D3.1 – 8 National reports on data availability at national and local level

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Author(s) of national reports: the GBCs involved in the project
### Deliverable Information

<table>
<thead>
<tr>
<th>Grant agreement</th>
<th>840926</th>
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<tr>
<td>Project title</td>
<td>Supporting public sector’s capacity and leadership in decarbonising Europe’s building stock, through the development of a multi-level renovation impact framework</td>
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<tr>
<td>Project acronym</td>
<td>BUILD UPON²</td>
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<tr>
<td>Project coordinator</td>
<td>Emilio Miguel Mitre (<a href="mailto:emilio.miguelmitre@gbce.es">emilio.miguelmitre@gbce.es</a>)- GBCe</td>
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<tr>
<td>Project duration</td>
<td>1st June 2019 – 31st May 2021 (24 Months)</td>
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<tr>
<td>Related work package</td>
<td>WP 3 - Development of a Monitoring Methodology for the Framework</td>
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<tr>
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<td>Task 3.1 - Check Availability of Data at Local Level to Measure Selected Indicators</td>
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<tr>
<td>Lead organisation</td>
<td>GBC Italia</td>
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<td>Contributing partner (s)</td>
<td>GBCs</td>
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<td>Due date</td>
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List of acronyms

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<tr>
<th>Acronym</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>P</td>
<td>Public buildings</td>
</tr>
<tr>
<td>R</td>
<td>Residential buildings</td>
</tr>
<tr>
<td>SH</td>
<td>Social housing</td>
</tr>
<tr>
<td>C</td>
<td>Commercial buildings</td>
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<tr>
<td>#</td>
<td>number</td>
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</tbody>
</table>
1 Introduction

1.1 Background

The Article 4 of Energy Efficiency Directive (Directive 2012/27/EU) introduced the requirement for Member States to establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private. In the first round of submission, after one year from the deadline of the 30th April 2014, twenty-three countries out of the expected thirty-one, submitted strategies (74.2%) that satisfactorily addressed the main elements of EED Article 4. Among the missing parts of the non-compliant strategies, relevant remarks were made in terms of long-term policy measures and their monitoring, cost-effectiveness scenarios and renovation targets.

It is on this European context that the BUILD UPON project consortium proposes a coordination and support action to help Member States in fulfilling the first and following 3-yearly updates of national renovation strategies, by setting national participated processes. Among the activities of the project, the analysis of existing initiatives to support national renovation objectives, carried out in the 13 countries involved in the project, collected nearly 700 initiatives in a public portal, the Renowiki. Very few of these initiatives publicly reported impact data and had monitoring activities in place.

With the publication of the new Energy Performance of Buildings Directive 2018/844, the requirement for EU countries to adopt a long-term renovation strategy is set out in Article 2a of the EPBD. Strategies have to support the renovation of the national stock of buildings into a highly efficient and decarbonised building stock by 2050 and will form part of EU countries' integrated National Energy and Climate Plan. The 2018 recast of the EPBD strengthens the role of these Strategies and obliges MS to set out a roadmap to decarbonised building stock by 2050, supported by a suite of measurable progress indicators and milestones.

BUILD UPON proposes to address one of the main barriers limiting the proper public management, and consequent upscaling, of Deep Energy Efficiency Renovation: the lack of an adequate, widely shared Impact Framework. BUILD UPON proposes to work with local, national and European stakeholders to create a Multi-Level Renovation Impact Framework that contains a suite of milestones and measurable progress indicators for building renovation strategies, integrating data and insights from the city level.

The progress indicators reflect targeted outcomes across multiple benefits areas for the renovation strategies at local, national and EU level (e.g. on emissions reductions, increased jobs and decreased public health costs). This will help to align different levels of governance as countries implement their renovation strategies.

1.2 Objective

This report aims at analysing the availability of data needed to support the use of core indicators of the Framework across 8 European countries, partners of the project BUILD UPON. The report addresses policy makers at local and national level, to assess whether the indicators of the Framework are likely to be used, or some actions are needed to cross databases, populate them, make data available across government department and levels, as well as if new procedures and tools need be set up to allow a deeper analysis of the impact of policies and measures.

This report doesn’t mean to present a comparative analysis, but rather a picture of the state of the art on data availability for the indicators selected by GBCs and their national steering groups, as relevant for each country.

The proposed analysis is aligned to the early draft version 3 of the Framework, to provide material for discussion into the Focus Group of the project in May 2020.
This report represents an opportunity to preliminarily test the feasibility of use of the Framework, and what it is needed to obtain more and better-quality data.

1.3 Relation to other activities in the project

This report is the first step of Work Package 3 that will lead to the definition of a methodology to use the Framework and its indicators.

The methodology to use the Framework that will be the result of WP3, will be the main reference document for Pilot cities during the testing phase, in WP4.

The results of this exercise will feed the research for specific measures (intended as procedures, tools) to collect and use data to support the indicators of the Framework, that will be the core activity of T3.2.

The analysis carried out in this task 3.1, are dependent to the activities of WP2, particularly to the development of the second and third version of the Framework, in T2.4 and T2.5. In fact, the on-going update and improvement in the definition of indicators, on the one-hand lead to a more precise research of information about data at local and national scale, but on the one other, requires a continuous update of this analysis.

This deliverable will also be one of the fundamental documents for the national Focus Groups to start the discussion on the usability of the Framework, in T2.6.

1.4 Structure of the report

Each GBC has analysed the availability of data for each “core” indicator of the Framework, subdivided by their category of reference: environmental, economic and social. Core indicators are common across all countries, but each GBC indicated some further indicators to address national priorities.

An introduction describes the general objective of the document as well as reports the latest version of the framework as shared at the end of April to support the discussion on the Focus Groups.

To allow GBCs to carry out the analysis, the version of the framework they used the V3 reported in the introduction.

However, after the results of the discussion at the national Focus Groups planned for the month of May, Version 4 of the Framework have been defined and it has been shared with pilot cities to support the testing phase of the project, started in July 2020.

In the following section 2 of this document it is reported a table of comparison between the two versions to highlight which indicators have changed between version 3 and 4 of the Framework.

The introduction also includes two tables that summarize at a glance the results of the analysis for all GBCs.

The last part of the document collects the national reports produced by each GBC with the support of NSG members.

The national reports are organized according to the following structure:

- For each category of indicators, 2 tables express the analysis at national and local scale respectively.

Particularly it is highlighted the presence of data and the possible source of information at the specific scale.

- Each GBC developed a short SWOT analysis to summarize national key conclusions on the analysis.

UK GBC has followed a slightly different structure for the Framework to meet national goals with the choice of progress core indicators, however the analysis is consistent with the work of the other GBCs.
2 Table of comparison between Version 3 and Version 4 of the Framework

Environmental indicators

<table>
<thead>
<tr>
<th>Indicators V3 - National</th>
<th>Indicators V3 - Local</th>
<th>Indicators V4 – National and local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in direct annual CO2 emissions from renovation compared to 1990 levels - P - T - R</td>
<td>Reduction in direct annual CO2 emissions from renovation compared to the municipality’s baseline year as per CoM reporting - M - T - R</td>
<td>Reduction in direct annual CO2 emissions from energy renovation - P - T - R</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td>Final energy consumption reduction from renovation - M - T - R</td>
<td>Final annual energy consumption reduction from energy renovation - P - T - R</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - M - T - R</td>
<td>EXCLUDED FROM CORE INDICATORS</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R</td>
<td>Total annual energy renovation rate % - M - T - R</td>
<td>Total annual energy renovation rate % - P - T - R</td>
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<td>&gt; Of which light renovation</td>
<td>&gt; Of which light renovation</td>
<td>&gt; Of which light renovation</td>
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<td>&gt; Of which medium renovation</td>
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<td>&gt; Of which deep renovation</td>
<td>&gt; Of which deep renovation</td>
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<tr>
<td>% of renovated buildings reaching nZEB standard annually - P - T - R</td>
<td>% of renovated buildings reaching nZEB standard annually - M - T - R</td>
<td>EXCLUDED FROM CORE INDICATORS</td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by central government retrofitted each year - P</td>
<td>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year - M</td>
<td>EXCLUDED FROM CORE INDICATORS</td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
</tr>
<tr>
<td>Source: EPBD 2010, Article 2 Definitions (2) - NZEB</td>
<td>Source: EPBD 2010, Article 2 Definitions (2) - NZEB</td>
<td>Source: EPBD 2010, Article 2 Definitions (2) - NZEB</td>
</tr>
<tr>
<td>Member states will provide their own methodology for incorporating the EPBD requirements</td>
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</tr>
</tbody>
</table>
### Core Social Indicators

<table>
<thead>
<tr>
<th>Indicators V3 - National</th>
<th>Indicators V3 - Local</th>
<th>Indicators V4 – National and local</th>
</tr>
</thead>
</table>
| % of households having arrears on utility bills - R - SH | % of households having arrears on utility bills - R - SH | # households affected by energy poverty - R - SH (as per national definition)  
or # households affected by energy poverty - R - SH (as per alternative definition: Energy poverty is defined as when a household’s required fuel costs are above the median level, and if they were to spend what is required, then the household would be left with a residual income below the official poverty line)  
or % of households having arrears on utility bills + one of the alternative indicators listed in the methodology - R - SH |
| Actions to improve Indoor Air Quality post Renovation Works - R - SH - P - T | # households living in renovated dwellings with commissioned ventilation system - R - SH | # households living in renovated dwellings with commissioned ventilation system  
or/and actual on site IAQ monitoring - R - SH |
| # non-residential renovated buildings with a commissioned ventilation system - M - T | # non-residential renovated buildings with a commissioned ventilation system or/and actual on site IAQ monitoring - P - T |
| Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T | # households living in renovated dwellings where calculations demonstrates that post renovation condition will satisfy heating requirements - R - SH | # households living in renovated dwellings where calculations demonstrate that post renovation condition will satisfy heating requirements  
or that the percentage of the annual occupied hours out of comfort conditions is below a certain threshold - R - SH |
| # households living in renovated dwellings where actions have been taken to minimise summer overheating risk - R - SH | # households living in renovated dwellings where actions have been taken to minimise summer overheating risk - R - SH |
| Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T | # non-residential renovated buildings where calculations demonstrates that post renovation condition will satisfy heating requirements - T - M | # non-residential renovated buildings where actions have been taken to minimize summer overheating risk - T - P  
EXCLUDED FROM CORE INDICATORS |
| # non-residential renovated buildings where actions have been taken to minimise summer overheating risk - T - M | # non-residential renovated buildings where actions have been taken to minimize summer overheating risk - T - P  
EXCLUDED FROM CORE INDICATORS |
| # private households retrofitting their homes / year - R | # private households retrofitting their homes / year - R | # graduates from 3rd level courses and technical training courses with focus on energy renovation - T - R - P  
This data should be collected at national level |
| # sq. m² commercial buildings retrofitted annually - T | # sq. m² commercial buildings retrofitted annually - T | # graduates from 3rd level courses and technical training courses with focus on energy renovation - T - R - P  
This data should be collected at national level  
> a. # building professionals and construction workers taking part in energy renovation upskilling - T - P - R - This data should be collected at national level.  
> b. of which # Municipality staff upskilling in energy renovation |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 840926
Core Economic indicators

