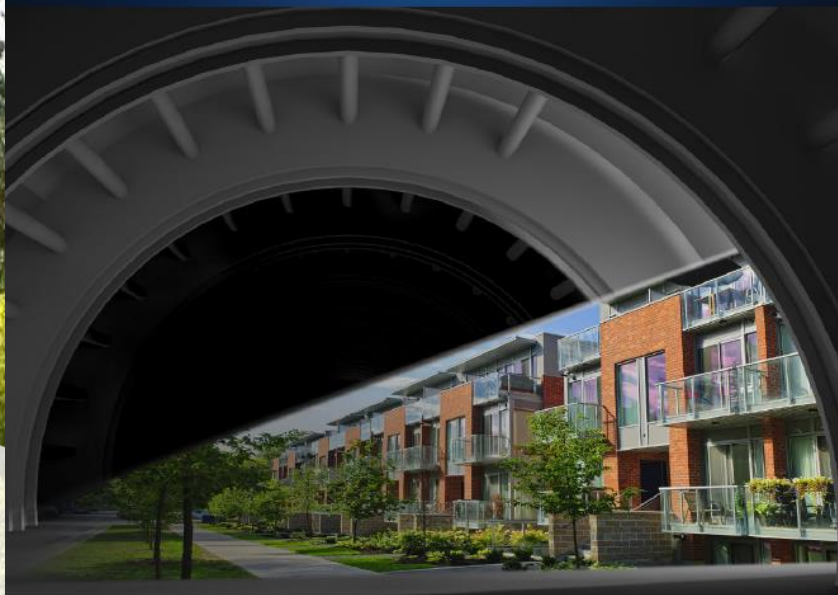


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°754045



## Stepwise and structured

Surrounding policy instruments to support the iBRoad approach for building renovation take-off

ifeu – Institute for Energy and Environmental Research  
September 2019

[www.ibroad-project.eu](http://www.ibroad-project.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 754045



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**Feb 19<sup>th</sup> 2020**



## Pages of the Renovation Roadmap

## Current building state

## Detailed renovation step

## Roadmap overview

## Detailed Roadmap

### Current State

## Your Building Today



MARKET CLASS	Building Date	Use Information on Energy	Technical Data
	Year of Construction of the Building	Abundance Time	Reasonable Examples
G	Building Type 1918 Single Family House	Hot Water Use Habits several persons take a shower daily and take a bath at least once a week	Year of Construction of the Heating System 1904
	Number of Floors 3	Ventilation Use Habits during heating period use window saps for several hours per day	Energy Bill \$600/4yr
	Number of Residential Units		
	Living Space Area 200 sq'		
	Previous Renovations		

### User Influence

Even your behaviour influences energy use. Here are some pointers to lower your total energy use:



Reduce room temperature. Every degree less room temperature saves around 6 % of heating energy. Usually 20 to 22 °C is sufficient in living rooms, 18 to 20 °C in the kitchen, 23 °C in the bathroom and 16 to 18 °C in the bedroom.



Correct intensive ventilation should be provided 2 to 3 times a day for about 4 to 5 minutes, with open windows and doors in all rooms. This ensures the necessary air exchange.







Vent radiators: If radiators chortle and do not warm up properly even though the thermostat is fully turned on, there is air in the radiator which wastes unnecessary energy. By regular venting you save heating costs and consume less CO<sub>2</sub>.

### Details of the renovation Roadmap

#### Renovation Step 4

[illegible]

### Previous Steps Benefits

- 
**Health**  
 Refurbishment of the facade thus optimal improvement of the building.  
 improved architectural quality and prestige of the building.
- 
**Health**  
 The innovation measures reduce the amount of moisture entering your room.  
 Reduction of indoor humidity, mold and fungi.
- 
**Noise Protection**  
 There will be new windows with better sound insulation.  
 Reduction of noise intrusion.
- 
**Thermal Comfort**  
 The temperature of 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

