluded from the cost for the energy measure itself. For the enhanced EPC (both the European one and the national adoption), it is important to make clear whether this aspect (and others), should be considered or not.

- Several of the attendees were positive to the new part describing the energy properties of building components and technical systems. However, some of the others were dubious to the idea of including an assessment (the traffic lights) in the EPC, and thought that this might be problematic (even legally). As an example, it was pointed out that a building component can have poor energy qualities, but the property owner may not be able to do anything about it (for example due to protection values of the building). A couple participants thought that this part should be left out altogether, while someone else suggested to make it less judgmental by calling it *Room for improvement* or similar, rather than *Rating*.
- Power requirements for heat and electricity, and power balancing, is an important and increasingly urgent issue. Several of the attendees thought that it would be good if this aspect, somehow, could be included in the EPC. It was proposed that reduction of power (or power regulation) is encouraged to be considered in the recommendations on energy efficiency measures. Also, this is interesting for the property owners from an economic perspective and can improve the profitability of proposed measures.

4.3.2 Suggestions for improvements of Enhanced EPC template

Elements that a majority of the attendees think should be included:

- Nearly all of the attendees thought that a reference for comparison with similar buildings should be added to the new template.
- Most of them also thought that energy renovation measures implemented since the previous EPC should be included in the template. This is important in order to enable follow-up.
- A majority of the attendees also thought that it would be advantageous to include a checklist of possible renovation recommendations. (As the one included in the Swedish standard EPC.)

Other suggestions:

- Some of the attendees thought that it would be good to include measured energy use for more than one year, e.g., the last three years. The others were neutral to this suggestion.
- Moreover, some considered it to a good idea to also include CO2 emissions, and possibly CO_2 savings, in the EPC.
- It would be good if the energy performance requirement for a new building as well as the base for energy classes could be more clearly presented. Perhaps it could be highlighted which energy class means fulfilling the new building requirement.

From the round table discussion, it was also clear that a guide (addressed to EPC assessors) on how to fill in the EPC template is needed. Regarding renovation recommendations, it is for example important to make clear whether different aspects that may affect the profitability calculation (e.g., reduced maintenance, reduced costs for tap water, reduced costs for power tariffs, potential subsidies) or other added values (eg., improved indoor climate) should be considered or not.

Suggestions for improvements are also presented in sections above.

4.3.3 Suggestions for national adaption of Enhanced EPC schemes

Suggestions for improvements proposed to be implemented through national adaptation:

- Most of the attendees considered it to be good to also include energy consumption adjusted to normal use and climate normal. (As it is in the standard EPC.)
- Also, most thought that the climate normal correction should be done automatically when the template is filled in. (As it is in the standard EPC.)

- A suggestion was to also consider if it would be possible to automatically adjust measured energy consumption to normal use. Most likely this would be beneficial for simple buildings (e.g. residential), while it should still be done manually by the EPC assessor for more complex building.
- Some thought that obligatory ventilation control (OVK) should be included. (As it is in the standard EPC.)
- Finally, a suggestion was to show both actual use (eg., energy, tap water) and what is considered normal use (eg., energy, tap water). In this way, it would be easier for the building owner to see if the consumption is high or low compared to normal use.

4.3.4 Other proposals (Online tool, Deep Renovation Network Platform, Advertisement Guidelins)

An additional comment from one of the attending EPC assessors was that primary energy is very difficult for the building owners to understand, and also very difficult to explain.

Proposals concerning an Online tool, Deep Renovation Network Platform and Advertisement guidelines were shortly mentioned, but not discussed in this meeting.

5 CONCLUSIONS AND SUGGESTIONS

This part of the reports contains conclusions and summarizes the suggestions which can be used to improve the Enhanced EPC schemes.

