European Commission

INTELLIGENT CITIES CHALLENGE

RENOVATION WAVE IN PRACTICE

The European Commission's 100 Intelligent Cities Challenge

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About the Intelligent Cities Challenge

The Intelligent Cities Challenge (ICC) is a European Commission initiative that supports cities in using cutting-edge technologies to lead the intelligent, green and socially responsible recovery. ICC cities and their local ecosystems will be engines for the recovery of their local economies, create new jobs and strengthen citizen participation and wellbeing. The first phase of ICC supported a total of 136 cities in the period from 27 January 2020 to 30 November 2022. The ICC is continued by the second phase - launched on 1 December 2022 - with a new group of cities to be selected to take part in the network and benefit from advisory support.

Cities receive one-to-one strategic advice from international experts and mentor cities. In the first phase of ICC this was delivered across five themes: green economy and local green deals; improving citizen participation and the digitalisation of public administration; green and digital transition in tourism; resilience of local supply chains; and up- and reskilling of the workforce. The second phase's thematic focus concentrates on the green and digital transition as well as the proximity economy. Cities are also supported by transversal services covering access to data, access to finance and through Tech4Good, a marketplace of innovative solutions.

The ICC is part of a wider EU support system that recognises the importance of delivering on the promises made by the European Green Deal, the digital strategy and other EU policies. It looks to help cities deliver on the transition, moving towards an increasingly green, digital, service-oriented and low-carbon economy, supported by a knowledge-based society, that enables circular economy systems through 'local value loops', evidence-based reskilling and sustainable investments.

More information on the ICC is available at *www.intelligentcitieschallenge.eu*

The Intelligent Cities Challenge is funded by COSME, the EU programme for the Competitiveness of Enterprises and SMEs

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1 Introduction

In October 2020, the European Commission (EC) launched the 'renovation wave', a comprehensive strategy and action plan with the objective of boosting renovation rates of buildings and delivering deeper renovation, while creating good jobs and improving quality of life for all.

This guide is a resource for all cities who wish to:

- understand the key principles and priority actions of the Renovation Wave;
- understand how the Renovation Wave relates to the wider enabling environment of European Union (EU) policies, directives and standards;
- learn which role cities can play in accelerating the Renovation Wave at a local level through:
  - piloting
  - unlocking funding and finance
  - removing market barriers
  - developing partnerships
  - placing communities at the centre of the Renovation Wave;
- be inspired from tangible and successful examples of renovation initiatives delivered or facilitated by local governments across Europe;
- learn about novel instruments and technologies supporting renovation, such as transition funds and Product-as-a-Service.

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2 The case for renovation

Europe aims to be the first climate neutral continent in the world. To achieve this ambitious goal and align all agents within the EU, the European Green Deal aims to overcome the challenges of climate change and guide the continent towards carbon-zero by 2050, while creating economic growth.

One of the key actions identified by the European Green Deal is the need to renovate the existing building stock. The building sector is one of the largest energy consumers, accounting for 40% of the EU's total energy consumption and over one third of total energy-related greenhouse gas emissions. To date, however, the pace of deep renovation across Europe is lagging. This is not only a threat to the achievement of climate targets, but also impacts the far-reaching social, economic and environmental benefits that could be brought by renovation at scale, creating jobs and improving lives of communities across the EU.

Conversely, European cities are facing big challenges in reducing their vulnerability to climate change and in retrofitting their built infrastructure. European building stock is concentrated in cities, 85% of which were built before 2001. Alongside the imperative to decarbonise the construction sector, local governments are also preoccupied with rising energy poverty, skill shortages and the impact that disruption to global supply chains, brought by COVID-19 first and then by the cost-of-living crisis, is having on citizens and local businesses.

These challenges cannot be overcome without a comprehensive and integrated strategy that encompasses policies and regulations, as well as financial and technical support, to achieve a step-change in the depth and scale of renovations across Europe.

With this aim, in 2020, the EC released: **A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives.**

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*All data points refer to 2020 (Eurostat)

The EU's buildings account for:

40% of energy consumed

36% of energy-related greenhouse gas emissions

Construction and demolition activity is the single biggest source of waste in the EU, with **37.1% of the total** in 2020.

The EU's existing building stock renovation level is at **11%**. However, renovation works very rarely address energy performance of buildings: the weighted annual energy renovation rate is low at around **1%**.

Only **0.2% of deep renovation** (yearly average rate).

To reduce emissions by at least 55% by 2030, the Renovation Wave aims to at least double the annual energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations.

Mobilising forces at all levels towards these goals, including leveraging around €275 billion of additional investments, will result in 35 million renovated building units by 2030.

35 million Europeans are living in a situation of energy poverty

800,000 social homes require renovation every year in Europe

Investment gap of **€57 billion** per year on affordable and social housing

Reductions required at multiple levels to achieve the **55%** reduction in greenhouse gas emissions by 2030 compared with the 1990 levels:

60% building greenhouse gas emissions

14% building energy consumption

18% energy consumption for heating and cooling

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3 The Renovation Wave

The Renovation Wave is a strategy with the aim to at least double the annual energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations. The Renovation Wave acts as a unifying framework for existing EU directives that are currently revised with increased levels of ambition (i.e. the recasts of the Energy Performance of Buildings Directive and of the Energy Efficiency Directive, the revised Renewable Energy – Recast to 2030 Directive, eco-design regulations). It aims to provide adequate tools[1] (i.e. European Local Energy Assistance) to foster investments and accelerate the mobilisation of private financing, supporting the decarbonisation of the construction sector, together with the support of sustainable development and just transition.

