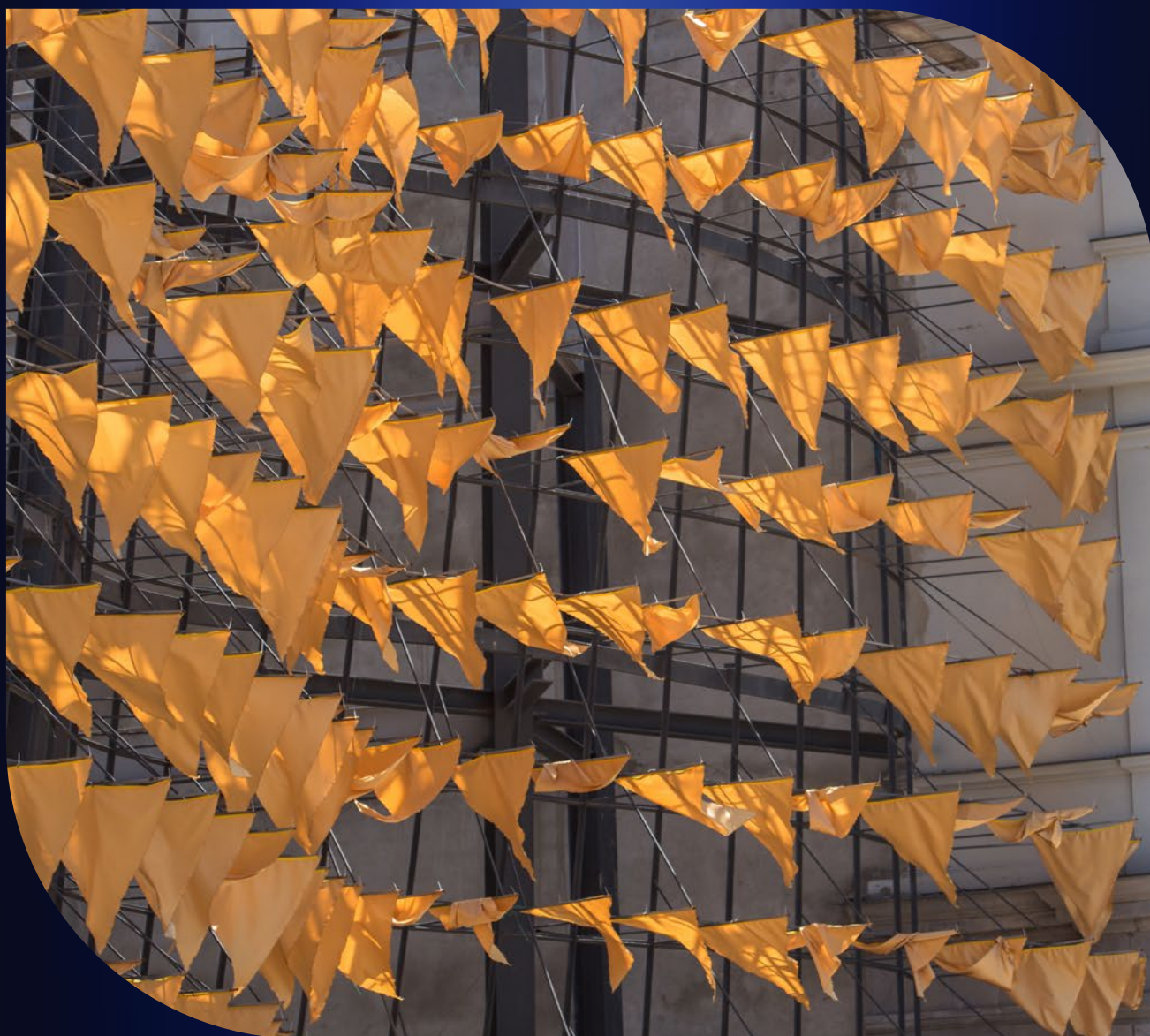




Advisory Package for public authorities

Aiding public authorities in advancing deep energy renovation



Center for Energy Efficiency EnEffect
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www.ibroad2epc.eu



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EXECUTIVE SUMMARY

Step-by-step renovation has emerged as a pivotal aspect of renovation efforts across Europe. This has been spurred by legislative advancements such as the EU Green Deal, particularly the 2030 climate and energy targets outlined in the European Climate Law and the 'Fit for 55' legislative revisions, including the 2024 Energy Performance of Buildings Directive (EPBD) recast and corresponding national policy adaptations. Renovation passports, a direct outcome of these initiatives, play a crucial role in bolstering EU energy and climate goals. Recent amendments by the European Parliament underscore the potential linkage between renovation passports and financial support measures, despite their voluntary nature.

Integrating renovation passport elements into Energy Performance Certificate (EPCs), as championed by the iBRoad2EPC project, presents a pragmatic avenue for policy implementation. Leveraging an already established service at a pivotal stage of the investment process reduces costs and brings expertise in renovation planning and design.

The iBRoad2EPC project's training activities, targeted at energy planning authorities, emphasise the significance of deep and, where necessary, staged energy renovation and cultivating trust in renovation endeavours. By incorporating the topic of EPCs enhanced with renovation passport elements into existing training programmes and collaborating with EU-funded initiatives to provide tailored modules, the project aims to address gaps in energy planning education for public authorities to boost renovation.

The Advisory Package for Public Authorities offered by the iBRoad2EPC project delves into essential facets, offering insights and resources to aid authorities in advancing deep energy renovation. It outlines EPC models and examples of individual building renovation roadmaps, and showcases the added value of the innovative iBRoad2EPC approach, which integrates elements of renovation passports into established EPCs to serve as practical guides for energy planning initiatives. Additionally, it identifies target groups within public authorities and elucidates stakeholder roles to tailor training effectively.

At the core of the report is the iBRoad2EPC toolkit designed exclusively for public authorities. This comprehensive resource package, comprising guidelines, templates and best practices, facilitates the implementation of deep energy renovation strategies by using the reports, tools and other project outcomes of iBRoad2EPC. The structured training module aims to equip authorities with the requisite knowledge and skills, complemented by supplementary materials to enrich the learning experience and foster effective knowledge transfer.

Through these initiatives, the report serves as a foundational guide for public authorities seeking to promote sustainable energy practices and drive meaningful change in renovation endeavours.

1. INTRODUCTION

New-generation Energy Performance Certificates (EPCs) and related instruments like the renovation passports are increasingly recognised as potent tools to drive renovation throughout Europe. The 2024 recast of the Energy Performance of Buildings Directive (EPBD) was signed on 26 April 2024.¹ It acknowledges that although one-step deep renovation provides cost efficiency, reduces emissions and minimises disruption, renovation passports offer a planned approach to staged renovations; owners and investors can plan interventions effectively over time. It affirms the value of renovation passports and underscores their importance by indicating the potential linkage to financial support measures and instruments.

The iBRoad2EPC project, funded by the EU Horizon 2020 programme, represents a significant advancement in energy performance assessment schemes and certification practices. It aims to promote and demonstrate the integration of renovation passport elements into EPCs to boost deep renovation, stepwise where necessary. The project builds upon the achievements of the [iBRoad](#) project (2017-2020), which developed a model supporting single-family homeowners with personalised advice for stepwise deep renovation. The project's objective is to enhance, expand and refine the structure and scope of EPCs by integrating Building Renovation Passport elements, making them applicable not only to single-family homes but also to multi-family and, notably, public buildings. The ultimate goal is to enhance reliability, utility and effectiveness, establishing the next generation of EPCs to support Europe's decarbonisation goals while improving comfort and living conditions.

The project's activities are organized into four main pillars: (1) assessing the feasibility of merging EPCs with Building Renovation Passports; (2) adapting the iBRoad concept to integrate it into EPCs; (3) testing and evaluating iBRoad2EPC in six countries (Bulgaria, Greece, Poland, Portugal, Romania and Spain), with training for EPC issuers; and (4) facilitating the adoption and implementation of the iBRoad2EPC model across Europe. Public authorities in the six countries are actively engaged in the conceptualisation, development and testing of iBRoad2EPC, aiming to integrate it seamlessly into existing schemes. Targeted communication, dissemination and pilot activities at both national and European levels support widespread acceptance and adoption. The project draws on existing knowledge from other initiatives to enhance EPC features and contributes to the development of specific policy proposals, as well as of training and capacity-building modules.

While the iBRoad2EPC project primarily addresses energy and building professionals, this report emphasises the broader implications for public authorities engaged in energy planning and management processes. It supports the delivery of an advisory package for public authorities to enhance their expertise, capacity and access to resources for the design and implementation of efficient renovation policies. Recognising the pivotal role of qualified services in the construction industry value chain as a key factor influencing the success of renovation projects, the report underscores the importance of building trust in deep energy renovation.

This report outlines the specific concept and methodology of training developed within iBRoad2EPC to cater to public authorities involved in planning, design, implementation and monitoring of national and local energy-related programmes, including EPC programmes, training and/or financing schemes with a focus on incentivising deep, and where necessary stepwise, energy renovation.

¹ [Directive \(EU\) 2024/1275](#)

The primary goal of this iBRoad2EPC report and related training material is to encourage the incorporation of deep energy renovation topics and, more specifically, new-generation EPCs that include elements of the Building Renovation Passport into existing training programmes and curricula for public authorities involved in energy planning. By doing so, it aims to serve as a foundational resource for fostering collaboration with specialised EU-financed projects and networks of local authorities. Additionally, the report aims to engage with training and educational institutions to further disseminate knowledge and practices for incentivising and implementing deep, and possibly stepwise, energy renovation.

The deliverable provides documentation for a specialised iBRoad2EPC training module for public authorities. The objective is to enhance the quality of existing training programmes in the realm of energy planning and management. The training module emphasises the benefits of the practical implementation of renovation passport recommendations, offering customised guidance for stepwise deep renovation to prevent potential lock-in effects, and facilitating the integration of deep energy renovation topics and toolsets into national and local energy planning.

2. IBROAD2EPC IN ACTION: EXAMPLES FROM PILOT COUNTRIES

This section shows how iBRoad2EPC improves national EPC schemes in partner countries, and gives examples of individual buildings for which iBRoad2EPC has been developed in these countries. These examples show the main strategies for step-by-step renovation and offer conclusions and recommendations.

