



Specification for the iBRoad2EPC software tools

Report on adaptation requirements for roll-out countries



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TABLE OF CONTENTS

List of Acronyms	4
Executive summary	5
Objectives of this Report	7
Overview of iBRoad2EPC.....	7
Adaptation requirements	11
Foreseen savings in the building sector according to the LTRS/NBRP	12
Building types	12
Climate zones	12
Customer approach.....	12
Prefabricated text blocks.....	13
Dates of renovation steps and foreseeable future obligations.....	13
Foreseen placement of iBRoad2EPC / selection of modules	13
Energy Performance Indicators	14
Language	14
Interlinkages and automation.....	14
Overview of country adaptations.....	15
Country specific adaptations using a database.....	19
Target groups of the iBRoad2EPC database.....	19
Data flow in the process of country adaptation.....	19
iBRoad2EPC spreadsheet template structure.....	21
Description of the current state	22
Basic module	23
Investment cost module	27
Energy demand module.....	28
IEQ module.....	29
SRI module	30
MEPI module	31
EPC colour codes.....	32
Icons and images.....	32
User influence	33
Country specific adaptations to external instruments	34
Data exchange between iBRoad2EPC and the iBRoad Logbook	34
Documentation and user support.....	34
Conclusion.....	34
Annex - iBRoad2EPC spreadsheet template.....	35

LIST OF ACRONYMS

BRP	Building Renovation Passport
DBL	Digital Building Logbook
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
IEQ	Indoor Environmental Quality
MEP	Measured Energy Performance
MEPI	Measured Energy Performance Indicator
MEPS	Minimum Energy Performance Standards
MFH	Multi-family house
MS	Member State
LTRS	Long-Term Renovation Strategy
NBRP	National Building Renovation Plan
SFH	Single-family house
SRI	Smart Readiness Indicator
U-value	Heat transfer coefficient

EXECUTIVE SUMMARY

The aim of iBRoad2EPC is to bridge the Building Renovation Passport (BRP) with the Energy Performance Certificate (EPC) to support Europe's building stock decarbonisation ambitions. iBRoad2EPC in this respect works on the integration of BRP elements and new parameters into existing EPC schemes and improving the EPC recommendations to guide renovation, either in one or several steps. When implementing iBRoad2EPC in individual Member States (MSs), many features need to be adapted to country-specific requirements. iBRoad2EPC has therefore been created with a semi-flexible approach: it has a fixed framework within which the content and functionalities can be varied (see “*iBRoad2EPC in depth – Technical report on the definition of the proposed concept, content and methodology*”). In this way, iBRoad2EPC can ensure consistent design, programming, and quality assurance with the national EPC schemes.

The iBRoad2EPC output documents are issued by energy experts with an online tool called “iBRoad2EPC Assistant”. It guides the experts through the process of issuance, provides customised support depending on the implementing countries’ requirements, and produces the output documents in a uniform design. The output documents are generally provided as online documents. This allows to update the included information, e.g., if legal requirements or funding schemes change in the future. Building owners receive an internet link to their online documents.

The iBRoad2EPC Assistant offers various supportive content to the issuers. In particular, this comprises a standardised grid of reference years to which renovation measures can be assigned. The reference years reflect (interim) targets in specific countries or foreseeable policy instruments coming into force. Furthermore, the Assistant complements all recommended renovation measures with technical specifications that are aligned with the national climate targets of the respective country by default. The Assistant also automatically adds notes to prepare for later renovation steps in earlier stages to prevent lock in situations.

The process of adapting iBRoad2EPC to an implementing country is described in this report showcasing the concrete adaptation in six pilot countries, namely in Bulgaria, Greece, Poland, Portugal, Romania and Spain. This process can serve as a model for other countries that intend to implement iBRoad2EPC at a later stage.

Every information in iBRoad2EPC is adapted to the implementing countries’ requirements. The content adaptations have been developed in collaboration with the pilot country partners who report about the input from their National Advisory Committees. All adaptations in iBRoad2EPC are realised with the help of a database where the contents of the iBRoad2EPC output document and that of the iBRoad2EPC Assistant tool are stored. This database is the central pivot point for the flexible adaptation of iBRoad2EPC. Country partners do not work in the database directly. They enter adaptations into an excel spreadsheet template which is then forwarded to the software developer of the iBRoad2EPC consortium (Blue Planet Academy Consulting, BPAC). This procedure allows easy processability of the proposed adaptations. The structure of the spreadsheet follows the structure of the content and modules of iBRoad2EPC:

- Tab “**Description current state**” - stores information to classify the building in general
- The spreadsheet comprises several tabs to process the basic module which is the core of iBRoad2EPC:
 - tab “**Basic - general text**” - stores static text blocks
 - tab “**Basic - measures**” - stores titles and categories of measures, descriptions text blocks, and specifications
 - tab “**Basic - note_recommendation**” - stores the recommendations text blocks

- tab **"Basic - steps_year_MEPS_regul"** (Steps/MEPS Minimum Energy Performance Standards/Regulations) - stores future legal regulations and dates of renovation steps
- tab **"Cost - general text"** - stores general information about the investment cost module
- Data for the adaptation of the cost indicators are stored in tab **"Cost - cost information"**
- General information text blocks about the energy demand module which explain the functionality of the module and various technical terms are stored in tab **"Energy - general text"**
- Data for the adaptation of the energy indicators are stored in tab **"Energy - energy information"**
- Text blocks for the IEQ (Indoor Environmental Quality) module are stored in the **"IEQ"** tab
- Text blocks for the SRI (Smart Readiness Indicator) module are stored in the **"SRI"** tab and renovation measures in the **"Basic - measures"** tab are marked if they influence the SRI rating
- Text blocks for the MEPI (Measured Energy Performance Indicator) module are stored in the **"MEPI"** tab
- Advice for energy saving behaviour is stored in tab **"User influence"**
- The colour codes of all energy efficiency classes of the EPCs of the individual countries are stored in tab **"EPC_colour scheme"**
- Technical specifications for the recommended renovation measures are provided in tab **"U-values"** (heat transfer coefficients).

There is a country administrator for each pilot country. In all cases, the administrators are the country specific project partners. Country administrators are usually energy agencies or other authorities responsible for managing EPCs, EPC databases or other energy consulting tools. They provide all data and texts necessary in order to make the iBRoad2EPC Assistant suitable for use in their respective country.

This report is based on close cooperation between ifeu (Institute for Energy and Environmental Research), Sympraxis (SYMPRAXIS TEAM P.C.), BPAC (Blue Planet Academy & Consulting), BPIE (Buildings Performance Institute Europe), and the individual pilot countries. Those are EnEffect (Foundation Centre for Energy Efficiency) for Bulgaria, GBCe (Green Building Council Espana) for Spain, INZEB (Initiative towards Zero Energy Buildings) for Greece, KAPE (National Agency for Energy conservation) for Poland, Adene (Energy Agency) for Portugal and URBAN-INCERC (National Institute for Research and Development in the Building Sector, for Urbanism and Sustainable Territorial Development) for Romania. The country adaptation of iBRoad2EPC has been realised following bilateral discussions between the pilot countries and the project partners regarding the technical details, various questionnaires, and the implementation of results from several preparatory tasks.

OBJECTIVES OF THIS REPORT

This report describes the technical adaptation of iBRoad2EPC to the requirements of implementing countries, namely in Bulgaria, Greece, Poland, Portugal, Romania and Spain. This includes definitions of country specific adaptations of parameters and building assessment. Complete solutions for implementing countries were developed in close cooperation with the iBRoad2EPC consortium partners, mainly ifeu, pilot country leaders and software developers from BPAC.

Furthermore, the report shows how the developed iBRoad2EPC tools are adapted to specific target building types and target customer groups in the implementing countries. The adaptation comprises prefabricated text blocks, indicators, images and the format of iBRoad2EPC. The adaptations are made in the iBRoad2EPC database where the contents of the iBRoad2EPC output document and that of the iBRoad2EPC Assistant tool are stored. Additional indicators (indoor environmental quality, smart readiness indicator and measured energy performance indicator) are also handled using the database. This database is the central pivot point for the flexible adaptation of iBRoad2EPC. The objective of this report is to explain the context, target groups and methodology for country specific adaptation, and thereby the approach for embedding, use and structure of the iBRoad2EPC. This report is accompanied by an excel spreadsheet containing the country specific templates and main content of the database as well as the translations of the content to the respective languages of the participating countries.

