BUILD UPON Framework

Capturing the Benefits of Building Renovation

UK Version & Methodology

November 2021

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 840926

Main Authors
John Fingleton & Marion Jammet – Irish Green Building Council
Antonia Khayatt - UK Green Building Council

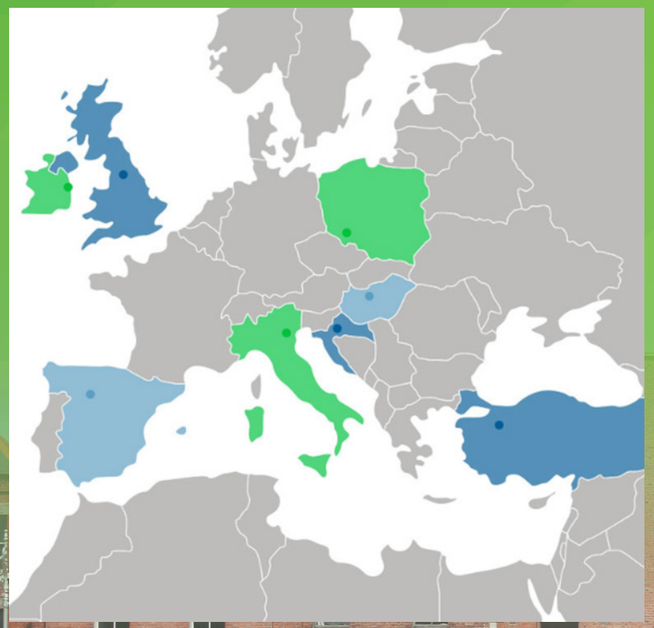
Contributors
Joanne Wheeler - UKGBC
Benjamin Petrović – Croatian GBC
Éva Beleznay – Hungary GBC
Irene Rondini – Irish GBC
Valentina Marino – Italian GBC
Anna Jurczak – Polish GBC
Raquel Díez Abarca – Spanish GBC
Büşra Çelik – Turkish GBC
Miles Rowland - Europe Regional Network of WorldGBC
Stephen Richardson – Europe Regional Network of WorldGBC

Disclaimers
Icons by Flaticon

Published online - www.ukgbc.org - Novermber 2021

The BUILD UPON Framework, was developed by WorldGBC's Europe Regional Network involving eight European GBCs (see map below) with input from Climate Alliance, the Buildings Performance Institute Europe and over 30 cities and local authorities across Europe.

The BUILD UPON[2] project received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 840926.



Croatia
Velika Gorica, Zagreb, Sveti Ivan Zelina, Karlovac

Hungary
Budaörs, Budavár, Kispest

Ireland
Dublin, Kilkenny, Cork, Laois, Offaly

Italy
Padova, Brescia, Pesaro, Rome

Poland
Rybnik, Ruda Slaska, Gliwice

Spain
Valladolid, Zaragoza, Madrid, Sestao

Turkey
Eskişehir, Sakarya, Gaziantep, Bursa, İzmir

UK
Leeds, Cambridge, Essex, Hammersmith & Fulham (London borough)

BUILD UPON FRAMEWORK

Report Contents

4 About This Document

7 BUILD UPON Framework

8 An Overview for Policy Makers & Local Authorities

10 Acronyms & Glossary

14 Introduction

18 Implementing the Framework

22 What to measure

73 Case Studies

74 Pilot City Examples

75 Building on Existing Tools

77 Useful Guidance

78 Guidance for Policy Makers and Framework Users

About This Document

Who this report is for

This report is for any cities and local authorities who are looking to tackle the climate impact of their existing buildings and scale up renovation activity at the municipal level, as well as government officials at the national and European level. In particular, it will be useful to local governments who wish to optimise the use of quality impact data to measure and track the effectiveness of renovation schemes.

Report Objectives

This document provides an introduction and guide to a new methodology called the 'BUILD UPON Framework', which consists of a set of indicators to assess the environmental, social and economic impacts of building renovation activity.

The document also highlights and links to many of the resources on building renovation for cities and local authorities that have been developed as part of the BUILD UPON² project.

Background to the Framework

The BUILD UPON Framework was developed over two years as part of the European Union Horizon 2020-funded BUILD UPON² project, which was coordinated by GBCespaña. It was a collaboration of WorldGBC's Europe Regional Network, eight European GBCs and National Steering Groups, Climate Alliance, the Buildings Performance Institute Europe and over 30 cities and local authorities across Europe.

We hope that all readers will be inspired by the holistic, data-driven approach to tracking renovation impacts, pioneered by the BUILD UPON² project consortium. We invite you to join us in promoting this approach to catalyse the Renovation Wave that Europe's ageing building stock so desperately needs.

Acknowledgements

The UK Green Building Council (UKGBC) would like to thank our European partners, the members of the UK's National Steering Group (see photos below) and the four local authorities involved in the pilot phase. These are Leeds City Council, Cambridge City Council, Essex County Council and the London Borough of Hammersmith & Fulham.

UK's National Steering Group

Leeds City Council
Sandy Rutherford

URBED Coop
Marianne Heaslip

National Energy Action
Matt Copeland

Warm Works
Simon Kemp

Energy Saving Trust
David Weatherall

Buro Happold
Duncan Price

Ecology Building Society
Paul Ellis

Evora Global
Ryan Sit

Public Health England
Michael Chang

Parity Projects
Russel Smith

Sustainable Design Collective
Donal Brown

Ecology Building Society
Ian Rigarlsford

The BUILD UPON Framework will help unlock the Renovation Wave

"Renovating our existing buildings is absolutely key to meeting EU energy and climate targets. Renovate Europe aims to accelerate the rate and depth of renovation, delivering benefits for people, their quality of life, and the economy."

Adrian Joyce - Campaign Director - Renovate Europe

"Creating a central focus on monitoring the real impacts of renovation initiatives - learning what is working, and learning fast what is not working and why - must be at the heart of the Renovation Wave."

World GBC Report - 'Starting a Renovation Wave, Putting Real Impact First' - September 2021

"The BUILD UPON Framework allows local authorities to measure and record the impacts of their retrofit projects in a holistic manner, looking at CO2 emissions reductions, but also at the wider impacts, such as the benefits to people's health and wellbeing and indeed reduction in energy poverty. In future the BUILD UPON Framework will help us in better considering and communicating the multiple benefits of retrofit, which in turn should increase the rate of retrofit."

Ali Grehan - City Architect - Dublin City Council

BUILD UPON FRAMEWORK

BUILD UPON Framework

- An Overview for Policy Makers & Local Authorities
- Acronyms & Glossary
- Introduction
- Implementing the Framework
- What to measure

BUILD UPON Framework

An Overview for Policy Makers & Local Authorities

The BUILD UPON Framework helps cities and local authorities measure the different benefits of building renovation in a simple and consistent manner.

Why the BUILD UPON Framework is useful

Buildings account for 25% of the UK's annual greenhouse gas emissions. Therefore, renovating existing buildings to reduce their carbon emissions is key to achieving the UK's ambition to reach climate neutrality by 2050. The majority of the UK's buildings will need upgrading.

Fortunately, building renovation at scale can help tackle many other societal challenges: reducing energy consumption and improving energy security; reducing energy poverty and improving health; boosting economies and supporting local skills and jobs.

Policy Makers

Understanding and measuring these benefits will inform a wide range of policy decisions.

- Climate change targets & strategies
- Energy infrastructure needs & investment
- Healthcare needs & costs
- Fuel poverty alleviation

Click **here** for policy recommendations and information on how EU technical assistance can be used to implement the BUILD UPON Framework.

Local Authorities

Understanding and measuring these benefits helps Local Authorities:

- Measure their progress against a broad range of targets
- Learn from mistakes and successes to inform best practice
- Build business cases for future retrofit
- Increase public awareness of building renovation benefits
- Determine future policy based on sound evidence

How the BUILD UPON Framework works

The Framework defines Environmental, Social and Economic indicators that can be measured. It shows how to measure them and provides tools to aid data collection. This helps cities and local authorities capture data in a simple but standardised format.

The Framework is flexible, easy and free to use. It covers all buildings types. It can be used at a city level - to measure impacts across an entire area and support a city's Sustainable Energy & Carbon Action Plan; or a project level - to measure the impacts of individual projects. Local Authorities can measure all of the indicators or focus on just one or two to suit their priorities and resources.

BUILD UPON FRAMEWORK	INDICATOR	METRIC	EXAMPLE IMPACTS (not based on real project data)
ENVIRONMENTAL	Env. 1 Energy Renovation Rate	%	**0.5%** of the city's housing renovated under this project. All 300 homes to nZEB standard
	Env. 2 CO2 Emissions	Ton CO2/yr	**1,260 ton CO2/yr saved** from heating and powering 300 homes. **60% reduction** on average
	Env. 3 Energy Consumption	kWh/yr	Energy consumption reduced from **15,000kWh/yr** to **8,000kWh/yr** for the average home
	Env. 4 Renewable Energy Production	kWh/yr	**900,000 kWh/yr** produced by PVs on the 300 homes, supplying almost **40%** of the homes' energy needs
	Env. UK1 EPC Ratings	# of dwellings or m2 of non-residential	Energy Efficiency Rating improved from average of **58 (EPC D)** to an average of **85 (EPC B)**
SOCIAL HEALTH & WELLBEING	Soc. 1 Energy Poverty	% of households	% of households at risk of energy poverty **reduced from 25% to 3%**
	Soc. 2 Indoor Air Quality	# of residential units or non-residential floor area	Before renovation, many homes had damp and mould. Now, **95%** of the homes enjoy good Indoor Air Quality.
	Soc. 3 Winter Thermal Comfort		Before renovation, many homes were underheated and draughty. Now, **100%** of homes are warm and comfortable in winter
	Soc. 4 Summer Thermal Comfort		Before renovation, most homes suffered from summer overheating. Now, **60%** of homes remain comfortable in summer
	Soc. UK1 Climate Resilience	# of dwellings or m2 of non-residential	Flood resilience has been assessed and addressed in all 300 homes renovated
ECONOMIC	Eco. 1 Investment in Energy Renovation	£	**£7.5m** total project cost **£25,000** spent per home on average
	Eco. 2 Cost Efficiency of Energy Reductions	(kWh/yr)/k£	280kWh/yr saved for each £1,000 invested
	Eco. 3 Jobs in Energy Renovation	# FTE	**60 FTE jobs** directly supported throughout the 18 month project
	Eco. 4 Upskilling in Energy Renovation	# Building professionals / construction workers	n/a at a project level - city level indicator only
	Eco. 5 Financial Savings from Energy Renovation	£	Energy bills reduced by **£400/yr** to **£900/yr** per home on average

The BUILD UPON Framework was developed by eight Green Building Councils from the Europe Regional Network of WorldGBC in partnership with Climate Alliance, the Building Performance Institute Europe and with support from over 30 local authorities across Europe.

Web: www.ukgbc.org
Email: info@ukgbc.org
Twitter: ukgbc

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

November 2021

Acronyms & Glossary

EPC	Energy Performance Certificate
DHW	Domestic Hot Water
EU	European Union
FTE	Full Time Equivalent
HVAC	Heating, Ventilation and Air Conditioning
IAQ	Indoor Air Quality
SECAP	Sustainable Energy and Climate Action Plan
VOCs	Volatile Organic Compounds
WTC	Winter Thermal Comfort

Within the Framework, **building professionals** are defined as those involved in the design of energy renovation. In the UK, these are ARB registered architects, chartered engineers, chartered and registered building surveyors, architectural technologists, project managers, site managers and supervisors, building and facilities managers, as well as Retrofit Coordinators.

Completion date is the issue date of the EPC post renovation or contract practical completion.

Within the Framework, **construction workers** are defined as those involved in the installation of energy renovation. In the UK, these are electricians, plumbers, bricklayers and stone layers, carpenters and joiners, plasterers, glaziers, PV and solar installers, biomass boiler installers, heat pump installers, and insulation installers.

Direct local jobs are jobs supported as a result of the intervention (e.g. designing renovation projects and working on the construction site) – Source: Definition adapted from C40 Cities, The Multiple benefits of deep retrofits - A toolkit for cities.

Energy Renovation refers to works that improve the energy efficiency of a building. Energy renovation works typically improves building envelope and/or technical building systems, such as heating, cooling, ventilation, hot water and lighting. European Commission, 2019. For further information on energy renovation works see Energy Efficiency Investment Table under "Useful Guidance".

Energy Performance Certificate (EPC) is a certificate which notes the standardised calculation of the operational regulated energy. In the UK, this is the energy used for heating, cooling, hot water, ventilation and fixed lighting. It does not calculate consumption for cooking, appliances or plug loads related to portable devices such as computers / table lamps.

Final/Delivered energy is the total energy consumed by end users, such as households, industry and businesses. It is the energy which reaches the final consumer's door and excludes that which is used by the energy sector itself. It is the energy that is metered at the property.

Energy poverty can be defined as "a situation where a household or an individual is unable to afford basic energy services (heating, cooling, lighting, mobility and power) to guarantee a decent standard of living due to a combination of low-income, high-energy expenditure and low energy efficiency of their homes". European Commission, Citizens' Energy Forum 2016 - Definition used by the Covenant of Mayors.

It is defined differently between the UK's home nations.

England uses the Low Income Low Energy Efficiency (LILEE) indicator. A household is fuel poor if: they are living in a property with a fuel poverty energy efficiency rating of band D or worse AND when they spend the required amount to heat their home, they are left with a residual income below the official poverty line.