Besides providing an ambitious and cohesive policy landscape, the Renovation Wave aims at shaping future initiatives, by setting clear principles and lead actions to meet the dual objective of decarbonisation and inclusive economic growth. Affordability, lifecycle thinking, high environmental standards and digital tools, but also respect for aesthetics, will inform the design and implementation of renovation measures, maximising environmental, social and economic benefits for communities. These impacts will go beyond the construction sector, creating healthier places, reducing deprivation and stimulating innovation.

The Renovation Wave sheds light on the tremendous investment gap for social infrastructure, such as affordable housing and launched the *Affordable Housing Initiative* (AHI) to pilot the renovation of '100 lighthouse social and affordable housing districts' by 2030. This initiative provides support (e.g. technical, financial, regulatory) to local partnerships composed of SMEs in the construction sector, public authorities, social housing providers and other relevant stakeholders in affordable and social housing construction and renovation projects. Community involvement, multi-actor partnerships, economic regeneration of neighbourhoods and energy efficiency technologies are key drivers to alleviating energy poverty through renovation and construction of affordable housing stock.

This presents cities in the EU with a unique opportunity to create a win-win for climate neutrality and recovery. The actions promoted by the Renovation Wave address market and legislative barriers that usually cannot be addressed at a local government level and provide support bridging existing funding, capacity and skills gaps. Conversely, the centrality given to participative, neighbourhood-level approaches, the support of shorter supply chains and the retrofit of public buildings and social housing, demonstrate the crucial role cities can play in accelerating the Renovation Wave throughout Europe.

1 *See also: European Commission (2020) COMMISSION STAFF WORKING DOCUMENT Support from the EU budget to unlock investment into building renovation under the Renovation Wave https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122391413&uri=CELEX:52020SC0550*