Overall, both the pilot building representatives and the EPC assessor who carried out the pilot building EPCs preferred the enhanced EPC template to the standard Swedish EPC. In general, the building owners found the enhanced EPC to be graphically nicer, better structured and therefore more appealing. Although parts of both the EPCs were difficult to understand without prior knowledge, several of the building representatives thought that the Enhanced EPC was easier to understand than the standard EPC. In particular, the following elements of the enhanced EPC (not included in the standard EPC) were appreciated by both EPC assessor and building representatives:

- The assessment of energy properties of building components and technical systems.
- The table that summarizes the renovation recommendations.

The building owners also appreciated the figures *total energy savings* and *energy performance, if suggested measures are implemented*, included only in the enhanced EPC. However, there is a small concern among other stakeholders that these figures will be seen as the limit for what may be achieved in the specific building.

Moreover, the attendees in the round table discussion all agreed that it is positive that values of measured energy use are presented in the enhanced EPC template. In the Swedish standard EPC only energy consumption after adjustment to normal use is included.

Taking into account the results from the pilot building testing, the pilot building representative questionnaire and the round table discussion, it is suggested to add the following elements and figures to the enhanced EPC template for further improvement:

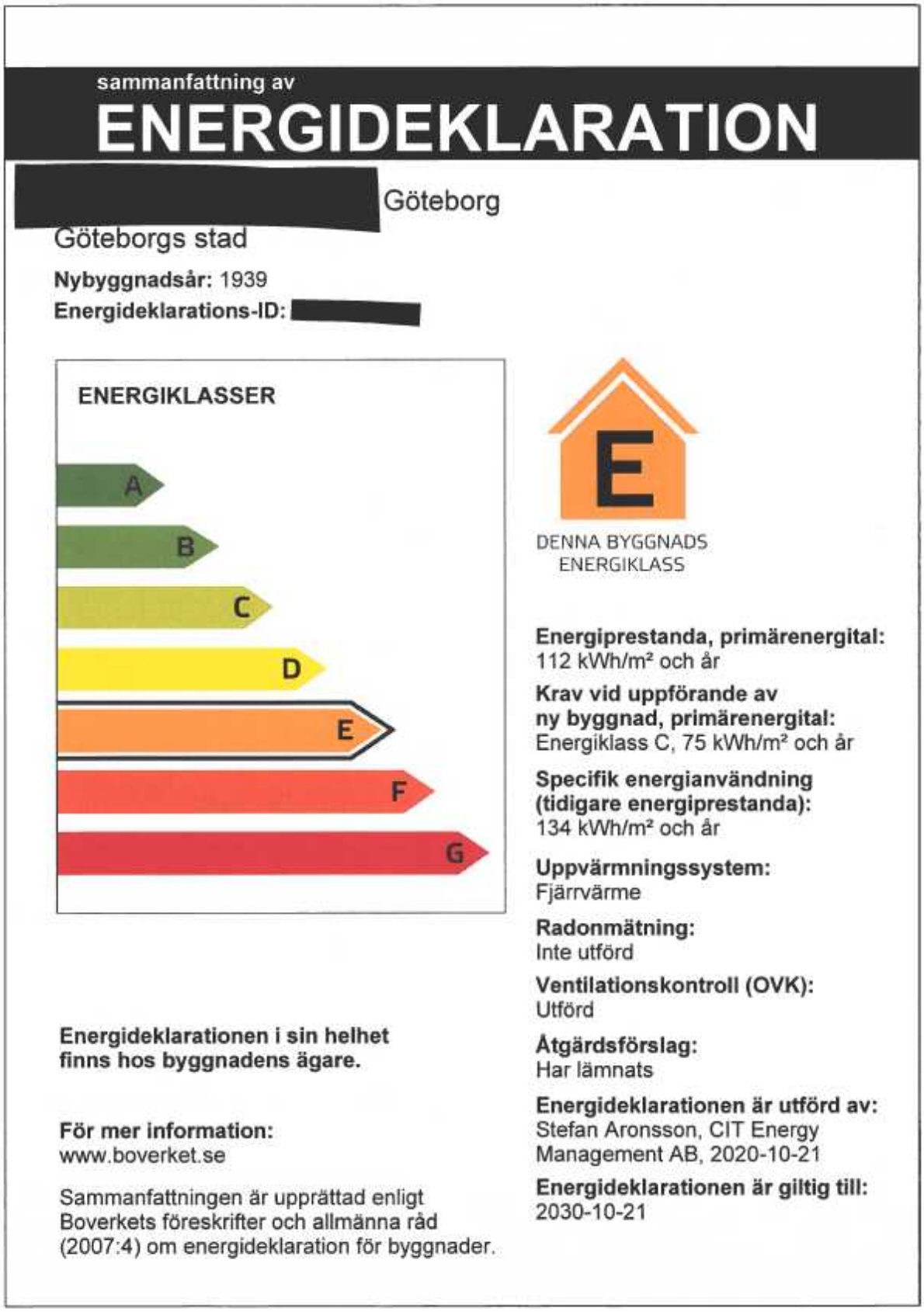
- A description of the basis for this assessment of building components and technical systems. This is needed in order to make the assessment transparent and more useful.
- A reference value for comparison with similar buildings.
- A metric that considers the overall profitability (thus, taking into account the time value of money and factor in the value of additional cash flows beyond the payback period) of recommended renovation measures, e.g., IRR (Internal rate of Return).
- Energy renovation measures implemented since the previous EPC, not the least in order to enable follow-up.
- The aspect of power requirements, and power balancing, for heat and electricity. From the round table discussion. As a suggestion, by encouraging that it is considered in the renovation recommendations.
- A guide (addressed to EPC assessors) on how to fill in the EPC template. Regarding renovation recommendations, it is for example important to clarify whether to consider different aspects in the profitability calculation, such as reduced maintenance, reduced costs for tap water, reduced costs for power tariffs, potential subsidies), or other added values (eg., improved indoor climate).

