iBRoad

Individual Building
Renovation Roadmaps

iBRoad training toolkit

Guidance for auditors in the iBRoad pilot countries

ifeu – Institut für Energie- und Umweltforschung Heidelberg

March 2019

www.ibroad-project.eu

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TOOLKIT OVERVIEW

The iBRoad Renovation Roadmap and Logbook are subjected to field testing in the so-called pilot countries, Bulgaria, Poland and Portugal. The aim is to test their practicality and manageability and feed the experiences of the participating energy auditors and building owners back into the tools for further adjustments. Fifteen to twenty buildings per pilot country are examined using the iBRoad tools in cooperation with professional energy auditors from the respective countries.

In a first step, the country partners attended a train-the-trainer seminar. This was arranged as an online webinar. It enabled the country partners to recruit energy auditors for the field tests. In a second step, the energy auditors were provided with comprehensive training before the field tests. They were trained through face-to-face seminars that each lasted one full day.

The training toolkit provided for this purpose contains all the information needed to issue the iBRoad and to perform the field tests:

- *Handbook for energy auditors – Guidance and advice on how to create an iBRoad Individual Building Renovation Roadmap and how to use the iBRoad Building Logbook* (Available from the iBRoad website). It explains the iBRoad tools' basic motivation, process, and technical detail specimen. It explains the Renovation Roadmap, the various audit steps and the individual approach to the customers´ buildings and needs. Furthermore, it comprises a step-wise manual for the iBRoad Roadmap Assistant. It also guides the auditors through the creation of an iBRoad Logbook.
- *Presentation for the train-the-trainer seminar* (included here). The seminar deals with the organisation of the field tests and the auditors´ training. It shows the requirements and time schedules. Additionally, it presents the functionalities of the live iBRoad Roadmap Assistant and Logbook tools and explains the evaluation procedure of the field tests.
- *Presentation for the auditors´ training* (included here). During the training, both the iBRoad Roadmap and Logbook are presented to the auditors. Starting with the original motivation for the tools, the implementations are introduced and explained step-by-step. Finally, the questionnaires for the evaluation of the field tests are shown and the logistic approach of the evaluation is explained.
- The auditors receive two questionnaires, one for their own experiences and one for the homeowners' experience. The questionnaires are handed over during the auditors´ training. However, in the true sense of the meaning, the questionnaires and their analyses are not part of the toolkit and are not part of this report. They will be displayed separately in the upcoming iBRoad report on *"The implementation and evaluation of iBRoad in the pilot countries"*, which will show the concept and results of the evaluation.
- After the training, the auditors have two months' time to examine the buildings and issue the iBRoad Roadmap and Logbook. During this time, the auditors have access to a telephone hotline in their country. The hotline is regarded as part of the toolkit as well.

After the evaluation of the field tests, the experiences of the participants shall influence the improvement of the toolkit. In the future, the toolkit should be adopted from various relevant chambers and associations in order to promote and support further training.

Train-the-Trainer Seminar

iBRoad Individual Building Renovation Roadmaps

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Agenda

- Organisation of the Field Test
- iBRoad Roadmap
- iBRoad Logbook
- Evaluation of the Field Test

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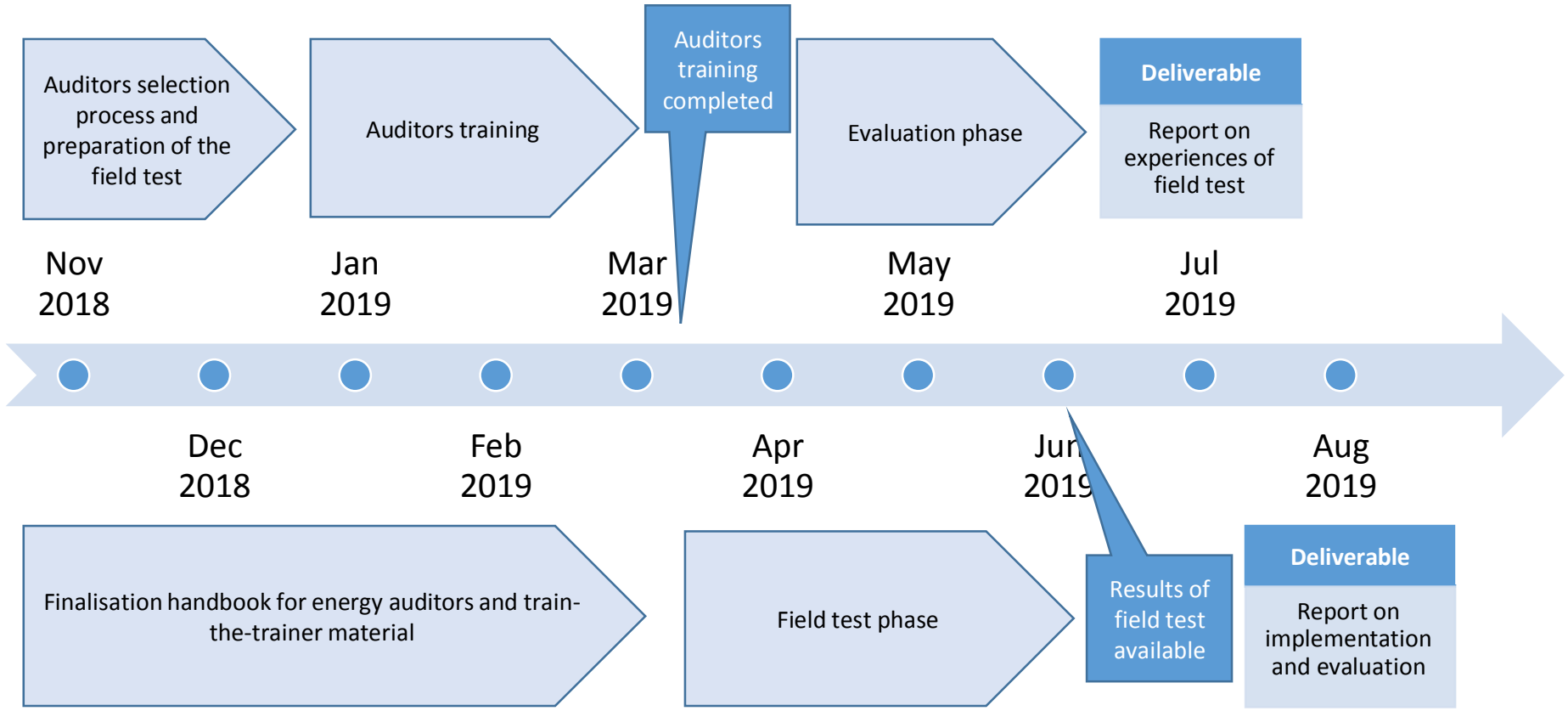
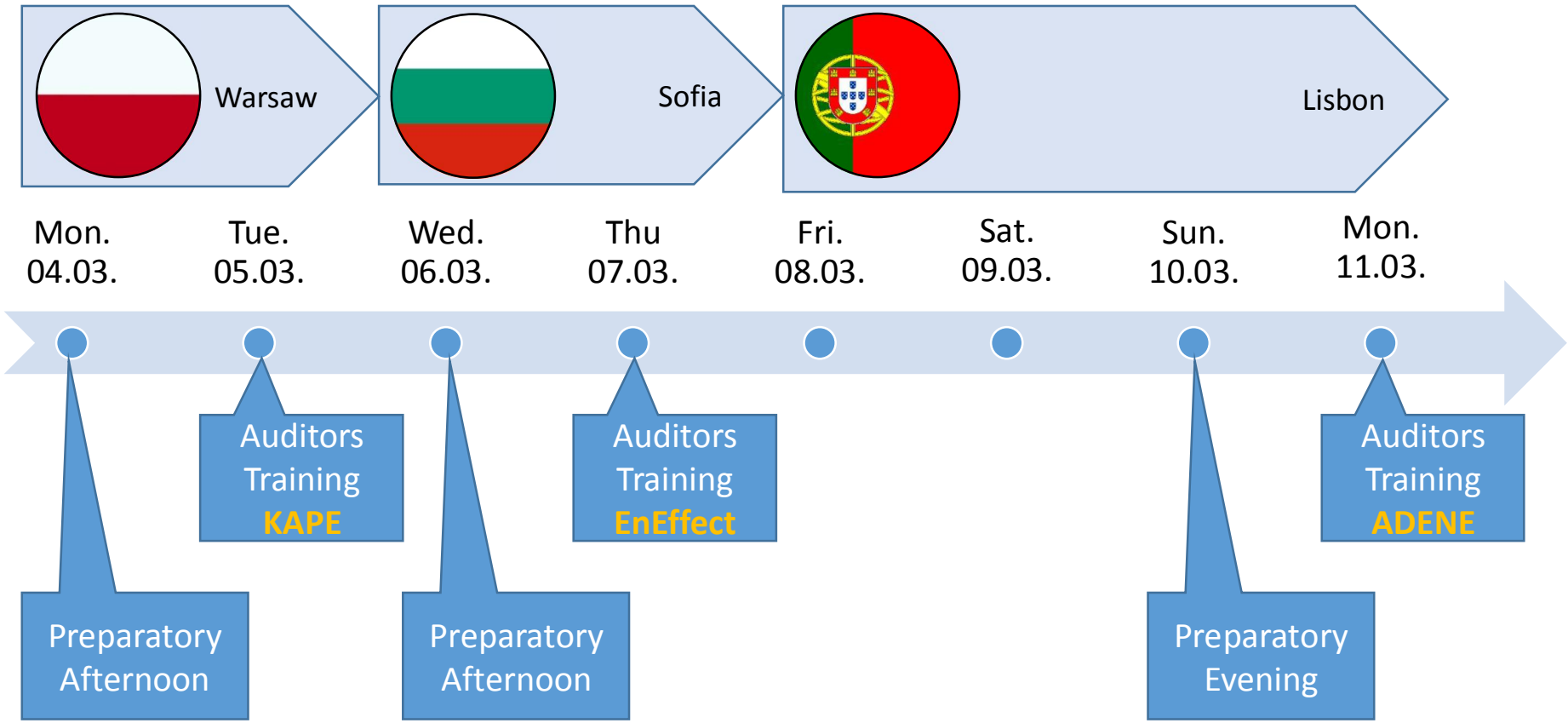
Field Test Schedule



Auditors´ Training



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Auditors´ Training Seminar

- 9:00 Welcome and Introduction
- 9:15 Why a Renovation Roadmap?
  What is the Renovation Roadmap?
  Steps to create a Renovation Roadmap
- 11:00 Coffee Break
- 11:20 Why a Logbook?
  What is the Logbook?
  Steps to create a Logbook
- 13:00 Lunch
- 13:45 Evaluation of the Field Test
- 14:30 Questions
- 15:15 End of the Seminar

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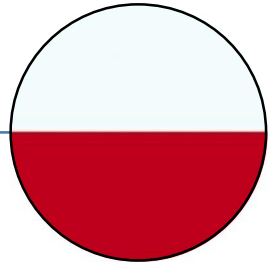
Requirements for the Training

What is needed for the Auditors´ Training?

- Preparatory afternoon
- Ideally 10 experienced energy auditors or EPC issuers
- Suitable conference room with video beamer
- Presenter in the respective language
- Presentation (ifeu)
- Handbook (ifeu)
  Printed by you (?)

Bulgaria



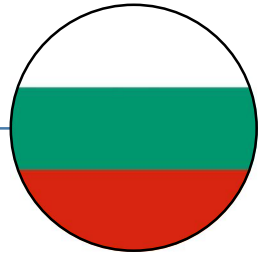
Poland

Portugal

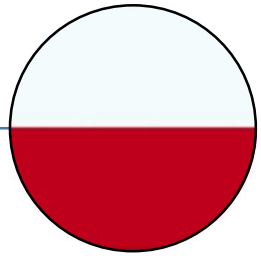
Requirements for the Field Test

What is needed during the field test?

- Ideally 20 buildings with individual renovation demands
- Interested building owners
- National calculation software
- A telephone-hotline for remaining questions



Bulgaria



Poland

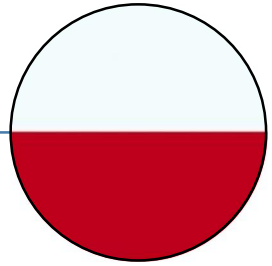
Portugal

Requirements for the Evaluation

What is needed for the evaluation?

- Willingness from homeowners to answer a questionnaire in English
- Willingness from auditors to answer a questionnaire in English
- Questionnaires (ifeu)
- A telephone-hotline for remaining questions

Bulgaria



Poland

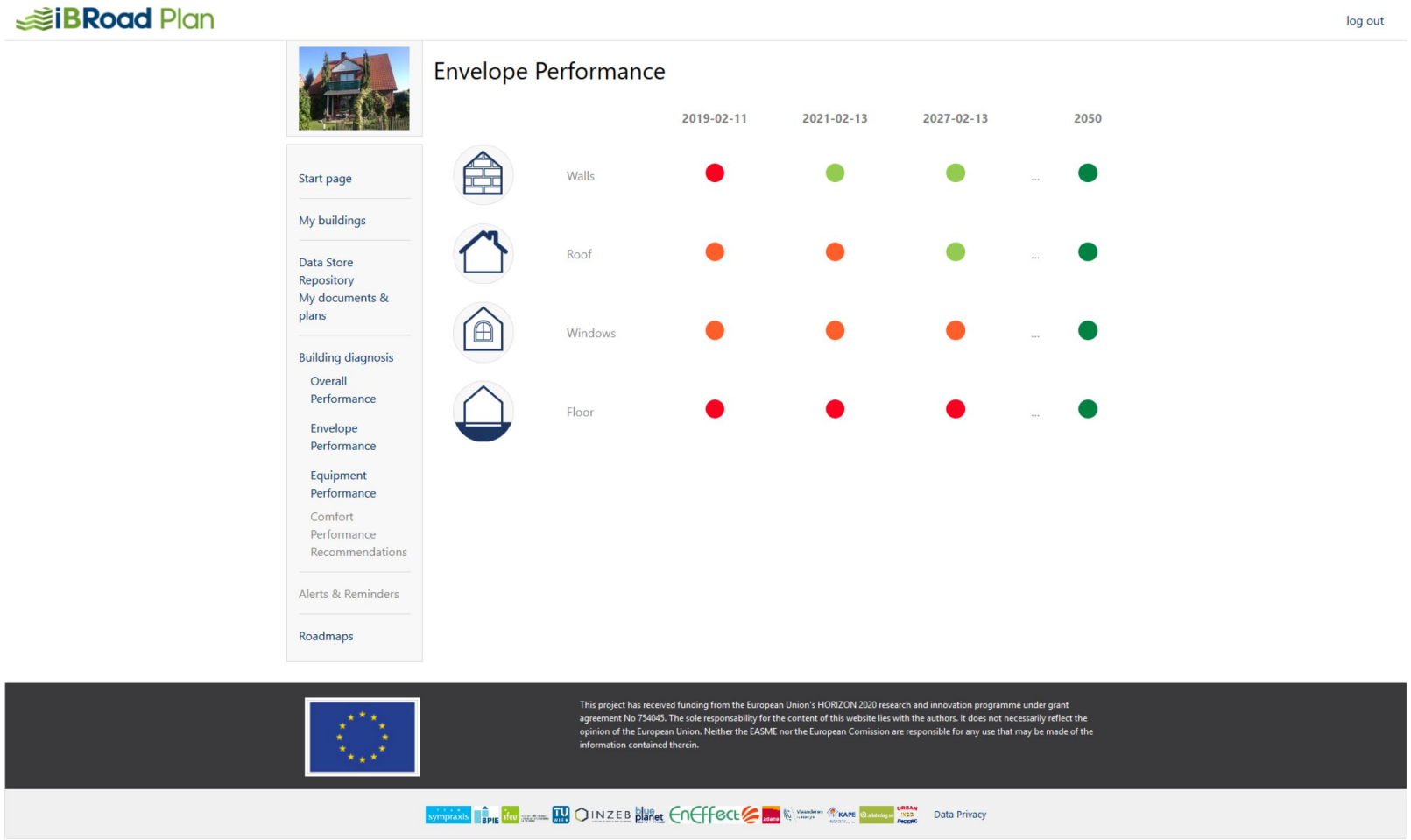
Portugal

Live Presentation of the Roadmap

Step by Step Plan

ENERGY CLASS F	ENERGY CLASS D	ENERGY CLASS A
TODAY YOUR BUILDING	WHEN BOILER NEEDS TO BE EXCHANGED RENOVATION STEP 1	WHEN WINDOWS NEED TO BE EXCHANGED RENOVATION STEP 2
	WHAT TO DO? • Improve the air permeability of the envelope • Optimization control system	WHAT TO DO? • Installation of a thermal insulating layer on top of concrete ground floor in contact with the ground
	INVESTMENT COSTS 456555 € COSTS FOR MAINTENANCE 2467 €	INVESTMENT COSTS 44 € COSTS FOR MAINTENANCE 44 €
ENERGY BILL 159 €/a	ENERGY BILL 144 €/a	ENERGY BILL 143 €/a

Live Presentation of the Logbook



- Evaluation of the Field Test
  - Energy Auditor Survey
  - Homeowner Survey
  - Country Partners Survey
  - Evaluation Report

- Energy Auditors Survey
  - Manageability (working with tools, effort for audit, …)
  - Understanding (concept of iBRoad, colour coding, …)
  - Customer´s Perception (easy to understand, motivating, …)

- Homeowners Survey
  - Building State
  - Renovations (in the past or planned for the future)
  - Understanding (concept of iBRoad, colour coding, …)
  - Contentment with iBRoad (motivating, helpful, …)

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- Country Partners Survey
  - Experience with Auditors (e.g. Training, Hotline, …)
  - Tools (data transfer, national adaption, …)
  - Next Steps

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iBRoad

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Auditors´ Training Seminar

Peter Mellwig

ifeu – Institut für Energie- und Umweltforschung

Warsaw, Sofia, Lisbon, March 5th - 11th 2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №754045

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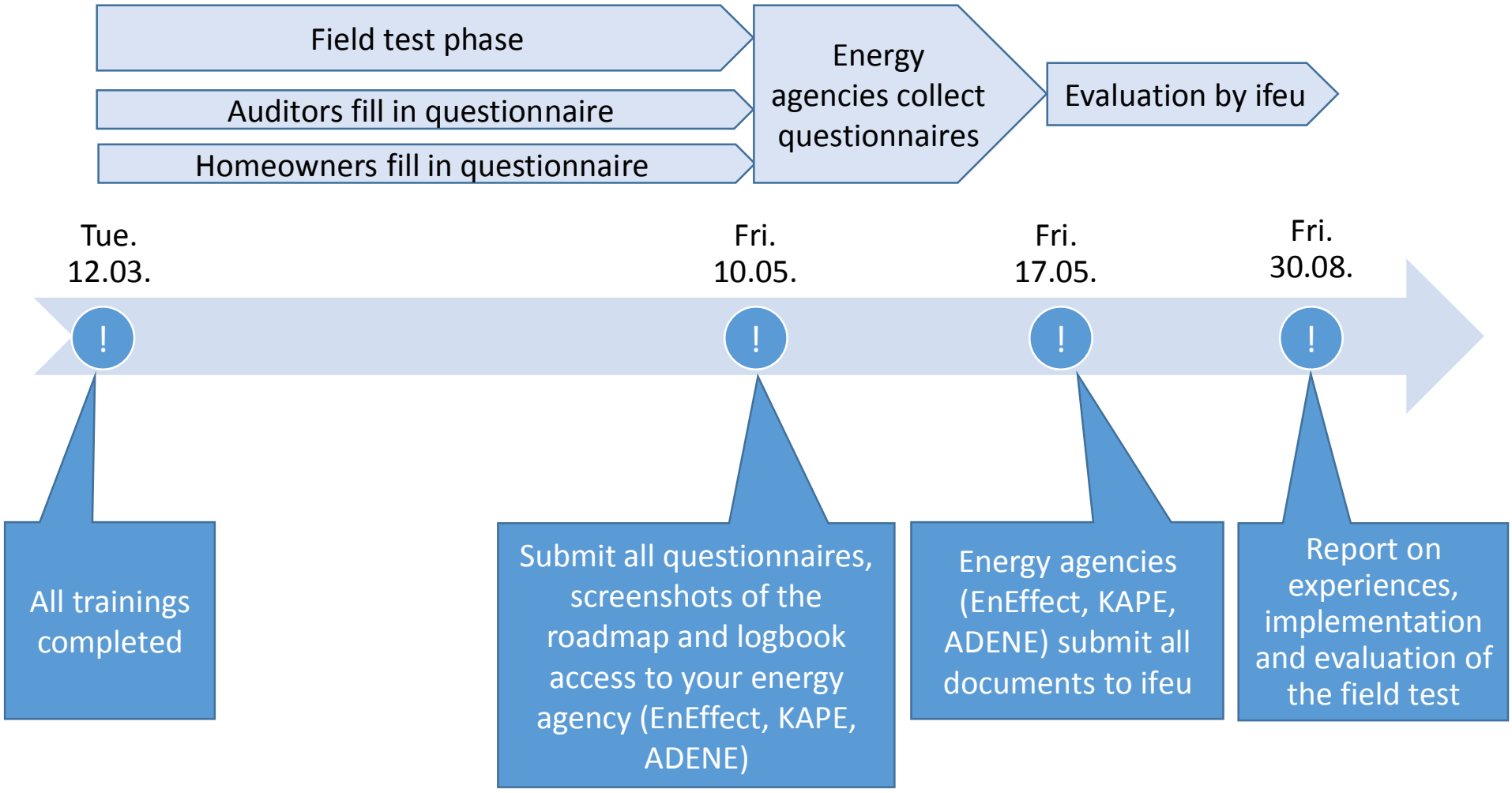
Time Schedule for the Field Test

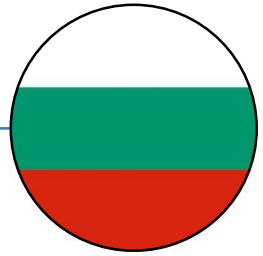


Framing for the Field Test

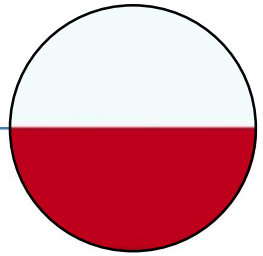
Field Test

- 3 pilot countries
- 10 energy auditors per country
- 20 real buildings per country

In addition, the logbook approach will be tested in Germany.