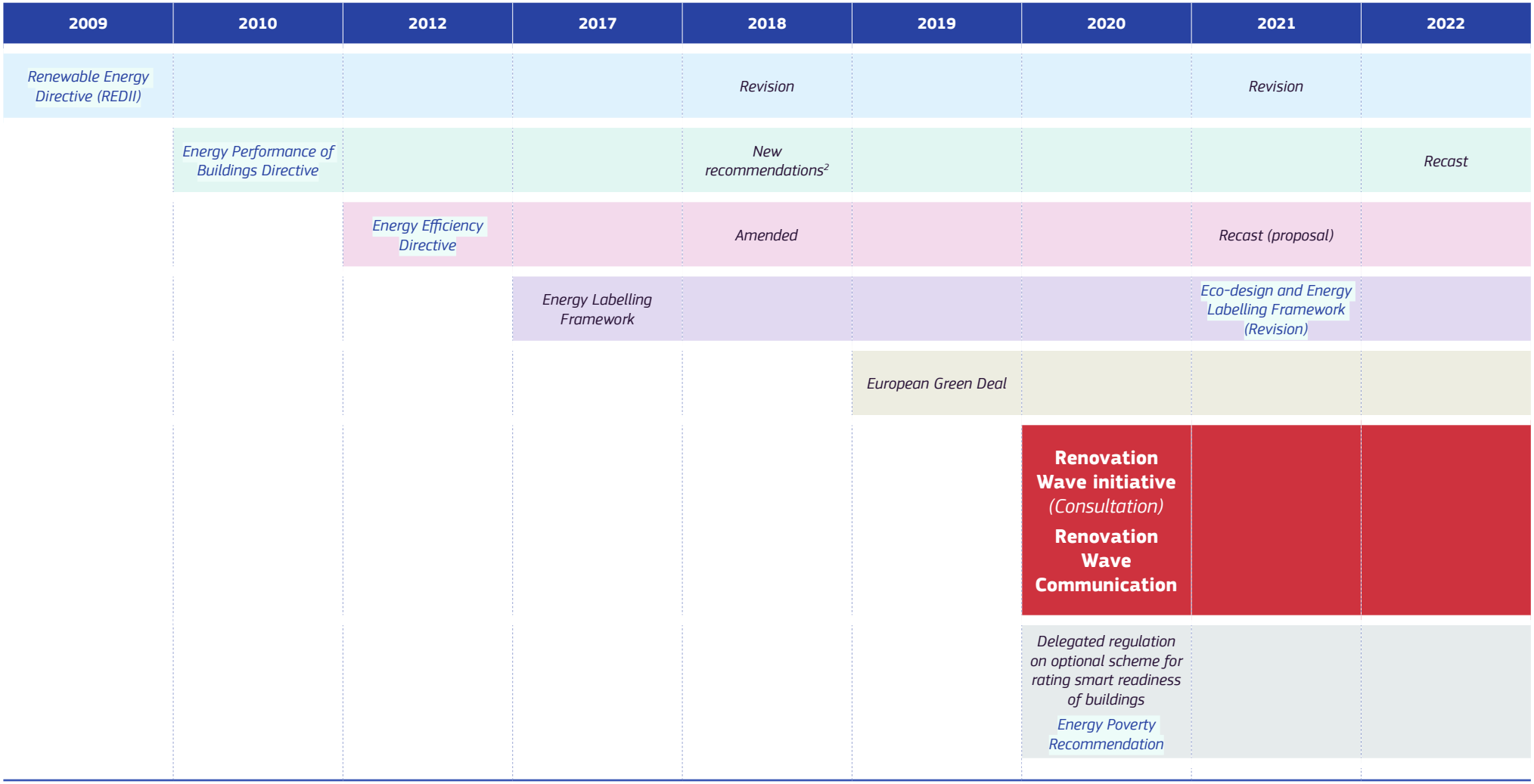

Diagram: Policy Timeline

2 The Commission published 2 recommendations in 2019, including guidelines for EU countries: Commission recommendation on building renovation (EU) 2019/78 and Commission recommendation on building modernisation (EU) 2019/1019

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KEY PRINCIPLES	LEAD ACTIONS	FOCUS AREAS
What guides the development of new measures to meet the Renovation Wave's goals?	**Which measures will unlock and accelerate renovation?**	**What to prioritise and how to maximise social, economic and environmental impacts**
• Energy Efficiency First • Affordability • Decarbonisation and integration of renewables • Lifecycle thinking and circularity • High health and environmental standards • Tackling the twin challenges of the green and digital transitions together • Respect for aesthetics and architectural quality	• Strengthening information, legal certainty and incentives for renovation • Reinforced, accessible and more targeted funding and financing • Increasing capacity and technical assistance • Creating green jobs, upskilling workers and attracting new talent • Creating a sustainable built environment • Placing an integrated, participatory and neighbourhood approach at the heart of the Renovation Wave • The New European Bauhaus: matching style with sustainability	• Tackling energy poverty and worst-performing buildings • Renovating public buildings, such as administrative, educational and healthcare facilities • Decarbonising heating and cooling

Diagram: Principles, Lead Actions, Focus Areas

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4 Which principles will guide building renovation towards 2030 and 2050?

The EU identified a set of principles that will drive the scaling-up of building renovation over the next thirty years. These encompass objectives that include the reduction of energy consumption together with decarbonisation, the provision of affordable and healthy housing, the employment of smart solutions and the respect of aesthetics of heritage.

There are multiple opportunities for cities to embed these principles in local level plans. For instance, the achievement of the twin transition and energy decarbonisation are reflected in Sustainable Energy and Climate Action Plans (SECAPs) under the *Covenant of Mayors*, *Local Green Deals* under the Intelligent Cities Challenge and the upcoming Climate Contracts under the 100 Climate Neutral and Smart Cities Mission. Regeneration strategies often include affordability among their main goals, while local building codes define aesthetics preservation guidelines.

Energy Efficiency First

Cost-effective energy efficiency measures that make energy supply, distribution and transmission more efficient are given paramount importance in the planning, policy and investment decisions. This principle serves as the EU's guide for governance and strategy, directly addressing the problem of energy poverty and worst-performing buildings.

Affordability

Affordable prices and wide availability of energy-performing buildings can help people with lower incomes to effectively manage their energy expenditure and avoid being caught in a cycle of high energy bills and arrears.

Decarbonisation and integration of renewables

Renovation should become an opportunity to prioritise renewables or low-carbon energy sources from local sources and increase system integration at different scales. This principle helps guide towards a climate-neutral economy.

Lifecycle thinking and circularity

Efficient resource management and the reuse and recycling of materials through cyclical processes contributes to the reduction of a building's footprint. Renovation, instead of demolition and reconstruction, can enable the improvement of the building's carbon footprint over its lifecycle whereby operational energy savings can offset embodied energy associated with construction.

High health and environmental standards

Renovation should ensure buildings have the capacity to withstand climate hazards relating to temperature, wind, water and soil, but also ensure that standards related to air quality and water management are met. Accessibility should be ensured for all.

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Tackling the twin challenges of the green and digital transitions together

Employing smart solutions in building infrastructure helps address the decarbonisation of the heating and cooling systems. Smart buildings can enable the efficient production and use of renewables at house, district, or city level.

Respect for aesthetics and architectural quality

Renovation should aim to respect the local architectural, craftmanship and construction culture. This will help preserve heritage and support local skills and supply chains.

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5 Which measures will unlock and accelerate renovation?

The Renovation Wave Strategy works at the nexus of several policies and financial instruments available for cities to accelerate the transformation of the built environment. Through analysis and public consultation, the Commission has identified a number of lead actions that can unlock and accelerate the uptake of renovation, addressing the current market, technical and governance barriers.

Tackling energy poverty and worst-performing buildings

Poorly performing buildings are often connected with energy poverty and vulnerable communities. Retrofitting worst-performing collective housing has a true potential for increasing quality of life for people in need, while achieving energy and carbon savings at scale.