Case 1. Bulgaria – Municipal building, Etropole

Partner: **EnEffect**



Building address: **Etropole, Sofia Province**

Building name: **Municipality of Etropole**

Building type: **Office building**

Year of construction: **1987**

How iBRoad2EPC upgrades the national EPC

The issuance of an EPC in Bulgaria requires the preparation of a detailed energy audit, according to a detailed methodology, which prescribes energy-saving measures and is always accompanied by a summary report for the public authorities through which the sustainable energy development agency (SEDA) stores information on the main energy characteristics of the building. This is already quite a detailed system and there are not many missing elements; rather, there is a need to simplify the procedure to make this information more accessible to more users. iBRoad2EPC supports this with ready-made recommendations for stepwise renovation, aligned with climate and energy targets and related national obligations, linked to notes for the avoidance of lock-in effects. This makes it easier for energy auditors to issue their EPC, and increases the quality of energy audits.

Case study

The municipal administration building in Etropole has not been renovated since it was built in 1987. The budget of the small municipality (with about 10,000 inhabitants) cannot cover the costs for full renovation of the building, which is not the only priority in the town. The municipality has found external auxiliary funding to cover part of the investment and is ready to start in the beginning of the next year. Employees are willing to accept the state of the building inside for a while longer but are uncomfortable with the cold walls and drafts through

the old windows. In addition, heating is very expensive and inefficient, based entirely on fossil fuels (diesel).

Following the wishes of the occupants, a step-by-step renovation plan was developed. This consisted of exterior renovation of the building and insulation on all surrounding surfaces, along with replacement of doors and windows, and replacing the outdated heating system with a new variable refrigerant flow (VRF) heat pump system.

The next step will be to renovate the inside of the building, which will be done when the roof needs renovation (2040). As the interventions inside will disrupt office work and administrative services and affect the comfort of employees and visitors, a complete internal renovation will take place in a single step.

Specific characteristics and triggers of the building

Although the building envelope has very poor thermal insulations the building is classified as energy class C, which is relatively high. This discrepancy occurs mainly due to the specific use of the building. The structure of the building is reinforced concrete with solid bricks, without thermal insulation. The windows are old, with crooked wooden frames and very poor sealing. The roof was repaired about 15 years ago and is not in immediate need of renovation. Interior work should be minimal to avoid having to make repairs inside before the next planned investment in 2040.

The trigger point for the first step is the planned investment in the building next year. The planned repair of the roof is a trigger point for the second step, where internal renovation can be carried out.

Benefits of renovation

- Improving thermal comfort and working environment
- After second step, indoor air quality and lighting
- Demonstrating high goals for energy efficiency in public buildings and encouraging citizens to take a similar approach to their own buildings
- Respecting budgets without compromising the quality of the renovation

Renovation steps

	Current state	Step 1	Step 2
Year of implementation:		ASAP	2040
Trigger for renovation:		Replacing poor façade and inefficient and expensive heating system	Roof renovation needed, improving ventilation together with planned internal reconstruction
Energy class:	C	A	A
Energy sources:	Diesel fuel for heating, electricity for cooling and appliances	Electricity	Electricity

Final energy demand:	208 kWh/m ² /year	34 kWh/m ² /year	10 kWh/m ² /year
Greenhouse gas emissions:	71 kgCO ₂ /m ² /year	28 kgCO ₂ /m ² /year	8 kgCO ₂ /m ² /year
Energy costs:	65.33 BGN/m ² /year	23.5 BGN/m ² /year	9.42 BGN/m ² /year
SRI rate*:	4.1	33.4	41.4
IEQ rate**:	5.2	6.5	7.5

* Smart readiness indicator (SRI) points are assigned on a scale from 0 to 100, where 100 is the highest smart readiness of the building

** Indoor environmental quality (IEQ) points are assigned on a scale from 0 to 10, where 10 is the highest indoor environment quality

iBRoad2EPC

iBRoad2EPC


Енергиен консултант

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Дата Ноември 17, 2023

Стратегия за обновяване

Добре дошли във вашия iBRoad2EPC

iBRoad2EPC дава обща представа за стъпките за обновяване, които можете да предприемете в рамките на определен период от време, за да направите сградата си неутрална по отношение на климата. Отделните стъпки се надграждат една над друга в дългосрочна стратегия за обновяване.

За iBRoad2EPC ▾





Сегга 2023 **C**





Стъпка 1
Възможно най-скоро **A**

Подмяна на прозорци --
 Топлоизолация на пода на подпокривно пространство --
 Външна топлоизолация (система ETICS) --
 Топлоизолация на тавана на сутерена -- Термомомпи





Стъпка 2
2040 **A**

Инсталиране на механична вентилация с рекуперация на топлина -- Фотоволтаична система -- Контрол на температурата в акумулацията съд за гореща вода (с директно електрическо отопление или интегрирана електрическа термомомпи) -- Инсталиране на

Отпечатък

Отказ от отговорност
 Вашият iBRoad2EPC е опростена стратегия за обновяване. Тя не замества детайлното планиране. За подробни енергийни консултации се обърнете към енергиен одитор за сгради.

УВЕДОМЛЕНИЕ ЗА ФИНАНСИРАНЕ
 Този проект е финансиран от програмата за научни изследвания и иновации "Хоризонт 2020" на Европейския съюз по споразумение за безвъзмездна помощ № 101000001



⏪ Обратно към подробности за проекта

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magi.assenova@gmail.com **Дата** Ноември 17, 2023 **Страница 1**

Страница 1 Възможно най-скоро

Задължителни цели или разпоредби
До 1 януари 2025 г. всички нележищни сгради трябва да отговарят най-малко на клас E.

Мерка 1
Подмяна на прозорци

Описание на мерката
Подмяна на всички прозорци, които са по-стари от 10 години. Ако подмяната прозорците, бива да са с топлоизолационни външни стени, погледнати външен енергиен консултант за възможни топлинни източници и свързани с тях разходи от купуват. Също така погледнати дали потенциалните вентилационни на повърхностите все още е подходящи.

Спецификация на мерката
Минималните изолационни за нележищните на топлоизолационни U са от 1.1 W/(m²K) за PVC до 1.7 W/(m²K) за алуминий.

Подготовка за последващи мерки за обновяване
Когато се подмянат прозорци или врати, моста, подгответе се за последваща изолация на външните стени, като промените топлинните източници и връзките към такова, подгответе и изолация на изолационните системи до повърхностите на външните стени. Неизползваните врати и прозорци минималните топлинни изолационни стойности са дадени от закона.

Когато се подмянат прозорци или врати в къщи, моста, подгответе се за по-нататъшна изолация под тавана на къщата. Погледнати разходи за прозорците трябва да остави достъпно място за изолационния слой.

Мерка 2
Топлоизолация на пода на подпокривно пространство

Описание на мерката
Топлоизолация на пода на подпокривно пространство непосредствено над последният отоплителен етаж. Изолационните плочи от пенополистирол или минерална вата се полагат върху пода отгоре без никакви пропуски. В случай на непропорционални тавани може да се използват под изолацията да се поставят прозорци, за да се предотврати натрупването на влага в изолационния материал. Погледнати външен консултант за това, ако по тавана ще се постави изолационен материал трябва да се погледне със събрани документи в случай на ИРС топлоизолация с вонична ценностна изолация.

Спецификация на мерката
10 cm топлоизолация (Минимална изолация R⁺ = 3.10 m²/W)

Подготовка за последващи мерки за обновяване
Когато се извършва полагане на моста, подгответе се за по-нататъшна изолация на външните стени, като промените достъпните наред на покрива, който да покрива изолацията на стените. Погледнати разходи за вентилационните системи да бъдат отчитани степените на изолацията изолация на стените.

Когато изолацията се извършва, моста, подгответе се за последваща изолация на вентилационните системи, като изолацията изолация на изолационните системи и свързаният таван в изолационния слой или над тавана на обекта. Вонича вонича на компонентите в покривното пространство трябва да бъдат променени така, че да се избегнат, за да отговарят на по-нататъшното изолационно на контролирано вентилационно вентилационната трябва да се провери по време на строителната фаза, за да могат да се извършват корекции, ако е необходимо.

Мерка 3
Външна топлоизолация (система ETICS)

Описание на мерката
Изолация на цялата външна стена от външните стени с "тънкими топлоизолационни композитни системи" (ETICS). Компонентите на ETICS, като цимент, изолационни плочи, армировка и мазилка, са приспособени един към друг и заедно образуват изолационна система, като изолацията обхваща не само външната стена, но и цялата външна повърхност на покрива и вентилационните системи.

Спецификация на мерката
Коэффициент на топлоизолация U = 0.26 W/(m²K) или дебелина на топлоизолацията 12 cm

Подготовка за последващи мерки за обновяване
Когато се извършва външната стена, изолацията за изолацията на съществуващата таваните на тавана трябва да се адаптират към изолационния материал. Външен консултант трябва да погледне дали таваните са на топлоизолация и работят на погледите на изолацията кои могат да бъдат изолация.

Когато се извършва външната стена, подгответе се за по-нататъшна изолация на вентилационните системи, като изолацията изолация слой на стените свързват на външната стена за изолацията на свързването и свързването таван на вентилационните системи. Външен консултант трябва да погледне вентилационните системи за изолацията на вентилационните системи.

Мерка 4
Топлоизолация на тавана на сутерена

Описание на мерката
Топлоизолация на тавана на сутерена от пода. В зависимост от повърхността на тавана, топлоизолацията под него и цялостната изолация на тавана трябва да се погледне за различни изолационни материали. Също така проверете за ограничения във вентилационните системи.

Спецификация на мерката
10 cm топлоизолация (Минимална изолация R⁺ = 1.66 m²/W)

Мерка 5
Термопомпи въздух-въздух

Описание на мерката
Добавяне към отоплителната система на термопомпи въздух-въздух. Термопомпите въздух-въздух се монтират в едно или повече помещения за отопление и изолация. Външните тела се монтират на външната, а топлоизолацията се извършва в помещенията през стенови или фасадни стени.

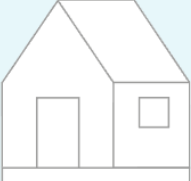
Спецификация на мерката
Термопомпите трябва да произведат от три до четири части топлина от една част електроенергия (това означава, че сезонният коефициент на трансформация (SCOP) е по-голям от 3.0). Отоплителният капацитет трябва да бъде изчислен за цялата сграда.

iBRoad2EPC  **Енергиен консултант** **Маги Асенова**
magi.assenova@gmail.com **Дата** Ноември 17, 2023 **Енергия**

За нуждите от енергия

Този преглед ви показва източника на енергия, крайното потребление на енергия, емисиите на парникови газове и разходите за енергия за всеки етап от обновяването. По този начин iBRoad2EPC показва въздействието на мерките за обновяване върху потреблението на енергия във вашата сграда.