### Step by Step Plan

ENERGY CLASS <b>F</b>	ENERGY CLASS <b>D</b>	ENERGY CLASS <b>A</b>
TODAY	WHEN BOILER NEEDS TO BE EXCHANGED	WHEN WINDOWS NEED TO BE EXCHANGED
YOUR BUILDING	RENOVATION STEP 1	RENOVATION STEP 2
	<b>WHAT TO DO?</b> <ul style="list-style-type: none"> <li>➢ Improve the air permeability of the envelope</li> <li>➢ Optimisation central system</li> </ul>	<b>WHAT TO DO?</b> <ul style="list-style-type: none"> <li>➢ Installation of a thermal insulating layer top of concrete ground floor in contact with the ground</li> </ul>
	<b>INVESTMENT COSTS</b> 205555 €	<b>INVESTMENT COSTS</b> 141 €
	<b>COSTS FOR MAINTENANCE</b> 2387 €	<b>COSTS FOR MAINTENANCE</b> 141 €
<b>ENERGY BILL</b> 110 €/a	<b>ENERGY BILL</b> 144 €/a	<b>ENERGY BILL</b> 120 €/a



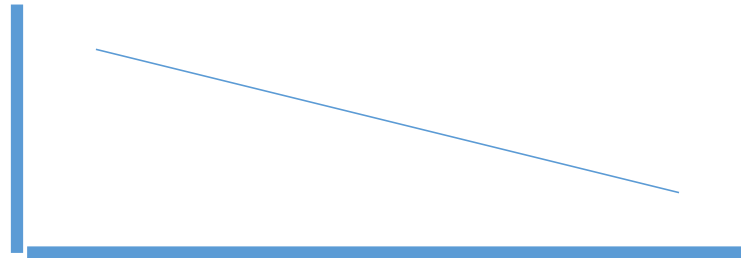
### Detailed Renovation Roadmap

### Step by Step Plan

	ENERGY CLASS <b>G</b>	ENERGY CLASS <b>E</b>	ENERGY CLASS <b>D</b>	ENERGY CLASS <b>B</b>	ENERGY CLASS <b>A</b>
	<b>Your Building</b> Moment of delivery	<b>Renovation Step 1</b> When Boiler needs to be re-exchanged	<b>Renovation Step 2</b> 2020 - 2025	<b>Renovation Step 3</b> 2026 - 2025	<b>Renovation Step 4</b> 2025 - 2040
Measures		<b>Measures</b> • Add a thermal solar system	<b>Measures</b> • External Wall Insulation	<b>Measures</b> • Substitution of the old radiators • Roof insulation	<b>Measures</b> • Installation of a recovery coil • Substitution of the heating system by a heating coil
Energy Use	<b>Primary Energy Demand</b> 250 kWh/m <sup>2</sup> a <b>Main Energy Source</b> Natural Gas <b>Final Energy Demand</b> 200 kWh/m <sup>2</sup> a	<b>Primary Energy Demand</b> 210 kWh/m <sup>2</sup> a <b>Main Energy Source</b> Natural Gas <b>Final Energy Demand</b> 200 kWh/m <sup>2</sup> a	<b>Primary Energy Demand</b> 150 kWh/m <sup>2</sup> a <b>Main Energy Source</b> Natural Gas <b>Final Energy Demand</b> 150 kWh/m <sup>2</sup> a	<b>Primary Energy Demand</b> 100 kWh/m <sup>2</sup> a <b>Main Energy Source</b> Natural Gas <b>Final Energy Demand</b> 80 kWh/m <sup>2</sup> a	<b>Primary Energy Demand</b> 100 kWh/m <sup>2</sup> a <b>Main Energy Source</b> Natural Gas <b>Final Energy Demand</b> 30 kWh/m <sup>2</sup> a
	<b>Final Energy Demand</b> second Source 5 kWh/m <sup>2</sup> a	<b>Final Energy Demand</b> second Source 15 kWh/m <sup>2</sup> a	<b>Final Energy Demand</b> second Source 15 kWh/m <sup>2</sup> a	<b>Final Energy Demand</b> second Source 15 kWh/m <sup>2</sup> a	<b>Final Energy Demand</b> second Source 15 kWh/m <sup>2</sup> a
	<b>Auxiliary Energy Source</b> Electricity <b>Final auxiliary Energy Demand</b> 30 kWh/m <sup>2</sup> a	<b>Auxiliary Energy Source</b> Electricity <b>Final auxiliary Energy Demand</b> 15 kWh/m <sup>2</sup> a	<b>Auxiliary Energy Source</b> Electricity <b>Final auxiliary Energy Demand</b> 15 kWh/m <sup>2</sup> a	<b>Auxiliary Energy Source</b> Electricity <b>Final auxiliary Energy Demand</b> 15 kWh/m <sup>2</sup> a	<b>Auxiliary Energy Source</b> Electricity <b>Final auxiliary Energy Demand</b> 15 kWh/m <sup>2</sup> a
	<b>Energy Bill</b> 4000 €/a	<b>Energy Bill</b> 2300 €/a	<b>Energy Bill</b> 1800 €/a	<b>Energy Bill</b> 1100 €/a	<b>Energy Bill</b> 900 €/a
	<b>Carbon Emissions</b> 40 kg/m <sup>2</sup> a	<b>Carbon Emissions</b> 30 kg/m <sup>2</sup> a	<b>Carbon Emissions</b> 25 kg/m <sup>2</sup> a	<b>Carbon Emissions</b> 15 kg/m <sup>2</sup> a	<b>Carbon Emissions</b> 10 kg/m <sup>2</sup> a
Costs		<b>Investment Costs for Renovation Step 1</b> 15000 € <b>Included Costs for Maintenance</b> 15000 € <b>Name of incentives</b> KfW	<b>Investment Costs for Renovation Step 2</b> 25000 € <b>Included Costs for Maintenance</b> 25000 € <b>Name of incentives</b> Incentives 0 €	<b>Investment Costs for Renovation Step 3</b> 25000 € <b>Included Costs for Maintenance</b> 40000 € <b>Name of incentives</b> KfW	<b>Investment Costs for Renovation Step 4</b> 38000 € <b>Included Costs for Maintenance</b> 20000 € <b>Name of incentives</b> Incentives 0 €
Savings					
Comfort/Usage		<b>Changed Comforts</b>	<b>Changed Comforts</b>	<b>Changed Comforts</b>	<b>Changed Comforts</b>