Lastly, some of the elements and figures that are included in the Swedish EPC needs to be added to the enhanced EPCs in order for it to be suitable for national conditions, e.g., radon, ventilation air flow rate, mandatory inspection of ventilation and heating system, and adjustment to normal use and climatological normal. These elements may be implemented by national adaptation.

6 ANNEXES

6.1 Annex B: Standard EPCs

Example of the first page of a standard Swedish EPC for a residential building:



sammanfattning av

ENERGIDEKLARATION

[redacted] Göteborg

Göteborgs stad

Nybyggnadsår: 1939

Energideklarations-ID: [redacted]

ENERGIKLASSER

A

B

C

D

E

F

G

E

DENNA BYGGNADS ENERGIKLASS

Energiprestanda, primärenergital:
112 kWh/m² och år

Krav vid uppförande av ny byggnad, primärenergital:
Energiklass C, 75 kWh/m² och år

Specifik energianvändning (tidigare energiprestanda):
134 kWh/m² och år

Uppvärmningssystem:
Fjärrvärme

Radonmätning:
Inte utförd

Ventilationskontroll (OVK):
Utförd

Åtgärdsförslag:
Har lämnats

Energideklarationen är utförd av:
Stefan Aronsson, CIT Energy Management AB, 2020-10-21

Energideklarationen är giltig till:
2030-10-21

Energideklarationen i sin helhet finns hos byggnadens ägare.

För mer information:
www.boverket.se

Sammanfattningen är upprättad enligt Boverkets föreskrifter och allmänna råd (2007:4) om energideklaration för byggnader.