OVERVIEW OF iBRoad2EPC

Flashback from the iBRoad2EPC Handbook for issuers

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), mortgage portfolio standards or the EU taxonomy regulation

- 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. 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 is 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 to 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.

The following pages show the online output forms of the iBRoad2EPC basic module and the information they provide. The overview page presents the whole renovation strategy at one glance. Building components that have been renovated to a target-proof standard turn green. When the whole building is green in the target year it means the building will have achieved the national climate goals of the respective Member State. For every renovation step there is a subpage explaining in detail what, when, and how to renovate, what to beware of, and what to pay attention to.



Figure 1: Overview page of the iBRoad2EPC online output form.

The screenshot displays the 'iBRoad2EPC' software interface for a renovation strategy report. The interface is organized into a grid of boxes, each representing a renovation step. Callouts provide additional context for the layout:

- Step that is described in this page:** Points to the 'Step 1 Soon' dropdown menu.
- One box per measure A renovation step can comprise several measures:** Points to the 'Measure 1' box.
- Future Requirements Information about content and timing:** Points to the 'MEPS/Regulations' section.
- Preparation for later renovation steps reach deep renovation and avoid lock-in:** Points to the 'Note/Recommendation' section.
- Name of the measure same as in the overview for easy orientation:** Points to the 'Measure 1' title.
- Description of the measures What should be renovated?:** Points to the 'Description of the measure' text.
- Specification of the measures How should it be renovated?:** Points to the 'Specification of the measure' text.
- Icon same as in the overview for easy orientation:** Points to the house icon.

The interface includes a header with the company name 'iBRoad2EPC', contact information for 'Energy consultant Max Mustermann', and a date '18. August 2022'. The main content area is titled 'RENOVATION STRATEGY' and shows 'Step 1' selected. The 'Step 1 Soon' dropdown is visible. The 'Measure 1' box details 'External wall insulation' with a description and specification. The 'Measure 2' box details 'Replacement of the windows' with a description and specification. The 'MEPS/Regulations' section provides information on future requirements, and the 'Note/Recommendation' section provides advice on preparation for later renovation steps.

Figure 2: Page 2 of the iBRoad2EPC output form presents detailed information for every single renovation step.

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

- create the iBRoad2EPC in a uniform design
- output the iBRoad2EPC in an online version
- clear and intuitive user guidance
- facilitate issuers in assigning renovation measures at specific points in time
- automatic pre-selection of
 - time steps
 - specifications of renovation measures that are aligned with national targets
 - recommendation texts to prepare for later renovation measures
- easy overwriting of all default texts by the issuer
- easy expandability with additional modules

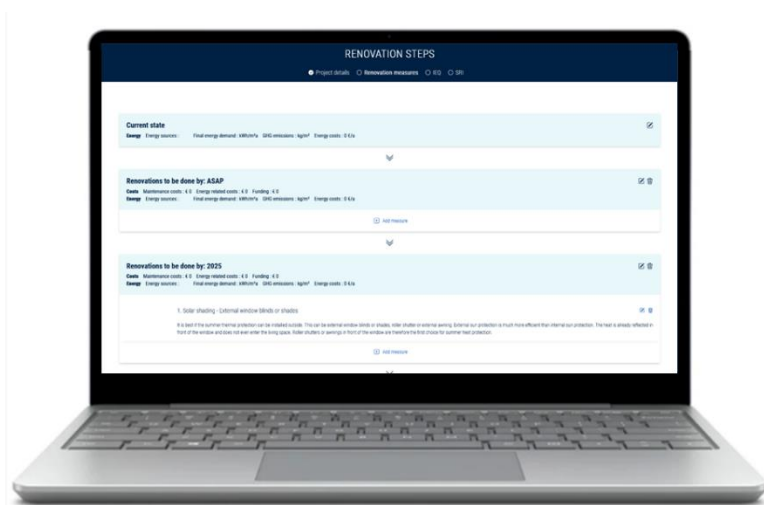


Figure 3: The iBRoad2EPC Assistant is an online tool to process and issue the iBRoad2EPC.

iBRoad2EPC adds an extra page to the EPC. It contains the link to the individual online document.

This is a brief introduction to the iBRoad2EPC. The iBRoad2EPC concept, implementation and embedding in the framework conditions of the pilot countries are described in detail in the following reports: “Conceptualising iBRoad2EPC: can EPCs be upgraded to include building renovation passport elements?”, “iBRoad2EPC in depth”, “national initial guides”, respectively.

ADAPTATION REQUIREMENTS

iBRoad2EPC is an energy consulting service that can be created with little effort and at a correspondingly low cost, however offering very specific benefits to building owners, e.g.:

- improved recommendations to stimulate (staged) renovation of existing buildings
- an individual long-term renovation strategy considering the avoidance of mistakes (lock-in effects)
- recommendations that are aligned with the national climate targets as well as future requirements and obligations
- improve quality and user trust
- additional indicators (e.g., IEQ, SRI, etc.)
- a holistic and integrated approach to other national tools/schemes

To achieve this, the information in iBRoad2EPC must be customised to the conditions in each implementing country.

On the one hand, the need for adaptation results from the different strategies with which the countries want to achieve the climate targets. Each country has defined its strategy in the national Long-Term Renovation Strategy (LTRS) or National Building Renovation Plan (NBRP). The renovation recommendations in iBRoad2EPC are derived from these strategies to ensure that they are in line with the climate targets.

On the other hand, iBRoad2EPC can be adapted very flexibly to the market requirements of the implementing country. To this end, the depth of consultation can be defined individually for each country: countries that are primarily aiming for a low sales price for iBRoad2EPC and therefore high market penetration can apply only the basic module; countries which, with iBRoad2EPC, want to introduce comprehensive energy advice can add additional features using the modular extensions.

Further customisation is linked to local conditions related to building types, building use, climate, procedures, etc., but also to the language in which content must be translated into.

Foreseen savings in the building sector according to the LTRS/NBRP

The savings that are to be achieved in the building sector by 2050 are an indicator of the final energy savings that are to be achieved with each individual building renovation. Usually, the targeted savings are determined in scenario calculations. The savings are, among others, directly linked to the quality of the building insulation. In addition to building insulation, the savings also depend on the renovation rate, the rate of new construction and other factors. Nevertheless, building insulation is a key factor in achieving the target; if it is not compatible with the long-term targets, it can hardly be changed retrospectively. In iBRoad2EPC, the recommended insulation thicknesses for individual buildings is automatically linked to the savings target for the building sector. They are therefore specified for each building component (e.g., exterior wall, roof, windows) on a country-specific basis. The implementing countries define the requirements themselves and can decide whether they present the requirements as insulation thicknesses or as U-values (transmission heat coefficient) or both.

Building types

iBRoad2EPC adapts to the requirements of different building types. By default, a distinction is made between single-family, multi-family and public buildings. If required, implementing countries can define additional building types. The distinction between different building types is foreseen because it is possible that requirements vary depending on the building type. For example, in one country the recommended insulation thickness of external walls for single-family homes may be lower than that for non-residential buildings. These different requirements must be correctly reflected in iBRoad2EPC. It can also be helpful to be prepared to differentiate between the recommendations and instructions for avoiding lock in situations according to building type.

Climate zones

It is possible that requirements vary depending on the climate zone. For example, the recommended insulation thickness for external walls within the same country may be lower in a warmer climate zone than in a cooler one. These different requirements must be correctly reflected in iBRoad2EPC. Therefore, the different climate zones are relevant to assign the respective recommendations for the different cases in iBRoad2EPC.

Customer approach

In iBRoad2EPC, the beneficiaries are addressed using standardised formulas. For example, there are welcome text blocks, text blocks to explain individual aspects or to interpret the results. In iBRoad2EPC,

it is possible to define specific text blocks for each group of beneficiaries. This allows them to be addressed in a tailored manner. Professional property managers, for example, can be addressed in a more factual manner than owners of a single-family house. Knowledge of the type and number of different target groups is the basis for an appropriate approach.

Prefabricated text blocks

To assist issuers, iBRoad2EPC by default contains numerous ready-to-use text blocks. The text blocks are automatically selected based on country, climate zone, building type, type of renovation measures, and more. By including a large number of selection criteria, the text blocks can provide targeted and customised information.

Dates of renovation steps and foreseeable future obligations

The EU's building stock should be climate-neutral by 2050. In order to achieve this goal, many Member States have already set their own long-term and interim targets for their building stock. In addition, various regulations have already been decided in many Member States concerning future requirements, such as bans on the installation of fossil fuel boilers from a certain year or bans on renting out buildings that are not in a certain minimum efficiency class.