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



2 Most owners renovate step by step. But also stepwise renovations have to be deep and avoid lock-ins.

Step by Step Plan

ENERGY CLASS	ENERGY CLASS	ENERGY CLASS
F	D	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 48000 € COSTS FOR MAINTENANCE 300 €/a	INVESTMENT COSTS 20 € COSTS FOR MAINTENANCE 20 €/a
ENERGY BILL 150 €/a	ENERGY BILL 104 €/a	ENERGY BILL 101 €/a



3

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



4

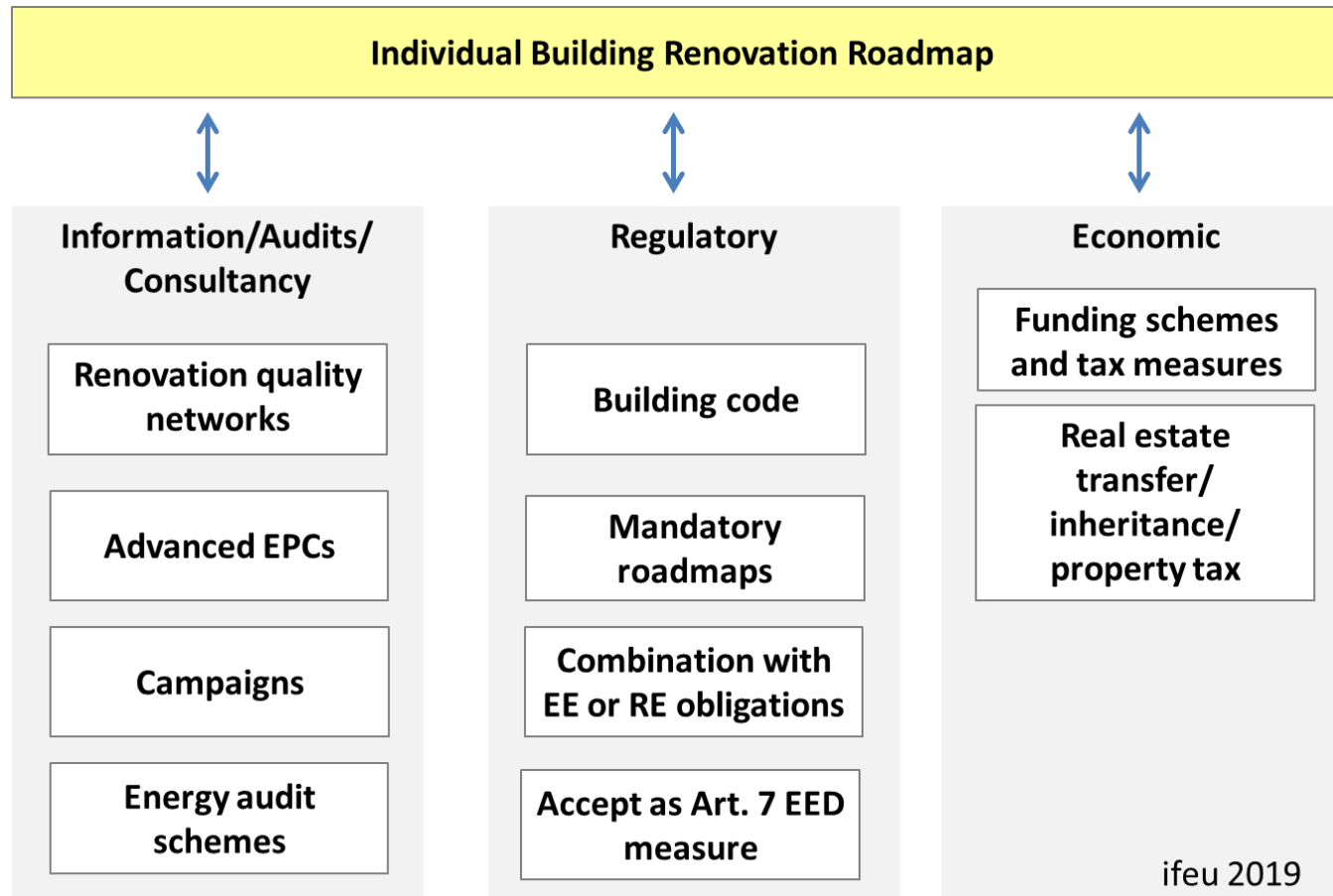
A long-term plan can consider the occasions („trigger points“) in the homeowners' lives



- Software tool to calculate the building energy demand (today and after the renovation steps), ideally including renovation costs
  - *If not: additional cost tools are available.*
- Trusted and trained energy auditors / renovation experts
