



Training toolkit

Handbook for issuers – Guidance on how to create an iBRoad2EPC



ifeu – Institute for Energy and Environmental Research
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1. INTRODUCTION

The European building sector accounts for 40 per cent of energy consumption and 30 per cent of greenhouse gas emissions. The European Union laid down in the Fit for 55 package that Europe should be climate neutral by 2050. This includes that no fossil fuels shall be used in for heating or domestic hot water in 25 years. Currently, almost 75 % of the European building stock is not energy efficient, while the building renovation rate is very low¹. Deep building renovation has the potential to lead to significant energy savings, lower CO₂ emissions and contribute to the energy and climate objectives, at national and European level.

While the technological vision for the target state is almost undoubted, the transition to get there holds multiple challenges. The sheer speed required to renovate this number of buildings down to zero emission can be intimidating. Moreover, the necessary financial means are challenging, and it is not clear who will account for them. This shows clearly that deviations from the transition path need to be avoided. We need thorough strategical planning from the first to the last step to keep the chance of reaching the target.

iBRoad2EPC aims to widely spread the idea of long-term renovation strategies (as introduced in Building Renovation Passports (BRP)) integrating them into EPCs, and to provide building owners with pragmatic assistance.

This handbook is designed to support energy experts by guiding them step by step through the whole process of issuing the iBRoad2EPC. It provides all relevant information and complementary materials. This handbook is part of the iBRoad2EPC training toolkit. It was developed for training institutions and apart from the handbook consists of a presentation, the blank template and the checklist for the on-site visit.

OBJECTIVES OF THIS HANDBOOK

- This handbook will explain:
 - what iBRoad2EPC is,
 - and which added value it provides to building owners.
- It guides building professionals through the steps of issuing the iBRoad2EPC:
 - What to consider during the on-site visit,
 - how to develop a long-term strategy for a building,
 - how to use the iBRoad2EPC Assistant,
 - and how iBRoad2EPC is coupled with the EPC.

¹ EU annual average renovation rate is confirmed at 1%, with deep renovations accounting for only 0.2-0.3% of the renovated floor area (European Commission, 2019).

2. OVERVIEW OF IBROAD2EPC

iBRoad2EPC is an energy consultation tool for building owners, issued by building professionals. iBRoad2EPC outlines an initial renovation strategy on how a building can become climate neutral in the long term. The strategy can include a full renovation in one step, but also a renovation in several steps. The long-term perspective means that the individual renovation steps build on each other, building component connections can be prepared in good time and even future renovation obligations can be taken into account today.

iBRoad2EPC serves as a link between existing Energy Performance Certificates (EPC) and Building Renovation Passports (BRP). BRPs are roadmaps for individual buildings that provide a long-term renovation strategy to reach a deep renovation target in the future. iBRoad2EPC integrates BRP elements into existing EPC schemes by adapting the BRP concept to fit existing EPC certification regimes and to improve the list of recommendations.

The aim of iBRoad2EPC is to bring existing EPCs closer to a decarbonisation roadmap and introduce a focus on the long-term objective of decarbonisation by:

- including improvement measures in a specific sequence that lead straight to the target and avoid costly deviations and misinvestments (lock-in effects)
- ensuring that every measure implemented is part of a comprehensive renovation strategy
- complying with future regulatory and financial requirements, e.g. mandatory Minimum Energy Performance Standards (MEPS) that may be introduced with the revised EU Energy Performance of Buildings Directive (EPBD)², mortgage portfolio standards or the EU taxonomy regulation³
- presenting the recommendations in a way that can easily be understood by the end-user and consider the user's needs.

The specific way in which iBRoad2EPC will be designed in individual Member States (MSs) may vary depending on the specific national requirements. Currently, there are already country specific adaptations in place for Bulgaria, Greece, Poland, Portugal, Romania, and Spain. The implementation of iBRoad2EPC with a modular approach allows maximum flexibility and customisability. Thus, iBRoad2EPC can appear as an annex to the EPC as well as a stand-alone consulting product, it can be issued as paper or be available online. The basic content, the general design and the key features, however, make the brand core of iBRoad2EPC and remain the same regardless of the flexible adjustments.

iBRoad2EPC is intended to provide the basic information of a BRP but require only a small amount of effort to create. To this end, it should be generated largely automatically from as few data entries as possible. Complex calculations, which cause a large part of the effort for the BRP, are only foreseen as an option. Despite extensive automation, care must be taken to provide advice that is as individual as possible.

2.1 What challenges need to be faced?

The building sector accounts for approximately 40 per cent of total energy consumption and 36 per cent of CO₂ emissions in the European Union. Currently, almost 75 per cent of the European building stock is not energy efficient, while the building renovation rate is very low. Roughly 97 per cent of the European

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[https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739377/EPRS_ATA\(2023\)739377_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2023/739377/EPRS_ATA(2023)739377_EN.pdf)

³ https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en

Union's building stock, amounting to over 30 billion m² of living area, is not considered energy efficient, and 75 per cent to 85 per cent of it will still be in use in 2050⁴. Defining a pathway towards a 'highly efficient and decarbonised building stock by 2050' is a fundamental pillar of the revised Energy Performance of Buildings Directive (EPBD), requiring the transformation of the majority of buildings from highly inefficient to, at least, nearly zero-energy buildings (NZEBS). Deep building renovation, has the potential to lead to significant energy savings and to lower CO₂ emissions and thus, contributes to the energy and climate objectives at national and European level.

However, building owners face multiple barriers when planning a renovation, which they have to overcome to achieve this goal. One of the main barriers to renovation is the lack of knowledge about what measures to implement and in which order. Building renovation is often considered a burden usually associated with time-consuming planning, uncertainty about the costs and value of the planned measures, dust, and dirt.

2.2 Content of iBRoad2EPC

iBRoad2EPC consists of an overview page (Figure 1) and several detail pages (Figure 2).

⁴ https://commission.europa.eu/news/focus-energy-efficiency-buildings-2020-02-17_en

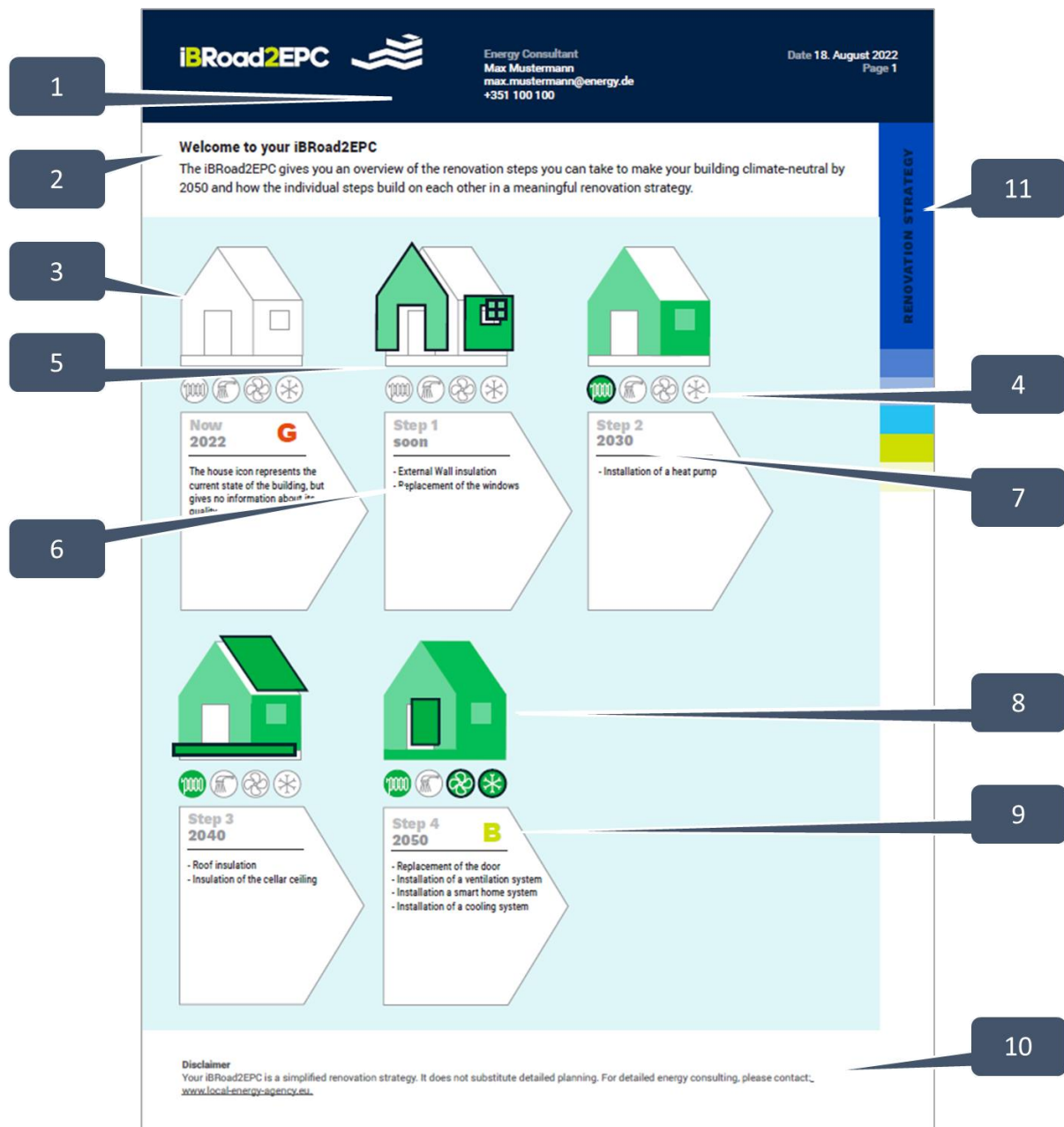


Figure 1: Content of the overview page of iBRoad2EPC.

Overview page

- 1.** Header with the contact details of the issuer.
- 2.** Welcome text and brief introduction to iBRoad2EPC.
- 3.** Each house symbol represents one renovation step, from the current building state to the target one.
- 4.** Icons represent the technical building equipment, such as heating, cooling, domestic hot water and ventilation systems.
- 5.** Building components or equipment that shall be renovated are highlighted in the respective renovation step.
- 6.** The renovation measures that are foreseen are briefly described. One renovation step can comprise several renovation measures.
- 7.** The year when the renovation step should be implemented is a static preset based on each country's intermediate targets.
- 8.** All completed measures remain green, so that the house becomes greener and greener over time.
- 9.** The target efficiency is shown in the last step.
- 10.** Footer with disclaimer and further information.
- 11.** Tabs to facilitate navigating through the document.

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Step 2
2030

Measure 1:
External Wall insulation

Description of the measure
The external wall is insulated with a "Exterior Insulation Finishing System (EIFS)". EIFS is a lightweight synthetic wall cladding that includes foam plastic insulation and thin synthetic coatings.

Specification of the measure
i 5 cm of insulation ($U = 0,2 \text{ W}/(\text{m}^2\text{K})$)

Measure 2:
Improve the thermal quality of the window

Description of the measure
Replacement of all windows that are older than 10 years.

Specification of the measure
Triple glazing, highly efficient windows ($UW = 0,8 \text{ W}/(\text{m}^2\text{K})$).

MEPS/Regulations
The average primary energy use in $\text{kWh}/(\text{m}^2 \text{ y})$ of the whole residential building stock has to be at least equivalent to energy performance class E by 2030.

Note / Recommendation
When the outer wall is being insulated, please prepare a low thermal bridge connection to a later pitched roof insulation. Existing panels at the eaves should be opened so that the insulation can be laid up to the upper edge of the rafters. At the verge, the insulation should be laid up to the upper edge of the gable wall. For this, the roof overhang must usually be extended.

When the outer wall is being insulated the control settings of the existing heat generator should be adapted to the reduced heat load. Your installer should check whether the flow temperatures and the flow rate of the heating circuit pump can be reduced.

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Figure 2: Content of the detailed page of iBRoad2EPC.

Detail page

12. Number and foreseen year of the renovation step.
13. Brief description of the measure.
14. Symbol or icon of the measure repeated from the overview page.
15. Specification of the measure, e.g. insulation thickness or U-value.
16. One renovation step can comprise several renovation measures that will all be displayed in the detail page.
17. Reference to future obligations that are already foreseeable, e.g. minimum energy performance standard (MEPS) or fossil fuel ban.
18. Recommendation on how to prepare the component connection to following renovation measures in staged renovations.

2.3 Output Formula

iBRoad2EPC is available as an online document. A printed (pdf) version is currently not available but could be developed at a later date if desired in a Member State. The online version offers several advantages for building owners as it can display the information dynamically, it can be updated and is always available on all regular devices.

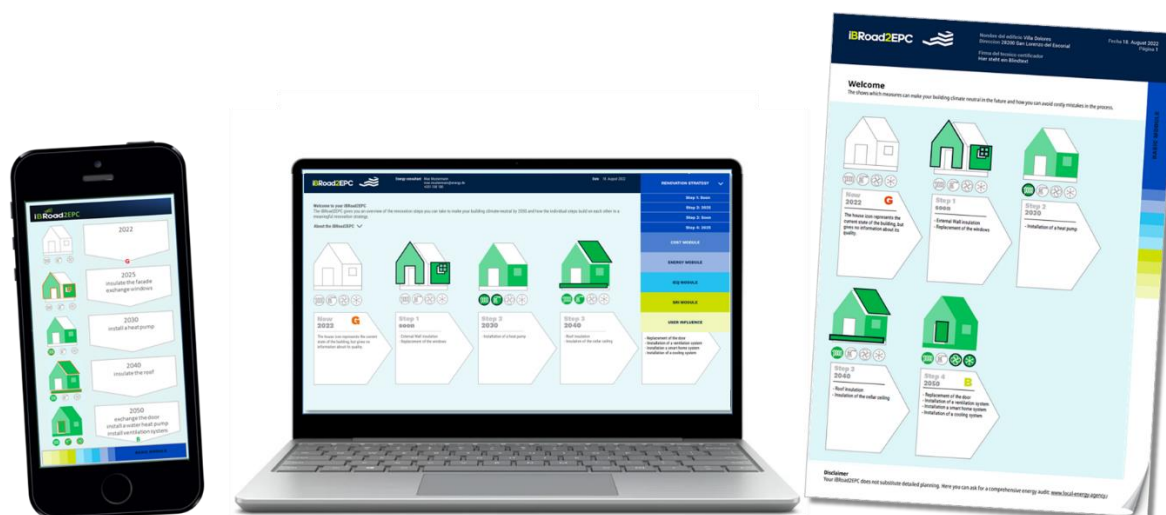


Figure 3: Output variants of iBRoad2EPC as online or printed version (currently only online version available).

3. TARGET GROUPS OF IBROAD2EPC

iBRoad2EPC is designed for multi-family buildings and non-residential - especially public - buildings. It is applicable also for single- and two-family houses. The target group for the iBRoad2EPC is basically all building owners as they make renovation decisions. This includes:

- owners of rented apartment buildings and housing associations,
- condominium associations,
- owners of single apartments in apartment buildings,
- property managers and other building societies,
- owners and operators of non-residential public buildings,
- also, owners of owner-occupied one- and two-family houses although not the main focus of the project.

The different target groups have different approaches to iBRoad2EPC and are addressed in specific ways in the output documents. Issuers must take into account the characteristics of the different target groups.

3.1 Old and new owners in case of purchase

When a building is sold, issuers must distinguish whether the client for the iBRoad2EPC is the old or the new owner. The old owners will usually have little interest in a refurbishment strategy for the building. If applicable, issuers should clarify whether the iBRoad2EPC should be produced for the new owner. In this case, their wishes and ideas should be asked for.

3.2 Owners of rented apartment buildings and housing associations

In rented apartment buildings, the owners decide on renovation measures, but are not necessarily residents of the buildings and do not benefit directly from increased comfort and reduced energy costs. Renovation measures are usually assessed from an economic point of view. They can help generate higher rental income and raise the value of the building as an asset.

3.3 Condominium associations

In condominium associations, issuers must clarify who the recipients of the iBRoad2EPC are and adapt their recommendations accordingly. They can be representatives of the condominium association, a property management company or individual condominium owners.

3.4 Owners of single apartments in apartment buildings

iBRoad2EPC is a whole-building renovation strategy. Individual apartments can only contribute to the strategy to a limited extent. Nevertheless, several renovation recommendations have been prepared for individual apartments, for example to take advantage of the opportunity of a change of ownership. The design of iBRoad2EPC needs to be adapted to the requirements of individual apartments. This has not yet been implemented in the current version.

3.5 Property managers and other building societies

Please see chapter 2.2 “Owners of rented apartment buildings and housing associations”.

3.6 Owners and operators of non-residential buildings

In non-residential buildings, issuers must find out who is the recipient of the iBRoad2EPC and take this into account when issuing. Public non-residential buildings are usually managed by a property office. The available budget for renovations must be taken into account in the short-term recommendations.

Special technical requirements may apply to buildings operated by public bodies in order to set an example. These are usually automatically adjusted in iBRoad2EPC. Issuers must still check compliance with any particular requirements.

3.7 Owners of owner-occupied one- and two-family houses

In owner-occupied buildings, the occupants decide on renovation measures and benefit themselves from increased comfort and reduced energy costs. In one- and two-family houses the decision process is easier than in multi-family houses. Renovation decisions are made by a small number of people, often only one or two families.

4. ADDED VALUE OF IBROAD2EPC

4.1 Information about future obligations

According to the EU “Fit-for-55”-package, the building stock in the entire EU is to be climate neutral by 2050. Even though this may seem like it is far in the future, considering that life cycles of building components range from 20 to over 50 years, the time left is already very short. Every renovation measure must already be aligned with the goal. Wrong renovation decisions will most likely have to be corrected at high cost before the end of their lifetime.

Many Member States have already enacted legal regulations to make the path to climate neutrality as harmonious as possible. The proposal for the revision of the Energy Performance of Buildings Directive (EPBD) also introduces interim targets for existing buildings: they must meet certain requirements in certain target years. These “minimum energy performance standards” (MEPS) are important milestones for building owners and their long-term renovation strategy. Only if building owners are aware of future regulations, they can prepare their buildings in time. Figure 4 shows how the awareness of future obligations influences present renovation measures.

iBRoad2EPC informs building owners when their building has to meet which requirements in the future. This allows them to set up their renovation strategy in a legally secure way.