Bulgaria



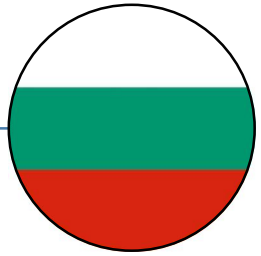
Poland

Portugal

Framing for the Field Test

Toolkit for the field test

- Online tool
  Roadmap Assistant
- Online tool
  Logbook
- Handbook for auditors
- Video tutorial for auditors
- Telephone-hotline in the national language



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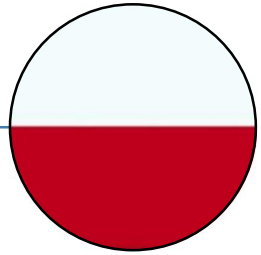

Poland

Portugal

Two Parts of iBRoad

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iBRoad

iBRoad Plan

Step by Step Plan

ENERGY CLASS F	ENERGY CLASS D	ENERGY CLASS A
TODAY	WHEN BOILER NEEDS TO BE EXCHANGED	WHEN WINDOWS NEED TO BE EXCHANGED
YOUR BUILDING	RENOVATION STEP 1	RENOVATION STEP 2
	WHAT TO DO? • Improve the air permeability of the envelope • Optimization control system	WHAT TO DO? • Installation of a thermal insulating layer on top of concrete ground floor in contact with the ground
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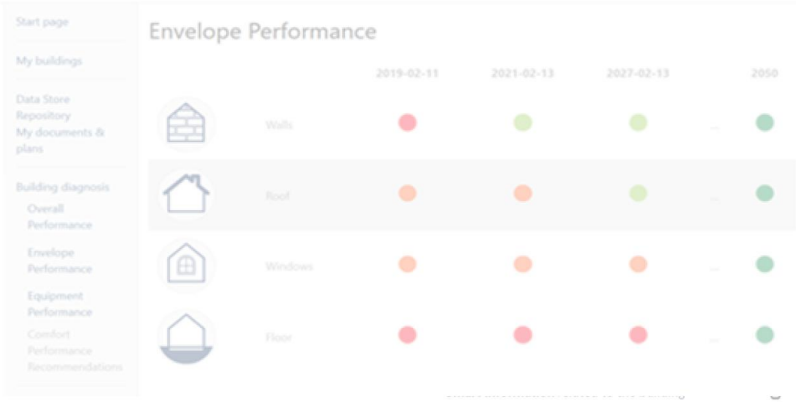
iBRoad Logbook



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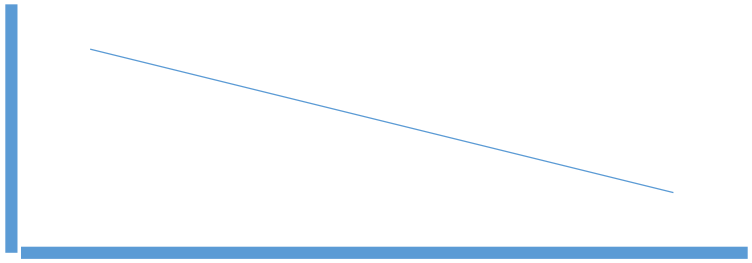
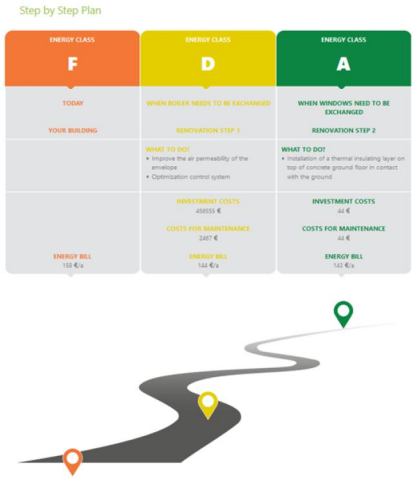
Renovation Roadmap – Why?

1. building components have long life cycles – today, each renovation must contribute to the climate target



2. most renovations are implemented stepwise and not in one step. But also stepwise renovations should be deep and avoid lock-ins.



Renovation Roadmap – Why?

3

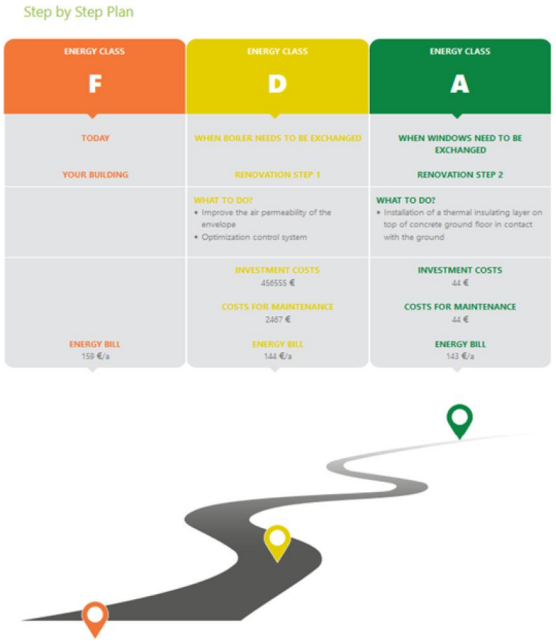
it takes an overarching plan to combine single renovation steps to a deep renovation

4

a long-term plan can consider the occasions (“trigger points“) in the homeowners´ lives

Renovation Roadmap - Concept

What is the Renovation Roadmap?



iBRoad Roadmap: diagnosis tool on building's performance providing stepwise renovation plan for buildings owners

Purpose:

- development of a building renovation strategy
- definition of the targeted level of carbon savings together with the owner
- development of a customised stepwise renovation plan with reasonable and coordinated measures
- providing a long-term renovation overview

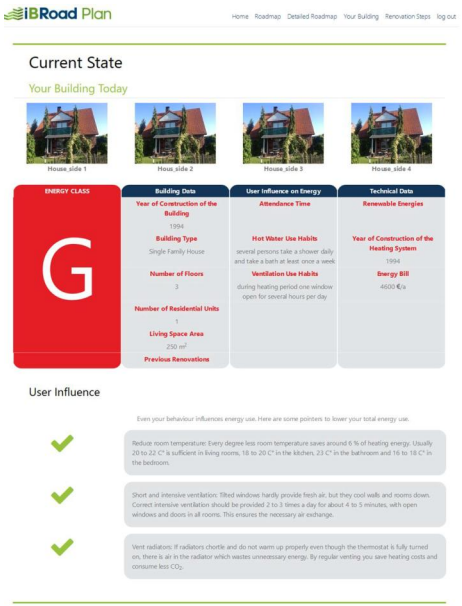
Your tasks:

- support the homeowner in specifying his or her vision of the house and in visualising retrofit implementation strategies
- take into account intended uses, interests and wishes of inhabitants, capabilities of the homeowner and the individual building situation
- define reasonable renovation packages that contribute to the climate targets and which the homeowner agrees to realise

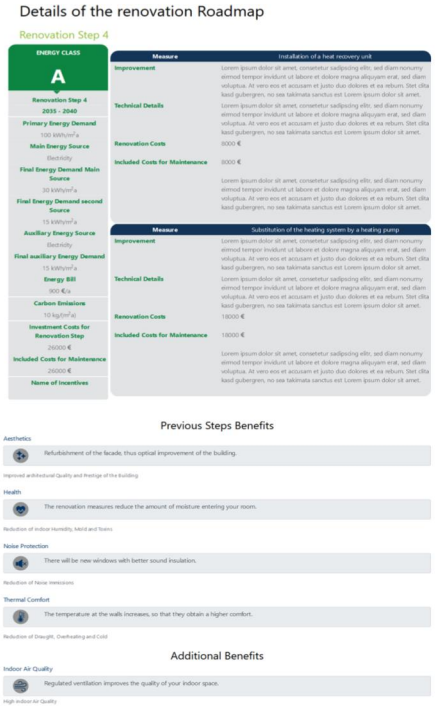
Renovation Roadmap - Concept

Pages of the Renovation Roadmap

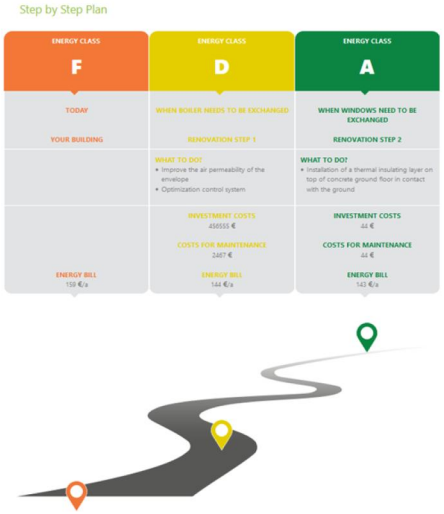
Current building state



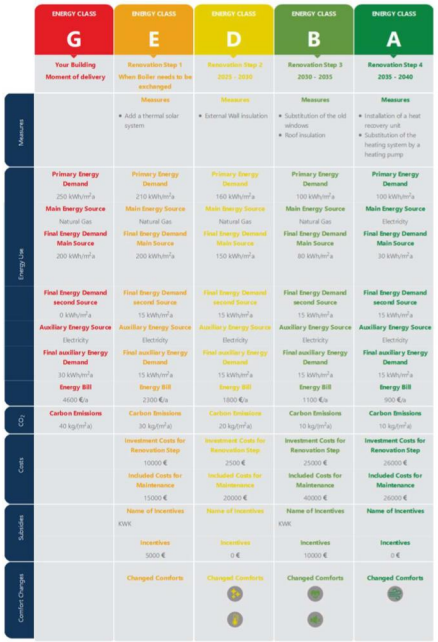
Detailed renovation step



Roadmap overview

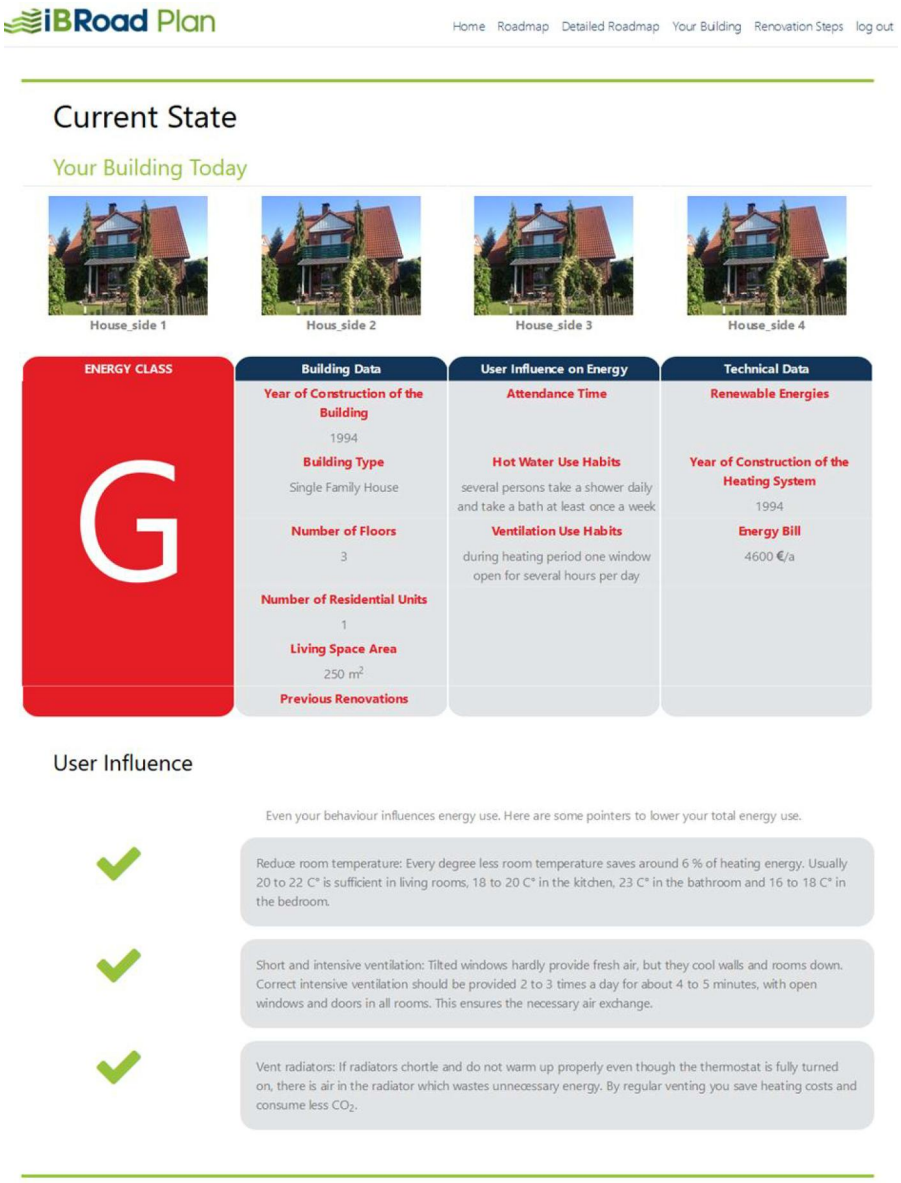


Detailed Roadmap



Renovation Roadmap - Concept

Current Building State



Renovation Roadmap - Concept

Current Building State

iBRoad Plan

Home Roadmap Detailed Roadmap Your Building Renovation Steps log out

Current State

Your Building Today

House_side 1

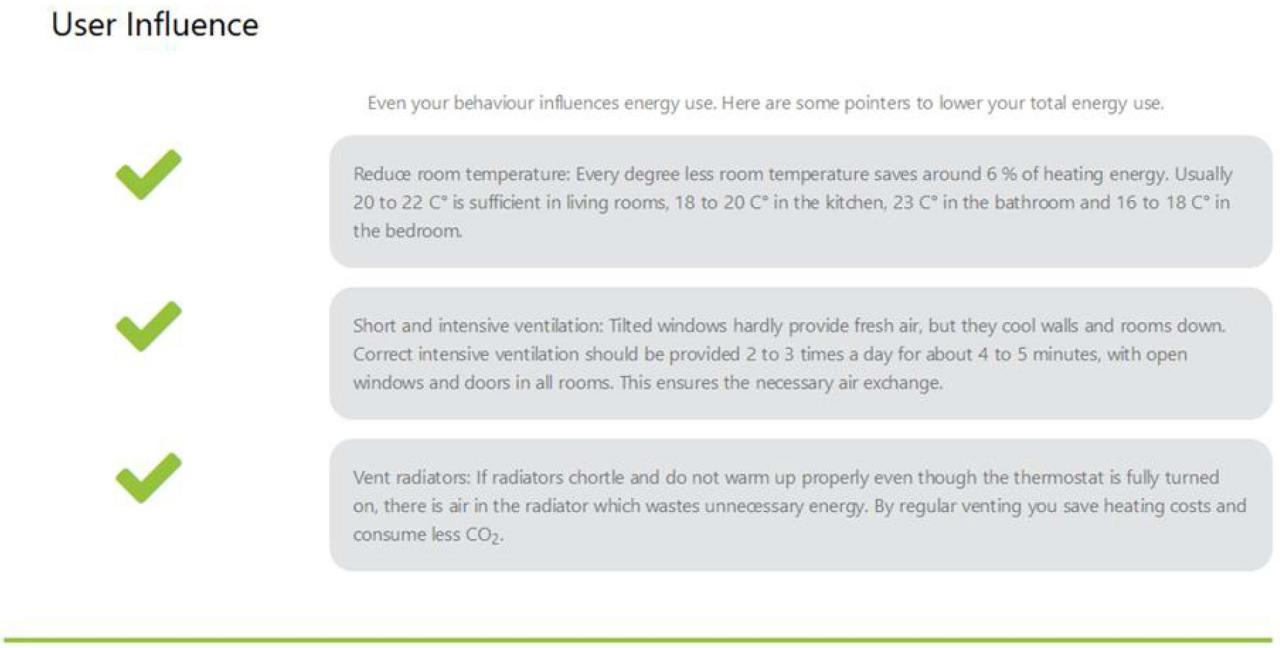
Hous_side 2

House_side 3

House_side 4

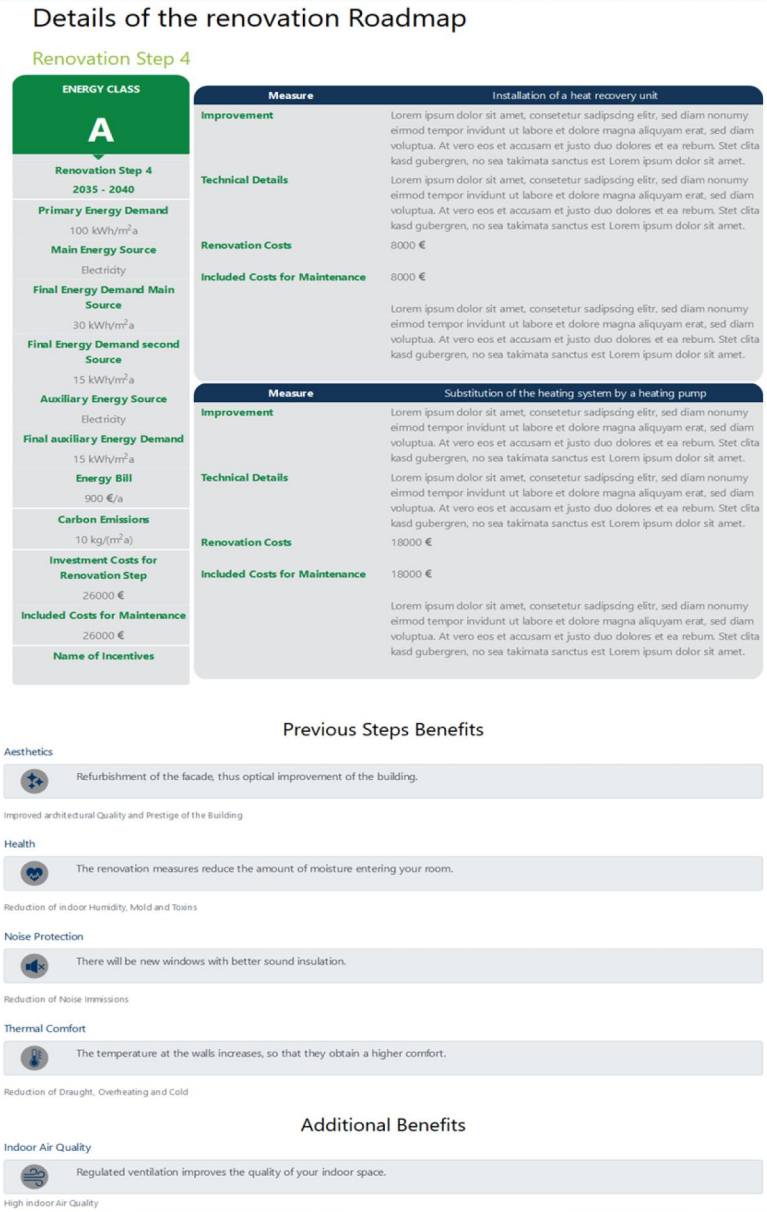
ENERGY CLASS	Building Data	User Influence on Energy	Technical Data
G	**Year of Construction of the Building** 1994 **Building Type** Single Family House **Number of Floors** 3 **Number of Residential Units** 1 **Living Space Area** 250 m²	**Attendance Time** **Hot Water Use Habits** several persons take a shower daily and take a bath at least once a week **Ventilation Use Habits** during heating period one window open for several hours per day	**Renewable Energies** **Year of Construction of the Heating System** 1994 **Energy Bill** 4600 €/a
	Previous Renovations		