These already foreseeable country-specific dates or milestones form the basis for future renovation steps in iBRoad2EPC. Thus, iBRoad2EPC provides building owners with an overview of the obligations that their buildings will have to fulfil by a specific year in the future. At the same time, the renovation strategy in iBRoad2EPC shows which measures to take to ensure that the building will fulfil these requirements by that time.

The specified dates provide a helpful framework also for issuers who do not have to define the dates for future renovations themselves, but only need to assign renovation measures to predefined dates.

Each country that implements iBRoad2EPC can define when which targets and interim targets are to be achieved and which future obligations will apply. A short explanatory text for building owners is automatically displayed for each target and obligation.

Foreseen placement of iBRoad2EPC / selection of modules

Each country can define how and where to strategically place iBRoad2EPC in the market in relation to existing instruments for the building sector and, particularly, in between the EPC and the BRP. Ideally, iBRoad2EPC complements the existing instruments by closing gaps that previously existed.

The basic module of iBRoad2EPC is designed in such a way that a fixed link to the EPC is possible. This means that the effort and costs for the issuers are low and a large market coverage can be achieved. In this case, iBRoad2EPC is placed very close to the EPC in the market (see left side in Figure 4). iBRoad2EPC can also be modularly expanded in order to progressively display comprehensive additional information. The modules for energy demand, investment costs, SRI, IEQ and measured energy performance are used for this purpose. If a country chooses to implement all modules, iBRoad2EPC will fulfil the characteristics of a BRP (see right side in Figure 4). At the same time, the effort and costs required to issue iBRoad2EPC increase and the potential market coverage decreases.

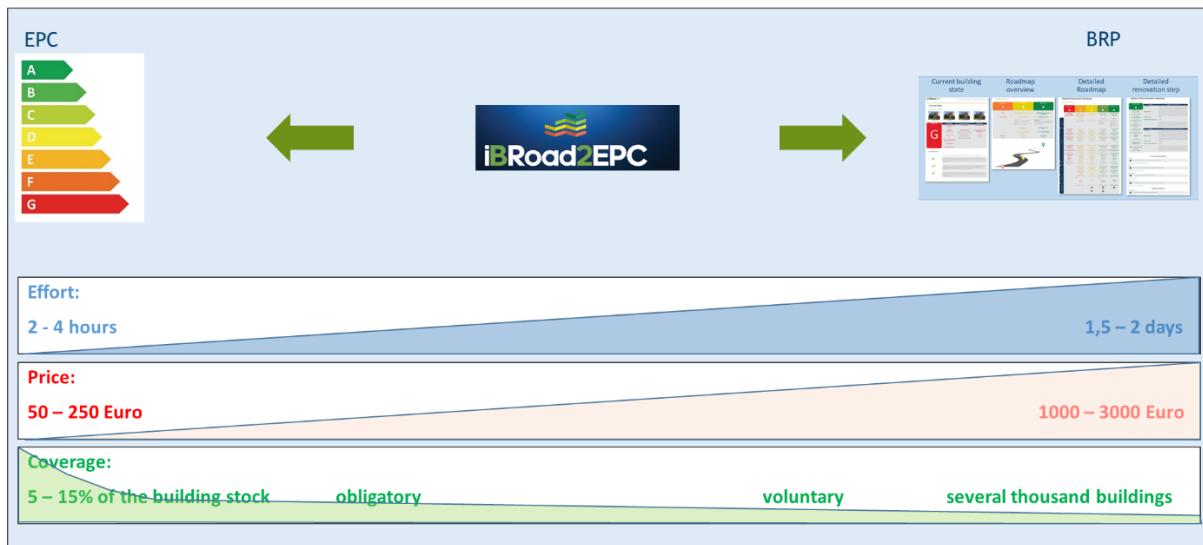


Figure 4: Strategic placement of iBRoad2EPC between the EPC and a BRP.

The placement of iBRoad2EPC is thus closely linked to the selection of modules. The more iBRoad2EPC modules are implemented in a country, the further the placement moves towards a fully BRP (right). Implementing countries must carefully weigh up which modules are absolutely necessary for them and which are just nice to have.

The placement of iBRoad2EPC in the market has strong impacts on the occasions for its issue. This must also be considered when placing it on the market. iBRoad2EPC can be implemented as a mandatory part of the EPC. In this case, it is issued at the same trigger points as the EPC, e.g., sale or rental of buildings. Alternatively, iBRoad2EPC can also be a voluntary consultation tool.

Energy Performance Indicators

Most common indicators for displaying the results of the EPC in EU MSs are either specific primary energy demand or specific final energy demand. iBRoad2EPC uses the same indicators and format as that of the respective EPC.

Cost and price information is given in the respective national currency.

Language

iBRoad2EPC is a consultancy service for building owners and building managers. It aims to provide only the most important information required for long-term building renovation, so that it is also understandable and appealing to laypersons. To this end, the output document must be available in the language of the respective implementing country.

In addition, the iBRoad2EPC Assistant should also be available in the respective national languages so that it is easy and clear to use for the issuers.

Interlinkages and automation

iBRoad2EPC is foreseen to include an API interface to enable an interactive link with various other tools in the implementing countries. These can be EPC software or other tools. The API enables all iBRoad2EPC functions to be integrated into existing software. Experts can therefore issue an iBRoad2EPC without having to open an additional programme. In order to integrate all the functions of iBRoad2EPC, additional input and output fields must be integrated into the existing software. In most

existing programmes, for example, it is not yet possible to assign remediation measures to specific points in time in the future, as is essential in iBRoad2EPC. The providers of the existing software in the respective countries must integrate such fields. This work cannot be carried out by external persons.

It is also possible to transfer the results of iBRoad2EPC to existing databases. However, the interfaces required for this must be individually adapted to the conditions in the countries and cannot be prepared in a standardised way. Therefore, they will not be created within the project duration.

Overview of country adaptations

The main parameters for the adaptation of iBRoad2EPC to country requirements are explained in the previous chapters. Table 1 shows an overview of the different parameters for the adaptation of iBRoad2EPC in the six pilot countries. It is based on the report “National initial guides”.

Table 1: Overview of necessary parameters for country adaptations of iBRoad2EPC in the six pilot countries.

iBRoad2EPC addressees	Building types	Climate zones	Foreseen savings in the building sector according to the LTRS					
			Bulgaria	Greece	Poland	Portugal	Romania	Spain
			2,9 GWh/year by 2030.	Reduction of final energy consumption of 8% by 2030; 20-28% by 2040; 28% by 2050 (base 2015). 100% reduction of GHG emissions from buildings by 2050 (base 2005).	No specific values on savings.	Reduction of GHG emissions from buildings of 45-55% by 2030; 65-75% by 2040; 85-90% by 2050 (base 2005). Primary energy savings of 11% by 2030; 27% by 2040; 34% by 2050. Reduction of discomfort hours by 26% by 2030; 34% by 2040; 56% by 2050.	Reduction of final consumption by 9% in 2030. 24% reduction of GHG emissions and 65% reduction of final consumption in 2050.	37% reduction of energy use and 99.8% reduction of GHG emissions in 2050 (base 2020) for residential buildings. 36% reduction of energy use for non-residential buildings.
			9	4	4	9	5	12
			Residential SFH, residential MFH, public buildings	Residential SFH, residential two-FH, residential MFH, public buildings, apartments	Residential SFH, residential two-FH, residential MFH, public buildings, apartments	Residential SFH, residential two-FH, residential MFH, public buildings, apartments	Residential SFH, residential two-FH, residential MFH, public buildings, apartments	Residential SFH, residential two-FH, residential MFH, public buildings, apartments