<table>
<thead>
<tr>
<th>Indicators V3 - National</th>
<th>Indicators V3 - Local</th>
<th>Indicators V4 – National and local</th>
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</thead>
<tbody>
<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - P - T</td>
<td>Total annual investment in energy renovation - R - SH - M - T</td>
<td>Total annual investment in energy renovation - R - P - T</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T</td>
<td>Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T</td>
<td>Total annual public investment in energy renovation - R - P - T</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - T</td>
<td>Total annual private investment in energy renovation - R - SH - M - T</td>
<td>Total annual private investment in energy renovation - R - P - T</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - P</td>
<td># companies involved in energy renovation - T - R - SH - M</td>
<td>Companies involved in energy renovation - T - R - P</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - M</td>
<td>MOVED TO SOCIAL INDICATORS</td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R</td>
<td>MOVED TO SOCIAL INDICATORS</td>
</tr>
<tr>
<td>&gt; of which # Public sector staff upskilling in energy renovation</td>
<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
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<tr>
<td>Theoretical (energy) efficiency of investment - R - T - P</td>
<td>Increase in total energy renovation jobs - R - T - P</td>
<td>Direct savings associated to energy renovation - R - T - P</td>
</tr>
</tbody>
</table>

3 The draft public report

In the following pages is reported the final draft of the report D3.1. It has been updated with the results of the discussion led by GBCs at Focus Groups. The final version is being published in July 2020, as agreed by all project partners.
Reports on data availability at national and local level

Release date as July 2020

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 840926
The BUILD UPON² Project

We are in a state of climate emergency. We must act now to reach net zero carbon by 2050 - and cities can lead the way. To get there, cities must unlock the huge potential of their buildings - and building renovation in particular.

Deep building renovation has far-reaching benefits for society as increasing indoor comfort and air quality avoids illnesses and premature deaths associated with living in cold and damp homes. This in turn reduces pressure on healthcare and social services.

The EU Horizon 2020 funded BUILD UPON² project will empower cities across Europe to join forces with national governments and industry to decarbonise their existing building stock by 2050. BUILD UPON² will strengthen the local effectiveness and implementation of the national building renovation strategies required by the EU Energy Performance of Buildings Directive (EPBD).

www.worldgbc.org/build-upon
"In pursuing the objectives of decarbonisation, cities must be able to involve all parts of civil society, the economy and even individual citizens. Dialoguing with them and being part of this strategy is the most interesting and also the most challenging part of this path. People when adequately involved respond in an extraordinary way"

- Arturo Lorenzoni, Mayor of Padova

"To reach the ambitious climate goals, politicians have to find and work closely with their employees, the easy-movers, those who are willing to make the change happen. Public Administration have to use their purchasing power and to add specifications in public tenders, they have to keep the process simple and collaborate with the rest of the market."

- Ely Grimsby, Director of Oslo Municipal Undertaking for Culture and Sports Facilities
About Green Building Council Italia

Green Building Council Italia (GBC Italia) is a non-profit association bringing together the most competitive companies and the most qualified Italian associations and professional communities active in the sustainable building industry.

By its mission, GBC Italia works to:

• favor and accelerate the diffusion of a sustainable building culture, guiding the transformation of the market
• raise public awareness and institutions on the impact that the design and construction methods have on the quality of life of citizens;
• provide clear reference parameters to operators in the sector
• encourage discussion between operators in the sector by creating a sustainable building community

GBC Italia promotes a process of transformation of the Italian construction market through the promotion of the third-party certification system and its certification protocols (GBC systems) expressly developed for the specific features of the Italian market, whose parameters establish precise design criteria and construction of healthy, energy efficient buildings with limited environmental impact.

GBC Italia is part of the World GBC, and it is active in European and global projects taking part to research and innovation activities on sustainable construction to support policy development, digitalization of the construction sector, the implementation of green finance and the adoption of the European framework Level(s) for sustainable buildings.

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Building renovation have a huge role to play in delivering net zero emissions – from improving energy efficiency to enabling other sectors to transition.

BuildUpon\(^2\) puts buildings at the centre of the cities’ ambitions to respond to the climate emergency by delivering/promoting building renovation projects with measurable impact.
1. Introduction
The Build Upon2 project has developed a Framework of indicators to assess the benefits of building renovation measures on the environment, the economy and the society. The framework is designed to report the impact of actions across different governmental levels: from the European Union to municipalities passing through national governments. Understanding the impact of renovation actions is fundamental to assess their effectiveness and inform current and future policy development.

This report aims at analysing the availability of data needed to support the use of core indicators of the Framework across 8 European countries, partners of the project Build Upon2.

The report addresses policy makers at local and national level, to assess whether the indicators of the framework are likely to be used or some actions are needed to cross databases, populate them, make data available across government department and levels, as well as if new procedures and tools need be set up to allow a deeper analysis of the impact of policies and measures.

This report doesn’t mean to present a comparative analysis, but rather a picture of the state of the art on data availability for the indicators selected by GBCs and their national steering groups, as relevant for each country.

The proposed analysis is aligned to version 3 of the Framework to provide material for discussion into the Focus Group of the project in May 2020. A further update is foreseen for aligning the national reports to version 4 of the Framework, that will be tested by pilot cities from summer 2020.

The national reports are organized according to the following structure:

Each GBC has analyzed the availability of data for each “core” indicator of the framework, subdivided by their category of reference: environmental, economic and social ones. Core indicators are common across all countries, but each GBC indicated some further ones according to national priorities.

For each category, GBCs selected one or more indicators where data are currently unavailable or could be better expressed and proposed a path to collect and cross data to support the use of the specific indicator/s.

Finally, each GBC developed a short SWOT analysis to summarize national key conclusions.

This report represents an opportunity to preliminarily test the feasibility of use of the Framework, and what it is needed to obtain more and better-quality data.

**Key for icons**

- ![Environmental indicators](image)
- ![Social indicators](image)
- ![Economic indicators](image)
- ![Residential buildings](image)
- ![Social housing](image)
- ![Public Buildings](image)
- ![Office buildings](image)

**Key to identify data availability:**

- ![Yes](image)
- ![Partial](image)
- ![No](image)
## GOAL - which contribute to EU targets

### ENVIRONMENTAL

- **Greenhouse gas emission reduction**: 50% by 2030 compared with 1990 level and carbon neutrality by 2050.
  - *Source: EU Green Deal*

- **At least 32.5% improvement in energy efficiency by 2030** relative to the 2007 modelling projections for 2030.

- **At least 32% share of renewable energy** by 2030

### SOCIAL

- **Reduction of energy poverty**

- **Provide safe buildings to people** *(Indoor Air Quality and Thermal Comfort)*

- **Empowering citizens - Ensuring citizens are at the centre of the transition**

### ECONOMIC

- **Increasing investment in energy renovation**

- **Increasing number of people directly working on energy renovation**

### NATIONAL - Progress Indicators

- **Reduction in direct annual CO2 emissions from renovation** relative to the 1990 levels

- **Final energy consumption** reduction from renovation

- **Improvement of Net Space Heating & Cooling Demand**

- **Annual energy renovation rate %**

- **% of renovated buildings reaching NZEB standard annually**

- **% of the total floor area of buildings owned and occupied by the government retrofitted each year**

- **Total additional energy produced from renewable resources nearby** as a result of renovation

- **% of households having arrears on utility bills**

- **Actions to improve Indoor Air Quality post Renovation**

- **Actions to improve average thermal Comfort Post Renovation**

- **Total additional investment in energy renovation**

- **Total annual public investment in energy renovation** to renovating public building and % invested in grants per T

- **Total annual private investment in energy renovation**

- **# companies involved in energy renovation**

- **# graduates from 3rd level courses and technical training courses with focus on energy renovation**

- **# building professionals and construction workers taking part in renovation upskilling**

- **# private households retrofiting their homes / year**

- **# sq. m² commercial buildings retrofited annually**
<table>
<thead>
<tr>
<th>Indicators</th>
<th>MUNICIPAL - Progress Indicators</th>
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<tbody>
<tr>
<td>Final energy consumption reduction from renovation compared to the municipality's baseline year as per CoM reporting - P - T - R</td>
<td></td>
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<td>% of renovated buildings reaching nZEB standard annually - P - T - R</td>
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<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
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<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
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</tbody>
</table>
Overview of data on energy efficiency at national and local level

**National level:**

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2. National reports on data availability
## Environmental indicators
### National level

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<td>Croatian Ministry of Construction and Physical Planning Official policy documents, National strategy on renovation and embodied carbon reduction Further development of measurable mechanisms</td>
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</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>
### Core social indicators
#### National level

<table>
<thead>
<tr>
<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>✅</td>
<td>Data from Hrvatska elektroprivreda – Croatian national power company</td>
</tr>
<tr>
<td>Actions to improve Indoor Air Quality post Renovation Works - R - SH - P - T</td>
<td>❌</td>
<td>No available tools and monitoring mechanisms</td>
</tr>
<tr>
<td>Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T</td>
<td>❌</td>
<td>No available tools and monitoring mechanisms</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>✅</td>
<td>Banking data regarding green loans and also from ESCO database of investments. Previously developed databases</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>✅</td>
<td>Croatian Ministry of Construction and Physical Planning, private companies and NGO's. Previously developed databases</td>
</tr>
</tbody>
</table>
Core social indicators
Local level

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<tr>
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<tbody>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>✓</td>
<td>ESG tool and SMIV tool</td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td>✓</td>
<td>SMIV tool owned by Center for Monitoring Business Activities in the Energy Sector and Investments</td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - R - SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
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<td></td>
<td></td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>✓</td>
<td>Banking data regarding green loans and also from ESCO database of investments</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>✓</td>
<td>Croatian Ministry of Construction and Physical Planning, private companies and NGO's databases</td>
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### Core Economic Indicators

