

# IEA EBC Annex 75

Cost-Effective Building Renovation at District Level Combining Energy Efficiency & Renewables

13 countries are involved in the project:  
AT, BE, CH, CN, CZ, DK, ES, GE, IT, NL,  
NO, PT, SE

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Technical webinar  
11th June, 2021

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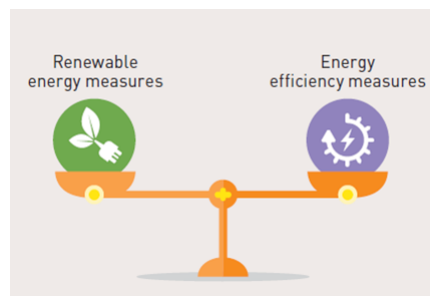
## 1. Project Goal

**Project Goal:** reach cost-effective energy and carbon emission optimization in building renovation at an urban district scale combining both energy efficiency measures and renewable energy measures

**Key issue:** find the balance point between energy efficiency measures and measures that promote the use of renewable energy

**Annex 56:** At the building level

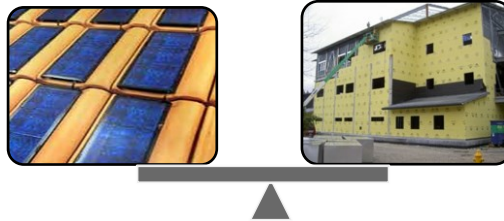
**Annex 75:** At the level of groups of buildings / urban districts



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## 2. Project Idea

- At **district level** there are **specific opportunities** as well as **specific challenges** when compared to the building level
- **Finding the balance** between renewable energy supplies and energy efficiency measures for the renovation of the existing stock **is more complex at district level** than for individual buildings, but **may also bring larger benefits**



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## 2. Project Idea

There are **several options available** that need to be explored:

Examples:

- There is an opportunity to **benefit from district based renewable energy approaches**
- The **availability of heat storage facilities are wider at district level** as in a single-building intervention the options are limited to the building floor space
- We can benefit from significant **economies of scale for energy efficiency measures due to aggregated demands and synergies** in construction procurement, processes and planning
- The provision of district heating systems to groups of buildings may benefit from synergies when combined with energy efficiency measures applied to the buildings envelopes

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## 2. Project Idea

However, **there are** also some **challenges**:

- At the **level of individual buildings**, **synergies** between energy efficiency measures and installation of renewable energy systems **can be easily achieved** but, **at district level** such **synergies are not necessarily available** as they depend on the existing heating systems and on the synchronization of the buildings' renovation cycles

In this context, it is important **to explore the potential of cost-effective renovation interventions at district level** to accelerate the necessary transition towards low-emissions and low-energy districts

Annex 75 project aims to make a **comprehensive analysis** that covers not only the **energy, economic and environmental issues**, but also identify **opportunities and barriers** in the relations between different stakeholders and in **policies and incentives for boosting energy renovations**

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## 3. Research Questions

**Questions investigated:**

- What are the most **cost-effective combinations** of **RES** measures and **EE** measures
- Which **factors** determine the **cost-effectiveness** of the balance between **EE and RES measures**
- What is the **most cost-effective approach** between a centralized or a decentralized approach
- Which **technologies** are seen as most **relevant**
- How do **energy efficiency** measures relate to **technology choices**
- To what extent are **EE measures beyond anyway renovations** cost-effective
- Is the cost effectiveness of EE measures the same for different RES options
- Which approaches allow achieving districts **fully supplied with renewable energy at the lowest cost**
- ...



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## 4. Annex 75 Objectives

### The objectives of Annex 75 are:

- To give an overview on various **technology options**, taking into account existing and emerging efficient technologies with potential to be successfully applied
- To define a **flexible methodology**, supported by **efficient tools**, to **identify cost-effective strategies** for **renovating urban districts** to significantly reduce carbon emissions and energy use
- To identify and document **good practice examples showing strategies** for **transforming** existing **urban districts** into low-energy and low-emissions districts
- To prepare **Guidelines for policy makers and energy-related companies** on how to **encourage the market uptake** of cost-effective strategies combining energy efficiency measures and renewable energy measures
- To prepare **Guidelines for building owners and investors** about **cost-effective district-level solutions**

<http://annex75.iea-ebc.org/>

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## 5. Outputs

### Technology Overview Report



The report presents an overview of the **available technologies** for **energy renovation** and **renewable energy supply** at the district level, showing:

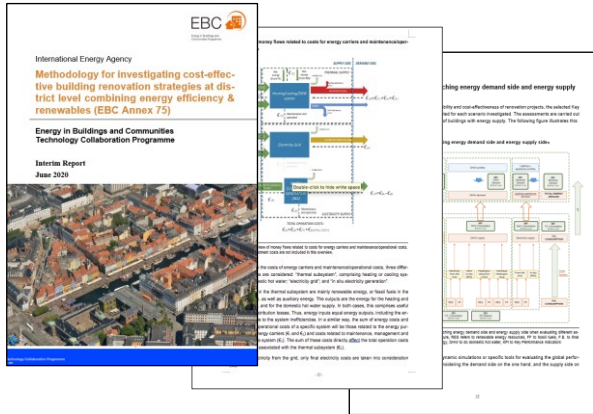
- **Technical and economic characteristics** of the technology options, taking into account **economies of scale**
- **Interdependencies, obstacles and success factors** for combining the technology options
- **Available potentials**, and expected **future developments**

<https://annex75.iea-ebc.org/publications>

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## 5. Outputs

### Methodology Report



The report describes the **methodology for identification and assessment of cost-effective strategies for renovating urban districts:**

- Defines the **boundary conditions** for the assessments
- Presents the recommended **approach for the assessments**
- Presents the main **research questions** to be investigated
- Defines the **outputs** to be generated in the analyses

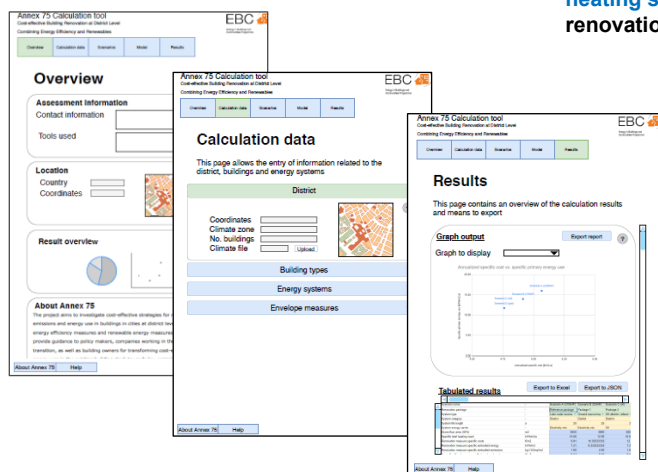
This document intends to **support decision makers** in the evaluation of the **efficiency, impacts and cost-effectiveness** of different strategies for **renovating urban districts**

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## 5. Outputs

### Annex 75 District Calculation Tool

**Online calculation tool for district heating sizing and cost-effectiveness of renovation strategies**

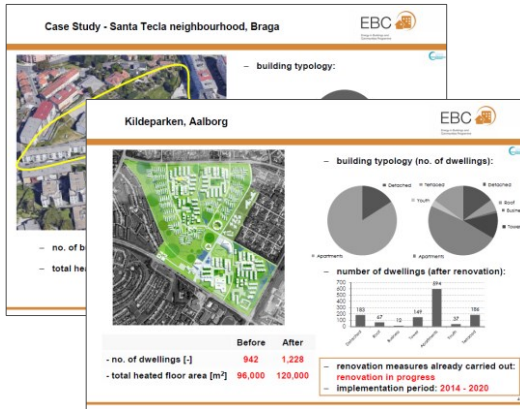


- characteristics of the district
- characteristics of the buildings
- renovation scenarios
- cost curves
- ...

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## 5. Outputs

### Identification of Success Stories and Case Studies



**Success Stories** – already finished district-based renovation projects

where **economic, technical and social factors** that enable or hinder successful renovations were identified and analysed

**Case Studies** – open renovation projects used to apply and test the Annex 75 Methodology

There is still the possibility to provide guidance in choosing the most appropriate renovation strategies especially in finding synergies and trade-offs for combining energy efficiency measures and renewable energy measures

**Results obtained and lessons learned** are used to prepare a **good practice guidance** for low-energy and low-emission districts

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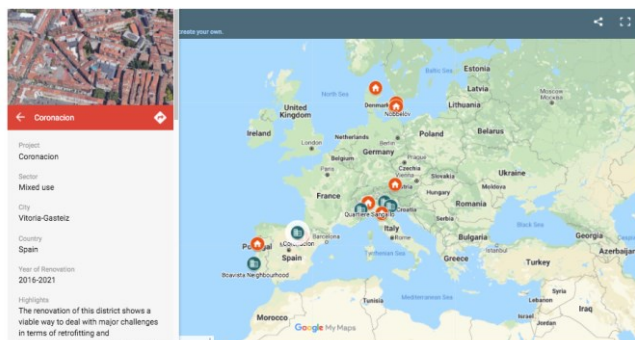
## 5. Outputs