This will be tackled with a rich mix of measures including expanding the use of ESCOs and energy performance contracts, financing retrofit through on-bill repayments, Minimum Energy Performance Standards (MEPS) and new programmes such as the Affordable Housing Initiative, among others.

Renovating public buildings and social infrastructure

Social infrastructure and public assets can pilot and spearhead the Renovation Wave, demonstrating benefits to communities and boosting the visibility of retrofit.

This effort will be supported by the Commission through issuing guidance and developing green public procurement criteria, as well as by stronger provisions in the public sector in the *Energy Efficiency Directive* recast, along with MEPS.

Decarbonising heating and cooling

Decarbonising heating and cooling is the key counterpart to reducing energy consumption through retrofit.

The *Renewable Energy Directive* sets specific renewable heating and cooling targets, working in synergy with the Energy Efficiency Directive to strengthen the capacities of public authorities to prepare, finance and implement comprehensive heating and cooling planning.

Strengthening information, legal certainty and incentives for renovation

Transparency and providing relevant information to public and private actors is key to efficiently accomplishing the required levels of renovation.

Policies outlined by the Renovation Wave, including the Energy Efficiency and *Energy Performance of Buildings Directive*, look at the extension of renovation requirements to buildings at all public administration levels. These policies introduce mandatory minimum energy performance standards for existing buildings and place a stronger obligation to have Energy Performance Certificates, which will be available in *Digital Building Logbooks* – a repository of all building-related data including those provided by the upcoming Building Renovation Passports, the Smart Readiness Indicator and the Level(s) Assessment.

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Reinforced, accessible and more targeted funding and financing

Building renovation is a main priority for national recovery plans of Member States. To effectively implement it, all relevant actors must be engaged through targeted EU funding.

The Renovation Wave aims to leverage available resources and fiscal instruments that work towards the decarbonisation of the building sector, while providing diverse forms of financing options for different actors in the form of loans and grants, technical assistance and project development support[3].

Policies and instruments including the *Energy Taxation Directive*, the *Recovery and Resilience Facility* and *Invest EU* also contribute to this aim, stimulating initiatives pertaining to decarbonisation and renewable energy transition.

Increasing capacity and technical assistance

The Renovation Wave makes the case for setting up standardised one-stop shops that can be deployed quickly at national, regional, or local levels for delivering tailored advice and financing solutions for homeowners and SMEs.

Instruments such as the *European Local ENergy Assistance* (ELENA) facility enable the scaling up of technical assistance and make it closer to regional and local actors, as well as other vehicles like the *LIFE* programme and the *Horizon Europe* funding programme.

Horizon Europe's funding calls for project development assistance help to prepare investments in the circular economy at the local and regional level.

Additionally, the EC's *Circular Cities and Regions Initiative* (CCRI) provides technical assistance to cities and regions to develop local competencies and capacities to implement their circular systemic solutions, including in the buildings and construction sector.

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3 *See: European Commission (2020) COMMISSION STAFF WORKING DOCUMENT Support from the EU budget to unlock investment into building renovation under the Renovation Wave https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122391413&uri=CELEX:52020SC0550*

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Further support is offered via the *Smart Cities Marketplace*, closely collaborating with other EU level initiatives, such as the *Covenant of Mayors* or the *EU City Facility* amongst others and building on the experience of 18 H2020 Lighthouse projects[4] involving 120 cities from across Europe. The Smart Cities Marketplace offers hands-on guidance[5] and an integrated Explore-Shape-Deal Matchmaking process[6] for the implementation, replication and upscaling of solutions, many of which are in the built environment sector.

Creating green jobs, upskilling workers and attracting new talent

The role of a skilled labour force is crucial for a truly effective renovation of the built environment. The Renovation Wave aims to increase technical training capacity through skills development for workers, enabling the opportunity to create new green jobs and increase the presence and role of women in the construction sector.

This action is driven by available funding options from multiple EU funds including the *European Social Fund*, the *Just Transition Fund* or the *Build Up Skills* initiative, focused on increasing employment rates.

Creating a sustainable built environment

The renovation of buildings should incorporate sustainable and circular criteria to really contribute to a better, healthier and environmentally-friendly built environment. Along with the Energy Performance of Buildings Directive, among other policies, the Renovation Wave proposes the review of material recovery targets and increasing the support of the internal market for secondary raw materials. Technology and digital tools are key to integrating sustainability at the core of cities, enabling the deployment of the required digital infrastructure to move away from fossil fuel dependent energy systems and accelerating the green transition, while increasing the resilience of the EU-wide energy system.

Cities can help accelerate the granting of permits to renovate by digitalising the building permitting process and encouraging local construction SMEs to digitalise[7].

Placing an integrated, participatory and neighbourhood approach at the heart of the Renovation Wave

The Renovation Wave focuses on the promotion of smart infrastructure while driving citizen engagement through neighbourhood-based approaches, such as the ones under JPI Urban Europe's *Driving Urban Transitions to a Sustainable Future* (DUT).

The Renovation Wave facilitates the development of energy communities and local action through Horizon Europe and the R&I co-creation space, while supporting the development of climate-resilient building standards.