#### National Level

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<tr>
<td>Total annual investment in energy renovation - R - SH - P - T</td>
<td>⬗</td>
<td>Croatian Ministry of Construction and Physical Planning Available data from the Ministry Banking data regarding green loans and also from ESCO database of investments.</td>
</tr>
<tr>
<td>Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T</td>
<td>⬗</td>
<td>Register led by the Ministry of Construction and Physical Planning and also from private companies providing training and NGO's</td>
</tr>
<tr>
<td>Total annual private investment in energy renovation - R - SH - P - T</td>
<td>⬗</td>
<td>Register led by the Ministry of Construction and Physical Planning and also from private companies providing training and NGO's</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - P</td>
<td>⬗</td>
<td></td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td>⬗</td>
<td></td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td>⬗</td>
<td></td>
</tr>
<tr>
<td>Of which # Municipality staff upskilling in energy renovation</td>
<td>⬗</td>
<td></td>
</tr>
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</table>

### Other Core Indicator

<table>
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<tr>
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<tbody>
<tr>
<td>Total annual investment in renovation innovation - R - SH - P - T</td>
<td>⬗</td>
<td></td>
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### Core economic indicators

#### Local level

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<tr>
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<tbody>
<tr>
<td><strong>&gt; Total annual investment in energy renovation - R - SH - P - T</strong>&lt;br&gt;<strong>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T</strong>&lt;br&gt;<strong>&gt; Total annual private investment in energy renovation - R - SH - M - T</strong></td>
<td>✔️</td>
<td>Data from Croatian Ministry of Construction and Physical Planning&lt;br&gt;banking data regarding green loans and also from ESCO database of investments</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - M</td>
<td>✗</td>
<td>Register led by the Ministry of Construction and Physical Planning and also from private companies providing training and NGO's</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - M - R</td>
<td>✔️</td>
<td>Register led by the Ministry of Construction and Physical Planning and also from private companies providing training and NGO's</td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R&lt;br&gt;<strong>&gt; of which # Municipality staff upskilling in energy renovation</strong></td>
<td>✔️</td>
<td>Register led by the Ministry of Construction and Physical Planning and also from private companies providing training and NGO's</td>
</tr>
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</table>
Data is least available for the environmental indicators. Efficient use of SMIV and ESG tools is vital. There is no national data to measure Indoor Air Quality. Use of previously developed private and public databases is beneficial. The core indicators and their purpose need to be explained more specifically. Some of the core indicators are hard to measure on a yearly basis because some data is only available after two or more year. Lack of harmonization between national and local methodologies. Data owners/providers need to share data on a regular basis in an easy to access unified procedures. Pilot cities and follower cities gave feedback that data is hard to collect. Local level can only use national and private databases. Environmental and Social – easier, but through the use of national mechanisms and national methodology like SMIV, ESG tool and ESCO databases. Further unification of practices on national and local level is needed with adaptation of one to the other. Croatia is lacking in mechanisms on how to measure such indicators on both national and local level. Opportunity to develop procedures to be followed in data collection. Unification of methodologies by both national and local actors. Developing easy to follow practices and procedures. Data owners/providers must become aware that data needs to be available for further use. Capacity development with additional skill and competence. Raising awareness of use of such indicators in improvement of renovation practices and reduction of emissions of CO2. Raising awareness that local level practices are not good enough and that their capacities should be improved. Incentive for private sector companies, investors and corporations to cooperate with national and local actors.
### Environmental indicators

#### National level

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<thead>
<tr>
<th>Indicator</th>
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<tbody>
<tr>
<td>Reduction in direct annual CO$_2$ emissions from renovation compared to 1990 levels - P - T - R</td>
<td>National data on emissions of CO2 is reported under Kyoto-protocol, however renovation of building stock is not specified separately. Partial data is available from the funding mechanisms from National Government, Ministry of Innovation and Technology (ITM), Banks, especially Hungarian Development Bank. Estimation can be based on partial data and surveys.</td>
<td>Periodic studies and individual surveys, but no structured energy efficiency market monitoring and impact assessment.</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td></td>
<td>Various, compiled by the Hungarian Meteorological Service (OMSZ) The data is available for all primary energy consumption.</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td></td>
<td>Data is available partially from survey results, national or local own records and funding programs statistics, Hungarian National Statistical Office (HNSO), Real Estate Market Reports</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R</td>
<td></td>
<td>Data could be derived from building permits, if recorded in a National database. However, renovations / constructions of units &lt;300m$^2$ are not going through the permitting process.</td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td></td>
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</tr>
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<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td></td>
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<td>Indicator</td>
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</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to</td>
<td>The energy performance certificates include the calculation of CO₂ emissions by energy sources. Data is available in uploaded pdf-s, no searchable database is available.</td>
<td>Periodic studies and individual surveys, but no structured energy efficiency market monitoring and impact assessment.</td>
</tr>
<tr>
<td>the municipality’s baseline year as per CoM reporting - M · T · R</td>
<td></td>
<td>Partial data is available by HNSO for electric and natural gas. Data on other energy sources can be obtained by municipalities and local district heating companies. CoM signatories have estimated data, with bi-yearly monitoring commitment. Also, many municipalities are currently developing their Climate Plan with a Hungarian GHG reporting methodology.</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - M · T · R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M · T · R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total annual energy renovation rate % - M · T · R</td>
<td></td>
<td>No systemic reporting. Indicator can be estimated from partial data, so it is available only partially.</td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td></td>
<td></td>
</tr>
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<td></td>
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<tr>
<td>% of the total floor area of buildings owned and occupied by the</td>
<td></td>
<td>Database. Municipalities keep records of public investments.</td>
</tr>
<tr>
<td>municipality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby</td>
<td></td>
<td>Data could be derived from building permits, if recorded in a National database. However, renovations / constructions of units &lt;300m² are not going through the permitting process.</td>
</tr>
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<td>as a result of renovation - M · T · R</td>
<td></td>
<td></td>
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<tr>
<td>Indicator</td>
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<td>Sources of data</td>
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<td>----------------</td>
</tr>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>![Orange]</td>
<td>Arrear is recorded by energy service providers. No aggregated data available. National statistics have temporary surveys and 10 year census on deprivation.</td>
</tr>
<tr>
<td>Actions to improve Indoor Air Quality post Renovation Works - R - SH - P - T</td>
<td>![Green]</td>
<td>Current regulations cover IAQ, namely the fresh air rate, and Energy Regulation includes comfort requirements.</td>
</tr>
<tr>
<td>Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T</td>
<td>![Orange]</td>
<td>Periodic studies and individual surveys, but no structured yearly data available.</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>![Orange]</td>
<td>Representative surveys by HNSO, no yearly data available.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>![Orange]</td>
<td>Estimation could be based on yearly/quarterly Real Estate Market Reports, and from HNSO statistics.</td>
</tr>
<tr>
<td>Indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
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<td>--------------------------------------------------------------------------</td>
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<td>--------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>![x] Arrear is recorded by energy service providers. No aggregated data available.</td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td>![x] Current regulations cover IAQ, namely the fresh air rate, and Energy Regulation includes comfort requirements. In households natural ventilation system is common. As retrofitting option with MEV is very limited because of floor heights, it is not recommended into CORE indicators in Hungary.</td>
<td></td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - R - SH</td>
<td>![✓] Required by law, data could be aggregated from building permits. No database have been built.</td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>![✓] Required by law, data could be aggregated from building permits. No database have been built.</td>
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<td># non-residential renovated buildings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>![✓] Required by law, data could be aggregated from building permits. No database have been built.</td>
<td></td>
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<tr>
<td>heating requirements and minimise summer overheating risk</td>
<td>![✓] Required by law, data could be aggregated from building permits. No database have been built.</td>
<td></td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>![✓] No overall monitoring is available. Partial knowledge can be collected from funding bodies. Subsidies or loans are recorded and monitored by issuing bodies (government, banks, etc.)</td>
<td></td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>![✓] No overall monitoring is available. Partial knowledge can be collected from funding bodies. Subsidies or loans are recorded and monitored by issuing bodies (government, banks, etc.)</td>
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# Core Economic indicators
## National level

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<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - P – T</td>
<td>![Green Check]</td>
<td>National Government, local municipalities and multiple owners</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P – T</td>
<td>![Red X]</td>
<td>Municipalities and governmental databases keep records of public building investments. Partial knowledge can be collected from funding bodies. Subsidies or loans are recorded and monitored by issuing bodies (government, banks, etc.)</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - P – T</td>
<td>![Red X]</td>
<td>National Tax Bureau could be the data owner, if energy renovation is referenced to NACE Rev.2, Statistical classification of economic activities</td>
</tr>
<tr>
<td>&gt; # companies involved in energy renovation - T - R-SH - P</td>
<td>![Red X]</td>
<td>National Tax Bureau could be the data owner, if energy renovation is referenced to NACE Rev.2, Statistical classification of economic activities</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td>![Green Check]</td>
<td>Training, middle-, vocational and high education records are at National Government, Ministry of Human Capacities (EMMI)</td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td>![Red X]</td>
<td>National Government, Ministry of Human Capacities (EMMI) and Hungarian Chamber of Commerce and Industry (MKIK) could be partners to aggregate database. &gt; of which # Municipality staff upskilling in energy renovation</td>
</tr>
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</table>
### Core Economic Indicators

#### Local Level

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<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - M - T</td>
<td></td>
<td>Multiple owners.</td>
</tr>
</tbody>
</table>
| > Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T |               | Municipalities and governmental databases keep records of public building investments. | Municipalities and governmental databases keep records of public building investments.
| > Total annual private investment in energy renovation - R - SH - M - T   |               | Municipalities and governmental databases keep records of public building investments. |
| # companies involved in energy renovation - T - R-SH - M                 |               | Database of companies could include energy renovation, as business tax is levied by local municipalities. Potential partner: PMKIK (Pest County Chamber of Commerce and Industry). |
| # graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - M - R |               | Training and middle-, vocational and high education is at national level. Data receiving might be restrained by GDPR. |
| # building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R |               | The number of building professionals and construction workers seems to be not relevant on the local level, especially in Hungary, where there are over 3000 small municipalities. Municipality keeps track of own staff upskilling. Potential partner: PMKIK (Pest County Chamber of Commerce and Industry). |
Conclusion

- Engagement of Budaörs in 40% decrease of CO2 emissions by 2030 as CoM signatory
- Budaörs introduced ISO50001
- Local governments have the interest to set up a database with core indicators