Example of the first page of a standard Swedish EPC for a non-residential building:

sammanfattning av

ENERGIDEKLARATION

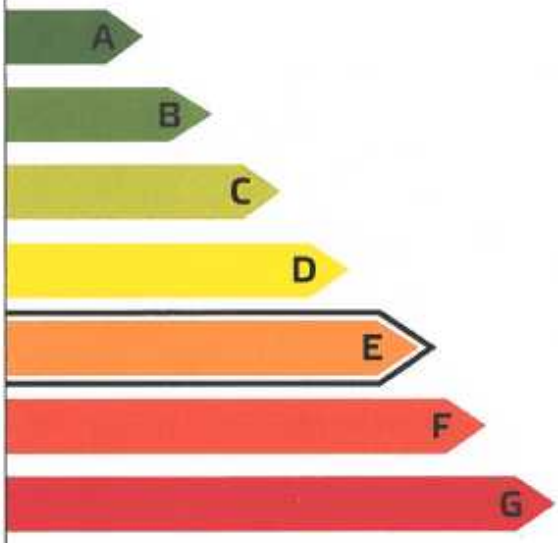
[redacted]

Kungsbacka kommun

Nybyggnadsår: 1979

Energideklarations-ID: [redacted]

ENERGIKLASSER



Energiprestanda, primärenergital:
172 kWh/m² och år

Krav vid uppförande av ny byggnad, primärenergital:
Energiklass C, 119 kWh/m² och år

Specifik energianvändning (tidigare energiprestanda):
138 kWh/m² och år

Uppvärmningssystem:
Fjärrvärme

Radonmätning:
Utförd

Ventilationskontroll (OVK):
Utförd

Åtgärdsförslag:
Har lämnats

Energideklarationen är utförd av:
Stefan Aronsson, CIT Energy Management AB, 2020-08-31

Energideklarationen är giltig till:
2030-08-31

Energideklarationen i sin helhet finns hos byggnadens ägare.

För mer information:
www.boverket.se

Sammanfattningen är upprättad enligt Boverkets föreskrifter och allmänna råd (2007:4) om energideklaration för byggnader.

6.2 Annex C: Enhanced EPCs

Example of the first page of an enhanced EPC for a residential building (same as in Annex B):

Qual DeEPC

Energideklaration

i enlighet med BBR XZY

Energideklarations-ID: 1234567	Giltig till: 21/10/2030	Baserad på: mätning

A. Uppgifter om byggnaden

Verksamhet	Flerbostadshus, bostäder
Adress Fastighetsbeteckning Byggnadsid	xx Göteborg xxx xxx
Atemp	1747 m²
Nybyggnadsår	1939
Annan information	6 våningsplan ovan mark samt ett uppvärmt källarplan. 23 bostadslägenheter.

B. Energiklass och energiprestanda

Gränser för energiklassning Energiprestanda i procent av kravet för en ny byggnad, 75 kWh/m² (specifikt för denna byggnad)	Energiklass	Energiprestanda, primärenergital [kWh/m².år]	Specifik energianvändning (tidigare energiprestanda) [kWh/m².år]	Möjlig energiprestanda om åtgärdspaket* implementeras [kWh/m².år]
EP ≤ 50 %	A			
EP > 50 - ≤ 75%	B			
EP > 75 - ≤ 100 %	C			
EP > 100 - ≤ 135 %	D			93
EP > 135 - ≤ 180 %	E	112	134	
EP > 180 - ≤ 235 %	F			
EP > 235 %	G			

* En beskrivning av föreslaget åtgärdspaket ges nedan.

Potentiell besparing av köpt energi om föreslaget åtgärdspaket implementeras:
38 000 kWh/år

Utförd av	Datum
Stefan Aronsson, CIT Energy Management	2020-10-21

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

Example of the first page of an enhanced EPC for a non-residential building (same as in Annex B):

Qual DeEPC

Energideklaration

i enlighet med BBR XYZ

Energideklarations-ID: 1234567	Giltig till: 31/08/2030	Baserad på: mätning

A. Uppgifter om byggnaden

Verksamhet	Förskola
Adress Fastighetsbeteckning Byggnadsid	xx, Kungsbacka xx xx
Atemp	1080 m²
Nybyggnadsår	1979
Annan information	2 våningsplan ovan mark (varav 1 suterräng)