The New European Bauhaus: matching style with sustainability

In order to achieve a refurbished and improved building stock in the EU that matches sustainability with aesthetic quality, the Commission has launched the *New European Bauhaus* in 2020. This is conceived as an interdisciplinary, largely bottom-up movement that connects practitioners and citizens in creating a growing pool of projects showcasing socially and aesthetically promising green and digital solutions, technologies and products.

The Net-Zero Industry Act (NZIA)

The legislation proposed by the European Commission in March 2023 aims to scale up clean technology manufacturing in the EU with a target to provide at least 40% of the EU's annual deployment needs for strategic net-zero technologies by 2030. These strategic net-zero technologies include solar, wind, batteries and storage, heat pumps and geothermal energy, electrolysers, and fuel cells, biogas/biomethane, carbon capture and storage, and grid technologies. *NZIA* is therefore a key booster and catalyst of the EU Renovation Wave.

4 https://smart-cities-marketplace.ec.europa.eu/projects-and-sites/projects?f%5B0%5D=lighthouse%3ALighthouse%20projects
5 https://smart-cities-marketplace.ec.europa.eu/insights/solutions
6 https://smart-cities-marketplace.ec.europa.eu/matchmaking

7 For additional services and resources, please also see: EISMEA – Digitalisation of Construction SMEs

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6 What can city governments do to accelerate the Renovation Wave?

Cities can play a central role in accelerating the implementation of the Renovation Wave. While some barriers and opportunities depend on structural issues, or National-level legislation and regulation, local governments can leverage both soft and institutional power to:

Place communities at the centre of the Renovation Wave

City governments can truly bring citizens into the core of the Renovation Wave, through involvement in co-design and delivery, as well as supporting positive behavioural change through the creation of new business and delivery models.

Implement pilots and demonstrators

This includes strategies to mainstream renovation practices and clean-tech solutions, as well as piloting interventions at scale, demonstrating the benefits delivered to the local communities and economy.

Remove market barriers for both supply and demand

Through the provision of physical and digital marketplaces and resources, municipalities can lower access barriers for supply chain stakeholders and customers of circular and renovation practices.

Unlock funding and finance

Local governments can be a first mover in creating sustainable systems to finance renovation, by de-risking investment and matching funding from different sources.

Develop partnerships

The local public sector can broker relationships between different segments of the private, third sector and civil society, supporting the creation of new business and delivery models.

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The benefits of cities taking the lead in implementing renovation at a local level are manifold. Renovation can reduce pressure on local budgets due to energy consumption and help reduce energy poverty for residents and businesses, which in turn will support employment, productivity and local spend. The support of innovative and sustainable construction practices can stimulate innovation at a local level, boost the deployment of clean-tech[8] and increase demand for green and highly skilled jobs. Ultimately, renovation can help deliver healthier, zero emission, resilient homes and neighbourhoods, providing a better quality of life for all.

The following pages collect strategies and pragmatic actions for cities to achieve each of these objectives. Based on literature and successful case studies, these are meant to offer a concise but effective input to cities in order to develop local renovation strategies.

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8 See also: Special Address by President von der Leyen at the World Economic Forum, Davos, 17 January 2023, https://ec.europa.eu/commission/presscorner/detail/en/speech_23_232

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6.1 Piloting

Demonstration of the project through the creation of a pilot provides an opportunity to proof concepts, test approaches and experiment with new technologies. Small-scale pilots at the neighbourhood scale can offer insights that will inform the future practices and policies guiding the retrofit process and identification of barriers to entry or potential complications can be addressed. Success of the pilot project also creates a short-term win for the city and allows the community to see the benefit of the transition, creating engagement and buy-in.

Ideas for city governments

- **Embed the Renovation Wave principles in a comprehensive urban strategy,** such as a Circular Economy plan or a Sustainable Energy and Climate Action Plan (SECAP). This will help support cross-sector action and mobilisation of stakeholders.
- **Increase the ambition of existing regeneration programmes, drawing from the renovation focus areas.** This may mean, for instance, adopting advanced digital diagnostics for retrofit projects, or encouraging the reuse of neglected public space.
- **Incorporate renovation principles in public procurement[9].** This can build on existing sustainable procurement practices and achieve impact at scale as well as inducing change in the private sector.
- **Adopt a challenge-driven approach to innovation[10].** Challenges have a huge power to mobilise a city's ecosystem, including SMEs and citizens, in addressing relevant issues and producing Proof of Concepts as well as scalable solutions.

- **Identify and engage with the most proactive stakeholders.** National retrofit agencies, research institutions, social enterprises, charities, developers and cooperatives with strong Corporate Social Responsibility can be strong allies in promoting renovation practices.
- **Commission a digital survey of the built stock.** This can vary in scale and ambition, from mapping roofs with solar potential to creating a digital twin. These will maximise the efficiency and effectiveness of interventions, besides demonstrating value to funders.
- **Start from transforming city-owned and/or operated assets.** These may have the critical mass to demonstrate the economic, financial and environmental benefits of renovation. If distributed across the city (i.e. municipal kindergartens) they will boost outreach and multiply benefits for residents.