- Lack of data on the national level
- Lack of database on local level
- Lack of integration of multiple data owners
- Lack of methodology applicable for all levels of governments

- GDPR, privacy issues of using the data for efficient building revovation strategy
- Increased burden on administration with no extra manpower and resources

- National governments have databases which could elaborate energy efficiency data
- Obligation to complete LTRS opens the opportunity and responsibility to set up the related monitoring system
- Local governments have the means and own interest to set up a database with core indicators
### Environmental indicators

**National level**

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<tbody>
<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to 1990 levels - P - T - R</td>
<td>EPA</td>
<td>The EPA publish annual report on CO₂ emissions in Ireland by sector. EPC data and (potentially) actual consumption data could be used to see how this relates to renovation.</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td>SEAI: Public EPC database (theoretical data)</td>
<td></td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td>SEAI: Public EPC database (theoretical data)</td>
<td></td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R</td>
<td>SEAI: Publicly available EPC database (theoretical)</td>
<td></td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
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<td></td>
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<tr>
<td>&gt; Of which deep renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by central government retrofitted each year - P</td>
<td>Public bodies report on their energy use annually as part of the SEAI’s Monitoring &amp; Reporting programme. But data isn't linked to any specific buildings.</td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td></td>
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### Environmental indicators

#### Local level

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<tr>
<td>Reduction in direct annual CO$_2$ emissions from renovation compared to the municipality's baseline year as per</td>
<td>EPC database (theoretical) could be used for private stock and social housing. (Source: SEAI) Actual data can be collected for public buildings. Local authorities which are signatory to the Covenant of Mayors have data on CO2 emissions by sector but methodology would need to be developed to make a connection with renovation if this is to be used.</td>
<td>SEAI: Public EPC database (theoretical data)</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - M - T - R</td>
<td></td>
<td>National EPC database is publicly available (source: SEAI) and can be used at local authority level (theoretical)</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - M - T - R</td>
<td></td>
<td>It is becoming mandatory for more and more SEAI grants to have pre and post retrofit EPC. This could be tracked on the publicly available EPC database. From there, we would probably need to extrapolate to have an estimate of total number of buildings retrofitted in a year.</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - M - T - R</td>
<td></td>
<td>Could be done at city level for local authority's stock – This data is already captured by local authorities. Need to coordinate with central government if all public buildings located within the boundary of a local authority are to be covered</td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which medium renovation</td>
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<tr>
<td>&gt; of which deep renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year - M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td></td>
<td>SEAI: Publicly available EPC database (theoretical)</td>
</tr>
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### Core Social Indicators

#### National Level

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<tr>
<th>Indicator</th>
<th>Existing Data</th>
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</thead>
</table>
| % of households having arrears on utility bills - R - SH                  | ![Yes](https://icons8.com/icons/png/30/18728.png) | Central Statistics Office (CSO)  
Annual Survey on Income and Living Conditions |
| Actions to improve Indoor Air Quality post Renovation Works - R - SH - P - T | ![No](https://icons8.com/icons/png/30/18728.png) | SEAI - IGBC - USGBC – BREEAM – WELL  
Residential:  
SEAI would have data for some of their funded programmes (e.g. Warmth & Wellbeing).  
Non-residential: We might be able to access some (very limited) data for privately certified schemes |
| Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T | ![No](https://icons8.com/icons/png/30/18728.png) | Theoretical data available through EPC, but the number of buildings with pre and post retrofit EPC is extremely limited. |
| # private households retrofitting their homes / year - R                  | ![Yes](https://icons8.com/icons/png/30/18728.png) | Good quality data on #housesholds who have retrofitted their homes with SEAI support. The SEAI's contractors survey could be used to extrapolate and have a more comprehensive figure. |
| # sq. m² commercial buildings retrofitted annually - T                     | ![Yes](https://icons8.com/icons/png/30/18728.png) | Good quality data on public buildings.  
For privately owned non-residential buildings, good quality data on projects that have received state support, including SEAI grants – Survey of SEAI contractors could then be used to extrapolate |

### Other Core Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing Data</th>
<th>Sources of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td># post-renovation radon assessment</td>
<td><img src="https://icons8.com/icons/png/30/18728.png" alt="No" /></td>
<td>EPA has measured more than 60,000 homes in Ireland for radon since the early 1990s. Measurements will now need to be more specifically related to energy renovation.</td>
</tr>
</tbody>
</table>
| Are policies in place to ensure retrofitted buildings are climate resilient? Y/N and/or contribute to climate resilience? Y/N | ![Yes](https://icons8.com/icons/png/30/18728.png) | DCCAE – DoH - Department of arts, heritage and the Gaeltacht – EPA  
Various departments' website and agency |
## Core social indicators

### Local level

<table>
<thead>
<tr>
<th>Indicator</th>
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</thead>
<tbody>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td><img src="#" alt="Green Icon" /></td>
<td>CSO - Annual Survey on Income and Living Conditions</td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td><img src="#" alt="Red Icon" /></td>
<td>Local authorities don't have this data, not even for social housing. Could gather data from some SEAI funded retrofit. (pre and post retrofit EPC).</td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - R - SH</td>
<td><img src="#" alt="Red Icon" /></td>
<td>Some very partial data could be collected from green building certification bodies e.g. IGBC, USGBC and BRE.</td>
</tr>
<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td><img src="#" alt="Red Icon" /></td>
<td>SEAI Grant schemes - Partial</td>
</tr>
<tr>
<td># non-residential renovated buildings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td><img src="#" alt="Red Icon" /></td>
<td>SEAI Grant schemes - Partial</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td><img src="#" alt="Green Icon" /></td>
<td>Same as national</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td><img src="#" alt="Green Icon" /></td>
<td>Same as national</td>
</tr>
<tr>
<td>Other core indicators</td>
<td>existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td># post-renovation radon assessment</td>
<td>✗ EPA radon testing is broken down by local authority but not specifically linked to renovation</td>
<td>Each local authority</td>
</tr>
<tr>
<td>Have local vulnerability to climate change studies / maps been developed?</td>
<td>✓ Each local authority</td>
<td></td>
</tr>
<tr>
<td>Have guidance/ strategies and tools been developed to ensure renovation projects cope with identified risks (e.g. flooding and overheating)?</td>
<td>✓ Each local authority</td>
<td></td>
</tr>
<tr>
<td># buildings retrofitted in line with guidance documents</td>
<td>✗ Does not currently exist</td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>&gt; Total annual investment in energy renovation ( R \cdot SH \cdot P \cdot T )</td>
<td></td>
<td>Central government (public investment) + estimates (private investment)</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) ( R \cdot SH \cdot P \cdot T )</td>
<td></td>
<td>Central government – Department of Finance \nThe annual budget published by the Department of Finance details how much money is allocated to renovation annually</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation ( R \cdot SH \cdot P \cdot T )</td>
<td></td>
<td>SEAI research shows that in Ireland most people use savings to pay for retrofits as opposed to loans. An option might be to extrapolate on grants provided by SEAI but a good methodology would need to be developed.</td>
</tr>
</tbody>
</table>

**Suggested approach:**

a. Take number of registered SEAI contractor
b. Total amount of SEAI grants awarded for retrofit

| # companies involved in energy renovation \( T \cdot R \cdot SH \cdot P \) | | Could extrapolate data from SEAI contractor and BER assessor databases, as well as SEAI Grants and CSO data on people working in “Heat and energy saving and management” FTE. |
| # graduates from 3rd level courses and technical training courses with focus on energy renovation \( T \cdot SH \cdot P \cdot R \) | | Suggested approach: |
| # building professionals and construction workers taking part in energy renovation upskilling \( T \cdot SH \cdot P \cdot R \) | | a. Take number of registered SEAI contractor |
| > of which # Municipality staff upskilling in energy renovation | | b. Total amount of SEAI grants awarded for retrofit |
| | | c. Divide a/b and apply the ratio to the CReMA 13B Output to give an estimate of the number of companies in the 13B |

| # graduates from 3rd level courses and technical training courses with focus on energy renovation \( T \cdot SH \cdot P \cdot R \) | | 3rd level institutions and VET institutions |
| # building professionals and construction workers taking part in energy renovation upskilling \( T \cdot SH \cdot P \cdot R \) | | Data from all the institutions individually. |
| > of which # Municipality staff upskilling in energy renovation | | Professional bodies and CIF – data on number of members upskilling in renovation |
| | | Local authorities have data on staff upskilling |
### Core economic indicators

#### Local level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
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</tr>
</thead>
<tbody>
<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - M - T</td>
<td></td>
<td>Local authority (and state) data for public buildings + estimates for private investments</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T</td>
<td></td>
<td>Could potentially be extrapolated from amount of state funded (grants) provided for renovation in the jurisdiction</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - M - T</td>
<td></td>
<td></td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R-SH - M</td>
<td></td>
<td>Could get good quality data of numbers of companies involved in the local authority’s renovation projects - although these may not all be local. Also, SEAI register of contractors, BER assessor database and CSO data could be used as per national level.</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - M - R</td>
<td></td>
<td>To make contact with all the institutions individually.</td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R</td>
<td></td>
<td>Building professionals: Professional bodies require certain number of CPD, but don’t currently capture data on specific number of hours relating to renovation</td>
</tr>
<tr>
<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
<td></td>
<td>Construction workers: CIRI capture data on CPD and could be used but as it is not statutory wouldn’t capture data on all construction workers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Irish local authorities capture data on upskilling of their staff)</td>
</tr>
</tbody>
</table>
The number of buildings with pre and post renovation EPC is limited
Data on IAQ and thermal comfort is limited
Many indicators are based on estimates and can't be used without strong methodology being developed

- Publicly available EPC database
  - EPCs include lots of useful information for environmental indicators

Lack of resources /funding to capture all data

Could be a way to encourage development of pre and post retrofit EPCs, as well as of better IAQ and thermal comfort data

**Conclusion**
### Introductory note
At national level the Ministry of Economic Development (MISE) has set several financing measures to support renovation works for all building typologies (R, P, SH and O). Impact data from these measures can cover data for several indicators. The following key summarizes acronyms used to refer to these measures and organizations across the tables.