B. Energiklass och energiprestanda

Gränser för energiklassning Energiprestanda i procent av kravet för en ny byggnad, 119 kWh/m² (specifikt för denna byggnad).	Energiklass	Energiprestanda, primärenergital [kWh/m².år]	Specifik energianvändning (tidigare energiprestanda) [kWh/m².år]	Möjlig energiprestanda om åtgärdspaket* implementeras [kWh/m².år]
EP ≤ 50 %	A			
EP > 50 - ≤ 75%	B			
EP > 75 - ≤ 100 %	C			
EP > 100 - ≤ 135 %	D			138
EP > 135 - ≤ 180 %	E	172	138	
EP > 180 - ≤ 235 %	F			
EP > 235 %	G			

E

* En beskrivning av föreslaget åtgärdspaket ges nedan.

Potentiell besparing av köpt el om föreslaget åtgärdspaket implementeras:
22 750 kWh/år

Utförd av	Datum
Stefan Aronsson, CIT Energy Management	2020-08-31

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

6.3 Annex E: Questionnaire for building owners on the Enhanced EPC issued for their building

During QualDeEPC project we have developed two Energy performance certificates (EPC) in your building:

- *Standard EPC – an EPC that is issued according to national legislation/calculation methodology/EPC template;*
- *Enhanced EPC – an EPC form that has been developed in QualDeEPC project and aims to improve upon the Standard EPC.*

This questionnaire is intended to be filled in by the representative of the building. This questionnaire aims to understand whether the Enhanced EPC has achieved the goal of improving upon then Standard EPC. For all questions we want you to look at both issued EPCs for your building and give an answer for each (Standard and Enhanced) EPC.

Address of building: _____

Part 1 – Comparison of Standard and Enhanced EPC form

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
1	The EPC gives an overview of the strengths and weaknesses of the building's energy performance	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
2	The information in the EPC is presented in understandable language and figures	Standard EPC						
		Enhanced EPC						
3	From the EPC, I can understand if my building is already energy efficient or not	Standard EPC						
		Enhanced EPC						
4	From the EPC, I can understand if my building reaches the minimal energy efficiency requirements of buildings set in our national legislation	Standard EPC						
		Enhanced EPC						
5	From the EPC, I can understand if my building's energy demand is large or small compared to other similar buildings	Standard EPC						
		Enhanced EPC						
6	The energy efficiency potential of my building is clearly shown in the EPC	Standard EPC						
		Enhanced EPC						
7	I understand the units of measurement [kWh/m^2 per year, MWh, tons CO_2, e.t.c.] used in	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	EPC							
8	I understand the basis for the building classification in energy classes (A, B, C, e.t.c.)	Standard EPC						
		Enhanced EPC						
9	The classification used in the EPC makes it clear how the energy performance of the building compares to other buildings/ building types	Standard EPC						
		Enhanced EPC						
10	The energy demand/ consumption values shown in EPC help me to estimate future energy consumption	Standard EPC						
		Enhanced EPC						
11	The energy demand/ consumption values shown in EPC help me to estimate future energy costs	Standard EPC						
		Enhanced EPC						
12	The EPC clearly shows what energy efficiency measures should be implemented in my	Standard EPC						
		Enhanced EPC						

No.	Statement	Standard EPC/Enhanced EPC	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree	Please in your words comment which of the EPCs (Standard or Enhanced) you think is better in achieving the goal stated in the statement Other comments are also welcome
	building							
13	The EPC helps me to decide on energy-efficient renovation measures	Standard EPC						
		Enhanced EPC						
14	The EPC helps me to decide on cost-effective renovation measures	Standard EPC						
		Enhanced EPC						
15	The renovation recommendations encourage me to pursue future renovation activities towards deep renovation (saving at least 50-60% of energy)	Standard EPC						
		Enhanced EPC						
16	The EPC contains all information that I expected to see in the EPC	Standard EPC						
		Enhanced EPC						
17	It is clear what is the EPC validity period	Standard EPC						
		Enhanced EPC						

Part 2 – Additional tools for information and support on building energy efficiency renovation and easier use of EPCs in advertisements.