Current Building State



Renovation Roadmap - Concept

Detailed Renovation Step



Details of the renovation Roadmap

Renovation Step 4

ENERGY CLASS

A

Renovation Step 4

2035 - 2040

Primary Energy Demand

100 kWh/m²a

Main Energy Source

Electricity

Final Energy Demand Main Source

30 kWh/m²a

Final Energy Demand second Source

15 kWh/m²a

Auxiliary Energy Source

Electricity

Final auxiliary Energy Demand

15 kWh/m²a

Energy Bill

900 €/a

Carbon Emissions

10 kg/(m²a)

Investment Costs for Renovation Step

26000 €

Included Costs for Maintenance

26000 €

Name of Incentives

Measure	Installation of a heat recovery unit
Improvement	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Technical Details	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Renovation Costs	8000 €
Included Costs for Maintenance	8000 €
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Measure	Substitution of the heating system by a heating pump
Improvement	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Technical Details	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Renovation Costs	18000 €
Included Costs for Maintenance	18000 €
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Previous Steps Benefits

Aesthetics

Refurbishment of the facade, thus optical improvement of the building.

Improved architectural Quality and Prestige of the Building

Health

The renovation measures reduce the amount of moisture entering your room.

Reduction of indoor Humidity, Mold and Toxins

Noise Protection

There will be new windows with better sound insulation.

Reduction of Noise Immissions

Thermal Comfort

The temperature at the walls increases, so that they obtain a higher comfort.

Reduction of Draught, Overheating and Cold

Additional Benefits

Indoor Air Quality

Regulated ventilation improves the quality of your indoor space.

High indoor Air Quality

Renovation Roadmap - Concept

Detailed Renovation Step

ENERGY CLASS
A
Renovation Step 4
2035 - 2040
Primary Energy Demand
100 kWh/m²a
Main Energy Source
Electricity
Final Energy Demand Main Source
30 kWh/m²a
Final Energy Demand second Source
15 kWh/m²a
Auxiliary Energy Source
Electricity
Final auxiliary Energy Demand
15 kWh/m²a
Energy Bill
900 €/a
Carbon Emissions
10 kg/(m²a)
Investment Costs for Renovation Step
26000 €
Included Costs for Maintenance
26000 €
Name of Incentives

Measure	Installation of a heat recovery unit
Improvement	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Technical Details	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Renovation Costs	8000 €
Included Costs for Maintenance	8000 €
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Measure	Substitution of the heating system by a heating pump
Improvement	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Technical Details	Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Renovation Costs	18000 €
Included Costs for Maintenance	18000 €
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Renovation Roadmap - Concept

Detailed Renovation Step

Previous Steps Benefits

Aesthetics

Refurbishment of the facade, thus optical improvement of the building.

Improved architectural Quality and Prestige of the Building

Health

The renovation measures reduce the amount of moisture entering your room.

Reduction of indoor Humidity, Mold and Toxins

Noise Protection

There will be new windows with better sound insulation.

Reduction of Noise Immissions

Thermal Comfort

The temperature at the walls increases, so that they obtain a higher comfort.

Reduction of Draught, Overheating and Cold

Additional Benefits

Indoor Air Quality

Regulated ventilation improves the quality of your indoor space.

High indoor Air Quality

Roadmap Overview

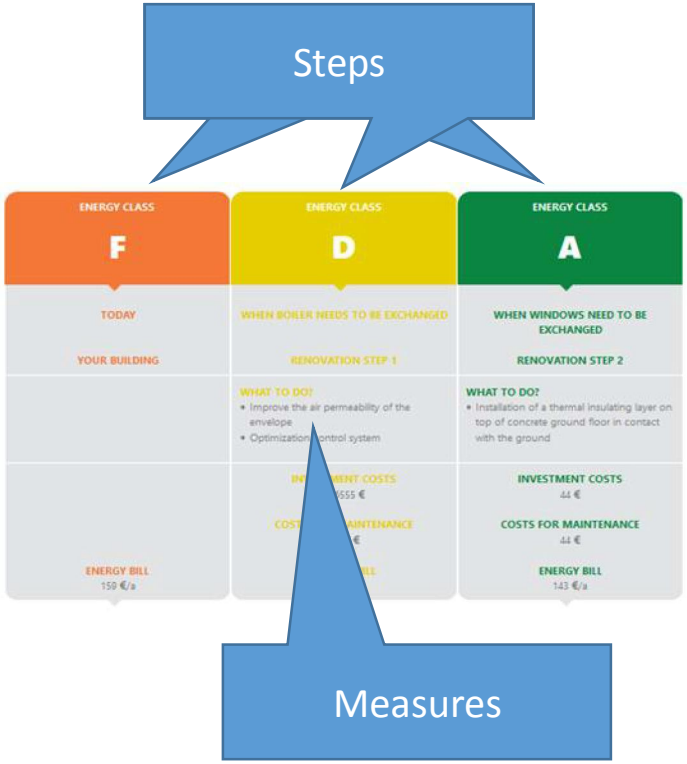
Step by Step Plan

ENERGY CLASS F	ENERGY CLASS D	ENERGY CLASS A
TODAY YOUR BUILDING	WHEN BOILER NEEDS TO BE EXCHANGED RENOVATION STEP 1	WHEN WINDOWS NEED TO BE EXCHANGED RENOVATION STEP 2
	WHAT TO DO? • Improve the air permeability of the envelope • Optimization control system	WHAT TO DO? • Installation of a thermal insulating layer on top of concrete ground floor in contact with the ground
ENERGY BILL 159 €/a	INVESTMENT COSTS 456555 € COSTS FOR MAINTENANCE 2467 € ENERGY BILL 144 €/a	INVESTMENT COSTS 44 € COSTS FOR MAINTENANCE 44 € ENERGY BILL 143 €/a

Renovation Roadmap - Terminology

- **Renovation Step**
- Renovation steps are the core of the Roadmap
- E.g. you may plan to renovate a building in 3 steps
- You can add as many steps as you like

- **Renovation Measure**
- Renovation measures refer to only one component
- One renovation step can comprise several measures
- E.g. in step 1 you may combine the measures
  - insulation of the walls
  - exchange of windows and
  - replacement of heating boiler



Renovation Roadmap - Concept

Detailed Roadmap

Detailed Renovation Roadmap

Step by Step Plan

	ENERGY CLASS G	ENERGY CLASS E	ENERGY CLASS D	ENERGY CLASS B	ENERGY CLASS A
	Your Building **Moment of delivery**	**Renovation Step 1** **When Boiler needs to be exchanged**	**Renovation Step 2** **2025 - 2030**	**Renovation Step 3** **2030 - 2035**	**Renovation Step 4** **2035 - 2040**
Measures		**Measures** • Add a thermal solar system	**Measures** • External Wall insulation	**Measures** • Substitution of the old windows • Roof insulation	**Measures** • Installation of a heat recovery unit • Substitution of the heating system by a heating pump
Energy Use	**Primary Energy Demand** 250 kWh/m²a **Main Energy Source** Natural Gas **Final Energy Demand Main Source** 200 kWh/m²a	**Primary Energy Demand** 210 kWh/m²a **Main Energy Source** Natural Gas **Final Energy Demand Main Source** 200 kWh/m²a	**Primary Energy Demand** 160 kWh/m²a **Main Energy Source** Natural Gas **Final Energy Demand Main Source** 150 kWh/m²a	**Primary Energy Demand** 100 kWh/m²a **Main Energy Source** Natural Gas **Final Energy Demand Main Source** 80 kWh/m²a	**Primary Energy Demand** 100 kWh/m²a **Main Energy Source** Electricity **Final Energy Demand Main Source** 30 kWh/m²a
	Final Energy Demand second Source 0 kWh/m²a **Auxiliary Energy Source** Electricity **Final auxiliary Energy Demand** 30 kWh/m²a **Energy Bill** 4600 €/a	**Final Energy Demand second Source** 15 kWh/m²a **Auxiliary Energy Source** Electricity **Final auxiliary Energy Demand** 15 kWh/m²a **Energy Bill** 2300 €/a	**Final Energy Demand second Source** 15 kWh/m²a **Auxiliary Energy Source** Electricity **Final auxiliary Energy Demand** 15 kWh/m²a **Energy Bill** 1800 €/a	**Final Energy Demand second Source** 15 kWh/m²a **Auxiliary Energy Source** Electricity **Final auxiliary Energy Demand** 15 kWh/m²a **Energy Bill** 1100 €/a	**Final Energy Demand second Source** 15 kWh/m²a **Auxiliary Energy Source** Electricity **Final auxiliary Energy Demand** 15 kWh/m²a **Energy Bill** 900 €/a
CO_2	**Carbon Emissions** 40 kg/(m²a)	**Carbon Emissions** 30 kg/(m²a)	**Carbon Emissions** 20 kg/(m²a)	**Carbon Emissions** 10 kg/(m²a)	**Carbon Emissions** 10 kg/(m²a)
Costs		**Investment Costs for Renovation Step** 10000 € **Included Costs for Maintenance** 15000 €	**Investment Costs for Renovation Step** 2500 € **Included Costs for Maintenance** 20000 €	**Investment Costs for Renovation Step** 25000 € **Included Costs for Maintenance** 40000 €	**Investment Costs for Renovation Step** 26000 € **Included Costs for Maintenance** 26000 €
Subsidies		**Name of Incentives** KWK **Incentives** 5000 €	**Name of Incentives** **Incentives** 0 €	**Name of Incentives** KWK **Incentives** 10000 €	**Name of Incentives** **Incentives** 0 €
Comfort Changes		**Changed Comforts**	**Changed Comforts**	**Changed Comforts**	**Changed Comforts**

Renovation Roadmap - Concept

Detailed Roadmap

	ENERGY CLASS G	ENERGY CLASS E	ENERGY CLASS D	ENERGY CLASS B	ENERGY CLASS A
	Your Building **Moment of delivery**	**Renovation Step 1** **When Boiler needs to be exchanged**	**Renovation Step 2** **2025 - 2030**	**Renovation Step 3** **2030 - 2035**	**Renovation Step 4** **2035 - 2040**
Measures		**Measures** • Add a thermal solar system	**Measures** • External Wall insulation	**Measures** • Substitution of the old windows • Roof insulation	**Measures** • Installation of a heat recovery unit • Substitution of the heating system by a heating pump
Energy Use	**Primary Energy Demand** 250 kWh/m²a	**Primary Energy Demand** 210 kWh/m²a	**Primary Energy Demand** 160 kWh/m²a	**Primary Energy Demand** 100 kWh/m²a	**Primary Energy Demand** 100 kWh/m²a
	Main Energy Source Natural Gas	**Main Energy Source** Natural Gas	**Main Energy Source** Natural Gas	**Main Energy Source** Natural Gas	**Main Energy Source** Electricity
	Final Energy Demand Main Source 200 kWh/m²a	**Final Energy Demand Main Source** 200 kWh/m²a	**Final Energy Demand Main Source** 150 kWh/m²a	**Final Energy Demand Main Source** 80 kWh/m²a	**Final Energy Demand Main Source** 30 kWh/m²a
	Final Energy Demand second Source 0 kWh/m²a	**Final Energy Demand second Source** 15 kWh/m²a	**Final Energy Demand second Source** 15 kWh/m²a	**Final Energy Demand second Source** 15 kWh/m²a	**Final Energy Demand second Source** 15 kWh/m²a
	Auxiliary Energy Source Electricity	**Auxiliary Energy Source** Electricity	**Auxiliary Energy Source** Electricity	**Auxiliary Energy Source** Electricity	**Auxiliary Energy Source** Electricity
	Final auxiliary Energy Demand 30 kWh/m²a	**Final auxiliary Energy Demand** 15 kWh/m²a	**Final auxiliary Energy Demand** 15 kWh/m²a	**Final auxiliary Energy Demand** 15 kWh/m²a	**Final auxiliary Energy Demand** 15 kWh/m²a
	Energy Bill 4600 €/a	**Energy Bill** 2300 €/a	**Energy Bill** 1800 €/a	**Energy Bill** 1100 €/a	**Energy Bill** 900 €/a

Detailed Roadmap

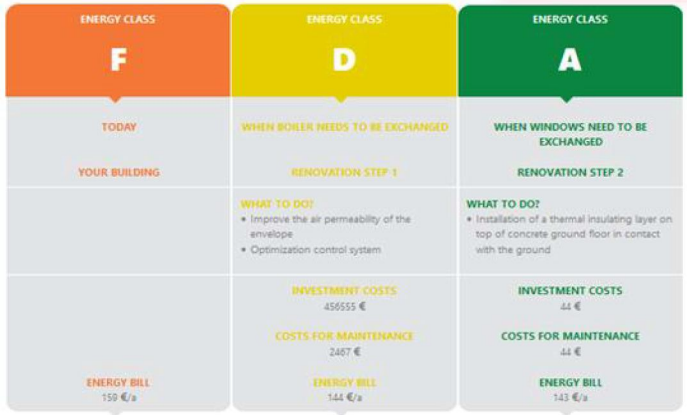
CO_2	**Carbon Emissions** 40 kg/(m²a)	**Carbon Emissions** 30 kg/(m²a)	**Carbon Emissions** 20 kg/(m²a)	**Carbon Emissions** 10 kg/(m²a)	**Carbon Emissions** 10 kg/(m²a)
Costs		**Investment Costs for Renovation Step** 10000 € **Included Costs for Maintenance** 15000 €	**Investment Costs for Renovation Step** 2500 € **Included Costs for Maintenance** 20000 €	**Investment Costs for Renovation Step** 25000 € **Included Costs for Maintenance** 40000 €	**Investment Costs for Renovation Step** 26000 € **Included Costs for Maintenance** 26000 €
Subsidies		**Name of Incentives** KWK **Incentives** 5000 €	**Name of Incentives** **Incentives** 0 €	**Name of Incentives** KWK **Incentives** 10000 €	**Name of Incentives** **Incentives** 0 €
Comfort Changes		**Changed Comforts**	**Changed Comforts**	**Changed Comforts**	**Changed Comforts**

Renovation Roadmap - Steps

Five steps to create a Renovation Roadmap

Initial Contact

On-site Visit



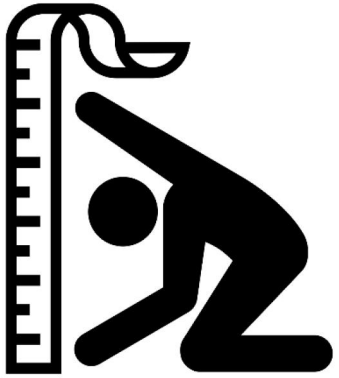
Calculation of present building state with national calculation software

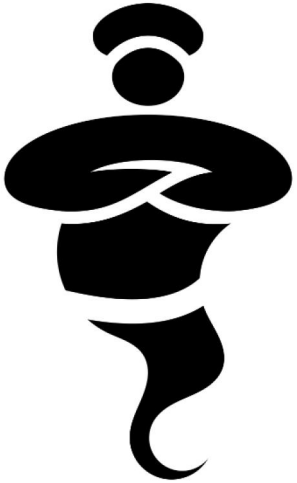
Produce Roadmap with the iBRoad Roadmap Assistant

Definition of Renovation Steps

Renovation Roadmap – On-site visit

- **Purpose of the on-site visit**
  - Data acquisition of technical building state
    - Geometry, components, heating, DHW, cooling, …
    - Strengths and weaknesses of the building
  - Note preferences of the homeowners
    - Currently (too cold, too hot, …)
    - For the future (specific requirements, time slots, …)





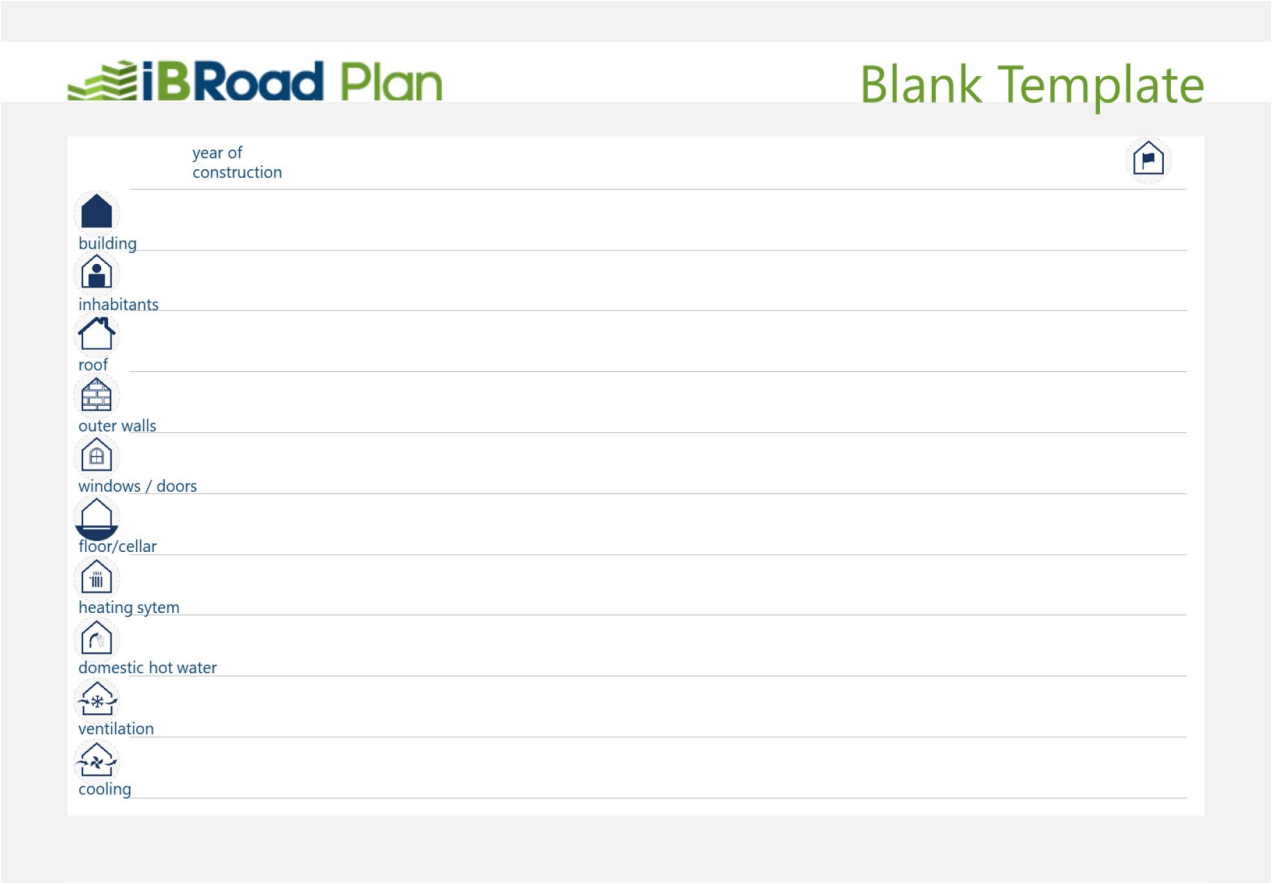
Checklist for the on-site visit (in the handbook)

Checklist for the on-site visit

- ✓ What does the homeowner feel disturbing about his/her current living situation?
- ✓ Is it mostly too warm or too cold in the house?
- ✓ Will there be changes in the living situation with regard to the building or are changes foreseeable (e. g. child birth, children moving out, grandparents moving in etc.)?
- ✓ What are the homeowner´s and habitants' preferences in comfort?
- ✓ What kind of measures does the homeowner plan to undertake anyway?
- ✓ What measures is the homeowner interested in anyway?
- ✓ Is a certain system technology preferred by the homeowner?
- ✓ Which renewable energy source is the homeowner interested in?
- ✓ Does the owner face a problem with moisture or mould?
- ✓ Is the ambient air polluted or is there a lot of noise outside?
- ✓ 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 rapid 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 cycle? 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 order should the components and systems be renovated?