Допълнителна информация





Сера 2023 **C**

Енергийни източници
Мазут, Електричество

Крайна потребна енергия
208 kWh/m²year

Емисии на парникови газове
71 kg/m²

Разходи за енергия
65.33 лв./m²





Стъпка 1 Възможно най-скоро **A**

Енергийни източници
Електричество

Крайна потребна енергия
34 kWh/m²year

Емисии на парникови газове
28 kg/m²

Разходи за енергия





Стъпка 2 2040 **A**

Енергийни източници
Електричество

Крайна потребна енергия
10 kWh/m²year

Емисии на парникови газове
9 kg/m²

Разходи за енергия
9.42 лв./m²

Отпечатък**Отказ от отговорност**

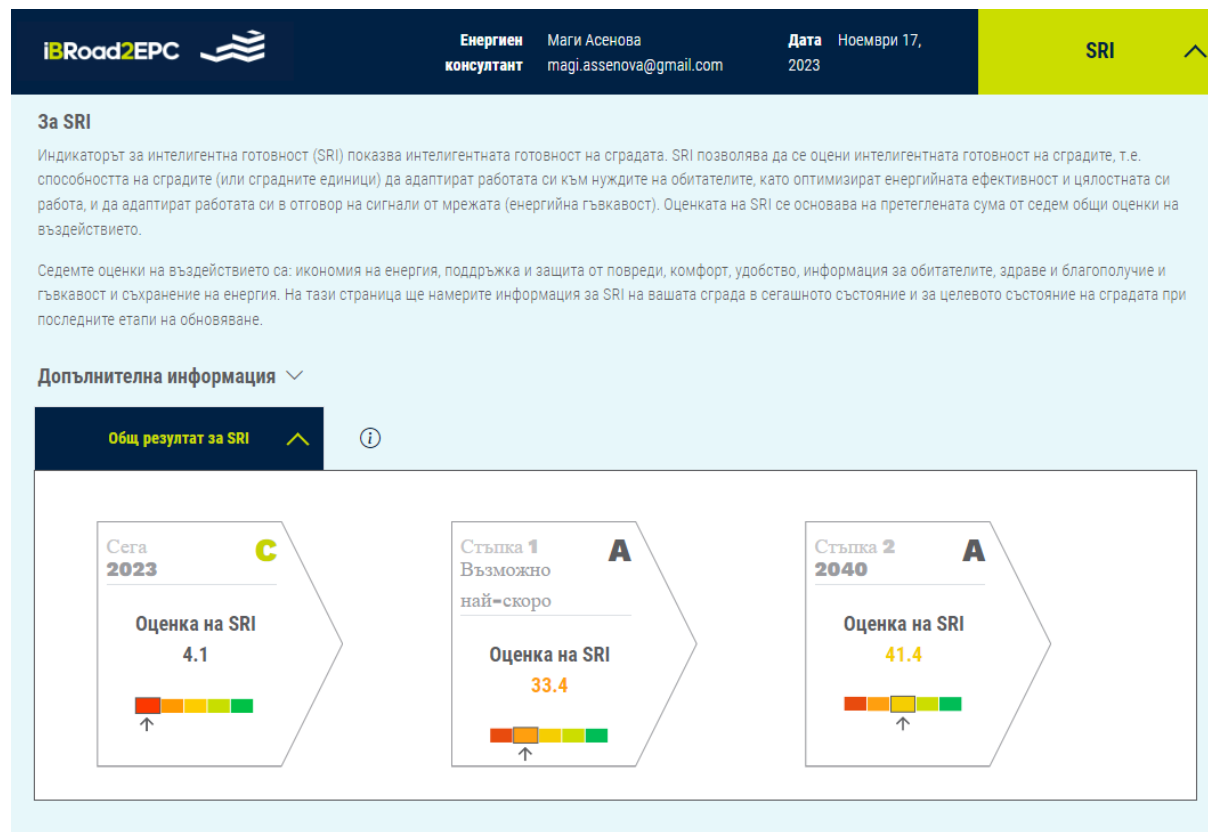
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УВЕДОМЛЕНИЕ ЗА ФИНАНСИРАНЕ

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← Обратно към подробности за проекта

**Отпечатък****Отказ от отговорност**

Вашият iBRoad2EPC е опростена стратегия за обновяване. Тя не замества детайлното планиране. За подробни енергийни консултации се обърнете към енергиен одитор за сгради.

УВЕДОМЛЕНИЕ ЗА ФИНАНСИРАНЕ

Този проект е финансиран от програмата за научни изследвания и иновации "Хоризонт 2020" на Европейския съюз по споразумение за безвъзмездна помощ № 101033781.



Case 2. Spain - Residential building, Vitoria

Partner: **GBCe**



Building address: **Basque Country, Vitoria, Spain**
Building name: **Residential building in Zaramaga neighbourhood**
Building type: **Residential**
Year of construction: **1967**

How iBRoad2EPC upgrades the national EPC

The iBRoad2EPC gives a whole vision of the renovation until the building has been decarbonised, taking the time needed to achieve it. The Spanish EPC only provides the current state of the building and some measures that could be taken to improve it, but not a complete renovation strategy. In this case, the property didn't have the resources to get the building renovated in one step, but iBRoad2EPC offers the opportunity to see how deep renovation could be achieved.

iBRoad2EPC also improves the Spanish EPC by setting out measures in a logical sequence that leads directly to the objective of high energy performance, avoids costly deviations and bad investments, and complies with future regulatory and financial requirements. These aspects are ignored by the regular EPC.

Finally, the iBRoad2EPC presents the strategy and the recommendations in a way that can be easily understood by the end user and considers the user's needs. The regular EPC is not normally read by homeowners because it is very technical.

Case study

The building is a multi-family residential block in Vitoria, with the following characteristics:

- Climatic zone: D1
- Seven floors for housing, two apartments per floor, and two commercial premises on the ground floor. The homes have an area of 80-90 m². Storage rooms are located on the ground floor.
- Year of construction: 1967
- Roof renovated more than 10 years ago.

- Facades mostly made of exposed brick, the rest covered with cement mortar and painted; paint is chipping; air chambers of approximately 5cm.
- Exterior carpentry, in general, is more than 30 years old, although in certain homes (which could not be visited) the windows appear more recent. The windows of the homes visited are made of aluminium with double glazing, with no thermal bridge break. Some homes duplicated their single glazed windows instead of changing them to double glazed once.
- The domestic hot water and heating system in most homes is through an individual gas boiler, at least eight years old on average.
- A technical inspection report, dated 26 February 2018, recommends monitoring observed deficiencies that could lead to more serious problems, and others that could appear. These include chips in the paint, lack of protection of the asphalt fabric that covers the eaves, and points where this seems to be peeling off at the overlaps.

Specific characteristics of the building and triggers for renovation

The main trigger is for the residents of the building to live better and to reduce their energy consumption, since the building is old and poorly insulated.

Benefits of renovation

- Improve thermal comfort
- Reduce energy consumption
- Switch from fossil fuels to clean energy

Renovation steps

	Current state	Step 1	Step 2	Step 3	Step 4
Year of implementation:		2024	2030	2033	2040
Trigger for renovation:		Insulate the building to reduce energy consumption	Change windows to reduce energy consumption	Change the fossil fuel heating installation for a heat pump	Be close to energy self-sufficiency by adding solar panels
Energy class:	G	E	E	B	A
Energy sources:	Natural gas for heating, electricity for appliances	Natural gas for heating, electricity for appliances	Natural gas for heating, electricity for appliances	Electricity	Electricity, including on-site solar
Final energy demand:	369 kWh/m ² /year	152 kWh/m ² /year	127 kWh/m ² /year	28 kWh/m ² /year	18 kWh/m ² /year
Greenhouse gas emissions:	94 kgCO ₂ /m ² /year	36 kgCO ₂ /m ² /year	32 kgCO ₂ /m ² /year	9 kgCO ₂ /m ² /year	6 kgCO ₂ /m ² /year

iBRoad2EPC

Bienvenido a su iBRoad2EPC

El iBRoad2EPC le brinda una descripción general de los pasos de renovación que puede tomar para que su edificio sea climáticamente neutral para 2050 y cómo los pasos individuales se complementan entre sí en una estrategia de renovación significativa.

Acerca de iBRoad2EPC



Sobre la demanda de energía

Esta visión general le muestra la fuente de energía, la demanda final de energía, las emisiones de gases de efecto invernadero y los costes energéticos en cada paso de la rehabilitación. De este modo, iBRoad2EPC muestra el impacto de las medidas de rehabilitación en el consumo energético de su edificio.

Información adicional



Paso 1 2024

Medida 1
Aislamiento exterior (fachada ventilada)

Descripción de la medida

Aislamiento de la fachada por el exterior. Sistema constructivo formado por una hoja interior, una capa aislante de bajo impacto ambiental (aislamiento de lana mineral hidrofugada, ISOVER ECOVENT VN, e= 12 cm.), y una hoja exterior (placa aligerada resistente a la humedad). Sobre la hoja interior de la fachada ventilada, se ancla una subestructura metálica destinada a soportar la hoja exterior de acabado. El aislamiento se coloca entre las dos hojas quedando protegido por la hoja exterior. La cámara de aire ventilada situada detrás de la hoja exterior, protege el edificio de la radiación solar y corrigiendo fácilmente todos los puentes térmicos existentes en el edificio, según el técnico que emitió el Informe de Inspección Técnica del edificio, con fecha 26 de febrero de 2018.

Especificación de la medida

U = 0,22 W/(m²K)

Preparativos para posteriores medidas de renovación

Quando se aislen las paredes exteriores, prepare una conexión posterior que elimine el puente térmico para una instalación posterior de ventanas o puertas. Los topos de las ventanas o puertas deben retirarse para que las ventanas o puertas puedan colocarse en el futuro contra el borde frontal de la fachada. Las cajas de persianas existentes pueden retirarse y las nuevas persianas integrarse en el aislamiento del muro. Si las nuevas ventanas o puertas van a permanecer en el mismo nivel de instalación, el aislamiento del intradós debe conectarse a las ventanas existentes de forma resistente a la intemperie con una junta de difusión abierta.