1. Online tool to receive first proposals for energy efficiency renovation

If there was a simple online calculation tool that you could use for estimating the potential energy efficiency measures and savings in your building, what information you would like to see in the tool? It could either be used to inform yourself before talking to an energy consultant or EPC issuer.

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
Energy efficiency measures that will be calculated for building renovation are suggested by the tool			
Energy efficiency measures that will be calculated for building renovation can be selected by the user of the tool			
Calculated energy demand before and after renovation of my building and potential energy savings presented in energy units [MWh per year, kWh/m^2 per year, e.t.c.]			
Calculated energy costs before and after renovation of my building and potential energy cost savings presented in monetary units [EUR per year, EUR/m^2 per year, e.t.c.]			
Calculated energy class before and after renovation of my building [A, B, C, e.t.c.]			
Estimation of CO_2 emissions after renovation of my building resulting [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c]			
The tool estimates simple payback period of building energy renovation in years and shows which are the actions with shortest payback period			
The tool estimates economic gains (eg through net present value (NPV), internal rate of returns (IRR) values) for my building renovation and shows which are the actions with the highest gains			
The tool estimates costs of my building energy renovation			

Would you like to receive this information from such a tool?	Yes	Not interested	Comments
The tool shows if my building's current energy consumption meets legal requirements			
Other things that I would like to see in the tool (write in comments part)	n/a	n/a	

2. Deep Renovation Network Platform

If a website (Deep Renovation Network Platform) containing all information on EPCs, building renovation and all other relevant information on building energy efficiency would be available, which parts of this website you would be most likely using or it would be interesting for you?

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
Information on renovation actions **General information**	• Providing general information and other benefits due to renovation • Providing information on principles of insulation, heating, cooling, and ventilation systems, renewable energy systems • descriptive texts and graphics on the website with information • text and graphic documents downloadable as pdf-documents			
Information on potential savings and costs	Providing general information on costs of renovation for deep renovation, building components, building services, renewable energy, potential energy and cost savings			
Linking with renovation tools	Links to specific renovation tools and calculators which clearly outline the costs of renovation, potential energy savings and other benefits due to renovation (**see previous question on online tool)**)			
Linking with Energy Performance Certificates	• Providing detailed information on EPC assessment purposes/uses, procedure, tools and assessors • Comprehensive information on EPCs, including EPC obligations, registry of EPC assessors (with a link), explaining EPCs in terms of nZEB and national en-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	ergy targets			
Linking with building deep renovation roadmap and possibly a passport	• Linking EPC information to detailed analysis to upgrade it to a Building deep renovation roadmap • Possibly development of the content and form of the "Building Passport" for bringing together the history of a building and the information tied to it (roadmap, energy audits, energy-saving works and/or restoration works)			
Information on building contractors/ technicians and energy-efficient-experts **Support with finding experts and building contractors/ technicians**	• Providing information regarding energy-efficient-experts, building contractors/ technicians/ installers • Providing a search engine or a databases of energy-efficient-experts/ contractors / technicians/ installers • Requesting various renovation offers/quotes from contractors/ technicians and comparing them so that the end-user can make an informed choice			
Information on material or product manufacturers/ suppliers	• Provides information on product manufacturers /suppliers required for deep renovation			
Information on financing opportunities for deep renovation	• Provide information about financial incentives, loans, and subsidies or third party financing			
Active provision of information of deep renovation and its benefits and costs	• Using all kinds of media and events to promote deep renovation and its benefits and costs to building owners and investors • Using demonstration projects to show enhanced „quality of life through insulation and energy-			

Type of Information	Detail on the kind of information provided	I would use it	I would not use it	Comments
	saving“			
Personal advice and guidance through the renovation project	• An energy consultant in my city/region to guide me through my renovation project			
Other things that I would like to see in Deep Renovation Network Platform (write in comments part)	n/a	n/a	n/a	

3. *Advertising guidelines for EPCs*

When selling/renting/buying a building it is mandatory to show the energy class and energy data from the building's EPC in the advertisement. Which guidance would be useful for you to comply with this regulation when selling/letting a building?