In Wales and Northern Ireland, a household is fuel poor if: in order to maintain an acceptable level of temperature throughout the home, the occupants would have to spend >10% of their income on all household fuel use

In Scotland, a household is fuel poor if: after housing costs have been deducted, >10% (20% for extreme fuel poverty) of their net income is required to pay for their reasonable fuel needs AND after further adjustments are made to deduct childcare costs and any benefits received for a disability or care need, their remaining income is insufficient to maintain an acceptable standard of living, defined as being at least 90% of the UK Minimum Income Standard (MIS).

Heating System is the mechanical system that supplies space heating to the building.

Investment in energy renovation refers to all investments to improve the energy efficiency of a building. It includes investments in light, medium and deep renovations. For further information on what may constitute an energy renovation investment, see Appendix 1.

Net floor area is the total useful floor area of the property measured in metre squared as per the EPC.

Onsite renewable refers to the energy, electrical and thermal, generated by renewables within the site boundary to cover the building energy demand.

Overheating Risk is defined as "the phenomenon of a person experiencing excessive or prolonged high temperatures within a building, resulting from internal and/or external heat gains, and which leads to adverse effects on their comfort health or productivity".

Source: ZeroCarbon HUB, 2015, Defining Overheating – Evidence Review

Primary Energy takes account of the energy losses due to energy transformation such as electricity generation and also the losses from transmission and distribution.

Renewable energy are energy sources that can be used without depleting their reserves. Common sources of renewable energy are bioenergy, geothermal, hydropower, ocean, solar and wind. The national definitions and methods for procurement in relation to renewables take precedence over the principles and methods listed above.

According to the EN ISO 7730, **thermal comfort** is that condition of mind which expresses satisfaction with the thermal environment.

Ventilation is the supply of fresh outside air and the removal of stale indoor air to or from spaces in a building.

Introduction

The purpose of the BUILD UPON Framework is to help cities and local authorities measure the impact of building renovation in a simple and consistent manner.

The Framework is not a standard and does not define renovation goals. It does not rank cities/local authorities with regard to their renovation strategies and successes. The Framework simply supports cities/local authorities in monitoring their activities so they can identify best practices and develop better strategies.

The UK version of the Framework comprises three key elements:

- A set of **15 indicators** covering environmental, social and economic issues.
- A pdf **methodology document** detailing how these indicators are measured.
- An **excel spreadsheet** into which data can be inputted. This automates some of the basic analysis.

See page opposite

The Framework also provides a **suite of guidance tools** to assist implementation and data collection. These include:

- Documents specific to certain indicators.
- Report on how local authorities can adopt or integrate the Framework.
- Report on SECAP* integration to aid cities wishing to integrate SECAP reporting with use of the BUILD UPON Framework. (*SECAP = Sustainable Energy & Carbon Action Plan)
- Training materials which can be used as templates by anyone wishing to educate others about the Framework.
- Case studies of cities and local authorities who have tested or implemented the BUILD UPON Framework

See "Useful Guidance" for links to all the documents noted on this page

See "Casestudies"

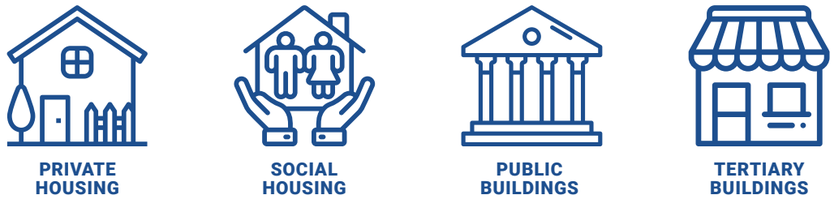
The BUILD UPON Framework will continue to be improved. For example, the BUILD UPON team is hoping to develop an online digital tool. We have also produced a specification to aid cities/nations looking to develop their own digital tool.

BUILD UPON FRAMEWORK

	INDICATOR	METRIC	LEVEL: PROJECT	LEVEL: CITY
ENVIRONMENTAL	Env. 1 Energy Renovation Rate	%		✓
	Env. 2 CO2 Emissions	Ton CO2/yr	✓	✓
	Env. 3 Energy Consumption	kWh/yr	✓	✓
	Env. 4 Renewable Energy Production	kWh/yr	✓	✓
	Env. UK1 EPC Ratings	# of dwellings or m2 of non-residential	✓	✓
SOCIAL HEALTH & WELLBEING	Soc. 1 Energy Poverty	% of households	✓	✓
	Soc. 2 Indoor Air Quality	# of residential units or non-residential floor area	✓	✓
	Soc. 3 Winter Thermal Comfort		✓	✓
	Soc. 4 Summer Thermal Comfort		✓	✓
	Soc. UK1 Climate Resilience	# of dwellings or m2 of non-residential	✓	✓
ECONOMIC	Eco. 1 Investment in Energy Renovation	£	✓	✓
	Eco. 2 Cost Efficiency of Energy Reductions	(kWh/yr)/k£	✓	✓
	Eco. 3 Jobs in Energy Renovation	# FTE	✓	✓
	Eco. 4 Upskilling in Energy Renovation	# Building professionals / construction workers		✓
	Eco. 5 Financial Savings from Energy Renovation	£	✓	

The BUILD UPON Framework is inherently **flexible**. Local authorities can use the framework in different ways to suit both their priorities and their resources.

1. All building types can be measured using the Framework. All indicators except one (Soc.1: Energy Poverty) are relevant to all building types. However, for ease - and given the exemplary role that public bodies must play - municipalities may choose to start by gatherering data on public buildings and/or publicly owned social housing only.



2. The Framework can be used at a **project level or at a city level**. At a project level - for example the renovation of 300 homes - the reductions in carbon emissions (Env.1) are calculated for that one project of 300 homes. At a city level, local authorities determine what the total contribution building renovation makes - year on year - to city-wide carbon emission reductions. City level data can be collected at a city level from the start, or data from individual projects can be collated to build a city-wide picture over time.

PROJECT LEVEL

All indicators can be measured if the following data is collected on a project:

- pre&post renovation meter readings or energy bills
- pre&post renovation EPCs *
- post renovation monitoring or occupant questionnaires
- renewable electricity calculations
- contractor questionnaire
- household income data (Soc.1 only)

*EPC = Energy Performance Certificate

See Data Collection Strategy under "Useful Guidance"

CITY LEVEL

Opt 1: Collect data at city level as part of SECAP reporting.

See SECAP Report under "Useful Guidance"

Opt 2: Collect data from individual projects over time and collate to build up a city-wide picture.

See image on page opposite

See Rehaviva tool under "Casestudies"

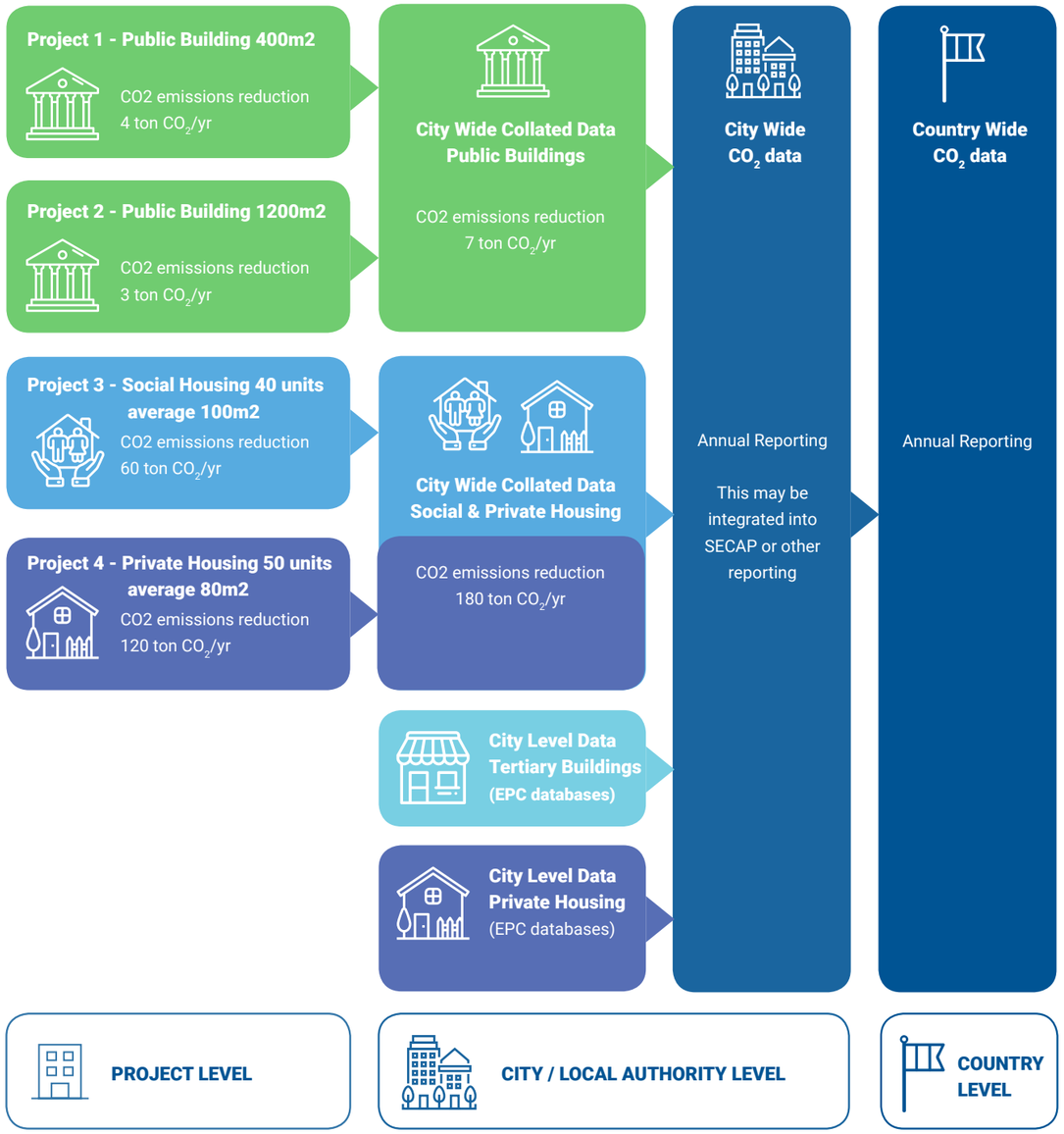
3. The Framework is **modular**. Local authorities can choose which indicators to measure to suit their priorities and resources. For example, local authorities could begin with one or two indicators and then add more over time as priorities change and data collection improves.

4. The city/local authority can define its own **reporting period** and baseline year. Cities with SECAPs should align with their SECAP reporting period. Local authorities/cities without SECAPs should aim for annual reporting. However, for simplicity, reporting could be linked to other existing reporting processes or carried out on a project by project basis. In all cases, the local authority should be transparent about their chosen baseline year and reporting period.

DATA COLLECTION PATHWAY

Combining city-level and project-level data to build a picture of impacts at a city or national scale

Indicator Env.2 Carbon Emissions is used as an example



Implementing the Framework

This section of the report gives a simple overview of how a local authority can start to think about using and implementing the BUILD UPON Framework. These recommendations have been developed from our experiences of working with more than 30 cities.

This exercise might best be carried out as a brainstorming session or series of workshops.

As a first step, we recommend you establish how you intend to use the BUILD UPON Framework: your 'Framework Vision'.

Then you can work out how the Framework can best be implemented following a '6-step process'. (See below.)

For further details, see Report on Implementation of the Framework

This is a collaborative exercise necessitating input from many different stakeholders including among others:

- Different departments across your local authority
- Different departments from regional authorities
- Local further education providers
- Local businesses
- Large housing providers and estate owners

Local Authority's Vision for the Framework

To develop your Framework vision, begin by noting down your local authority's current high level targets and priorities and see whether there is any overlap with the BUILD UPON Framework's indicators. For example: carbon emissions or energy poverty targets.

See questions on next page to help you develop your Framework vision

Next, note down your existing reporting/communication mechanisms and procedures, which might be adapted to integrate the Framework. Note whether you have a SECAP (Sustainable Energy & Carbon Action Plan) or are signed up to WorldGBC's Net Zero Carbon Buildings commitment and if so, the level of engagement.

See "Case Studies" for examples of existing initiatives that could be adapted in order to integrate the BUILD UPON Framework

Thirdly, note down your local authority's current targets, priorities, strategies and projects for your existing building stock. For example: a project to renovate 300 public homes, grants for private homeowner renovations or a programme for school improvements.

See "Case Studies" for examples of how 4 pilot cities are using the BUILD UPON Framework in very different ways

With this information in mind you can then determine how best the BUILD UPON Framework can serve your needs and priorities.

A few questions to help you develop your vision for using the Build Upon Framework

What is already happening in your local authority?

What local targets or policies exist? Do any of them overlap with the BUILD UPON Framework's indicators? Refer to the 13 core indicators + any national indicators.

Do you have a SECAP and if so, what stage are you at? It not, do you intend to develop one?

Have you made the Net Zero Carbon Buildings Commitment and if so, what stage are you at? If not, do you intend to?

Go here for further information about the Net Zero Carbon Buildings Commitment

What reporting mechanisms or procedures are you signed up to or already have in place?

What data collection and communication tools do you already use?

What is the state of your existing building stock? What will it take to get your existing buildings to net zero?

Do you have any policies that affect renovation projects? Planning, taxes, incentives, grants, targets etc.

Do you have any recently completed, ongoing or planned renovation projects?

What is your vision for using the Build Upon framework?

Where would the BUILD UPON Framework add most value?