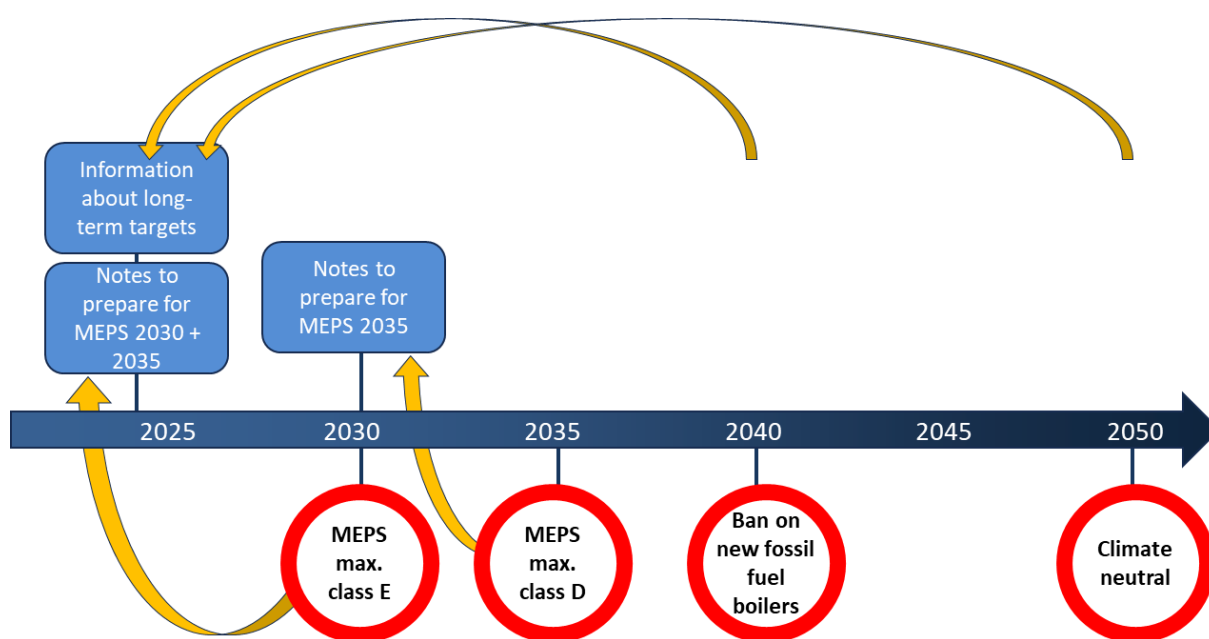


Figure 4: Example for foreseeable future legal obligations as they might come into force in a Member State.

Example

Figure 4 shows an example of how iBRoad2EPC includes future obligations in the renovation strategy of a building. All (intermediate) targets are outlined automatically for the respective Member State even before the first renovation step. iBRoad2EPC points out soon to come obligations in each step.

The future obligations and climate targets in iBRoad2EPC are specific to each implementing country. They appear by default in the input and output forms of iBRoad2EPC.

4.2 How to meet future obligations

iBRoad2EPC automatically displays the future obligations in the schedule. On this basis, the issuers can specify the renovation measures to meet them.

Creating an individual renovation strategy for a specific building is the most important task of the issuers of iBRoad2EPC.

How exactly the sequence of renovation measures is determined and which additional aspects need to be taken into account can be found in chapter 5.5. Figure 5 shows an example of how the obligations can be met in a specific building.

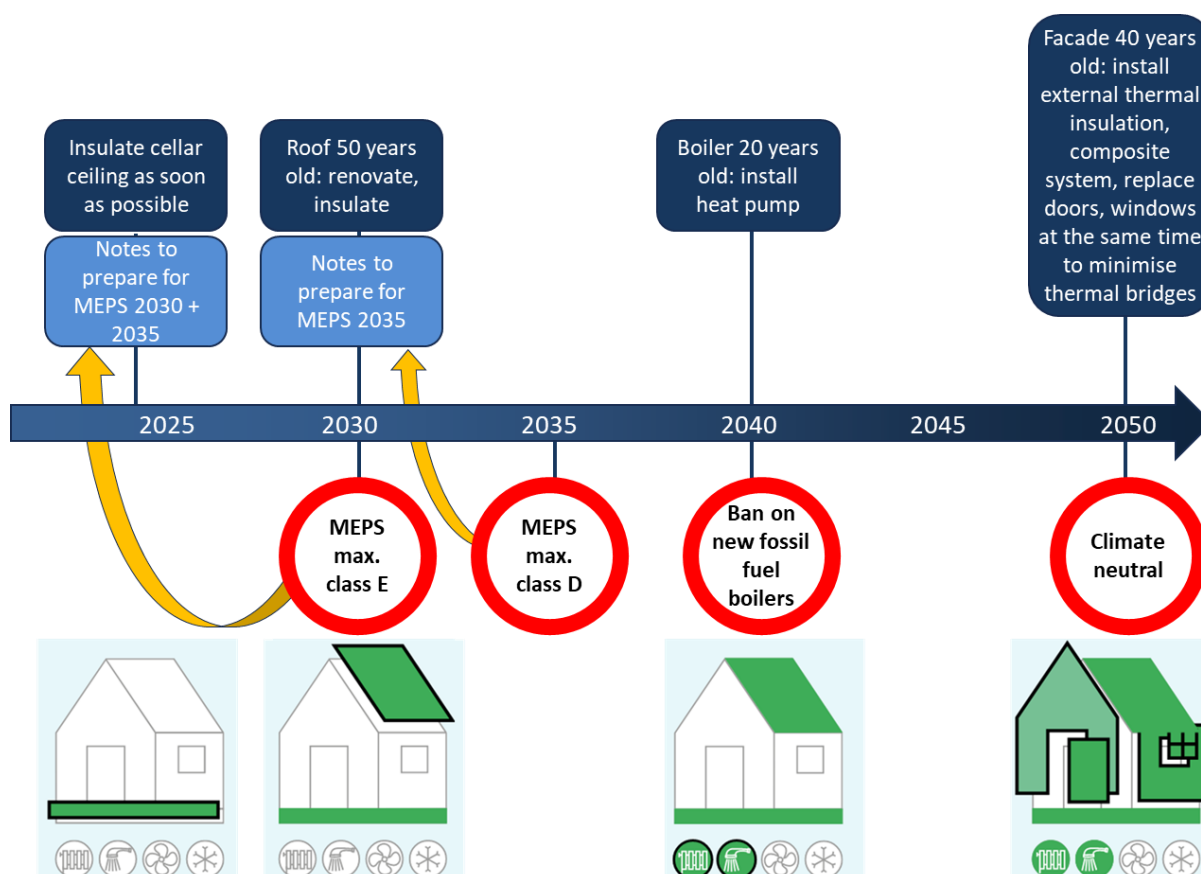


Figure 5: Example for notes that announce foreseeable future legal obligations.

Example

In the example of Figure 5, it is possible to meet the requirements in 2030 by insulating the basement ceiling and the roof. The next requirements in 2035 will also be met. The existing boiler reaches the end of its service life around 2040. It will be replaced by a heat pump. In this example, new boilers using fossil fuels may no longer be installed after 2040 anyway. The building will finally become climate-neutral in 2050 when the façade is insulated and the windows are replaced.

iBRoad2EPC is supposed to serve as a cost-effective initial guidance. Therefore, extensive optimisation calculations are generally not envisaged in iBRoad2EPC. The issuers should decide on the basis of their experience with which measures a building can be expected to meet the requirements.

Europe aims to become the first climate-neutral continent by 2050. This means that buildings must also become climate neutral by then. In iBRoad2EPC, building components that have been renovated in a target-compatible manner are shown in green. Ideally, all building components will be green by the target date. Only renovation measures that are to be implemented as of the creation of iBRoad2EPC are coloured green. Earlier measures remain white, even if they are target-compatible, to show building owners only their future tasks.

4.3 How to merge single renovation steps into one deep renovation

Once the sequence of renovation steps has been determined (detailed description in chapter 4.3), issuers can define how they can best build on each other. Often, later measures can already be prepared in an earlier step. With the iBRoad2EPC renovation strategy, everyone involved in the construction always knows which measures are to be carried out first and which follow afterwards. In this way, component connections, thermal bridges, air tightness and other tasks can be realised even though the renovation steps are many years apart.

iBRoad2EPC offers automatic recommendations for preparatory measures.

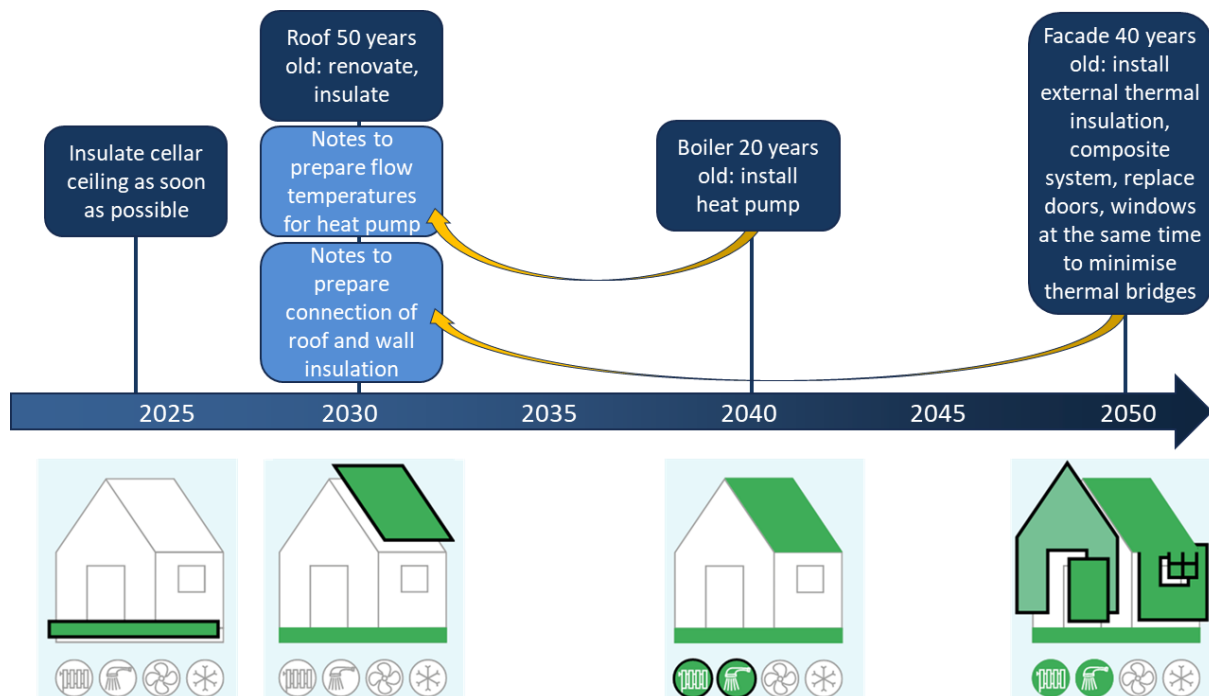


Figure 6: Once the sequence of renovation measures is defined notes to prepare for later measures appear automatically.

Example

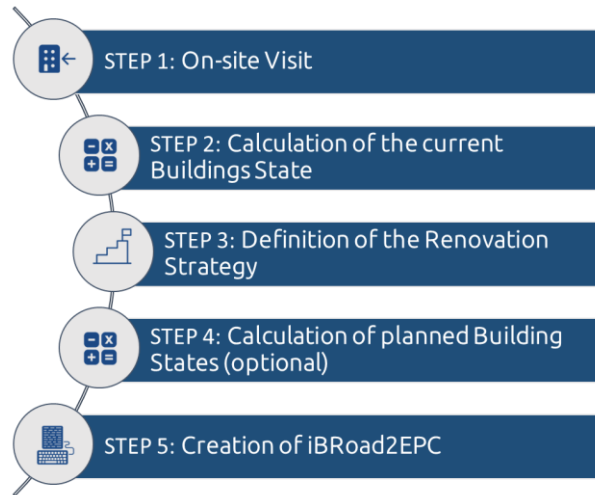
In the example presented in Figure 6, when the roof is renewed in 2030, a sufficient roof overhang can be prepared for thermal insulation of the exterior wall in 2050. Since it is known that a heat pump is to be installed in 2040, measures can be taken beforehand to reduce the flow temperature to ensure efficient operation.

ADDED VALUE OF iBRoad2EPC FOR BUILDING OWNERS

- Core information of a Building Renovation Passport at low extra cost
- Outline of a long-term renovation strategy for their building considering
 - legal requirements and obligations in the future and renovation measures to fulfil them,
 - early preparation of future renovation measures for seamless connections, thus achieving deep renovation even with step-by-step renovation

5. FIVE STEPS TO ISSUE THE IBROAD2EPC

In general, issuing the iBRoad2EPC follows five steps as shown below. As iBRoad2EPC can be adapted to national requirements there can be slight deviations from the five steps, though.



5.1 Step 1: On-site Visit

The on-site visit is crucial to the quality of the consultation in iBRoad2EPC. It ensures that the long-term renovation strategy is individually tailored to the building. In addition, the ideas and wishes of the building owners are gathered during the visit and initial questions are already answered. This increases the owners' identification with the strategy.

Checklist for the on-site Visit

The checklist may guide issuers through the on-site visit. It provides issuers with fourteen questions about the building owner's perspective on the planned renovation, the technical condition of the building or dwelling as well as sensitive points concerning the lifespan of components and legal obligations that need to be met in the future.

The checklist supports issuers in acquiring all relevant information during the on-site visit for the actual issuing of the iBRoad2EPC.

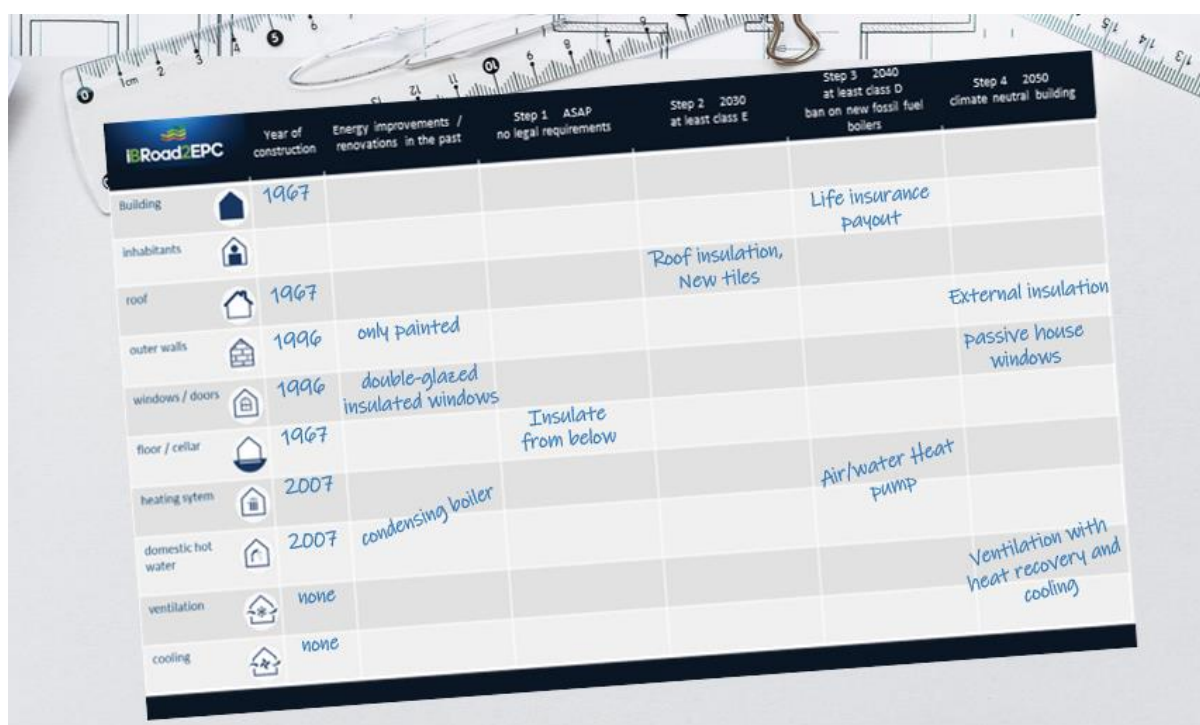
A printable checklist is included in the Annex to this report.

Blank Template for the on-site Visit

It is recommended that the issuers prepare a first draft of the renovation strategy together with the building owners during the on-site visit. This way, the owners' ideas and plans can be directly integrated into the strategy. The blank template provided in the Annex can be used for this purpose.

The blank template allows entering the year of construction and the improvements and renovations already carried out for all building component groups. In addition, there are rows for the entire building and the occupants or owners. The time steps are arranged in the columns. They are specified individually for each Member State. The future obligations are already entered in the respective years.

Issuers can use the blank template to work through the items of the checklist above. Renovation measures can be assigned to a time period in advance.



	Year of construction	Energy improvements / renovations in the past	Step 1 ASAP no legal requirements	Step 2 2030 at least class E	Step 3 2040 at least class D ban on new fossil fuel boilers	Step 4 2050 climate neutral building
Building	1967				Life insurance payout	
inhabitants				Roof insulation, New tiles		
roof	1967					External insulation
outer walls	1996	only painted				passive house windows
windows / doors	1996	double-glazed insulated windows				
floor / cellar	1967		Insulate from below			
heating system	2007				Air/water Heat pump	
domestic hot water	2007	condensing boiler				
ventilation	none					Ventilation with heat recovery and cooling
cooling	none					

Figure 7: Example for a filled-in blank template.

5.2 Step 2: Calculation of the current Building State

The current state of the building is calculated with the EPC software. The calculation is exactly the same as the calculation to issue an EPC based on energy demand. This means that an EPC is always issued with each iBRoad2EPC, or that the iBRoad2EPC can be issued when an EPC is already in place/valid for a building.

5.3 Step 3: Definition of the Renovation Strategy

This is the central step in the iBRoad2EPC and the main task of the issuer. The issuers create the individual renovation strategy for the building on the basis of the on-site visit, the wishes of the building owners, the technical correlations and their experience. This process is deliberately not automated.

When preparing a long-term renovation strategy for an individual building, the key questions to be answered are when and what to renovate.