	Bulgaria	Greece	Poland	Portugal	Romania	Spain
Foreseen placement of iBRoad2EPC	Closer to EPC; supportive to auditors	Closer to EPC	Almost at EPC level; cheap and quick	Very close to the EPC	Somewhere in the middle between EPC and BRP, slightly leaning to the EPC	Closer to BRP; clear distinction to EPC
Foreseen modules of iBRoad2EPC	Basic, Cost, Energy Demand, IEQ, SRI	Basic version: Basic, Cost, Energy Demand Advanced version: Basic, Cost, Energy Demand, IEQ, SRI, MEPI	Basic, Cost, Energy Demand, SRI	Basic, Cost, Energy Demand, IEQ, SRI	Basic, Cost, Energy Demand, IEQ, SRI	Basic, Cost, Energy Demand, IEQ, SRI
Trigger points for iBRoad2EPC	Voluntary with the EPC	Voluntary with the EPC	Voluntary; not connected to the EPC	Voluntary; mandatory when used with funding; same trigger points as the EPC	Voluntary annex to EPC; same trigger points as the EPC	Voluntary; same trigger points as the EPC
Interlinkages and automation	Connection of Assistant to EPC database to provide auditors with standardised texts	EPC database; legislative platforms for building permissions, etc.; API connection	None	Connection to EPC; automatic pre-filling of basic information from the EPC; API connection to several building platforms	Possible link to development of Digital Building Registry (to be published by 12/2024); linkage to EPC issuing software is preferred; linkage to National Cadastre logbook, Digital Building Roadmap and local databases could also help	Existing Building Logbook (LEE); Building renovation plan; Urban vulnerability Atlas; national cadastre and EPC database; EPC issuing software

EPC indicator unit		Bulgaria	Greece	Poland	Portugal	Romania	Spain
EPC indicator unit	Dates and obligations	By 1.1.2030: all res. buildings class E; non-res. class F By 1.1.2033: all res. buildings class D; non-res. class E By 1.1.2050: All buildings NZEB	More specific obligations in place by 1.1.2024, 1.1.2030, 1.1.2040 and 1.1.2050. The details were published in the “Summary analysis of EPCs’ alignment with national Long-term renovation strategies”	All buildings (n)ZEB by 1.1.2050	Very specific and distinguished obligations in place by 1.1.2030, 1.1.2040 and 1.1.2050. The details were published in the “Summary analysis of EPCs’ alignment with national Long-term renovation strategies”	No official obligations. Dates to be aimed for are 1.1.2024, 1.1.2030, 1.1.2040 and 1.1.2050.	No official obligations. Dates to be aimed for are 1.1.2024, 1.1.2030, 1.1.2049 and 1.1.2050.
	Final energy demand	kWh/(m ² a)	kWh/(m ² a)	kWh/(m ² a)	kWh/(m ² a)	Final Primary kWh/(m ² a)	kWh/(m ² a)
	GHG emissions	kg/m ²	kg/m ²	kg/m ²	kgCO ₂ /(m ² a)	kg/(m ² a)	kg/m ²
	Energy costs	Lw/m ²	€/m ² ; €/kWh	zł/m ²	€/m ² a	l/(m ² a)	€/m ²
	Language	Bulgarian	Greek	Polish	Portuguese	Romanian	Spanish

COUNTRY SPECIFIC ADAPTATIONS USING A DATABASE

This chapter describes the concrete adaptation of iBRoad2EPC to the requirements of the six pilot countries, namely Bulgaria, Greece, Poland, Portugal, Romania and Spain. The general approach to the adaptation can serve as a blueprint for other countries that want to implement iBRoad2EPC.

All contents of the iBRoad2EPC output form and of the iBRoad2EPC Assistant tool are managed with an integrated database. This includes both static content, such as input field labels, and dynamic content that is customised to individual customer buildings. When iBRoad2EPC is implemented in a country, all country-specific content is entered into the iBRoad2EPC database thus adapting iBRoad2EPC to the country requirements.

Through the use of this integrated and structured database, all country customisations and any further adjustments to the iBRoad2EPC output form and the iBRoad2EPC Assistant can be managed easily and flexibly. If other countries beyond the six pilot countries want to implement iBRoad2EPC, this is also feasible with the prepared data structure.

To make adjustments to iBRoad2EPC beyond the output form and the iBRoad2EPC Assistant, technical processing is required in the countries (see chapter Country specific adaptations to external instruments).

Target groups of the iBRoad2EPC database

The iBRoad2EPC database is designed to be used by the administrators in the implementing countries. In general, there are three predefined user groups with different rights in the iBRoad2EPC Assistant. Administrators make the assignment to a group and grant respective rights.

- Administrators have unlimited access rights (developers and programmers of iBRoad2EPC)
- Country administrators have access to all background data, user data and projects (issued iBRoad2EPCs) for their respective country (energy agencies, green building councils, government agencies for energy efficiency in buildings)
- Users have access to the projects they have created (energy experts, EPC issuers, consultants, assessors)

In iBRoad2EPC, only the project managers, concept developers and programmers have administrator rights. Once the concept and programming phase is complete, their main task will be to register new country admins and set up the structures for new countries that want to introduce iBRoad2EPC.

When implementing iBRoad2EPC in a country, the country administrators have to provide all data and texts to be made available in the iBRoad2EPC Assistant. Country administrators are usually energy agencies or other authorities responsible for managing EPCs, EPC databases or other public energy consulting tools. They implement the adaptation of iBRoad2EPC to their country, provide all data and translated text blocks and test the correct and plausible functioning of the adapted output documents and online tools. Currently, country administrators in the six iBRoad2EPC pilot countries are” EnEffect for Bulgaria, INZEB for Greece, KAPE for Poland, ADENE for Portugal, INCERC for Romania, and GBCe for Spain. They define also which users will have access to the Assistant to issue iBRoad2EPC in the context of the project testing phase.

Data flow in the process of country adaptation

Prior to the implementation phase of iBRoad2EPC in a country, the country administrators do not work directly in the iBRoad2EPC database but enter all data in a data exchange table. This is an Excel spreadsheet template. This format enables easy data handling and exchange between country

administrators (the pilot country partners) and administrators (BPAC). The structure of the spreadsheet follows the structure of the content and modules of the iBRoad2EPC Assistant. Once iBRoad2EPC is basically set up for a country, country administrators can use the iBRoad2EPC Assistant to change data in the database (building types and subtypes, change measure categories titles, measure description, edit and add measures, edit and add country predefined settings for renovations steps/future obligations, conflict types, etc). The general data flow in the process of country adaptation follows five to six steps (Figure 5):

- The country administrators receive a pre-filled spreadsheet template in English language containing all basic content that is required for every iBRoad2EPC regardless of the implementing country.
- The country administrators add country-specific content in the same spreadsheet template, both in the language of the implementing country and in English language to facilitate communication with the iBRoad2EPC administrators. The form of an excel spreadsheet was chosen because it is widely used and, as a rule, partners from all implementing countries can work with it.
- The iBRoad2EPC administrators transfer the data to the iBRoad2EPC database. The data is checked in the process. This step ensures good quality of the country-specific data and prevents unintentional incorrect entries or deletions in the database.
- The iBRoad2EPC Assistant operates with the country-specific content from the database.
- The country administrators can edit parts of the database directly within the iBRoad2EPC Assistant.
- Energy experts in the implementing country can issue the iBRoad2EPC which is tailored to the country requirements.