- *To measure progress against existing targets and policies?*
- *To learn from mistakes and successes of past renovation projects and identify best practices?*
- *To build business cases for future renovation projects?*
- *To inform future local and national policy?*

How would you like to use the Framework?

- *On all building types or just public buildings to begin with?*
- *At a project level or a city level or both?*
- *All of the Framework indicators, or just some of them?*
- *Would you report on this internally or publicly, annually or on a project by project basis?*
- *Could you link BUILD UPON Framework findings to your SECAP or other existing reporting procedures?*

Six-Step Process for Implementation

Once a vision has been established, the local authority can begin to work out how they might implement the BUILD UPON Framework in practice.

1. Engage senior politicians and management

This needs support at a senior and political level to ensure findings are acted upon and resources are prioritised. *Who needs to champion the BUILD UPON Framework in your local authority? Which local government plans should this be integrated into?*

2. Ensure staff are allocated to the Framework

Whilst cross-departmental collaboration is key to the success of using the BUILD UPON Framework, identifying a lead department and individual is helpful. *Who will lead on this? Which other departments and external organisations will need to be involved? Do you have the in-house capacity and skills to collect and analyse the data? How will you fund the staff required? Will you share resources with other local, regional or national authorities?*

3. Check data sources and availability

Some data will be available in house, some will come from national/regional government sources, some from individual projects and some from private enterprises and households. *Where will each item of data come from? Which organisations do you need to bring on board to obtain that data? What agreements should you put in place?*

4. Define the data monitoring process

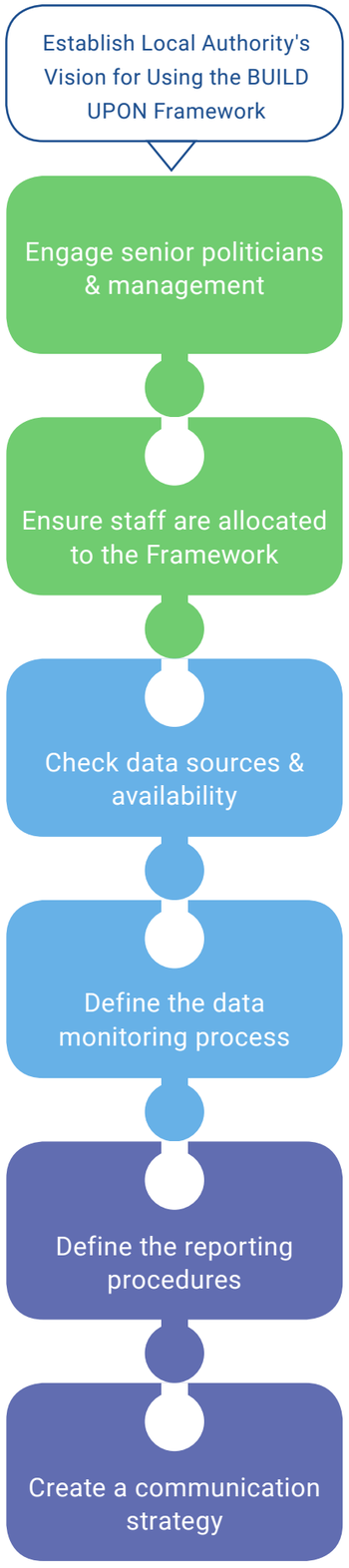
How will all the data be gathered and stored? On an online database or on the local authority's servers? How will you address data protection and privacy issues?

5. Define the reporting procedures

Will the Framework findings slot into your existing reporting procedures? For example your SECAP; in-house reporting procedures for tackling energy poverty or healthcare issues; or reporting requirements linked to central government funding of renovation?

6. Create a communication strategy

Community support and involvement are key to successful renovation programmes because mass renovation will affect all sections of society. *Will you use the BUILD UPON Framework only internally? Or will you engage with the broader public about your findings?*



A few examples of how some cities have set their vision and used the 6-step process

What to measure

The BUILD UPON team have produced a general methodology, which can be used across Europe. This sets out what should be measured for each indicator. This document sets out the UK's methodology, which is attuned to the UK's needs and includes two UK-specific indicators. See list of indicators, opposite.

See BUILD UPON Framework Generic Methodology under "Useful Guidance"

For each indicator, the BUILD UPON Framework provides the following information:

DESCRIPTION

The **DEFINITION** of the indicator
eg: "households removed from risk of energy poverty"

The **UNIT OF MEASURE** to be used
eg: "percentage of households"

The **RELEVANCE** of the indicator and why it is important.
eg: "Nearly 34 million Europeans were unable to afford to keep their homes adequately warm in 2018"

OBJECTIVES at EU, national and city level that are relevant to the indicator. *eg: "All energy poor homes in England to achieve at least EPC C by 2035."*

METHODOLOGY

The **METHODOLOGY** that must be followed, including units, what calculations must be undertaken and where data can be sourced

ADDITIONAL GUIDANCE to aid data collection

BUILD UPON FRAMEWORK

	INDICATOR	METRIC	LEVEL: PROJECT	LEVEL: CITY
ENVIRONMENTAL	Env. 1 Energy Renovation Rate	%		✓
	Env. 2 CO2 Emissions	Ton CO2/yr	✓	✓
	Env. 3 Energy Consumption	kWh/yr	✓	✓
	Env. 4 Renewable Energy Production	kWh/yr	✓	✓
	Env. UK1 EPC Ratings	# of dwellings or m2 of non-residential	✓	✓
SOCIAL HEALTH & WELLBEING	Soc. 1 Energy Poverty	% of households	✓	✓
	Soc. 2 Indoor Air Quality	# of residential units or non-residential floor area	✓	✓
	Soc. 3 Winter Thermal Comfort		✓	✓
	Soc. 4 Summer Thermal Comfort		✓	✓
	Soc. UK1 Climate Resilience	# of dwellings or m2 of non-residential	✓	✓
ECONOMIC	Eco. 1 Investment in Energy Renovation	£	✓	✓
	Eco. 2 Cost Efficiency of Energy Reductions	(kWh/yr)/k£	✓	✓
	Eco. 3 Jobs in Energy Renovation	# FTE	✓	✓
	Eco. 4 Upskilling in Energy Renovation	# Building professionals / construction workers		✓
	Eco. 5 Financial Savings from Energy Renovation	£	✓	

Env. 1: Energy Renovation Rate

DEFINITION

Percentage of the building stock that has completed energy renovations, breakdown of the depth of renovations and percentage of renovations reaching nZEB standard

UNIT OF MEASURE

Main Metric: Percentage per year of energy renovations completed

Sub Metric 01: Percentage breakdown of depth of energy renovations completed

Sub metric 02: Percentage of energy renovations completed achieving nZEB standard

RELEVANCE

The energy renovation of the building stock is key to reaching the 2050 climate neutrality target. The renovated buildings must meet at least the minimum energy performance requirements. Therefore, it is important to be aware of the energy consumption reduction achieved. That is why the renovation rate is split up by building type and by depth of renovation. With that regard, it is also relevant to monitor the percentage of renovated buildings that are compliant with the nation's nearly Zero Energy Building's standard.

OBJECTIVE

EUROPEAN UNION

The increased rate of energy renovation is a key objective at EU level for the decarbonisation of the building stock. More specifically, the following targets have been set:

- 3 % of the total floor area of heated and/or cooled buildings owned and occupied by central government to be renovated each year

  Source: Article 5 of Directive 2012/27/EU (Under the EU Renovation Wave Strategy (2020), it is anticipated that the revised Energy Efficiency Directive will extend that requirement to all public administration levels and increase that rate).

- Under the EU green deal, annual renovation rate must double to 2.4% per year.

  Source: EU Renovation Wave

COUNTRY

The UK has no renovation rate target and no numerical NZEB definition. However, the four nations do have varying home retrofit programmes and EPC ratings are targeted - refer to indicator Env.UK1.

LOCAL AUTHORITY

Targets vary between Local Authorities.

Does your Local Authority have a renovation rate target?

TERTIARY AND PUBLIC (based on m²)

				TOTAL
MAIN METRIC: ENERGY RENOVATION RATE		**2.2 %**	**1.8 %**	**2.0 %**
SUB METRIC 01: of which	**light**	29.8 %	54.5 %	43.1%
	medium	2.1 %	27.3 %	15.7 %
	deep	68.1 %	18.2 %	41.2 %
SUB METRIC 02: nZEB uptake		80.2%	45.5%	56.9 %

RESIDENTIAL (based on # dwellings)

				TOTAL
MAIN METRIC: ENERGY RENOVATION RATE		**2.3 %**	**1.3 %**	**1.4 %**
SUB METRIC 01: of which	**light**	32.6 %	20.0 %	22.4 %
	medium	2.2 %	30.0 %	24.0 %
	deep	65.2 %	50.0 %	52.8 %
SUB METRIC 02: nZEB uptake		67.4 %	80.0 %	76.8 %

The table above is an example of potential outputs for a local authority. It shows what % of the local authority's buildings have been renovated during the reporting period (Main Metric). It also indicates the depth of renovation achieved across the renovated building stock (Sub Metric 01) and what % of those renovated buildings meet nZEB standards (Sub Metric 02). Note: Sub Metrics 01 & 02 refer to the renovated building stock, not the total building stock.

ADDITIONAL GUIDANCE

Private residential & tertiary buildings

- For private residential and tertiary buildings, encourage owners to have pre and post EPC as per above methodology.
- Grants can include a condition by making pre and post EPC a requirement to access public funding.

Actual data

As a result of considerable variables, it is better to calculate the renovation works based on calculated agreed national methodology for EPC. Actual energy use will vary significantly depending on occupation levels, internal temperature requirements, time settings, degree days and other factors which are outside the scope of energy renovation and may skew results for before and after renovation.

METHODOLOGY

Calculate the buildings renovated during the reporting period (ideally annually) as a percentage rate of the overall building stock.

Three levels of renovation, light, medium and deep are defined in the options below.

CALCULATION

Main metric – Renovation Rate

- Residential

$$\text{Renovation rate over reporting period} = \frac{\text{Residential units renovated during reporting period}}{\text{Total residential units}} \times 100$$

- Non-Residential

$$\text{Renovation rate over reporting period} = \frac{\text{Net floor area renovated (m}^2\text{) during reporting period}}{\text{Total non-residential net floor area (m}^2\text{)}} \times 100$$

Sub metric 01 - Percentage breakdown by depth of energy renovations completed (See Env. 1 - Table below)

To assess the depth of energy renovation a pre works and post works EPC is required. If final energy is not available/used in the context of nZEB in your jurisdiction, primary energy may be used.

Municipalities must be fully transparent on the source of data and methodology used.

Step 01 - Define depth of renovation

Option A - Post Renovation Improvement (Renovation Depth)

$$\text{Depth of renovation} = \frac{\text{Pre works final energy} - \text{post works final energy}}{\text{Post works final energy}} \times 100$$

This method defines the renovation in terms of the improvement in delivered (final) energy. A light renovation is an improvement of 3-30%. A medium renovation is an improvement of 30%-60%. A deep renovation is an improvement of greater than 60%.

Source: Commission Recommendation (EU) 2019/786 of 8 May 2019 on building renovation.

Option B - National nZEB Renovation Methodology

Light renovation = Post works final energy > nZEB final energy (for renovation where applicable)
Medium renovation = Post works final energy < nZEB final energy (for renovation where applicable)
Deep renovation = Post works final energy < 0.7 x nZEB final energy (for renovation where applicable)

METHODOLOGY (cont.)

This method defines the nZEB renovation target as a medium renovation and is appropriate in countries where a specific nZEB renovation target exists. A light renovation is below this target and a deep renovation is a 30% improvement above this target in terms of final energy.

Step 02 - Percentage breakdown

$$\text{Percentage breakdown (light/medium/deep)} = \frac{\text{Number of buildings achieving light/medium/deep}}{\text{Total number of buildings being renovated}} \times 100$$

Sub metric 02 – nZEB renovation uptake

- Residential

$$\text{nZEB renovation uptake} = \frac{\Sigma\ \text{Residential units renovated that reach nZEB standard per year}}{\Sigma\text{Residential units renovated per year}} \times 100$$

- Non-Residential

$$\text{nZEB renovation uptake} = \frac{\Sigma\ \text{Net floor area renovated (m}^2\text{) to nZEB standard per year}}{\Sigma\text{Net floor area renovated (m}^2\text{) per year}} \times 100$$

Source Of Data

For both the main metric and sub metrics: it is important to have figures for the existing property stock in terms of residential units and non-residential floor area. These figures should be available as part of SECAP reporting or collated in line with SECAP requirements for non-signatories.

For the main metric - Renovation rate: the number of renovated homes completed during the reporting period and the m² of renovated non-residential completed during the reporting period must be recorded. The project figures must be added together to get the city-wide data. If this data is not recorded at project level (e.g., for private residential and tertiary buildings), this may be estimated based on external databases such as EPC databases or grants databases.

Sub metric 01 will require a pre works and post works EPC. Municipalities should require EPCs at least for municipal buildings and social housing that they own and manage. This will provide a calculated figure for the proposed reduction in final energy at a project level which can be used to define the depth of renovation as light/medium/deep. If final energy is not available through the National EPC methodology, primary energy may be used.

Env. 2: CO_2 Emissions

DEFINITION

Reduction in the direct annual CO_2 emissions equivalent achieved through renovation - operational energy only

UNIT OF MEASURE

Main Metric: Ton CO_2 eq/year

Sub Metric: % Reduction in CO_2 eq/year

RELEVANCE

CO_2 is a major contributor to global warming. CO_2 is emitted into the atmosphere by burning fossils to heat and cool, as well as to produce Domestic Hot Water (DHW) and produce electricity for use in the building. Buildings are responsible for 36% of CO_2 emissions in the European Union (EU).