The issuers create a long-term strategy for a building to reach the state specified by the climate targets of the respective country. For this purpose, all energy-relevant components of the building must be considered. The issuers can be guided in this task by the following points.

GUIDING PRINCIPLES TO DEFINE THE STRATEGY

Full renovation or gradual renovation

The issuers should recommend a full renovation in one step if it is technically feasible and can be afforded by the owners. A full renovation has many advantages over a step-by-step approach. The Greenhouse Gas (GHG) emissions of the building fall immediately to the target value, i.e. the cumulative emissions over the entire period are significantly lower. Building component connections can be made in such a way that all thermal bridges and airtightness requirements are met. In the case of a one-step renovation, however, it must be ensured that the target standard is achieved. Too low ambition would lead to the building having to be renovated again or the targets not being met. However, since full renovations are time-consuming and expensive, many building owners opt for stepwise renovations.

Age of the Components

In the case of stepwise renovation, the building components can be prioritised according to their age. Components that have already reached or will soon reach the end of their normal technical life span must be renovated earlier than those that will still be usable for many years. The usual technical life span is individually different for all components.

Sequence of Measures

The renovation measures must build on each other. For example, it often makes sense to improve the building envelope first. This means that later a heat generator with a lower heat capacity can be installed, which is more cost-effective. Furthermore, many renewable heat generators, such as heat pumps, only work efficiently if a building is at least partially insulated.

Components that should be combined

In addition to the age of the components, issuers must also consider which components should preferably be renovated together. For example, many problems when connecting windows to the façade can be avoided if both components are renovated in one step.

Obligations that must be met

The renovation measures must be put together in such a way that obligations with which the building must comply, and which are already foreseeable, are fulfilled. For example, according to the draft for a revision of the EU Energy Performance of Buildings Directive (EPBD) (15.12.2021), it should be noted that buildings with efficiency class G must be renovated by 2030 and buildings with efficiency class F by 2033.

The above points are to be understood as guidance for the issuer. Experienced issuers may include further or other aspects in the prioritisation of the renovation measures.

If issuers do not foresee any measures for a specific period in iBRoad2EPC, they should explain why no measures are required. This allows owners to understand that their building already meets requirements that will not take effect until a later date. Although the number of steps in iBRoad2EPC is predefined, there is no need to output empty text fields.



5.4 Step 4: Calculation of the planned Building States (optional)

For countries implementing iBRoad2EPC, this step is optional. They decide when introducing iBRoad2EPC whether the calculation of each renovation step is required. This decision then applies to all issuers in a country. The decision depends on whether a country chooses to implement certain iBRoad2EPC modules that require a calculation for each step (see chapter 6). A calculation for each renovation step is especially required for the iBRoad2EPC Energy demand module (see chapter 6.1).

The calculation is performed with the regular EPC software. It is the same as the regular EPC calculation, except that the renovation measures foreseen for each step are taken into account in the calculation. With most EPC software, a copy of the EPC calculation for the current state of the building can be saved with a new name as a renovation scenario (e.g., step 1). Here, only the renovation measures that are planned for the first step are entered and the new energy demand is calculated. Then a copy of this calculation is made and saved again under a new name (e.g., step 2). In this copy, the renovation measures intended for step 1 are kept and the renovation measures for step 2 are added. The procedure for the other steps is the same. Because the individual renovation steps build on each other, the target state is reached step by step.

How exactly the calculation of the individual renovation steps is carried out depends on the specific EPC software and its operation.

5.5 Step 5: Creation of iBRoad2EPC

The iBRoad2EPC is created with an online tool called the iBRoad2EPC Assistant. The main objectives of this tool are to:

- create the iBRoad2EPC in a uniform design,
- output the iBRoad2EPC in an online format,
- facilitate issuers in assigning renovation measures at specific points in time,
- support issuers with prefabricated content,
- allow easy overwriting of all default texts by the issuer.

The iBRoad2EPC Assistant is used by issuers only and not by building owners, as it requires expert knowledge.

The structure used in the iBRoad2EPC Assistant allows a user-friendly input of the building information, supported by dropdown menus as well as prefabricated text fields, and functionalities. The iBRoad2EPC Assistant is designed to work on the guiding questions of the iBRoad2EPC. They are briefly shown here and their processing in the iBRoad2EPC Assistant is outlined:



Chapter 5 provides detailed guidance on how to navigate through the iBRoad2EPC Assistant.

6. THE IBROAD2EPC ASSISTANT

6.1 Sign In

Users of the iBRoad2EPC Assistant standard front end must first receive an invitation link via email from an administrator. They log in with their email address and set a password of their choice. They will then receive an email with a link to confirm their identity. After this confirmation they are signed in as a user and log in the next time with their email address and password.

The user's login name is displayed in the upper right corner of the Assistant interface. Clicking on the name will take the user to their profile data.



Figure 8: iBRoad2EPC Assistant Standard Front End: profile of the user.

The profile data is displayed under the “MY PROFILE” screen and can be edited by clicking on the “edit” button in order to access the editing menu.

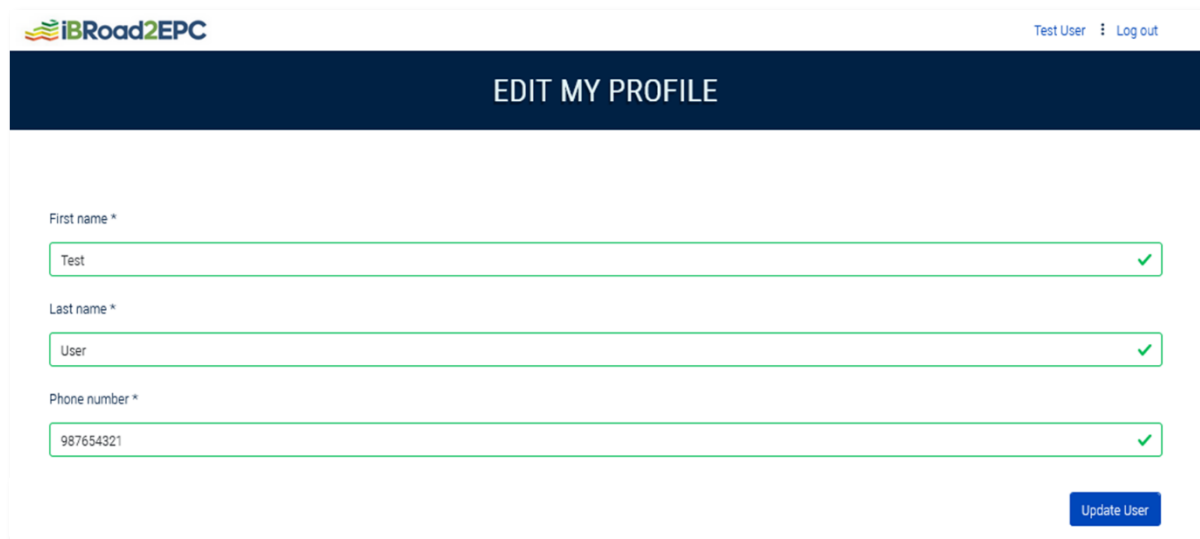


Figure 9: iBRoad2EPC Assistant Standard Front End: editing the user profile.

Under the “EDIT MY PROFILE” screen, the user can change his/her name and phone number. By clicking on the “Update User” button, changes are applied.

By clicking on the “Log out” text in the upper right corner the user can log out of the Assistant and end the session.

6.2 Add a Project

Users are first directed to the project overview which is empty for new users.

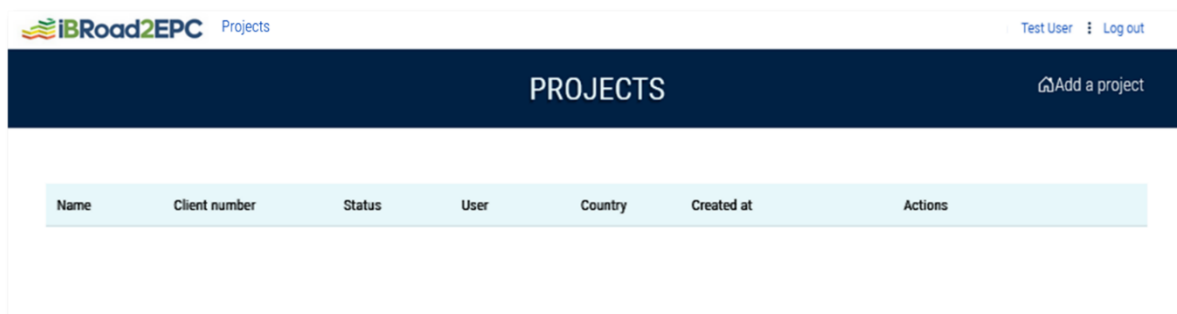


Figure 10: iBRoad2EPC Assistant Standard Front End: for new users the project list is empty.

In iBRoad2EPC, a project is created for each building. The definition of what exactly defines a building corresponds to the rules already in place in the country for EPCs. If an issuer has already created projects, they will be displayed in this window. The list shows the name, date and status of the projects. They can be opened with the link in the last column.

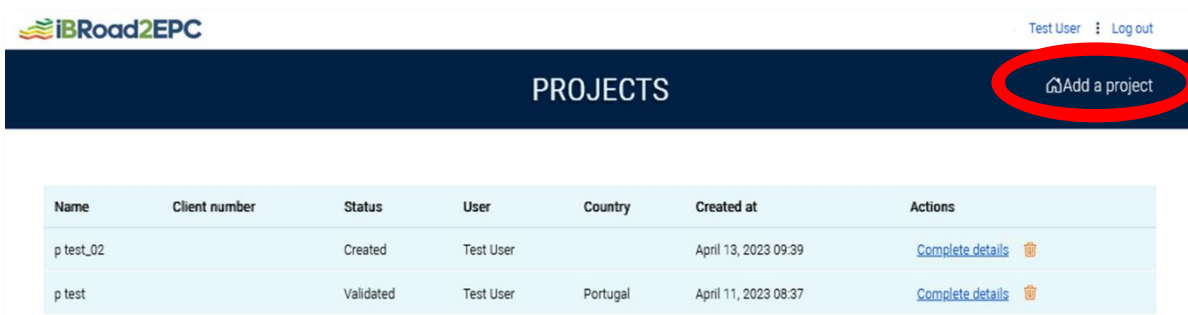


Figure 11: iBRoad2EPC Assistant Standard Front End: all projects of an issuer are shown in a list. New projects are created by clicking “add a project”.

The issuer can click “Add a project” in the upper right corner in order to create a new project. This opens a new window in which a name is given to the new project. Clicking “create project” will confirm the name and open the page “COMPLETE PROJECT DETAILS”.

The screenshot shows the 'COMPLETE PROJECT DETAILS' page of the iBRoad2EPC Assistant. The page has a dark blue header with the iBRoad2EPC logo and navigation links (Home, Partner countries, Users, Projects). Below the header, there are two radio buttons: 'Project details' (selected) and 'Renovation measures'. A 'Next step' button is in the top right corner.

The form is divided into several sections:

- Name ***: A text input field containing 'p_test_07' with a green checkmark.
- Client number**: An empty text input field.
- Building constructed in ***: A dropdown menu.
- Country**: A dropdown menu.
- Climate zone**: A dropdown menu.
- Current energy class**: A dropdown menu.
- Building type**: A dropdown menu.
- Building sub type**: A dropdown menu.
- Environment ***: A dropdown menu.
- Tenure status ***: A dropdown menu.
- Heating system constructed in**: A dropdown menu.
- Cooling system constructed in**: A dropdown menu.
- Project trigger ***: A dropdown menu.
- Project receiver ***: A dropdown menu.
- Recommendations addressed to ***: A dropdown menu.
- Image**: A file upload field with a 'Durchsuchen...' button and the text 'Keine Datei ausgewählt.'
- Certificat EPC ***: A file upload field with a 'Durchsuchen...' button and the text 'Keine Datei ausgewählt.'

Three colored frames highlight specific sections: a blue frame around the building information fields (Building constructed in, Country, Climate zone, Current energy class, Building type, Building sub type, Environment), a green frame around the EPC information fields (Tenure status, Heating system constructed in, Cooling system constructed in, Project trigger, Project receiver, Recommendations addressed to), and a red frame around the EPC upload field (Certificat EPC).

Figure 12: iBRoad2EPC Assistant Standard Front End: input page for building information (blue frame), EPC information (green frame) and EPC upload (red frame).

Issuers create one iBRoad2EPC per building. To this end, they need to enter a few basic data and information about the building into the Assistant. This information must be identical to that included in the uploaded EPC (see Figure 12; red frame) because technical specifications, foreseeable obligations and notes to prevent lock-in situations are drawn from the respective national databases based on these fields. The information on the current state of the building mainly deals with two topics:

- **Building Information (see Figure 12; blue frame):**
Issuers enter information that allow the building to be classified according to country, address,

environment, climate zone, year of construction or building type. This data is crucial to filter the appropriate and individual renovation recommendations.

- **EPC information (see Figure 12; green frame):**

Issuers enter the tenure status, renovation triggers, addressees of the EPC and addressees of the recommendations. With these specifications, further text can be customised and recommendations can be adjusted.

At the bottom of the page, issuers are asked to upload the EPC in PDF format. This is the EPC certificate that they (or another issuer) created for the respective building with the regular EPC software.

By clicking “Confirm details” in the lower right corner leads the user to the page “renovation steps”.

6.3 Create the Renovation Strategy

In this input mask, the issuers enter the renovation strategy they developed in step 3 (chapter 4.3).



[TestLog](#)
[English](#) [User](#) [out](#)
 ⋮

Renovation steps

☒ Project details
 ☐ Renovation measures
 ☐ SRI
 ☐ IEQ
 ☐ MEPI

Next step

Current state


Energy Energy sources : Final energy demand : kWh/m²a GHG emissions : kg/m² Energy costs : 0 €/a

Renovations to be done by: ASAP
 

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
Energy Energy sources : Final energy demand : kWh/m²a GHG emissions : kg/m² Energy costs : 0 €/a

+ Add measure

Renovations to be done by: 2025
 

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
Energy Energy sources : Final energy demand : kWh/m²a GHG emissions : kg/m² Energy costs : 0 €/a

+ Add measure

Renovations to be done by: 2030
 

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
Energy Energy sources : Final energy demand : kWh/m²a GHG emissions : kg/m² Energy costs : 0 €/a

+ Add measure

Renovations to be done by: 2031
 

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
Energy Energy sources : Final energy demand : kWh/m²a GHG emissions : kg/m² Energy costs : 0 €/a

+ Add measure

+ Add step

Next step

Figure 13: iBRoad2EPC Assistant Standard Front End: mask to assign renovation measures to given dates.

In this page, renovation measures can be assigned to given steps, thus creating the renovation strategy for an individual building. The time frames for the renovation steps are predefined for each country.

This means that the number of steps and their date are prefilled by default. However, the steps do not yet contain any renovation measures. Issuers may add more steps or change the default dates if regarded useful.

6.4 Add Renovation Measures

One renovation step can comprise several renovation measures. Issuers navigate to the step they want to assign a measure to and click “add measures”. This opens a drop-down menu (Figure 14) from which they can choose the type of measures. This defines the name of the measure in the output document.

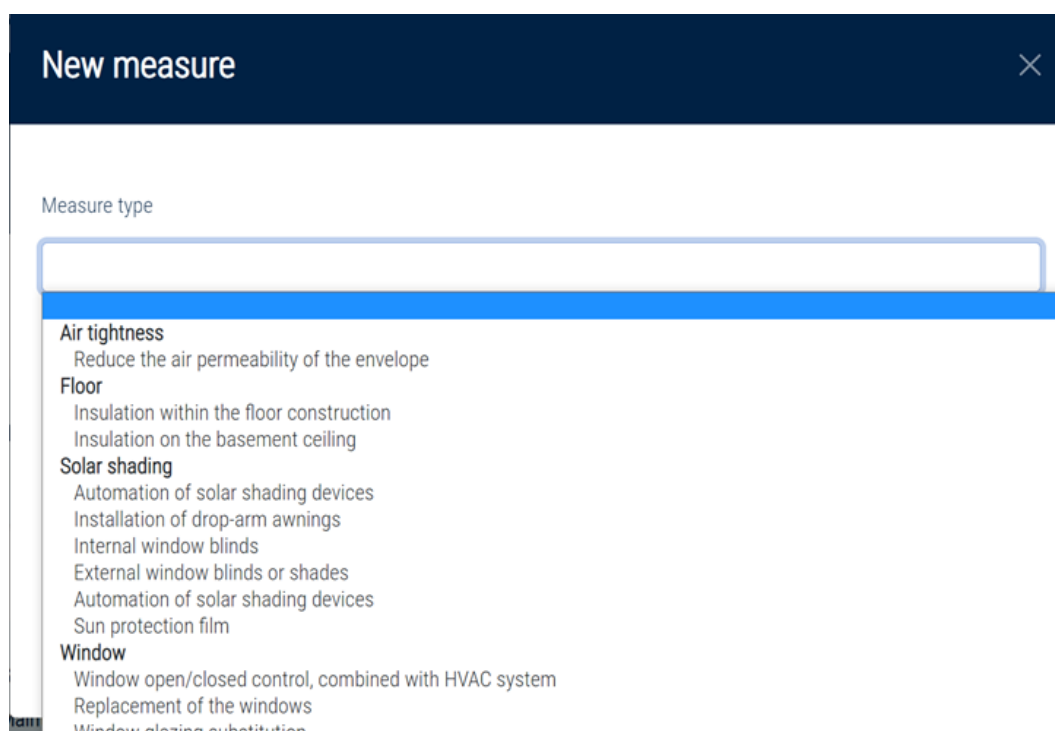


Figure 14: iBRoad2EPC Assistant Standard Front End: drop down menu to select the top category for a renovation measure.

Clicking on a measure type will open a submenu. The iBRoad2EPC Assistant offers ready-made description texts for each measure. Technical specifications are provided automatically according to the specific requirements in the implementing country and, if necessary, depending on climate zone, building type and tenure status. They describe the quality of the measure according to the long-term targets of the respective country. Issuers can edit these texts if the planned implementation of the measure differs from the standard text or to point out specific details to consider in the specific building (Figure 15).