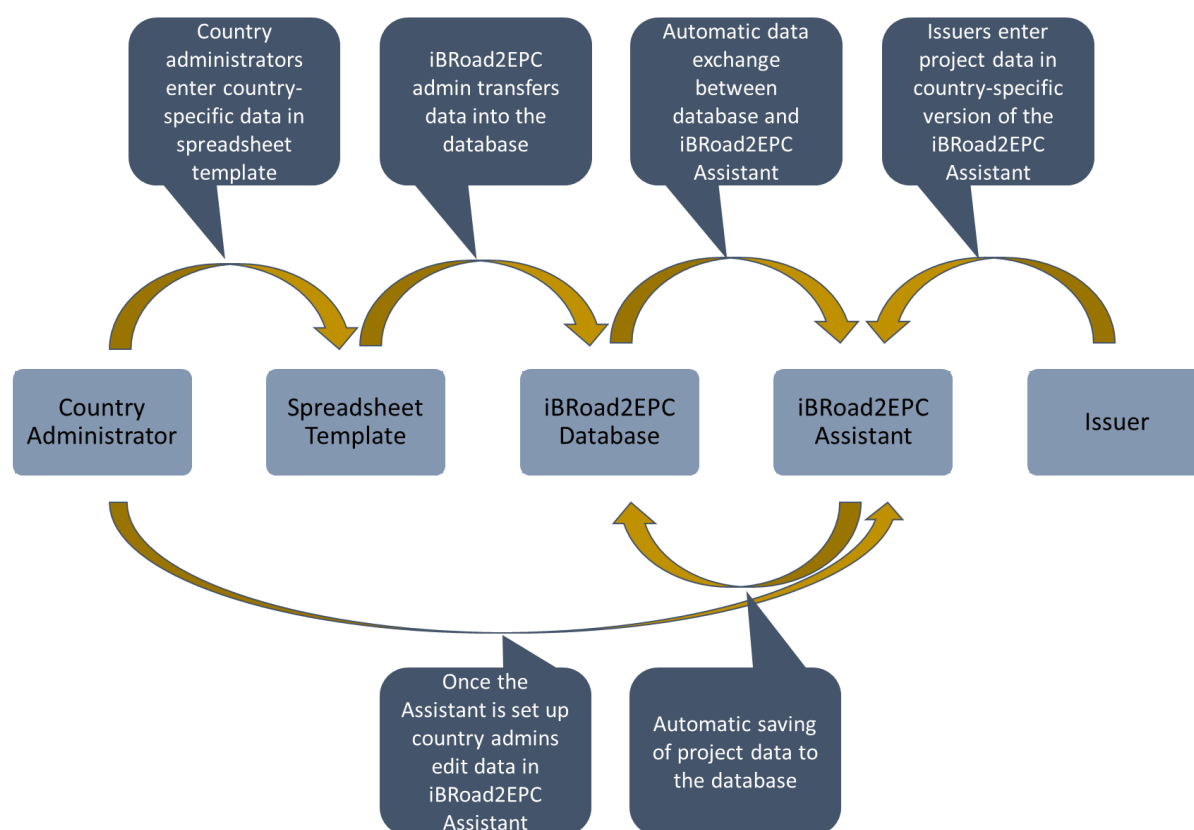


Figure 5: Data flow in the process of country adaptation.

It should be noted that the project data from iBRoad2EPC are fundamentally different from the country adaptation data. The country adaptation data is the basis for the content of the iBRoad2EPC Assistant and the output documents. It comprises all fields of adaptations described in the previous chapter. They enable the operation and use of these tools. They are stored in an internal database. The project

data, on the other hand, refer to building specific data like the energy performance, the efficiency class in the actual state and in future planned building states, etc.

iBRoad2EPC spreadsheet template structure

The iBRoad2EPC spreadsheet template is the user interface of the iBRoad2EPC database for country administrators. Its structure follows the various modules of iBRoad2EPC (iBRoad2EPC basic module, energy demand module, investment cost module, SRI module, MEPI module and IEQ module), and the current state of the building (Figure 6). The following chapters describe the country adaptation using the database for each iBRoad2EPC module as shown in Figure 6.

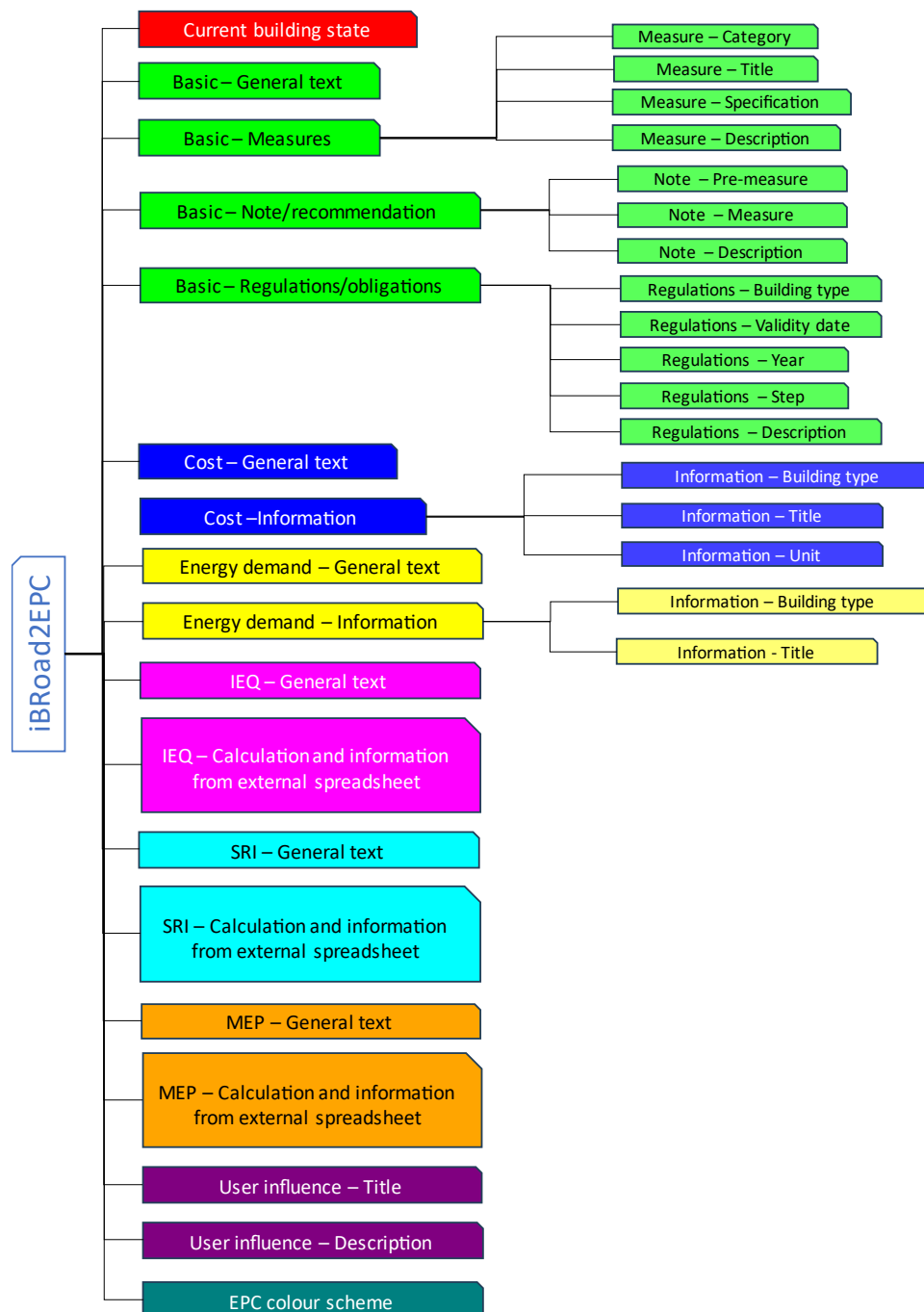


Figure 6: Structure of the iBRoad2EPC spreadsheet template for the modular concept of iBRoad2EPC.

Description of the current state

In the spreadsheet template, the tab “**Description current state**” stores information to classify the building in general, e.g., country, climate zone, building type, tenure status, building’s environment (urban; suburban; rural), project trigger, current energy class and many more. The iBRoad2EPC Assistant’s user interface offers dropdown menus for easy data entry, if applicable. The menus can be adapted to country-specific requirements, if necessary (e.g., if required, countries can enter specific climate zones).

COMPLETE PROJECT DETAILS

☐ Project details ☐ Renovation measures

Static text (points to Name *)

Data entry (points to p_test_07)

Country-specific climate zones (points to Climate zone)

Country-specific efficiency classes (points to Current energy class)

Country-specific trigger, receiver and addressee depend on the occasions to issue an EPC (points to Project trigger *, Project receiver *, Recommendations addressed to *)

Form fields include:

- Name *
- Client number
- Building constructed in *
- Country
- Climate zone
- Current energy class
- Building type
- Building sub type
- Environment *
- Tenure status *
- Heating system constructed in
- Cooling system constructed in
- Project trigger *
- Project receiver *
- Recommendations addressed to *
- Image
- Certificat EPC *

Buttons: Next step (top right), Next step (bottom right)

Figure 7: User interface in the iBRoad2EPC Assistant for the description of the current building state.

Basic module

For each iBRoad2EPC module, static and dynamic content is defined in the database.

Static content (or general text) comprises headers, field names and explanatory texts that are not dependent neither responsive to other data entries. Static content only has to be translated into the implementing country's language. In the iBRoad2EPC spreadsheet template, static text blocks are stored in the tab **"Basic - general text"**.

Dynamic content is responsive to other data entries such as climate zone, building type and other. For example, predefined recommendations for insulation thicknesses vary in some countries depending on the climate zone. The presence or number of climate zones may vary among implementing countries as well as the way they influence the related content.