OBJECTIVE

EUROPEAN UNION

The objective of the indicator is to identify the CO_2 emissions reductions from renovations at a project level and to track overall progress at a municipal level towards the EU's objective of reducing CO_2 emissions by at least 55% by 2030 and to reach carbon neutrality by 2050. **Read more**.

COUNTRY

The UK aims to achieve net Zero Carbon by 2050.

The UK's 6th carbon budget targets a 78% reduction in total UK CO_2 eq emissions by 2035, compared to 1990 levels. The UK government's 10-point plan seeks reductions in public sector direct emissions by 50% compared to a 2017 baseline.

MUNICIPALITY

Municipal targets vary.

What CO_2 emissions target does your Local Authority have?

METHODOLOGY

Calculate the difference between the emissions before and after the renovation works. The calculation must be done over an agreed reporting period, ideally on a yearly basis.

CALCULATION REDUCTION OF CO_2 EMISSIONS

Main metric

CO_2 emissions reduction (Ton CO eq. / year) = Σ (Pre-renovation CO_2 Emissions - Post renovation CO_2 emissions)

Sub metric - Percentage reduction of CO_2 emissions

$$\text{Percentage reduction of } CO_2 \text{ emissions} = \frac{CO_2 \text{ emissions reduction}}{\text{Total sector } CO_2 \text{ emissions}} \times 100$$

Source of data

Municipalities may use option A, B or C or a mix of them. For instance, a municipality may use option A to gather data on energy renovation of municipal buildings and option B to gather data on the private residential sector.

Option A – Starting from data at project level

Municipalities require pre works and post works EPCs* for specific projects (or actual monitoring of final energy consumption for a minimum of 12 months pre and post retrofit) multiplied by the CO_2 emission factors (tCO_2/MWh) for the forms of energy used in the building**.

For ease, it is suggested municipalities initially use it for municipal buildings and social housing that they own and manage. This will provide a calculated – or actual - figure for the proposed reduction in CO_2 emissions at a project level which should be centrally recorded.

Option B – Calculated from Env. 3

In countries where the EPC does not include data on CO_2 emissions, municipalities can calculate it based on Env. 3 (Energy Consumption) using the appropriate CO_2 emission factors (tCO_2/MWh) for the forms of energy used in the building**.

METHODOLOGY (cont.)

Option C – Starting from data at municipal level

If gathering data at municipal level, the following methodologies may be used:

- Desegregation of national statistics to the municipal level
- Using data from your local / regional cadastre
- Using your national EPC database
  - Tertiary buildings: Any renovation works will generally be followed by a new lease, in which case a new EPC should be provided.
  - Private homes that are renovated with grant funding are likely to have a post renovation EPC with a calculated savings. This and the EPC database can be used to estimate CO_2 emissions reduction in private residential.

**CO_2 emissions are usually displayed on the cover page of the EPC as CO_2/sqm. This will need to be cross referenced against the EPC Building Report which will state the floor area.*

***For CO_2 emission factors, local figures can be used, or default national figures, which are provided at national level, especially for electricity, which depend on the national electricity production annual mix. Certain countries have different electricity conversion factors depending on the region. The Covenant of Mayors for Climate and Energy Reporting Guidelines also include tables for default emissions factors for fuel combustion (fossil and renewable) and for electricity by country and year.*

ADDITIONAL GUIDANCE

Private residential & tertiary buildings

- For private residential and tertiary buildings, encourage owners to have pre and post EPC as per above methodology.
- Grants can include a condition by making pre and post EPC a requirement to access public funding.

Actual data

- Once the Framework has been established the use of actual consumption data from projects should be recorded in the Framework. If using actual data, the CO_2 emissions can be obtained by applying conversion factors to the actual energy consumption measured through monitoring or from energy bills (energy utility could provide this data).
- Depending on how Article 13 of Directive 2010/31/EC has been transposed in your country, you may be able to use Display Energy Certificates (DECs) to capture information on actual energy use of public buildings. The gathering of data should also be facilitated in the future by the introduction of smart meters across member states.

Env. 3: Energy Consumption

DEFINITION

Reduction in final (delivered) energy consumption through renovation

UNIT OF MEASURE

Main Metric: kWh/yr - Final (delivered) energy

Sub Metric: % reduction in kWh

RELEVANCE

The final energy consumption (also called delivered energy) reflects the consumed energy by the end-user and depends on the energy needs of the building and the efficiencies of its technical systems. Measuring and assessing the final energy consumption of renovation encourages a fabric first approach to energy renovation.

OBJECTIVE

EUROPEAN UNION

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

Source: Energy Efficiency Directive (2018/2002).

To achieve the 55% emission reduction target by 2030, the EU should reduce buildings' final energy consumption by 14% and energy consumption for heating and cooling by 18% (Compared to 2015 levels).

Source: EU's Renovation Wave Strategy.

COUNTRY

The UK has no defined energy efficiency targets. (EPC ratings are targeted - refer to indicator Env.UK1)

CITY

Municipal targets vary.

Does your Local Authority have building energy consumption or reduction targets?

METHODOLOGY

Calculate the difference between the kWhr/yr consumption before renovation works and after the renovation works. All the forms of energy usage must be considered for HVAC, DHW, ventilation and lighting (or in line with the National Methodology for EPCs). The calculation must be done over an agreed reporting period, ideally annually.

CALCULATION

Main Metric - Final energy consumption reduction

Final (delivered) energy consumption reduction (kWh/yr) = Σ (Pre-renovation final energy (kWh/yr) - Post renovation final energy (kWh/yr))

Sub metric - Percentage reduction of final energy consumption over the reporting period

$$\text{Percentage reduction of final energy consumption} = \frac{\Sigma\ \text{Final energy consumption reduction}}{\text{Total sector final energy consumption}} \times 100$$

Source of data

Municipalities may use option A or B or a mix of both. For instance, a municipality may use option A to gather data on energy renovation of municipal buildings and option B to gather data on the private residential sector. Municipalities must be transparent on the source of data used.

Option A – Starting from data at project level

Municipalities require pre works and post works EPCs* for specific projects – or actual monitored data for a minimum of 12 months. For ease, it is suggested municipalities initially use it for municipal buildings and social housing that they own and manage. This will provide a calculated – or actual - figure for the proposed reduction in final energy kWh at a project level which should be centrally recorded.

**Final (delivered) energy by source of energy is usually displayed on the results page of the EPC as kWh/sqm year (total and per usage). This will need to be cross referenced against the EPC Building Report which will state the floor area. If final energy is not available through the National EPC methodology primary energy may be used.*

Option B – Starting from data at municipal level

If gathering data at municipal level, the following methodologies may be used:

- Desegregation of national statistics to the municipal level
- Using data from your local / regional cadastre
- Using your national EPC database
  - Tertiary buildings: Any renovation works will generally be followed by a new lease, in which case a new EPC should be provided.
  - Private homes that are renovated with grant funding are likely to have a post renovation EPC with a calculated savings. This and the EPC database can be used to estimate reduction in kWh in private residential.

ADDITIONAL GUIDANCE

Private residential & tertiary buildings

- For private residential and tertiary buildings, encourage owners to have pre and post EPC as per above methodology.
- Grants can include a condition by making pre and post EPC a requirement to access public funding.

Actual data

- Once the Framework has been established the use of actual consumption data from projects should be recorded in the Framework. If using actual data, the energy consumption prior to the renovation works should be assessed (from actual meter readings on bills) for at least 12 months and compared against the energy consumption post works for another 12 months.
- Depending on how Article 13 of Directive 2010/31/EC has been transposed in your country, you may be able to use Display Energy Certificates (DECs) to capture information on actual energy use of public buildings. The gathering of data should also be facilitated in the future by the introduction of smart meters across member states.

Env. 4: Renewable Energy Production

DEFINITION

Increase in renewable energy generated and used on site as a result of energy renovation

EPBD 2018/844 Annex I, Point 2

UNIT OF MEASURE

Main Metric: kWh/yr from renewables as part of renovation projects

Sub Metric: % increase in kWh/yr from renewables as part of renovation projects

RELEVANCE

The provision of additional renewables for both electricity and heating will replace fossil fuels and associated CO_2 emissions with clean renewable energy. It also reduces energy dependence and provides security and diversification of energy supply.

OBJECTIVE

EUROPEAN UNION

The objective of the indicator is to capture data on the additional energy produced from renewable resources on site or nearby as a result of energy renovation.

The overall goal is to increase renewable energy sources consumption to 32% by 2030 - *Directive (EU) 2018/2001*.

COUNTRY

The UK has no overall targets for on-building renewables.

Scotland: 50% of overall energy consumption to be from renewable sources by 2030.

Wales & N Ireland: 70% of electricity to be from renewable sources by 2030.

CITY

Municipal targets vary.

Does your Local Authority have targets for renewable energy production?

METHODOLOGY

Calculate as the difference between the kWh generation from renewable resources on site or nearby before renovation works and after the renovation works. The calculation must be done over the agreed reporting period, ideally annually.

CALCULATION

Main Metric - Increase in kWh/year from renewables

Increase in kWh/year from renewables = Σ (Post Renovation kWh/year from renewables produced onsite or nearby - Pre renovation kWh/year from renewables produced onsite or nearby)

Sub metric - Percentage increase in kWh/year from renewables

$$\text{Percentage increase in kWh/year from renewables} = \frac{\text{Increase in kWh/year from renewables produced on site or nearby}}{\text{Total energy production kWh/year from renewables produced onsite or nearby}} \times 100$$

Source of data

Municipalities may use option A or B or a mix of both. For instance, a municipality may use option A to gather data on energy renovation of municipal buildings and option B to gather data on the private residential sector.

Option A – Starting from data at project level

Municipalities require pre works and post works EPCs* for specific projects – or actual monitored data for a minimum of 12 months pre and post renovation. For ease, it is suggested municipalities initially use it for municipal buildings and social housing that they own and manage. This will provide a calculated – or actual - figure for the proposed renewable energy in kWh at a project level which should be centrally recorded.

Option B – Starting from data at municipal level

If gathering data at municipal level, the following methodologies may be used:

- Desegregation of national statistics to the municipal level
- Using data from your local / regional cadastre
- Using your national EPC database
  - Tertiary buildings: Any renovation works will generally be followed by a new lease, in which case a new EPC should be provided.
  - Private homes that are renovated with grant funding are likely to have a post renovation EPC with a calculated savings. This and the EPC database can be used to estimate reduction in kWh in private residential.

**Renewables energy is usually displayed on the results page of the EPC as kWh/sqm. This will need to be cross referenced against the EPC Building Report which will state the floor area.*

ADDITIONAL GUIDANCE

Private residential & tertiary buildings

- For private residential and tertiary buildings, encourage owners to have pre and post EPC as per above methodology.
- Grants can include a condition by making pre and post EPC a requirement to access public funding.

Actual data

- Once the Framework has been established the use of actual consumption data from projects should be recorded in the Framework.
- If using actual data, the energy consumption prior to the renovation works should be assessed (from actual meter readings on bills) for at least 12 months and compared against the energy consumption post works for another 12 months. Depending on how Article 13 of Directive 2010/31/EC has been transposed in your country, you may be able to use Display Energy Certificates (DECs) to capture information on actual energy use of public buildings. The gathering of data should also be facilitated in the future by the introduction of smart meters across member states.

Env. UK1: EPC Ratings

DEFINITION

Tally of different EPC Ratings for all buildings including SAP scores and Environmental Impact Ratings

UNIT OF MEASURE

Main Metric: No. of dwellings / m2 of non-residential floor area for each EPC rating (A-G)

Sub Metric 1: Average SAP Score (1-100)

Sub Metric 2: Average EIR Score (1-100)

RELEVANCE

EPC ratings are used in UK energy efficiency and fuel poverty targets and EPCs are required in the UK when a building is constructed, sold or let. Whilst flawed - because they rely on modelled (not measured) data and use broad-brush assumptions - they do provide a crude assessment of a building's carbon emissions, irrespective of its location or occupancy, allowing buildings to be compared.

OBJECTIVE

EUROPEAN UNION

n/a

COUNTRY

England & Wales: All fuel poor and privately rented households to be EPC C by 2030. All households to be EPC C by 2035.

Scotland: All households to be EPC C by 2040.

CITY

Municipal targets vary.

Does your Local Authority have EPC targets beyond the national aims?

METHODOLOGY

This indicator can be used at a project or city level. At project leve the reporting period = pre renovation & post renvoation. At city level, the reporting period = annual. Obtain pre & post EPCs for all buildings renovated. Calculate number of dwellings / m2 of non-residential buildings for each ECP rating (A-G), average SAP and EIR scores across all buildings – and compare pre & post renovation results.

CALCULATION

Main indicator – EPC Rating

Impact on EPC ratings over reporting period to be shown in a table or graph as follows:

no. of residential units / m2 of non-residential floor area with EPC rating A at start and end of reporting period

no. of residential units / m2 of non-residential floor area with EPC rating B at start and end of reporting period

etc. up to EPC rating G

Sub indicator 1 – SAP Score (energy efficiency rating)

Impact on SAP score over reporting period = **Average SAP score of all buildings at end of reporting period** - **Average SAP score of all buildings at start of reporting period**

Sub indicator 2 – EIR Score (environmental impact rating)

Impact on EIR score over reporting period = **Average EIR score of all buildings at end of reporting period** - **Average EIR score of all buildings at start of reporting period**

Source of data

For both the main indicator and sub indicator, data can be found from EPC certificates, all of which are logged on the UK national Energy Performance of Buildings register: https://find-energy-certificate.digital.communities.gov.uk/ In the UK, EPCs are only legally required when a building is constructed, sold or rented. Not all properties therefore have an EPC.