Quando se aisle la pared exterior, los ajustes de control del generador de calor existente deberán adaptarse a la carga térmica reducida. El instalador deberá comprobar si es posible reducir las temperaturas de impulsión y el caudal de la bomba del circuito de calefacción.

Medida 2
Aislamiento de cubierta inclinada, bajo forjado

Descripción de la medida

Aislamiento de la cubierta inclinada bajo forjado, zona destinada a trasteros. El trabajo se realiza desde el interior, por lo que no es necesario el levantamiento de la cubrición exterior. La intervención consiste en crear una cámara que será rellena por el material aislante térmico de lana mineral de bajo impacto ambiental (ISOVER ARENA APTA, e= 12cm), mediante un techo suspendido con placas de yeso laminado. El material aislante se coloca sin huecos entre los listones y se asegura contra el desprendimiento. Por regla general, la capa aislante del lado del interior se protege con una barera de vapor. Ésta puede servir como capa estanca. En este caso, todas las juntas deben sellarse con cinta estanca. Se recomienda comprobar la estanqueidad mediante pruebas antes de instalar el revestimiento interior.

Especificación de la medida

U = 1 W/(m²K)

Preparativos para posteriores medidas de renovación

Quando se aisle la cubierta, prepárela también para una futura instalación de placas fotovoltaicas, instalando las tuberías, bastidores y orificios pasantes necesarios; esto ahorrará esfuerzos redundantes en el futuro.

Quando se aisle la cubierta, los ajustes de control del generador de calor existente deberán adaptarse a la carga térmica reducida. El instalador deberá comprobar si es posible reducir las temperaturas de impulsión y el caudal de la bomba del circuito de calefacción.

Medida 3
Aislamiento en el techo del sótano

Descripción de la medida

Aislamiento en el techo de la planta baja o en el suelo de la planta primera, mejorando las prestaciones térmicas y acústicas entre espacios claramente diferenciados y que normalmente suponen elementos de separación entre zonas calefactadas y no. La intervención consiste en la colocación de un aislamiento térmico específico (panel rígido de alta densidad de lana mineral ISOVER PANEL PST, de alta resistencia a la compresión, revestido por un film de polietileno en una de sus caras. La instalación del aislamiento bajo forjado, se hará mediante fijaciones mecánicas.

Especificación de la medida

U = 0,34 W/(m²K)

Case 3. Portugal – Residential building in Lisbon

Partner: **ADENE**



Building address: **Lisbon, Portugal**
 Building name: **SCML building - Rua Leandro Braga, 10**
 Building type: **Residential building**
 Year of construction: **1932**

How iBRoad2EPC upgrades the national EPC

The Portuguese EPC system is already quite advanced, and with sufficient information on energy efficiency recommendations. Issuing iBRoad2EPC is therefore not expected to require a high additional investment considering that the collection of information is similar to the data needed to issue an EPC. iBRoad2EPC contributes to consumers' needs, providing simple and coherent information on energy measures, and to the harmonisation of technical aspects and standards (thermal, acoustic, indoor air quality, smart readiness, etc.) that could make processes more agile. The step-by-step approach also adds value for homeowners and building managers. iBRoad2EPC can also easily connect with and complement existing platforms such as the casA+ web portal, a national one-stop-shop provided by ADENE, with other features such as a digital building logbook or renovation measures based on the EPC recommendations, linking specific intervention needs, building owners and service providers.

Finally, iBRoad2EPC will contribute to the new version of the national building energy certification system which is planned for the next 1-2 years according to the national energy and climate plan, where building renovation passports will play a pivotal role. This will comply with the long-term renovation strategy measure "Creation of the building renovation passport, as an optional instrument, which complements the energy certificate (in line with the one developed under the European iBRoad project)" and contribute to the success of the recently adopted national long-term strategy to combat energy poverty.

Case study

The building is in an old neighbourhood of Lisbon. It is owned by Santa Casa da Misericórdia de Lisboa (SCML) and rented to the residents at market prices (although some rents are lower since they are old contracts). SCML was one of the institutions that supported the iBRoad2EPC project by providing its buildings for the test phase, alongside GEBALIS (Lisbon social housing management company) and Construção Pública, E.P.E. (formerly Parque Escolar, responsible for a large school renovation programme in Portugal). SCML is a private non-profit institution active in Lisbon and in Portugal for over 500 years, with a focus on social action, health,

training and education, culture, heritage, and research and innovation. A large part of its building assets comes from charitable donations, and are rented in the market or for social purposes (such as renting to young people) or used for the institution's own activities.

Specific characteristics of the building and triggers for renovation

This is a three-storey building with six one-bedroom apartments built in 1932. Each dwelling has an approximate area of 50 m² which is representative of buildings from the same period and location. It is built on a northwest-southeast axis.

The building has low-quality envelope and windows, and the dwellings have no heating or cooling systems installed. Domestic hot water is normally prepared via small gas heaters. One of the dwellings does not have any domestic hot water system. Together with the current energy classification, these are indicators of likely energy poverty.

The building needs intervention works on the façade and roof as these components' maintenance and/or lifetime periods are long overdue. There are also visible signs of building pathologies affecting indoor environmental quality such as mould. Given the overall status of the building, the owner foresees that a general intervention will be needed and this is in the institution's investment pipeline, although there is no planned date. When it goes forward, being a large renovation, the interventions will have to comply with minimum energy performance requirements as per the Portuguese legislation.

Benefits of renovation

The financial capacity of the institution is limited compared to the investment needed, so a step-by-step approach was welcomed. The intervention also considered the balance between financial resources available and the highest energy efficiency ambition possible.

During the iBRoad2EPC issuing process several ancillary benefits were identified: reduction of energy needs; improvement of acoustic, thermal comfort and indoor air quality conditions; prevention or reduction of pathologies; promotion of energy production from renewable sources; and improvement of aesthetics and visual quality.

Specifically, the proposal envisages a total refurbishment of the building envelope, water- and energy-efficient systems for domestic hot water (addressing the water-energy nexus), highly efficient windows (labelled according to ADENE's managed scheme CLASSE+), biomass space heating systems and solar thermal systems for domestic hot water. Some of these include monitoring and control systems, which also significantly increases the SRI value and impacts positively on IEQ values.

This is an opportunity to include additional investment to ensure a future-proof building, upgrade the real estate value of the asset, improve the quality of life of current and future inhabitants, and address urgent needs such as building pathologies and likely energy poverty.

Renovation steps

	Current state	Step 1	Step 2	Step 3	Step 4
Year of implementation:		ASAP	2030	2040	2050
Energy class:	F	F	B-	A	A+
Energy sources:	Natural gas (and electricity*)	Natural gas, electricity	Natural gas, electricity	Electricity, biomass	Electricity, biomass, solar
Final energy demand:	164 kWh/m ² /year	162 kWh/m ² /year	73 kWh/m ² /year	68 kWh/m ² /year	68 kWh/m ² /year
Greenhouse gas emissions:	53 kgCO ₂ /m ² /year	52 kgCO ₂ /m ² /year	19 kgCO ₂ /m ² /year	3 kgCO ₂ /m ² /year	1 kgCO ₂ /m ² /year
Energy costs:	€21.68 m ² /year	€21.53 m ² /year	€7.50 m ² /year	€1.75 m ² /year	€0.93 m ² /year)
SRI rate*:	0.8	3.4	3.4	10.6	14.7
IEQ rate**:	5.4	5.7	6.4	7.1	7.1

According to the national EPC methodology only installed systems for water, space heating and ventilation are included in the calculation. There is electricity for appliances and lighting, but these are not included in the calculation for residential buildings.

* SRI points are assigned on a scale from 0 to 100, where 100 is the highest smart readiness of the building

** IEQ points are assigned on a scale from 0 to 10, where 10 is the highest indoor environment quality

iBRoad2EPC



iBRoad2EPC Perito João Afonso Data Novembro 19, 2023 Etapa 1

Etapa 1 Assim que possível

Medida 1
Instalação de novo sistema de produção de águas quentes sanitárias

Descrição da ação
Substituição dos chuveiros de duche existentes nas frações por outros mais eficiente em termos de poupança de água em todas as frações, com certificação e rotulagem de eficiência hídrica (com rótulo A), de acordo com um sistema de certificação de eficiência hídrica da responsabilidade de uma entidade independente reconhecida pelo setor das instalações prediais. O custo de investimento estimado para implementação desta medida é de 240€. Nota: O título não está coerente com a descrição da medida de melhoria. Esta situação deverá ser corrigida numa próxima versão da ferramenta.

Especificação da medida
Chuveiro com elevada eficiência hídrica.

Medida 2
Instalação de novo sistema de produção de águas quentes sanitárias

Descrição da ação
Instalação de bombas de calor (ar-água) para produção de águas quentes sanitárias nas frações R/C Esq. e 2.º Drt. As bombas de calor têm uma capacidade nominal de 98 litros, uma potência útil de 1,5 kW e uma eficiência de 3,4. O custo de investimento estimado para esta medida de melhoria é de 3000€.

Especificação da medida
P útil = 1,5 kW e SCOP = 3,4

Medida 3
Melhoria da ventilação

Descrição da ação
Instalação de grelhas fixas ou reguláveis manualmente nas paredes exteriores das cozinhas das frações R/C Drt., 1.º Esq., 2.º Drt. e 2.º Esq., com uma área útil total de abertura que permita obter em cada uma das frações uma taxa de renovação horária de ar superior a 0,50 h⁻¹. A aplicação desta medida de melhoria permite melhorar as condições de conforto e de salubridade do espaço. Uma ventilação adequada permite prevenir situações de doenças ao nível do foro respiratório e, consequentemente, uma redução indireta nas despesas de saúde. Antes da operação, o proprietário deverá verificar se existiu alguma alteração da legislação relacionada com os requisitos mínimos aplicáveis. O custo de investimento estimado para a execução desta medida, que visa melhorar a qualidade do ar interior na fração, é de 800€.