### Success Stories Webpage

HOME ABOUT SUBTASKS SUCCESS STORIES PUBLICATIONS PARTICIPANTS NEWS MEETINGS MEMBER AREA

HOME / SUCCESS STORIES

#### Success Stories



HOME ABOUT SUBTASKS SUCCESS STORIES PUBLICATIONS PARTICIPANTS NEWS MEETINGS

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<https://annex75.iea-ebc.org/success-stories>

**Interactive map** integrated in the **Annex 75 website**.

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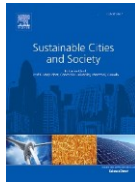
## 5. Outputs

**Renovation at district scale is a cost effective key strategy to boost the reduction of CO2 emissions by optimising the implementation of renewable energy sources and taking advantage of economies of scale and higher levels of efficiency regarding the use of resources and waste minimization**

Table 2 (continued)

Corrección district, Spain (20 dwellings + 5 tertiary buildings)		ES1	
Area (m <sup>2</sup> )	Energy use (kWh/m <sup>2</sup> )	before	after
		District	151
Heated floor	DHW	Included in heating	
Cooling		0	0
Renewable energy (a <sup>2</sup> )		0	0

This project is part of SmartCity, a project funded under the European Union's Horizon 2020 in which Vitoria-Gasteiz is one of the three lighthouse demonstrator cities. The intervention consisted of the thermal renovation of 220 dwellings and the installation of a new district heating system based on biomass boilers (wood chips). An integrated energy management system will optimise efficiency at dwelling, building and district level. The project was partly financed (up to 54%) by different public institutions; in some cases (households with low incomes), the regional government cover up to 100% of the cost.



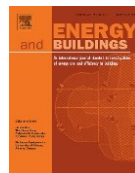
Building renovation at district level – Lessons learned from international case studies  
May 2021

<https://doi.org/10.1016/j.scs.2021.103037>

Luzuriaga Neighbourhood, Spain (486 dwellings)		ES2	
Area (m <sup>2</sup> )	Energy use (kWh/m <sup>2</sup> )	before	after
		District	90
Heated floor	DHW	Included in heating	
Cooling		0	0
Renewable energy (a <sup>2</sup> )		0	0

\* Non-renovated buildings  
\*\* Renovated buildings

This project responds to the need to promote the integral renovation of this deprived social housing area and the upgrade of the inefficient district heating system (DHS) co-operable with biomass as well as the improvement of thermal envelopes of only three blocks. The project was funded within a CONCERTO Programme and subsidies and the favorable financing opportunities played an important role in the successful implementation of the intervention. This success is moving other neighbours into action and a second redevelopment project in the district is currently under development, promoting the renovation of thermal envelopes of the rest of the blocks.



Cost-effective building renovation at district level combining energy efficiency & renewables - Methodology assessment proposed in IEA EBC Annex 75 and a demonstration case study  
October 2020

<https://doi.org/10.1016/j.enbuild.2020.110280>

**Drives, Barriers and Lessons Learned were identified**

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## 5. Outputs

### Cost-Effective Building Renovation at District Level

#### Drivers

- Energy savings and emission reductions
- Improving the overall building quality, including indoor climate
- Improving the image and the economic value of the district
- Financial models that can alleviate split-incentive problems between investors and resident organizations



#### Barriers

- Need to comply with the increasingly demanding energy regulations
- Restrictions in the renovation scope to avoid a clear increase in the rent
- The resettling of tenants during the renovation



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## 5. Outputs

### Preliminary Lessons Learned regarding key factors for district scale renovations

- **Available funding** is a decisive factor in carrying out district scale renovations
- **Good communication** amongst the different stakeholders, especially with residents
- **Strong leadership** to coordinate activities due to the great number of stakeholders
- **Citizen engagement**
- **Existence of pilot projects** to demonstrate the possibilities
- **Availability of not only technical solutions** but also **business and financing models**
- **Availability of local policy instruments** to assist local uptake and co-creation in municipalities, cities and regions



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## 5. Outputs

### Workshops on Policy Instruments, Stakeholder Dialogue and Business models for upscaling District energy renovation



Workshop at Bilbao – March 2019



Workshop at Delft – October 2019



With insights from the **workshops** and **interviews**, a **report** is being prepared:

- To **give an overview** on various **policy instruments** and **business models** at the district level
- To **evaluate stakeholder's acceptance** of the proposed policy instruments
- To **illustrate the development and assessment of innovative local policy instruments** in selected cases
- To **give recommendations** to **policy makers** and their **key partners** on how they can **influence the uptake** of cost-effective low carbon renovation strategies

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# Thank you for your attention!

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