Best practice initiatives to support the implementation of the Framework

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The BUILD UPON² Project

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

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

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

www.worldgbc.org/build-upon

Pilot cities of the project BUILD UPON²

- Velika Gorica, Croatia
- Budaörs, Hungary
- Dublin, Ireland
- Padova, Italy
- Rybnik, Poland
- Valladolid, Spain
- Eskişehir, Turkey
- Leeds, UK
"Champions keep playing until they get it right."

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

The Framework was tested for the first time by the 8 pilot cities between September and November 2020, and again in April/May 2021. Follower cities were informed about the framework and its use in dedicated workshop in June/July 2021. Most of the cities highlighted the need for a tool or a platform to make easy the use of the indicators, both for data collection and for reporting at city level and on projects and initiatives.

All cities made reference to local/national tools available that could support a digitalised collection and reporting of data, covering some type of data such as energy performances and CO2 emissions. These tools represent best practices that help understanding how normally cities collect and communicate data and what features worked well in these proposed examples.

Moreover, the application of the framework already generated some new processes in some of the cities, that made step forward for the integration of indicators into daily administrative practices. Some examples are: the project to expand the tool Our City our Energy to include more indicators in two cities in Spain (Zaragoza and Valladolid), that is now called Rehaviva, the definition of a methodology to report building renovation data in the city of Leeds, the integration of some indicators into the reporting procedures of SECAP’s actions in Padova, as well as the creation of a guidance document on how to use the framework in favour of SECAP reporting by HUGBC.
About this guide

This report aims at describing in more detail the best practices collected by GBCs during the two testing phases of the Build Upon² framework. Pilot cities shared with GBCs the type of tools and platforms they use in daily practice for data collection and management of building permits and renovation works as well as for reporting building performances against public funding received for specific local initiatives.

The first section of the report aims at outlining the best practices highlighted during the workshops held with the pilot and follower cities of the project. Most of them are tools or platforms, sometimes are programs that include a monitoring phase

For each initiative the description is captured with 5 questions:

- Who did develop it?
- What data is collected?
- Who can access/use this data?
- Why is this data useful?
- How the Build Upon² indicators can be integrated?

The second section reports some early examples of how cities are implementing the integration of the Framework in local reporting practices and initiative are presented, with a special focus on 4 experiences:

- the development of Rehaviva tool in Valladolid and Zaragoza (ES)
- the application of the Framework in a renovation program in Leeds (UK)
- the integration of the Framework in SECAP reporting for Padova (IT) and Budaors (HU)
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Part 1

Best practices in Europe: existing tools and platforms
Who did develop it?
In order to fulfil its commitment to climate protection and sustainable development, the Municipality of Budaörs seeks to make climate-conscious and responsible decisions in the field of energy management. Through the recent cooperation and project activities additional opportunities open for the local government to take action at the local level to prevent climate change, respond adequately to its challenges, present and disseminate good practices to the local residents, while the newly developed SECAP will enable the participation in international grant programs as well as to mobilize additional resources for the achievement of the above goals.

In 2018, the City of Budaörs joined the Compete4SECAP (Sustainable Sustainer) international project¹. The project consisted of three main activities: recruiting cities, organizing competitions as awareness programs and the establishment and implementation of Energy Management Systems (MSZ EN ISO 50001: 2019, EMS) at the local government according to the international standard ISO 50001. The data collection system was developed by the Compete4SECAP project, by project partner EKODOMA Ltd². EKODOMA is an engineering consulting company, whose main activities are related to Energy Efficient solutions and Sustainable Energy Sources. The company holds the rights to develop the database software, and charges fees to include new buildings in the system as well as to extend the number of indicators.

EMS was introduced in the fall of 2019 for 6 municipal buildings (city hall, public swimming pool, and sports centre, 2 kindergartens, BTG office building, and a community hall). After the testing phase in 2019, the EMS is fully running and the possibility for expansion to all public buildings is under discussion.

What data is collected?
The monitoring software and database is accessible online and has now multiple years of energy (heat & electricity) consumption of the 6 public buildings and weather data. The changes over time can be analysed. The main building data sheet compares automatically the monthly data compared to the average of the previous three years of the same month, and to follow the variations in consumption in relation

¹ https://compete4secap.eu/hungary
² http://www.ekodoma.lv/en
to environmental and social conditions (cold weather, closures, etc.).

- Basic building data
- Monthly measured data of
  - Electricity consumption (kWh)
  - Thermal energy consumption (MWh)
  - Cold water consumption (m3)
- Monthly weather data
- Comparison charts and analysis

The data is collected manually at this time via emailing the monthly consumption from the buildings and the assigned responsible person input data into the system.

**Who can access/use these data?**

The data access is limited to admin rights. The City Energy Expert, the Chief Architects’ Office and local politicians have access to data besides Greendependent Institute, who is the local partner in the consortium of Compete4SECAP as well as the consultant for the SECAP.

The Municipality uses this data for the monitoring activities of the municipality-owned buildings and EMS reporting and audit.

**Why is this data useful?**

To display consumption trends, eliminate errors in energy investments.

**How could Build Upon²’s indicators be integrated?**

The collected data helps to build the basic public building portfolio database. The City of Budaörs has the intention to use the EMS Database for all public buildings.

The measured data matches BU2 Env3 indicator. The CO₂ emissions are not part of the system – they are calculated from the energy consumption using national emission factor data for the SECAP reporting.

There is a possibility to show real costs (Eco1) within the EMS database.

At this time, there is no intention to develop the database further.

HuGBBC initiated contact with Greendependent Institute and EKODOMA Ltd about the potential inclusion of BUILD UPON² core indicators.
Croatia
Information system on energy use (ISGE)

Who did develop it?
The system was developed by the Agency for legal transaction and real estate brokerage and Ministry of Physical Planning, Construction and State Assets.

What data is collected?
The system is designed to:

• Accepting hourly readings of energy consumption from objects where there are embedded systems for remote reading of energy consumption

• Collecting and inputting basic data on buildings; energy and water consumption management on a monthly, weekly, and daily basis (monthly bills and/or remote meter readings)

• Collecting data on public lighting consumption in Croatian cities and municipalities

Who can access/use this data?
The Information system is recognized and used in all Croatian cities, counties, and the ministries (data from 2019). An increasing number of municipalities and other budget and extrabudgetary users are using the Information system. An increasing number of distributors and suppliers fulfil the legal obligation on direct entry of invoices in the database and there is an increasing number of educated users every year.

Why is this data useful?
Several applications of these tools are foreseen:

• This information system is a useful tool for systematic energy management

• Internet application for energy consumption oversight and analysis in buildings of public sector

• Module for inputting energy inspections, certificates and other energy efficiency measures conducted on building
- Monitoring module for the Public sector energy renovation program

- Calculations and analysis to detect adverse, excessive, and irrational consumption and to identify possibilities for energy and monetary savings achievement

- Monitoring and verification savings achieved

- Automated warnings on critical situations and malfunctions

- Enrolments for various workshops and educations through the interface (isge.hr/seminar)

- Enabling direct entry of invoices into the database by distributors and suppliers and analytical monitoring of sent data

How could Build Upon²’s indicators be integrated?

From the categories within the Framework, environmental indicators would be the best fit to be integrated to the ISGE system because of the focus on energy consumption, buildings management and energy savings. Additionally economic indicators would fit because of the highlighted energy and monetary savings calculations. Also, enrolments to different educative programs is available through the interface which would be an interesting tool for tracking additional economic indicators within the Framework.
Croatia

System for measuring, monitoring and verification of energy savings (SMIV)

Who did develop it?

This internet application is coordinated by the National coordinator body for energy efficiency within the Center for monitoring business activities in the energy sector and investments (cro. Centar za praćenje poslovanja energetskog sektora i investicija – CEI) following the provisions of the ordinance on tracking, measuring, and verification system for energy savings.