Edit measure

Measure type

External air-water heat pump

Description

Installation of an air-water heat pump. This uses outside air as a heat source. The outdoor unit of the heat pump is installed outdoors. Attention must be paid to the sound diffusion in the neighbourhood. The pipes are led into the heating room through openings in the outer wall. They must be well insulated. Heat pumps can

Specification

The heat pumps should produce three to four parts of heat from one part of electricity (this means the seasonal c

Submit

Figure 15: iBRoad2EPC Assistant Standard Front End: brief description of the renovation measure.

The texts will be displayed in the output document in the detailed description of the measure. Clicking “Submit” adds the new renovation measure to the desired step, closes the window “New measure” and returns to the overview of renovation steps (Figure 13).

Issuers can add further measures within the same step. After each step is finalised, additional measures can be assigned to the desired renovation steps by repeating the procedure described above.

The goal is for the building to be climate neutral after the final renovation step, as defined in the national climate protection targets. To achieve this, all building components that are not of sufficient quality in terms of climate-neutrality in their current state must generally appear as renovation measures in one of the renovation steps.

6.5 Check Preparatory Recommendations

After all renovation measures have been entered, the iBRoad2EPC Assistant automatically inserts preparatory recommendations to prevent lock-in situations (see Figure 16). They appear at the bottom of each renovation step in the overview of renovation steps unless no corresponding recommendations for a step are provided.

Renovations to be done by: ASAP

Costs

Maintenance costs : € 0

Energy related costs : € 0

Funding : € 0

Energy

Energy sources :

1. Gas

Final energy demand : 0 kWh/m²a

GHG emissions : 0 kg/m²

Energy costs : 0.0 €/a

▼

1. Floor - Insulation on the basement ceiling

✎

🗑

Insulation of the cellar ceiling from below. Depending on the surface of the ceiling, the piping underneath and the overall usage of the basement you should consider different insulation materials. Also check for height restrictions.

▲

2. Heating - External air-water heat pump

✎

🗑

Installation of an air-water heat pump. This uses outside air as a heat source. The outdoor unit of the heat pump is installed outdoors. Attention must be paid to the sound diffusion in the neighbourhood. The pipes are led into the heating room through openings in the outer wall. They must be well insulated. Heat pumps can also be used for cooling. The flow temperature in the heating circuit must be lowered as much as possible so that the heat pump can run efficiently.

⚠ Preparations for later renovations steps

▼

+

Add measure

Figure 16: iBRoad2EPC Assistant Standard Front End: recommendations to prepare for later renovation steps and prevent lock-in situations appear automatically at the bottom of the renovation steps.

Clicking the orange exclamation mark will open them in a new window (Figure 17). The recommendations refer to the interaction of the individual measures if they are not implemented simultaneously. Often, connection problems can be avoided by preparing later measures in an earlier step. The recommendations often describe the connection between different building components so that they can be executed airtight and without thermal bridges. The recommendations are intended to help ensure that deep renovation is achieved in the end, even if the measures are carried out in several steps. The recommendations are created automatically. Issuers should check them for correctness and can edit them if necessary. They can be edited by clicking the pencil symbol on the right side. The sequence of measures is also observed within a renovation step. For example, if the 2030 step includes measures in 2027 and 2029 and they are entered in the corresponding order in the step, this is taken into account in the recommendations.



2. Heating - External air-water heat pump

Installation of an air-water heat pump. This uses outside air as a heat source. The outdoor unit of the heat pump is installed outdoors. Attention must be paid to the sound diffusion in the neighbourhood. The pipes are led into the heating room through openings in the outer wall. They must be well insulated. Heat pumps can also be used for cooling. The flow temperature in the heating circuit must be lowered as much as possible so that the heat pump can run efficiently.

 Preparations for later renovations steps 

Prepare for External insulation (ETICS System) 

When replacing the heat generator, please prepare for later insulation of the exterior walls by selecting a heating capacity that is adjusted to the foreseen insulated state. This will allow you to buy a smaller, cheaper heat generator. This will increase its efficiency after the insulation measure.

Figure 17: iBRoad2EPC Assistant Standard Front End: recommendations to prepare for later renovation steps and prevent lock-in situations.

6.6 Preview of iBRoad2EPC

Once all renovation measures that the issuer foresees for the building are assigned to the desired renovation steps and the according recommendations are produced, the basic iBRoad2EPC is finalised and issuers can quit the editing mode by clicking the button “Create the overview document” in the lower right corner of the page (see Figure 18).

This creates an overview page summarising all entries (renovation measures, project details, building image, and efficiency class). Future legal obligations are marked in the respective step. Issuers can check the overall strategy and the uploaded image (see Figure 19).



English

Log out

RENOVATION STEPS

☒ Project details
 ☐ Renovation measures
 ☐ IEQ
 ☐ SRI

Next step

Current state

Energy sources :
 Final energy demand : kWh/m²a
 GHG emissions : kg/m²
 Energy costs : 0 €/a

Renovations to be done by: ASAP

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
 Energy sources :
 1. Gas
 Final energy demand : 0 kWh/m²a
 GHG emissions : 0 kg/m²
 Energy costs : 0.0 €/a

1. Floor - Insulation on the basement ceiling

Insulation of the cellar ceiling from below. Depending on the surface of the ceiling, the piping underneath and the overall usage of the basement you should consider different insulation materials. Also check for height restrictions.

2. Heating - External air-water heat pump

Installation of an air-water heat pump. This uses outside air as a heat source. The outdoor unit of the heat pump is installed outdoors. Attention must be paid to the sound diffusion in the neighbourhood. The pipes are led into the heating room through openings in the outer wall. They must be well insulated. Heat pumps can also be used for cooling. The flow temperature in the heating circuit must be lowered as much as possible so that the heat pump can run efficiently.

Preparations for later renovations steps

Add measure

Renovations to be done by: 2025

Renovations to be done by: 2040

Costs Maintenance costs : € 0 Energy related costs : € 0 Funding : € 0
 Energy sources :
 1. Electricity
 Final energy demand : 0 kWh/m²a
 GHG emissions : 0 kg/m²
 Energy costs : 0.0 €/a

Add measure

Regulation targets

All buildings should be nZEB/ZEB by 2050.

Add step

Create the overview document

Figure 18: When the strategy is completely entered the user can “create the overview document” [only if no other module (IEQ, SRI) is activated].


Projects
test user | Logout

PROJECT: TEST
Download enhanced EPC pdf
iBRoad2EPC document
Edit

RENOVATION PLAN

Current state

Renovations to be done by: ASAP

1. Roof - Roof insulation

Insulation of the roof surface together with the renewal of the roof tiles. The new insulation will be installed on top of the slab/framework.

ⓘ Preparations for later renovations steps

Renovations to be done by: 2025

1. Window - Replacement of the windows

Replacement of all windows that are older than 10 years. If you replace the windows without insulating or having insulated your external walls, ask your energy adviser for possible thermal bridges and related risk of mould. Also ask if the minimum ventilation is guaranteed any longer. The new windows must be connected to the masonry in a long-lasting airtight manner. Foaming with installation foam is usually not sufficient.

ⓘ Preparations for later renovations steps

2. External wall - External insulation (ETICS System)

Insulation of the entire external wall on the outside with an "External Thermal Insulation Composite Systems" (ETICS). The of ETICS, such as cement, insulation boards, armouring and plaster, are adjusted to each other and together form an certified system. Polystyrene foam, mineral fibre or renewable insulation materials are usually used as insulation.

ⓘ Preparations for later renovations steps

3. Renewable energy sources - PV system

Installation of a PV system on the roof. If possible, the entire suitable roof area should be utilised. The electricity generated is primarily used in the building via an inverter and alternatively fed into the public grid via an additional electricity meter. Get advice on the different types of PV modules.

Renovations to be done by: 2040

1. Heating - External air-water heat pump

Installation of an air-water heat pump. This uses outside air as a heat source. The outdoor unit of the heat pump is installed outdoors. Attention must be paid to the sound diffusion in the neighbourhood. The pipes are led into the heating room through openings in the outer wall. They must be well insulated. Heat pumps can also be used for cooling. The flow temperature in the heating circuit must be lowered as much as possible so that the heat pump can run efficiently.

Regulation targets

By 1 January 2040, 52% of non-residential buildings will need to have replaced all the lighting by LED and have upgraded electric equipment

By 1 January 2050, 100% of non-residential buildings will need to have replaced all the lighting by LED and have upgraded electric equipment

By 1 January 2040, 50% of non-residential buildings will need to have efficient heating and cooling systems such as electrical heat pumps in place. All gas and diesel systems replaced by electrical systems.

By 1 January 2050, 100% of non-residential buildings will need to have efficient heating and cooling systems such as electrical heat pumps in place

By 1 January 2040, 75% of non-residential buildings owned by public bodies will need to have efficient heating and cooling systems such as electrical heat pumps in place. All gas and diesel systems replaced by electrical systems.

By 1 January 2050, 100% of non-residential buildings owned by public bodies will need to have efficient heating and cooling systems such as electrical heat pumps in place.

PROJECT DETAILS

Utilizator	Test User	Country	Portugal
Environment	Urban	Climate zone	I1 v1
Building type	Public Building	Building sub type	Office building
Current energy class	F	Building constructed in	1950
Heating system constructed in	2010	Cooling system constructed in	
Tenure status	Owner occupied	Project trigger	No legal trigger
Project receiver	Property manager	Recommendations addressed to	Property manager
Componentele clădirii au fost deja renovate până la starea țintă?		Stare	Trimis

Currently attached image

Currently attached EPC document

[energieausweis.pdf](#)

Figure 19: iBRoad2EPC Assistant: the overview includes all renovation steps and the measures contained in each step, regulation targets and project details.

After finalising the input as shown before, a new menu (see Figure 20) appears in the upper right corner.



Figure 20: This menu appears after the completion of data entry.

The menu allows issuers to

- return to the editing mode in case any changes are required (“edit”).
- open a preview of the iBRoad2EPC output document by clicking “iBRoad2EPC document”. This opens the online version of the iBRoad2EPC output document (see Figure 21) and allows navigating through all output pages designed for the building owners.
- download the enhanced EPC in pdf format. This will output the EPC document that was uploaded in the project detail page (Figure 12) together with an additional page showing a QR code and an internet link (Figure 22). Both will direct the building owner to their iBRoad2EPC output page (Figure 3) using either their mobile phone or computer.

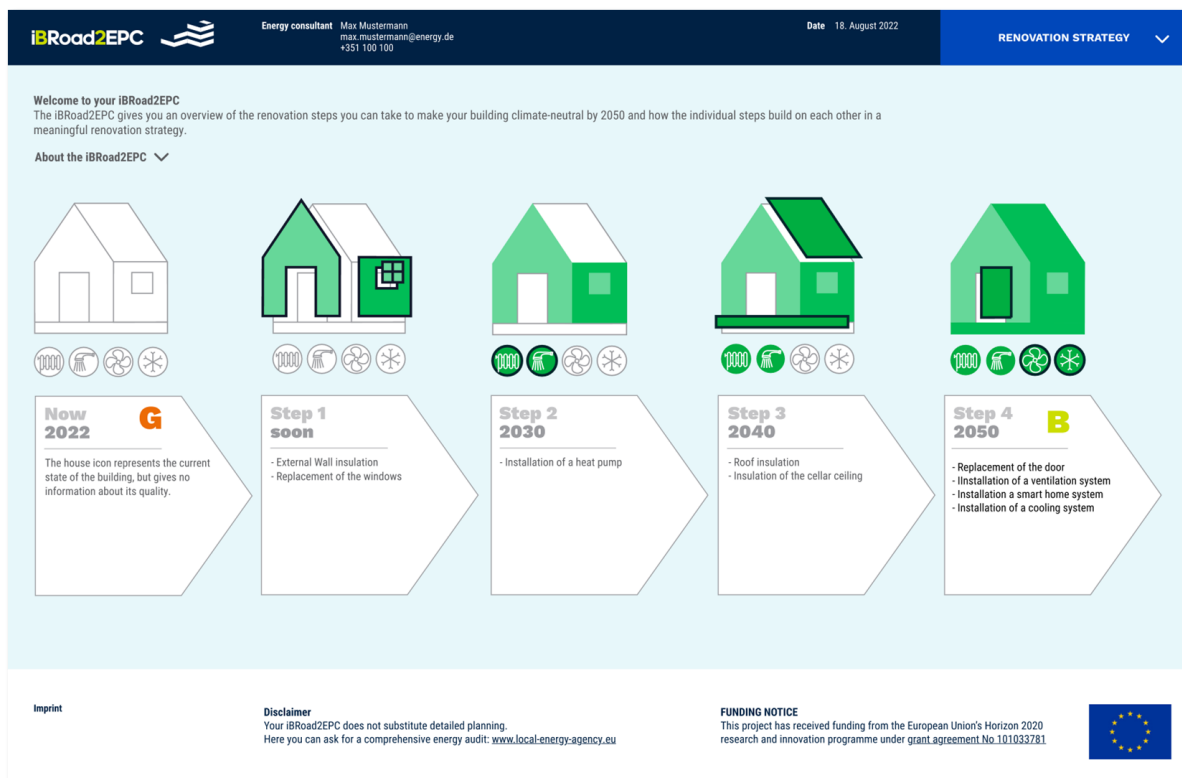


Figure 21: Preview of the iBRoad2EPC: overview page for building owners



Figure 22: The iBRoad2EPC Assistant can attach an extra page to the EPC providing the link to the online output of the iBRoad2EPC document.

7 ADDITIONAL FUNCTIONALITIES OF IBROAD2EPC

All features of the iBRoad2EPC described so far comprise the iBRoad2EPC Basic module. They form the core of iBRoad2EPC and are the same in all implementing countries except for minor national adaptations. The Basic module can be extended with other modules to provide further information to the building owners. Each country implementing iBRoad2EPC decides which modules to introduce. This decision then applies to all iBRoad2EPCs issued in that country. Issuers cannot switch modules on or off themselves.

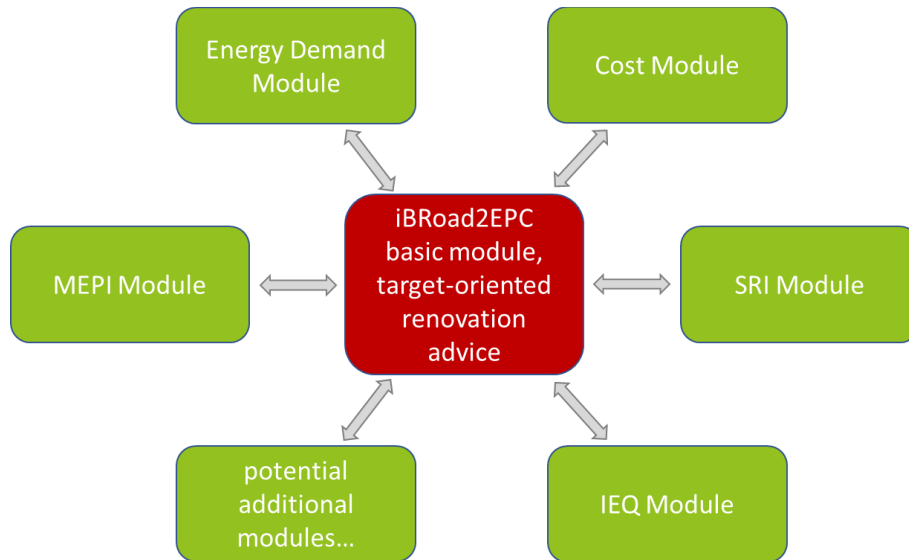


Figure 23: Modular concept of iBRoad2EPC: the Basic module can be enhanced with other modules to adapt iBRoad2EPC to the requirements in implementing countries.

The following modules are available:

- Energy Demand module
- Investment Cost module
- Indoor Environment Quality (IEQ) module
- Smart Readiness Indicator (SRI) module
- Measured Energy Performance Indicator (MEPI) module

Each module adds an input page to the iBRoad2EPC Assistant where issuers can enter all relevant input for that module. The respective results of the modules are displayed in a similar layout as the Basic module.

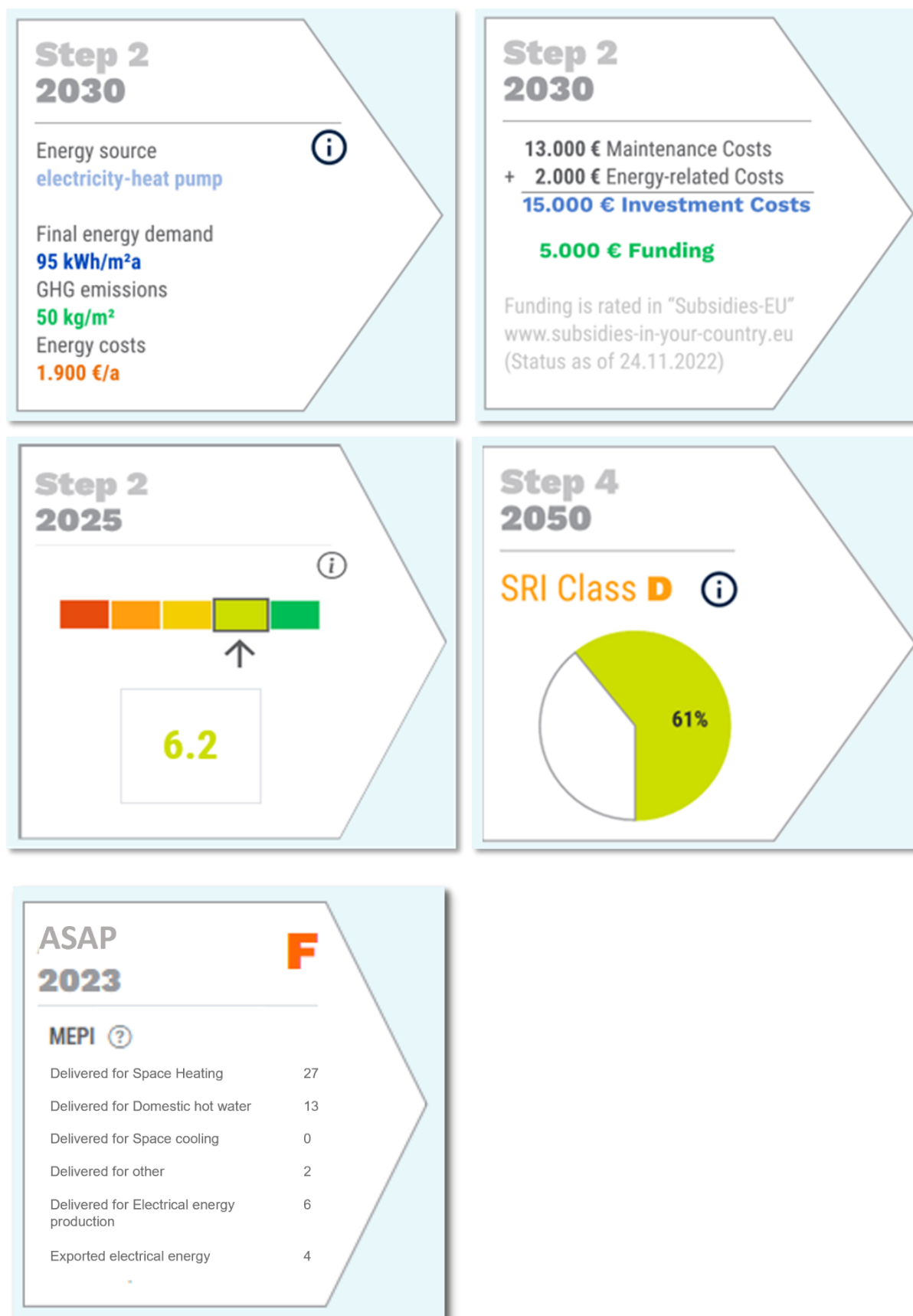


Figure 24: Display of additional modules in iBRoad2EPC: energy demand, investment cost, indoor environment quality, smart readiness indicator and measured energy performance in the output document of iBRoad2EPC.