In the iBRoad2EPC basic module, the renovation strategy is tailored individually for each building. The issuers determine which renovation measures are to be carried out when and in which order. Renovation measures address several topics like airtightness, auxiliary systems, cooling, domestic hot water, door, dynamic building envelope, electric vehicle charging, electricity, external wall, floor, heating, lighting, monitoring and control, renewable energy sources, roof, smart building, smart home, solar shading, ventilation or windows. These decisions require the expertise of a professional following an on-site visit and are therefore not done automatically. This considerably increases the added value for the building owners because the special features of the building are considered.

Following the measures identified by the professional issuer, iBRoad2EPC automatically adds relevant descriptions and specific requirements. The requirements are by default aligned with the national building renovation strategies. This avoids recommending inadequate renovation measures that do not meet future obligations. The default specifications are stored in tab **"U-values"**. If necessary, issuers can overwrite the default texts or values to adapt them to individual circumstances (see Figure 8). In the iBRoad2EPC spreadsheet template, measure titles sorted by category, description text blocks and specifications are stored in the tab **"Basic - measures"**. The measure text blocks can be filtered by pilot country, building type, and climate zone.

Edit measure

Measure type
External insulation (ETICS System) ✓

Description
Insulation of the entire external wall on the outside with an "External Thermal Insulation Composite Systems" (ETICS). The components of ETICS, such as cement, insulation boards, armoring 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. ✓

Specification
U = 0,70 W/(m²K) or 3 cm thick ✓

Submit

Country-specific choice of measure category and title

Country-specific description of the measure

Recommended specification of the measure according to national building renovation strategy, region and building type

Figure 8: User interface in the iBRoad2EPC Assistant to create and specify renovation measures.

iBRoad2EPC automatically provides notes to link the recommended renovation measures among them and support achieving a deep renovation through a staged approach. In particular, the notes are recommendations to prepare for later renovation steps. The tab “**Note_recommendations**” in the iBRoad2EPC spreadsheet template stores these recommendations. They are displayed automatically depending on the sequence of the recommended measures.

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 components of ETICS, such as cement, insulation boards, armoring 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

Prepare for Replacement of the windows

When the outer walls are being insulated, please prepare a later low thermal bridge connection to a later window or door installation. The window or door stops should be removed so that windows or doors can be set against the front edge of the masonry in the future. Existing roller shutter boxes can be removed and new roller shutters integrated into the wall insulation. If the new windows or doors are to remain in the same installation level, the soffit insulation should connect to the existing windows in a weatherproof manner with a diffusion-open joint.

Recommendation to prepare later renovation measures. Textblock inserted automatically depending on earlier and later measure type

Figure 9: User interface in the iBRoad2EPC Assistant to create and specify renovation measures.

An integral part of a long-term strategy as provided by iBRoad2EPC are future legal regulations that are already foreseeable. The regulations may result from European or national legislation, e.g., the national implementation of minimum energy performance standards (MEPS) as foreseen in the current draft of the Energy Performance of Buildings Directive (EPBD). The iBRoad2EPC basic module provides building owners with information about future regulations and when they apply. The iBRoad2EPC thus takes on an important communication task, as no other tools have yet condensed this information for building owners. The recommended renovation strategy will help building owners preparing their building to meet all legal obligations in a planned manner. The future regulations are displayed in the iBRoad2EPC output document in a specific text field and for the respective time period. The legal regulations are also included in the iBRoad2EPC Assistant. They also help the issuer to structure the renovation strategy (see Figure 10).

The definition of the renovation steps depends strongly on the regulations. It makes sense to define the renovation steps in a way that they coincide with the regulations. The building owners can then see by when they should implement which measures. Implementing countries can specify the timing of the renovation steps individually and thus also include national targets and interim targets. Issuers can also add additional steps or rearrange the predefined steps if these are important to reflect the specific building situation or the recipient of iBRoad2EPC plans/aspirations.

In the iBRoad2EPC spreadsheet template, future regulations and dates of renovation steps are stored in the tab **"Basic - Steps_Year_MEPS_Regul"**.

Current building state and ASAP measures are available in every iBRoad2EPC

Dates of the renovation steps are defined according to country requirements and future regulations

Outlook to future regulations in the respective country. They determine the renovation strategy.

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: 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

Regulation targets

By 1 January 2030, 65% of residential buildings will need to have replaced all the lighting by LED and have upgraded electric equipment ✎

⇩

Renovations to be done by: 2040 ✎ 🗑
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

Regulation targets

Até 1 de Janeiro de 2040, 77% dos edifícios residenciais que não atinjam a categoria III de conforto após a introdução de medidas passivas terão de dispor de sistemas eficientes de aquecimento e arrefecimento, tais como bombas de calor elétricas. Todos os sistemas de gás e gasóleo deverão ter sido substituídos por sistemas elétricos. ✎

⇩

Renovations to be done by: 2050 ✎ 🗑
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

Regulation targets

By 1 January 2050, 100% of residential buildings that don't achieve category III comfort levels after the introduction of passive measures will need to have efficient heating and cooling systems such as electrical heat pumps in place ✎

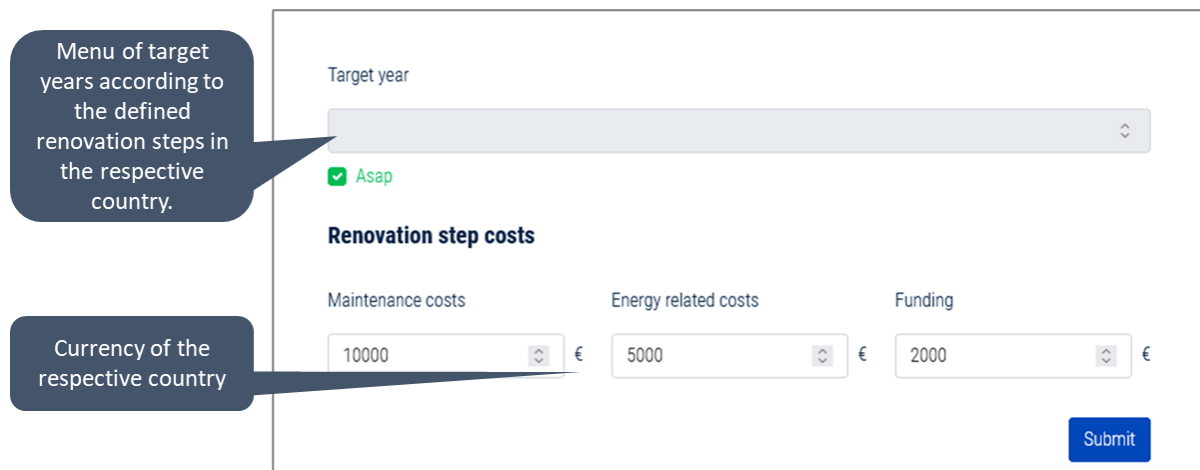
Figure 10: Overview of renovation steps in the iBRoad2EPC Assistant.

Investment cost module

The iBRoad2EPC investment cost module allows displaying the following cost types in the output document:

- total investment costs
- maintenance costs
- energy-related additional costs
- funding

Issuers can enter the investment costs in the module. They are displayed in an additional page in the iBRoad2EPC output document.



Menu of target years according to the defined renovation steps in the respective country.

Target year

✓ Asap

Renovation step costs

Maintenance costs Energy related costs Funding

10000 € 5000 € 2000 €

Submit

Currency of the respective country

Figure 11: User interface in the iBRoad2EPC Assistant to edit the renovation cost.

The iBRoad2EPC spreadsheet template stores general information about the investment cost module in the tab **"Cost - cost information"**. These text blocks explain the function of the module and explain the various cost types. The currency of the respective country is stored in the database as well.

Energy demand module

The iBRoad2EPC energy demand module allows including the following indicators for every renovation step in the iBRoad2EPC output document:

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

This energy-related information requires additional energy calculations with the national EPC software for each renovation step. Figure 12 shows the input window of the energy demand module. The dropdown menus for the target year and the energy efficiency class have to be adapted to each implementing country. The target year is usually aligned with the dates of the renovation steps. Issuers may overwrite the dates, if required. The efficiency classes in the menu reflect the exact EPC classes that exist in an implementing country.

The iBRoad2EPC spreadsheet template stores the data for the adaptation of the energy indicators in the tab **“Energy - energy information”**. General information texts about the energy demand module which explain the functionality of the module and various technical terms are stored in the tab **“Energy - general text”**.