Renovation Roadmap – On-site visit

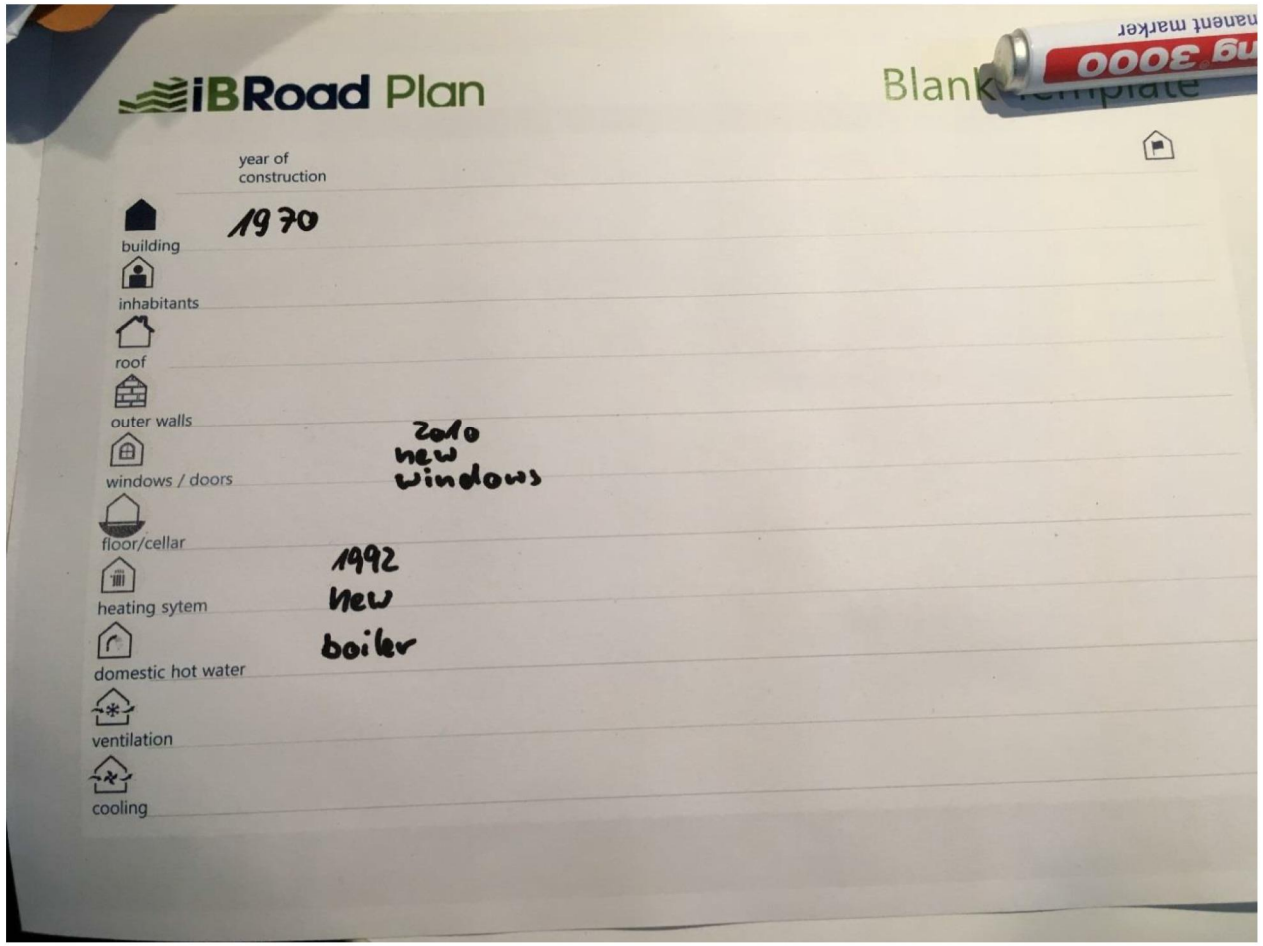
During the on-site visit, you can use the “Blank Template” to develop a first sketch of the Roadmap together with the homeowner.



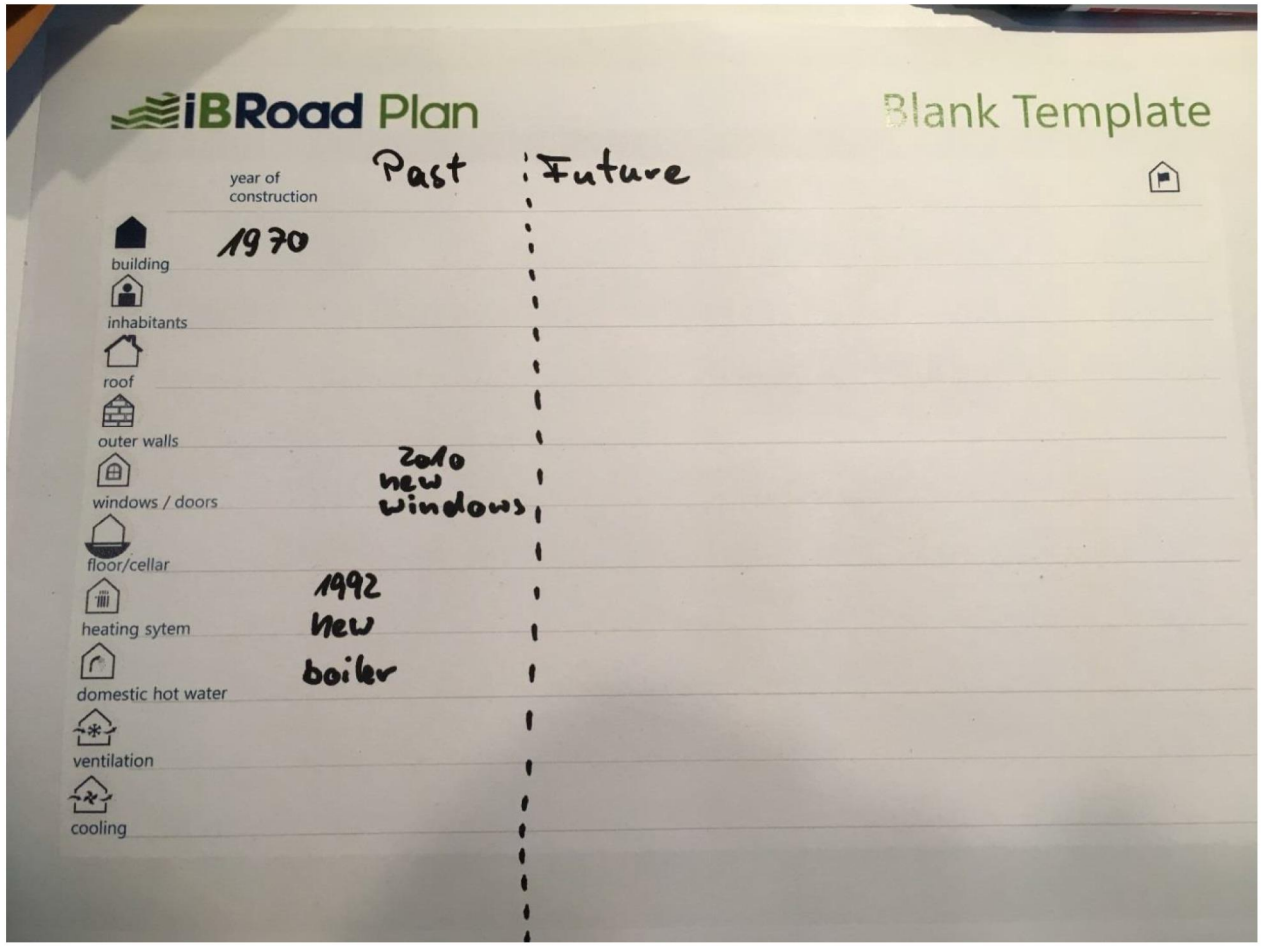
Start with the year of construction of the building

Renovation Roadmap – On-site visit

Enter past renovation measures that refer to energy demand

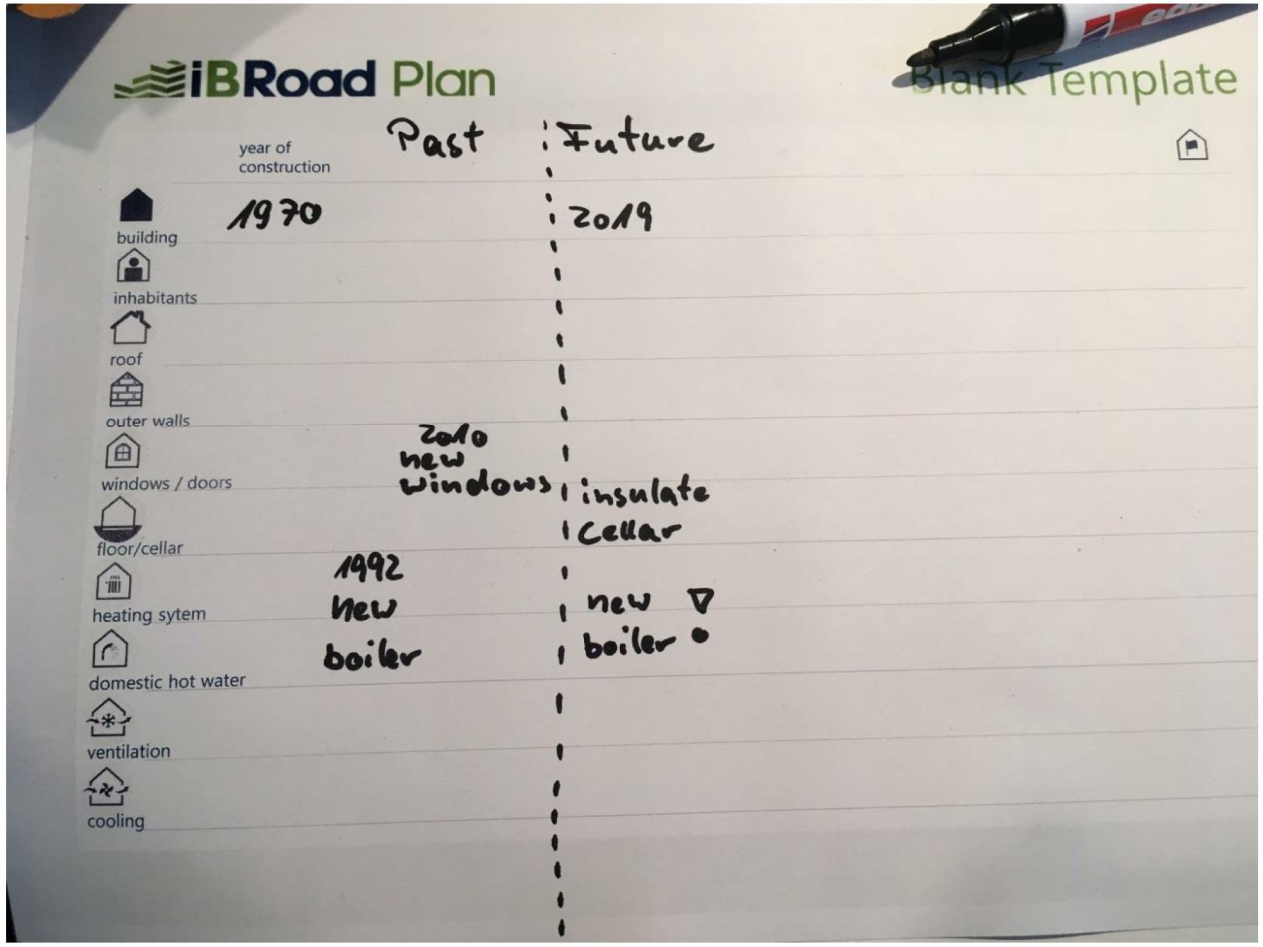


Now you can start planning the future



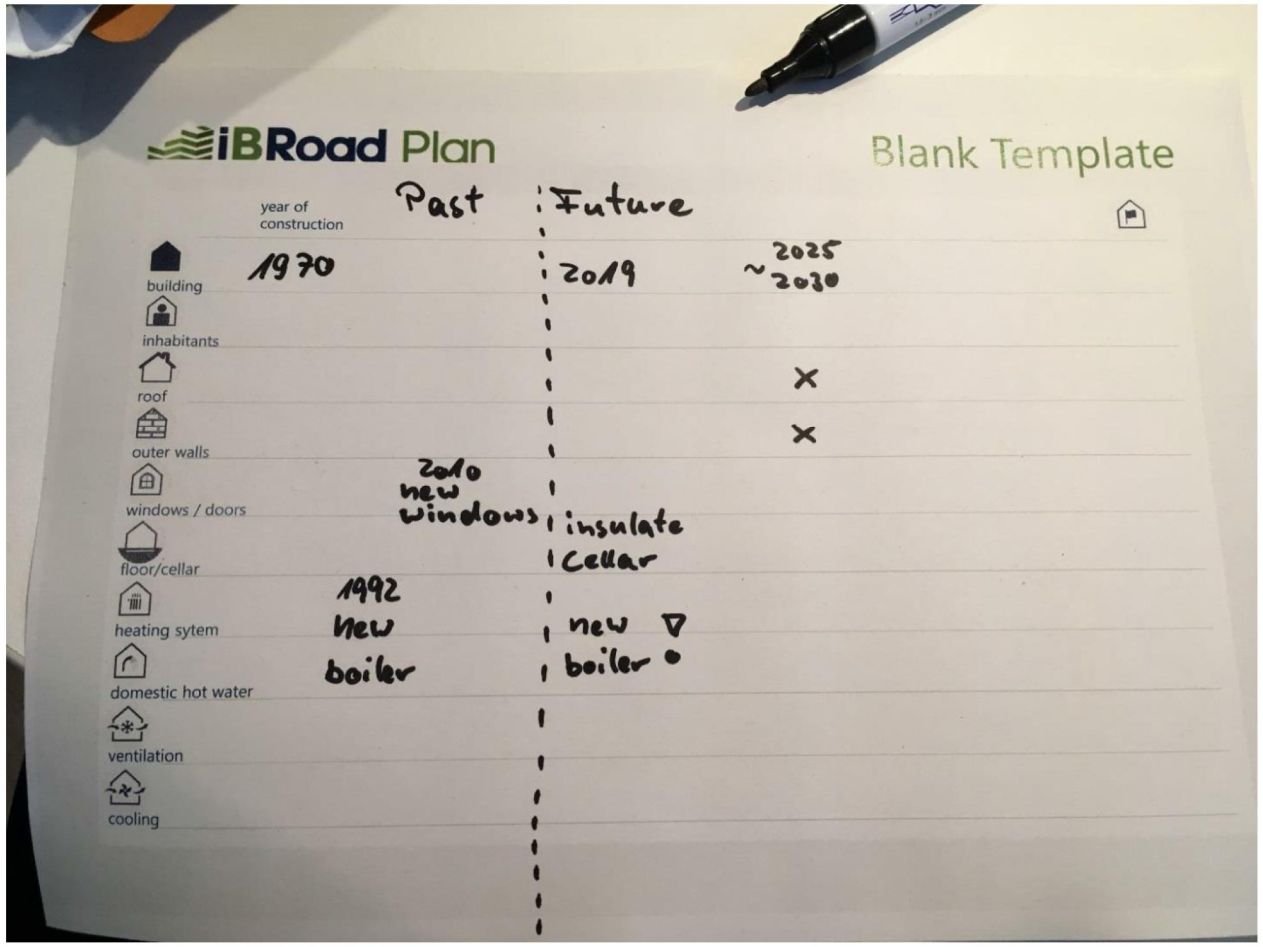
Renovation Roadmap – On-site visit

You can start with pending measures or measures that are easy to implement.



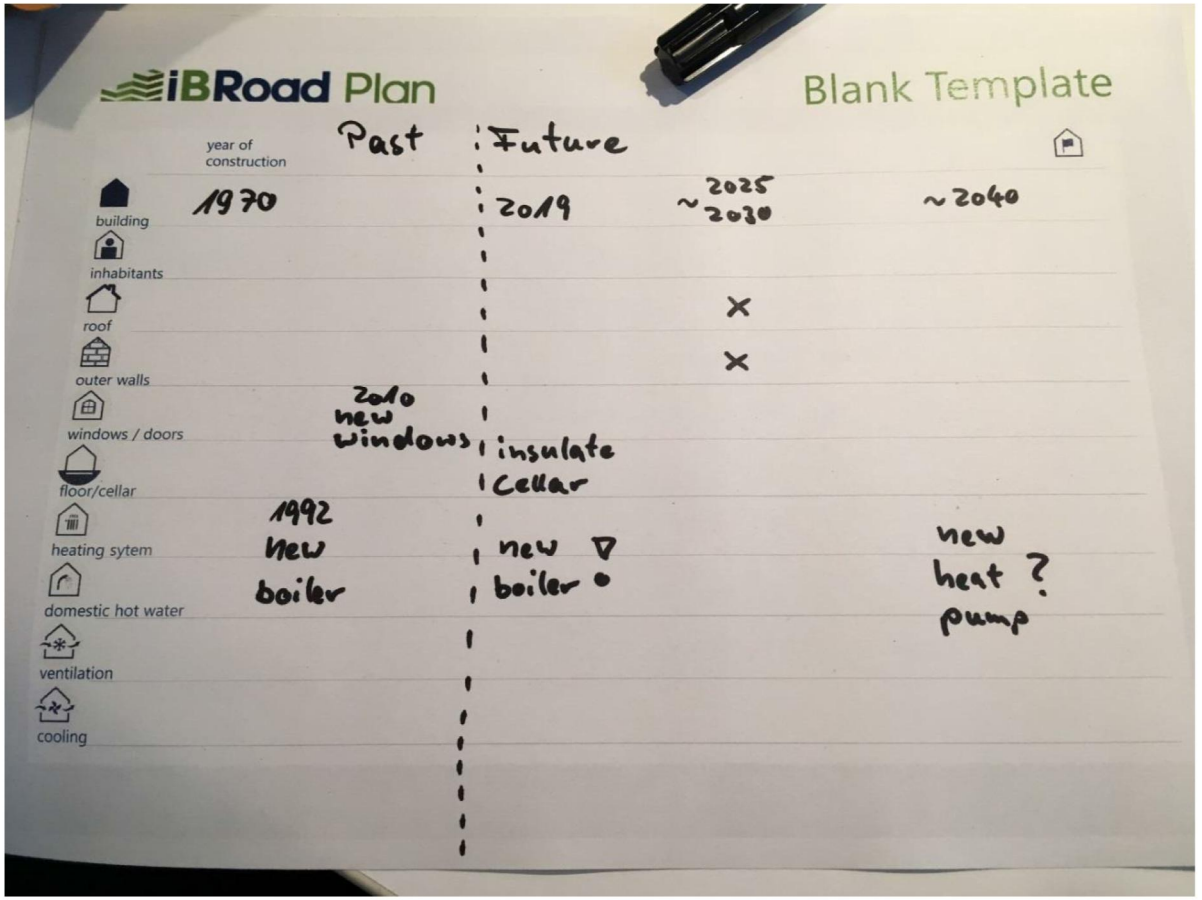
Renovation Roadmap – On-site visit

When will the life span of components expire and maintenance be needed anyway?