Especificação da medida
Rph Estimada > 0,50 h⁻¹

Voltar

iBRoad2EPC Perito João Afonso Data Novembro 19, 2023 IEQ

Sobre a IEQ
O valor do IEQ - Indoor Environmental Quality / Indicador de Qualidade do Ambiente/Conforto Interior, depende das diferentes medidas de renovação de um edifício. Quanto mais eficiente for um edifício e quanto menos energia consumir, melhores serão os resultados do IEQ. Após a atribuição de ponderações a cada um dos indicadores (conforto térmico, qualidade do ar interior, conforto visual e conforto acústico), este separador indica a classificação de conforto obtida.

Agora 2023 **F**
Valor IEQ 5.4

Etapa 1 Assim que possível **F**
Valor IEQ 5.7

Etapa 2 2030 **B-**
Valor IEQ 6.4

Etapa 3 2040 **A**
Valor IEQ 7.1

Etapa 4 2050 **A+**
Valor IEQ 7.1

Case 4. Poland – Residential building in Wesola, Warsaw

Partner: **KAPE**



Building address: **Wesola, Warsaw**
Building name: **PWP 113**
Building type: **Multi-family building**
Year of construction: **1973**

How iBRoad2EPC upgrades the national EPC

Polish Energy Performance Certificates are quite a comprehensive document, but usually do not contain information on possible renovations to the building, or offer only a very abbreviated version. iBRoad2EPC will help owners/users of the building because it contains expanded recommendations and a complete step-by-step plan of what renovations to make, when and what benefits they will bring. Additional modules (e.g., SRI or IEQ) make iBRoad2EPC a very versatile tool that addresses many market needs. In addition, the introduction of iBRoad2EPC would help meet the goal set in the Polish national building renovation plan to introduce renovation passports.

Case study

This four-storey multi-family building located in Wesola district, Warsaw, was built in 1973 as a modular reinforced concrete structure. Like many similar buildings, it underwent thermal modernisation in the early 2000s. Despite this, the building is not insulated sufficiently. Changes in technology, improved insulation of materials, and increasing EU requirements for building energy classes require changes in the coming years.

An additional trigger for the building's occupants is inflation and increased energy prices affecting household budgets, so it was decided to install a heat pump along with solar panels on the roof. In accordance with the wishes of the residents, the modernisation of the building will be spread over as many stages as possible so that funds can be raised through the renovation fund.

Benefits of renovation

Renovating this building offers a multitude of benefits, ranging from improved thermal comfort to decreased costs and increased property value.

Renovation will contribute to a better standard of living by addressing issues such as improved thermal comfort, upgrading outdated hot water and heating systems, and avoiding costly heating problems. This not only enhances occupant well-being but also ensures compliance with current building codes, safety standards and EU requirements.

Financially, renovation projects have the potential to significantly increase the market value of a property. Upgraded and well-maintained buildings are generally more attractive to buyers or tenants, resulting in higher resale or rental values. Additionally, proper energy-efficient renovations lead to long-term cost savings by reducing utility bills and maintenance expenses.

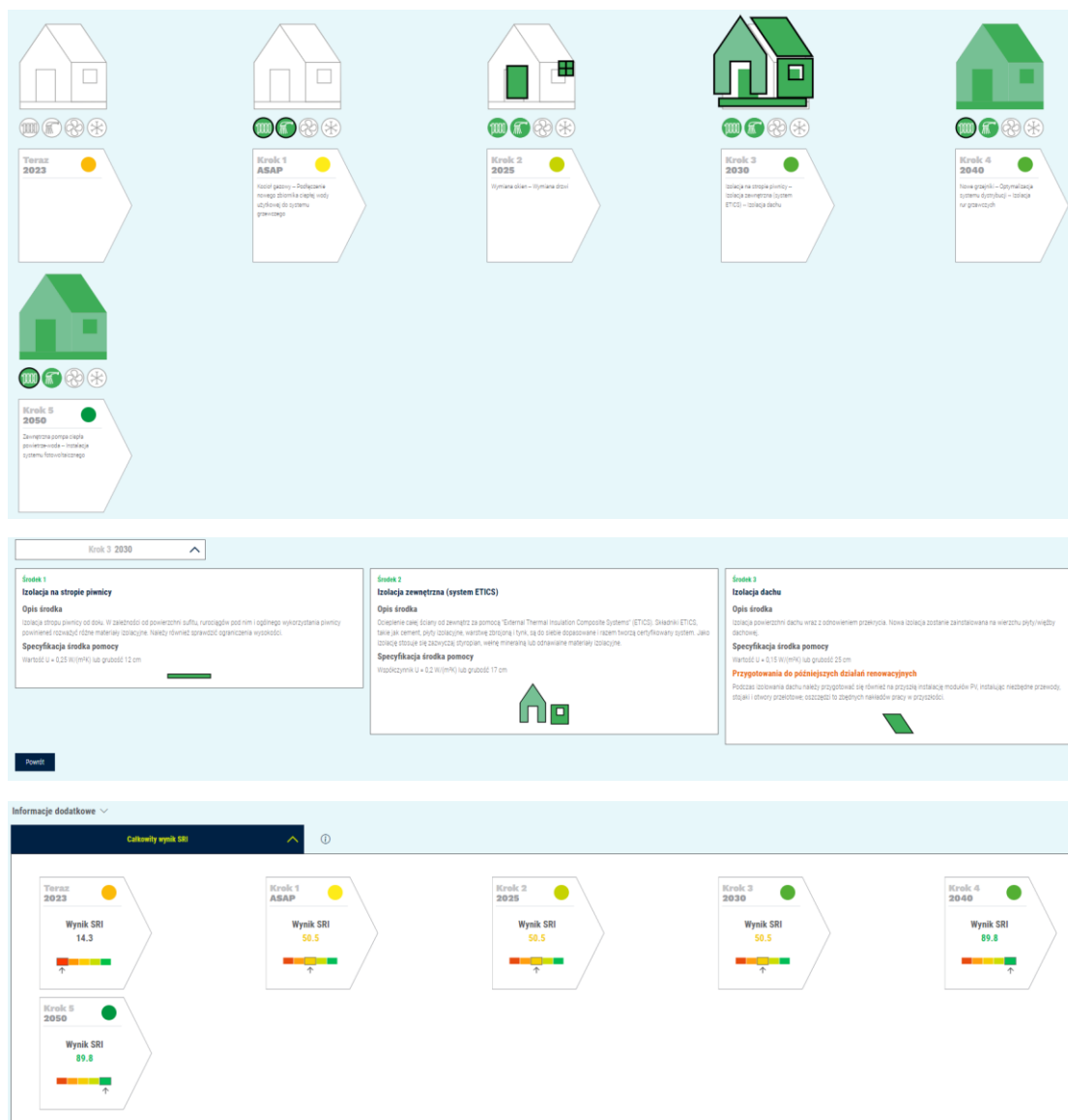
Renovation steps

	Current state	Step 1	Step 2	Step 3	Step 4	Step 5
Year of implementation:		ASAP	2025	2030	2035	2040
Trigger for renovation:		Old heating and hot water preparation system	Non-compliant windows and doors/preparation for building insulation	Necessity of thermal modernisation	Preparation of the heating system for heat pump installation	The need to change to a renewable heating system
Energy class:	Orange	Yellow	Light green	Green	Green	Dark green
Energy sources:	Natural gas for heating/hot water, electricity for appliances	Natural gas for heating/hot water, electricity for appliances	Natural gas for heating/hot water, electricity for appliances	Natural gas for heating/hot water, electricity for appliances	Natural gas for heating/hot water, electricity for appliances	Electricity/renewable sources for heating/hot water/appliances
Final energy demand:	176 kWh/m ² /year	142 kWh/m ² /year	117 kWh/m ² /year	88 kWh/m ² /year	79 kWh/m ² /year	50 kWh/m ² /year
Greenhouse gas emissions:	43 kgCO ₂ /m ² /year	38 kgCO ₂ /m ² /year	33 kgCO ₂ /m ² /year	28 kgCO ₂ /m ² /year	26 kgCO ₂ /m ² /year	16 kgCO ₂ /m ² /year
Energy costs:	113.92 zł/m ² /year	57.51 zł/m ² /year	50.25 zł/m ² /year	42.25 zł/m ² /year	39.79 zł/m ² /year	19.68 zł/m ² /year
SRI rate*:	14.3	50.5	50.5	50.5	89.8	89.8
IEQ rate**:	5.8	5.8	5.8	5.8	5.8	5.8

* SRI points are assigned on a scale from 0 to 100, where 100 is the highest smart readiness of the building

** IEQ points are assigned on a scale from 0 to 10, where 10 is the highest indoor environment quality

iBRoad2EPC



3. TARGET GROUPS FOR IBROAD2EPC TRAINING FOR PUBLIC AUTHORITIES

Public authorities play a crucial role in advancing the objectives of the EU Green Deal, particularly the 2030 climate and energy targets outlined in the European Climate Law and the 'Fit for 55' legislative revisions. These revisions, including the recast of the Energy Efficiency, Renewable Energy and Energy Performance of Buildings Directives, along with the goal of achieving climate neutrality by 2050, underscore the significance of public authorities at different levels of governance in driving sustainable initiatives. For example, in the new, recast Energy Efficiency Directive (EU) 2023/1791, which was adopted by the European Parliament and the Council in 2023, the second chapter is entitled “exemplary role of public sector” and covers three articles: Article 5 - Public sector leading on energy efficiency, Article 6 - Exemplary role of public bodies’ buildings, and Article 7 - Public procurement

The recast directive further strengthens the exemplary role to be played by the public sector in enhancing energy efficiency practices. A significant advancement is the introduction of an annual energy consumption reduction target of 1.9% for the public sector as a whole. Moreover, the annual 3% buildings renovation obligation is being extended to all levels of public administration. The public sector will also play a driving role in the development of the energy services market. Energy performance contracts will be prioritised in public sector energy efficiency projects whenever possible. Public bodies will continue to consider energy efficiency requirements when making decisions regarding the purchase of products, buildings and services, fostering systematic improvements.²

The 2024 EPBD recast includes the following changes that address public authorities:³

Zero-emission buildings

The proposal introduces a zero-emission standard for new buildings - as of 1 January 2030, all new buildings must be zero-emission buildings; new buildings owned by public bodies must be zero-emission as of 1 January 2028.

Solar energy in buildings

Depending on technical, economic and functional feasibility, Member States must ensure the deployment of suitable solar energy installations:

- On all new public and non-residential buildings with a useful floor area larger than 250 m² by 31 December 2026
- On all existing public buildings with a useful floor area larger than:
 - 2,000 m², by 31 December 2027
 - 750 m², by 31 December 2028
 - 250 m², by 31 December 2030.