What data is collected?

The application represents a single registry in which it is possible to track the realization of the arbitrary number of plans on different levels of government (national, regional, and local) in Croatia.

Who can access/use these data?

The main users of the application are defined by the Law on energy efficiency. There are three main groups of users:

- Public sector
- Energy service providers
- Subsidy contributors

Why is this data useful?

It is possible to monitor the realization of energy efficiency measures in sectors of direct consumption which are:

- Service sector (public and commercial)
- Industry
- Transport
- Household

The main purpose of the SMiV system is to monitor the implementation of the National action plan of energy efficiency (cro. Nacionalni akcijski plan energetske učinkovitosti – NAPEnU).

How could Build Upon²’s indicators be integrated?

BU2 indicators, from all three framework categories would make great sense if integrated with the SMiV system as they represent the energy efficiency outcomes similar to the ones tracked in the SMiV tool. Especially considering the categories for which SMiV monitors the data for such as service providers and households.

Best practices for the implementation of the Framework
Who did develop it?
The EnergyElephant software was developed by a private entity based in Dublin to help organisations (public and private) reduce their energy use.

What data is collected?
EnergyElephant collect data from utility bills, including gas and electricity bills. It helps organisations tracking energy baselines and benchmark them against peers. When used by municipalities, the following information is captured on the municipal stock: Actual energy use, carbon footprint (based on the Sustainable Energy Authority of Ireland’s emission factor) and costs.

Who can access/use these data?
The data is not publicly available but is used by municipalities and local energy agencies to reduce energy use, identify opportunities for improvement and better engage with staff. It is also used to report to Ireland’s national Energy Agency (the Sustainable Energy Authority of Ireland) on municipal buildings’ energy use as part of the SEAI’s Monitoring & Reporting.

Why is this data useful?
The programme captures actual data on the municipal building stock in relation to energy use, renewable energy, CO2 emissions, cost and savings. This allows municipalities to better identify savings and CO2 reduction opportunities. It’s also a great tool for staff engagement.

How could Build Upon’s indicators be integrated?
The following Build Upon indicators may be integrated with the software: Env. 2 – CO2 Emissions, Env. 3 -Energy Consumption, and Eco. 5 – Financial Savings from Energy Renovation.

The following screenshots show the EnergyElephant Dashboard and data visualization (more at https://energyelephant.com/demo).
The Retrokit tool

Who developed it?
RetroKit was developed by a private entity based in Cork, Ireland. The software supports local authorities and other large housing providers in developing energy renovation strategic plans for their housing stock.

What data is collected?
RetroKit harnesses the dataset underlying the Energy Performance Certificates for its clients’ housing stock. This data can be combined with other asset management data including stock condition surveys (including state of repair of heating systems, ventilation, windows and doors, etc.), occupancy, etc. as well as socio-economic data that can be leveraged to inform strategies to deal with fuel poverty and decarbonisation of the housing stock, while respecting privacy of the tenants.

Who can access/use these data?
The local authorities can use these data to assess the current energy performance of their housing stock, develop energy renovation strategic plans and monitoring progress towards their targets. Going forward, RetroKit aims to become a multi-stakeholder energy renovation platform supporting all aspects of energy renovation projects’ cycle, including procurement, contract management, funding claims, etc. It will facilitate communication and cooperation between the local authorities, their contractors, the funding authorities, their tenants, etc. In addition, RetroKit provides a range of modelling capabilities to support policy-making.

Why is this data useful?
RetroKit enables the modelling of a wide range of energy renovation scenarios and provides a comprehensive cost/benefit analysis. Evidence-based decision-making and planning is facilitated by presenting users with a range of KPIs including budget costs, impacts on CO2 emissions, energy costs, EPC distribution, energy efficiency credits, renewable energy supply, etc. RetroKit’s platform also includes a mapping application that support spatial planning of energy renovation projects and enables an area-based approach to project deployment. RetroKit also provides the data necessary for the Local authorities to develop their SECAP and update their emission inventories under the CoM. For instance, Cork City Council’s SECAP was developed using Retrokit.

How could Build Upon²’s indicators be integrated?
Integrating the BU2 indicators into Retrokit would allow the software to develop even more detailed and accurate energy renovation scenarios, hence further supporting decision-making.
Poland
National Register of Buildings’ Emissions (CEEB)

Who did develop it?
The creation of the National Register of Buildings Emissions at the national level is envisaged by the act on supporting renovations, adopted in September 2020 by the Polish Parliament. In practice, this means that CEEB will be mandatorily implemented under the legal force.

What data is collected?
CEEB will be a register of heat sources installed in buildings, but not exclusively. It will also include information on public support (funds) for renovation and replacement of heating sources.

As a result, property owners and managers will be required to report on heat sources of up to 1 MW installed in the building and/or sources of electricity used to heat the building. The deadline for providing the information is:

• 14 days from the first commissioning of the equipment or installation for new heat sources,
• 12 months from the promulgation of the Regulation to register the data in CEEB platform, in the case of heat sources already in operation.

There will be a dedicated online platform to register the appropriate data. Information from other records (e.g. energy suppliers), as well as inspections and interventions and further data will also be entered into CEEB in long-term perspective.
In Poland, there is no uniform system for collecting data on buildings at the moment (except for the EPC database). The lack of clear guidelines with legal power on data collection allows local authorities flexibility in this regard and causes the scope of data collected at the municipal level to vary greatly. Municipalities have different monitoring initiatives, but it is important to take into consideration, that they mainly focus on energy efficiency and GHG emissions.

Who did develop it?
The City of Rybnik has an active data collection program called PrZEMek (Program for energy and media management in educational facilities).

Its objective is to optimize energy consumption in educational facilities, such as kindergartens, primary and secondary schools, nurseries and children’s homes.

What data is collected?
The program consists of three parallel activities:

- introduction of rational energy media management in the facilities through activation of administrators, staff and users (no-cost and low-cost activities, such as monitoring of media consumption, benchmarking, introduction of an incentive system, training of administrators, implementation of metering, etc.);
- update of technical documentation of buildings, introducing energy questionnaires and, in the long run, energy certificates for buildings;
- performance of energy audits for selected buildings, acquisition of external funds (from regional, national, and European funding programs) for renovation measures identified in the audits, perform comprehensive renovation of buildings.

Why is this data useful?
The implemented measures are aimed particularly at reducing the consumption of energy carriers in educational facilities without deteriorating the quality of the indoor environment. This concerns in particular the quality of indoor thermal and humidity conditions, the quality of lighting, etc.

Effects of PrZEMek program:

- adjustment of tariffs and volume of ordered power to actual needs;
- reduction of energy media consumption;
- reduction of operating costs;
- reduction of CO2 and PM10 emissions;
- completion of building inventories, energy audits, etc.;
- renovation of buildings;
- increased environmental awareness of employees, children and youth working and studying in the facilities covered by the program.
Who did develop it?
The portal Impresa In Un Giorno (Impresainungiorno) is provided by the DPR 160/2010 and was initially created for Productive Activities within the One Stop Shop for Productive Activities. To face the digitalization of building practices, this portal has also been adapted for private housing. The portal has been developed at national level by the Chambers of Commerce, with local customizations according to regional regulations given the legislative power shared by the State and Regions in the field of construction and urban planning.

What data is collected?
Impresainungiorno collects all the data needed to carry out the building practice, both administrative and technical. As the templates have been compiled on the portal according to the type of practice, users can attach technical documentation for extra data and information. However, these documents are difficult to process for macro-data.

Who can access/use these data?
The data of Impresainungiorno are available for all the public administrations.

Why is this data useful?
The main reasons are the drive to digitalization, the need for integrated control systems and easy reporting of results to meet deadlines.