- CB= Certificati bianchi (white certificates)
- DF= Detrazioni Fiscali -Ecobonus, Sismabonus and Bonus casa (tax deduction)
- CT= Conto Termico (thermal account)
- FNEE= Fondo nazionale efficienza energetica (national fund for EE)
- PREPAC= Programma di riqualificazione energetica degli edifici della P.A. centrale (EE program for public buildings)
- PC = Politiche di Coesione (Cohesion policy fund)
- GSE= National authority for energy services
- ENEA= National agency for energy, environment and new technologies
- ISPRA=National institution for protection and research on the environment

### Environmental indicators

#### National level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to 1990 levels - P - T - R</td>
<td>![Green Circle]</td>
<td>-The EPC (Italian APE) include this data. APE are collected by Regional databases and a common national one (SIAPE). Quality of APE is an issue. -CO₂ reduction can be derived from calculated energy savings from applications to MISE’s support measures for building renovation works (CB, CT, PREPAC, DF, FNEE) and to Regional Cohesion Policies funds.</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td>![Green Circle]</td>
<td>-The EPC (Italian APE) include this data. -The measures supported by MISE also collect this information: GSE collects data on CB, CT; MISE collects data on PREPAC, FNEE; Regions collect data on CP; ENEA collects data on DF.</td>
</tr>
<tr>
<td>Improvement of Net Space Heating and cooling demand due to energy renovation - P - T - R</td>
<td>![Green Circle]</td>
<td>-The EPC (Italian APE) include this data. -Applications to national measures to support renovation works may also be a source of data.</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R &gt; Of which light renovation &gt; of which medium renovation &gt; of which deep renovation</td>
<td>![Green Circle]</td>
<td>MISE calculates the annual renovation rate based on the applications to supporting measures for building renovation (as in PNIEC 2030). Some of the measures specify the % of applications per type of renovation works (e.g. DF).</td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td>![Green Circle]</td>
<td>GSE reports annually on energy production from (thermal and electric) renewable resources. The point is how to select data about renovation works.</td>
</tr>
<tr>
<td>Other core indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td># buildings refurbished in conformity with sustainable buildings principles</td>
<td>Databases of certified buildings (LEED, BREEAM, GBC tools, WELL...)</td>
<td></td>
</tr>
<tr>
<td>Average water consumption/person/day for domestic uses</td>
<td>ISTAT collects data at municipality scale on average water consumption for domestic uses. The data is reported by ISPRA’s. annual report RAU as urban average in ltr/person/day.</td>
<td></td>
</tr>
<tr>
<td>Amount of built volume (m³) per building type/function in a given period (from - to) or compared to a reference year</td>
<td>ISPRA collects data about the % of soil occupied on the full land territory by the Municipality or Metropolitan Area for 40 major Italian cities</td>
<td></td>
</tr>
</tbody>
</table>
### Environmental indicators

#### Local level

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduction in direct annual CO(_2) emissions from renovation</strong></td>
<td>CoM signatory cities may have specific actions on building renovation.</td>
<td>The data is collected into EPC (Italian APE), databases are available at Regional level, but municipalities do not have access to data. Quality of APE is an issue.</td>
</tr>
<tr>
<td>compared to the municipality’s baseline year as per CoM reporting</td>
<td></td>
<td>For measures supported by MISE Municipalities could make specific request of data.</td>
</tr>
<tr>
<td><strong>- M - T - R</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Final energy consumption reduction from renovation - M - T - R</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Improvement of net space heating and cooling demand due to energy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>renovation - T - R - SH - M</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total annual energy renovation rate % - M - T - R</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which medium renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which deep renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total additional energy produced from renewable resources on site</strong></td>
<td>GSE collects data about private in situ production for private and public buildings, municipalities should make a specific request for data. Municipalities have data on own buildings.</td>
<td></td>
</tr>
<tr>
<td>or nearby as a result of renovation - M - T - R</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>m² of renovated public buildings - SH - M</strong></td>
<td>Municipalities own data about own buildings and can collect them from other local authorities.</td>
<td></td>
</tr>
</tbody>
</table>

### Other core indicators

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<tr>
<td><strong>Amount of built volume (m(^3)) per building type/function in a given period (from-to)</strong> or compared to a reference year</td>
<td></td>
<td>ISPRA collects data about the % of soil occupied on the full territory owned by the Municipality or Metropolitan Area for 40 major Italian cities.</td>
</tr>
</tbody>
</table>
### Core Social Indicators

#### National Level

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<tr>
<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>% of households having arrears on utility bills - R · SH</td>
<td></td>
<td>ISTAT collects data on average families’ expenses per energy resources at national and regional scale</td>
</tr>
<tr>
<td>Actions to improve Indoor Air Quality post Renovation Works - R · SH · P</td>
<td></td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td>Actions to improve average thermal Comfort Post Renovation Works - R · SH · P · T</td>
<td></td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>✔️</td>
<td>Data can be collected by the number of applications to public incentives and tax deductions for energy renovation works.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td></td>
<td>Data can be collected by the number of applications to public incentives and tax deductions for energy renovation works.</td>
</tr>
</tbody>
</table>

#### Other Core Indicators

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</thead>
<tbody>
<tr>
<td>Are policies in place to ensure retrofitted buildings are climate resilient? Y/N and/or contribute to climate resilience? Y/N · SH · R · T · P</td>
<td></td>
<td>Not at national level</td>
</tr>
<tr>
<td># energy renovated buildings which are upgraded to be earthquake resistant - R · SH · P · T</td>
<td>✔️</td>
<td>- Among tax deduction measures Sismabonus, managed by Agenzia delle Entrate, support building works to upgrade earthquake resilience. If paired to Ecobonus, data are collected by ENEA. - There is a national database for primary school buildings</td>
</tr>
<tr>
<td>Are policies / guidance documents available to ensure retrofit projects take into account cultural value of buildings? Y/N · SH · R · T · P</td>
<td></td>
<td>Not at national level</td>
</tr>
<tr>
<td>Are policies / guidance in place to promote smart technologies in retrofitted buildings? - R · SH · P · T</td>
<td>✔️</td>
<td>Among tax deduction initiatives, Ecobonus support building works that include smart metering. Data on the number of applications are collected by ENEA.</td>
</tr>
<tr>
<td>Indicator</td>
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<tr>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>![Green]</td>
<td>ISTAT collects data on average families’ expenses per energy resources at national and regional scale. Private energy companies and utilities also hold these data, but privacy issues arise.</td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td>![Red]</td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - R - SH</td>
<td>![Red]</td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td># households living in renovated dwellings where calculations demonstrate that post renovation condition will satisfy heating</td>
<td>![Green]</td>
<td>The EPC (Italian APE) includes this information. Cities should request data to Regional databases for renovated buildings. Quality of APE is an issue.</td>
</tr>
<tr>
<td># non-residential renovated buildings where calculations demonstrate that post renovation condition will satisfy heating requirements and will minimize summer overheating risk</td>
<td>![Green]</td>
<td>The EPC (Italian APE) includes this information. Cities should request data to Regional databases for renovated buildings. Quality of APE is an issue.</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>![Green]</td>
<td>Data can be collected by the number of applications to public incentives and tax deductions for energy renovation works. Municipalities should make specific request of data.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>![Green]</td>
<td>Data can be collected by the number of applications to public incentives and tax deductions for energy renovation works. Municipalities should make specific request of data.</td>
</tr>
</tbody>
</table>
Some municipalities’ building codes or urban regulations may include these guidelines, to solve issues as e.g. urban heat island effect. CoM guidelines include among adaptation indicators number or % of (P, R, C) buildings damaged by extreme weather conditions/events (per year / over a certain period).

Among tax deduction measures Sismabonus, managed by Agenzia delle Entrate, support building works to upgrade earthquake resilience. If paired to Ecobonus, data are collected by ENEA.

Among tax deduction initiatives, Ecobonus support building works that include smart metering. Municipalities should make specific request to ENEA.

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td># buildings retrofitted in line with guidance documents to ensure renovation projects cope with identified risks (e.g. flooding and overheating) - SH - R - T - M</td>
<td>Some municipalities’ building codes include these guidelines, to solve issues as e.g. urban heat island effect. CoM guidelines include among adaptation indicators number or % of (P, R, C) buildings damaged by extreme weather conditions/events (per year / over a certain period)</td>
<td>Some municipalities’ building codes or urban regulations may include these guidelines</td>
</tr>
<tr>
<td># energy renovated buildings which are upgraded to be earthquake resistant - R - SH - P - M</td>
<td>Among tax deduction measures Sismabonus, managed by Agenzia delle Entrate, support building works to upgrade earthquake resilience. If paired to Ecobonus, data are collected by ENEA.</td>
<td>Among tax deduction initiatives, Ecobonus support building works that include smart metering. Municipalities should make specific request to ENEA.</td>
</tr>
<tr>
<td># buildings of cultural value retrofitted using energy renovation guidelines for this type of buildings - SH - R - T - M</td>
<td>Some municipalities’ building codes or urban regulations may include these guidelines</td>
<td></td>
</tr>
<tr>
<td># retrofitted dwellings with smart monitoring systems - R - SH</td>
<td>Some municipalities’ building codes or urban regulations may include these guidelines</td>
<td></td>
</tr>
</tbody>
</table>
### Core Economic Indicators: National Level

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>Sources of Data</th>
</tr>
</thead>
</table>
| > Total annual investment in energy renovation - R - SH - P - T | ✓ | About public investments:  
- MISE sets specific national support measures for building renovation works (CB, CT, PREPAC, DFF, FNEE).  
- Opencoesione portal reports funded measures under Cohesion Policies funds.  
- Annual balance of public authorities  
- ABI may have data on private loans/mortgages for renovation works |
| > Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T | ✓ | CRESME produced a report for a number of years from 2011 to 2018 |
| > Total annual private investment in energy renovation - R - SH - P - T | ✓ | Data could be collected with the support of MIUR and Regions |
| # companies involved in energy renovation - T - R - SH - P | ✓ | Public administrations collect data about number and type of training activity of civil servants |
| # graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R | ❌ | |
| # building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R | ❌ | |
| > of which # Public sector staff upskilling in energy renovation | ❌ | |

### Core Economic Indicators: Local Level

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<tr>
<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - M - T</td>
<td>✓</td>
<td>Municipalities have data in their annual balance about own public buildings and could make request for data to MISE for the applications made to the incentives and support measures to building renovation of private and public buildings</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T</td>
<td>✓</td>
<td>No data collected. SISTAR service at regional scale collects data of businesses by sector. Chambers of commerce may support as well.</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - M - T</td>
<td>✓</td>
<td>Data could be asked to university and private educational bodies based at the municipalities</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - M</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - M</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R</td>
<td>✓</td>
<td>Municipalities have data of trained staff and type of training</td>
</tr>
<tr>
<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

Collecting data about benefits of building renovation supports the understanding the impact and effectiveness of policies at national and local scale, as well as to assess how local communities are able to contribute to national objectives. Public authorities and organizations collect lots of data and produce reports, even if they lack of a specific focus on building renovation works.