All available modules are presented in the following sections. Issuers only need to look at the description of the modules that are available in their country.

7.1 Energy Demand Module

The Energy Demand module adds the following information for each renovation step to the iBRoad2EPC:

- energy consumption
- efficiency class
- greenhouse gas emissions
- energy costs

This clearly shows the impact of the measure on the building and the relevant savings. This way, building owners receive additional information that may support their decision to renovate.

The Energy Demand module creates an extra page in the output document of iBRoad2EPC (see Figure 25). The sequence of the renovation measures equals the sequence in the Basic module. The information included in the arrows shows the energy demand, GHG emissions and energy costs for each renovation step (Figure 26).

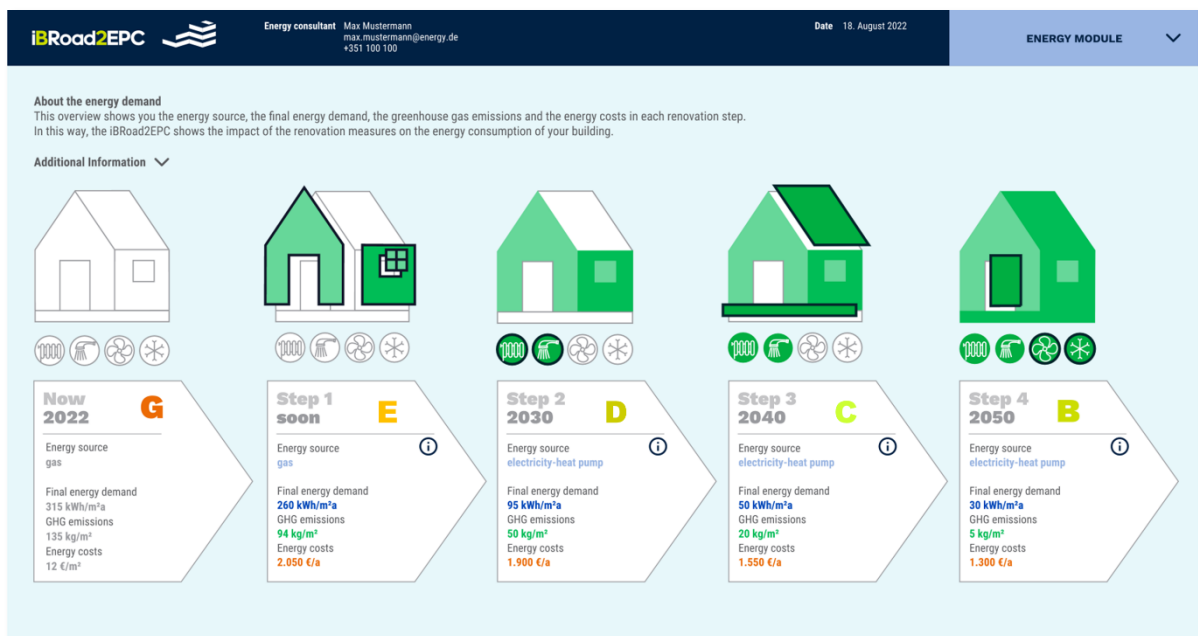


Figure 25: Output page of the Energy Demand module in the online version in the output document of iBRoad2EPC.

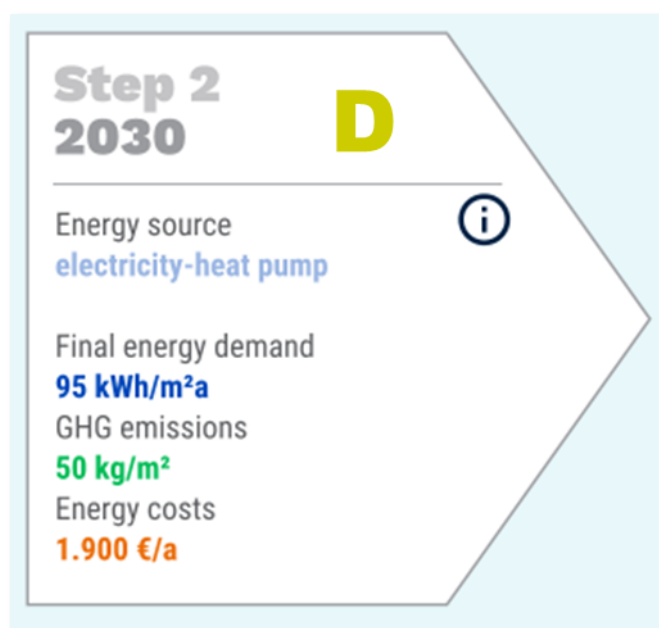


Figure 26: Additional information from the Energy Demand module in the output document of iBRoad2EPC.

The Energy Demand module requires an EPC calculation for every foreseen renovation step. The calculation is performed with the regular EPC software. Issuers save the calculation of the current building state (e.g. “Now 2022” in Figure 25).

With most EPC software, a copy of the EPC calculation for the current state of the building can be saved with a new name (e.g. “Step 1, soon” in Figure 25). Here, only the renovation measures that are planned for the first step are entered (in the example in Figure 25, the insulation of the outer wall and the exchange of the windows) and the new energy demand is calculated and saved. Then a copy of the calculation of Step 1 is made and saved again under a new name (e.g. “Step 2, 2030” in Figure 25). In this copy, the renovation measures of step 1 are kept and the renovation measures for step 2 are added (in the example in Figure 25, a new heat pump for heating and domestic hot water). The procedure for the other steps is the same. Because the individual renovation steps build on each other, the target state is reached step by step.

How exactly the calculation of the individual renovation steps is carried out depends on the specific EPC software in the country and its operation.

The efficiency class, greenhouse gas emissions and energy costs for each step can be calculated from the energy demand. When these results are available, they can be entered manually into the iBRoad2EPC Assistant input screen. It will open automatically when a renovation step is defined if the Energy Demand module is implemented in the country (see Figure 27).

Project: p test: edit step for ASAP

Target year

☒
Asap

Energy

Energy sources

1. Gas

+

-

Current energy class

E

A+
A
B
B-
C
D

Final energy demand

153

153 kWh/m²a

GHG emissions

39

39 kg/m²

Energy costs

3000

3000 €

Submit

Submit

Figure 27: iBRoad2EPC Assistant Standard Front End: Input screen of the Energy Demand module.

7.2 Investment Cost Module

The Investment Cost module allows for the display of renovation costs in iBRoad2EPC. The following cost types can be presented:

- Total investment costs**
 The total cost of all renovation measures included in a renovation step. This is the sum that the building owners will have to pay for this step.
- Maintenance costs**
 Part of the total costs that have to be spent anyway for the maintenance of the building. They would arise in renovations without any energy improvement.
- Energy-related additional costs**
 Part of the total cost that arises only from the energy improvement.

- **Funding**

The presentation of the funding mainly refers to grant subsidies. They can easily be shown for each renovation step. The benefits of subsidised loans, on the other hand, can hardly be assigned to a single point in time. Therefore, loans should preferably be described in writing. A corresponding input field for free text is provided. Here, issuers can also provide links to further information.

The output is done in a separate page, which only appears when implementing countries opt for the Investment Cost module. The output is graphically oriented to the output of the Basic module, so that building owners can understand the information intuitively (see Figure 28 and Figure 29). The issuer does not necessarily have to enter the cost types completely. If a cost type is not entered, it will not be displayed in the output document.

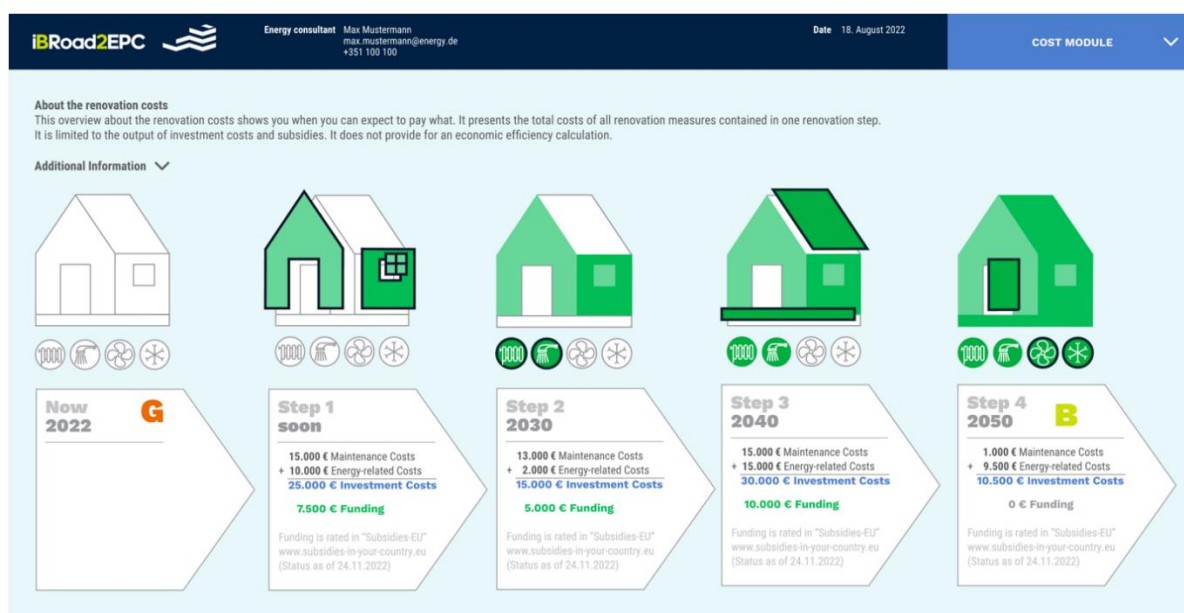


Figure 28: Display of the results from the Investment Cost module in the output document of iBRoad2EPC.



Figure 29: Additional information from the Investment Cost module in the output document of iBRoad2EPC.

Issuers calculate the investment costs using the methods they usually use. They sum up the costs of all measures contained in one renovation step. The results of the cost calculation can be entered for each step in an input mask (see Figure 30). It appears once the entries of the renovation measures for a renovation step have been completed.

The total investment cost will be summed up automatically from the maintenance cost and the energy related cost.

Project: p test: edit step for ASAP

Target year

Asap

Renovation step costs

Maintenance costs	Energy related costs	Funding
10000 €	5000 €	2000 €

Submit

Figure 30: iBRoad2EPC Assistant Standard Front End: Input screen of the Investment Cost module

For building owners, the question of costs of energy renovation is central. Energy efficiency measures reduce costs and thus have the potential to compensate investment cost. Although a reduction in total costs is a strong motivation for many building owners, it cannot be used as the sole guide for the depth of renovation. The economic viability of renovation measures depends heavily on the future development of energy prices. A long-term view such as the iBRoad2EPC must take into account the long-term development of energy prices. The evaluation of economic efficiency should therefore not only focus on short payback periods, but rather on the affordability and reasonableness of the costs.

7.3 Indoor Environmental Quality (IEQ) Module

The IEQ module allows issuers to evaluate the indoor environmental quality of a building. The main determinants of IEQ are

- indoor air quality
- thermal comfort
- lighting
- acoustics

An IEQ comfort indicator was developed in the X-tendo project⁵ together with an assessment approach for the calculation of comfort rating covering all aspects of IEQ. iBRoad2EPC integrates the Comfort Asset Rating Procedure (CARP) of X-tendo where the required information can be captured through checklists.

If the IEQ module is implemented in a country, the corresponding input mask (see Figure 31) opens automatically after the definition of the renovation measures is completed. At the top left of the page is a link to download the excel tool (button "download the template"). The spreadsheet is not downloaded from the original X-tendo website, but a copy is provided within the iBRoad2EPC Assistant. This ensures that issuers can find the tool even if the external providers at X-tendo should change the link in the future. It also ensures that issuers download the appropriate version of the spreadsheet to which the iBRoad2EPC Assistant is aligned if updates are generated in the X-tendo project in the future. The issuers fill in all necessary information for the CARP method in this spreadsheet and thus calculate the IEQ rating of the building.

⁵ <https://x-tendo.eu/>

IEQ data

☒ Project details
 ☒ Renovation measures
 ☒ SRI
 ☐ **IEQ**
☐ MEPI

[Next step](#)

Indoor Environmental Quality Assessment

During this step, you as an auditor can calculate the Indoor Environmental Quality (IEQ) of the building you are analysing. The template for the calculations is provided in the link below. In the first few sheets of the document, you can find a more detailed explanation of how to get to the resulting IEQ values.

The tool will highlight all measures per step that are relevant to the IEQ of your building. This way you can see for which steps IEQ calculations are recommended.

Please do not change the location of any fields in the spreadsheets. Corrupted documents will not be accepted.

[Download the template](#)

Current state

IEQ Document

Keine ausgewählt

[Upload IEQ spreadsheet](#)

⌵

Figure 31: iBRoad2EPC Assistant Standard Front End: input mask for the indoor environment quality (IEQ) rating.

Scoring and weighting in the IEQ spreadsheet

The main indicators assessed within CARP-method are: (1) thermal comfort, (2) indoor air quality, (3) visual comfort, (iv) acoustic comfort. To identify the overall IEQ level all four indicators are assessed independently based on multiple different criteria. Under each criterion specific parameters are assessed. A combined rating is possible to assess all indicators but it is also possible to rate individual indicators as shown in Figure 32:

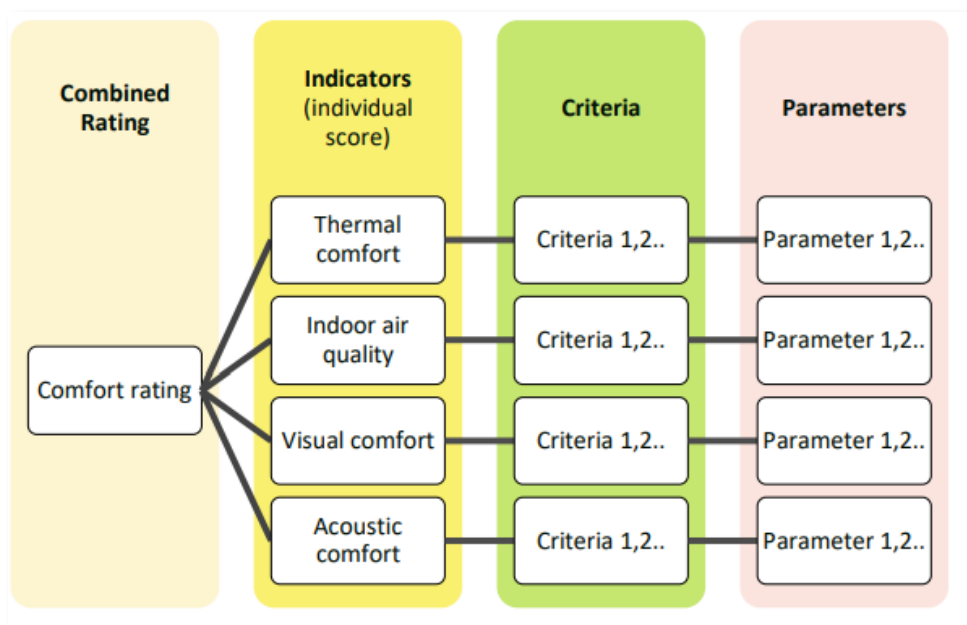


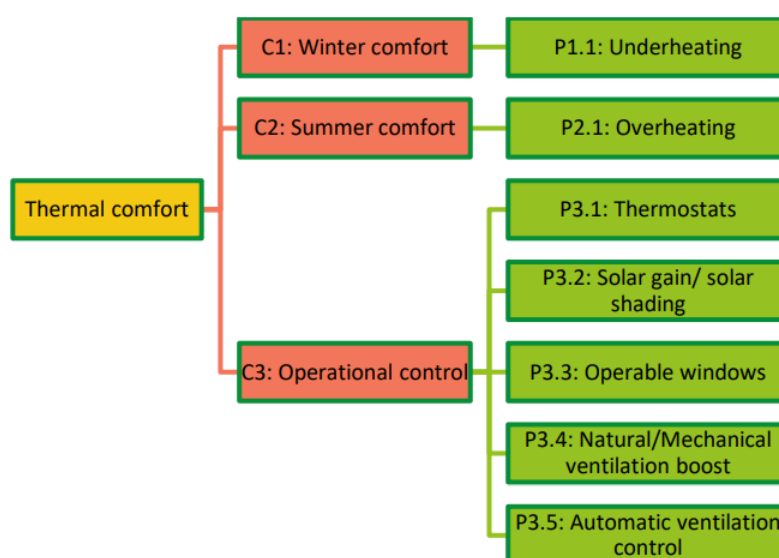
Figure 32: Indicators, criteria, and parameters in IEQ (source: IEQ user guide).

Indicators: Refer to the four main components of the comfort feature. These components may be assigned equal or different relative weightage depending on the different aspects, e.g. region, type of buildings, etc. Each indicator will be assessed based on several criteria.