How could Build Upon²’s indicators be integrated?
If specific data are needed, such as for KW of photovoltaic installed, the template can be customized to ask the end user to enter the data, maybe with a block in the procedure.
Who did develop it?
GPE was developed by the Veneto Region under the regional legislation L.R 19/2021 to standardize procedures for all municipalities of the Region.

What data is collected?
GPE is a digital data manager, it collects data from Impresainunigiorno, classifies them and makes them usable for internal purposes of the office. In the preliminary phase then the technician can add some technical data including any charges, the cadastral/geographical coordinates, the legal qualification of the intervention. The Municipality of Padova is trying to integrate as many data as possible, for instance building volume extension as by Veneto 2050 - LR 14/2019 or KW of installed PV.

Who can access/use these data?
GPE data are accessible only by the office for private buildings of the Municipality.

Why is this data useful?
The main reasons are the drive to digitalization, the need for integrated control systems and the reporting of deadlines and results.

How could Build Upon²’s indicators be integrated?
For specific requests, the implementation of the program is potentially always possible. Depending on the type of data, it is necessary to verify the user who should physically insert it. If the data shall be added by the public officer it can be integrated in the GPE.
Spain
Our city our energy

Who did develop it?

*Our City Our Energy* is a tool developed by a private entity with the collaboration of a local government at its origin (Rubí). For its development, IN2, Ecoo and Rubí town council have joined forces to provide a software package for the control of energy costs and expenses of the municipalities. This application for the management of public administration and private organisation at the same time serves as a tool for public use to communicate, raise awareness and involve society in the transition to an energy model based on energy savings, efficient energy use and clean energy sources.

- Ecooo Local: Ecooo is a Non-Profit company founded in 2005 and focused on all kinds of actions that activate citizens in favour of a new energy model, clean, sustainable and in the hands of the people for the people.
- IN2 (innovating 2gether): IN2 is a technology company, created in 1994 entirely with local capital, expert in the development and implementation of integral solutions based on open-source technologies, helping our clients to optimise their activity in the 4.0 environment.
- Rubi Brilla: The city of Rubí, located 20 km from the city of Barcelona, has launched the Rubí Brilla project, a strategy to promote energy efficiency and the use of renewable energy in the industrial, commercial, domestic, and public spheres, as a means for a more competitive and environmentally friendly municipality.
What data is collected?

The app works as a transparency tool for public and private organisations regarding energy and water consumption. It shows the actual consumption and cost of these supplies in municipal buildings and facilities in a way that is easy to see and understand. These data are updated periodically as the bills for the various utilities (electricity, gas, diesel, water, etc) arrive, which allows to compare different years and check increase or decrease in the energy consumption, CO2 emissions and cost. The new data is then incorporated into the consumption history and the graphs shown in the application are updated.

The data collected and shared to the users through the app are:

- Total cost (of energy in your municipality)
- Consumption data for electricity, gas, water, and all the supplies that the municipality has registered.
- Data per consumption point
- CO2 emissions

Who can access/use this data?

As most apps, it has two types of users:

- The local administration, which makes use of a back office designed to:
  - Structure the data for energy management.
  - Energy planning and better budgeting

  o Data Analysis:
    - Calculate tCO2c emissions and kWh consumption.
    - Continuous improvement and knowledge on price, consumption, and budget.

- The citizens, which make use of the front office (app) designed with three main objectives in mind.

  o Transparency: Our City Our Energy shows, in a simple and comprehensible way, the consumption and costs of water and energy in municipal buildings and facilities. As a result, it enables public administrations to achieve high levels of transparency regarding these supplies to anyone using this app.

  o Citizens participation: Our city Our Energy is a tool for transparency and participation. We all can and should help public administrations and private organisations to reduce the consumption of infrastructure to avoid waste.

  o Governance: Our City Our Energy shows the results of local administrations’ actions on energy, so that citizenship gets active for a model based in energy saving and renewables.

Currently 24 Spanish municipalities are using Our City Our Energy, which means that 1.75 million citizens are being transparently informed about the energy and water consumption of their municipalities.

1) Screenshots of the back office managed by the city
Why is this data useful? How could Build Upon²’s indicators be integrated?

Energy cuts across virtually all activities carried out in a modern society. How we produce energy, how it is managed and how it is consumed affects the quality of democracy, employment, the economy, and access to basic rights. As a result, it affects people’s quality of life as well as the quality of the environment that sustains life.

The serious environmental context that we must address (climate change, environmental pollution, loss of biodiversity, etc.) requires a transition to an energy model based on energy savings, efficient energy use and clean energy sources.

The monitoring of consumption and costs of water and energy supplies (and their associated CO2 emissions) and the possibility to analyse the data through simple statistics allow administrations to obtain information from the data and thus make data-driven decisions and develop policies aimed at reducing costs, emissions and increasing investment in renewable energy.

For the moment, only the public building stock is being monitored through this tool and the indicators being followed-up (water and energy consumption and their associated costs and emissions) are related to each single public building (consumption point) of the city, regardless of whether they have been renovated or not. With some small adaptations of the tool and some additional data, the specific indicators derived from renovation could separately be followed-up reaching an integration of the Framework quite easily, at least for the indicators being already followed-up by the tool: energy consumption, CO2 emissions and money savings.

Although the Impact Framework is directly focused on indicators extracted from renovation, the analysis of the data obtained from this application allows to compare between consumption points (non-retrofitted and retrofitted consumption points) and thus to draw conclusions on the cost-effectiveness of carrying out deep renovations.

Further, for the private building stock the tool could also be developed by analysing the potential sources of data for this kind of buildings and show the results in a similar way as for the public building stock.

Some indicators of the Framework could be easily integrated in this tool with an appropriate relatively easy adaptation and with the collection of accessible additional data (in green the indicators already being followed-up for the whole municipal building stock and that would require some small adaptation for having the particular data from renovation; in orange new indicators that could be added to the tool collecting data about the buildings being renovated):

- **On the Environmental Indicators:**
  - Env.1 Energy renovation rate
  - Env2: Reduction on direct annual CO2 emissions.
  - Env3: Final energy consumption reduction.
  - Env6: Renewable energy production

- **On the Economic Indicators:**
  - Eco.1: Annual investment in energy renovation
  - Eco. 2 Energy efficiency of investment
  - Eco.5: Financial savings from energy renovation

A wider development of the tool could lead to a larger integration of the Framework in this tool. In any case, the biggest challenge in this case would not be related to the software development but to the data needed for the rest of the indicators.
Best practices for the implementation of the Framework
Spain
Mirador

**MIRADOR**: open database with information on public buildings owned/occupied by the central government.

**MIRADOR** is a data viewer publicly available. It additionally includes a private section for public administration only (called VEREDA) with further information and functionalities (simple diagnosis and guidelines for improving the sustainability of the building).

Who did develop it?
GBC España (GBCe) for MITMA to monitor energy consumption of public buildings owned/occupied by the central government (AGE - Administración General del Estado (General State Administration)).

GBCe signed an agreement with MITMA (Ministry of Transport, Mobility and Urban Agenda) in 2010. As part of the agreement, GBCe started to develop MIRADOR in 2015 within the Environmental Building Renovation Action Plan (PARAE).

However, is another organization, IDAE (Energy Diversification and Saving Institute), who is responsible for tracking data of AGE buildings through an inventory sheet. This document is public.
**What data is collected?**

1. General information collected from state buildings (from energy inventory of AGE buildings):
   - i. Building name
   - ii. Location
   - iii. Surface (m²)
   - iv. Final energy consumption (electricity, natural gas, heating oil, propane) from utility bills
   - v. EPC (primary energy consumption and emissions)

   The inventory is compulsory every year for IDAE.