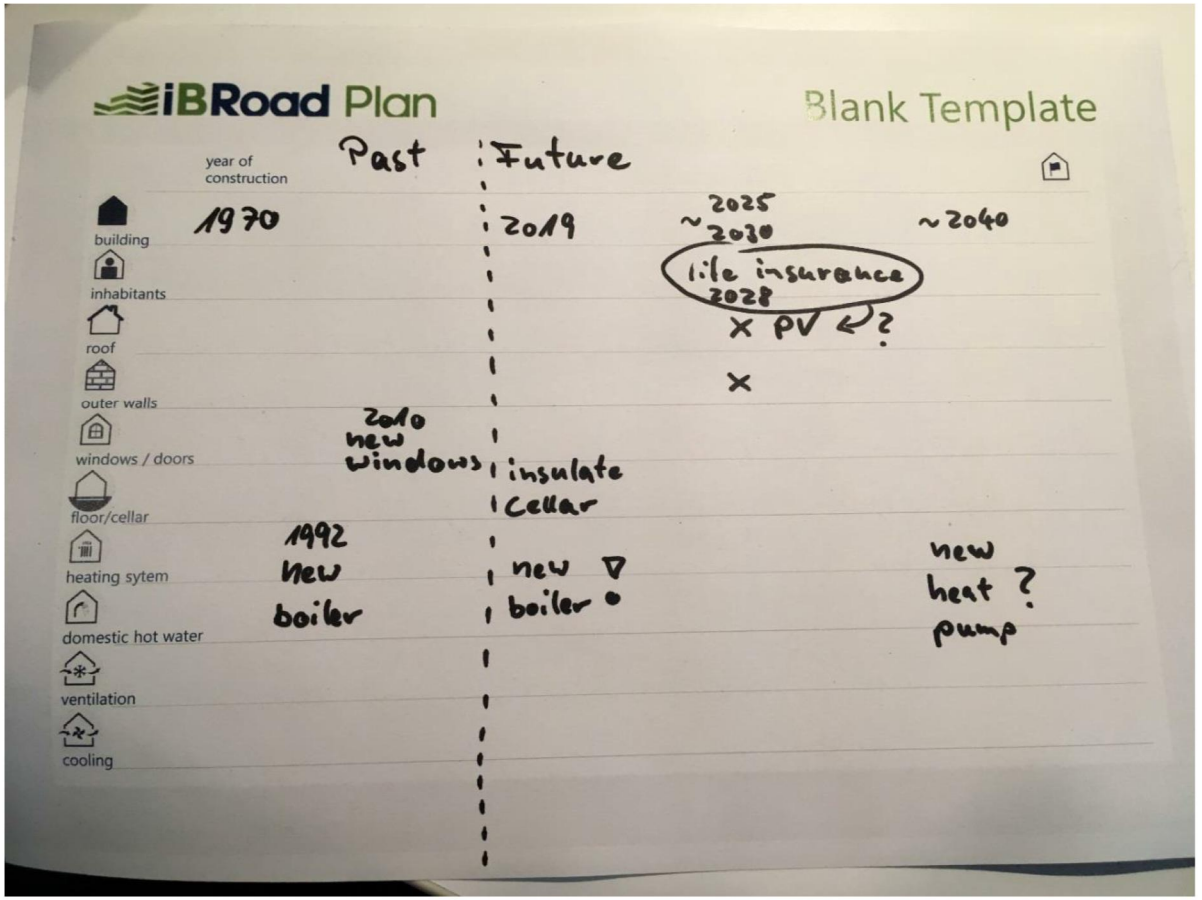


Renovation Roadmap – On-site visit

Even new components will need to be exchanged one day.
Depending on the considered period this might be interesting.



Maybe there will be occasions in the life of the homeowner that influence the measures.

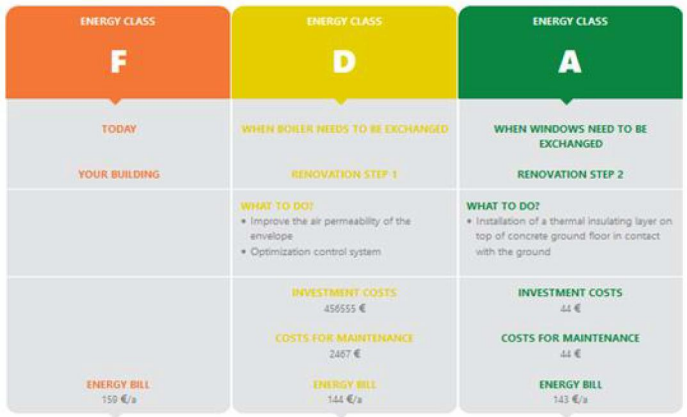


Renovation Roadmap - Steps

Five steps to create a Renovation Roadmap

Initial Contact

On-site Visit



Calculation of present building state with national calculation software

Produce Roadmap with the iBRoad Roadmap Assistant

Definition of Renovation Steps

Calculation present building state

Tasks of the Calculation of present building state with national calculation software

- Enter building envelop (surface areas, u-values)
- Enter heating, hot water, ventilation, cooling
- Calculate final energy demand, primary energy demand (same as EPC calculation)
- Calculate energy cost or copy energy cost from bill

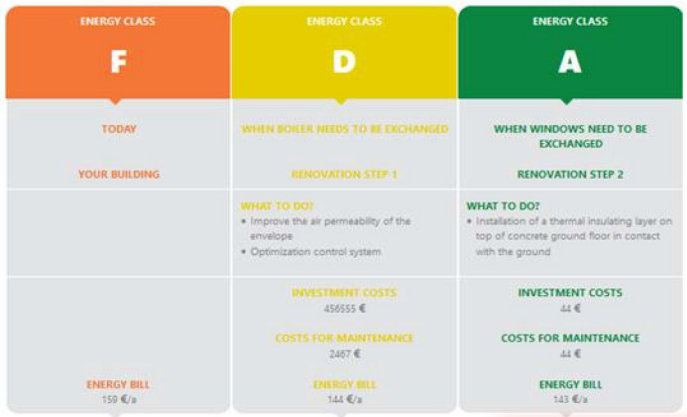
Bulgaria	Poland	Portugal
• ENSI EAB Software for Energy Auditing of Buildings	• Audytor OZC • ArCADia Thermo BuildDesk Energy Certificate • ENSI Profitability	• Energy Plus, • ESP-r

Renovation Roadmap - Steps

Five steps to create a Renovation Roadmap

Initial Contact

On-site Visit



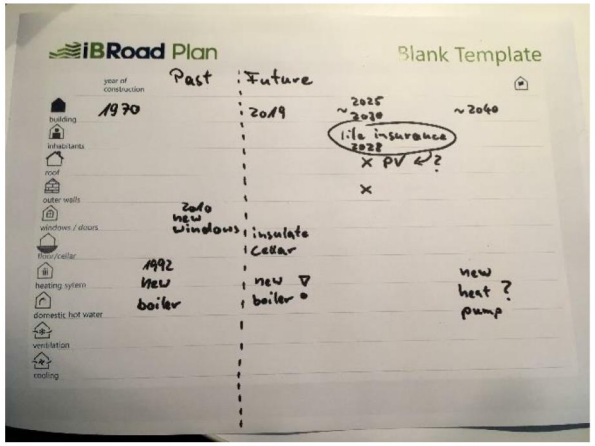
Calculation of present building state with national calculation software

Produce Roadmap with the iBRoad Roadmap Assistant

Definition of Renovation Steps

Definition of Renovation Steps

Guiding questions to define Renovation Steps



- Can the owner implement measures that are independent from the age of a building component (e.g. insulation of the cellar ceiling,)?
- Are there measures that provide considerable energy savings at low investment cost?
- Do the owners complain about specific comfort aspects, e.g. draught or summer heat?
- Are there components that need to be renovated or exchanged anyway in the near future?
- When will components need maintenance in the future according to their specific life span?
- Are there technical needs that require a specific order of renovations? Some renovations are much easier if they are combined.

Definition of Renovation Steps

Guiding Principles for Establishing the Roadmap

Best-Possible-Principle

Propose the measures with the highest possible energy efficiency

Individual Renovation Context

Consider the wishes, needs, financial situation of the homeowner and the inhabitants, and the circumstances of the building

Long-Term Perspective

Help the homeowne to understanfd the importance of having a long-term renovation strategy

Timing and Sequencing

Demonstrate the homeowner that a step-by-step renovation does have several advantages

Attractive and Motivating

The Roadmap should be attractive and easily understandable for homeowners so that they can be motivated to take action

Guiding Principles for Establishing the Roadmap (1/5)

Best Possible Principle

You should propose the measures with the highest possible energy efficiency.

Every building is unique. Therefore, it is not possible to formulate a universal target that applies to all buildings. However, the target of a nearly climate-neutral building stock must be fulfilled. Thus, you should pursue and propose the measures with the highest possible energy efficiency, taking into account the circumstances of the building and the preferences or financial capabilities of the owner - importantly, "best possible" does not mean "no matter how expensive".

Guiding Principles for Establishing the Roadmap (2/5)

Individual Renovation Context

Consider the wishes, needs, financial situation of the homeowner, and the circumstances of the building in the renovation process.

Assessing the homeowners' or family's situation today and how it is expected in the future is essential: this includes, for instance, financial opportunities, comfort requirements, living space changes, or family planning (e.g. having a baby, children moving out or grandparents moving in).

Also you need to consider the circumstances of the respective building, e.g.: Are there weaknesses in the building requiring immediate or rapid action? Are there measures that lead with little effort to major improvements?

Guiding Principles for Establishing the Roadmap (3/5)

Long-Term Perspective

Help the homeowner to understand the importance of having a long-term renovation strategy

It is important to pursue a long-term renovation strategy in order to avoid lock-in effects, i.e., energy savings which are not going to be realised due to unambitious and insufficiently stringent energy requirement targets for buildings, building elements and equipment.

Guiding Principles for Establishing the Roadmap (4/5)

Timing and Sequencing of Actions

A step-by-step renovation does have several advantages

Often, renovations cannot be carried out in a single operation so that many buildings are only renovated partially. In many cases, the financial situation of the homeowner does not allow comprehensive refurbishment at once. However, a step-by-step renovation does not mean that it is not as good as a renovation at once. In contrast, early replacement of components can also lead to economic losses. A step-by-step renovation, however, is also possible with limited budget. Summarising, also a step-by-step modernisation leads to the final goal, if each renovation step is well planned and takes into account every next step.

Guiding Principles for Establishing the Roadmap (5/5)

The Roadmap should be attractive and easily understandable for the users so that they can be motivated to take action.

The Roadmap needs to be attractive and easily understandable for homeowners in order to motivate them to take action. Therefore, make sure that you use, for instance, pictures whenever appropriate to illustrate specific situations and pay attention to comprehensibility. Building owners have to be guided throughout the Roadmap process and receive clear indications so that they can take action without getting lost.

Definition of Renovation Steps

After the renovation steps are defined you have to calculate them in your national software

- Make a copy or variant of the current building state and rename it to `renovation step 1´
- Change the respective components that should be renovated in step 1
- Make a copy of `renovation step 1´, rename it to `renovation step 2´ and change the components that should be renovated in step 2
- Proceed in this way for all renovation steps

Renovation Roadmap - Steps

Five steps to create a Renovation Roadmap

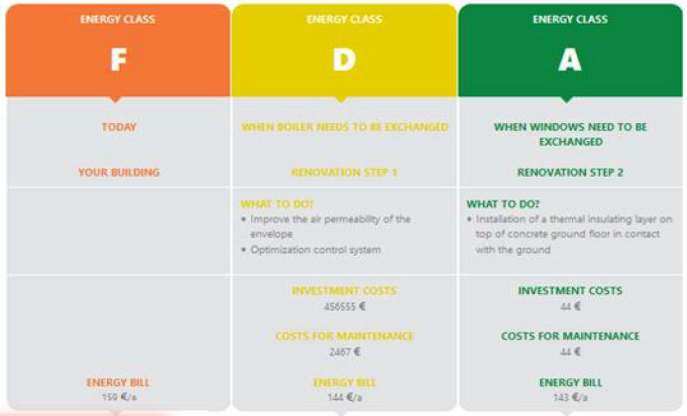
Initial Contact

On-site Visit

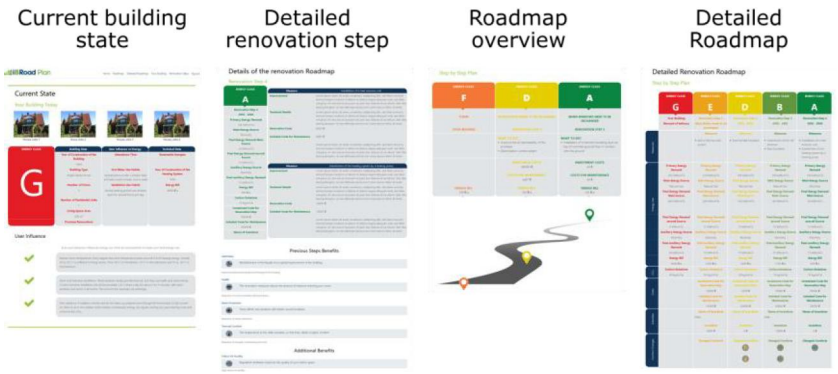
Calculation of present building state with national calculation software

Definition of Renovation Steps

Produce Roadmap with the iBRoad Roadmap Assistant

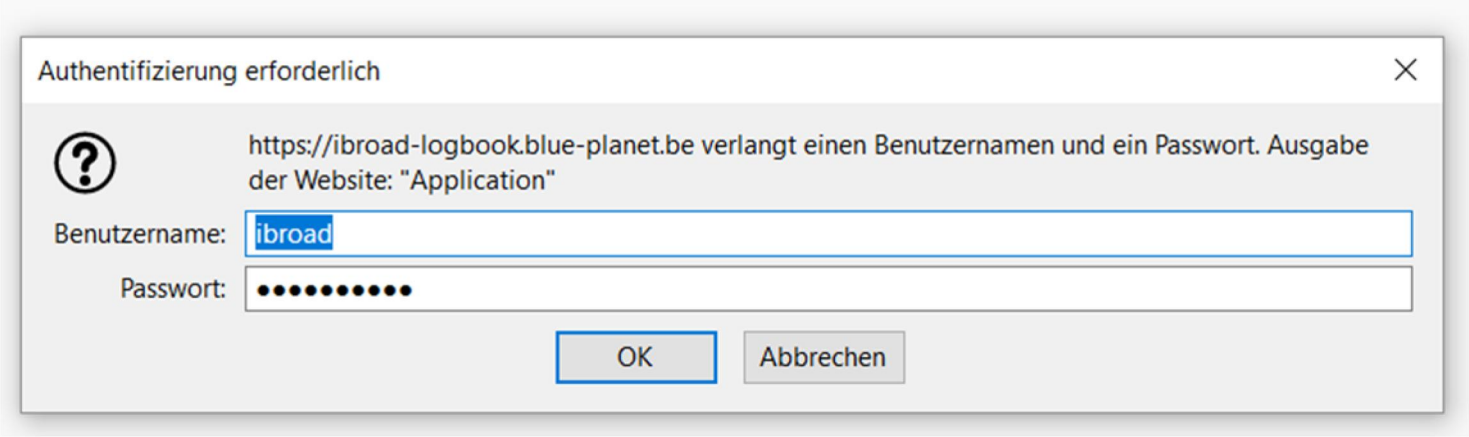


- **Transferring the data to the Renovation Roadmap**
- The Roadmap Assistant is an online tool to produce the Roadmap in a standardised layout

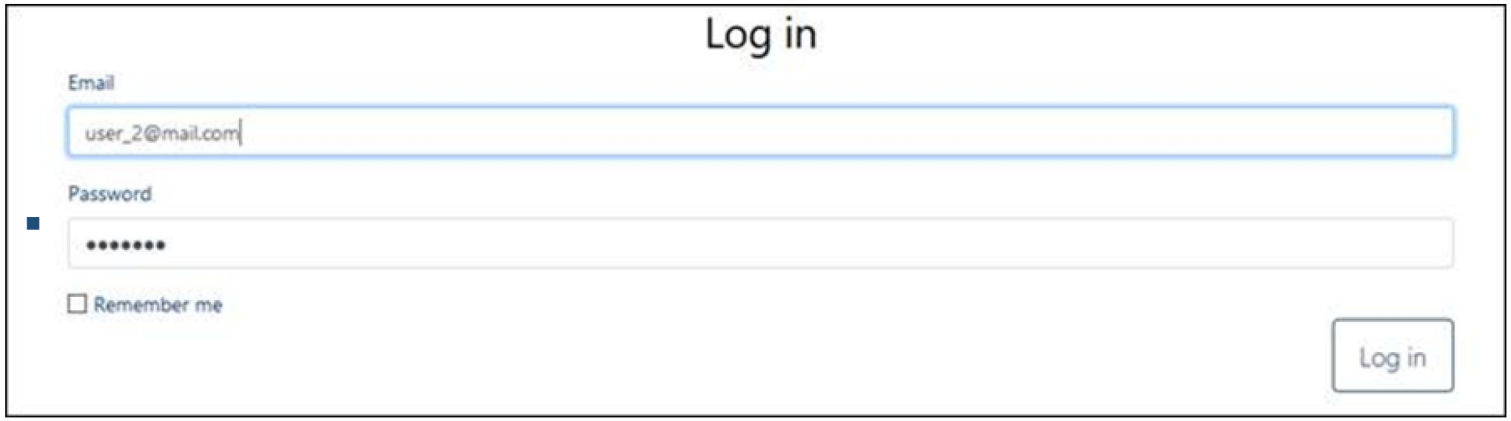


- The Roadmap Assistant produces an online link, which you can pass over to the homeowner. With this link the homeowner can see the Roadmap.