The major threat is the lack of resources and of working time to dedicate to data collection and elaboration.

Despite the amount of funding dedicated to building renovation measures, results are not fully exploited to express their impact on environment, society and economy. Available at national level are seldom shared to the local scale.

The Framework highlights the need of a major interaction between level of governments to implement infrastructures for data management for understanding the real impact of policies: e.g. crossing data from the major streams of funding for building renovation works and make them available to inform public authorities at local scale.
Poland, both at national and local level, is taking a number of measures to accelerate the pace of renovation of existing building stock. At present, several programs supporting this issue are available at national level, aimed at municipalities, single-family house owners (including energy poverty) and business. Unfortunately, in most cases, receiving financial support for renovation does not require an energy audit or EPC, so there is little knowledge about energy efficiency or CO$_2$ emission improvement of renovated buildings.

### Environmental indicators

**National level**

Poland, both at national and local level, is taking a number of measures to accelerate the pace of renovation of existing building stock. At present, several programs supporting this issue are available at national level, aimed at municipalities, single-family house owners (including energy poverty) and business. Unfortunately, in most cases, receiving financial support for renovation does not require an energy audit or EPC, so there is little knowledge about energy efficiency or CO$_2$ emission improvement of renovated buildings.

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<tr>
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<tbody>
<tr>
<td>Reduction in direct annual CO$_2$ emissions from renovation compared to 1990 levels - P - T - R</td>
<td>GUS (Statistics Poland) and Eurostat – based on research and analysis. *NFOŚiGW (National Fund for Environmental Protection and Water Management), BGK (National development bank) and Ministry of Development - as part of provided grants, these units collect data that can be used to calculate the indicator. Local level authorities – data on energy performance of owned buildings (EPCs before and after renovation).</td>
<td><strong>National Revenue Administration (Krajowa Administracja Skarbowa) working under the Ministry of Finance – based on the number of given tax reliefs for energy renovation</strong></td>
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<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td>GUS (Statistics Poland) and Eurostat – based on research and analysis. *NFOŚiGW (National Fund for Environmental Protection and Water Management) and BGK (National development bank) - as part of provided grants, these units collect data that can be used to calculate the indicator. Local level authorities – data on energy performance of owned buildings (energy audits before and after renovation for part of the building stock).</td>
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<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td>Local level authorities – data on energy performance of owned buildings (energy audits before and after renovation for part of the building stock).</td>
<td><strong>National Revenue Administration (Krajowa Administracja Skarbowa) working under the Ministry of Finance – based on the number of given tax reliefs for energy renovation</strong></td>
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<tr>
<td>Total annual energy renovation rate % - P - T - R &gt; Of which light renovation &gt; of which medium renovation &gt; of which deep renovation</td>
<td>Local level authorities (based on the inventory of building resources owned by each municipality and information on quantity of renovated buildings).</td>
<td><strong>National Revenue Administration (Krajowa Administracja Skarbowa) working under the Ministry of Finance – based on the number of given tax reliefs for energy renovation</strong></td>
</tr>
</tbody>
</table>
**Existing support renovation programs run by these units:**
STOP SMOG (financed by the Ministry of Development, run by municipalities), Czyste Powietrze (managed by NFOŚiGW and WFOŚiGW), Renovation premium/Compensation premium for investors (managed by BGK within Fund for Thermal Upgrading and Repairing - FTIR).

**Existing support renovation programs run by this unit:** energy renovation tax relief.

**Existing RES support programs:** PROSUMENT and Mój Prąd (both managed by NFOŚiGW).

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<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td>***NFOŚiGW (National Fund for Environmental Protection and Water Management) - as part of provided grants. Energy suppliers – based on data collected under prosumer contracts with energy consumers. Voivodship authorities – based on grants awarded for RES installation (from regional operational programs – RPO). EPCs data base – Ministry of Development</td>
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<tr>
<td><strong>Reduction in direct annual CO\textsubscript{2} emissions from renovation compared to the municipality's baseline year as per CoM reporting - M - T - R</strong></td>
<td>Municipal entities in charge of EU grants – data available only for the investments which received funding (P-R-SH).</td>
<td>PGN (Low Emission Economy Plan) – in case of municipalities that apply for additional funding (P - SH).</td>
</tr>
<tr>
<td><strong>Final energy consumption reduction from renovation - M - T - R</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - M - T - R</strong></td>
<td></td>
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<tr>
<td><strong>Total annual energy renovation rate % - M - T - R</strong></td>
<td>&gt; Of which light renovation</td>
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<td></td>
<td>&gt; of which medium renovation</td>
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</tr>
<tr>
<td></td>
<td>&gt; of which deep renovation</td>
<td></td>
</tr>
<tr>
<td><strong>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year - M</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</strong></td>
<td></td>
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</tr>
</tbody>
</table>
### Core social indicators

#### National level

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<tr>
<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td></td>
<td>Municipalities (SH) or GUS (Statistics Poland). Energy suppliers.</td>
</tr>
<tr>
<td>Indoor Air Quality and Thermal Comfort Post Renovation Works - R - SH - P - C</td>
<td></td>
<td>No source of data</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td></td>
<td>Municipalities - based on quantity of grants allowed. GUS (Statistics Poland) – based on research and analysis. NFOŚiGW (National Fund for Environmental Protection and Water Management) - as part of provided grants. National Revenue Administration (Krajowa Administracja Skarbowa) working under the Ministry of Finance – based on the number of given tax reliefs for energy renovation.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td></td>
<td>Municipalities (for owned commercial buildings only). GUS (Statistics Poland) – based on research and analysis. *BGK (National development bank) - as part of provided grants.</td>
</tr>
<tr>
<td>Indicator</td>
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<td>Sources of data</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>![Image]</td>
<td>Municipal entities in charge of social and communal housing – data contains information only on rental amount (district heating and warm water included). Energy suppliers.</td>
</tr>
<tr>
<td># households living in renovated dwellings with certified IAQ upgrades including a commissioned ventilation system - R - SH</td>
<td>![Image]</td>
<td>No source of data</td>
</tr>
<tr>
<td># non-residential renovated buildings with certified IAQ upgrades including a commissioned ventilation system - P - C</td>
<td>![Image]</td>
<td>No source of data</td>
</tr>
<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>![Image]</td>
<td>Municipal entities in charge of EPCs and social/commune buildings (it concerns only heating)</td>
</tr>
<tr>
<td># non-residential renovated buildings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>![Image]</td>
<td>Municipal entities in charge of EPCs and public and commercial buildings (it concerns only heating)</td>
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<tr>
<td># private households retrofitting their homes / year - R</td>
<td>![Image]</td>
<td>Municipal entities in charge of EU grants – data available only for the investments which apply for funding.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>![Image]</td>
<td>Municipal entities responsible for commercial buildings owned.</td>
</tr>
</tbody>
</table>
### Core Economic indicators
#### National level

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<tr>
<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total annual investment in energy renovation - R - SH - P - T</td>
<td>For public investments: Ministry of Development, Ministry of Funds and Regional Policy, BGK (National development bank), NFOSiGW (National Fund for Environmental Protection and Water Management) and possibly other entities not listed above. For private investments: there are no sources.</td>
<td></td>
</tr>
<tr>
<td>Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T</td>
<td>No source of data</td>
<td></td>
</tr>
<tr>
<td>Total annual private investment in energy renovation - R - SH - P - T</td>
<td>No source of data</td>
<td></td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - P</td>
<td>No source of data</td>
<td></td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td>No source of data</td>
<td></td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td>No source of data</td>
<td></td>
</tr>
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<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
<td>No source of data</td>
<td></td>
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</table>
Data unavailability for private investments which are out of municipal control.

Partial data stored in the resources of different municipality departments or entities, difficult to gather.

Lack of a database where all the data could be stored and easily accessible.

Poor communication and information flow between departments and entities (including procedures).

Quality of the data on energy reduction - data are in part based on calculations, in part on actual consumption (information from energy suppliers) and part on estimates from private homeowners.

- Control of the pace of renovation and its effects and taking additional measures in case it is not satisfactory

- Additional burden on staff (without possibility of new employments)

- Collection of insufficient data to calculate each indicator

- Data unavailability for private investments which are out of municipal control.

- Partial data stored in the resources of different municipality departments or entities, difficult to gather.

- Lack of a database where all the data could be stored and easily accessible.

- Poor communication and information flow between departments and entities (including procedures)

- Quality of the data on energy reduction - data are in part based on calculations, in part on actual consumption (information from energy suppliers) and part on estimates from private homeowners.

- Creation of new procedures for data collection and analysis

- Improvement of communication between different municipal departments and entities

- Collection, structuring and mapping different data gathered along the process

- Collection of data that will allow the reliable calculation of indicators reflecting the actual state of the building stock, not only estimates
For all the environmental indicators, the data available for renovation make no differentiation between the type of intervention. So there is no way to know if a renovation includes energy efficiency measures or is a plain renovation for security reasons for example.