2. Additional information (by GBCe)
   - i. Climate zone
   - ii. Building use
   - iii. Estimated emissions (based on official emissions factors)

   The data is updated yearly by GBCe based on the inventory sent by IDAE since 2015 to date. First data inclusion in 2015 collected all previously available data since 2013.

Based on the collection of this information, MIRADOR shows the following indicators:

- A. % of energy source used
- B. Final energy consumption per area (kWh/m²year)
- C. Emissions per area (kgCO₂eq/m²year)
- D. EPC letter (primary energy consumption and emissions)

**Functionalities:**

I. Map with pop-up windows of each individual building, showing the indicators listed above.

II. Filters of each parameter that allows to (individually or applying several filters):
   - Detect the buildings that have an energy consumption within a customizable range of figures.
   - Visualize the buildings with a selected letter on the EPC (based on emissions and/or energy consumption)

III. Comparison between years

The private section for civil servants use (VEREDA) includes:

- Additional data collection to guide administration. This section includes an excel-based tool to guide the administration through a series of questions (related to environmental and social issues of the building), to implement measures for a sustainable renovation or best practices in the use of the building. The excel file generates a tentative diagnosis as a result of an automatic assessment of the answers.
   - Repository
     - Regulation documents
     - Renovation guidelines
     - Best practices

**Functionalities:**

I. Filter by thematic groups (climate, water, air, acoustic, lighting..)

II. Filter by language (Spanish, English, German, French, Catalan)

**Who can access/use these data?**

MIRADOR is a public tool, so open to everyone. VEREDA is private, just for public administration workers who have a user and password. It could be said that the main user is public administration.

**Why is this data useful?**

The objectives of the plan in which MIRADOR is framed are, consequently, the points for which data collection is useful:

For administration technicians:

- Raise awareness, inform and train
- Activating change processes
- Capacity building
Empowering the renovation sector
Transfer of learnt knowledge.

Usefulness of the tool itself:
- Not only have a collection of data but also identify problems that affect to a huge amount of public buildings and have a evolutive learning through the solutions resulting from the VEREDA guidance.

How could Build Upon²’s indicators be integrated?

MIRADOR (for public buildings owned at national level) could be developed for public buildings at city level as well, which will bring a complete alignment between the different administrative and territorial scales.

MIRADOR already includes some environmental indicators of the Build Upon2 Framework:
- Env.2 CO2 emissions
- Env.3 Energy Consumption

These indicators are based the total amounts, regardless of whether a building has been renovated or not. This information is not available in the MIRADOR viewer, which could be easily incorporated if IDAE’s inventory included if a renovation has taken place and when. This would allow to compare figures before and after the renovation and therefore calculate reductions due to the renovation intervention. If the information about the renovation is made available and also the expenditure in energy (the data is taken from the energy bills), it will also automatically allow to include:
- Eco.1 Renovation rate.
- Eco.5 Financial Savings from energy renovation

For AGE buildings, the rest of Build Upon2 indicators could be included in the actual inventory sheet that is compulsory, but the main barrier would just be data availability and its collection. This is something that could be partly obtained if the additional module for civil servants use only (VEREDA) had a further development and if an interconnection with VEREDA was created. This VEREDA tool is oriented to easily assess the status of a building in relation to certain environmental and social aspects, which allows to have a quick diagnosis and key guidelines to improve the sustainability of the building (through a renovation or applying best practices in the use of the building). Some of the aspects collected for the diagnosis are related to:

Indoor air quality or thermal comfort, which are part of the social indicators. If MIRADOR included the data additionally collected through the excel file of VEREDA (something not implemented yet and not mandatory to be performed for each individual building), the database would be larger and would allow to include further data about the status before the renovation. If additionally, when a renovation takes place, the same analysis is done, the information would also be available after the renovation, which would allow to monitor the improvement.

For other public buildings at city level:
- some of the environmental data used in MIRADOR are available and are already being captured.
- the rest Build Upon2 core indicators could be collected through a similar compulsory inventory. In this case the main barrier would just be data availability and its collection.

Potential problems:
- MIRADOR integration. Single data viewer may mean a complex management between different scales of administrations within a same MITMA webpage.
- Notes: Could a similar tool be developed in each city council? With similar agreements with the city council?
- Difficulty to include non-public buildings. The objectives and the resources are focused on public building for the moment.
Spain
Estadísticas de la Construcción del Gobierno Central

Who did develop it?
The Central Government Building Statistics was developed by the MITMA (Ministry of Transport, Mobility and Urban Agenda, by the time it was created, The Ministry of Public Works) in 1990. This statistic is derived from the questionnaire that developers or technicians responsible for a project must submit to the local council when applying for a building permit for the construction, refurbishment, or demolition of buildings. Its completion is compulsory in accordance with the fourth additional provision of Law 4/1990.

What data is collected?
Any major building work to be carried out in Spain that requires the corresponding municipal building permit has the obligation to fill out this questionnaire.
to provide data about the intervention through a questionnaire. This is therefore a procedure that generates privileged information for the knowledge of the number and characteristics of the buildings that are started up as well as the dwellings that, where appropriate, are generated. This survey, of an administrative nature, therefore, provides advance information on building activity in the following modalities:

- New construction
- Renovation
- Total or partial demolition

The information is filled in by the person responsible for the project the time of the building permit application at the City Council. For this reason, a questionnaire was designed that the developer had to hand in at the City Council when applying for the building permit.

This information is organised and systematised in such a way that the aggregation of new building work, demolitions and renovations provides advance data on the evolution of the building and housing stock, although it should be borne in mind that the survey is not carried out on material execution of the works but on building projects, and that the reference periods correspond to the month in which the permit is granted.

To be pointed out that the statistics sheet is mandatory only for major construction projects, a category that is characterised by the fact that the application for a permit must be accompanied by a project approved by the corresponding Architects Association.

**Administrative supervision**

This information must be filled in by the corresponding City Council, as it is the body that definitively marks the authorisation for the work to be carried out.

**Who can access/use this data?**

The questionnaire source of the data is mandatory to submit to the local council by any developer or technician responsible for a project in order to get the building permit for the construction, refurbishment or demolition of any building.

The data obtained and the methodology behind it (legal framework, definitions, formulas) is accessible to everyone at this link, in the Ministry for Transport, Mobility and Urban Agenda webpage. But there is not a public data base, but spreadsheets and reports regularly made public with aggregated data at autonomous region and national level. So even if the data is collected at municipal level, the information is only accessible aggregated at region and country level.

**Why is this data useful?**

These data are useful as it has been the main source of data from the construction and refurbishment of buildings for more than 20 years. The information units of the collected data at the local level are represented by the building permits granted by the municipalities each month. The data then is aggregated at the regional and the national level.

This information is organised and systematised in such a way that the aggregation of new construction, demolitions and renovations provides advance data on the evolution of the building and housing stock, although it should be borne in mind that the research is not carried out on physical executions but on construction projects, and that the reference periods correspond to the month in which the licence is granted.

Together with the information collected and processed by the Development Areas in the
Government Delegations at the regional level, the data is compiled by the central services of the Ministry, which proceed to the filtering, homogenisation and aggregation of it and the publication of the national figures.

Use the existing data collection mechanisms is optimal for capturing data (already existing and new).

How could Build Upon²’s indicators be integrated?

The survey for building construction statistics is a well-established form in the Spanish building sector, so revising and updating it is a relatively simple way of extending the information collected from building and renovation permits. We must bear in mind that the procedure was created in 1990 and the content of the statistics form has not been reviewed since then. We have today far more elements that are mandatory for obtaining a building permit and that are, therefore, a very valuable source of data that should be harnesses, not only for the Framework but also for following up the building stock evolution considering today’s requirements. An adaptation of this form would therefore be of great interest and it would take advantage of a procedure implemented long time ago and, therefore, culturally internalized as part of the process for obtaining a building permit at the corresponding municipality.