When renovating a property, the framework requires EPCs to be obtained pre and post renovation. To encourage this, renovation grants/funding and any municipality led projects should demand pre & post EPCs.

Soc. 1: Energy Poverty

DEFINITION

Percentage of households living in renovated homes removed from risk of energy poverty post energy renovation

UNIT OF MEASURE

Percentage

RELEVANCE

As Recital 59 of the recast ***Electricity Directive*** recapitulates, energy poverty arises from a combination of low income, high expenditure on energy, and poor energy efficiency of dwellings. Therefore, it is a multidimensional phenomenon that must be approached comprehensively, where improving the building thermal quality through renovation is one of the key elements to tackle. With nearly34 million Europeans unable to afford to keep their homes adequately warm in 2018, energy poverty is a major challenge for the EU. Source:2018. Eurostat, Statistics on Income and Living Conditions (SILC).

OBJECTIVE

EUROPEAN UNION

The objective of the indicator is to assess the impact of energy efficiency renovation on reducing the risk of energy poverty.

COUNTRY

England: by 2030, all fuel poor households as reasonably practical to have an EPC C rating by 2030.

Wales: by 2035, not more than 5% of households to be living in fuel poverty at any one time as far as reasonably practicable.

Scotland: by 2040, not more than 5% of households to be living in fuel poverty.

CITY

Municipal targets vary.

Does your Local Authority have an energy poverty target?

METHODOLOGY

Calculate the percentage of energy renovation works which lead to a decrease in the number of households at risk of energy poverty. Ideally, this data should be compiled at municipal level on an annual basis. Municipalities are also encouraged to capture city-wide data within the Framework where they exist.

CALCULATION

$$\text{Percentage of households living in renovated homes removed from risk of energy poverty} = \frac{\Sigma\,(\text{Number of households at risk of energy poverty pre-renovation work} - \text{Number of households at risk of energy poverty post-renovation work})}{\text{Number of residential units renovated}} \times 100$$

Source of data

The definition of Energy Poverty varies between the four home nations - refer to glossary on p8 above.

EPC certificates will provide information about likely expenditure on fuel bills. Local Authorities can access postcode level household income information through the Office for National Statistics and organisations like Experian.

Municipalities may use options A or B or a mix of both. For instance, a municipality may use option A to gather data on energy renovation of the social housing stock they own and manage and option B to gather data at city level. The methodology used and any assumptions made must be fully disclosed and recorded.

Option A – Starting from data at project level

The municipality should collect the following data:

- number of residential units renovated during the project
- pre and post renovation EPCs for all units
- pre and post renovation postcode-level data on household income.

Option B – Starting from data at municipal level

The municipality should collect the following municipality-wide data:

- number of residential units renovated in a given reporting period
- number of households at risk of fuel poverty at start and end of reporting period (from Local Authority/national data)

ADDITIONAL GUIDANCE

Ensure the methodology used in the Framework to define households at risk of energy poverty remains fully aligned with the methodology developed and used at national level.

Encourage private social housing providers to capture data at project level when renovating their own stock.

Encourage municipalities to capture data on actual energy use (utility bills) and income for a minimum of 12 months pre and post energy renovation for the social housing they own (where possible).

Soc. 2: Indoor Air Quality

DEFINITION

Renovated building stock with improved Indoor Air Quality (IAQ) in the conditioned spaces.

UNIT OF MEASURE

Main Metric: No. of residential units or Non-residential floor area (m²)

Sub Metric: Percentage improvement

RELEVANCE

Europeans spend up to 90% of their time indoors. Indoor air pollution is a major environmental health and well-being concern as it can lead to serious health effects. The contaminants that are critical to IAQ are CO_2, carbon monoxide, particulate matter and volatile organic compounds (VOCs). Most indoor air pollution comes from sources inside the building. It is therefore key to control the sources of these contaminants and to ensure their removal through proper ventilation. Good ventilation is critical in well insulated and airtight buildings and must be considered as part of any energy renovation works.

OBJECTIVE

EUROPEAN UNION

The objective of the indicator is to provide safe buildings for people by eliminating the risks that might result in unintentionally reducing the indoor air quality as a result of carrying out energy renovation works.

To achieve the 55% emission reduction target by 2030, the EU should reduce buildings' final energy consumption by 14% and energy consumption for heating and cooling by 18% (Compared to 2015 levels).

Source: EU's Renovation Wave Strategy.

COUNTRY

The UK has no IAQ targets.

CITY

Municipal targets vary.

Does your Local Authority have targets for Indoor Air Quality?

METHODOLOGY

Calculate improvement in IAQ post energy renovation. This must be reported over an agreed reporting period, ideally annually. This indicator can be used initially at project level. Once it has been adopted and reported across a sufficient number of projects it can be reported at a city level.

CALCULATION

Main Metric - Renovated building stock with improved IAQ

No. of residential units with improved IAQ = Σ renovated units with adequate IAQ

Non-residential floor area (m²) with improved IAQ = Σ area of renovated buildings (m²) with adequate IAQ

Sub metric – Percentage of renovated building stock with improved IAQ

$$\text{Percentage of residential units with improved IAQ} = \frac{\Sigma \text{ renovated units with adequate IAQ}}{\text{Total no of units renovated}} \times 100$$

$$\text{Percentage of non-residential floor area (m}^2\text{) with improved IAQ} = \frac{\Sigma \text{ area of renovated buildings (m}^2\text{) with adequate IAQ}}{\text{Floor area (m}^2\text{)}} \times 100$$

Source of data

Municipalities may use option A, B, C, or a mix of them. In all cases, municipalities must be transparent on the methodology used and assumptions made.

Option A – Ventilation systems in compliance with National Building standards and PAS 2035/38

Count the dwellings and spaces in renovated buildings that comply with the predefined (theoretical) airflow rates required in the national building codes as well as PAS 2035 (for residential buildings) and PAS 2038 (for non residential buildings)*. The ventilation system should be commissioned to ensure it functions correctly - as per requirements in PAS 2035/38. This applies to both natural and mechanical ventilation systems.

**PAS 2035:2019 and PAS 2038:2021 are standards on retrofitting energy efficiency measures in buildings from the British Standards Institute.*

METHODOLOGY (cont.)

Option B – Occupant Survey

The indoor air quality is measured by occupant surveys pre and post renovations – ideally, 12 months post-renovation, once the building is occupied. Count the dwellings or area (m²) with improved air quality post energy renovation. The main reference standards for post occupancy surveys of indoor environments and user perceptions of comfort and well-being are ISO 10551 and ISO 28802. The survey methodology should clearly state the metrics of improvement.

References and examples:

- Survey developed by UKGBC for Leeds City Council as part of the Build Upon project (see Housing Project Data Collection Strategy under "Useful Guidance")
- BusMethodology
- *Center for the Built Environment - Harnessing Occupant's Insights - What we measure Survey developed for synikia project. (See appendix G of the document)*

Option C – In-situ monitoring on a sampling basis

CO_2 is a good proxy for IAQ as it can provide an indication of the ventilation rate in spaces used by people. In-situ monitoring measures the CO_2 level in units of parts per million (ppm). To consider that a space has an adequate IAQ, the measurements of CO_2 should not exceed the defined range (IEQII in table 1 or national requirement) by more than 5% of the occupied time**.

***Based on "Methodology framework for plus energy buildings and neighbourhood" (synikia innovation project)*

Table 1. CO2 concentrations per category assuming a standard CO2 emission of 20L/h per person (Source: EN ISO 16798-1-2019)

CATEGORY	CO_2 Concentrations above outdoor during full occupancy (outdoor levels assumed to be equal to 400 ppm)
IEQ I	≤ 550 ppm
IEQ II	> 550 ppm and ≤ 800 ppm
IEQ III	> 800 ppm and ≤ 1350 ppm
IEQ IV	> 1350

ADDITIONAL GUIDANCE

Encourage municipalities as per option A to carry out design of ventilation systems as per the National Building Code and PAS 2035/2038 and commissioned where applicable and include in the scope of works to the design team and installers.

Encourage municipalities as per option C to carry out in-situ monitoring on a sample of buildings, in particular a reasonable sample of social housing that do not have commissioned ventilation systems.

Soc. 3: Winter Thermal Comfort

DEFINITION

Renovated building stock with an improved winter thermal comfort (WTC) in all the conditioned spaces

UNIT OF MEASURE

Main Metric: no. of residential units or non-residential floor area (m²)

Sub Metric: Percentage improvement

RELEVANCE

Thermal comfort can improve people's health and well-being. Thermal comfort is defined by environmental parameters, like temperature, relative humidity and air velocity, and by personal parameters such as clothing, level of activity,gender and age, which affect a person's metabolic rate.

OBJECTIVE

EUROPEAN UNION

In 2018, nearly 34 million Europeans were unable to afford to keep their homes adequately warm. People in inefficient buildings are more exposed to cold spells, heatwaves and other impacts of climate change. Inadequate comfort in housing and work environments, such as inadequate indoor temperatures and deficient air quality, contribute to lower productivity, health problems and higher mortality and morbidity.

Source: EU's Renovation Wave Strategy.

COUNTRY

The UK has no thermal comfort targets, although the Housing Health & Safety Rating System addresses excessive cold in rented housing.

CITY

Municipal targets vary.

Does your Local Authority have thermal comfort targets?

METHODOLOGY

Calculate the number of renovated dwellings and areas (m², for non-residential) with adequate winter thermal comfort conditions established through the options below.

This must be done over an agreed reporting period, ideally annually. This indicator can be used initially at project level. Once it has been adopted and reported across a sufficient number of projects it can be reported at a city level.

CALCULATION

Main Metric - Renovated building stock with improved winter thermal comfort

- Residential

  No. of residential units with improved WTC = Σ renovated units with adequate WTC

- Non-Residential

$$\text{Non-residential floor area (m}^2\text{) with improved WTC} = \frac{\Sigma \text{ area of renovated buildings (m}^2\text{) with adequate WTC}}{\text{Total building renovated}} \times 100$$

Sub metric – Percentage of renovated building stock with improved winter thermal comfort

$$\text{Percentage of residential units with improved WTC} = \frac{\Sigma \text{ renovated units with adequate WTC}}{\text{Total area (m}^2\text{) of renovated buildings}} \times 100$$

$$\text{Percentage of non-residential floor (m}^2\text{) with improved WTC} = \frac{\Sigma \text{ area of renovated buildings (m}^2\text{) with adequate WTC}}{\text{Total area (m}^2\text{) of renovated buildings x 100}} \times 100$$

Source of data

Municipalities can use one or more of the following methods. In all cases, they must be transparent on the methodology used and the assumptions made.

METHODOLOGY (cont.)

Option A – Heating systems to National Building Code or EN 16798-1:2019
Count the number of renovated dwellings and m² in non-residential buildings that comply with the predefined (theoretical) indoor winter thermal comfort conditions as set in the national building code at design stage.

If the national building code has no clear requirements to ensure the winter thermal comfort at design stage, EN 16798-1:2019 reference can be taken, according to the Category II temperature ranges**. There is no standard stating the acceptable hours outside the comfort temperatures but 5% of annual occupied hours is sometimes referenced*****.

Option B – Occupant Survey

In this case the winter thermal comfort is determined based on the level of dissatisfaction with the thermal comfort conditions from post-occupancy surveys. These should be completed 12 months post-completion, once the buildings are occupied.

The main reference standards for post occupancy surveys of indoor environments and user perceptions of comfort and well-being are ISO 10551 and ISO 28802***.

References and examples:

- Survey developed by UKGBC for Leeds City Council as part of the Build Upon2 project (see Housing Project Data Collection Strategy under "Useful Guidance")
- *https://busmethodology.org.uk*
- *https://cbe.berkeley.edu/resources/occupant-survey/what-we-measure/ Survey developed for synikia project*.

Option C – In-Situ monitoring on a sampling basis**

Monitoring (hourly) data on the thermal conditions in a building can be used to assess the winter thermal comfort over a complete heating season. If the national building code establishes minimum requirements in relation to winter thermal comfort, they should be taken as reference for the monitoring.

As in option A, if the national building code has no clear requirements to ensure the winter thermal comfort at project stage, EN 16798-1:2019 reference can be taken according to the Category II temperature ranges. There is no standard stating the acceptable hours outside the comfort temperatures but 5% of annual occupied hours is sometimes referenced*****.

**The EN 16798-1:2019 is a non-obligatory standard and was developed to guarantee that well-being and comfort of building occupants is systematically taken into account when new and existing buildings are (re)designed to improve their energy efficiency.[1]*
***Based on Level(s) indicator 4.2 for Level 2*
****Level(s) indicator 4.1*
*****Based on Level(s) indicator 4.2 for Level 3*
******Regnier, Cindy. Guide to Setting Thermal Comfort Criteria and Minimizing Energy Use in Delivering Thermal Comfort. United States: N. p., 2012. Web. doi:10.2172/1169480*

ADDITIONAL GUIDANCE

It must be assumed that if there is no data on design of heating systems that no design and commissioning of the system took place and winter thermal comfort may be compromised post renovation.

Encourage municipalities as per option A to carry out an assessment of the requirements to ensure the winter thermal comfort at project stage.