### Environmental indicators

#### National level

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<tr>
<th>Indicator</th>
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<tr>
<td>Reduction in direct annual CO$_2$ emissions from renovation compared to 1990 levels - P - T - R</td>
<td>![Green Icon]</td>
<td>Ministry for ecological transition and the demographic challenge (MITECO). The national GHG inventory collects direct emissions data from the building sector (residential, commercial and institutional) annually (from 1990).</td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - P - T - R</td>
<td>![Red X]</td>
<td>The annual report &quot;La energía en España&quot; collects the energy consumption structure in Spain globally and by sector. But there are no specific data related to building renovation [LINK1].</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td>![Green Icon]</td>
<td>Ministry of Transport, Mobility and Urban Agenda (former Ministry of Public Works) through the Housing and land observatory. Annual bulletin. Chapter 4: Renovation, shows the rates of renovation and new construction, but no information about the depth of the intervention.</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R</td>
<td>![Red X]</td>
<td>Only global figures of renewables here: [LINK1] Electrical system: [LINK2]</td>
</tr>
<tr>
<td>&gt; of which medium renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which deep renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by central government retrofitted each year - P</td>
<td>![Red X]</td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td>![Green Icon]</td>
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## Environmental indicators

### Local level

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<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to the municipality's baseline year as per CoM reporting - M - T - R</td>
<td><img src="image" alt="X" /></td>
<td>It is possible that some municipalities have this data, but there is not a general database to consult the information related to any municipality</td>
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<td>Final energy consumption reduction from renovation - M - T - R</td>
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<td>&gt; of which deep renovation</td>
<td><img src="image" alt="X" /></td>
<td><img src="image" alt="X" /></td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by the municipality</td>
<td><img src="image" alt="X" /></td>
<td>Internal statistics should be gathered</td>
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<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td><img src="image" alt="X" /></td>
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### Core Social Indicators
#### National Level

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<tr>
<td>% of households having arrears on utility bills - R - SH</td>
<td>![Green]</td>
<td>INE - National Institute of Statistics, partially through &quot;Survey on living conditions&quot; that collects delays in payment of expenses related to the main home (mortgage or rent, gas bills, community... but not specified in what exactly) Energy supply companies have this information, but it is not available.</td>
</tr>
<tr>
<td>Actions to improve Indoor Air Quality post Renovation Works - R - SH - P - T</td>
<td>![Red]</td>
<td>We would need to define this indicator at national level, or directly taken the ones used at municipal level. This is an example of indicator that we consider core, nut not feasible for the moment.</td>
</tr>
<tr>
<td>Actions to improve average thermal Comfort Post Renovation Works - R - SH - P - T</td>
<td>![Red]</td>
<td>Here appears the total number of dwellings renovated, to know the number of households, necessary to know the renovated ones devoted to &quot;main dwelling&quot;. No distinction for energy renovations.</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>![Green]</td>
<td>In the existing statistics they are no differentiated.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>![Red]</td>
<td></td>
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#### Other Core Indicators

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<tr>
<td># People living in energy renovated homes</td>
<td>![Red]</td>
<td>The figure can be easily obtained from other data that anyway will be collected, but for the moment no data available.</td>
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</table>
### Core Social Indicators

#### Local Level

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<td>It is possible that some municipalities have this data, but there is not a general database to consult the information related to any municipality</td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td>![X]</td>
<td>Included among core indicators but lack of clarity of how to use data, so it is not implemented in the near time</td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - M - T</td>
<td>![X]</td>
<td></td>
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<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
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<td>The figure can be easily obtained from other data that anyway will be collected</td>
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### Core economic indicators

#### National level

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<td>&gt; Total annual investment in energy renovation - R - SH - P - T</td>
<td></td>
<td>Ministry of Transport, Mobility and Urban Agenda (former Ministry of Public Works)</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T</td>
<td></td>
<td>Housing and land observatory. Annual bulletin. Wider focus: all building types and all renovation types.</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - P - T</td>
<td></td>
<td></td>
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<tr>
<td># companies involved in energy renovation - T - R-SH - P</td>
<td></td>
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<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td></td>
<td></td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td></td>
<td>Maybe the Fundación Laboral de la Construcción could work on some statistics</td>
</tr>
<tr>
<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
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### Other core indicators

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</thead>
<tbody>
<tr>
<td>Number of workers (full-time equivalent - FTE) working directly on energy rehabilitation</td>
<td></td>
<td>Some data may be available based on some studies and reports</td>
</tr>
<tr>
<td>Return on investment in property value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theoretical (energy) efficiency of the investment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Core economic indicators:

**Local level**

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<tr>
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<td></td>
<td></td>
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<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R · SH · M · T</td>
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<tr>
<td>&gt; Total annual private investment in energy renovation - R · SH · M · T</td>
<td></td>
<td></td>
</tr>
<tr>
<td># companies involved in energy renovation - T · R · SH · M</td>
<td></td>
<td></td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T · SH · M · R</td>
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<td># building professionals and construction workers taking part in energy renovation upskilling - T · SH · M · R</td>
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<td></td>
</tr>
</tbody>
</table>
For some indicators it will take years to methodically collect data to make it sound and reliable. This implies that certain indicators won't be able to throw actual figures for a (long) time.

Related to the weakness highlighted, BUILD UPON2 is also about to think about the structures needed to be able to track renovation and its impact through indicators. This is an opportunity to implement the structures and mechanisms needed so that finally renovation can be monitored.

**Conclusion**

Although there is a great lack of data, in some of the cases the way to obtain the data needed is easier than it seems using the mechanisms already in place. For example, the statistical sheet mandatory for every building permit, could be adapted to get some of the data required for the calculation of the indicators. Further, we see sometimes the problem is not the lack of data, but the accessibility to them. So we need to work on how to make data open and available without breaching the GDPR.

Risk of complexity of the whole Framework, which would finally end up in not being implemented. That is why it is important to implement the Framework beginning with what is really feasible among the core indicators.
Environmental indicators
National level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to 1990 levels - P - T - R</td>
<td></td>
<td>General Directorate of Professional Services of MoEU collects the data through EPCs via BEP-TR software developed in 2011. Related data are entered into BEP-TR by EPC experts. Existing buildings (built in 2011 and after) have an EPC and thus CO₂ emissions values. To compare the CO₂ emission of the buildings after the renovation, a comparison will be made by taking the building’s renovation date as a reference. Studies on the subject have started by the MoEU.</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - P - T - R</td>
<td></td>
<td>General Directorate of Professional Services of MoEU collects the data through EPCs via BEP-TR software developed in 2011. Related data are entered into BEP-TR by EPC experts. Existing buildings (built in 2011 and after) have an EPC and thus CO₂ emissions values. However, in order to compare the CO₂ emission of the buildings after the renovation, a comparison will be made by taking the building’s renovation date as a reference. Studies on the subject have started by the MoEU.</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - P - T - R</td>
<td></td>
<td>Total number of the buildings: TurkStat BEP-TR database does not include this data directly. However, the data can be calculated by obtaining information from the database. Also, some National and International Projects’ databases such as the KABEV may help to reach the data. (KABEV: Energy-efficient renovation program for public buildings funded by IBRD)</td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which medium renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which deep renovation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - P - T - R</td>
<td></td>
<td>This data can be reached through EPCs. It includes data after 2011.</td>
</tr>
</tbody>
</table>
### Other core indicators

- # buildings refurbished in conformity with sustainable buildings principles

### Existing data

### Sources of data

Databases of certified buildings (LEED, BREEAM, YES-TR or B.E.S.T certification). The databases open to the public.
### Environmental Indicators

#### Local level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in direct annual CO2 emissions from renovation compared to the municipality’s baseline year as per CoM reporting - M - T - R</td>
<td>The data can only be reached through EPCs. The data is collected at the national level. Municipalities do not have their own database, but some CoM signatory cities may have specific actions on building renovation. Mainly they can have this data for buildings under their control.</td>
<td>MoEU and MENR. MoEU and MENR begin to work to increase energy efficiency in public buildings under Turkey Energy Efficiency in Public Buildings Project (EEPB) funded by IBRD. Local municipalities also own this data for buildings under their control, but not an effective database is available.</td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - M - T - R</td>
<td>The data can only be reached through EPCs. The data is collected at national level. Municipalities do not have their own database.</td>
<td>The data can be reached through EPCs.</td>
</tr>
<tr>
<td>Total annual energy renovation rate % - M - T - R &gt; Of which light renovation &gt; of which medium renovation &gt; of which deep renovation</td>
<td>The data can be reached through EPCs.</td>
<td>MoEU and MENR. MoEU and MENR begin to work to increase energy efficiency in public buildings under Turkey Energy Efficiency in Public Buildings Project (EEPB) funded by IBRD. Local municipalities also own this data for buildings under their control, but not an effective database is available.</td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year - M</td>
<td>The data: BEP-TR database does not include this data directly. However, the data can be calculated by obtaining information from the database. Also, some National and International Projects’ databases such as the KABEV may help to reach the data. (KABEV: Energy-efficient renovation program for public buildings funded by IBRD). Municipalities collects the data for their own buildings.</td>
<td>The data can be reached through EPCs.</td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td>The data can be reached through EPCs.</td>
<td>The data can be reached through EPCs.</td>
</tr>
</tbody>
</table>
A useful database is not available. For tracking this data, the outcomes of the project under Component C of ISMEP (Istanbul Seismic Risk Mitigation and Emergency Preparedness Project) could be reviewed.

### Core social indicators

#### National level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of households having arrears on utility bills - R · SH</td>
<td></td>
<td>Electricity transmission companies and Ministry of Energy and Natural Resources collect the data. Capturing the cumulative data would be difficult since there are lots of transmission companies in each region.</td>
</tr>
<tr>
<td>Indoor Air Quality and Thermal Comfort Post Renovation Works - R · SH · P · C</td>
<td></td>
<td>Data may be available for buildings certified by sustainability rating systems.</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td></td>
<td>Ministry of Environment and Urbanization and district municipalities may have this data partially. Besides, the number of loan applications made to banks for building renovation can also help access this information</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td></td>
<td>Ministry of Environment and Urbanization and district municipalities may have this data partially.</td>
</tr>
<tr>
<td># energy renovated buildings which are upgraded to be earthquake resistant - R · SH · P · C</td>
<td></td>
<td>A useful database is not available. For tracking this data, the outcomes of the project under Component C of ISMEP (Istanbul Seismic Risk Mitigation and Emergency Preparedness Project) could be reviewed.</td>
</tr>
<tr>
<td>Indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Change in direct annual CO$_2$ emissions from renovation compared to 1990 levels - C-R-SH-P</td>
<td>✗</td>
<td>Electricity transmission companies and the Ministry of Energy and Natural Resources collect the data. Not available at the local level.</td>
</tr>
<tr>
<td># households living in renovated dwellings with certified IAQ upgrades including a commissioned ventilation system - R - SH</td>
<td>✗</td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td># non-residential renovated buildings with certified IAQ upgrades including a commissioned ventilation system - P - C</td>
<td>✗</td>
<td>Data may be available for buildings certified by sustainability rating systems</td>
</tr>
<tr>
<td># households living in renovated dwellings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>✗</td>
<td>Ministry of Environment and Urbanization collects the data through EPCs.</td>
</tr>
<tr>
<td># non-residential renovated buildings where calculation demonstrates that post renovation condition will satisfy both heating requirements and minimise summer overheating risk</td>
<td>✗</td>
<td>Ministry of Environment and Urbanization collects the data through EPCs.</td>
</tr>
<tr>
<td># private households retrofitting their homes / year - R</td>
<td>✓</td>
<td>Ministry of Environment and Urbanization and local municipalities: Deep renovation projects are subject to building permit which is a permit document that must be obtained from the municipalities. Municipalities collect the technical files of the renovation projects at the local level.</td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td>✓</td>
<td>Ministry of Environment and Urbanization local municipalities: Deep renovation projects are subject to building permit which is a permit document that must be obtained from the municipalities. Municipalities collect the technical files of the renovation projects at the local level.</td>
</tr>
</tbody>
</table>