Information	Yes	No	Comments
I am familiar with the voluntary/mandatory guidelines for advertising EPC information in sale/rental advertisements			

Information	It would be useful for me	I do not need it	Comments
Where on the EPC to find energy demand/consumption data of my building that I have to show in energy units [kWh/m^2 per year, e.t.c.]			
Where on the EPC to find the energy class of my building that I have to show [A, B, C, e.t.c.]			
How to find or calculate the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m^2 per year, e.t.c.] #if this is not required or usual, a note should say it is voluntary			
How to find or calculate the current CO_2 emissions of my building in [tonnes CO_2 per year, kgCO_2/m^2 per year, e.t.c] #if this is not required or usual, a note should say it is voluntary			
Where on the EPC to find the Energy performance certificate number of this building from the official EPC registry			
The EPC class of this building as a graphical element to include in advertisements			
When was the EPC of this building issued			
Additional information that I would like to see in advertisement (write in comments part)	n/a	n/a	

• *It would be useful, to find or calculate from the EPC, the current energy costs of my building/dwelling in monetary units [EUR per year, EUR/m2 per year, etc., if that needs to be shown in the advertisements*			
• *The year of issue of the EPC, if that needs to be shown in the advertisements*			

6.4 Annex F: Results of questionnaire of Sweden

Address	Comparison of Standard and Enhanced EPC form (4-agree; 3-somewhat agree; 2-neutral; 1-somewhat disagree; 0-disagree; 2 if no answer was given)																	
	StandardEPC / Enhanced EPC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Nonresidential 1	Standard EPC	1	1	4	4	1	3	4	4	3	3	3	1	2	2	0	1	4
	Enhanced EPC	4	3	4	4	1	4	4	4	2	3	3	4	2	2	0	1	4
Nonresidential 2	Standard EPC	2	3	4	4	2	2	2	3	2	2	2	3	3	2	0	3	4
	Enhanced EPC	3	4	4	4	2	3	2	3	2	2	2	4	4	2	0	1	4
Nonresidential 3	Standard EPC	0	0	4	2	2	2	1	2	2	2	2	4	3	3	2	2	2
	Enhanced EPC	3	1	4	2	2	2	1	2	2	2	2	4	3	3	2	2	2
Residential 1	Standard EPC	1	1	3	4	2	1	2	0	3	3	1	3	2	3	1	3	4
	Enhanced EPC	3	1	3	4	1	1	2	0	3	4	1	4	2	3	1	3	4
Residential 2	Standard EPC	1	1	3	4	0	1	0	3	1	2	2	3	4	4	1	4	4
	Enhanced EPC	4	3	3	0	0	3	0	1	1	2	2	4	4	4	1	4	4
Residential 3	Standard EPC	1	3	4	4	2	2	2	0	2	2	2	4	4	4	3	4	4
	Enhanced EPC	3	3	4	4	2	3	2	1	2	2	2	4	4	4	3	4	4
Residential 4	Standard EPC	0	2	3	4	1	0	4	3	2	3	3	1	4	4	0	2	2
	Enhanced EPC	3	4	3	4	1	3	4	3	2	3	3	4	4	4	0	3	2
Residential 5A	Standard EPC	0	2	3	4	2	1	4	3	2	1	1	3	3	4	1	2	4
	Enhanced EPC	4	4	4	4	2	4	4	4	2	1	1	4	3	4	2	2	4
Residential 5B	Standard EPC	1	1	1	3	0	3	4	4	0	1	1	3	2	2	0	3	4
	Enhanced EPC	2	2	1	3	0	3	4	4	0	1	1	3	2	2	0	3	4
Residential 6	Standard EPC	1	1	4	4	3	3	2	1	1	3	3	3	3	4	0	1	2
	Enhanced EPC	2	2	4	4	3	3	2	1	1	3	3	4	3	4	0	1	2