Link: https://ibroad.blue-planet.be/

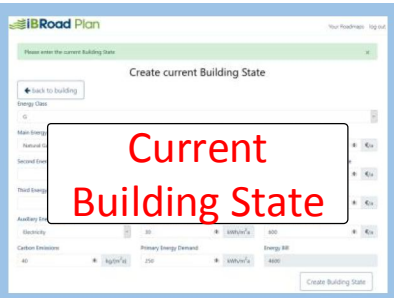


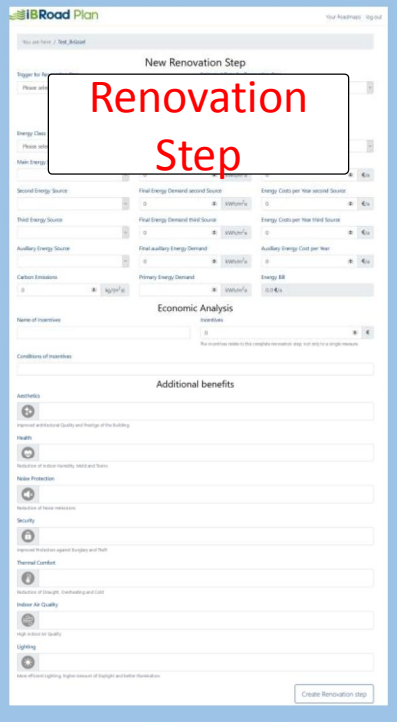
- Link: https://ibroad.blue-planet.be/

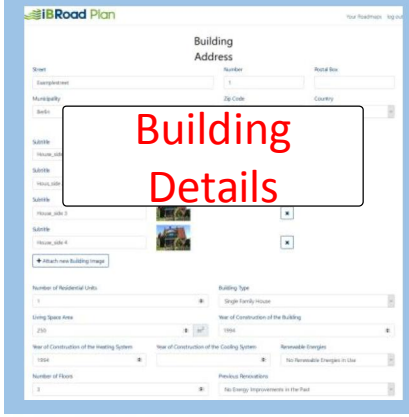


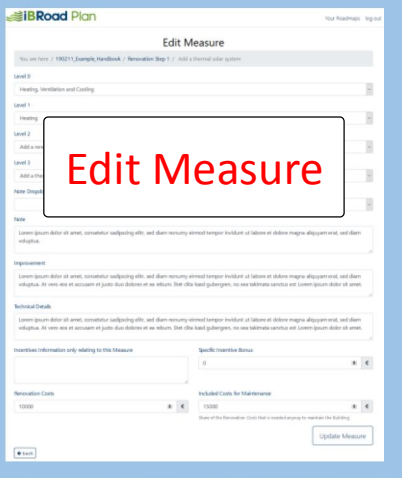
- For the roadmap we have specific email addresses with which you can log in.
  - user_1@mail.com
  - user_2@mail.com
  - user_3@mail.com
  - …
- The password for your account will be provided to you directly.

iBRoad Roadmap Assistant



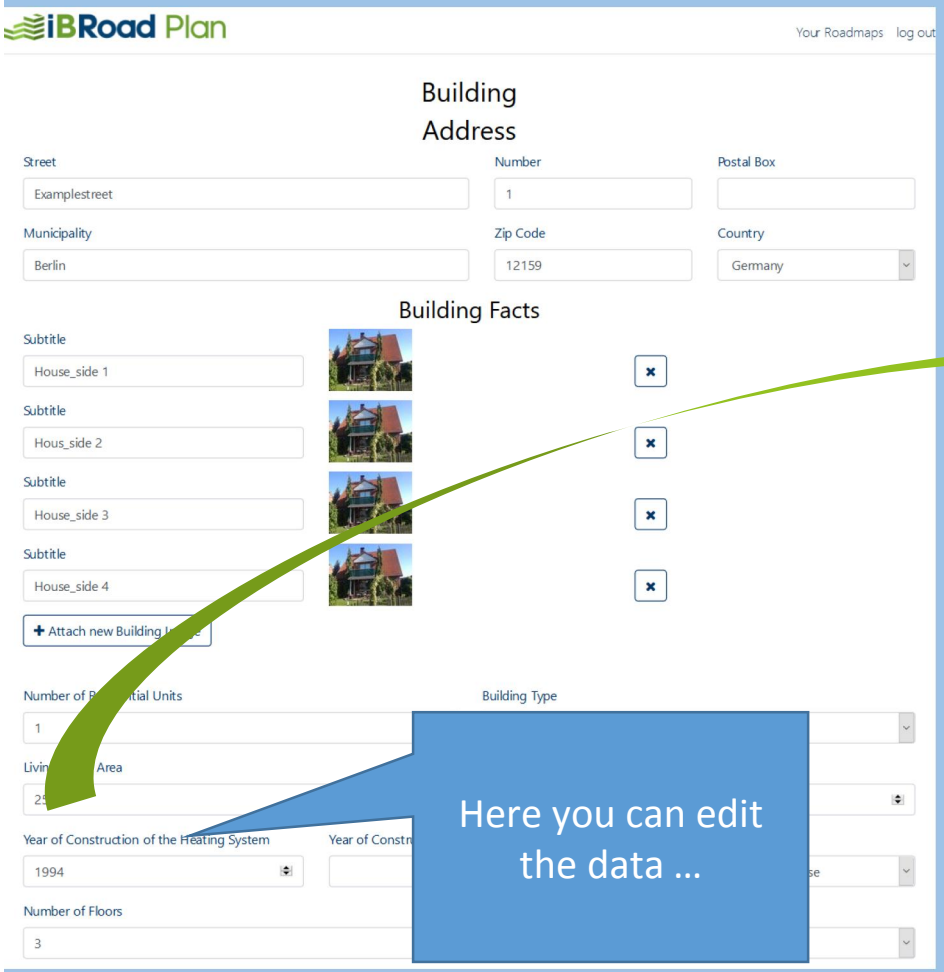




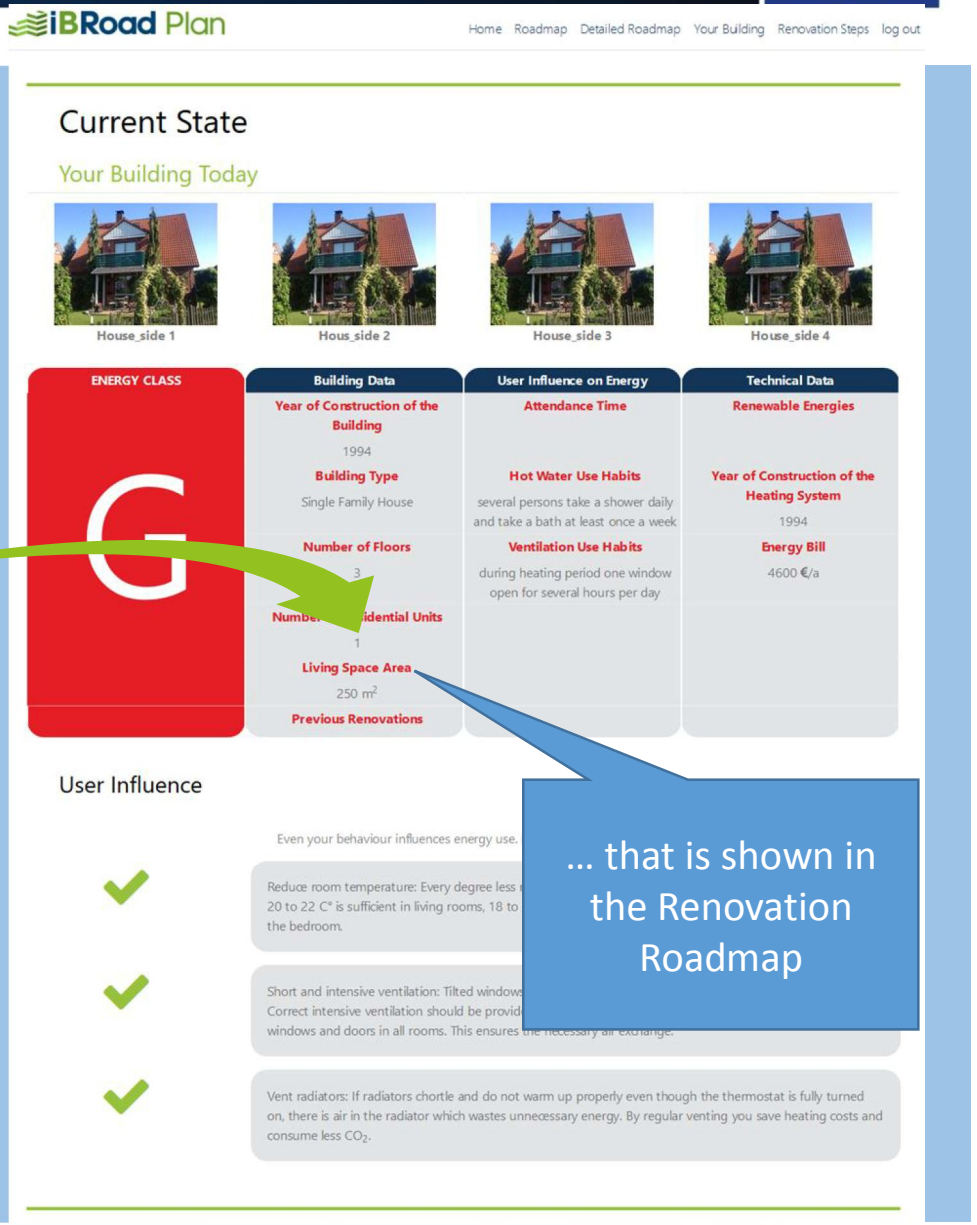


iBRoad Roadmap Assistant

Roadmap Assistant in general



Here you can edit the data …



… that is shown in the Renovation Roadmap

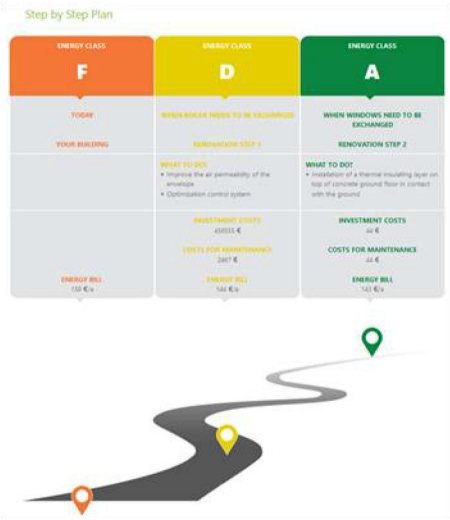
iBRoad Roadmap Assistant

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №754045

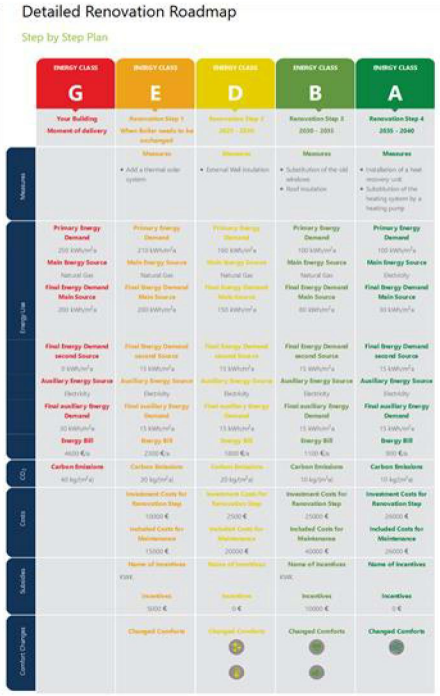
Current building state

Detailed renovation step

Roadmap overview



Detailed Roadmap



iBRoad Logbook

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №754045

iBRoad

iBRoad Plan

iBRoad Logbook

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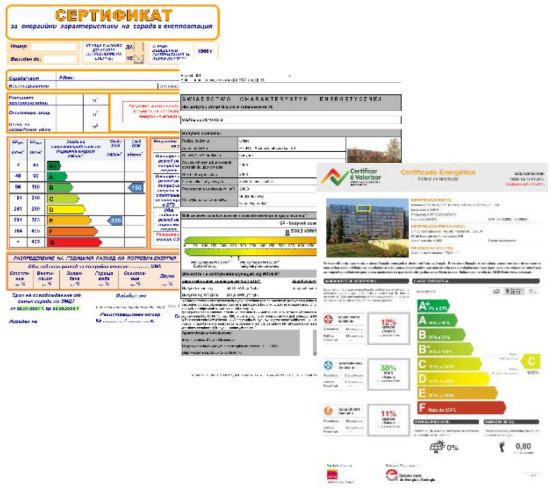
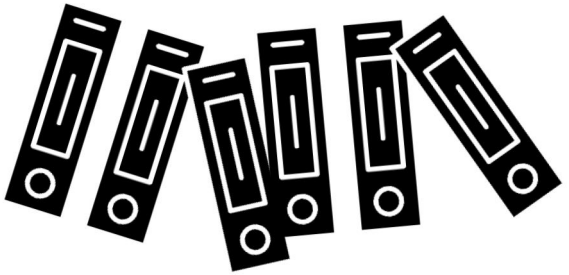
iBRoad Logbook – Why?

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №754045

1. A lot of information about the buildings already exists (EPC data, energy audit) – but where?



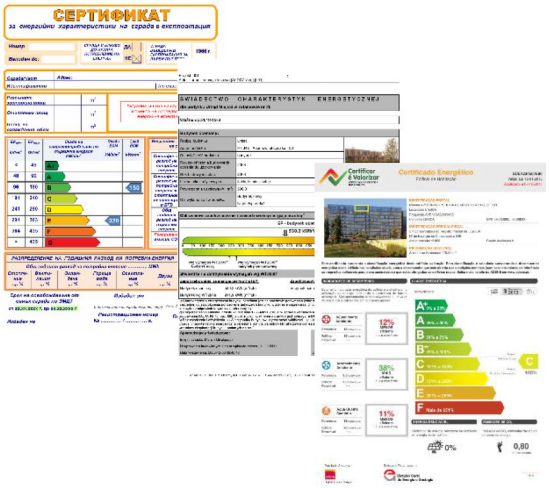
2. Most renovations are implemented stepwise and refer to a long period of time. How to keep track?



iBRoad Logbook – Why?

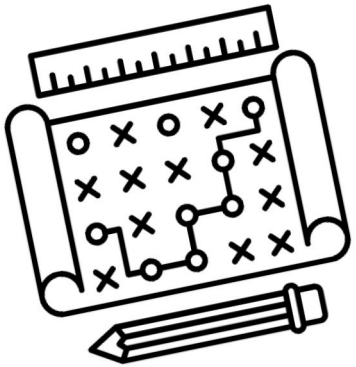
3

Simple presentation of the efficiency of the individual building and its components



4

Simple forward planning for homeowners



iBRoad Logbook – Concept

iBRoad Logbook:
- Digital repository for all building related information
- Simple presentation of the building´s efficiency in the past and future

Purpose:
- Save all changes to the building in a new current building state
- Log all previous building states and track all building information
- Check out possible future buildings states

Your tasks:
- Create a logbook for your customer
- Fill in the data for the present building state
- Explain the Logbook to your customer

Producing the Logbook

Alternative ways to produce the Logbook

No Roadmap audit yet

Owner creates Logbook

Owner enters data as far as possible

Without Roadmap audit

Owner grants access to auditor

Auditor can use existing data to create the Roadmap

Roadmap audit ready

Auditor creates Logbook from Roadmap data

Auditor finalises data entry

Auditor grants access to owner

Owner uses Logbook

Producing the Logbook

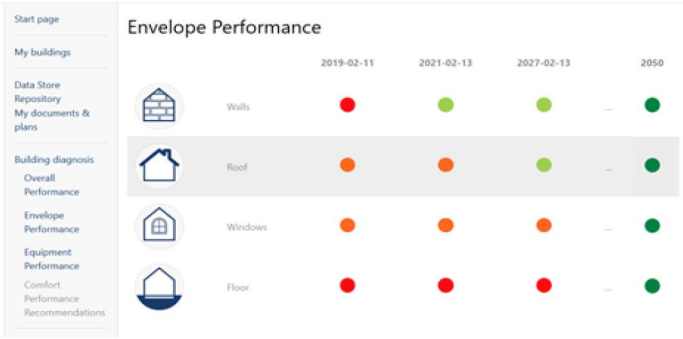
The iBRoad way to produce the Logbook during the field test