Criteria: The criteria are the aspects that are assessed under each indicator. The list of criteria is prepared based on existing literature. Criteria are assigned different or similar relative weightages based on expert inputs in the tool.

Parameters: Certain parameters are used to assess each criterion based on the impact on comfort and health and well-being of the occupants. Relative weightage is assigned to each parameter based on expert inputs. Each parameter can obtain a score of 0 (worst) to 10 (best) which is assessed using a checklist. Individual scales for each parameter are developed for their scoring.

The criteria (C1 - C3) and parameters (P1.1 - P3.5) of the thermal comfort indicator are shown in Figure 33:



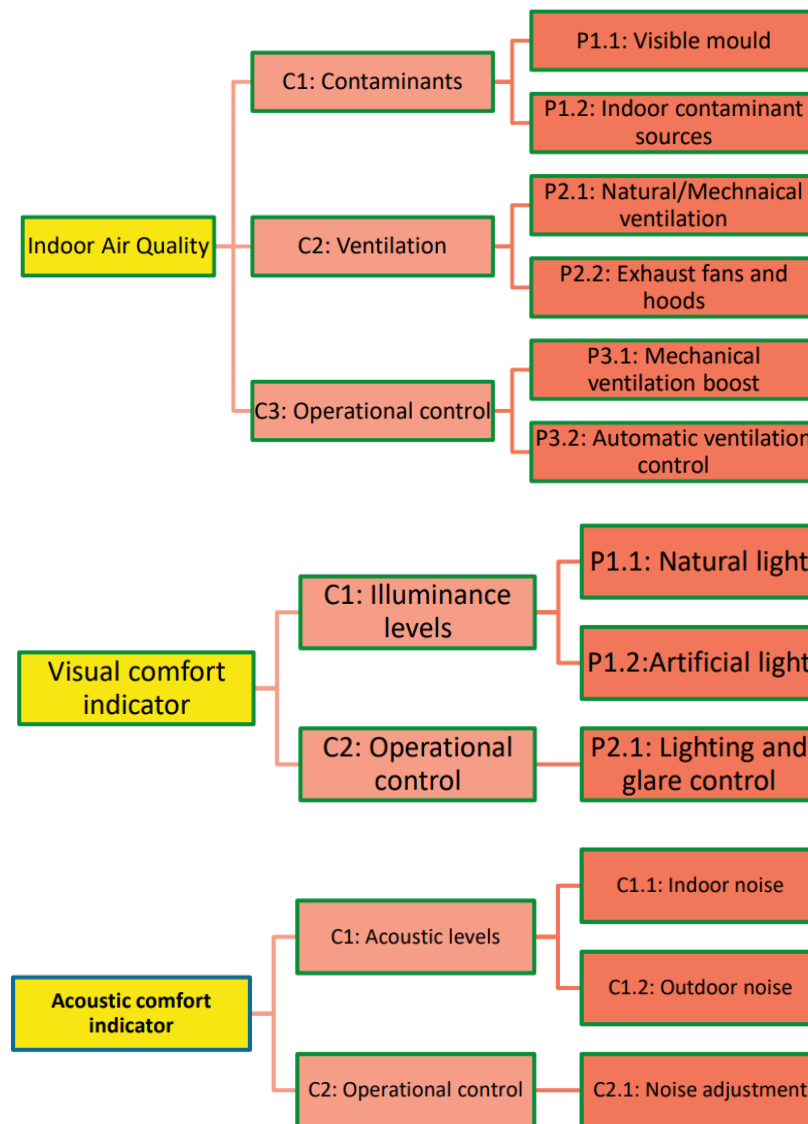


Figure 33: Structure of criteria and parameters in IEQ (source: IEQ user guide).

Issuers provide the information in the Excel spreadsheet. There is a separate tab for each indicator. The fields to be filled-in are marked in yellow. Drop-down menus are available for some information. When all the information for all the indicators has been entered, the tool automatically calculates the total IEQ score (see Figure 34).

Factors responsible for under-heating		
Geography		
Country		Spain
Climatic zone	Climate zone	Zone A3
Site characteristics		
Mutual shading of glazed areas from trees/buildings in winter	Shading (partial or full) from neighbouring trees and buildings reduce solar gains from solar exposed E/W/S surfaces.	Yes
Building/ system characteristics		
Type of dwelling	Certain factors such as dwelling type decrease underheating risk such as enclosed dwellings, dense apartments etc. Existing dwellings before and after renovation would have significant difference in indoor comfort levels due to insulation. Windows offer protection against thermal discomfort and are primary components of heat loss in the fabric of buildings.	Apartment/Flat (low/high-rise) - Please select - End-terrace - Mid-terrace - Detached - Semi-detached - Apartment/Flat (low/high-rise)
Insulation (wall/roof/floor)		
Windows		Single
Age of construction		
Age of the building	Age of the building is a determinant of the degradation of the envelope and its capacity to provide air-tightness.	1965- 1980
Under-heating probability		Medium
<Back to rating display		

Figure 34: Example of an input table in the IEQ excel tool.

The IEQ is first calculated for the current state of the building. The completed excel-file can then be uploaded in the "current state" field (Figure 31). Issuers can browse their computer and select the appropriate excel file. Clicking the button "upload IEQ spreadsheet" will submit the file. The Assistant checks the plausibility and completeness of the spreadsheet and imports the IEQ result. Based on the provided inputs, the IEQ output page (Figure 35) visualises the achieved rating of comfort after assigning weights to each of the indicators (thermal comfort, indoor air quality, visual comfort, and acoustic comfort).

If measures in the following renovation steps affect the IEQ, the calculation has to be repeated for these steps and a new excel-file must be uploaded in the corresponding step. If following measures do not affect the IEQ (e.g., new heat generator), no new IEQ calculation needs to be performed for this step. The spreadsheet-file does not have to be uploaded for such steps. In such steps, the IEQ value from the previous step is automatically taken over.

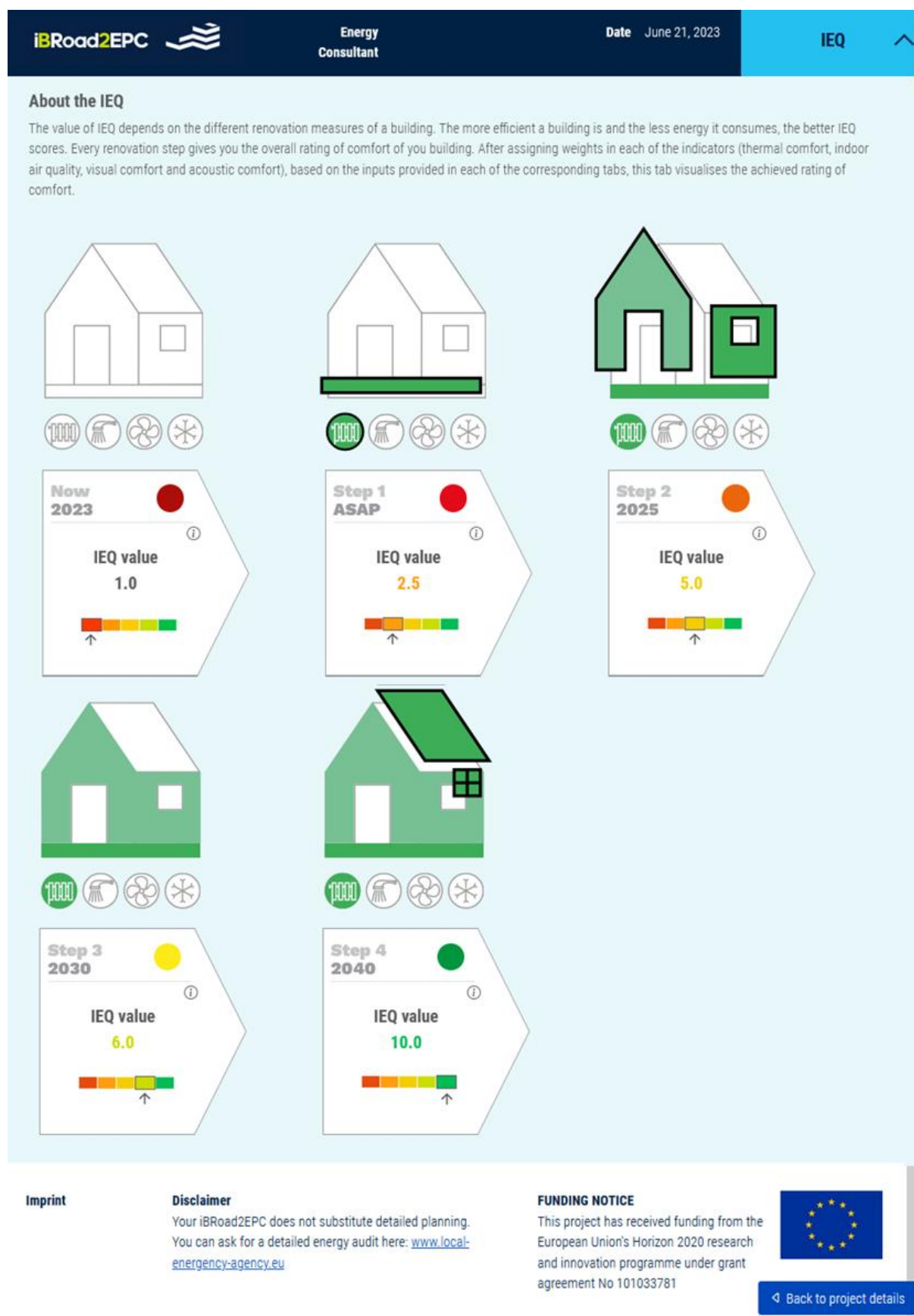


Figure 35: Indoor environment quality (IEQ) rating in the output document of iBRoad2EPC. The round circles present the energy class from Poland.

7.4 Smart Readiness Indicator (SRI) Module

The concept of the Smart Readiness Indicator (SRI) was introduced by the European Commission. The SRI rates the readiness of buildings in performing three key functionalities:

- to optimise energy efficiency and overall in-use performance
- to adapt their operation to the needs of the occupant
- to adapt to signals from the grid (for example, energy flexibility)

The SRI comprises heating, cooling, domestic hot water, ventilation, dynamic building envelope, electricity, electric vehicle charging and monitoring and control. Up to 15 subgroups can be processed for each of these services.

In iBRoad2EPC, the official calculation methods and tools of the European Commission are used. This ensures that they are in line with the standards. This manual briefly explains the SRI and describes the interface to iBRoad2EPC. Detailed explanations of the SRI can be found in the SRI user guides⁶. The European Commission provides an online SRI calculation sheet. This is an excel spreadsheet that allows for data entry, processing and displaying the SRI results in a unified layout. One can request for the SRI assessment package under [this link](#).

If the SRI module is implemented in a country, the corresponding input mask opens automatically after the definition of the renovation measures is completed. At the top left of the page is a link to download the excel tool (button "download the template") (see Figure 36). The spreadsheet is not downloaded from the original SRI site, but a copy is provided in the iBRoad2EPC Assistant. This ensures that issuers can find the tool even if the external providers should change the link in the future. It also ensures that issuers download the appropriate version of the spreadsheet to which the iBRoad2EPC Assistant is aligned if updates are generated in the SRI project in the future. The fields to be filled-in are marked in yellow (see Figure 37). The issuers fill in all necessary information in this spreadsheet and thus calculate the SRI.

⁶ <https://energy.ec.europa.eu/system/files/2022-06/SRI%20training%20slide%20deck%20-%20Version%2020-%20Jan%202022%20-%20updated.pdf>



SRI data

☒ Project details ☒ Renovation measures ☐ **SRI** ☐ IEQ ☐ MEPI

[Next step](#)

Smart Readiness Indicator

During this step, you as an auditor can calculate the Smart Readiness Indicator (SRI) of the building you are analysing. The template for the calculations is provided in the link below. In the first few sheets of the document, you can find a more detailed explanation of how to get to the resulting SRI values.

The tool will highlight all measures per step that are relevant to the smart readiness of your building. This way you can see for which steps SRI calculations are recommended.

Please do not change the location of any fields in the spreadsheets. Corrupted documents will not be accepted.

[Download the template](#)

Current state

SRI Document

Datei auswählen

Keine ausgewählt

[Upload SRI spreadsheet](#)

⇓

Renovations to be done by: ASAP

Figure 36: iBRoad2EPC Assistant Standard Front End: SRI Module.

GENERAL BUILDING INFORMATION	
Building type	residential
Building usage	residential - single-family house
Location	Denmark
Climate zone:	North Europe
Total useful floor area of the building	<200 m²
Year of construction	< 1960
Building state	Original
Please provide a brief description of the building	
Address:	
METHODOLOGY SELECTION	
Preferred weightings	Default
Preferred services catalogue	A
Domains present	
Are the following technical building systems present in your building?	
If not, are they mandatory for new constructions in your country of residence?	
1 - This domain is present; 2 - This domain is absent but mandatory; 0 - This domain is absent and not mandatory	
Heating	1
Domestic hot water	1
Cooling	0
Ventilation	1
Lighting	1
Dynamic building envelope	0
Electricity	1
Electric vehicle charging	0
Monitoring and control	0
ASSESSMENT DATE	
Year	2022
Month	1
Day	16

Figure 37: Excerpt from the SRI excel tool: general building information and selection of the calculation method and services to assess.

The excel file with the completed calculations can be uploaded to the iBRoad2EPC Assistant. Here, the results for the SRI are automatically extracted, checked, and inserted into the output format of the iBRoad2EPC SRI module.

This assessment should be done first for the current state of the building. Second, the issuer should check for every renovation step whether the package of measures is expected to result in a change in any of the input variables for the SRI calculation. Third, the issuer should carry out the SRI calculation for those renovation steps with a possible change of the SRI input variables.

code	service	1						
H-1c	Storage and shifting of thermal energy	Service group: Control heat production facilities						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	None	0	0	0	0	0	0	0
level 1	HW storage vessels available	1	0	1	1	0	0	0
level 2	HW storage vessels controlled based on external signals (from BACS or grid)	2	0	1	1	0	0	0
level 3	0	–	–	–	–	–	–	–
level 4	0							
Information sources								
Standard?		EN 15232						
code	service	0						
H-1d	Control of distribution pumps in networks	Service group: Heat control - demand side						
Functionality levels		IMPACTS						
		Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well-being and accessibility	Maintenance and fault prediction	Information to occupants
level 0	No automatic control	0	0	0	0	0	0	0
level 1	On off control	1	0	0	0	0	0	0
level 2	Multi-Stage control	2	0	0	0	0	0	0
level 3	Variable speed pump control (pump unit (internal) estimations)	2	0	0	0	0	0	0
level 4	Variable speed pump control (external demand signal)	2	0	0	0	0	0	0

Figure 38: Excerpt from the SRI excel tool: rating for different services.

After the assessment is completed, the results are obtained in three different levels, according to the level of detail and granularity that the user would like to see: (1) the total SRI score, (2) the impact scores and (3) by domain scores. These three levels are also shown in Figure 39. It is recommended to display these three levels of information for the status quo, the final status and every step where a change of the SRI may occur, i.e., where the package of measures foreseen in the corresponding renovation step results in a change of input data in the SRI tool.

The Figures 38 and 39 show an exemplary result of the testing of the SRI. Figure 39 shows the result from the overall trajectory whereas Figure 38 shows the results on service-level. Such a result would be displayed for every renovation step where a change in SRI-related input data occurs, e.g. when the control of the heating system is improved or reporting and monitoring devices on the consumption are added.

Figure 40 to Figure 42 visualise the SRI results that are shown in the iBRoad2EPC Assistant. Figure 40 shows the overview page with the SRI score displayed for every renovation step. The impact that the planned measures will have on the SRI score can be seen best in this view. The graphs in Figure 41 and Figure 42 show the results from Figure 39 adapted to the iBRoad2EPC design.

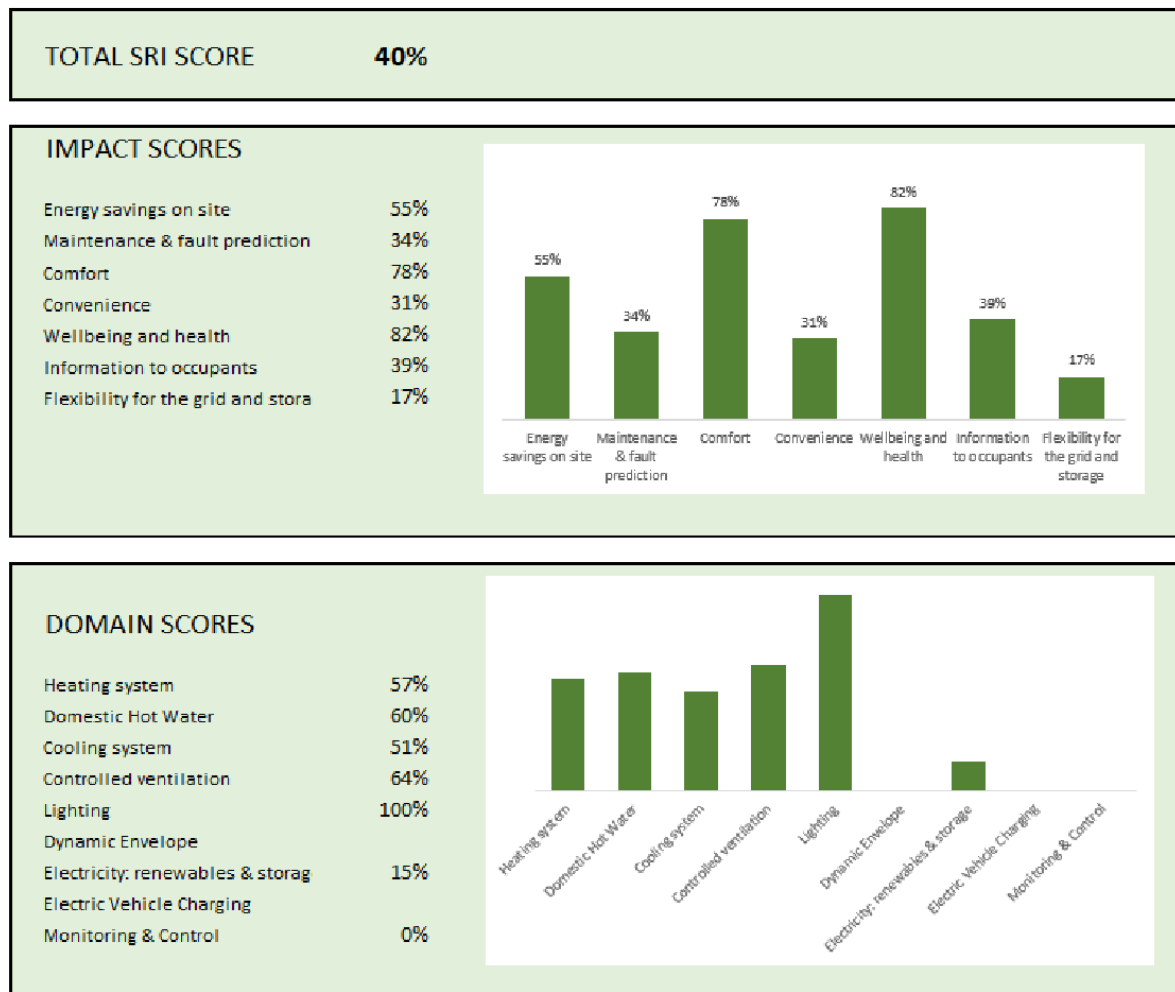


Figure 39: Exemplary test result of the SRI indicator.