9 https://procuraplus.org/case-studies/
10 https://wdo.org/wp-content/uploads/WDC2020_ImpactStudy.pdf Lille Metropole Proof Of Concepts (POCs); https://ec.europa.eu/info/sites/default/files/an_esir_memorandum-towards_a_mission-oriented_research-and-innovation_policy_in_the_european_union-executive_summary.pdf

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- **Develop small-scale pilots at the neighbourhood level** to bring change closer to communities and inform future, city-wide policies and plans and help identify barriers in the roll-out of large-scale initiatives before deploying actions across the whole of the city.
- **Make the Renovation Wave visible.** Prioritise clustered interventions (i.e. street-level retrofit) which act as a showcase for what a renovated neighbourhood may look like and perform.
- **Make the Renovation Wave relatable.** For instance, invest in demonstrating value-for-money to the owners of retrofitted homes and communicate how renovation projects will improve people's day-to-day lives.
- **Dedicate part of the seed funding to set up measures to scale up and achieve financial sustainability.** This may mean developing business cases or exploring the creation of financing instruments such as revolving funds.
- **Incorporate implemented pilots and solutions within the Tech4Good marketplace** and other best practice repositories.

BEST PRACTICE: NEIGHBOURLY POWER, GHENT

Piloting projects to generate influence allows for exploration and improvement of the concept before further development and rollout. Neighbourly Power trialled a community energy scheme with the installation of solar panels on the roofs of a number of building and ownership types. The initiative allowed for the exploration of technically and financially implementing an energy community as well any barriers. The energy generated was distributed in the community and excess production was managed to avoid destabilising the grid. Several smaller projects ran concurrently to the pilot scheme to look at energy storage and independence from the grid altogether.

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6.2 Unlocking funding and finance

The private sector and in particular, key stakeholders in the construction supply chain must be engaged to allow for the delivery of energy retrofits. Developing a phased process and plan in the initial concept stages allows for the creation of a market dialogue and the identification of gaps in the supply chain. When scaling up a pilot, the development of a blended finance approach (i.e. combining grant funding with repayment systems linked to outcome-seeking capital) is essential to ensuring financial sustainability in the long term.

Ideas for city governments

- **Focus on providing grants funding** to demonstrators with high scaling-up potential, i.e. prioritising interventions on the most common typologies of collective housing, or ease of replicability of contractual arrangement.
- **Develop funding programmes that reward and incentivise innovative organisations** working towards achieving wider renovation-aligned goals, such as reducing CO2 emissions, reducing fossil fuel use and retrofitting buildings.
- **Leverage public sector grants with private sector capital.** This is crucial to de-risking investment, elongating the investment payback horizon. In particular, public funding can make deep retrofit more appealing to private sector investment by paying for lower or negative-return interventions.
- **Consider joining private-to-public marketplace initiatives, such as the EU's Smart Cities Marketplace.** These can offer technical assistance to cities in making solutions technically sound and financially appealing to the private sector, as well as facilitating actual matchmaking with investors.
- **Explore the creation of blended finance solutions, such as a local transition fund**[11]**.** At the same time, assess how national funding programmes (*see next page*) can be leveraged to provide base funding.
- **Seek co-funding from inter-municipal and regional agencies.** This is particularly relevant for initiatives involving supply chains that transcend a city's administrative boundaries.
- **Implement forms of Energy Performance Contracting (EPCs) and on-bill repayment models** in retrofitting social housing and other city-owned and/or operated assets. Develop a trusted pool of Energy Service Companies (ESCOs)[12, 13, 14].
- **Quantify and communicate** the environmental and social value of pilot projects, for instance through an ex-post evaluation, to attract outcome investing for future phases.
- **Communicate opportunities linked to novel borrowing products for house buyers such as green mortgages**[15]**.** This can stimulate local demand for energy efficient homes.

A FOCUS ON: GREEN MORTGAGES

Green mortgages are not yet widespread but there are several products on the market in response to increasing customer demand. In general, products such as green mortgages offer a lower than usual interest rate for buying or re-mortgaging a property with an Energy Performance Certificate (EPC) rating of A or B. This could incentivise homeowners to invest in the energy performance of their houses and save back part of the investment through the interest difference or influence the market value of properties by giving better lending offers for high performance houses.

11 https://www.poliedra.polimi.it/en/project/mtf-2026/
12 https://www.iea.org/reports/energy-service-companies-escos-2/esco-contracts
13 https://energiesprong.org/about/
14 https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5caeffd7a&appId=PPGMS
15 https://energyefficientmortgages.eu/

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The bigger picture:

NATIONAL RETROFIT PROGRAMMES

There are currently a series of government programmes and initiatives that try to solve the conundrum of energy-related renovation at scale and pace. These could be leveraged by cities to accelerate and implement renovation at a local level, for instance, by exploring how national funding helps attract private investment, or by promoting funding schemes in neighbourhoods that combine socio-economic deprivation and poorly performing housing stock.

An overview of some key programmes is listed below:

- in July 2022, Germany announced the creation of a €177.5 billion *Climate and Transformation Fund*, which would spend €56.3 billion on energy efficiency renovation of buildings in the period 2023-2026, prioritising interventions with the highest emission savings per euro invested;
- in 2022, Ireland announced the *National Retrofitting Scheme* with unprecedented grant support (up to 50%) for building retrofits and heat pump installation, worth €8 billion to 2030. The focus of the scheme is on home retrofits and fossil-free heating in a 'One-Stop-Shop' process for homeowners, non-corporate landlords and approved housing bodies;
- France has upgraded close to 340,000 homes through the *MaPrimeRenov* programme in the first half of 2022, with a key focus on replacing inefficient fossil fuel heating systems and prioritising support to low-income households.