The EPC is a good example of the mandatory documents required nowadays and the capture of data that can be extracted directly from it is of special interest, for instance, energy savings or CO2 emissions. An in-depth analysis should be made of what data (environmental, social or economic) can be obtained from all the documents that are part now of a renovation project and its corresponding building permit. It would require also to adapt some of the information already collected in the building permits to feed the indicators in a very simple way. In addition to this, digitalizing this statistical sheet and transform it into a database that allows for aggregation and disaggregation of data at different territorial scales would facilitate many things in relation to data collection.

Additionally, in the current survey, there is a lack of data requirements for “renovation works”, as well as a clear definition and category within such “renovation work” section for deep energy renovation. Currently, energy information is just required for new constructions and, in any case, is limited to the description of the systems designed.

Since this statistics sheet is prior to the construction works (to get the building permit), for some of BUILD UPON² indicators only estimated data can be collected.
United Kingdom
Data Mill North tool

Who did develop it?
Data Mill North is an open data website originally set up by Leeds City Council (LCC) in 2014 as Leeds Data Mill. LCC wanted to tackle the challenge of increasing demands and decreasing resources in Leeds. The plan was to enable people and organisations to explore the different complex relationships between the city’s services and businesses, by collecting open data from Leeds into a single website.

In 2016, the website was rebranded as Data Mill North and expanded to include datasets from outside the council and its borders. People and organisations across Leeds and the North West can both contribute to and benefit from the data on the website. The open data – which is freely accessible to all - can be used to gain understanding and develop new service solutions. It has over 600 published datasets from over 60 private, public, third-sector and academic publishers.

What data is collected?
The breadth, depth and format of the data collected on Data Mill North varies enormously. The data covers topics ranging from travel and transport, to business and economy; from health and wellbeing, to education, skills and employment. Data formats include spreadsheets, reports and infographics among others.

For example, there is data on local election results, bin collections, houses of multiple occupancy, noise nuisance reports, housing land supply, council housing supply, planning applications, future energy scenarios, public rights of way, council spending, market stalls, business rates...

Who can access/use the data?
The data is open source – anyone can use it and the data is available at zero cost. In addition, anyone can make an informal request for additional data to be added to Data Mill North.
Who did develop it?

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Why is this data useful?

Due to the breadth of data available, Data Mill North is useful to individuals and organisations from all sectors: private, public, academic and third sector.

Data Mill North is also used to pose challenges to anyone interested in analysing the data collated to help solve some of the region’s issues. These challenges are raised by the council, by organisations and by individuals, who wish to address a particular concern but may not have the time, resources or skills to make sense of the data.

For example, Leeds City Council have worked with Leeds Beckett University to collect data on road surface quality. This data has now been uploaded to Data Mill North and an open call has been issued to anyone interested in analysing that data with a view to better identifying which roads need upgrading.

In addition, following a Social Housing Innovation Lab advertised on Data Mill North back in 2016, LCC developed their Social Housing Picker tool. This uses data published on Data Mill North to allow prospective tenants to find out how long it took others in a similar situation to them to be offered a Council property in different areas of Leeds.

How could Build Upon² indicators be integrated?

The Build Upon² framework and Data Mill North could work well together in three ways.

Firstly, Data Mill North could be used as a platform for collating and publishing data collected under the framework in one place. LCC intend to use Build Upon² primarily at a project level, collecting data on retrofit projects as and when they are undertaken. Both the data collected and the findings could be published on Data Mill North.

Secondly, Data Mill North could be mined for information that may aid implementation of Build Upon², particularly at a city level. LCC may find the data they need on Data Mill North or use Data Mill North to put out calls for data they are unable to collect themselves.

Thirdly, Data Mill North could be used to find experts and analysts to help LCC make sense of the data they collate under the Build Upon² framework, but are unable to analyse due to a lack of resources or skills.
Part 2
Integration of the Build Upon² Framework in local reporting procedures
This part of the document aims at reporting the first attempts to integrate the framework of indicators of Build Upon² into the reporting procedures of building renovation actions for the local authorities.

Four case studies are presented:

- The City of Leeds monitoring strategy for residential buildings renovation programs
- The Rehaviva tool for collecting, elaborating and communicating data about building renovation works in Zaragoza and Valladolid
- The city of Padova integration of the indicators into the assessment of SECAP actions for buildings and to report the general impact of the plan for the building sector
- The city of Budavàr's integration of indicators into the SECAP reporting strategy for the building sector

Almost all core environmental and economic indicators are instead integrated in all procedures, but those related to employment and capacity building, are not applied in Hungary and Italy. The data to calculate them are already collected by municipalities even if spread across several offices and procedures. These indicators are also easier to calculate.
Leeds City Council is one of the UK’s leading councils when it comes to environmental sustainability and improving the energy efficiency of their existing building stock. They also benefit from close ties with the Leeds Sustainability Institute and two major universities – Leeds University and Leeds Beckett University.

Leeds City Council is currently retrofitting hundreds of council and privately rented homes across a number of different projects. They are using the BU2 framework to measure the impacts of three of these retrofit projects.

To aid the use of the BU2 framework, Leeds Beckett University and the UKGBC have developed a very simple data collection strategy for Leeds. The data collection strategy aims to be as easy and low-cost as possible and does not rely on ongoing monitoring.

It defines 7 types of data that need collecting and when the data must be acquired. This data includes pre- and post-retrofit EPCs; pre-retrofit fuel bills; post-retrofit meter readings; degree-day weather data; contractor’s information; pre- and post-retrofit occupant questionnaires and MCS calculations.

EPCs are carried out as a matter of course on retrofit projects to suit funding requirements. Degree-day weather data can be obtained easily online. The contractor’s information covers costs, jobs supported and ventilation and heating systems installed. The information can be inputted directly into the BU2 spreadsheet on completion of the retrofit. MCS calculations are standard calculations undertaken whenever PV is installed in the UK.

The occupant questionnaires take 10 minutes to complete and are carried out just before retrofit and 12 months post retrofit, at times when the contractor or council are visiting the properties anyway. The questionnaires require information about the home’s fuel meters, heating and ventilation systems and any signs of damp. They also ask occupants to rate their summer and winter comfort and air quality on a scale of 1-5. This allows pre and post questionnaires to be compared and changes in perceived comfort observed.

Obtaining historic fuel bills is the most challenging aspect. Occupants are being asked to supply bills. If that is not possible, the council will approach utility companies directly. In addition, meter readings will be taken whenever the council or contractor visits the homes, both before and after the retrofit – natural ‘touchpoints’ have been identified.

Finally, Leeds City Council will obtain nationally available data on Probabilities of
Income for the area in which the homes are located. This data, combined with the pre and post retrofit EPCs will allow them to assess the average fuel poverty levels and fuel poverty gap of the homes pre and post renovation.

Clearly, data protection needs to be carefully addressed. Leeds City Council’s data governance team is reviewing how the data must be collected and stored and occupants will be asked to sign a disclaimer, allowing access to their data.

Following this simple strategy, Leeds City Council will be able to evaluate not just the modelled, predicted impacts but the real, measured impacts of their retrofit projects across all of the BU2 project-level indicators: carbon emissions, energy consumption, renewable energy generation, fuel poverty, indoor air quality, winter and summer thermal comfort, money invested, jobs supported and financial savings.
Spain
Valladolid
and Zaragoza
Rehaviva tool

AEICE, Clúster de Hábitat Eficiente, together with the Castilla y León Construction Institute (ICCL), CROLEC and MOVICODERS, and with the collaboration of TECNARA, GBCe and the cities of Valladolid and Zaragoza, have developed the REHAvIVA tool, which will enable the collection of energy renovation data at municipal scale (with a view to scalability to region and country), the development of indicators to measure its results, and above all, to make the best decisions for the design of policies to promote the renovation of the building stock. It was directly born from the BUILD UPON² project.