The screenshot displays the 'Energy' section of the iBRoad2EPC Assistant interface. It includes the following elements:

- Target year:** A dropdown menu currently showing 'Asap' with a green checkmark.
- Energy sources:** A list with '1. Gas' and a dropdown arrow, accompanied by '+' and '-' buttons.
- Current energy class:** A dropdown menu showing 'E' with a green checkmark. A callout box lists the available efficiency classes: A+, A, B, B-, C, and D.
- Final energy demand:** An input field with the value '153' and units 'kWh/m²a'.
- GHG emissions:** An input field with the value '39' and units 'kg/m²'.
- Energy costs:** An input field with the value '3000' and units '€'.
- Buttons:** Two 'Submit' buttons are located at the bottom right of the form.

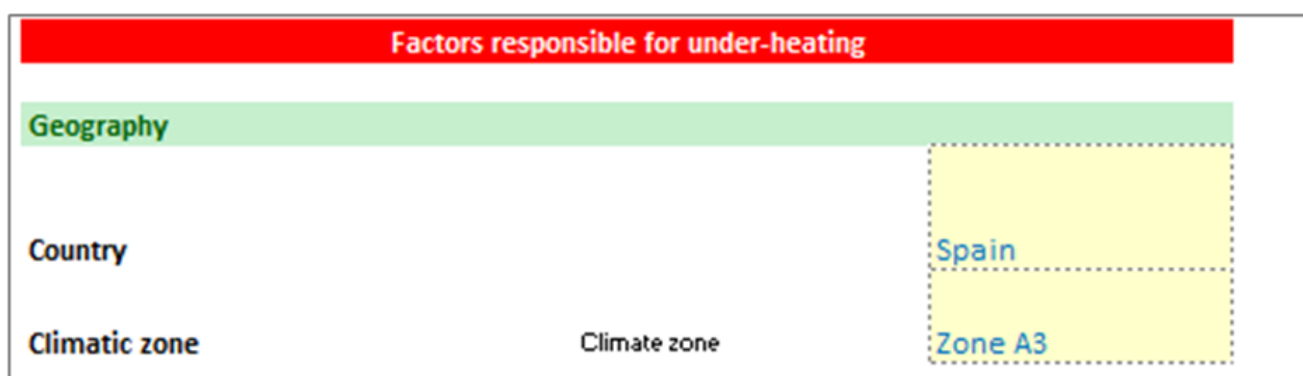
Two callout boxes provide additional context:

- Menu of target years according to the defined renovation steps in the respective country.** (Points to the 'Target year' dropdown)
- Menu of efficiency classes in the respective country.** (Points to the 'Current energy class' dropdown)

Figure 12: User interface in the iBRoad2EPC Assistant to edit the energy demand and cost.

IEQ module

The Indoor Environmental Quality (IEQ) module allows issuers to evaluate the indoor environmental quality of a building (e.g., indoor air quality, thermal comfort, acoustic comfort, lighting comfort). The methods for calculating IEQ are described in the iBRoad2EPC reports “Experience from other Projects related to Links between EPCs and the BRP” and “Expanding Indicators”. The IEQ module adds a specific input mask to the iBRoad2EPC Assistant. It allows downloading a copy of the original Excel spreadsheet for the calculation from the X-tendo project¹. The issuers fill in all necessary information for the IEQ in this spreadsheet and thus calculate the IEQ. They then upload the spreadsheet to the iBRoad2EPC Assistant. The Assistant checks the plausibility and completeness of the spreadsheet and imports the IEQ result automatically.



The screenshot shows a user interface for the IEQ calculation spreadsheet. At the top, there is a red header bar with the text "Factors responsible for under-heating". Below this, there is a green bar with the text "Geography". Under the "Geography" bar, there are two input fields: "Country" and "Climatic zone". The "Country" field has a dropdown menu with "Spain" selected. The "Climatic zone" field has a dropdown menu with "Zone A3" selected. The "Climatic zone" field is also labeled "Climate zone" in a smaller font.

Figure 13: Choice of country and climate zone in the user interface of the IEQ calculation spreadsheet.

The iBRoad2EPC Assistant displays explanatory texts to help the user understand the IEQ module. These texts come from the iBRoad2EPC database and are entered into the iBRoad2EPC spreadsheet template, in the tab “IEQ”.

For each renovation step in which the IEQ might change, issuers must fill in a separate IEQ spreadsheet. The IEQ rating is affected by various building features some of which are not connected to building renovation. However, many renovation measures, i.e., insulation measures or sun protection, improve the IEQ rating. In the IEQ calculation table no further country adaptations are required as the file itself includes specific country and climate zone data (see Figure 13).

¹ <https://x-tendo.eu>

SRI module

The concept of a Smart Readiness Indicator (SRI) was introduced in the European Energy Performance of Buildings Directive (EPBD) in 2018. A study by Vito (2021) on behalf of the European Commission describes its main targets: “the indicator allows for rating the smart readiness of buildings, i.e., the capability of buildings (or building units) to adapt their operation to the needs of the occupant, also optimising energy efficiency and overall performance, and to adapt their operation in reaction to signals from the grid (energy flexibility).”²

The iBRoad2EPC reports “Experience from other Projects related to Links between EPCs and the BRP” and “Expanding Indicators” describe the methods for calculating the SRI and outline a way to integrate that in iBRoad2EPC.

The European Commission provides an SRI calculation tool, which can be requested online³. This is an Excel spreadsheet that allows for data entry, processing and displaying the SRI results in a unified layout. The iBRoad2EPC SRI module adds a specific input mask to the iBRoad2EPC Assistant where the calculation sheet can be downloaded, and a completed calculation sheet can be uploaded again. The SRI result is automatically extracted and inserted into the output document of iBRoad2EPC.

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:	

Figure 14: Country choice in the user interface of the SRI calculation spreadsheet.

The iBRoad2EPC Assistant includes explanatory text blocks for users. They are stored in the iBRoad2EPC spreadsheet template, in the tab “SRI”. Certain efficiency measures can influence the SRI. In the iBRoad2EPC spreadsheet template measures that have an influence on SRI are marked. In the iBRoad2EPC spreadsheet template no further country adaptations of the SRI module are required, as the SRI calculation table already includes specific country and climate zone data.

² Vito et al. 2021

³ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/sri-implementation-tools_en

MEPI module

The Measured Energy Performance Indicator (MEPI) module allows issuers to display various indicators (e.g., non-renewable primary energy performance for electrical energy produced on-site and self-used electrical energy or total primary energy performance). The methods for processing those and other indicators are described in the iBRoad2EPC reports “Experience from other projects related to links between EPCs and the BRP” and “Expanding indicators”. The MEPI module adds a specific input mask to the iBRoad2EPC Assistant. It allows downloading a copy of the original excel spreadsheet from the X-tendo project⁴. Issuers fill in all necessary information in this spreadsheet and thus calculate the Measured Energy Performance Indicators (MEPI). The core of that information is measured energy delivered and exported (see Figure 15). Those values need to be available to use the MEPI module. After data entry, issuers upload the spreadsheet to the iBRoad2EPC Assistant. The Assistant checks the plausibility and completeness of the spreadsheet and imports the MEPI automatically. The iBRoad2EPC Assistant also displays explanatory texts to help users understand the MEPI module. These texts come from the iBRoad2EPC database and are entered into the iBRoad2EPC spreadsheet template, in the tab “MEPI”.

As mentioned before, the values for delivered and exported energy need to be available for the initial calculation during the issuing of the iBRoad2EPC. This means, it can only provide information about past consumption and the current building state. In contrast to other modules (e.g., IEQ, SRI), the MEPI cannot be calculated for future renovation steps.

However, it is possible to update the MEPI after the execution of renovation steps. In this way, the actual energy savings achieved can be monitored.

In the MEPI calculation table no further country adaptations are required as the file itself includes specific country and climate zone data which are applied based on the issuers building specific input (see Figure 16).

	Energy carrier											
	Fuel			Fuel for CHP			Electrical energy			Electrical energy produced by CHP		
	Solid			Liquid			Gaseous			District heating		
	Bio			Bio			Fossil			District cooling		
Total												
	Delivered from distant			Delivered from nearby			* PV			Delivered from on-site		

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

Figure 16: Input of building specific variables in the user interface of the MEPI calculation spreadsheet.

EPC colour codes

The iBRoad2EPC spreadsheet template contains the colour codes of all energy efficiency classes of the EPCs of the individual countries. They are stored in the tab “EPC_colour scheme”. All efficiency classes that are displayed in the output documents of iBRoad2EPC are shown in the correct colour of the respective country.