Richard Johnson - stock.adobe.com

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6.3 Removing market barriers

De-risking the transformation process of energy retrofits needs to be prioritised to encourage investment from all stakeholders, complemented by the development of accessible resources that allow knowledge exchange between stakeholders and individuals interested in implementing renovation projects. At a municipal level, understanding existing legal barriers and opportunities will enable the seamless inclusion of renovation practices in existing policies. Secondly, city governments have proven to play a key role in lowering market barriers by providing physical and digital places to test and pilot circular and renovation business models.

Ideas for city governments

- **Map all legal bottlenecks and opportunities for stimulating circular construction and faster and deeper renovation,** to enable seamless integration within existing policy. Overcoming these barriers is key to decarbonising the construction sector.
- **Understand the structure of the local construction supply chain** and existing future skill needs for scaling up circular and renovation practices. Engage with universities and vocational schools that could develop courses to meet existing and future skill needs.
- **Provide facilities and 'neutral spaces' to bring together parts of the ecosystem which would not meet otherwise,** such as SME incubators and accelerators.
- **Explore offering city-owned assets as testbeds**[16] for novel products and renovation practices developed by third and private sector innovators.
- **Provide storage space at sub-market prices for reclaimed and reusable materials.** This could be complemented with a match-making service to immediately reuse materials in new construction projects, limiting the need for storage (building-to-building model).

16 https://media.nesta.org.uk/documents/Testing_innovation_in_the_real_world.pdf

toxicoz - stock.adobe.com

- **Encourage alternative supply chains and business models such as urban mining** (i.e. recovery oriented demolition), to align businesses with new and emerging regulation.
- **Develop accessible resources to enable individuals to easily participate in circular markets,** such as creating an online catalogue and match-making service for re-useable building components, allowing developers, contractors and consumers to trade and purchase reclaimed materials.
- **Create digital platforms for the exchange of knowledge and resources around renovation practices:** peer-to-peer information sharing and training portals for residents and enterprises.

- **Promote the creation of operational service packages** for contractors and developers who wish to optimise pre-demolition and deconstruction.
- **Establish group-purchase platforms** to enable collective investment into new community assets, i.e. creating a solar power cooperative collectively decides how revenues from local solar panels should be re-invested in the neighbourhood.

BEST PRACTICE: CIRCULAR LEUVEN

Leuven aims to embed circular practices into all the city's projects with an urban circularity strategy. The framework encourages sustainable consumption and production habits, while providing opportunities for innovation. Circular Leuven establishes an action plan to facilitate a circular construction ecosystem that aligns with the municipality's procurement process. An online marketplace creates a point of exchange for materials, while the physical Materials Bank is a point of collection – both bring ecosystems together that otherwise may not have met.

A FOCUS ON: NOVEL RETROFIT TECHNOLOGIES[17]

From robots that can achieve low-disruption, non-intrusive insulation installations, to remote surveying techniques such as thermal imaging satellites and augmented reality, technology will have an important role to play in achieving energy renovations at scale. There are several advancements in digital tools and manufacturing processes with several tested in pilots and near commercialisation. The most mature products and solutions are mainly found in modern methods of construction, but there are growing efforts in research and industry focusing on digital twins and smart homes.

rh2010 - stock.adobe.com

17 https://www.nesta.org.uk/feature/signals-2022/retrofit-robots-technologies-set-make-homes-greener/

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6.4 Developing partnerships

The complexity of the task of renovating existing building stock requires the development of partnerships between the city, construction providers, landlords and the community. It is crucial to create partnership structures that leverage private companies' expertise and public organisations to allow for mobilisation of financial instruments and knowledge. Establishing participatory governance to engage the various stakeholders creates financial and technical channels to further the initiative. Including local residents and businesses from the outset, in the visioning and design stages, creates buy-in and engagement.

Ideas for city governments

- **Consider developing a renovation-aligned Local Green Deal (LGD).** A thematic approach to creating LDGs can best reflect local needs and allow for a targeted use of engagement resources[18].
- **Create a working group with municipally-owned corporations,** to explore how to embed Renovation principles in management and service provision practices.
- **Develop a step-by-step plan for engaging with supply chain stakeholders.** Place the development of partnerships with the private sector at the core of the local renovation strategy (see also *'Unlocking funding and finance'*).
- **Create a not-for-profit open membership organisation for the development of city-wide renovation strategies.** This offers the opportunity to develop and co-create objectives and action plans, leaving participants with flexibility on the level of commitment.
- **Design an inclusive participation process and retain the role of facilitator.** In the case of an energy community, this involves not only residents but also energy cooperatives and grid operators.
- **Cooperate with service providers in coordinating a green energy transition.** They can play a dual role, leading on technical delivery and on the education of residents.
- **Engage with universities and research institutions,** both to understand how to bridge local skill gaps and to explore how they could contribute to piloting innovative solutions locally.
- **Collaborate with local social enterprises** to recruit employees to complete the operational work on circular projects. This collaboration provides dual benefits, enabling value chain expansion through increased labour supply, while simultaneously creating new employment opportunities for underrepresented workers.
- **Onboard residents from the visioning and designing stages of renovation projects at a local level.** This will also provide valuable insights on which barriers need to be overcome in replicating a demonstrator project elsewhere.