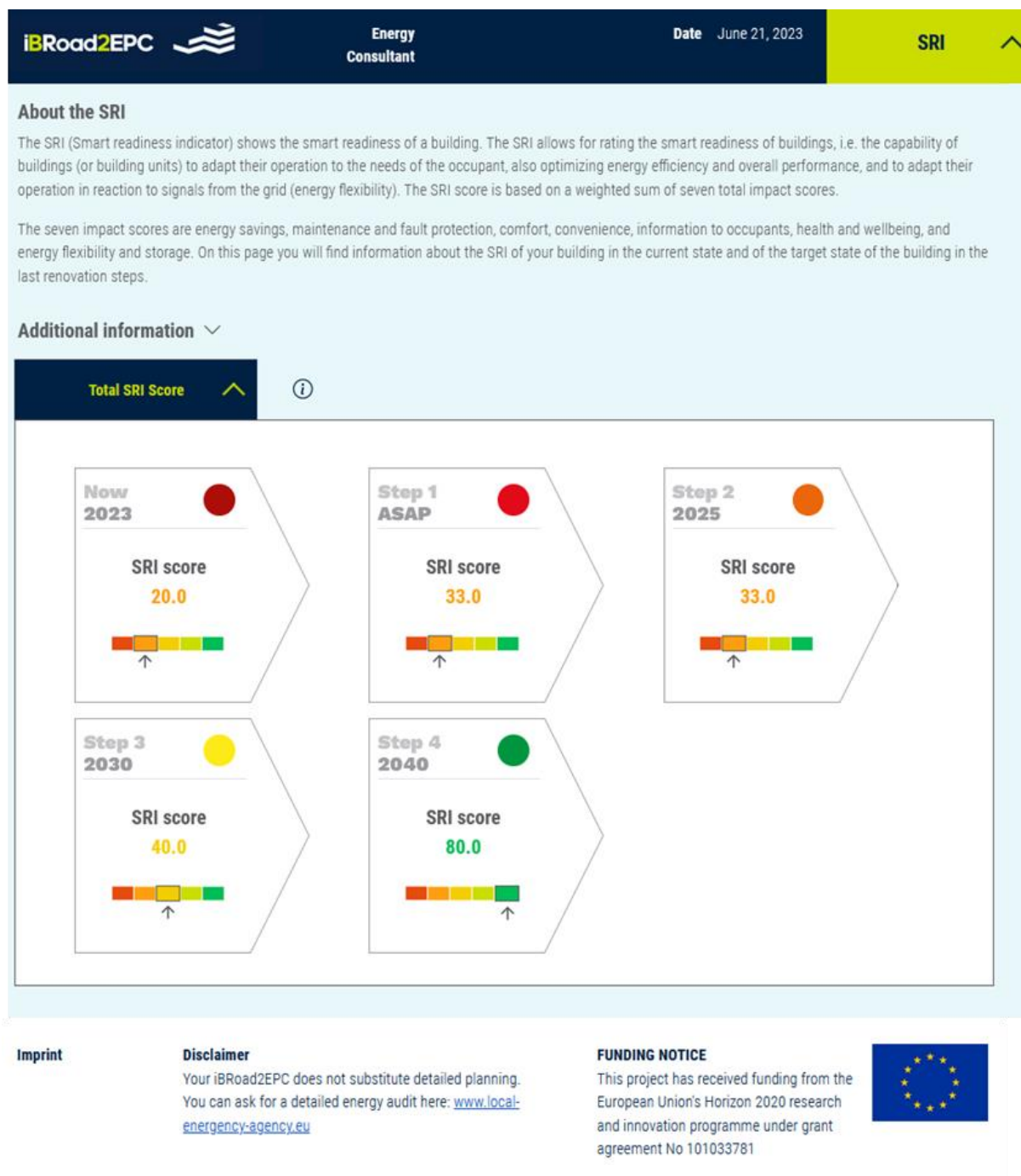


Figure 40: Output of the total SRI score in the output document of iBRoad2EPC.

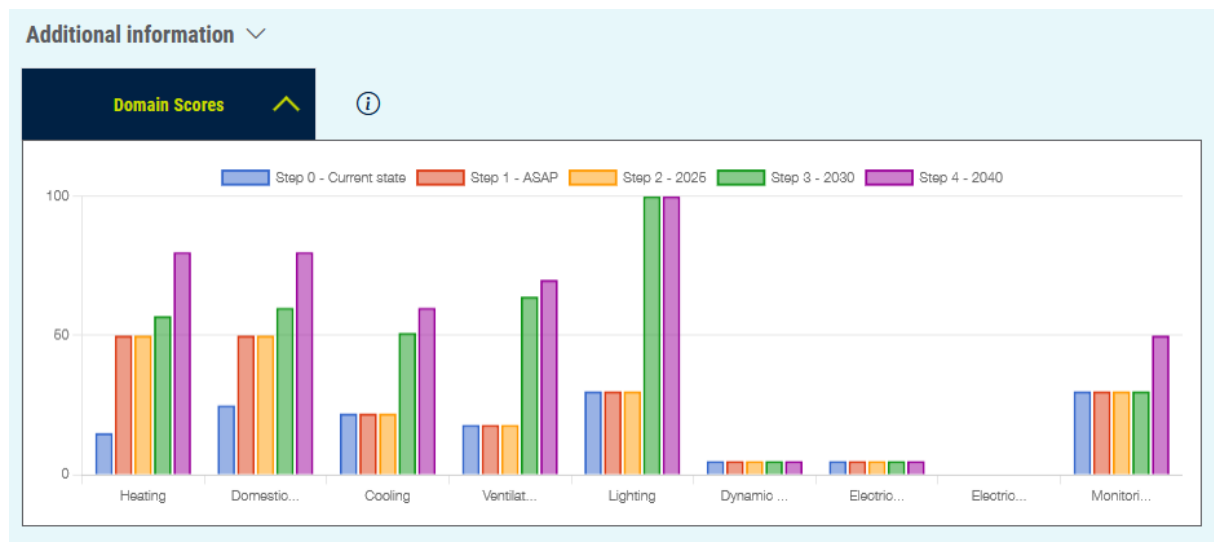


Figure 41: Output of detailed SRI domain scores in the output document of iBRoad2EPC.



Figure 42: Output of detailed SRI impact scores in the output document of iBRoad2EPC.

7.5 Measured Energy Performance Indicator (MEPI) Module

The Measured Energy Performance Indicator (MEPI) was introduced within the X-tendo⁷ project to quantify the real energy performance of buildings. The concept allows for the calculation of various indicators that are based on measured energy consumption. Those indicators are:

- **Q_std**: Standard measured energy [kWh/(m²a)] delivered and exported per energy carrier for:
 - space heating
 - domestic hot water
 - space cooling
 - other
 - electrical energy production
- Exported electrical energy

These indicators sum up to **Q_std_tot** [kWh/(m²a)] for the following energy carriers:

- fuel
- fuel for CHP
- electrical energy
- district heating
- district cooling
- electrical energy produced by CHP
- electrical energy from on-site
- solar thermal
- environment

The different MEPI are a result from an Excel-based calculation processing data on the type of energy carrier, monitoring period, delivered energy for space heating, domestic hot water, space cooling, electrical energy production and exported electrical energy.

In iBRoad2EPC, the original calculation methods and tools developed in the X-tendo project are used. The official MEPI calculation spreadsheet is available from the European Commission⁸. The spreadsheet allows for data entry and finally provides the user with a result in a unified layout.

The MEPI module adds a specific input mask to the iBRoad2EPC Assistant. This screen opens automatically when all input fields are edited one after the other by clicking on "next step" or by clicking on "MEPI" in the header bar. Via the "download"-button in the top left of the page a copy of

⁷ <https://x-tendo.eu>

⁸ <https://zenodo.org/records/6669376>

the original excel spreadsheet from the X-tendo project is downloaded (see



Measured Energy Performance Indicator

☒ Project details ☒ Renovation measures ☒ SRI ☒ IEQ ☐ MEPI

Create the overview document

Measured Energy Performance Indicator

During this step, you as an auditor can calculate the Measured Energy Performance Indicator (MEPI) of the building you are analysing. The template for the calculations is provided in the link below.

Please do not change the location of any fields in the spreadsheets. Corrupted documents will not be accepted.

Download the template

Current state

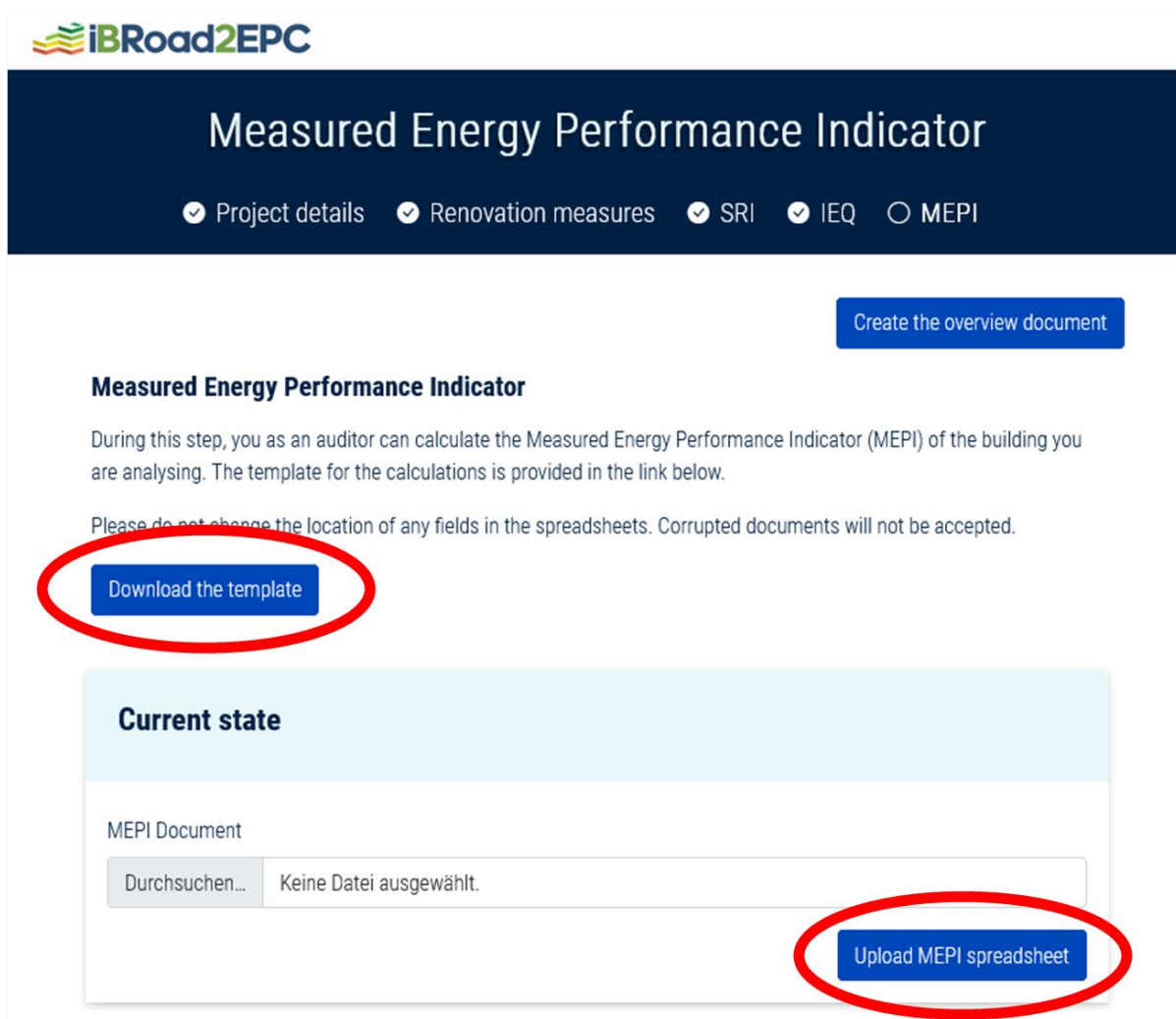
MEPI Scores:	
Space heating	27
Domestic hot water	13
Space cooling	0
Other	2
Electrical energy production	6
Exported electrical energy	4

MEPI Document

Datei auswählen

Keine ausgewählt

Upload MEPI spreadsheet



The screenshot shows the iBRoad2EPC Assistant Standard Front End interface. At the top, the iBRoad2EPC logo is on the left, and the title "Measured Energy Performance Indicator" is centered in a dark blue header. Below the header, a navigation bar contains five items: "Project details", "Renovation measures", "SRI", "IEQ", and "MEPI". The "MEPI" item is selected, indicated by a radio button. To the right of the navigation bar is a button labeled "Create the overview document".

Below the navigation bar, the section "Measured Energy Performance Indicator" is displayed. It contains the following text:

During this step, you as an auditor can calculate the Measured Energy Performance Indicator (MEPI) of the building you are analysing. The template for the calculations is provided in the link below.

Please do not change the location of any fields in the spreadsheets. Corrupted documents will not be accepted.

Below this text is a button labeled "Download the template", which is circled in red. Below the button is a section titled "Current state". Inside this section, there is a label "MEPI Document" and a file selection area. The file selection area has a button labeled "Durchsuchen..." and the text "Keine Datei ausgewählt.". To the right of the file selection area is a button labeled "Upload MEPI spreadsheet", which is also circled in red.

Figure 43: iBRoad2EPC Assistant Standard Front End: download of the MEPI spreadsheet and upload after processing.

The core information needed is the measured energy delivered and exported. Those values need to be available for a period of at least one year. After data entry, issuers upload the spreadsheet to the iBRoad2EPC Assistant. The Assistant checks the plausibility and completeness of the spreadsheet and imports the MEP indicator automatically.

As the values for delivered and exported energy need to be available for the calculation, the MEP indicator can only provide information about past consumption up to the current building state. In contrast to other modules (i.e., IEQ, SRI), the MEP indicator cannot be calculated for future renovation steps. The precision and validity of the MEPI rely on the quality of the metered data. Before starting to meter the energy consumption or entering already existing data into the spreadsheet it is recommended to familiarise oneself with the data needed (see Figure 44).

When using the MEPI spreadsheet, country specific adaptations are required. The file itself includes most specific country and climate zone data which are applied based on the issuers building specific input (see Figure 46).

However, there is one row of building specific values that needs to be added by the energy issuer. This is the monthly global horizontal solar irradiation for the address of the building. These values can be downloaded from the [PGVIS database](https://re.jrc.ec.europa.eu/pvg_tools/en/) (https://re.jrc.ec.europa.eu/pvg_tools/en/) which is hosted by the EU commission. Figure 44 provides an example and guidance how to download the specific dataset for the building that is issued.

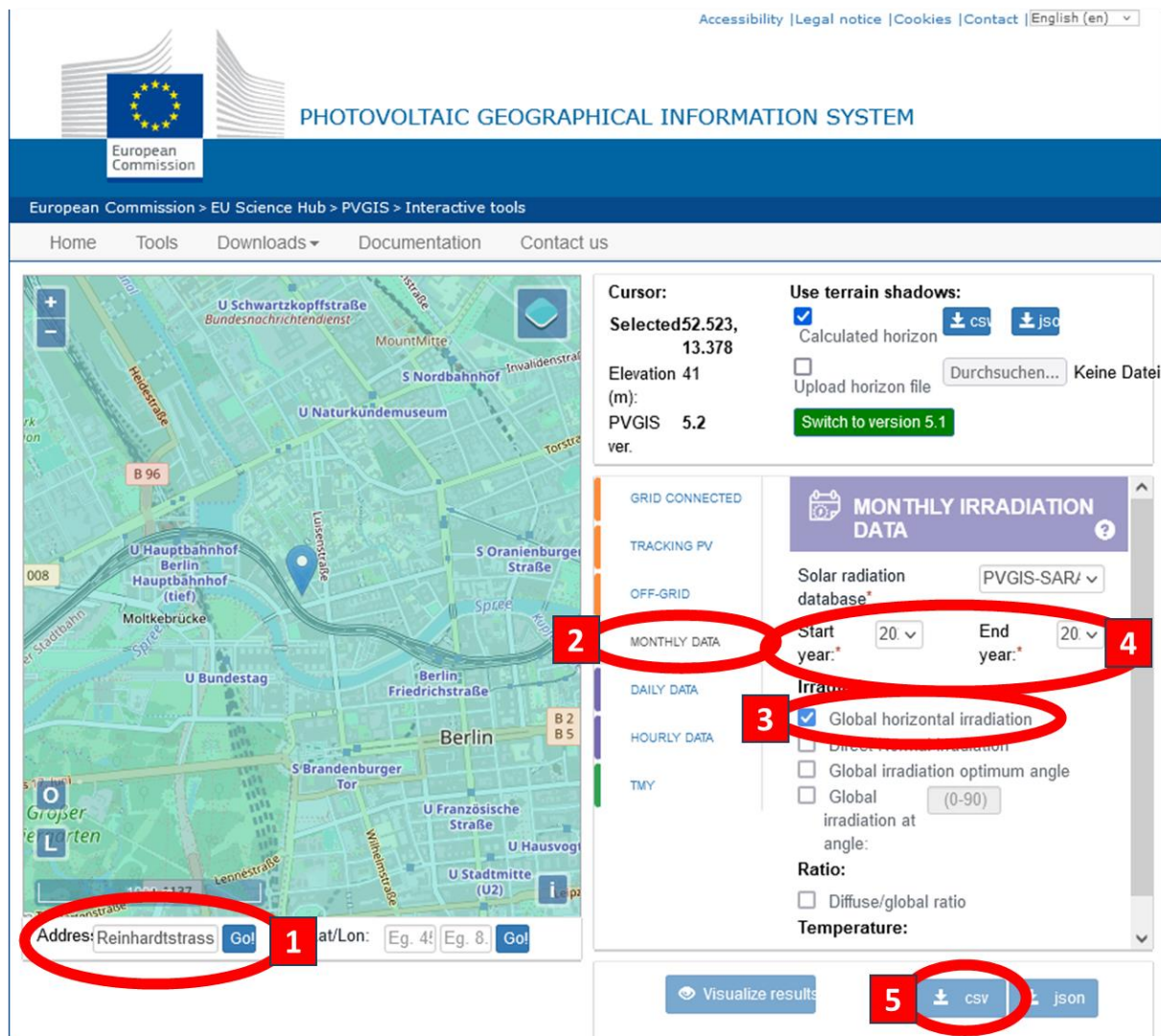


Figure 44: Screenshot from the PGVIS database. Marked in red are the relevant choices to make i.e. address of the building, temporal resolution of the data, type of irradiation and year of the metered data.