No Roadmap audit yet

Owner creates Logbook

Owner enters data as far as possible

without Roadmap audit



Owner grants access to auditor

Auditor can use existing data to create the Roadmap

Roadmap audit ready

Auditor creates Logbook from Roadmap data

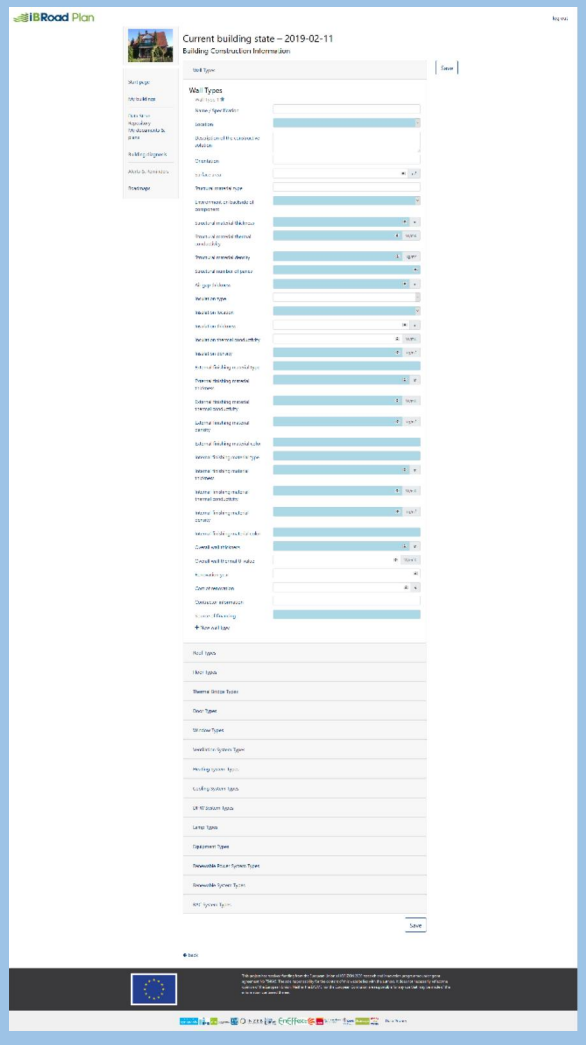
Auditor finalises data entry

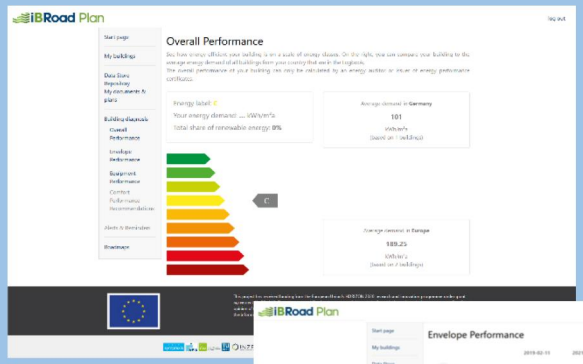
Auditor grants access to owner

Owner uses Logbook

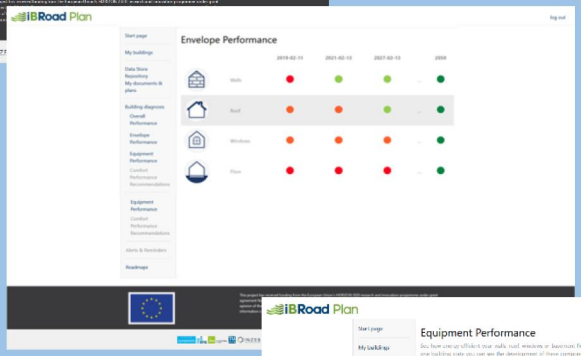
iBRoad Logbook – Concept

Data storage

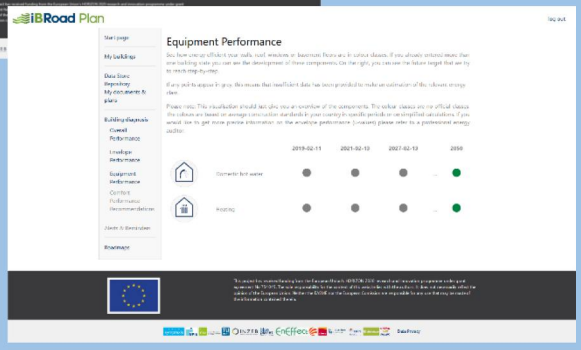




Building performance



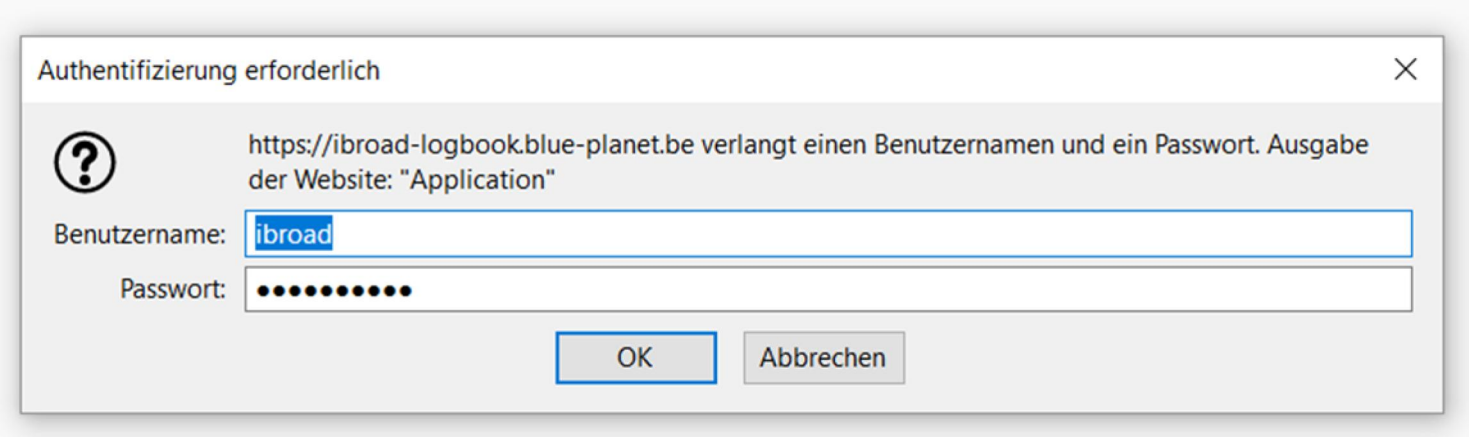
Envelop performance



Equipment performance

iBRoad Logbook Log In

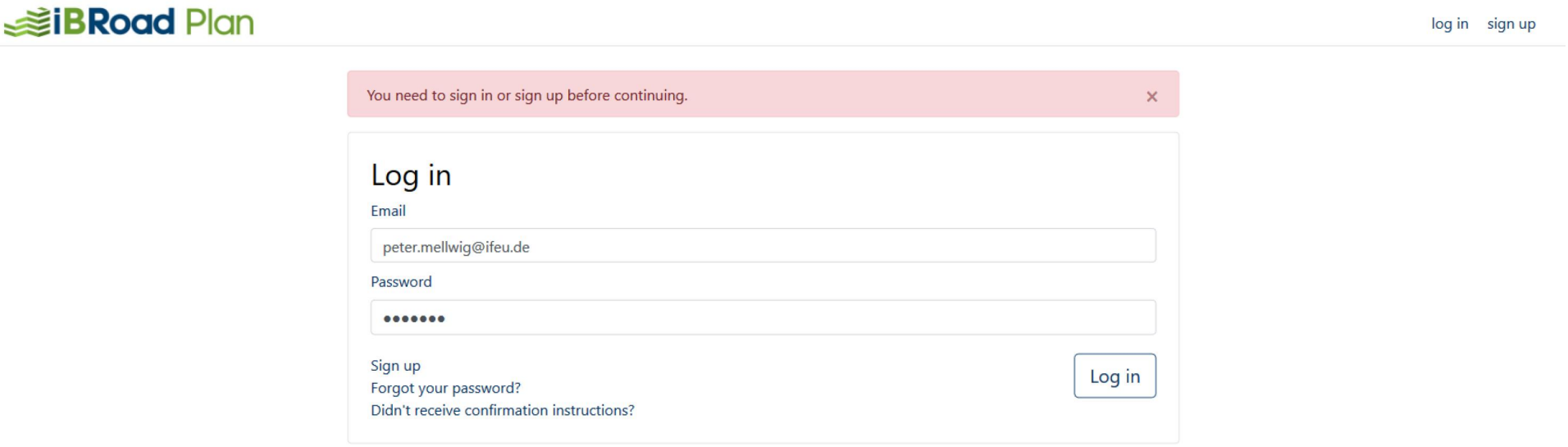
Link: https://ibroad-logbook.blue-planet.be/



iBRoad Logbook Log In

Logbook:
Link: https://ibroad-logbook.blue-planet.be/

To access the logbook, you must sign up with your email address and a password of your choice.
After confirming your email, you can log in and create a “New Building”.



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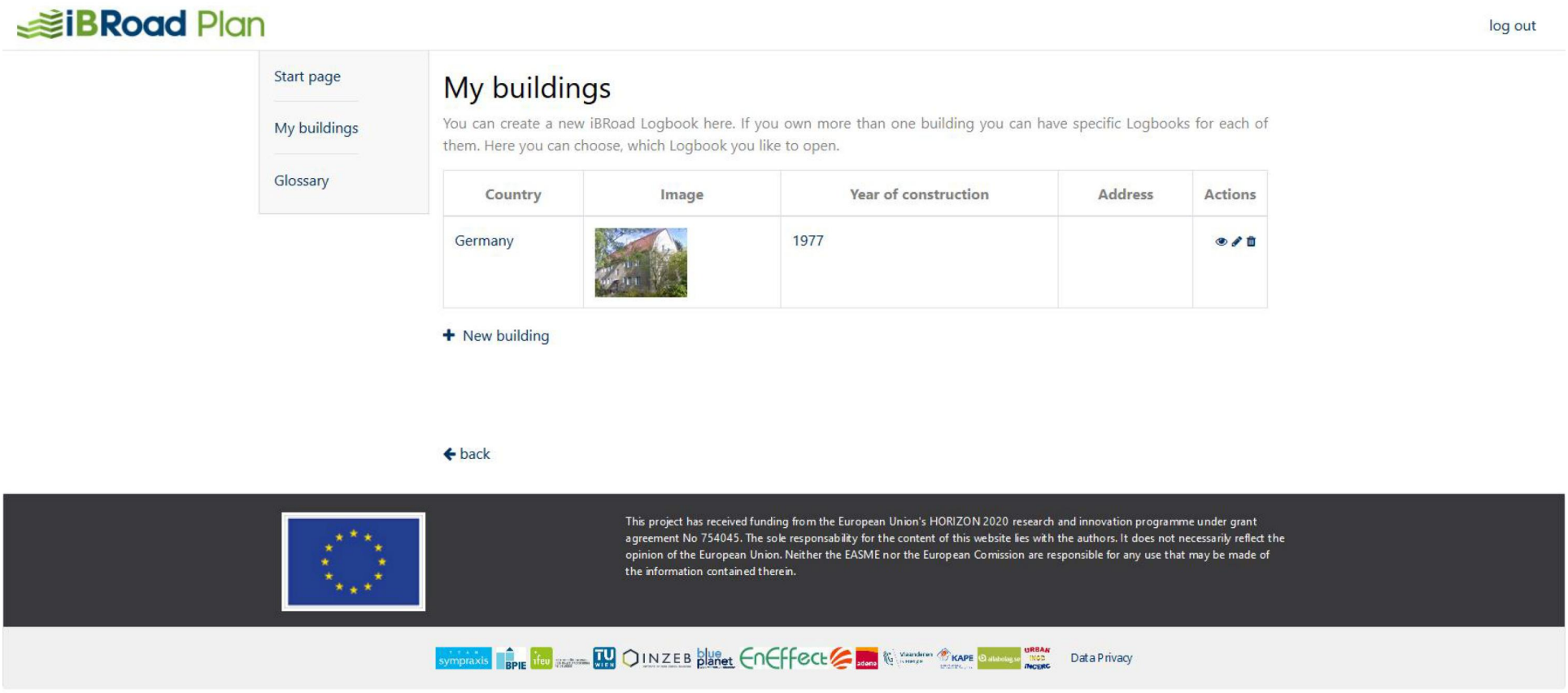
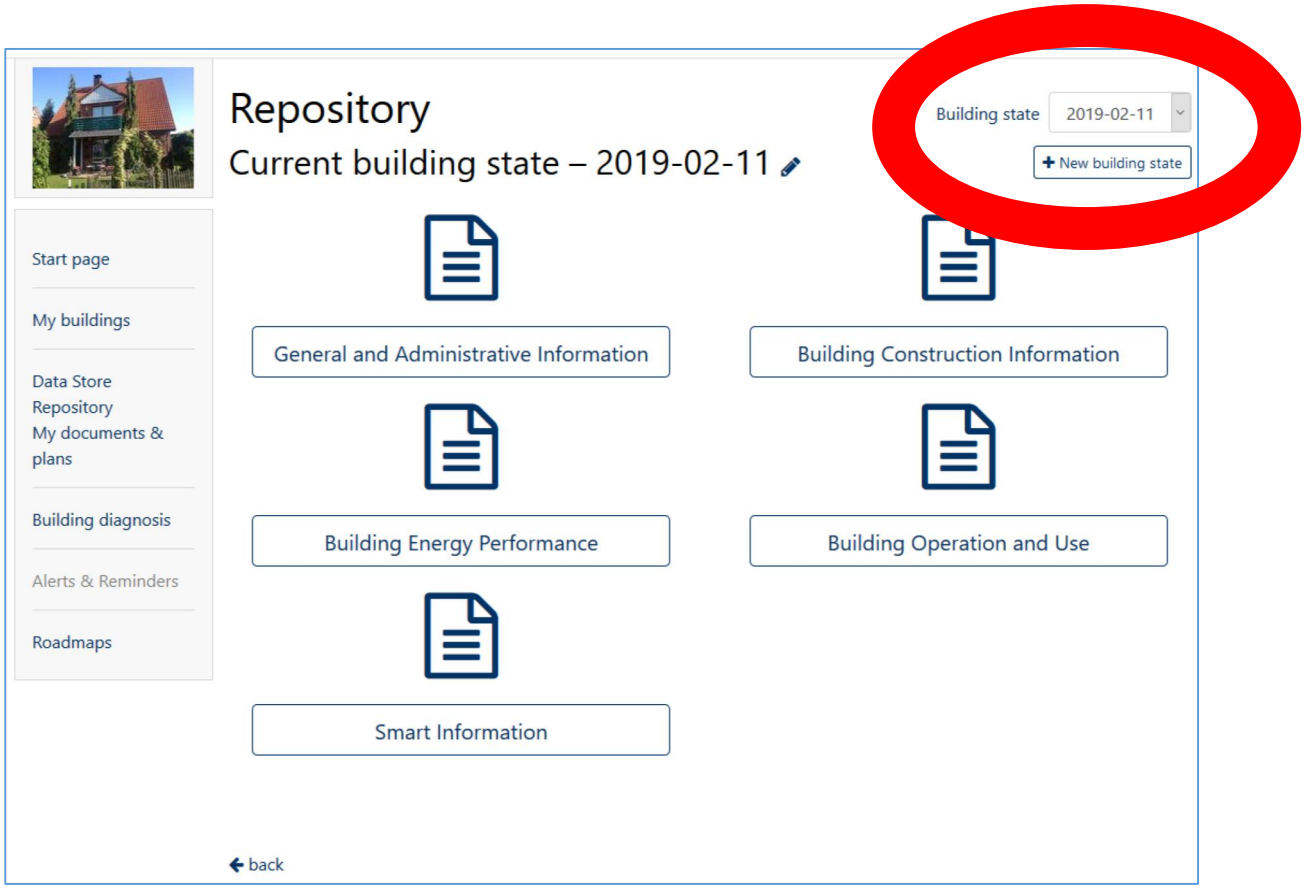
Data Privacy

Page “My buildings”

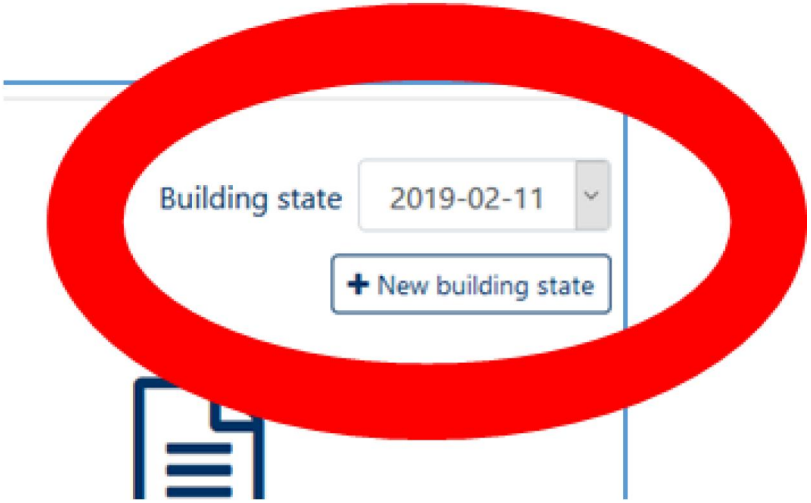
One owner can have several buildings



Overview of Repository



Dealing with building states

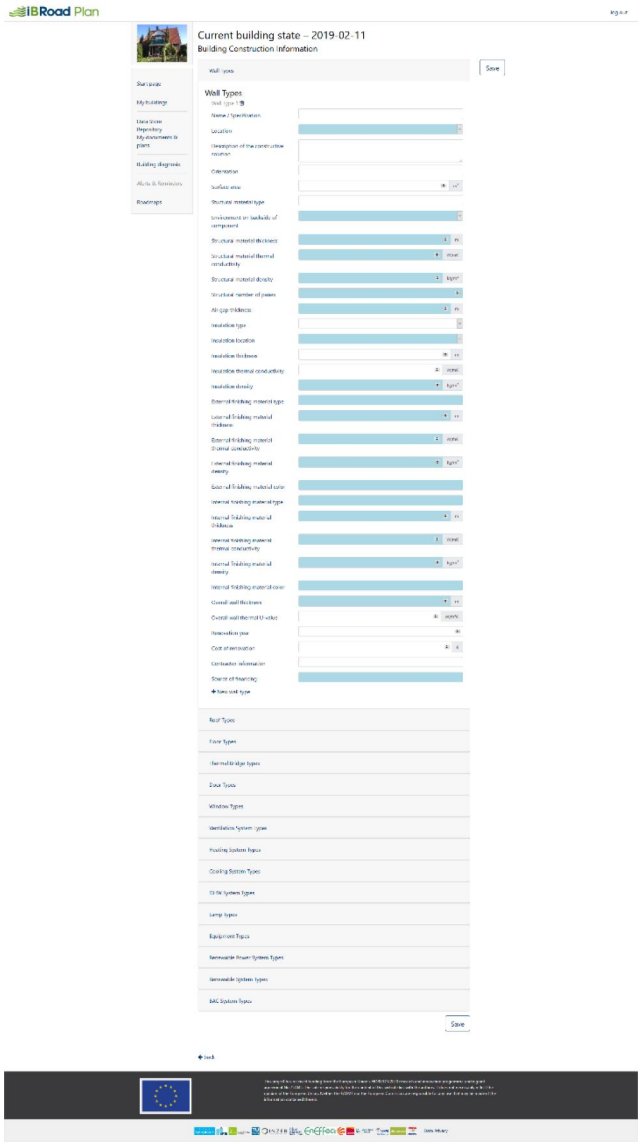


- Start with the current building state
- Try to complete data input as far as available
- Create a new building state. You can choose which of the existing building states you like to copy.
- Change the components or technical systems in the new state.

iBRoad Logbook – Data Storage

Data Storage

- Enter and see building data
- Blue fields are country specific
- White fields can be necessary for Logbook functionalities



iBRoad Logbook – Data Storage

iBRoad Plan

log out

- Start page
- My buildings
- Data Store
  - Repository
  - My documents & plans
- Building diagnosis
- Alerts & Reminders
- Roadmaps
- Glossary

Building state – 2027-02-13

Building Construction Information

Wall Types

Save

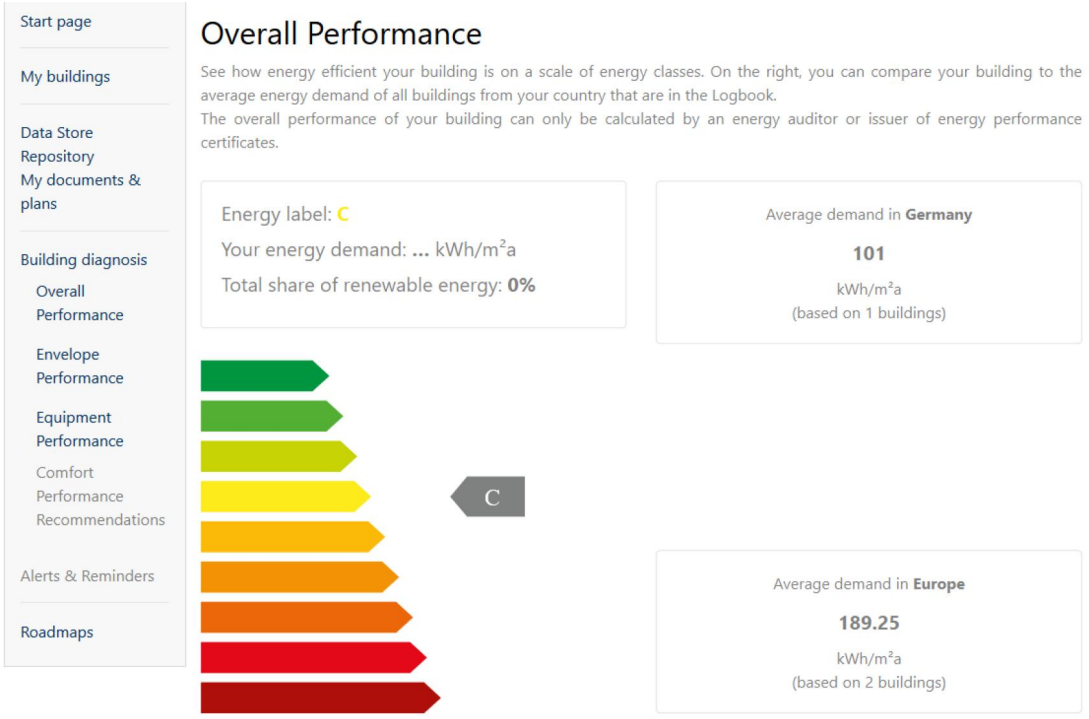
Wall Types

Wall Type 1

Name / Specification	AW W
Description of the constructive solution	Reibeputz außen, Leichtbetonsteine 30 cm, Holzfaserdämmung innen 6 cm, Lehmputz
Orientation	W
Surface area	24 m²
Stuctural material type	Masonry
Environment on backside of component	component against outside air
Insulation type	Wood Fibre Insulation
Insulation thickness	6 m
Insulation thermal conductivity	0,042 W/mK