Encourage municipalities as per option C to carry out on site testing on a sample of buildings to ensure adequate internal temperature is achieved. Thermal probes installed at sampling locations inside the building or for each representative residential property type. In residential buildings, at least the living rooms should be considered. For multi-family buildings, a sample of each distinctive configuration and orientation of apartments shall be assessed. In tertiary and public buildings, the reported performance shall apply to those spaces or zones that account for >10% of the total useful floor area of the building. Data shall be collected for 12-month post-renovation once the building is occupied******.

*******Based on Level(s) indicator 4.2 for Level 3*

Soc. 4: Summer Thermal Comfort

DEFINITION

Summer Thermal Comfort refers to the renovated building stock with limited overheating risks.

UNIT OF MEASURE

Main Metric: No. of residential units or non-residential floor area (m²)

Sub Metric: Percentage improvement

RELEVANCE

The frequency and severity of climate and weather extremes is increasing in Europe. Excess heat affects the health and well-being of occupants, especially if sleep is degraded. Factors such as climate change, increased urbanisation, high rise apartments and winter energy efficiency measures increase the overheating risk. To protect people's health and well-being, the objective of this indicator is to ensure energy renovation does not lead to an increase in overheating risk. The thermal performance of buildings during summertime is usually measured against a benchmark temperature that should not be exceeded for a certain number of hours during an annual occupied period.

OBJECTIVE

EUROPEAN UNION

Extreme weather and long-lasting climatic changes can damage buildings and their mitigation potential, e.g., solar panels after hailstorms. It can also impact people's comfort and well-being. The Commission is exploring options to better predict climate-induced stress on buildings and to integrate climate resilience considerations into the construction and renovation of buildings.

Source: EU Climate Adaptation Strategy (2020).

COUNTRY

The UK has no thermal comfort targets, although the Housing Health & Safety Rating System addresses excessive heat in rented housing.

CITY

Municipal targets vary.

Does your Local Authority have thermal comfort targets?

METHODOLOGY

Count the number of renovated dwellings and (m²) in non-residential buildings that achieve adequate summer thermal comfort as per options below.

This should be done over an agreed reporting period, ideally annually.

This indicator can be used initially at project level. Once it has been adopted and reported across a sufficient number of projects it can be reported at a city level.

CALCULATION

Main Metric – Renovated building stock with improved summer thermal comfort

- Residential
  No. of renovated residential units assessed with improved summer thermal comfort = Σ renovated units achieving adequate summer thermal comfort
- Non-Residential
  Non-residential floor area (m²) with improved summer thermal comfort = Σ area of renovated buildings (m²) achieving adequate summer thermal comfort.

Sub metric

$$\text{Percentage of residential units assessed with improved summer thermal comfort} = \frac{\Sigma \text{ residential units assessed which achieve adequate summer thermal comfort}}{\text{Total building renovated}} \times 100$$

$$\text{Percentage of Non-residential floor (m}^2\text{) assessed with improved summer thermal comfort} = \frac{\Sigma \text{ area of renovated buildings which achieve adequate summer thermal comfort}}{\text{Total area of renovated buildings x 100}} \times 100$$

Source of data

Municipalities can use one or more of the following methods. In all cases, municipalities must be transparent on the methodology used and any assumptions made.

METHODOLOGY (cont.)

Option A – National Building Code Standard / CIBSE TM52

This option is based on the assessment of the theoretical overheating risk at design stage. Compliant dwellings and spaces (m²) in renovated buildings are those below the benchmark (theoretical) of overheating criterion establishedin the national building code. If there is no definition in the national building code, CIBSE TM52 reference (TM59 for homes) can be used.

Option B – Occupant questionnaire

In this case post-occupancy surveys are used to determine the level of dissatisfaction with summer thermal comfort post energy renovation. These should be completed 12 months after renovation, once the building is occupied.

The main reference standards for post occupancy surveys of indoor environments and user perceptions of comfort and well-being are ISO 10551 and ISO 28802*.

References and examples:

- Survey developed by UKGBC for Leeds City Council as part of the Build Upon2 project (see Housing Project Data Collection Strategy under "Useful Guidance")
- *https://busmethodology.org.uk*
- *https://cbe.berkeley.edu/resources/occupant-survey/what-we-measure/ Survey developed for synikia project. Appendix G*

Option C – In-situ monitoring on a sampling basis

(Hourly) monitoring of the thermal conditions in a building can be used to assess if overheating is occurring. National criteria should be taken as reference for defining when overheating occurs. If there is no definition in the national building code, CIBSE TM 52 reference (TM59 for homes) can be used.

**Level(s) indicator 4.1*

ADDITIONAL GUIDANCE

It must be assumed that if there is no data on design of heating systems that no design and commissioning of the system took place and summer thermal comfort may be compromised post renovation.

Encourage municipalities as per option A to assess limiting heat gains to national regulations or CIBSE TM59 for Residential units / CIBSE TM52 for non-residential buildings.

Encourage municipalities as per Option C to carry out on site testing on a sample of buildings to ensure adequate internal temperature is achieved. Thermal probes should be installed at sampling locations inside the building or each representative residential property type. In residential buildings, at least the living rooms should be considered. For multi-family buildings, a sample of each apartment's distinctive configuration and orientation shall be assessed. In tertiary and public buildings, the reported performance shall apply to those spaces or zones that account for >10% of the total useful floor area of the building. Data shall be collected for 12-month post-renovation once the building is occupied**.

***Based on Level(s) indicator 4.2 for Level 3.*

Soc. UK1: Climate Resilience

DEFINITION

Number and % of buildings where flood resilience has been addressed as part of a retrofit.

UNIT OF MEASURE

Main Metric: No. of residential units or non-residential floor area (m²)

Sub Metric: Percentage of residential units or non-residential floor area (m²)

RELEVANCE

In the UK, 1 in 6 homes are considered at risk of flooding. This is predicted to rise to 1 in 3 by 2050. Energy efficiency renovation provides an opportunity to address the three R's of flood resilience: reduction (reducing the likelihood of flooding), resilience (ensuring buildings are more robust if flooded) and reinstatement (ensuring buildings can be easily reinstated post flooding). Similarly, repairing a building that has been flooded provides an opportunity to address not just flood resilience but improved energy efficiency and comfort.

OBJECTIVE

EUROPEAN UNION

The new EU Strategy on Adaptation to Climate Change (2021) highlights the need to do more to prepare Europe's building stock to withstand the impacts of climate change. More specifically, it states that the Commission will explore options to better predict climate-induced stress on buildings and to integrate climate resilience considerations into the construction and renovation of buildings through Green Public Procurement criteria for public buildings, the Digital Building Logbook, and as part of the process to revise the Energy Performance of Buildings Directive and the Construction Products Regulation.

The Renovation Wave (2020) also identifies climate resilience as a key principle.

COUNTRY

The UK has no flood resilience targets.

CITY

Municipal targets vary. Does your Local Authority have flood resilience targets or strategies?

METHODOLOGY

Flood resilience is deemed to have been addressed if a property has been assessed in accordance with the CIRIA Code of Practice for Property Flood Resilience (February 2020) - and measures implemented where necessary.

This indicator can be used at a project or city level. At a project level, a contractor questionnaire can be used to determine whether the CIRIA Code of Practice has been employed. The reporting period is pre and post renovation.

At a city level, the reporting period is defined by the Local Authority and is ideally annually. Data can be collated from multiple individual projects across the Local Authority to build up a city-wide picture of flood resilience over time.

CALCULATION

Main Metric – renovated building stock with flood resilience

Soc UK1 Indicator, main residential metric = **No. of renovated dwellings where flood resilience has been addressed**

Soc UK1 Indicator, main non-domestic metric = **Area of renovated non-domestic buildings where flood resilience has been addressed**

Sub metric - % of renovated building stock with flood resilience

$$\text{Percentage of renovated dwellings where flood resilience has been addressed} = \frac{\text{No. of renovated dwellings where flood resilience has been addressed}}{\text{Total no. of dwellings renovated}} \times 100$$

$$\text{Percentage of non-residential floor area (m}^2\text{) where flood resilience has been addressed} = \frac{\Sigma \text{ area of renovated non-domestic buildings where flood resilience has been addressed}}{\text{Total area of renovated buildings}} \times 100$$

Eco. 1: Investment in Energy Renovation

DEFINITION

Total amount of money invested in energy renovation projects within the boundary of a municipality each year (or in a specific project/initiative).

UNIT OF MEASURE

Main Metric: £ – with breakdown of private/public investment

Sub Metric:

- £/residential unit (and/or m²) renovated
- £/m² of non-residential space renovated

RELEVANCE

In economic terms it is very relevant to capture accurate information on how much money is invested annually in energy renovation at municipal and national level, and where this money comes from (public or private investment).

OBJECTIVE

EUROPEAN UNION

To meet the 2050 climate targets, the European Commission estimates that €185 bn must be invested annually in energy renovation in the EU.

COUNTRY

The National governments have between them committed £bns of retrofit funding and the UK government expects around £11bn of private investment in 'greening buildings' during the 2020s *

** HM Government: The Ten Point Plan for a Green Industrial Revolution, November 2020*

CITY

Municipal funding varies.

Does your Local Authority have targets for public and private investment in building renovation?

METHODOLOGY

Calculate investment/money spent on renovation projects that have been completed within a given reporting period, ideally a year. All energy renovation costs associated with the projects are to be included. The Energy Efficiency Investment table under "Useful Guidance" sets out what should/should not be included as energy renovation costs.

Investment/money spent on projects not completed during that reporting period/year should not be included. Large projects with phased completion stages can include the different stages if that section of the project is fully complete and the costs can be itemised.

VAT may be included or excluded and this needs to be clearly stated.

Municipalities must be fully transparent on the methodology used and assumptions made.

CALCULATION

Main Metric

Total investment in energy renovation (£*) = Σ £ spent on completed energy renovation projects

Provide the following breakdowns:

- where money comes from - private and public (including subsidies) investment
- where money is spent - local (regional), national (UK) and international spending

Sub metric

- Residential

$$\text{Investment costs of energy renovation per residential unit and/or m}^2 = \frac{\Sigma\ £\text{ spent on energy renovation of residential buildings}}{\Sigma\ \text{Units and/or m}^2\text{ renovated}} \times 100$$

With breakdown for social and private housing.

- Non-Residential

$$\text{Investment costs of energy renovation per m}^2\text{ renovated} = \frac{\Sigma\ \text{Investments on energy renovation of non-residential buildings}}{\Sigma\ \text{renovated area (m}^2)} \times 100$$

With breakdown for public and tertiary buildings.

**When using national currency, please convert the total amount into €, at the average of the daily exchange rates published in the C series of the Official Journal of the European Union, calculated over the corresponding reporting period. Please see Appendix 1 for further information.*

METHODOLOGY (cont.)

Source of data

Municipalities may use option A or B or a mix of both. For instance, a municipality may use option A to gather data on projects of municipal buildings and option B to gather data on the private residential sector. Municipalities must be transparent on the methodology used and any assumptions made.

Option A – Starting from data at a project level

Municipalities will pay for completed works (municipal buildings and social housing) and should use these figures to calculate the investment in renovation projects.

Private homes and tertiary buildings that are renovated with grant funding are likely to have total costs available too.

Option B – Starting from data at municipal level

If gathering data at municipal level, the following methodologies may be used:

- Desegregation of national statistics to the municipal level (this may require an agreement with your national statistics office and/or energy agency).
- Using data from your local / regional cadastre and/or data from planning permits.

ADDITIONAL GUIDANCE

Social Housing

All renovation works, and associated costs should be centrally recorded within the local authority.

Public Buildings

All renovation works, and associated costs should be centrally recorded within the local authority.

Private housing and tertiary buildings

- Where possible, municipalities and central government are encouraged to capture accurate data on private energy renovation investment, including on the financial mechanisms used. E.g., low interest loans, green mortgages, and bonds.
- Depending on countries, two alternative methodologies could be used to estimate these investments. The exact methodology may vary depending on local and national circumstances.
  - Option 1 is to capture data on grants allocated for renovation of these buildings and to estimate what percentage of contractors' renovation works relate to energy renovation projects which have received state or municipal subsidies and to extrapolate from there.
  - Option 2 is to retrieve this information from planning permits (this may only work in some jurisdictions).
- In future, municipalities may consider tracking where the money goes. I.e., if it is spent locally, nationally, or on imports. At a project level, this information can be gathered from the contractors and consultants. E.g., through the use of a contractor questionnaire (See appendix 2 for an example).

Eco. 2: Cost Efficiency of Energy Reductions

DEFINITION

Energy consumption saved for each thousand £ invested in energy renovation.

UNIT OF MEASURE

Main Metric: kWh saved for each thousand £ invested

Sub Metric: kWh/m²/yr saved for each thousand £ invested

RELEVANCE

Linking two key parameters of an energy renovation, energy savings (Env. 3) and monetary investment (Eco. 1) allows analysis of the energy efficiency of an investment and its cost-effectiveness. This indicator is critical to ensure value for money is delivered. It should also support municipalities in making a better business case for energy renovation. Furthermore, it will capture any reduction in energy renovation cost.

OBJECTIVE

Although no specific targets have been set at European, national or municipal level, the overall objective is to ensure a highly competitive and innovative energy renovation sector is developed and maintained.

A 2020's report by the European Court of Auditors highlighted that greater focus on cost-effectiveness is needed in relation to energy efficiency in buildings. Read more.

METHODOLOGY

Calculate the final energy saved (Env. 3) in a given reporting period (ideally annually) through energy renovation per thousands of £ invested (Eco. 1).