Public authorities must dedicate themselves to planning and executing the clean energy transition with unprecedented ambition and speed, especially in the area of deep energy renovation of buildings, where there is a significant delay towards achieving the set targets across the whole continent.

² https://energy.ec.europa.eu/news/european-green-deal-energy-efficiency-directive-adopted-helping-make-eu-fit-55-2023-07-25_en

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32024L1275>

Public authorities need to enhance their capacities and skills in developing and implementing clean energy transition (CET) plans and strategies, such as the national building renovation plans (NBRPs) at national level and sustainable energy and climate action plans (SECAPs) and similar frameworks at local level. Their role and responsibility for developing and implementing these planning documents can be briefly presented as follows:

National governments: National governments typically set overarching policy frameworks and targets related to energy transition, renewable energy deployment and climate action. They often provide financial support, incentives and regulations to facilitate the transition. National governments also coordinate with regional and local authorities to ensure alignment with their policies and objectives. They are responsible for high level strategic documents such as integrated national climate and energy plans, NBRPs, etc.

Local authorities: Local authorities are responsible for implementing many aspects of CET plans, NBRPs and SECAPs. They engage with local stakeholders, including businesses, residents and civil society organisations, to identify opportunities for renewable energy deployment, energy efficiency improvements and climate mitigation measures. Local governments often develop initiatives such as renewable energy projects, energy-efficient building codes, public transportation systems and waste management programmes to reduce greenhouse gas emissions and promote sustainable development. To a large extent, local authorities practically implement the European and national policies in the field of sustainable energy. They manage a significant part of the building stock in their territory and have a leading role as a motivator, but also as a supporting partner for citizens when energy renovation of residential buildings is required.

Energy agencies/authorities: Energy agencies or authorities at various levels (national, regional or local) are often tasked with providing technical expertise, conducting research, and supporting the development and implementation of CET plans, NBRPs and SECAPs. They may offer guidance on energy policy, technology options, financing mechanisms, and best practices for sustainable energy and climate action.

Robust and enduring organisational structures are essential to mainstream the goal of carbon neutrality across all sectors. The building sector is one of the most important for achieving overall energy-saving objectives, with specific targets for reducing the energy consumption and increasing the renovation rates already set in the recasts of the Energy Efficiency and Energy Performance of Buildings Directives. This requires an innovative approach to both energy planning, management and project implementation, which can be significantly strengthened by applying iBRoad2EPC to drive streamlined renovation action.

While there is significant variation in the roles and positions of experts engaged in energy planning and management in public authorities, there is a common consensus that stronger organisational frameworks are needed to deliver climate and energy plans and strategies within public bodies and among external consultants. This may involve forming multidisciplinary teams within the public authorities themselves or bolstering affiliated technical entities like local and regional energy agencies. The emphasis should be on integrated planning processes and embedding enabling elements for successful implementation. These elements encompass aspects such as political commitment, identifying resources and financing prospects, data access, effective communication across various governance levels, and the active involvement of both public and private stakeholders, including citizens and communities. Below, we give an example outline of roles, responsibilities and qualifications within the public sector that the iBRoad2EPC awareness raising and capacity building activities could target. The iBRoad2EPC advisory package/training may also serve other functions or be adapted as needed.

The position specifications below aim to provide a foundation for structuring roles within public authorities involved in energy planning, management and project implementation. They require advanced knowledge on the application of EPCs and their enhancement through the introduction of renovation passport elements, as proposed by iBRoad2EPC. The qualifications and responsibilities outlined can be tailored to the specific needs and priorities of the institution, jurisdiction and country, but they provide a comprehensive representation of capacity building needs.

Energy planner/manager

Responsibilities:

- Develop, implement and monitor energy planning strategies for the jurisdiction.
- Collaborate with stakeholders to assess energy needs and set objectives.
- Identify opportunities for energy efficiency and sustainability initiatives.
- Oversee the integration of renewable energy sources into the local energy mix.
- Monitor and report on energy consumption and related performance metrics.

Qualifications:

- Bachelor's or Master's degree in environmental science, technical science or related field.
- Knowledge of energy policy, regulations and sustainable practices.
- Experience in strategic planning and project management.
- Background in energy management.

Sustainability officer

Responsibilities:

- Develop and implement sustainability plans aligned with energy goals.
- Identify and assess sustainable practices for energy efficiency.
- Monitor and report on the environmental impact of energy initiatives.
- Collaborate with departments to integrate sustainability into operations.

Qualifications:

- Bachelor's degree in environmental science, sustainability or related field.
- Knowledge of sustainable development practices.
- Strong analytical and communication skills.

Policy analyst (energy)

Responsibilities:

- Analyse energy policies and regulations at local, regional and national levels.
- Provide recommendations for policy development and improvement.
- Stay informed about emerging trends and technologies in the energy sector.
- Collaborate with legal experts to ensure compliance with regulatory frameworks.

Qualifications:

- Bachelor's or Master's degree in public policy, energy policy or related field.
- Research and analytical skills.
- Understanding of legal and regulatory frameworks.

Community outreach coordinator (energy)

Responsibilities:

- Engage with the community to raise awareness about energy initiatives.
- Organise workshops and events to educate the public on energy conservation.
- Collect feedback from the community and integrate it into planning processes.

Qualifications:

- Bachelor's degree in communication, public relations or related field.
- Experience in community outreach and engagement.
- Knowledge of energy-related issues.

Data analyst (energy)

Responsibilities:

- Collect and analyse data on energy consumption and efficiency.
- Generate reports and insights to inform decision-making.
- Develop and maintain databases related to energy planning.

Qualifications:

- Bachelor's or Master's degree in data science, statistics or related field.
- Proficiency in data analysis tools and software.
- Strong attention to detail.

Procurement manager/officer

Responsibilities:

- Develop and implement procurement strategies for construction projects.
- Conduct market analysis and identify potential suppliers and contractors.
- Oversee the bidding process, evaluate proposals and award contracts.
- Ensure compliance with procurement regulations and ethical standards.
- Collaborate with project managers to define procurement needs.

Qualifications:

- Bachelor's or Master's degree in business administration, public administration or related field.
- Knowledge of procurement laws, regulations and best practices.
- Experience in managing procurement processes for construction projects.

Construction project manager

Responsibilities:

- Plan, coordinate and oversee construction projects from inception to completion.
- Develop project timelines, budgets and resource plans.
- Collaborate with architects, engineers and contractors to ensure project goals are met.
- Monitor construction progress and address issues as they arise.
- Ensure compliance with quality standards and contractual requirements.

Qualifications:

- Bachelor's or Master's degree in civil engineering, construction management or related field.
- Project management certification is a plus.
- Experience in managing construction projects, including quality assurance.

4. IBROAD2EPC TOOLKIT FOR PUBLIC AUTHORITIES

The iBRoad2EPC toolkit for public authorities is a combination of various training that can help public authorities to implement various provisions of the 2024 EPBD recast, specifically related to Article 12 on renovation passports (see Chapter 3. Target groups for iBRoad2EPC training for public authorities). It also includes a comprehensive set of reports and accompanying documents.

4.1. iBRoad2EPC training module for public authorities

Though differently organised, each of the iBRoad2EPC pilot countries (Bulgaria, Greece, Poland, Portugal, Romania and Spain) has training programmes in place to increase the capacity of public officials on energy policy and planning, including energy efficiency measures and EPCs. Often these are run by different organisations, including NGOs. The lack of a methodologically structured and specifically designed curriculum with clearly defined learning outcomes is one of the challenges in this area.

To integrate iBRoad2EPC in existing training frameworks, we have designed a dedicated training module including two key units of learning outcomes:

1. Understanding iBRoad2EPC - for public authorities
2. Application of iBRoad2EPC in national, regional and local energy planning and management by public authorities.

The module thoroughly defines the knowledge, skills and authority/responsibility the target group - public officials at national, regional and local level - needs to acquire. It is also extremely versatile and can be applied in both existing certification schemes for energy managers and ad hoc programmes run by individual public institutions or developed under external initiatives (such as the new projects initiated under the LIFE-CET call for proposals “Technical support to clean energy transition plans and strategies in municipalities and regions”).⁴ Additionally, the structure of the module allows further differentiation between competences necessary for planning and management roles and those associated with procurement and on-site supervision functions. The selected units of learning outcomes and the respective knowledge, skills and authority/responsibility to be acquired following the training (potentially using the iBRoad2EPC training materials available in annexes I and II) are presented in the following table.

⁴ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/life-2023-cet-local;callCode=null;freeTextSearchKeyword=LIFE-2023-CET;matchWholeText=true;typeCodes=1,0;statusCodes=31094501,31094502,31094503;programmePeriod=2021%20-%202027;programCcm2Id=43252405;programDivisionCode=null;focusAreaCode=null;destinationGroup=null;missionGroup=null;geographicalZonesCode=null;programmeDivisionProspect=null;startDateLte=null;startDateGte=null;crossCuttingPriorityCode=null;cpvCode=null;performanceOfDelivery=null;sortQuery=sortStatus;orderBy=asc;onlyTenders=false;topicListKey=topicSearchTablePageState>

Unit	Responsibility	Skills	Knowledge
1. Understanding iBRoad2EPC - for public authorities	Apply national regulations for energy certification of buildings Communicate the project design details to other professionals and users, relating them to the benefits of deep renovation of buildings, including comfort, health and safety requirements Interpret iBRoad2EPC and the underlying documentation Take responsibility for explaining the work to be performed, the connections between the different measures and steps and the time schedule to each involved professional	Understand and explain the requirements for building certification Understand the benefits of long-term planning, avoiding lock-in effects, for deep step-by-step renovation Identify gaps/weak points in current certification and related schemes Interpret the results of iBRoad2EPC Gain knowledge about the energy status and the worst-performing segment of their building stock Gain knowledge about technological trends/needs Explain how building renovation influences the indoor environmental quality (IEQ) Understand and explain what the SRI and measured energy performance indicators are, how they can be useful to building users - owner, technician, designer - and draw conclusions about the building based on the indicators Communicate properly the specific project designs and plans	National building certification requirements, minimum energy requirements, validity, content, certification process and certification tools Long-term renovation strategies Step-by-step renovation and the influence of the different energy measures on each other, from the point of view of energy consumption and physical on-site implementation Improvement of IEQ through building renovation, benefits for the occupants from different energy efficiency measures, how building envelope and building systems influence IEQ Comprehensive knowledge about the iBRoad2EPC renovation passport and the underlying documentation, EPCs, building energy passports and other instruments for evaluating the energy efficiency measures and step-by-step renovation Different indicators (e.g. SRI, measured energy performance) related to the energy performance of the building Step-by-step renovation plans and good and bad practices related to lock-in effects Multiple benefits of deep energy efficiency renovations Basic knowledge of thermophysical properties of materials and components used in the building envelope, thermal conductivity, heat transfer, density, moisture permeability, airtightness Basic knowledge of the requirements of the building systems, efficiency, efficacy, seasonal coefficient of performance, seasonal energy efficiency ratio