- Authorities (e. g. energy agencies) to administer a roadmap programme including auditor training
- Ideally: an already existing programme for building energy audits/consultancies
  - *If not: use roadmap to kick off such a programme.*

Training materials in iBROAD

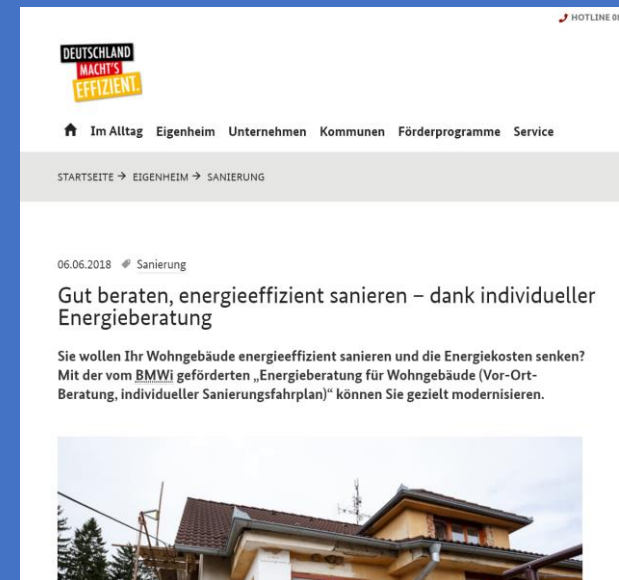
Training and technology, software, communication



- Make the instrument known, create a „brand“, create clear contact points („Where do I get a roadmap, who helps me, what happens next...“)
- Target oriented campaigns:
  - e. g. for elderly people or people who have to exchange their old boiler
- Integrate into existing EPC (Energy performance certificate) schemes
  - e. g. EPC plus



## Example: German campaign „Germany efficient“



## Approach 1: Support roadmap and energy audit financially

- Increases uptake and market diffusion
- Can be combined with a campaign („Get a clear picture for your building“...)