The REHAvIVA project, coordinated by AEICE and of an interregional and intersectoral nature, has been co-financed by the Spanish Ministry of Industry, Trade and Tourism (MINCOTUR) within the 2020 call for innovative business clusters, and contributes to the implementation of the BUILD UPON² Monitoring Framework, as well as to the further development of indicators and data collection methodology.

After nine months of development, the tool has been implemented on a trial basis in the above-mentioned cities, both participating in the BUILD UPON² project.
The tool

REHAVIVA is an Intelligent Information System, conceived for the collection, processing and massive analysis of indicator data on the different aspects that affect the value chain of the housing construction and renovation activity.

The system, built on the concept of open data, serves firstly as an open and organised repository of public information on housing renovation, and secondly as a decision-making tool for local administrations and companies in the renovation subsector.

REHAVIVA brings three major characteristics to the BUILD UPON² Impact Framework:

• It improves or partially modifies the governance model of renovation in the different participating cities (Valladolid and Zaragoza).

• REHAVIVA aims to involve both municipal technicians and private agents that promote renovation.

• Transparency towards citizens, by providing information both on the development of renovation activities and the results obtained.

REHAVIVA provides another added value for the business network of the housing and construction sector: it is a very useful tool to know the demand for renovation in the municipality, and to measure the results of the interventions they have carried out for their clients, allowing them to improve their value proposition.

REHAVIVA’s webpage: https://www.aeice.org/iniciativas/rehaviva/. The tool will be soon available specifically for Valladolid and Zaragoza.

Design of the tool

The design of the tool is based on the analysis of the technical and administrative management processes of renovation actions and the consideration of key information for the study of the individual and grouped impact of renovation actions in the global framework of indicators.

The analysis of the renovation processes has allowed us to define a logical sequence of activities and the determination of different roles for management, incorporation of data and carrying out consultations and analysis in each of the actions.

These roles have been determined with the different agents in mind and their participation in each of the stages that make up the renovation execution process.

In summary, we can explain that the processes of initiation and final consolidation of the data
for each renovation action are reserved to the Administration, while the developer (through his technical representative) is allowed to intervene in the incorporation of the technical information into the platform. Finally, a consultation role has been created for citizens that allows the objective of transparency explained above to become a reality.

In a multi-agent and open process such as the one that has been designed, the inclusion of an information validation mechanism that allows the real-time calculation of the values of each of the established indicators to be made with reliable data is particularly relevant.

This role of guaranteeing the validity of the information is reserved for the administration.

On the other hand, a decisive element in the design of the tool has been the analysis of the indicators of the Impact Framework from BUILD UPON² in which REHAVIVA wants to be inserted and the analysis of the information produced by any renovation action.

It is important to highlight that two fundamental criteria have been taken into consideration here: a realistic approach to the implementation of the Impact Framework and an operational approach that makes it possible to extract the necessary data without increasing the bureaucratic burden and cost overruns that this would entail for renovation actions.

The data sources and documents currently required throughout the technical and administrative management of the interventions have been analysed and an action sheet has been composed to collect the key data in a format compatible with the Impact Framework indicators.

Finally, it is important to point out that a scalability criterion has been followed so that the REHAVIVA tool can easily adopt future modifications of the Impact Framework and at the same time the analysis of other data of interest that extend its potential beyond the energy renovation of buildings.

REHAVIVA has been designed in such a way that its results interface allows for consultation and analysis at different urban scales: individual project, neighbourhood, district and municipality.

The graphic support for the representation of the actions on the city map allows the user to relate to the information produced in a simple and effective way.

The edition of results reports on the Impact Framework and grouped queries has been reserved for the appropriate roles of the administration, although summary information is provided on an open basis.
The tool is structured as follows:

1- Process of data insertion of renovation intervention in buildings: on the basis of Cadastre and OpenStreetMap, the building and the renovation work to be carried out on it are registered:

2- Form for the registration of an action unit (U.D.A.): a building may have interventions at different times, each of them will have its data on a form.
3- **Display and visualisation of each action/intervention**: on the map you can view all the renovation interventions that are being added and see all the information about them.

4- **Visualisation of indicator results**: the indicators can be visualised in different ways by making filters: by time range, by building type, by scope of energy renovation, by districts and neighbourhoods, at the whole city level, etc.
First prototype: information layers

The tool has a map visualisation where the user can zoom in to city and building scale.

The city map includes actions that are under development (green) and the actions that have taken place (blue) are geolocated. The building information source is the cadastre. When you click on one building, a window with additional information pops up.

Additionally, the user can filter to see on the map the renovation actions of buildings/properties by districts, neighbourhoods and by date of construction or global renovation.

1) Visualisation map. Wide scale.
2) Visualisation map, city scale.
3) Visualisation map, building scale.
How it works

The steps to include data are as follows:

1. The building is registered by the Administration.

2. The renovation actions are registered by the Administration or the contractor (construction company).

3. The construction company's technician incorporates the details of the intervention data.

4. The designated council technicians are the ones who will validate and consolidate the data. These consolidated data are those that will be taken into account for the calculation of indicators.

For each building on which an intervention is to be carried out, a sheet is created with a series of informative data: cadastral reference, year of construction, district, CEE result, building typology, tenancy regime, type of use, etc. That way, the actions can be filtered according to their characteristics. Each building will have from 1 to ‘n’ number of renovation actions associated with it (as they can be partial).

For each of the renovation actions to be carried out on a building/property, a sheet is defined that allows sufficient information to be incorporated to calculate the indicators, both before and after renovation.

Once the performance data has been introduced, the Administration is requested to validate the data. If the administration validates the data of that renovation action, it must consolidate them. In this way, once consolidated, the data upload process for renovation actions is concluded, and therefore the data will be available for the calculation of indicators, mainly environmental and economic indicators. The social indicators have not yet been incorporated in this phase of the project.

The indicators can be visualised in different ways through different filters: by time range, by type of use, scope of the energy renovation, by districts and neighbourhoods to see how it works in the city, etc.
Best practices for the implementation of the Framework

Building sheet

Information sheet of an intervention (step 3)
Development: next steps

The Impact Framework indicators is not yet built at this stage of the project, but work is underway on:

• The permissions approach

• The dynamics of internal work, how it should be managed in the municipality.

• The dynamics of provisional data and validated data.

• The dynamics of analysis and final discrimination of data, intervention by intervention.

The ambition of the project is not only to provide a tool for monitoring indicators, but also to enable developers to create scenarios for their own business plans related to renovation. And even as a training tool for the staff of the municipality.

The prototype was completed by 30th June (as a usable product, as of that date). It will be operational in Valladolid and Zaragoza City Councils until the end of the year while the tool will be consolidated and improved.

From the summer onwards, a possible calendar will be discussed as a tool to be shared with other cities.
Italy - Padova
Integration of the Framework indicators into SECAP reporting

The Sustainable Energy and Climate Action Plan of the municipality of Padova aims at reducing climate emissions by 55% by 2030 with the implementation of 83 mitigation actions and 33 adaptation actions.

The SECAP was drawn up with the collaboration of several technical partners around an intersectoral table of the various municipal offices. Private and public stakeholders have been consulted for data sharing and actions development and for the formulation of operative proposals through collaboration agreements. In fact, the PAESC determines the sustainable strategy of the Municipality and the Territory.