Bulgaria		Greece		Poland	
Class	RGB	Class	RGB	Class/RGB	
A+	3, 128, 54	A+	5, 100, 2		0, 150, 64
A	8, 169, 103	A	0, 135, 0		83, 175, 51
B	102, 171, 50	B+	0, 154, 0		199, 211, 4
C	199, 211, 4	B	154, 204, 5		253, 235, 27
D	255, 213, 0	Γ	250, 204, 10		251, 186, 7
E	247, 168, 55	Δ	253, 100, 0		243, 146, 5
F	240, 126, 26	E	255, 0, 5		236, 102, 10
G	230, 55, 31	Z	153, 52, 0		227, 9, 24
		H	134, 0, 0		174, 15, 10
Portugal		Romania		Spain	
RGB	Class/RGB	RGB	Class/RGB	RGB	Class/RGB
A+	0, 145, 65	A+	0, 153, 0	A	36, 150, 79
A	77, 175, 69	A	51, 204, 51	B	48, 178, 77
B	125, 177, 57	B	102, 255, 51	C	150, 202, 66
B-	188, 208, 52	C	255, 255, 0	D	233, 233, 50
C	218, 220, 39	D	255, 170, 0	E	238, 180, 40
D	249, 233, 37	E	255, 130, 0	F	219, 117, 46
E	221, 170, 37	F	255, 102, 0	G	221, 46, 47
F	196, 61, 38	G	255, 0, 0		

Figure 17: Colour codes of the efficiency classes of the respective countries.

Icons and images

In iBRoad2EPC, icons are used to symbolise the building services. By default, icons are shown for heating, hot water, ventilation and cooling because they cover the most common technologies. The six pilot countries will initially adopt these categories. If required, other categories can also be shown for individual implementing countries, such as household electricity or renewable energy. Furthermore, the number of icons displayed can be changed to less than four.

Renovation measures on the building envelope in iBRoad2EPC are shown with a house symbol. In the interests of an easy-to-understand visualisation, only the four most important building envelope component categories are shown: roof, external walls, windows and the lower building envelope. Components that already meet the target condition are shown in green, others in white colour.

iBRoad2EPC does not aim to provide a finer resolution of the component features in order to minimise the processing effort for issuers and provide building owners with easily understandable information. For implementing countries, it is nevertheless possible to display the component features in several levels, e.g., with colours from red to yellow to green, in order to depict different insulation thicknesses. This can be set individually when customising iBRoad2EPC to the country requirements.

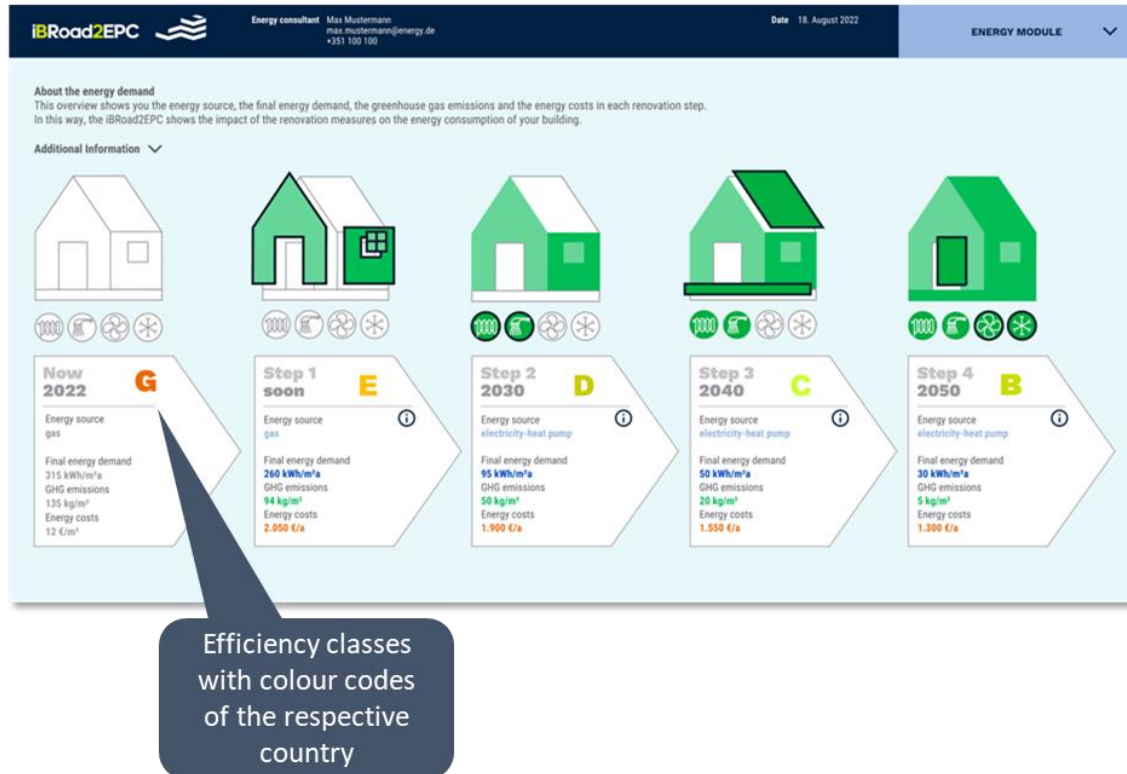


Figure 18: Colour codes of the efficiency classes of the respective countries in the iBRoad2EPC output document.

User influence

Residents can have a high influence on the energy consumption of the building. Through iBRoad2EPC, they receive advice for energy-saving behaviour in a dedicated page. The advice is country dependent and defined through the database. Issuers can select the advice they want to give to building owners from a drop-down menu adapted to their country (this feature is not yet implemented in the iBRoad2EPC Assistant while this report is being finalised). Up to six advice text blocks can be displayed. They are stored in the iBRoad2EPC database and entered into the iBRoad2EPC spreadsheet template "User influence" tab. Each pilot country can build on a list of already entered default text blocks and edit them individually.

COUNTRY SPECIFIC ADAPTATIONS TO EXTERNAL INSTRUMENTS

The results from iBRoad2EPC are automatically stored in an internal database. The database design allows exporting data to other databases for further processing. On the one hand, the data in iBRoad2EPC describe the actual status of the buildings and are therefore suitable for supplementing cadastres. If enough building data is available in a cadastre, energy demand structures can be made visible and, for example, renovation areas can be identified. Furthermore, the planned future states of the buildings are also available in iBRoad2EPC. If these are transferred into spatially resolved databases, they can support, e.g., municipal heating planning or grid planning.

Possible uses of iBRoad2EPC data in external databases are described in the report *“iBRoad2EPC in depth – Technical report on the definition of the proposed concept, content and methodology”*.

Data exchange between iBRoad2EPC and the iBRoad Logbook

Another possible utilisation of the iBRoad2EPC data is the coupling with the iBRoad Logbook. If this is already available in a country, the iBRoad2EPC data can be transferred to the logbook. In the future, building owners can thus compare their actually implemented retrofit measures with the originally planned building statuses and thus monitor their renovation path.

DOCUMENTATION AND USER SUPPORT

The creation of an iBRoad2EPC with the help of the iBRoad2EPC Assistant is described in detail in the handbook for the issuers (see *“iBRoad2EPC handbook for issuers”*). At the time this report was completed, the handbook had already been translated into four languages. This enables issuers in the implementing countries to better understand the aim and purpose of iBRoad2EPC and to easily learn how to use the online tool.

CONCLUSION

This report explains the requirements, context, target groups and methodology for country specific adaptation, and thereby the approach for embedding, use and structure of the iBRoad2EPC. This report is accompanied by an excel spreadsheet containing the country specific templates and main content of the database as well as the translations of the content to the respective languages of the participating countries. Using the specific example of the adaptation of iBRoad2EPC to six pilot countries, this report shows how other countries can also introduce iBRoad2EPC in the future and adapt it to their own specific demands. The concept of iBRoad2EPC is designed with a wide range of flexibility, so that the ready-made structures that were realised during the project can be used without the need for additional changes.

ANNEX - iBRoad2EPC SPREADSHEET TEMPLATE

The iBRoad2EPC spreadsheet template is submitted as an Excel spreadsheet with this report. It contains country-specific adaptations of iBRoad2EPC for six pilot countries (Bulgaria, Greece, Poland, Portugal, Romania, and Spain).



iBRoad2EPC

www.ibroad2epc.eu



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