### Example: Financial support from BAFA

Federal Office for Economic Affairs and Export Control (BAFA) supports each roadmap with 80 % of the costs for the roadmap (max. 1,300 € for one-family and 1,700 € for larger buildings).



Approach 2: Better support for implemented measures when they are recommended by a roadmap, e. g. by combining with existing support schemes

- Improves quality of implemented measures
- Makes the roadmap (and thus a systematic approach to a building) more attractive



Example:  
**City of Tübingen bonus for measures**

Lump-sum bonus of 500 EUR if a recommended measure referred to in the roadmap is implemented

## Approach 3: Roadmap as prerequisite for funding

- Ensures that no lock-in effects or not useful measures will be funded
- However, make sure that this does not cause an extra barrier to applying for the funding.



### Example: EFRE Funding

Prerequisite for receiving soft credits for renovation of single-family buildings by the Fund for Urban Development under Operational Programme “Regions in Growth”. The same approach is suggested for the implementation of the SMARTER Finance for Families project, applying the Green Mortgage scheme in deep energy retrofit scenarios:

## Approach 4: Funding for deep-renovation compatible measures

- Better funding for those measures that lead to deep renovation (as suggested by the roadmap) or
- Better funding for packages of renovation measures, *e. g. when you insulate the house and exchange the windows simulatenously*



### Example: Incentives for enhanced renovation qualities in the Vorarlberg “Wohnhaussanierungsrichtlinie”

Basic subsidy will be increased if the refurbishment is particularly energy-efficient and a few minimum ecological requirements must be met when selecting materials

Funding level	Roof		Top floor ceiling		Outer walls		Other floors and walls		Windows (glass & frame)	
	U-value	Funding (EUR/m <sup>2</sup> )	U-value	Funding (EUR/m <sup>2</sup> )	U-value	Funding (EUR/m <sup>2</sup> )	U-value	Funding (EUR/m <sup>2</sup> )	U-value	Funding (EUR/m <sup>2</sup> )
1	≤ 0.16	120 EUR	≤ 0.16	20 EUR	≤ 0.20	80 EUR	≤ 0.30	35 EUR	≤ 1.00	300 – 550 EUR (depending on the material)
2	≤ 0.13	180 EUR	≤ 0.13	35 EUR	≤ 0.15	120 EUR	≤ 0.23	45 EUR	≤ 0.85	450 – 700 EUR (depending on the material)

## Approach 1: Connect roadmap to EPC

- Supplement the EPCs by additional tailored information in the form of a roadmap
- Can build on existing infrastructure for issuing EPCs



## Example: Portuguese Energy Performance Certificate

**Certificado Energético**  
Edifício de Habitação  
SCET24567890

**PROPOSTAS DE MEDIDAS DE MELHORIA**

As medidas propostas foram identificadas pelo Perito Qualificado e tem como objectivo a melhoria do desempenho energético do edifício. A implementação destas medidas, para além de reduzir a fatura energética anual, poderá contribuir para uma melhoria na classificação energética.

Nº da Medida	Aplicação	Descrição da Medida de Melhoria Proposta	Custo Estimado do Investimento	Redução Anual Estimada de Fatura Energética (pelo mesmo)	Classe Energética
1	Isolamento térmico em paredes exteriores - aplicação pelo exterior com revestimento aplicado sobre o isolante		3.500€	até 150€	B+
2	Substituição de vãos envidraçados existentes por novos vãos envidraçados de classe energética A (classificação GLASUE+)		1.800€	até 200€	B
3	Instalação de sistema solar térmico individual - sistema de circulação forçada		2.500€	até 300€	B
4	Effectuar manutenção do equipamento de produção de águas quentes sanitárias		150€	até 0€	C
5	Isolamento térmico de cobertura plana - aplicação sobre a laje		4.500€	até 300€	B

**1** Dado mais sobre as medidas de melhoria nas restantes páginas do certificado.

**CONJUNTO DE MEDIDAS DE MELHORIA**

Representa o impacto a nível financeiro e do desempenho energético na habitação, que este conjunto de medidas de melhoria fará, se for implementado.