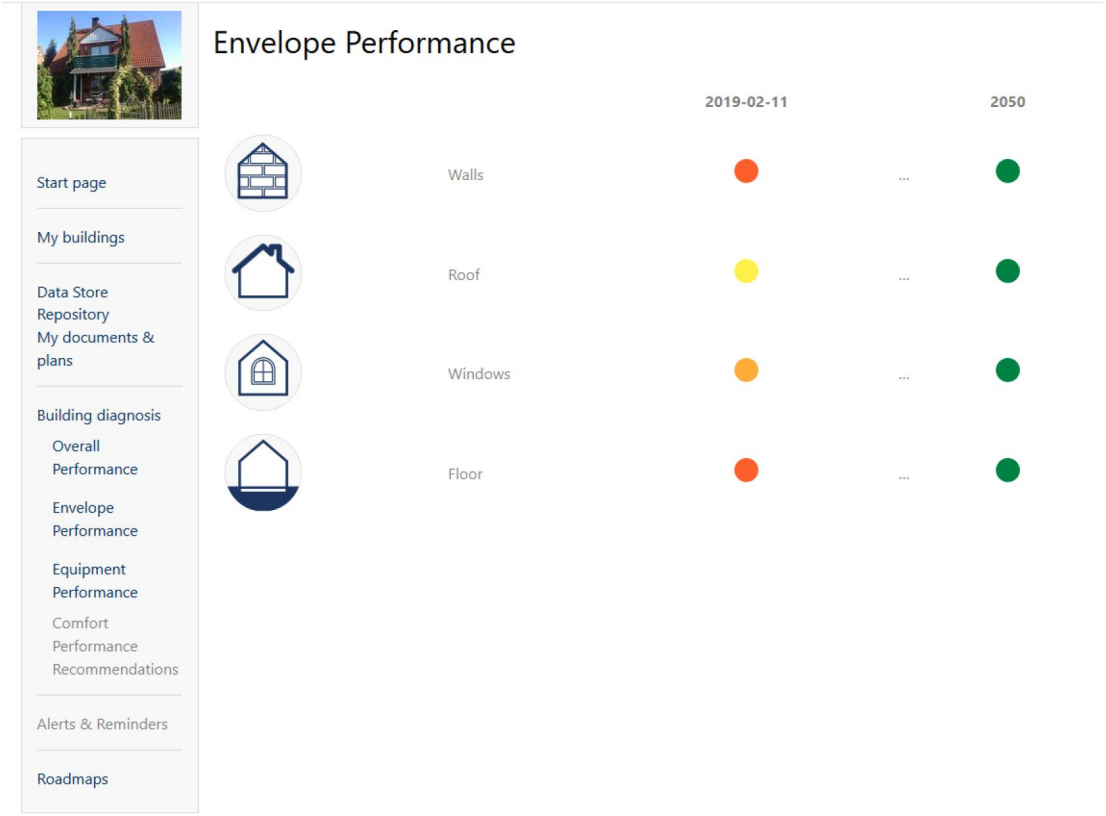
Building Performance

- Display the energy class that was entered
- According to EPC
- Comparison to the average energy demand of all buildings in the logbook in the respective country



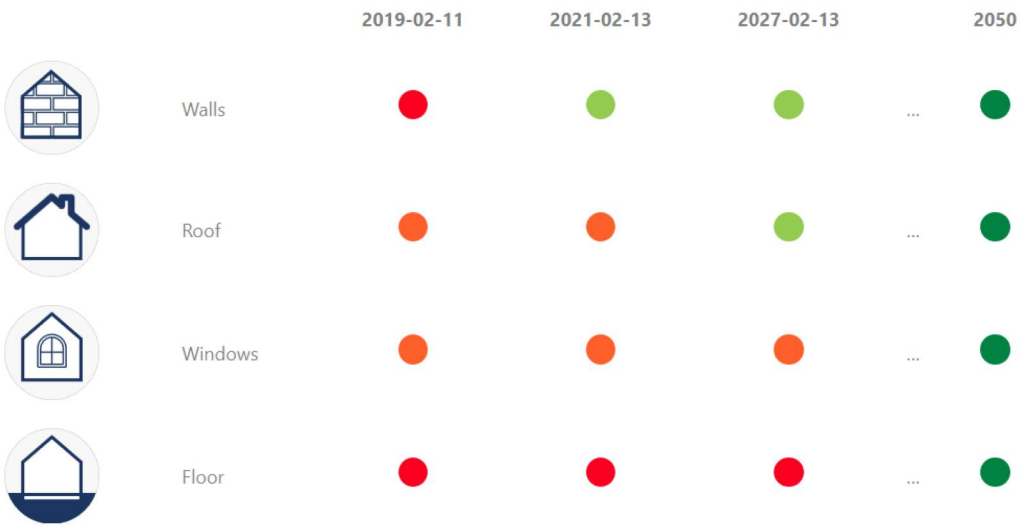
Energy Performance

- Display the energy class of walls, roof, windows and floor
- According to
  - year of construction
  - year of renovation
  - u-value
- Display the target performance on the right



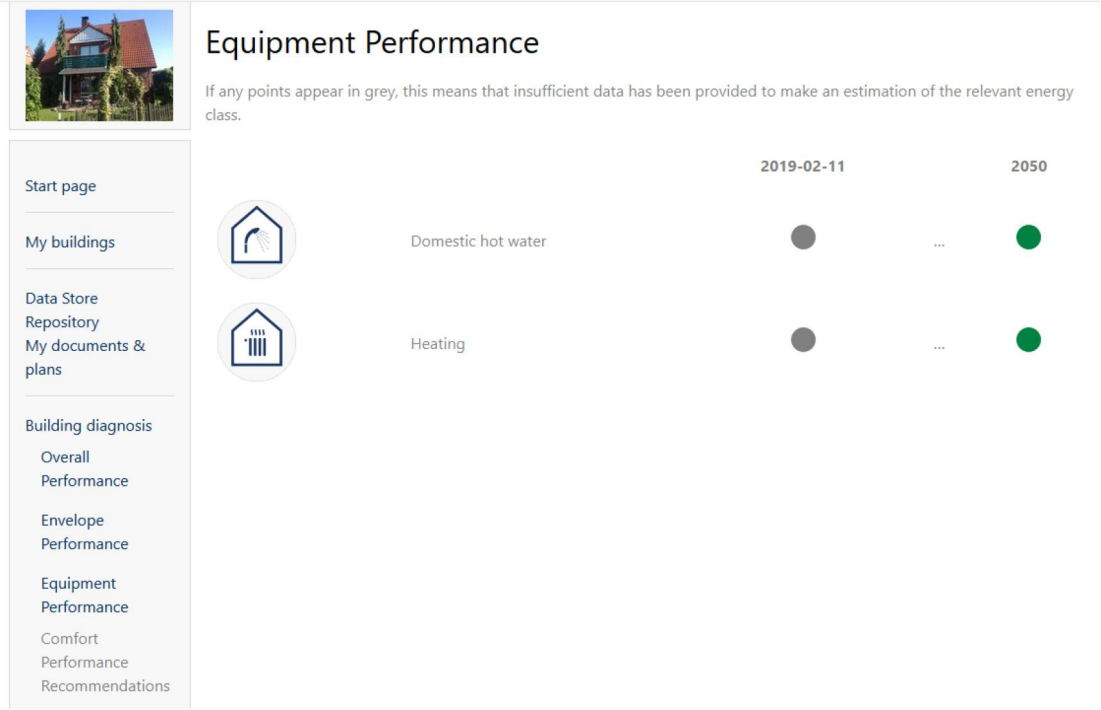
Envelop Performance

- If you already entered more than one building state you can see the development of these components.



Equipment Performance

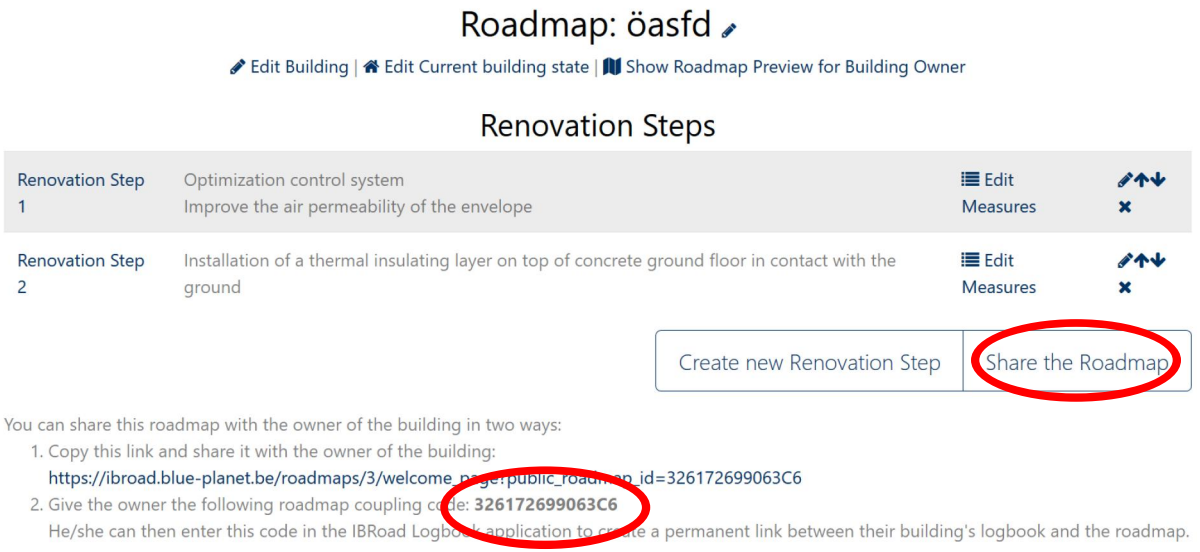
- Display the energy class of domestic hot water and heating system
- According to
  - boiler efficiency
  - energy source
  - coverage ratio
- If points appear in grey, data is not sufficient.



Coupling Roadmap and Logbook

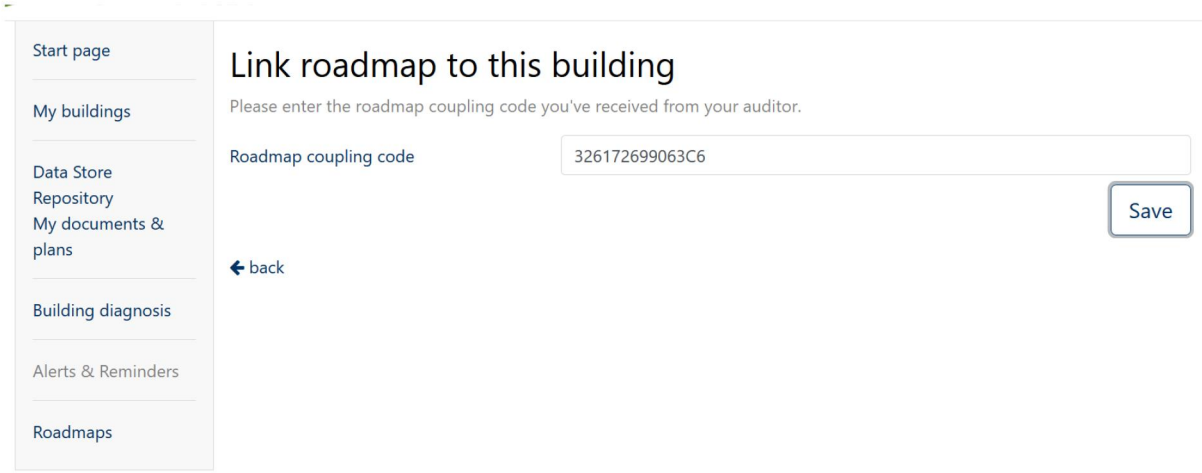
Link to Roadmap

- You can open the Renovation Roadmap from the Logbook
- Therefore, you finish the Roadmap in the Roadmap Assistant and click “Share the Roadmap”
- This creates a roadmap coupling code

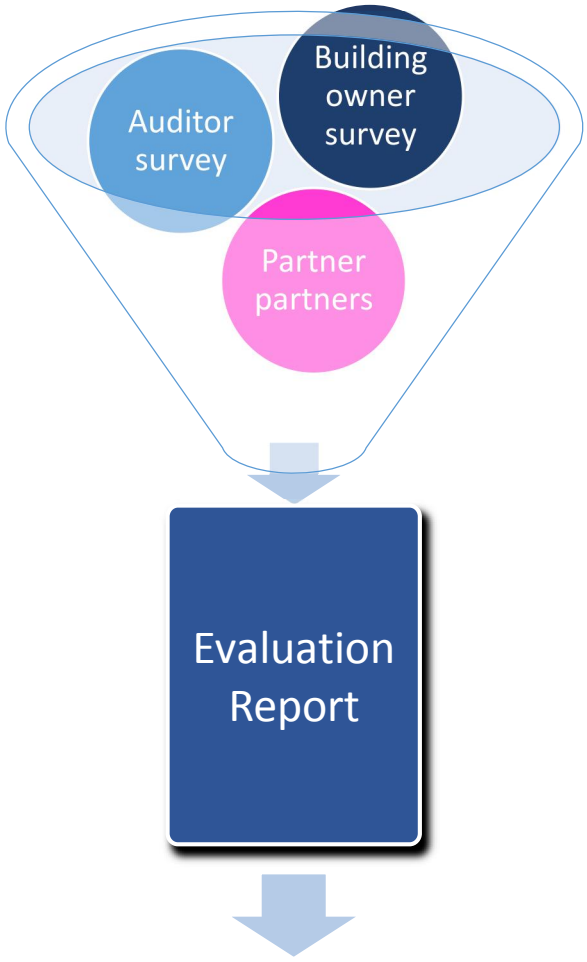


Link to Roadmap

- You can open the Renovation Roadmap from the Logbook
- Therefore, you finish the Roadmap in the Roadmap Assistant and click “Share the Roadmap”
- This creates a roadmap coupling code
- Enter the code into the Logbook in the “Roadmap” menu.



Evaluation



Improvement of iBRoad Tools

Topics

- Personal data
- Your building
- On-site visit
- Renovation Roadmap
- Logbook

1. **What is your position on building renovation in principle? To what extent do the following statements apply to you?**	Completely agree	Tend to agree	I do not know	Tend to disagree	Completely disagree
I am well informed about building renovation and modernisation.	☐	☐	☐	☐	☐
I carry out renovations myself as far as it is technically possible.	☐	☐	☐	☐	☐
It is a burden for me to constantly have to take care of the house.	☐	☐	☐	☐	☐
For me, the house is a residential object that I look at very unemotionally.	☐	☐	☐	☐	☐

Homeowner survey

Please hand over the questionnaire (for homeowners) to the homeowner during the on-site visit. If necessary please explain it briefly.

We recommend that the homeowners fill in the questionnaire step-by-step as soon as possible (e.g. questions referring to the on-site visit soon after the visit)

Homeowners are asked to send the filled questionnaire to the respective energy agency (EnEffect, KAPE, ADENE).

Topics

- Personal data
- On-site visit
- Planning and calculation of renovation steps
- Roadmap Assistant
- Renovation Roadmap
- Handbook
- Logbook

Note

Please fill in a separate questionnaire for each examined building.

Will be discarded. No personal data will be stored.

Personal Data

1. Initial letters of your name

2. Address of the homeowner (only street and country)

Example

1. Could you easily work with the Roadmap Assistant?	
The Roadmap Assistant did not work.	☐
I could not work with the Roadmap Assistant because I did not understand it.	☐
I could work with the Roadmap Assistant only after I got help from the hotline.	☐
I could work with the Roadmap Assistant but it needed much time to understand.	☐
I needed some time to get used to the Roadmap Assistant but had no major problems.	☐
The Roadmap Assistant was easy to use.	☐
Space for explanatory notes --- --- --- --- ---	

Auditor survey

We recommend that you fill in the questionnaires in parallel to the work.

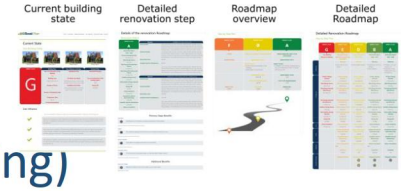
Advantages:

- Direct feedback of your experience
- No extra work after field test

Auditor survey

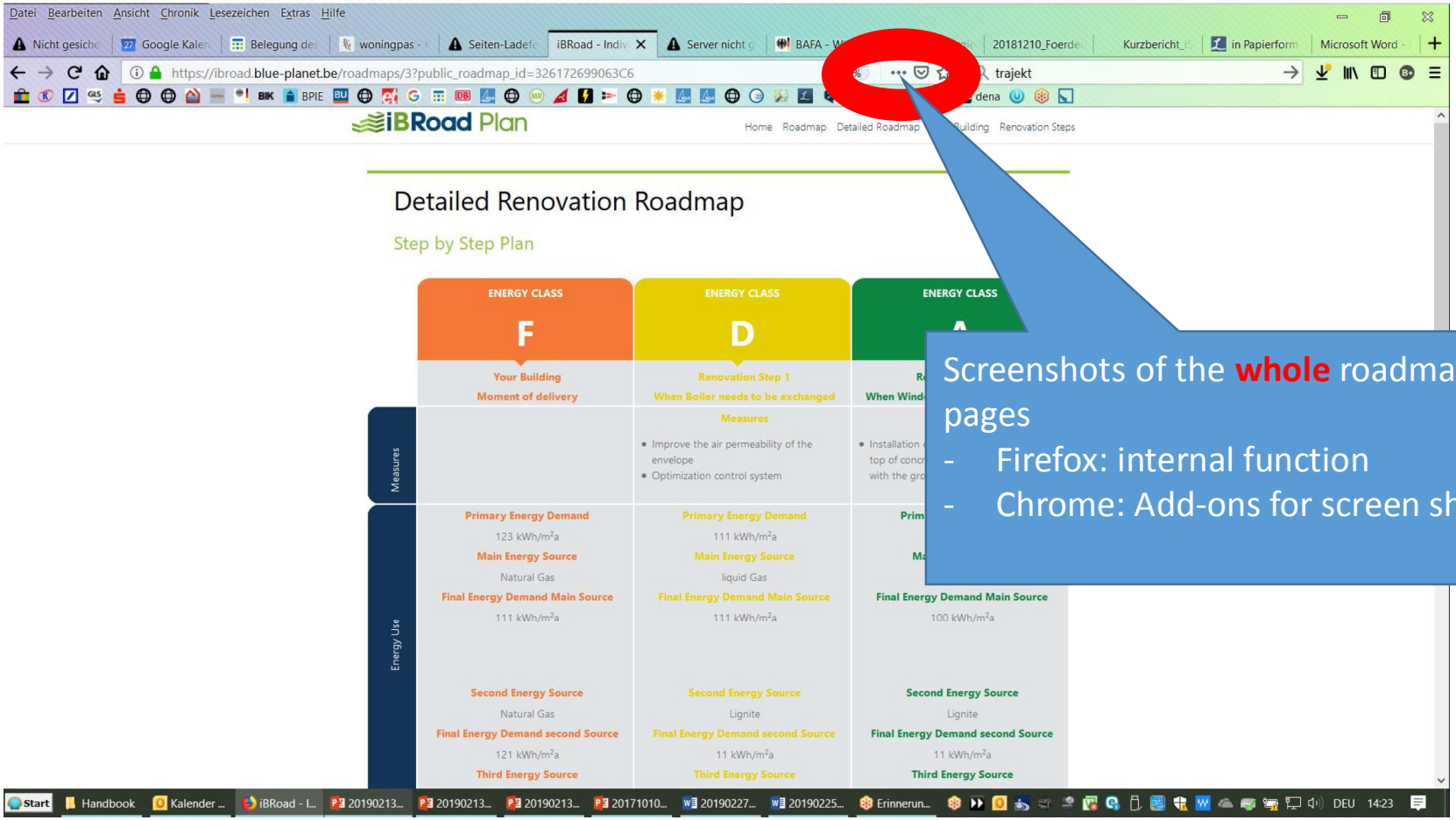
- What are the required documents?
  - Questionnaire for energy auditors (one for each building) in paper form
  - Screenshots from the iBRoad Renovation Roadmap (4 pictures of the whole page for each building)
  - Log in data to the iBRoad Logbook
    - Email address
    - Password

Please submit to your national energy agency (EnEffect, KAPE, ADENE)



- Screenshots from the iBRoad Renovation Roadmap

  Renovation Roadmap (4 pictures of the whole page for each building)



Evaluation

- Country Partners survey
- Topics
  - Experience with auditors (e.g. training, hotline, …)
  - Experience with homeowners (e.g. hotline, …)
  - Tools (data transfer, national adaption, …)
  - Next Steps

Do you have any Questions?

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement №754045

Thank you very much

Peter Mellwig

peter.mellwig@ifeu.de

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