The six pillars

- A city with new energies
  Promoting the production of energy from renewable energy sources
- A more efficient city
  Increase the efficiency of public and private building structures
- A city with smart networks and services
  Promote more efficient public and private services
- A city that moves better
  Promoting more sustainable mobility
- A city with a low-emission economy
  Promoting sustainability policies in business choices
- A more resilient city
  Increase the resilience of the territory and encourage the adaptation of the city to climate change
The Build Upon² framework’s indicators have been integrated into two chapters of the document:

- A more efficient city
- A more resilient city

Build Upon² indicators can support both the implementation and monitoring of the SECAP. Two sets of indicators have been identified:

### Result indicators:
Result indicators: 2 indicators per initiative in each chapter, they aim at assessing the outcome of each action. Many Build Upon² environmental and economic indicators have been included.

Examples of the use of Results indicators in the chapter 2 – A more efficient city, were presented by the Municipality of Padova at the Covenant of Mayors Investment Forum: Energy efficiency finance marketplace on the 15th June 2021. Some sildes are reported below with the Build Upon² indicators included in the monitoring strategy.

<table>
<thead>
<tr>
<th>Actions</th>
<th>Indicators</th>
<th>Unit of measurement</th>
<th>Data source</th>
<th>Frequency of data collection</th>
<th>Framework BuildUpon2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency measures in municipal buildings: offices, schools,</td>
<td>&gt; Interventions carried out in buildings</td>
<td>-</td>
<td>Public Works Department</td>
<td>Annual basis</td>
<td>Indicators:</td>
</tr>
<tr>
<td>sports facilities, etc. (actions 1,2,3,4)</td>
<td>&gt; Pre- and post-intervention energy consumption</td>
<td>MWh Tons CO₂</td>
<td>Public Works Department</td>
<td>Annual basis</td>
<td>Env.1, Env.2, Env.3,</td>
</tr>
<tr>
<td></td>
<td>&gt; Avoided emissions</td>
<td></td>
<td></td>
<td></td>
<td>Env.4</td>
</tr>
<tr>
<td>Energy efficiency measures for non-municipal public buildings:</td>
<td>&gt; Interventions carried out in buildings</td>
<td>-</td>
<td>Building owners/managers</td>
<td>Every 2-years</td>
<td>Indicators:</td>
</tr>
<tr>
<td>provincial buildings, etc. (actions 5,6,7,8,10)</td>
<td>&gt; Pre- and post-intervention energy consumption</td>
<td>MWh Tons CO₂</td>
<td>Building owners/managers</td>
<td>Every 2-years</td>
<td>Env.1, Env.2, Env.3,</td>
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<tr>
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<td>&gt; Avoided emissions</td>
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<td>Env.4</td>
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<tr>
<td>Support for energy efficiency measures in private buildings and</td>
<td>&gt; Number of interventions carried out/year and savings achieved</td>
<td>MWh Tons CO₂</td>
<td>National Energy Agency</td>
<td>Annual basis</td>
<td>Indicators:</td>
</tr>
<tr>
<td>introduction of environmental sustainability requirements</td>
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<td></td>
<td></td>
<td></td>
<td>Env.1, Env.2, Env.3,</td>
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<tr>
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<td></td>
<td>&gt; Investments made</td>
<td>€</td>
<td>National Energy Agency</td>
<td>Annual basis</td>
<td>Indicators:</td>
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<tr>
<td></td>
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<td>Eco.1</td>
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<tr>
<td>Implementing a One-Stop-Shop (OSS) for the energy refurbishment of</td>
<td>&gt; Number of refurbished buildings and interventions carried</td>
<td>n.</td>
<td>One-Stop-Shop</td>
<td>Annual basis</td>
<td>Indicators:</td>
</tr>
<tr>
<td>the building stock (PadovaFIT Expanded European project)</td>
<td>&gt; Annual savings achieved and production by RES</td>
<td>MWh Tons CO₂</td>
<td>One-Stop-Shop</td>
<td>Annual basis</td>
<td>Env.1, Env.2, Env.3,</td>
</tr>
<tr>
<td>[action 10]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Env.4</td>
</tr>
<tr>
<td>Promotion of boiler replacement [action 11]</td>
<td>&gt; Number of boilers replaced</td>
<td>n.</td>
<td>Environmental Department</td>
<td>Annual basis</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt; Ex ante and ex post installed power of replaced boilers/year</td>
<td>MWh Tons CO₂</td>
<td>Environmental Department</td>
<td>Annual basis</td>
<td>Indicators:</td>
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<tr>
<td></td>
<td>&gt; Avoided theoretical emissions</td>
<td></td>
<td></td>
<td></td>
<td>Env.2, Env.3</td>
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<td>Energy efficiency interventions, in private condominiums, carried out</td>
<td>&gt; Interventions carried out in buildings</td>
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<td>ASE – private company</td>
<td>Every 2-years</td>
<td>Indicators:</td>
</tr>
<tr>
<td>by ASE [action 13]</td>
<td>&gt; Pre- and post-intervention energy consumption</td>
<td>MWh Tons CO₂</td>
<td>ASE – private company</td>
<td>Every 2-years</td>
<td>Env.1</td>
</tr>
<tr>
<td></td>
<td>&gt; Avoided emissions</td>
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<td>Indicators:</td>
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<td></td>
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<td></td>
<td>Env.2, Env.3, Env.4</td>
</tr>
<tr>
<td>Energy efficiency in supermarkets: the SUPERHERO project [action 14]</td>
<td>&gt; Number and volume of stores involved in the project</td>
<td>n. M²</td>
<td>Environmental Department</td>
<td>Annual basis</td>
<td>Indicators:</td>
</tr>
<tr>
<td></td>
<td>&gt; Interventions carried out/year and savings achieved</td>
<td>MWh Tons CO₂</td>
<td>Environmental Department</td>
<td>Annual basis</td>
<td>Env.1</td>
</tr>
<tr>
<td></td>
<td>&gt; Avoided emissions</td>
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<td></td>
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<td>Env.2, Env.3, Env.4</td>
</tr>
<tr>
<td>Analysis, evaluation and monitoring of the building stock of the</td>
<td>&gt; Annual monitoring of energy consumption</td>
<td>MWh</td>
<td>University of Padova</td>
<td>Every 2-years</td>
<td>Indicators:</td>
</tr>
<tr>
<td>University of Padova [action 15]</td>
<td>&gt; Number of buildings certified and/or energy-diagnosed</td>
<td>% on total</td>
<td>University of Padova</td>
<td>Every 2-years</td>
<td>Env.3</td>
</tr>
</tbody>
</table>
Impact indicators: these are cross indicators that measure the effectiveness of the plan in each sector (built environment, mobility, infrastructures.). The Build Upon² Framework is going to be almost completely integrated in this set of indicators. The municipality is currently working at the development of a SECAP reporting procedures that include the impact indicators. It will be ready in the autumn 2021. An anticipation of the use of Build Upon2 indicators is reported below.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Unit of measurement</th>
<th>Data source</th>
<th>Frequency of data collection</th>
<th>Framework BuildUpon²</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;Reduction of final energy consumption from energy refurbishment measures</td>
<td>MWh/year</td>
<td>National Energy Agency</td>
<td>Annual basis</td>
<td>Indicators: Env.1, Env.3, Eco.5</td>
</tr>
<tr>
<td>(civil sector)</td>
<td>€ saved/year</td>
<td>Environmental Department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Reduction of direct CO2 emissions from energy refurbishment measures</td>
<td>Tons CO2/year</td>
<td>Environmental Department</td>
<td>Annual basis</td>
<td>Indicators: Env.2</td>
</tr>
<tr>
<td>&gt;Average energy saving by typology of intervention</td>
<td>MWh/intervention</td>
<td>National Energy Agency</td>
<td>Annual basis</td>
<td>Indicators: Env.3</td>
</tr>
<tr>
<td>&gt; Energy produced from renewable sources as a result of energy refurbishment measures</td>
<td>MWh/year</td>
<td>National Energy Agency</td>
<td>Every 2-years</td>
<td>Indicators: Env.4</td>
</tr>
<tr>
<td>&gt;Investments realized</td>
<td>€/kWh saved FTE</td>
<td>National Energy Agency</td>
<td>Annual basis</td>
<td>Indicators: Eco.1, Eco.2, Eco.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental Department</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hungary Budavár

Integration of the Framework’s indicators into SECAP reporting

Municipality of Budavár (1st district of Budapest, self-government independent from the Capital) joined the Covenant of Mayors, prepared and adopted its SECAP in May 2021.