The downloaded dataset must be imported into the corresponding row and column of the matrix R183:OW212 in the tab “Tables_&_Assumptions” (see Figure 45). Only if this import is done correctly the values for the solar energy can be corrected according to the buildings’ location.

Currently fictitious values are inserted for I_sol_hor (for the purpose of Task 3.3 validation calculations and WP5 in building testing)

TIME	TIME	2018-1	2018-2	2018-3	2018-4	2018-5	2018-6	2018-7	2018-8	2018-9	2018-10
GEO (Codes)	GEO (Labels)	14	15	16	17	18	19	20	21	22	23
BE	Belgium	21	33	75	118	137	147	147	122	90	55
BG	Bulgaria	58	51	94	175	194	181	186	207	143	102
CZ	Czechia										

Figure 45: Excerpt from the MEPI excel tool: exemplary import of values for solar irradiation for Belgium and Bulgaria in the corresponding rows.

After preparing the spreadsheet accordingly, the measured energy data and corresponding measurement period should be entered into the tab “summary building input” (see Figure 47). The tabs “File guidelines” and “Glossary” provide further guidance on where exactly to enter the data that is needed to calculate the MEPI. For an overview of all tabs see Figure 48.

Measured energy performance indicator: input data

See document "F4_Guidelines" for more information on the method and guidance on how to obtain the required input.

Input

General input

Building	Name	[-]	House
	Identifier	[-]	43210
	Address line 1	[-]	Streetname Postbox n°
	Address line 2	[-]	Postal code City name
	Address line 3	[-]	Country name
	Year of construction	[YYYY]	1945
	Year of renovation	[YYYY]	2011
	Country	[-]	Belgium
	Region	[-]	Flemish region
	Type of building	[-]	Residential
	Subtype of building	[-]	Single-family houses
	Number of residential units in multifamily house	[-]	3
	Building useful floor area	[m²]	180
Building users	Actual number	[-]	4
EPC Practitioner	Name	[-]	John Doe
	Identifier	[-]	01234
	Contact information	[-]	Contact information

Choices related to options in the methodology

Options	Apply correction for solar irradiation (optional)?	[-]	Yes
	Apply correction for domestic hot water energy (optional)?	[-]	Yes
	Total system efficiency of DHW is known?	[-]	Yes
	Total system efficiency of DHW parameter?	[-]	Fixed value
	Apply correction for Indoor temperature (optional)?	[-]	Yes

Figure 46: Excerpt from the MEPI excel tool: general building information and selection of the calculation method.

		Energy carrier	Fuel	Fuel	Fuel for CHP	Electrical energy	District heating	District cooling	Electrical energy produced by CHP	Electrical energy from on-site	Solar thermal	Environment
Energy carrier subtype 1	[-]	Solid	Liquid	Gaseous								
Energy carrier subtype 2	[-]	Bio	Bio	Fossil								
Technology	[-]			CHP								
Perimeter	[-]	Delivered from distant			Delivered from nearby			*	Delivered from on-site			
Monitoring period												
Start date	[dd/mm/yyyy]	15.11.2019	15.11.2019	15.11.2019	15.11.2019	15.11.2019		15.11.2019	15.11.2019	15.11.2019	15.11.2019	15.11.2019
End date	[dd/mm/yyyy]	25.12.2020	25.12.2020	25.12.2020	25.12.2020	25.12.2020		25.12.2020	25.12.2020	25.12.2020	25.12.2020	25.12.2020
Remarks on input (if any)	[-]	At least one of the set of start date & end date does not comply to the required specifications. See F4 Guidelines.										
Monitored energy												
Delivered for space heating	[kWh]	520	820	756	987	380	0	180	200	230	305	
Delivered for Domestic hot water	[kWh]	1200	2440	110	943	254	0	50	130	24	298	
Delivered for Space cooling	[kWh]	0	0	0	50	0	0	0	26	0	100	
Delivered for Other	[kWh]	20	10	36	57	10	0	150	35	28	6	
Delivered for Electrical energy production	[kWh]	1043										
Exported electrical energy	[kWh]							489	200			

Figure 47: Excerpt from the MEPI excel tool: Measured energy data and calculation boundary conditions.



Figure 48: Excerpt from the MEPI excel tool: Tabs.

When all necessary data have been imported, the tool automatically assesses the indicators. The following figure shows an exemplary result⁹.

Standard measured energy delivered and exported (standard year and use)

Q_std	[kWh/(m ² .year)]	
Delivered for Space heating		27
Delivered for Domestic hot water		13
Delivered for Space cooling		0
Delivered for Other		2
Delivered for Electrical energy production		6
Exported electrical energy		4
Q_std_tot	[kWh/(m ² .year)]	

Figure 49: Exemplary test result of the MEPI for standard measured energy delivered and exported.

The excel file with the completed calculations is uploaded to the iBRoad2EPC Assistant (Figure 43). After the upload, the results for the measured energy performance are automatically extracted, checked and displayed (Figure 49) in the iBRoad2EPC Assistant so that issuers can check them. They are also inserted into the output formula of the iBRoad2EPC MEPI Module (Figure 51).

⁹ The screenshot only shows the row „total“ for illustrational reasons. The result tab in the spreadsheet, however, displays the results subdivided into every energy carrier.



Measured Energy Performance Indicator

☒ Project details ☒ Renovation measures ☒ SRI ☒ IEQ ☐ MEPI

Create the overview document

Measured Energy Performance Indicator

During this step, you as an auditor can calculate the Measured Energy Performance Indicator (MEPI) of the building you are analysing. The template for the calculations is provided in the link below.

Please do not change the location of any fields in the spreadsheets. Corrupted documents will not be accepted.

Download the template

Current state

MEPI Scores:

Space heating	27
Domestic hot water	13
Space cooling	0
Other	2
Electrical energy production	6
Exported electrical energy	4

MEPI Document

Datei auswählen

Keine ausgewählt

Upload MEPI spreadsheet

Figure 50: iBRoad2EPC Assistant Standard Front End: MEPI module.

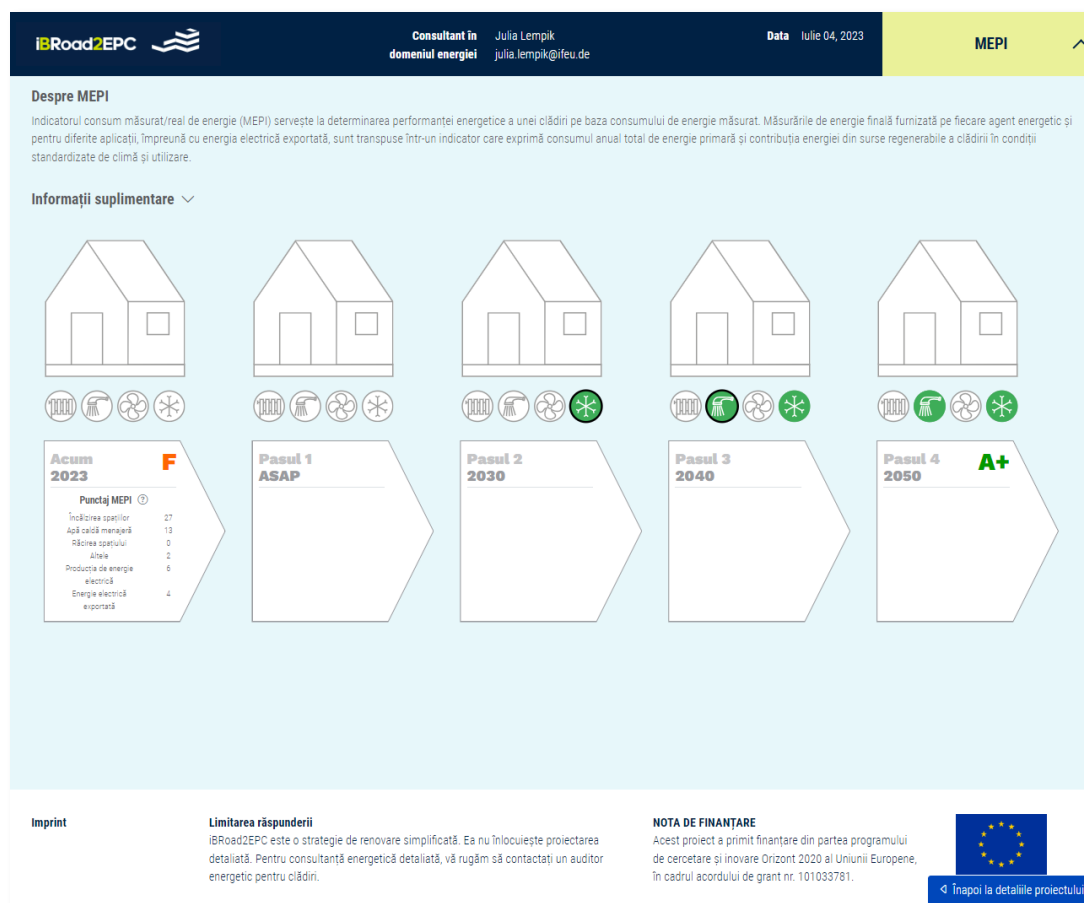


Figure 51: Output of the MEPI score in the output document of iBRoad2EPC (example in Romanian language).



MEPI SPECIFICS

The values for delivered and exported energy need to be available for the initial calculation of the MEPI during the issuance of the iBRoad2EPC. The MEPI can only provide information about past consumption and the current building state. In contrast to other modules (i.e., IEQ, SRI), the MEPI cannot be calculated for future renovation steps. However, it is possible to use the MEPI module without having the current consumption data available. Therefore, the metering of those data should start directly after the next renovation step has been carried out. After a year the metered data can be entered into the spreadsheet and uploaded into the iBRoad2EPC Assistant where the result will be displayed.

When applying the MEPI module, issuers need to ensure that the consumption data are metered correctly and at the right spot. They must ensure that only the energy consumption related to heating and cooling of the building is metered. PV systems often have separate meters pre-installed at the correct spot. Furthermore, all measured energy sources must be entered as kilowatt hours (kWh). If meters measure different units, the results have to be transformed with correct factors.

Before calculating the MEPI, it is necessary to download and import the building/address-specific values for the monthly global horizontal irradiation from the EU commission. They need to be added in the respective row of the tab "Tables & Assumptions".

Figure 52: specific information on the MEPI for iBRoad2EPC issuers.

8 TABS TO FACILITATE NAVIGATING THROUGH THE DOCUMENT

The iBRoad2EPC output document has a tab in the upper right corner that can be used to navigate through all pages. It automatically adapts to the number of renovation steps and modules activated in a country. One can navigate to the details for the individual renovation steps by clicking on the desired step or by clicking on the respective icon. The top menu item "RENOVATION STRATEGY" takes the user back to the overview page.

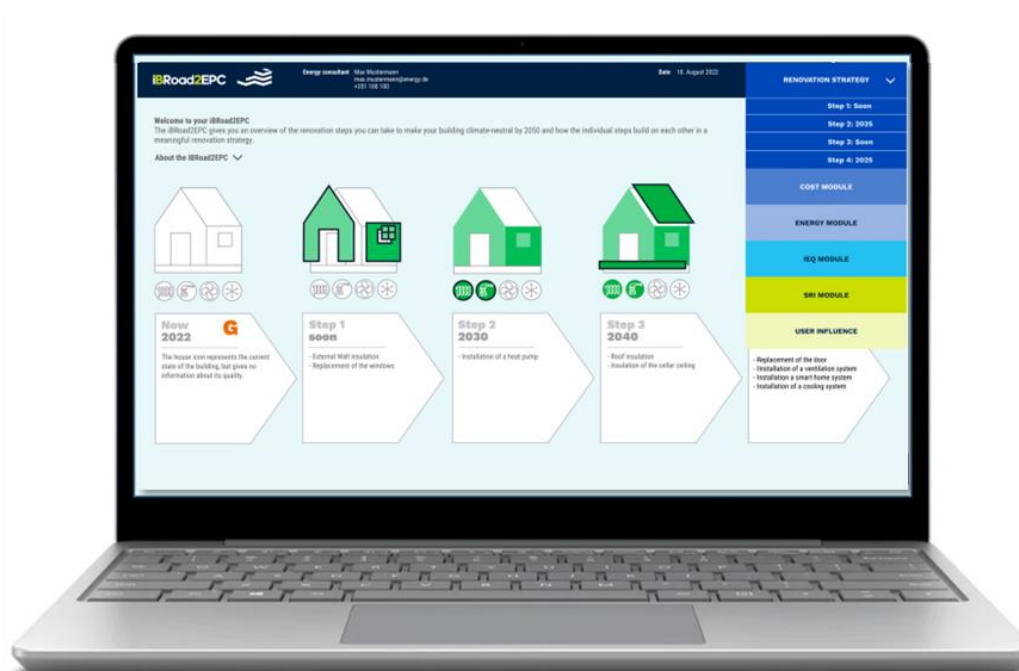


Figure 53: Tabs to navigate through the output document of iBRoad2EPC.

9 HANDING OVER THE IBROAD2EPC TO THE BUILDING OWNER

After the above steps, the iBRoad2EPC for the examined building is ready. The issuers have various options for handing it over to the building owners.

The EPC, which is extended with the additional page of the iBRoad2EPC containing a link and/or QR code, can be sent to the building owners as a PDF file via email. Building owners can open their iBRoad2EPC online by clicking on the internet link in the PDF document. They do not need to log in to the iBRoad2EPC site.

The EPC, which is extended with the additional page of the iBRoad2EPC containing a link and/or QR code, can be printed out and sent to the building owners by post or given in person by the issuer. Building owners can open their iBRoad2EPC online by scanning the QR code or entering the internet link in a browser.

The iBRoad2EPC can also be sent to building owners without the EPC. Only the link or the QR code is sent to them.

Ideally, the issuers are available to the building owner after the delivery for a final discussion if something is unclear, if further questions arise or if the next concrete renovation steps need to be discussed.

10 FURTHER INFORMATION ON IBROAD2EPC

This handbook is designed as a practical guide to issue the iBRoad2EPC. If you are interested in comprehensive background information, please visit the project website <https://ibroad2epc.eu/>. The following reports describe the development and conceptualisation of iBRoad2EPC in detail. They can be downloaded on the project website.

- EPCs – Energy Performance Certificates & LTRs – Long-Term Renovation Strategies: Summary analysis of Energy Performance Certificates’ alignment with national Long-Term Renovation Strategies
- Experience from other projects – Experience from other projects related to links between EPCs and the BRP
- Conceptualising iBRoad2EPC – Technical report on the definition of the proposed concept, content and methodology of iBRoad2EPC
- Extending the iBRoad Building Renovation Passport I – Report on the adaptation to multi-family and public buildings
- Extending the iBRoad Building Renovation Passport II – Report on expanding indicators (IEQ, smartness, ...)
- Specification for the iBRoad2EPC software tools – Report on adaptation requirements for countries - technical specification for the programming of the software tools, including templates for all roll-out countries
- Technical report on the definition of the proposed concept, content and methodology of iBRoad2EPC
- Report on adaptation requirements for countries – technical specification for the programming of the software tools, including templates for all rollout countries

ANNEX

The checklist for the on-site visit is provided on the next pages in a printable format. The blank template for the on-site visit is provided on page 75 in a printable format. The number and dates of the steps as well as the future obligations are just examples as this is a general version of the Handbook. When iBRoad2EPC is implemented in a specific Member State, the blank template should be adapted to the national context.

CHECKLIST FOR THE IBROAD2EPC ON-SITE VISIT

What kind of renovation measures does the homeowner plan to undertake anyway?			
Is the homeowner interested in a full renovation in one step or rather in a staged renovation?			
Full renovation		Staged renovation	
What renovation measures is the homeowner interested in?			
Is a certain system technology preferred by the homeowner (for heating, cooling,)?			
Which renewable energy source is the homeowner interested in?			
Does the building already fulfil the next obligations in the future? If not, which measures would help to meet them?			
Are there foreseeable occasions, when future renovation steps can be carried out preferably concerning the living situation of the owner or user or periods in which renovation is inappropriate?			
Are there weak points in the building that require immediate action?			

Are there any measures that lead to major improvements with little effort?
Are there any measures that can be carried out at any time without preconditions?
Which components and systems of the building will soon reach the end of their life span?
Which components and systems can probably be used longer?
Which components and systems should be renovated simultaneously for physical or technical reasons, even if their life span has not reached the end yet?
In which technically useful sequence should the components and systems be renovated?

	Year of construction	Energy improvements/renovations in the past	Step 1 2024 No legal requirements	Step 2 2030 At least class E	Step 3 2040 At least class D ban on new fossil fuel boilers	Step 4 2050 Climate neutral building
Inhabitants / Users						
Inhabitants / Users						
Roof						
Outer walls						
Windows / doors						
Floor / cellar						
Heating						
Domestic hot water						
Ventilation						
Cooling						
Smart Home						
Lighting						



iBRoad2EPC

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