2. Application of iBRoad2EPC in national, regional and local energy planning and management by public authorities	Implement stepwise building renovation in strategic planning and long-term renovation strategies Read and interpret step-by-step recommendations with focus on achieving regional or municipal energy planning with staged renovation projects Ensure regulatory compliance competence for energy-related laws and standards Apply financial planning competence for securing funding and incentives Competence in energy performance benchmarking and assessment Design and implement stepwise renovation in energy management programmes Facilitate stakeholder engagement for involving building occupants and community Monitoring and evaluation competence for continuous improvement Plan and implement effective communication campaigns Interpret and apply iBRoad2EPCs Risk management competence for addressing potential challenges Innovation competence for adopting cutting-edge technologies Cross-disciplinary competence for collaborating with diverse professionals Leadership competence for overseeing successful renovation projects	Apply analytical skills to assess building performance and identify improvement opportunities. Project management skills for planning and executing renovations. Design effective energy-saving plans Identify and design suitable mechanisms for financing and other incentives, as well as training, control and monitoring instruments Budgeting and financial skills for cost estimation and financial planning Communication skills to engage with stakeholders and contractors Suggest, build and reinforce links between various related instruments Data analysis skills to interpret energy consumption data Monitoring and evaluation skills to track energy performance over time Problem-solving skills to address energy-related challenges Communication skills to convey energy management recommendations Collaboration skills to work with architects, engineers and contractors Technical skills to assess energy-efficient solutions Quality assurance skills for ensuring compliance with renovation plans	Comprehensive knowledge of EU and national requirements in the area of energy and climate planning Comprehensive knowledge of EU and national requirements specific for building renovation strategies and plans Knowledge of financial mechanisms and incentives for building renovations Awareness of sustainable and green building practices Understanding of building construction and architecture principles regarding deep renovation Comprehensive knowledge about the iBRoad2EPC principles for determining the individual steps and understanding the reasons for determining the sequence of steps (technical and regulatory principles for determining the sequence) Awareness of energy performance assessment methodologies Familiarity with energy monitoring and data analysis tools Understanding of energy consumption patterns in buildings Awareness of smart building technologies
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Table 1. Units of learning outcomes of the iBRoad2EPC training module for public authorities

4.2. Other supporting materials

This subsection presents a set of reports and training materials that can further support public authorities in their work.

Report on adaptation requirements for countries – technical specification for the programming of the software tools, including templates for all rollout countries

Suitable for energy agencies, policy analyst (energy) and policymakers

This document can be used by national public authorities as a tool for integrating iBRoad2EPC into the legal framework. While focused on the implementing countries, it offers guidelines for implementation in other EU Member States.

The report is available here: <https://ibroad2epc.eu/portfolio-items/specification-for-the-ibroad2epc-software-tools/>

This detailed document outlines the adaptation of iBRoad2EPC to the specific requirements of implementing countries Bulgaria, Greece, Poland, Portugal, Romania and Spain.

The main objectives of iBRoad2EPC involve creating a unified design for iBRoad2EPC, issuing it online, providing clear user guidance, and offering support for assigning renovation measures at specific points in time. The report describes the adaptation process in terms of building types, climate zones, customer approach, prefabricated text blocks and more.

Additionally, the document highlights the adaptation requirements for iBRoad2EPC, emphasising its role as an energy consulting service. Specific benefits for building owners include improved recommendations for renovation to avoid lock-in effects and align with national climate targets, and integrate additional indicators like IEQ and SRI.

The report also looks at country-specific parameters, such as language, interlinkages and automation. The overview of country adaptations provides insights into customisation in the six pilot countries. Adaptation requirements are elaborated, considering factors like building types, climate zones, customer approach, prefabricated text blocks and dates of renovation steps.

The adaptation process is explained in detail, covering the structure of the iBRoad2EPC spreadsheet template, the role of country administrators, the data flows, and the steps involved in the adaptation. The report emphasises the importance of the iBRoad2EPC database in managing country-specific customisations, ensuring flexibility and facilitating easy adjustments.

Overall, the document serves as a comprehensive guide to the technical adaptation of iBRoad2EPC to meet the diverse requirements of implementing countries, laying the groundwork for successful integration and use in different contexts.

Initial national guides. iBRoad2EPC and national energy performance certification schemes of roll-out countries

Suitable for energy agencies, policy analyst (energy) and policymakers

This document can be used by national public authorities as a tool for integrating iBRoad2EPC into the legal framework. While focused on the implementing countries, it offers guidelines for implementation in other EU Member States.

The report is available here: <https://ibroad2epc.eu/portfolio-items/initial-national-guides/>

This document outlines the initial national guidelines for the iBRoad2EPC rollout across six pilot countries: Bulgaria, Greece, Poland, Portugal, Romania, and Spain.

The main focus is on the national roll-outs, with dedicated chapters for each pilot country. These chapters include an overview of energy targets, legislative frameworks, building stock characteristics, and EPC issuing procedures. The iBRoad2EPC vision is presented, incorporating perspectives from national partners and national advisory committees. The report also addresses cost and effort estimates, proposed modules, interlinkages with other tools, software, and necessary training for energy auditors.

Each country section concludes with an action plan developed in collaboration with national advisory committee members, outlining priorities, objectives, stakeholders and implementation timetables. The report ends with a summary of similarities and differences among the six action plans.

iBRoad2EPC training toolkit

Suitable for energy agencies, policy analyst (energy) and policymakers

This report can be used by energy experts from local authorities and experts from national public authorities responsible for the quality of energy certificates, and could be helpful to evaluate iBRoad2EPCs received by inspection authorities.

The report is available here: <https://ibroad2epc.eu/portfolio-items/training-toolkit/>

This document was created for the issuers of the iBRoad2EPC certificates but is also useful for professionals in the fields of construction and architecture. It describes how decisions are made to create the document, how to use the iBRoad2EPC Assistant and produce the document, what is visible to end users and how to use this document. Among the training materials are also those for the iBRoad2EPC add-on modules, useful information can also be obtained for energy agencies and municipal officials responsible for the reading and evaluating the new indicators such as IEQ and SRI.

The report also provides background material on changes in national legislation and the obligations of building owners under the EPBD, and explains how these may trigger different renovation steps.

Training module for construction professionals

Suitable for construction project manager, procurement manager/officer, energy agencies, policy analyst (energy) and policymakers

This report can be used by energy experts from local and public authorities responsible for institutional or other building stock, and could be helpful in implementing step-by-step energy measures.

The report is available here:

<https://ibroad2epc.eu/portfolio-items/ibroad2epc-training-material-for-construction-professionals>

This document, along with its accompanying presentations, supports construction professionals in the systematic implementation of stepwise renovation recommendations. It aids professionals in comprehending the intricacies of building renovation plans, addressing challenges associated with step-by-step renovations, and achieving key performance indicators crucial for successful renovations.

The report is also useful for public authorities by providing insights into how personnel should be equipped and trained. It assists authorities in understanding the requirements for renovating buildings within their municipality, region or country. The report and its training materials can help national authorities to plan training processes related to the renovation of the building stock, covering the different stages of the renovation process and the different levels of professional qualification.

The current training scheme is designed to bridge the existing gap in qualification frameworks and familiarise construction professionals with EPCs enhanced with elements of renovation passports. By focusing on task-based qualifications in collaboration with specialized Horizon 2020 projects such as BUS League and BUS GoCircular, this report not only analyses professional occupations but also defines tasks, learning outcomes and a comprehensive training curriculum.

How to best use financial and non-financial incentives for renovation in implementing markets

This report can be used by all public authorities, including national governments, local authorities, energy agencies and others responsible for institutional or other building stock, and could be helpful in planning and implementing step-by-step energy measures.

The report is available here: <https://ibroad2epc.eu>

The report assesses financial and non-financial incentives for renovation and examines how EPCs are integrated into these incentives to facilitate deep renovations. The analysis reviews 2-3 renovation programmes per partner country, evaluating if EPCs effectively trigger renovations through incentives, aligning with NBRPs. It explores the extent of iBRoad2EPC integration into these programmes, identifying opportunities for enhanced EPCs, incorporating renovation passports, to strengthen renovation incentive schemes, particularly in countries with limited successful renovation efforts. The report emphasises the need for regulatory frameworks to support, rather than hinder, EPC and renovation passport integration, addressing both existing gaps and policy incentives in implementing countries. Additionally, it highlights the importance of addressing financial barriers, since enhanced EPCs involve additional costs due to mandatory on-site visits and in-depth analysis.

5. IBROAD2EPC TRAINING CURRICULA

The iBRoad2EPC training curricula can be adapted to different target groups, professions and roles. A suggested curriculum to incorporate iBRoad2EPC content in existing training schemes or for use as a standalone training course is suggested below.

Name of the programme: Application of iBRoad2EPC in national, regional and local energy planning and management by public authorities
Course duration: 4.00 teaching hours + 2.00 hours of off-class practical exercises
Teaching hour duration: 45 min
Target group: Local authorities.....
Training institution: tbd

5.1 Graduate profile

The graduate is a qualified professional well versed in energy planning and management within public authorities. Possessing the necessary knowledge and skills, they are adept at independently overseeing the implementation of energy-related projects, leveraging iBRoad2EPC to guide their strategies. This individual demonstrates a deep understanding of technical documentation and details specific to energy planning. Responsible for designing workflows aligned with the objectives of the iBRoad2EPC, including tasks related to energy consumption, efficiency and renovation initiatives, the graduate excels in both independent and collaborative work. Proficient in applying acquired knowledge and practical skills to address challenges in energy-related projects, they exhibit a keen interest in staying abreast of the latest developments in energy concepts, materials and technologies. This graduate is poised to contribute significantly to the effective use of iBRoad2EPC in advancing energy planning, management and project implementation within public authorities.