# households affected by energy poverty: Municipalities provide fuel allowance to some households in line with their needs. Accessing the data is possible.
### Core economic indicators
#### National level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Total annual investment in energy renovation - R - SH - P - T</td>
<td></td>
<td>For P and SH, Strategy and Budget Directorate declares public investments in the investment program report yearly. These reports are open to the public and easy to access.</td>
</tr>
<tr>
<td>&gt; Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T</td>
<td></td>
<td>In terms of total annual private investments, there is no accessible database</td>
</tr>
<tr>
<td>&gt; Total annual private investment in energy renovation - R - SH - P - T</td>
<td></td>
<td>Ministry of Energy and Natural Resources - Department of Energy Efficiency and Environment. Energy efficiency consulting companies must get a licence from the Ministry. The list of these companies can be obtained from the website of MENR.</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - P</td>
<td></td>
<td>Ministry of Education and Ministry of Energy. And Ministry of Energy and Natural Resources. Energy efficiency trainings carried out by the Ministry within the scope of training-audit activities are presented in the annual reports and published on its website. Additional information can be obtained from the professional chambers and the Ministry of Education. A database containing cumulative data is needed.</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - P - R</td>
<td></td>
<td>Ministry of Education and Ministry of Energy and Natural Resources collect the data partially.</td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - P - R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; of which # Municipality staff upskilling in energy renovation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Theoretical (energy) efficiency of investment: Ministry of Environment and Urbanization may help to capture the data.
Increase in total jobs: It will increase proportionally with the increase in the renovation. It can be challenging to follow, but the data can be accessed with the support of professional chambers and ministry.
Direct savings associated to energy renovation: Need to check BEP-Tr database.
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Total annual investment in energy renovation - R - SH - M - T</td>
<td></td>
<td>Metropolitan Municipalities: They publish their strategic plan covering certain years. The strategic plan includes data on public investments on energy renovation. The plan can be obtained from municipalities official websites.</td>
</tr>
<tr>
<td>Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - M - T</td>
<td></td>
<td>MENR collects the data partially. Not available at the local level.</td>
</tr>
<tr>
<td>Total annual private investment in energy renovation - R - SH - M - T</td>
<td></td>
<td>Not available at the local level.</td>
</tr>
<tr>
<td># companies involved in energy renovation - T - R - SH - P</td>
<td></td>
<td>Municipalities have data of trained staff and type of training.</td>
</tr>
<tr>
<td># graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - M - R</td>
<td></td>
<td></td>
</tr>
<tr>
<td># building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R</td>
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</tr>
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<td></td>
<td></td>
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</table>
Some indicators may be compelling in terms of accessing data. During the implementation phase of the Framework, accessing the related data requires to cooperate with many institutions from local, national and private, which can be challenging at some point. It can serve as a bridge for local and national authorities to work together. International funds are available to develop new procedures for data analysis on defined indicators.

Conclusion

- The framework consists of well thought out and meaningful indicators that can be used by both the national government and local authorities. It serves as a guide for cities wishing to work on the energy renovation.
- For cities that will use the Framework, it allows becoming a pioneer city in the energy renovation.
- Both national and local needs are focused separately.

- Lack of the data on actual energy consumption and reference values.
- Lack of government support
- Lack of enough workforce

- Some indicators may be compelling in terms of accessing data. During the implementation phase of the Framework, accessing the related data requires to cooperate with many institutions from local, national and private, which can be challenging at some point.
### Environmental indicators

#### National level

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<th>Indicator</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Direct CO₂ emission reduction from renovation per building sector</td>
<td>![Yes]</td>
<td>Data is available on the individual installations of energy efficiency measures - no. of measures annually, and from that estimates can be made on energy consumption and CO₂ emissions saved.</td>
</tr>
<tr>
<td>Indirect CO₂ emission reduction from renovating buildings in sustainable location</td>
<td>![Yes]</td>
<td>Estimated savings in energy use based on the number of energy efficiency installations is available here.</td>
</tr>
<tr>
<td>Annual energy consumption reduction per unit type</td>
<td>![Yes]</td>
<td>Royal Institute for Chartered Surveyors (RICS) collects some data in a public database.</td>
</tr>
<tr>
<td>Policy developments supporting embodied carbon reduction</td>
<td>![Warning]</td>
<td></td>
</tr>
</tbody>
</table>
### Environmental indicators

#### Local level

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<thead>
<tr>
<th>Indicator</th>
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</thead>
<tbody>
<tr>
<td>Reduction in direct annual CO₂ emissions from renovation compared to the municipality's baseline year as per CoM reporting - P - T - R</td>
<td>Data comes from a mix of sources: National Government statistics Utility bills of municipality owned buildings EPCs (approx 50% of residential buildings) Energy Audits (some tertiary buildings)</td>
<td></td>
</tr>
<tr>
<td>Final energy consumption reduction from renovation - M - T - R</td>
<td>Data comes from a mix of sources: National Government statistics Utility bills of municipality owned buildings EPCs (approx 50% of residential buildings) Energy Audits (some tertiary buildings)</td>
<td></td>
</tr>
<tr>
<td>Improvement of Net Space Heating &amp; Cooling Demand due to energy renovation - M - T - R</td>
<td>Data comes from a mix of sources: National Government statistics Utility bills of municipality owned buildings EPCs (approx 50% of residential buildings) Energy Audits (some tertiary buildings)</td>
<td></td>
</tr>
<tr>
<td>Total annual energy renovation rate % - M - T - R</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>&gt; Of which light renovation</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>&gt; of which medium renovation</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>&gt; of which deep renovation</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>(may be deleted in final UK version as not perceived as relevant)</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>EU version: % of renovated buildings reaching nZEB standard annually - P - T - R</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>UK (England) version: % of renovated buildings reaching net zero standard annually.</td>
<td>Definition of light/medium/deep required. Very hard to capture all renovation taking place, especially if privately financed. Local Authority can combine national data (NEED) with local modelling (UNO) and local Stock Condition survey (done every 5-10yrs) - but this would apply to residential only.</td>
<td></td>
</tr>
<tr>
<td>% of the total floor area of buildings owned and occupied by the municipality retrofitted each year - M</td>
<td>Data comes from utility bills of council owned buildings</td>
<td></td>
</tr>
<tr>
<td>No. and type of building retrofit measures installed - R - SH - P - T</td>
<td>Data comes from national EPC database + modelling by local authority to extrapolate information from EPCs and apply to different tenure types.</td>
<td></td>
</tr>
<tr>
<td>No. of homes meeting minimum EPC C - R - SH</td>
<td>Data comes from national EPC database + modelling by local authority to extrapolate information from EPCs and apply to different tenure types.</td>
<td></td>
</tr>
<tr>
<td>No. of PRS homes meeting minimum EPC C - R - SH</td>
<td>Data comes from national EPC database + modelling by local authority to extrapolate information from EPCs and apply to different tenure types.</td>
<td></td>
</tr>
<tr>
<td>Total additional energy produced from renewable resources on site or nearby as a result of renovation - M - T - R</td>
<td>Data comes from national EPC database + modelling by local authority to extrapolate information from EPCs and apply to different tenure types.</td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Reduction in the % of people affected by energy poverty</td>
<td>![Checkmark]</td>
<td></td>
</tr>
<tr>
<td>QALY improvement attributable to the improvement of building stock - Reduction in health costs attributable to energy efficiency measures</td>
<td>![X]</td>
<td></td>
</tr>
<tr>
<td>Policies to ensure retrofitted building are climate resilient</td>
<td>![X]</td>
<td></td>
</tr>
<tr>
<td>Policies to ensure retrofitted buildings use smart readiness indicators</td>
<td>![X]</td>
<td></td>
</tr>
<tr>
<td>Increase in private investment in energy renovation</td>
<td>![X]</td>
<td></td>
</tr>
<tr>
<td>Increase in number of graduates: 3rd level courses and technical training courses with focus on energy renovation</td>
<td>![X]</td>
<td></td>
</tr>
</tbody>
</table>
### Core social indicators

#### Local level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Existing data</th>
<th>Sources of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU target: % of households having arrears on utility bills - R - SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK (England) version: No. of homes that were previously fuel poor, meeting a minimum of EPC C</td>
<td></td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings with commissioned ventilation system - R - SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td># non-residential renovated buildings with a commissioned ventilation system - M - T</td>
<td></td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings where calculations demonstrate that post renovation condition will satisfy heating requirements - R - SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td># households living in renovated dwellings where actions have been taken to minimise summer overheating risk - R - SH</td>
<td></td>
<td></td>
</tr>
<tr>
<td># non-residential renovated buildings where calculations demonstrate that post renovation condition will satisfy heating requirements - T - M</td>
<td></td>
<td></td>
</tr>
<tr>
<td># non-residential renovated buildings where actions have been taken to minimise summer overheating risk - T - M</td>
<td></td>
<td></td>
</tr>
<tr>
<td># sq. m² commercial buildings retrofitted annually - T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of public contracts requiring measurement of social value impacts</td>
<td>Available as public reporting</td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Existing data</td>
<td>Sources of data</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Increase in public and private investment in renovation</td>
<td>![Green checkmark]</td>
<td>Committee on climate change (TBC)</td>
</tr>
<tr>
<td>Labour productivity gain from better working environment/ improved living conditions</td>
<td>![Red cross]</td>
<td></td>
</tr>
<tr>
<td>Number of jobs created per million of € invested</td>
<td>![Red cross]</td>
<td></td>
</tr>
<tr>
<td>% reduction energy imports</td>
<td>![Red cross]</td>
<td></td>
</tr>
</tbody>
</table>
Core economic indicators

Local level

- Total annual investment in energy renovation - R - SH - P - T
- Total annual public investment in energy renovation (of which % directed to renovating public building and % invested in grants/subsidies) - R - SH - P - T
- Total annual private investment in energy renovation - R - SH - T

# companies involved in energy renovation - T - R - SH - M

# graduates from 3rd level courses and technical training courses with focus on energy renovation - T - SH - R - M

# building professionals and construction workers taking part in energy renovation upskilling - T - SH - M - R
- of which # Municipality staff upskilling in energy renovation

Conclusion

- National level data is available
- Current pressure may prevent Government departments and local authorities responding to inquiries
- Difficult to access regional breakdown
- Specific measures of some indicators is not matched by available data
- There is an opportunity to be flexible and adapt the indicators to suit the available data where still relatively similar