CALCULATION

Main Metric

$$\text{Energy efficiency of investment (kWh saved for each thousand £ invested)} = \frac{\Sigma \text{ Final energy consumption reduction (Env. 3) in kWh/year}}{\Sigma \text{ Investment in energy renovation (Eco. 1 in £) / 1000}}$$

With breakdown per building type.

Sub metric (Optional)

$$\text{Energy efficiency of the investment per m² (kWh/m²/year saved for each thousand £ invested)} = \frac{\Sigma \text{ Final energy consumption reduction (Env.3) in kWh/year / } \Sigma \text{ Renovated floor area (m²)}}{\Sigma \text{ Investment in energy renovation (Eco. 1 in £) / 1000}}$$

With breakdown per building type.

Source of data

When using the Framework, this figure will be automatically calculated based on the data inputted in Env. 3 (Energy Consumption) and Eco. 1 (Investment in Energy Renovation).

** When using national currency, please convert the total amount into €, at the average of the daily exchange rates published in the C series of the Official Journal of the European Union, calculated over the corresponding reporting period. Please see Appendix 1 for further information.*

ADDITIONAL GUIDANCE

See additional guidance for Env. 3 (Energy Consumption) and Eco. 1 (Investment in Energy Renovation).

Eco. 3: Jobs in Energy Renovation

DEFINITION

Direct jobs in energy renovation

UNIT OF MEASURE

Full time equivalent (FTE)

RELEVANCE

Supporting jobs is a key benefit of investing in energy renovation. Increased demand for energy efficiency services and technologies have proven to create a large number of local jobs*. For every €1 million invested in energy renovation of buildings, an average of 18 jobs are created in the EU**. The objective of the indicator is to support municipalities and central government in making a better business case for renovation, by showing the positive impact of energy renovation programmes on the jobs market. This is highly relevant in the context of the Covid-19 pandemic and as part of the economic recovery plans.

Sources:

** Burr, A. Majersik, C. Stelburg, S. and Garrett-Peltier, H. (2012). Analysis of job creation and energy cost savings: from building energy rational and disclosure policy.*

*** Renovate Europe - **Building Renovation: a kick-starter for the EU economy – Renovate Europe** (renovate-europe.eu).*

OBJECTIVE

There are no specific targets set at European, national or local level for this indicator. However the UK government anticipates that 'greening buildings' will support 50,000 jobs by 2030.*

** HM Government: The Ten Point Plan for a Green Industrial Revolution, November 2020*

METHODOLOGY

Calculate the direct jobs (FTE) in energy renovation in a given reporting period. Ideally, this should be a year.

CALCULATION

Depending on the municipality's objectives and resources available, municipalities may use option A or B or a mix of both. In all cases, municipalities must be transparent on the methodology and data set used. Any assumptions made should be fully disclosed and recorded.

Option A – Starting from data collected at project level

Direct jobs in energy renovation (FTE) in a reporting period = Σ Labour days (FTE) for energy renovation projects in the reporting period.

Option B – Starting from data at municipal level

$$\text{Direct jobs in energy renovation (FTE) in a reporting period} = \frac{\text{Eco.1 - Investment in energy renovation in the reporting period}}{1000} \times \text{Direct jobs proportion} \times \text{Direct jobs in energy renovation multiplier}$$

Direct jobs proportion = 0.33

Direct jobs in energy renovation multiplier = varies (use values from local studies or C40 default values noted below)

Option B is aligned with the C40 indicator (and methodology) on energy renovation and job creation. See below for further details.

Source of data

Option 1 – Starting from data at project level
Municipalities collect data on number of FTE working on specific projects through a contractor questionnaire – See Appendix 2. Appendix 1 may also be used to track what relates to energy renovation. For ease, it is suggested that municipalities initially use it for municipal buildings and social housing that they own and manage. This will provide a figure at a project level which should be centrally recorded.

METHODOLOGY (cont.)

Option 2 – Starting from data at municipal level
The effect on jobs can be calculated by applying multipliers to investment in energy renovation (Eco. 1). This methodology is based on the *C40, 2020 - The multiple benefits of deep retrofits - A tool kit for cities*.

The indicator used to calculate job creation is based on full-time equivalent (FTE) jobs per million £ spent. Employment creation is calculated across all building typologies. Expenditure is based on the capital cost of the energy renovation programme (Eco. 1) and employment opportunities have been proportioned between direct, indirect and induced job creation.

Direct jobs proportion
- The focus in the Build Upon Framework is on direct local jobs, i.e., jobs created as a result of the intervention (e.g., working on the construction site). C40 have estimated that direct jobs proportion is approximately 33% (0.33 in above calculation).

Direct jobs in energy renovation multiplier
- Where local studies detailing the impact of energy renovation on jobs creation are available, data from these studies should be used and inputted as multiplier numbers.
- Where a municipality does not have local studies detailing the impact of energy renovation on jobs creation, the following default values should be used:
  - Total jobs created - lower bound (FTE per million €): 12.8
  - Total jobs created - median (FTE per million €): 17.12
  - Total jobs created - upper bound (FTE per million €): 26.3

  (These values come from C40 literature review)

This will allow a municipality to obtain an estimate range of the direct jobs created (between the lower and the upper band).

Example:

A municipality invests £30 million in energy renovation. Using the default values, direct jobs in energy renovation in the reporting period can be estimated to be between 127 and 260 FTE.

Calculation:
- Lower bound: (30,000,000/1,000,000) x 0.33 x 12.18 = 127
- Upper bound: (30,000,000/1,000,000) x 0.33 x 26.3 = 260

Please see the Framework spreadsheet for further details.

Source: The methodology is based on the C40, 2020 - The multiple benefits of deep retrofits - A toolkit for cities.

Eco. 4: Upskilling in Energy Renovation

Main metric to be used at national or regional level. Sub-metric to be used at municipal level.

DEFINITION

Number of building professionals and construction workers who upskill in energy renovation annually, including municipal staff.

UNIT OF MEASURE

Main Metric: Number of building professionals and construction workers upskilled in energy renovation

Sub Metric: Number of municipal employees upskilled in energy renovation

RELEVANCE

The building sector offers a large untapped potential for cost-effective energy savings. The most challenging aspect of reducing energy use in the building sector lies in increasing the rate, quality and effectiveness of building renovation, since the current rate of renovation is only 1.2 % per year. One significant barrier that hampers the development of effective renovations is the lack of adequate construction skills. Improving the skills of middle- and senior-level building professionals as well as the various trade professionals in the area of sustainable energy-efficient construction is therefore of key importance.

Source: Construction skills: Equipping building professionals with new skills to achieve European energy targets | H2020 | Results Pack | CORDIS | European Commission (europa.eu).

OBJECTIVE

There are no specific targets set at European, national or local level for this indicator.

METHODOLOGY

This indicator cannot be used at a project level. The information is to be captured at national or regional level. What constitutes 'upskilling in energy renovation' has been defined by the Irish Green Building Council. Refer to Appendix 9 of *Developing a comprehensive Energy Renovation Register" (IGBC, LIT, 2020).*

Main metric: Calculate the number of building professionals and construction workers who have upskilled in energy renovation in a reporting period, ideally annually.

Sub-metric: Calculate the number of building professionals and construction workers employed by the municipality who have upskilled in energy renovation in a reporting period, ideally annually.

CALCULATION

Main Metric

Upskilling in energy renovation = Σ building professionals and construction workers who have upskilled in energy renovation in the reporting period

Sub Metric

Upskilling in energy renovation (municipality employees) = Σ building professionals and construction workers employed by the municipality who have upskilled in energy renovation in the reporting period

Source of data

Local Authorities can obtain some information from

- Trustmark: provides nation-wide information on TrustMark Scheme Providers
- Retrofit Academy: provides nation-wide information on Retrofit Coodinators

In addition, Local Authorities can obtain information through business surveys run by LEPs or city authorities and liaise with local training and higher education providers.

Municipalities must be fully transparent on methodology and data source, if any assumptions are made these must be fully disclosed and recorded.

As an example, the process followed in Ireland is described below (Case Study - How this data is captured in Ireland).

CASE STUDY – HOW THIS DATA IS CAPTURED IN IRELAND

This section details the step-by-step approach that was taken in Ireland to gather this data.

Step 1: Develop a comprehensive list of building professionals and construction workers involved in energy renovation.

Step 2: Identify key skills and competences for each category of building professionals and construction workers identified in step 1*.

Step 3: Identify training courses that allow building professionals and construction workers to gain these skills and competences. In Ireland, it was agreed to only capture data on accredited courses. **

Step 4:

- Main metric: Central/regional government to liaise with providers of courses identified in step 3 to get number of building professionals and construction workers who have completed them in a reporting period.
- Sub metric: Municipality (HR Department) to capture data on number of construction workers and building professionals employed by the municipality who have completed these courses in a reporting period.

Note: A multidisciplinary steering group made up of central government representatives, professional bodies, industry and academia was set up to support the Irish Green Building Council with steps 1, 2 and 3.

**For further information on key skills and competencies identified for each category of building professionals and construction workers in Ireland. please see appendix 9.a of "Developing a comprehensive Energy Renovation Register" (IGBC, LIT, 2020)*

***See appendices 9.b and 9.c of "Developing a comprehensive Energy Renovation Register" (IGBC,LIT, 2020) for further information.*

Eco. 5: Financial Savings from Energy Renovation

DEFINITION

Total financial cost savings for end-users per year based on savings on heating, cooling and DHW, carbon tax (when applicable), and the usable contribution from renewable energy systems.

UNIT OF MEASURE

Main Metric: £

Sub Metric:

- £ / number of residential unit renovated
- £ /m² of non-residential buildings renovated

RELEVANCE

One dimension of value creation by renovation is the extent to which the project generates cost savings for end-users. Energy renovation should not be only presented and perceived as a cost but as a financial benefit, which can be an important trigger for the user acceptance and the market uptake.

OBJECTIVE

No specific targets set at European, national or municipal level. A 2020's report by the European Court of Auditors highlighted that greater focus on cost-effectiveness is needed in relation to energy efficiency in buildings. ***Read more***.

METHODOLOGY

Calculate the total financial savings as a result of the energy renovation. This methodology can be cross referenced to the Env. 3 – Final Energy Consumption Indicator.

Only projects completed during the reporting period (ideally annually) should be included. Large projects with phased completion stages can include the different stages if that section of the project is fully complete and the costs can be itemised.

This indicator can be used initially at project level. Once it has been adopted and reported across a sufficient number of projects it can be reported at a city level.

Savings in energy bills and carbon taxes, as well as any incomes made from newly installed renewables should be included where applicable. Municipalities must be fully transparent on the methodology and data set used. Any assumptions made must be fully disclosed and recorded.

Main Metric

Total financial savings in £ from energy renovation projects = Σ £ savings on utility bills + Σ £ savings on carbon taxes + Σ £ income from on-site renewables

With breakdown for residential, social housing, public and tertiary buildings.

Sub metric

- Residential (private and social):

$$\text{Average financial savings from energy renovations per residential unit} = \frac{\Sigma \text{ Savings from energy renovated residential buildings}}{\Sigma \text{ Units renovated}}$$

With breakdown for social and private housing.

- Non-Residential

$$\text{Average financial savings from energy renovations per m}^2 = \frac{\Sigma \text{ Savings from energy renovated non-residential buildings}}{\Sigma \text{ Units renovated (m}^2\text{)}}$$

With breakdown for public and private buildings.

Source of data

Data at project level

Ideally, actual energy bills over a 12-month period pre and post renovation (once the building is occupied) should be used. This will cover all savings on heating, cooling and DHW, carbon tax (when applicable), and the usable contribution from renewable energy systems.

Alternatively, data on delivered energy (disaggregated per type, e.g., electricity, natural gas and biomass) should be available from the pre and post renovation EPCs. Data on any energy exported to the grid should also be calculated based on the EPCs. National average energy tariffs for each type of energy applied to the corresponding energy import/export, and carbon tax rates - where applicable, should then be used to calculate the financial savings.

ADDITIONAL GUIDANCE

Social Housing

A sample of house types should be assessed for 12 months pre and post renovation (once the homes are occupied) to ensure that actual energy bills reduction is in line with calculated figures from EPCs.

Public Buildings

Actual energy bills should be monitored for 12 months pre and post-renovation (once the buildings are occupied) to ensure that financial savings are realised.

Private housing and tertiary buildings

Actual energy bills pre and post renovation should be assessed (once the buildings are occupied) on a sample of buildings to verify the calculated savings.

Degree Days

Once established a financial saving sub metric should be introduced which will include reference to degree days. Weather data will be required for 12 months pre retrofit and post retrofit using the same base temperature. Corresponding meter readings over the same period will be used to calculate € saved per/year. The following data can then be extrapolated:

$$\text{Savings in €/degree day} = \frac{\text{(pre-retrofit €/degree day) - (post-retrofit €)}}{\text{degree day}}$$

This information can be used to verify that the actual savings are not skewed by extreme weather events which are more likely going forward.

The BUILD UPON Framework will help monitor impacts and progress

"Cork City Council will retrofit 2,700 social houses by 2030. The BUILD UPON Framework is a fantastic opportunity to better monitor the impact of this programme on our climate targets and to exchange best practices with fellow European Local Authorities."

Brian Cassidy - Senior Engineer - Cork City Council

"By integrating the environmental, social and economic indicators into our energy efficiency renovation tenders, the analysis of the impact of the implemented renovations will be based on several interrelated data, giving a much more accurate picture of the results achieved."