In the Sustainable Energy and Climate Action Plan Budavár implemented the Framework indicators into its reporting strategy for the building sector, that takes the largest part of CO2 emission reduction targets.

The Action Plan contains all Environmental and Social indicators, and the efficiency-related Economic ones. The local employment and trained workforce (Eco3 and Eco4) data cannot be interpreted on the local level, it is rather applicable to the Budapest metropolitan area.

Data collection – at this time – is ad-hoc. According to the strong commitment – one of which is to the Covenant of Mayors – in increasing energy-efficiency, reducing climate risks and adapting to climate change, the Municipality’s interest is to monitor performance, management, efficiency and usage, and to mainstream those throughout all decision making and processes. Budavár joined Build Upon² project as a follower city to reinforce capacities, to train responsible staff and to provide useful tools for data collection and analysis.
Best practices for the implementation of the Framework
Conclusions

This report collects a series of best practices in terms of tools and platforms to collect, elaborate, visualize and communicate several types of data collected from building renovation activities, as well as the first attempts to integrate the indicators of Build Upon² Framework into the current procedures for monitoring and reporting renovation works in 5 cities of the project. From the reported experiences a series of recommendations can be drawn to inform in WP5, where a concept of a tool to support the use of Build Upon² Framework is under development.
1) Cooperation for tool design

A collaboration of several stakeholders is needed to develop a tool that aims to manage several data sources and to serve several purposes. Examples of the actors to be involved in the design and testing phase of the tool are: local and regional authorities, software engineering, communication consultants, technical experts. A great example of this cooperation is the development of the Rehaviva tool for the cities of Valladolid and Zaragoza.

2) Types of data and access to data sources

To organize efficiently the use of the Framework and minimize the request of information, a selection of data needed that support more than one indicator is a priority exercise for the development of the tool. An example of this process was tested by the city of Leeds in its strategy to monitor and report the impact of building renovation works on residential buildings.

The tool should allow the integration of data at project level, such as those collected in building permits, and big data from energy distribution companies, for instance on final energy use at unit level. This would allow the use of the framework to support SECAP reporting, as demonstrated in the example of the city of Padova and Budávár.

The tool should also allow the collection of data in different forms, not only digits but also results from surveys, as it happens in Leeds' monitoring strategy for social indicators, because some indicators are currently expressed in qualitative terms.

The tool should allow the transfer of information from several data sources such as database of building permits at national level, as in the collaboration between GPE and Impresa in un giorno in Italy, the Estadísticas de la Construcción del Gobierno Central in Spain, or the EPC databases, as the examples of the tools developed in Croatia, Ireland and Poland.

All data collected should be available on the same platform and there should be the possibility to upload other documents if needed.

Municipal officers should be able to add some information manually, as on the GPE portal in Padova or they should be guided by specific templates for the required data to answer indicators, as the example of the Spanish tool Mirador. Mandatory request for some kinds of data would allow the automated calculation of some indicators.

The continuity of use of the tool for several years shall allow comparability of same performances in time, as it happens in Budaors with the application of the ISO 50001 monitoring process.
3) Users of the tool and customization

The experience in Leeds highlights the need of allowing different users to upload information on the portal in different phases of the renovation process. The possibility of transferring to the building owner or its consultant (architect, engineer) the responsibility of uploading some specific data, is something that was discussed in the pilot city workshop in Padova as well, it was seen a way to reduce workload on technical officers of local authorities.

The same concept is reported in Rehaviva tool where it is highlighted that different users can access different part of the platform, a related issue can be the guarantee of privacy for sensible information and the reduction of the complexity of the digital interface.

The tool Our City Our Energy highlights how public authorities can access different functionalities such as data analysis, energy planning, whereas citizens may be able to visualize mainly, and being involved in specific surveys.

4) Multi-functionality

All tools presented have a certain level of multi-functionality, also related to the number of users that exploit the tool.

Overall, municipalities need to assess energy consumption, costs, building and resources management, identify malfunctioning of buildings and systems (as by ISGE tool in Croatia). This level of information can be used for energy modelling, development of scenarios to inform policy processes and decision making, as well as assessing effectiveness in use of public funding for specific measures on the built environment, as highlighted by the experience in Budavar and in Spain with Mirador and Rehaviva tools. A major example is the SMIV tool, in Croatia, is used to assess the implementation of the national action plan for energy efficiency.

The tool should enable data collection for the calculation of KPIs that support energy planning at building and urban level, a great example of this multi-functionality is the irish Retrokit tool.

Multi-functionality shall not be only for local authorities but also for citizens who through the tool can check the progress of local policies, learn from the example of public buildings, take part to awareness raising campaigns and training activities, and have an active role in local policies in general. An example of participation of the citizens via a tool is explored in the Spanish application Our City Our energy. The Przemek program highlights how the platform developed for a series of schools in Poland can be used for training session of the school staff and for developing awareness and educational activities of the students.
5) Multi-scale application

The application of Build Upon² indicators to Padova’s SECAP as result- and impact-indicators highlights the need for a tool that can support two levels of monitoring and reporting, at project scale and at city scale for the assessment of comprehensive local policies for the built environment. This is implemented on the Rehaviva tool that can visualize data and results at building, neighborhood, and city scale.

6) Visualisation of data

The geo-localization of data on a city map is fundamental for technical and communication purposes. The former reason is linked to the support that data visualization can give to understanding of issues in the built environment, to assess several policy scenarios and to appreciate the level of penetration of the renovation action in the city. For communication purposes, the visualization of in progress and finished renovation works on buildings as well as other relevant data is fundamental to create awareness among citizens on the opportunity offered by renovation programs and engage them in public initiatives. Examples of the exploitation of maps to visualize data are given by the Rehaviva, Mirador and Retrokit tools.

7) Future upgrade of the tool

Finally, the tool should allow future integrations and improvements as the indicators may vary in their numbers and in methodology of calculation in future revision of the Framework. The Rehaviva tool already allows this level of editing and customization.

None of the case studies use the full Framework of indicators but a selection of them. Social indicators are overall those more difficult to apply. The strategy tested in Leeds employs the use of questionnaires to face social indicators related to indoor air quality and thermal comfort. Social indicators are excluded at the moment in the Italian and Spanish applications, but the reporting structure established in Budavar integrates all social indicators.
References
Tools’ websites

Not for all the tools the website is available, last view 30th July 2021

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Croatia - SMIV: http://cei.hr/en/

Ireland - Dublin City Council - Energy Elephant: https://energyelephant.com/demo

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Italy - Portale Impresa in un giorno: https://www.impresainungiorno.gov.it/


Spain - Mirador: https://www.programaparae.es/mirador

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Spain – Rehaviva Tool: https://www.aeice.org/iniciativas/rehaviva/
Green Building Council Italia (GBC Italia) is a non-profit association that includes the most competitive companies and the most qualified Italian professional associations and communities operating in the sustainable construction sector.

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• favorire e accelerare la diffusione di una cultura dell'edilizia sostenibile, guidando la trasformazione del mercato;
• sensibilizzare l'opinione pubblica e le istituzioni sull'impatto che le modalità di progettazione e costruzione degli edifici hanno sulla qualità della vita dei cittadini;
• fornire parametri di riferimento chiari agli operatori del settore;
• incentivare il confronto tra gli operatori del settore creando una community dell'edilizia sostenibile.

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