**1 + 2 + 3 + 4 + 5**

**12.300€**  
CUSTO TOTAL ESTIMADO DO INVESTIMENTO

**até 800€**  
REDUÇÃO ANUAL ESTIMADA DA FATURA

**A+**  
CLASSE ENERGÉTICA APÓS MEDIDA

**RECOMENDAÇÕES SOBRE SISTEMAS TÉCNICOS**

Os sistemas técnicos dos edifícios de habitação, com especial relevância para os equipamentos responsáveis pela produção de águas quentes sanitárias, aquecimento e arrefecimento são determinantes no consumo de energia. Face a essa importância é essencial que sejam promovidas, com regularidade, ações que assegurem o correto funcionamento desses equipamentos, especialmente em sistemas com caldeiras que produzam água quente sanitária e/ou aquecimento, bem como sistemas de ar condicionado. Neste sentido, é recomendável que sejam realizadas ações de manutenção e inspeção regulares a esses sistemas, por técnicos qualificados. Estas ações contribuem para manter os sistemas regulares de acordo com as suas especificações, garantir a segurança e o funcionamento otimizado do ponto de vista energético e ambiental.

Nas situações de aquisição de novos equipamentos ou de substituição dos atuais, deverá obter, através de um técnico qualificado, informação sobre o dimensionamento e características adequadas em função das necessidades. A escolha correta de um equipamento permitirá otimizar os custos energéticos e de manutenção durante a vida útil do mesmo.

Estas recomendações foram produzidas pela ADENE - Agência para a energia. Caso necessite de obter mais informações sobre como melhorar o desempenho dos seus equipamentos, contacte esta agência ou um técnico qualificado.

Entidade Gestora: **adene** Agência para a Energia

Entidade Fiscalizadora: **DGEG** Direcção Geral de Energia e Geologia

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## Approach 2: Making roadmaps mandatory

- Given certain trigger points, such as changes in property ownership, a roadmap could be made mandatory
- Advantage: high number of roadmaps required
- Disadvantages
  - Acceptance for obligations often low
  - A „relationship of trust” between the energy auditor and the home owner is affected



Example:

### Austin Energy Conservation Audit and Disclosure Ordinance

The Energy Conservation Audit and Disclosure Ordinance (ECAD) requires energy audits and disclosures for all buildings which are served by Austin Energy and located within Austin city limits prior to a sale if the building is ten years or older

## Approach 3: Combining iBRoad with efficiency or renewable heating obligations

- Advantage: Triggers additional audits
- Disadvantage: A certain share of those roadmaps will be produced with minimum effort just to fulfill the law.



### Example: **Renewable-Energies-Heat-Act in the State of Baden- Württemberg**

Owners of a heating system need to employ a minimum share of renewable energy. A part of the obligation (in residential buildings one third) can be fulfilled by carrying out an energy audit of the building based on an individual building renovation roadmap.

Since then, the number of energy audits per person in Baden-Württemberg is more than twofold that of most other States.

No impact     High impact

## Instruments

## Impacts

### Informational

Dissemination Quality Implementation Renov. Rate Renov. Depth

Campaigns etc.



Auditors training



### Economic

Support for audits



iBR as prerequisite



Increased funding w/ iBR



Increased funding for package



### Regulatory

Embed in EPC



Mandatory iBR



Combine w/RES obl.



Long-term targets in codes



Without „surrounding policies“, the roadmap will be an interesting energy audit/consultancy approach, but unfold only limited quantitative impact on renovation rate and depth.

**Information** campaigns and training increases awareness and quality of the roadmap.

**Economic measures** foster the impact and implementation („from paper to practice“).

**Regulatory** measures improve the diffusion of the roadmap, but should be synchronised with the national policy mix.

Take action, develop “your” roadmap approach!



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°754045

Thank you!



**iBRoad**

[www.ibroad-project.eu](http://www.ibroad-project.eu)

Martin Pehnt

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