Györgyi Újszászi - Environmental and Sustainability Senior Officer, Urban Management and Investment Office - Budapest I. District Budavár Municipality

"The BUILD UPON Framework allows improved coordination on energy renovation between different levels of government. Cities are provided with a set of indicators to measure their building renovation programmes, paving the way towards more holistic monitoring of progress towards the targets set out in our Long Term Renovation Strategy."

Eduardo de Santiago - Technical Advisor at the Sub-directorate General for the Urban Agenda - Ministry of Transport Mobility and the Urban Agenda (MITMA), Spain

Case Studies

- **Pilot City Examples**
- **Building on Existing Tools**

Pilot City Examples

Using the Framework at a city level

Budavar (Hungary) and Padova (Italy) have used the BUILD UPON Framework to develop their Sustainable Energy and Carbon Action Plans (SECAPs).

For further info see 'Report on best practice initiatives to support the implementation of the Framework' (D3.4)

Budavar has incorporated all of the Framework's environmental, social and economic indicators - except Eco.3 Jobs and Eco.4 Upskilling - into its recent SECAP.

Padova's SECAP includes most of the Framework's environmental and economic indicators. Padova's SECAP sets out 116 climate mitigation and adaptation actions. The Framework was used to both develop those actions and to define how these actions and their impacts will be measured.

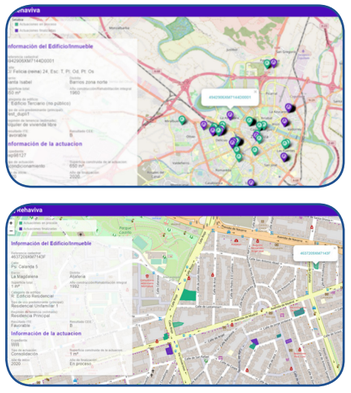
Using the Framework at a project level

In contrast, Leeds (UK) has decided to use the BUILD UPON Framework to measure the impact of three large housing renovation projects run by Leeds City Council. They are collecting pre- and post-renovation data that will allow all of the Framework's project level indicators to be measured. On completion of the projects, data from EPCs and questionnaires will enable an interim assessment of these projects' impacts. One year post completion, a final assessment will be made using data from energy meters. The findings will be used primarily to inform future renovation projects.

Back-to-back terrace houses to be renovated by Leeds City Council, Holbeck, Leeds

Using project level information to build a city wide picture - Rehaviva tool

Two Spanish cities (Valladolid and Zaragoza) have come together to create a digital monitoring tool that collates energy renovation data across the cities. Rehaviva is an open data tool into which municipal and private organisations can input data about their renovation projects. Users register their building and input information about the project including the measures undertaken, costs and energy data. The tool then automatically calculates the impacts of six of the Framework's environmental and economic indicators. The information - for both planned and completed projects - can be seen on a city map and is publicly accessible. Over time a picture will be built up of the impacts of renovation projects across the two cities in a fully transparent manner.



Maps from Rehaviva tool showing planned (green) and completed (purple) renovation projects

Building on Existing Tools

Integrating the Framework into existing initiatives

Integrating the BUILD UPON Framework into existing resources makes the most of information that is already being collected. This reduces the burden of using the Framework whilst simultaneously making the original resource much more valuable. Examples include:

For further info see 'Report on best practice initiatives to support the implementation of the Framework' (D3.4)

Croatia: National ISGE system collects both automated and manually inputted energy data.

Hungary: Budaors city's Energy Management System automatically collates and analyses energy & weather data on municipal buildigs.

Ireland: The private Energy Elephant app collects energy and cost data from utility bills. Organisations can track their energy usage, energy costs and carbon emissions and benchmark against peers.

Spain: Our City Our Energy app collects energy, water and cost data from municipal utility bills. Both the general public and municipalities can see how public buildings are performing. Used by 24 Spanish municipalities.

How could the BUILD UPON Framework be integrated into tools like these?

Automated Collection of Energy Data

These tools could be expanded to collect information on indoor air quality and thermal comfort AND note when renovation works take place.This would provide valuable insight into the health and comfort of buildings AND the impacts of renovation projects.

Ireland: RetroKit app provides cost/benefit analysis of energy renovation scenarios to help housing providers decide on renovation projets. It uses EPC data, stock condition surveys, occupancy information and socio-economic data.

Spain: Mirador is a publicly accessible, map-based, data viewer that provides information about central government buildings' energy use and emissions. It uses EPC data.

EPC Based Resources

These tools could include both pre- and post-renovation information so that the renovation impacts can be seen. EPCs could be improved to include IAQ and thermal comfort elements.

Spain: When applying for a building permit for new-build/ renovation/demolition work a questionnaire must be completed, which details the works to be carried out. This data is aggregated at regional and national levels.

UK: The PAS2035 retrofit standard is mandatory for all publicly funded domestic renovation projects. Information must be uploaded onto a national database and simple post-renovation monitoring undertaken.

Building/Renovation Permits

Spain's questionnaire could be improved to include EPC data and PAS2035 monitoring expanded to collect data on energy usage, IAQ and thermal comfort. Both could be digitalised to aid mass data analysis.

The BUILD UPON Framework will help build vital partnerships

"In order to realise the potential of the building sector in meeting ambitious energy and climate goals, we need constant stakeholder dialogue on long-term renovation strategies. BUILD UPON offers stakeholders across all levels of governance a platform to work together to develop and implement impactful solutions to our shared renovation challenge."

Irena KrizŠelendic - Head of Sector for Energy Efficiency in Buildings - Ministry of Construction and Physical Planning, Croatia

"E.ON firmly believe that the private sector has a key role to create the right partnerships and products that will help government and cities deliver on their climate ambitions. BUILD UPON is the perfect forum to create these partnerships and networks and test the most impactful solutions."

Marco Marijewycz - Global Business & Market Developer for Home Energy Solutions - E.ON

"The ambitious and comprehensive BUILD UPON energy renovation framework is a great incentive for local government units to increase the scope of monitoring the quality of renovation projects and create useful networks with key actors in attaining quality data."

Gordana Mikulčić Krnjaja - Head of Urbanization and Environmental Protection Sector - Velika Gorica

Useful Guidance

- **Guidance for policy makers and Framework users**

Guidance for Policy Makers and Framework Users

For publicly accessible guidance, click on the icons to access the guidance.

For other guidance (shown in green), click on the icons to contact a Green Building Council for further information.

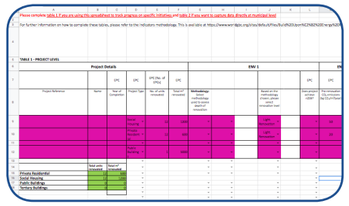
General Guidance

BUILD UPON Framework. Capturing the Benefits of Building Renovation. Generic Methodology

This pdf document details how each indicator should be measured: what data needs collecting, when and how. This is the general methodology for use across Europe. For national methodologies, go to the individual national green building councils' websites.

BUILD UPON Framework Template

This excel spreadshеet can be used to collate data in one place. It automates some of the data analysis. Both city-level and project-level data can be inputted. At a project level, data from multiple projects can be inputted.



BUILD UPON Framework: Specification for a Digital Tool

This pdf document provides a template specification for any nations/ regions/cities looking to create their own digital tool for the Build Upon Framework.

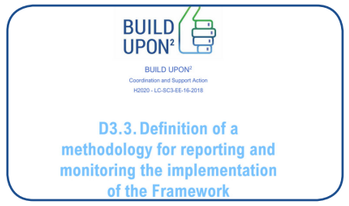
Contact WorldGBC who can provide further information

Report on Best Practice Initiatives to Support the Implementation of the Framework

This pdf report gives pilot city casestudies and outlines existing data collection and communication initiatives across Europe that could be adapted to integrate the Framework. See also the Casestudies page.

Definition of a Methodology for Reporting & Monitoring the Implementation of the Framework

This pdf report defines the actions cities and local authorities need to undertake in order to adopt or integrate the Build Upon Framework into their regular reporting practices.

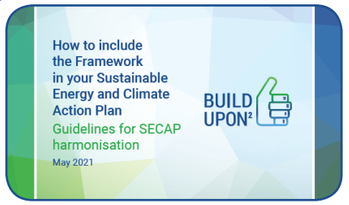


Capacity building and training materials for follower cities to adopt the framework (D4.2)

Training materials - powerpoint presentations and recorded webinars - have been prepared by Climate Alliance (in English) and local Green Building Councls (in their local language) to aid those wishing to introduce or train others to/about the BUILD UPON Framework.

Contact Climate Alliance or your local Green Building Council who can provide further information

Using the Framework at a city level?



How to include the Framework in your Sustainable Energy and Climate Action Plan. Guidelines for SECAP Harmonisation. May 2021 (D4.6)

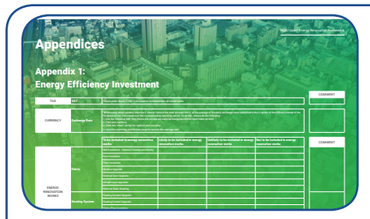
This pdf document outlines the alignment between SECAPs and the Build Upon Framework, to facilitate the setting up and monitoring of SECAPs' building renovation targets.

Contact GBC Italia who can provide further information

Example agreement between pilot city Padova and local Energy Companies

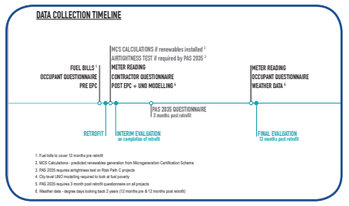
This agrement between the city of Padova and private energy companies sets out what is expected of both parties with respect to sharing data on energy consumption.

Using the Framework at a project level?



Energy Efficiency Investment table (Appendix in D2.9)

This pdf 2-pager lists out what construction works can be considered 'energy renovation works' and should be included in cost calculations for Eco.1 - Investment in Energy Renovation.



Housing Project Data Collection Strategy

This pdf document sets out the 7 types of data required to measure all the project-level indicators, and when it should be collected. It provides contractor and pre- and post-retrofit occupant questionnaires so social indicators can be assessed where IAQ and thermal monitoring isn't possible. Suitable for housing projects.

Guidance for Policy Makers

Starting a Renovation Wave: Putting Real Impact First

This pdf report outlines why understanding the impacts of building renovation is key to successfully scaling up renovation rates. It provides four key recommendations, supported by real-life examples, for achieving the EU's Renovation Wave.

Technical Assistance: Local Authorities' Needs and Upcoming Policy

This pdf report outlines what local authorities need in order to implement the Build Upon Framework. It then summarises the many technical assistance programmes run by the EU and provides recommendations on how these programmes can be used to meet the local authorities' needs.

Policy Recommendations for Local & National Governments for the uptake of systematic, multi-level monitoring of municipal renovation

This pdf report provides policy recommendations to local and national government, to support the measuring of building renovation through tools like the Build Upon Framework.

World Green Building Council
https://www.worldgbc.org/contact-us

Green Building Council Espana
https://gbce.es/

Croatian Green Building Council
https://gbccroatia.org/en/about-us

Hungary Green Building Council
https://www.hugbc.hu/kapcsolat

Irish Green Building Council
https://www.igbc.ie/contact-us/

Green Building Council Italia
https://gbcitalia.org/contatti

Polish Green Building Council
https://plgbc.org.pl/

Turkish Green Building Council
https://cedbik.org/

UK Green Building Council
https://www.ukgbc.org/contact/

Climate Alliance
https://www.climatealliance.org/home.html

Building Performance Institute Europe
https://www.bpie.eu/contact/

Contact Details

Seeking further information about the BUILD UPON Framework?

If you are based in one of the countries involved in the project, contact your local Green Building Council to find out how you can get involved in the roll out of the Framework.

If you are based in a country not involved in this phase of the project, you can contact WorldGBC to find out more about how the BUILD UPON Framework could be implemented in your country.

Contact details for all the project partners can be found by clicking the links on the opposite page.

BUILD UPON FRAMEWORK

The 2020s is a decade of climate action. We are inviting all cities, regions and companies to work with us on solutions in the building sector and would love to hear more about impactful renovation initiatives you are running in your city or Local Authority - which we can put on the European stage.

We are calling on leaders across the public and private sector to join the Net Zero Carbon Buildings Commitment to really make Europe's renovation wave a reality.

Alongside this, building on the success of the BUILD UPON[2] project, we are looking to improve the usability of the Framework, by developing it into an interactive digital tool. If you are interested in partnering with us in this important next phase, we want to hear from you! We are in the process of exploring the possible funding and strategic options for this task.

Read more about the project and get in touch with the team via the links and details above.

With many thanks to the eight pilot cities and 30 follower cities who helped us develop the BUILD UPON Framework. The pilot cities were: Velika Gorica, Croatia - Budaörs, Hungary - Dublin, Ireland - Padova, Italy - Wroclaw, Poland - Valladolid, Spain - Eskişehir, Turkey - Leeds, UK.

GBCe green building council españa · BPIE · Climate Alliance · HRVATSKI SAVJET ZA ZELENU GRADNJU CROATIA GREEN BUILDING COUNCIL · HuGBC Magyar Környezettudatos Építés Egyesülete Hungary Green Building Council · IGBC IRISH GREEN BUILDING COUNCIL · Green Building Council Italia · PLGBC Polskie Stowarzyszenie Budownictwa Ekologicznego · Cedbik ÇEVRE DOSTU YEŞİL BİNALAR DERNEĞİ TURKISH GREEN BUILDING COUNCIL · UK GBC

WORLD GREEN BUILDING COUNCIL

Email info@ukgbc.org

Web www.ukgbc.org

Twitter @UKGBC #BUILDUPON

UK GBC