5.2 Teaching framework (to be adapted as per the target group)

Application of iBRoad2EPC in national, regional and local energy planning and management by public authorities	Number of hours	Of which	
		Theory	Practice
↓ Introduction to key principles:	2	2	0
- National building certification requirements, minimum energy requirements, validity, content, certification process and certification tools - Knowledge of long-term renovation strategies - Knowledge of step-by-step renovation and the influence of the different energy measures on each other, from the point of view of energy consumption and physical on-site implementation - Improvement of IEQ through building renovation, benefits for the occupants from different energy efficiency measures, how building envelope and building systems influence IEQ - Knowledge regarding multiple benefits of deep energy efficiency renovations			

↓ Specific knowledge regarding iBRoad2EPC certification:	2	1	1
- Comprehensive knowledge about the iBRoad2EPC and underlying documentation (EPCs, renovation passports and other instruments for evaluating) - Knowledge of the different indicators related to the energy performance of the building, e.g., SRI, measured energy performance - Knowledge of energy efficiency measures and step-by-step renovation plans, and good and bad practices related to lock-in effects			
Specific knowledge about energy measures at the construction site: - Knowledge of the link between different measures in renovations and possible lock-in effects - Basic knowledge of thermophysical properties of materials and components used in the building envelope, thermal conductivity, heat transfer, density, moisture permeability, airtightness - Basic knowledge of the requirements of the building systems, efficiency, efficacy, seasonal coefficient of performance, seasonal energy efficiency ratio			
↓ Specific knowledge regarding energy planning, management and project implementation:	2	1	1
- Awareness of sustainable and green building practices - Understanding of building construction and architecture principles - Understanding of the principles and content of iBRoad2EPC - Comprehensive knowledge of the iBRoad2EPC principles for determining the individual steps and understanding the reasons for determining the sequence of steps (technical and regulatory principles for determining the sequence) - Awareness of energy performance assessment methodologies - Familiarity with energy monitoring and data analysis tools - Understanding of energy consumption patterns in buildings - Awareness of smart building technologies			
Total	6	4	2

5.3 Requirements for trainers

Knowledge and experience:

- Robust comprehension of energy planning and management principles, including familiarity with new-generation EPCs.
- Substantial hands-on experience in energy-related projects within public authorities, preferably encompassing diverse roles and project types.
- Knowledge and experience on iBRoad2EPC is advantageous

Education:

- Higher education in fields related to energy management, sustainable development, public administration or a closely related discipline.
- Possession of relevant certifications in energy planning or management is advantageous.

Teaching skills:

- Demonstrated experience or formal education in teaching, instructional design or adult education.
- Proficiency in translating complex energy concepts into accessible and engaging training materials.

Continuous learning:

- Commitment to staying abreast of the latest advancements in the energy planning and management field through ongoing education and professional development.
- Attendance at workshops, seminars and conferences or pursuit of advanced certifications to enhance expertise.

Personal qualities:

- Strong leadership skills, fostering an inclusive and collaborative learning environment.
- Patience and the ability to work effectively with a diverse group of learners, including public officials with varying levels of expertise.
- Excellent problem-solving abilities to address challenges specific to energy planning and project implementation.
- Good organisational and time management skills to plan and deliver training programmes effectively.

5.4 Necessary equipment and facilities

The learning environment should include classrooms with individual workspaces for each participant, complete with desks and chairs. Additionally, the trainer should have a designated workspace equipped with a desk and chair. Essential study materials, including study boards and cabinets, should be provided to support a conducive learning atmosphere. The teaching aids for the programme should encompass screens and stands for displaying instructional content, replacing traditional blackboards. Writing boards should be available to facilitate collaborative learning and note-taking. Various teaching aids, such as demonstration mock-ups, models and real samples related to energy planning and management, are essential. Visualising boards should be incorporated to enhance understanding, and access to educational videos relevant to the course content is crucial. To support interactive learning and research, computers should be provided, along with projectors for displaying presentations and visual content effectively. Visualisation software products will need to be installed to enhance the learning experience. These requirements are designed to ensure a comprehensive and modern learning environment for the specified course.

5.5 Further reading

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. OJ L 315/1, 14.11.2012

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0027>

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast). OJ L 153/13, 18.6.2010

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32010L0031>

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. OJ L 156/75, 19.6.2018

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.156.01.0075.01.ENG

Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency. OJ L 328, 21.12.2018

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.328.01.0210.01.ENG

Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council. OJ L 328, 21.12.2018

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.328.01.0001.01.ENG

European Commission (2021) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality. COM/2021/550 final, Brussels, 14.7.2021

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0550>

European Commission (2019) Commission Recommendation (EU) 2019/1658 of 25 September 2019 on transposing the energy savings obligations under the Energy Efficiency Directive. OJ L 275/1, 28.10.2019

<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32019H1658#d1e34-67-1>

European Commission (2019) Commission Recommendation (EU) 2019/786 of 8 May 2019 on building renovation. (notified under document C (2019) 3352) (Text with EEA relevance.) OJ L 127/34, 16.5.2019

<https://eur-lex.europa.eu/eli/reco/2019/786/oj/eng>

European Commission (2021) Factsheet - Energy Performance of Buildings.

https://ec.europa.eu/commission/presscorner/detail/en/FS_21_6691

European Commission. Long-term renovation strategies. European Commission/Energy.

https://ec.europa.eu/energy/topics/energyefficiency/energy-efficient-buildings/long-term-renovation-strategies_en

Maia, I. and Kranzl, L. (2019) Building renovation passports: an instrument to bridge the gap between building stock decarbonisation targets and real renovation processes. Panel: 7. Make buildings policies great again. ECEEE 2019 Proceedings.

https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2019/7-make-buildings-policies-great-again/building-renovation-passports-an-instrument-to-bridge-the-gap-between-building-stock-decarbonisation-targets-and-real-renovation-processes/

[7-289-19 Maia Presentation.pdf](#)

Mellwig, P., Werle, M. and Lempik, J. (2019) The iBRoad field test experience. EU H2020 iBRoad Project.

<https://ibroad-project.eu/news/the-ibroad-field-testexperience>

Monteiro, C.S. and Fragoso, R. (2018) The iBRoad Concept in practice. Report. EU H2020 iBRoad Project.

<https://ibroad-project.eu/news/the-ibroad-concept-inpractice>

PHI (2016) Step by step retrofits with passive house components. EuroPHIT project. Passive House Institute

https://europhit.eu/sites/europhit.eu/files/EuroPHit_Handbook_final_Optimized.pdf

Werle, M., Lempik, J. and Mellwig, P. (2019) Test driving the Individual Building Renovation Roadmap and Logbook. iBRoad Project.

<https://ibroadproject.eu/news/test-driving-ibroad>

5.6 Examination scheme

- 1) Written / Computer-assisted test
- 2) Implementation of a practical task/project assignment

Evaluation criteria:

Demonstrates mastery of theoretical knowledge about the concept, instruments and organisation of the work in the implementation of EPC-integrated building renovation roadmaps in the process of energy planning, management and project implementation

6. CONCLUSIONS AND RECOMMENDATIONS

The overall concept of EPCs enhanced with elements of renovation passports, as proposed by iBRoad2EPC, coupled with a specialised training scheme for public authorities, holds immense potential across various contexts. This multifaceted approach not only addresses the challenges of energy planning and management but also contributes to the broader goals of sustainable and innovative urban development.

The following steps are recommended for further deployment of the advisory package for public authorities across Member States:

1. **Integration of iBRoad2EPC into existing training schemes for municipal energy managers.** By enhancing the skillset of energy managers through targeted training, municipalities can optimise their energy planning and management efforts. Integrating iBRoad2EPC into existing training ensures that energy managers are proficient in leveraging EPCs as strategic tools within the broader framework of municipal energy initiatives.
2. **Integration in training schemes supported by EU LIFE programmes.** Aligning with the goals of EU LIFE programmes, the integration of iBRoad2EPC into training schemes for energy planning and management amplifies the impact of new projects. Public officials involved in energy initiatives supported by EU LIFE programmes gain a comprehensive understanding of how to integrate iBRoad2EPC for effective energy planning, fostering innovation and sustainability.
3. **Integration in local and regional planning to increase renovation.** Local and regional planning can benefit significantly from the systematic implementation of iBRoad2EPC. Incorporating iBRoad2EPC into plans for renovation of the public building stock ensures a well-coordinated staged approach. National authorities could also implement iBRoad2EPC in the design of supporting programmes for energy renovation of residential buildings. This strategic integration aligns with sustainable development objectives and maximises the impact of energy-efficient renovations.
4. **Application as requirements for preferential financing in innovative schemes.** iBRoad2EPC, or EPCs enhanced with elements of renovation passports, can serve as prerequisites for preferential financing in innovative schemes incentivising deep energy renovation. Making iBRoad2EPC a mandatory component of financing eligibility ensures that funded projects follow a comprehensive and well-defined energy renovation strategy. This approach promotes the adoption of best practices and maximises the long-term impact of financing initiatives.
5. **Integration in national renovation plans under the 2024 EPBD recast.** EPCs enhanced with elements of renovation passport, such as iBRoad2EPC, can act as cornerstones of national building renovation plans under the 2024 EPBD recast. By incorporating iBRoad2EPC into national strategies, public officials contribute to the development of innovative financing schemes. iBRoad2EPC becomes a catalyst for deep energy renovation, supporting national ambitions for sustainable and energy-efficient building stock.

The application of iBRoad2EPC, coupled with targeted training for public officials, transcends current isolated initiatives. It represents a holistic approach that empowers public officials to navigate complex energy planning landscapes, drive innovation and contribute meaningfully to the overarching sustainability goals of municipalities, regions and nations. As EPCs enhanced with elements of renovation passports become integral to training and planning, they pave the way for a future where energy efficiency is not just a goal but a strategic imperative in urban development.

ANNEX I: UNDERSTANDING IBROAD2EPC – FOR PUBLIC AUTHORITIES

ANNEX II: APPLICATION OF IBROAD2EPC IN NATIONAL, REGIONAL AND LOCAL ENERGY PLANNING AND MANAGEMENT BY PUBLIC AUTHORITIES



iBRoad2EPC

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