BEST PRACTICE: KLIMAATPUNT / PAJOPOWER PARTNERSHIP

Pajopower is a renewable energy source cooperative (*REScoop*) established in the province of Flemish Brabant in 2009. It evolved from supporting collective purchases for renovation (ie. insulation, heatpumps) to setting up a separate entity in the form of an association, 'Klimaatpunt', with the mission of promoting capacity building and knowledge exchange around renovation practices. One of Klimaatpunt's key initiatives was to set up a coaching system in partnership with the province, 'Benovation'. The local government coordinated and partially subsidised the coaching service, helping homeowners with assessing the most effective interventions, as well as providing direct financial support.

18 https://www.ams-institute.org/news/signed-and-sealed-green-deal-timber-construction/

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BEST PRACTICE: VILAWATT, VILADECANS

Vilawatt is an initiative that explores the development of an innovative partnership structure, allowing closer interaction between local energy providers and the local community. A public-private-citizen partnership (PPCP) was formed between the city council, the energy companies and citizen representatives. The governance structure allows for close coordination of energy transition in the community where there is an ability to technically execute the energy renovations and educate residents on energy saving practices. The approach empowers citizens and encourages a mindset change in the local community.

A FOCUS ON: PRODUCT-AS-A-SERVICE

Product-as-a-Service (PaaS) models have been increasingly recognised as a scalable business model which realigns incentives and business success with positive environmental outcomes. Under a PaaS model, rather than buying products, producers typically maintain product ownership and lifecycle responsibility, while construction clients and tenants buy subscriptions for services provided. Applying PaaS to renovation or retrofit (as-a-Service) can be a solution to navigating the challenging financing of such projects, which often require larger upfront capital mobilisation and have long(er)-term payback periods. PaaS can aggregate demand beyond a single household to achieve economies of scale. In a retrofit-as-a-service model, improvements (such as efficiency measures to the building envelope and heat pump installation) are financed and carried out by the service provider, while the owner/tenant holds an obligation for periodic payments for a continued service, which will survive the succession of the title.

PaaS models have been applied to vehicles, consumer goods (such as white goods) and a range of building systems like lighting and cooling. However, these are yet to be applied at scale for building retrofits. Key areas for further exploration include the creation and testing of standardised templates for contractual agreements and legal templates and financing models to cover risks associated with larger investments[19].

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19 Bankers without Boundaries (N.d.) Green Neighbourhoods as a Service. Online.

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6.5 Placing communities at the centre of the Renovation Wave

Communication and engagement are central to the Renovation Wave, whereby working with communities closely to understand barriers and opportunities will be crucial to initiating projects, building a solid pipeline of projects and bringing these to completion. In engaging with the community and giving them the chance to co-create solutions, as well as providing access to financial mechanisms, initiatives become attainable. Furthering behavioural change and learning ensures strategies can be successful once implemented. For a community-led approach to be effective and evolve into self-sufficient business entities, a combination of citizen activation and empowerment, legislation and governance structures are necessary to guide and support individuals and realise the potential of social capital.

Ideas for city governments

- **Incorporate renovation projects as part of participatory budgeting.**
- **Build trust through representation in the consortia delivering renovation projects.** Identify and engage with local community leaders, who can represent community needs, concerns and feedback during disruptive interventions such as retrofit.
- **Provide free advisory to vulnerable communities to understand and take control of their consumption behaviours,** which in turn will support the city's wider environmental goals i.e. improved health, lower overall consumption levels, cost-savings. This type of support can be developed in partnership with national retrofit bodies.
- **Equip residents with technology to measure their own consumption and enable them to understand their behaviour**[20], i.e. installing smart sockets and sensors to measure heat, electricity and waste and making results available to view at any point via an online app.
- **Partner with energy co-ops to provide a 'renovation coach'** for residents willing to explore options for retrofitting their homes.
- **Incentivise positive behaviour through rewards,** for instance through the creation of a local digital currency that can be spent in local shops or collectively to invest in new facilities for the community.
- **Advocate for reinvesting excess revenues** form energy community schemes in placemaking projects benefitting the whole neighbourhood.
- **Maximise the opportunities to socialise** through the design and implementation process of renovation programmes.
- **Conversely, make retrofit as nondisruptive as possible.**
- **Post-completion, validate assumptions and communicate results to all participants.** Celebrate change and success through events and documentary creation.

BEST PRACTICE: ENERGY ADVISORY POINTS, BARCELONA

Energy Advisory Points (EAP) in Barcelona tackles energy poverty through a community-led approach. The programme defends the energy rights of those at risk of energy poverty through a combined approach of financial support, advice on people's rights to money to reduce overall costs and knowledge and information about energy consumption. Offices are embedded in local communities and are staffed by energy advisors who have experienced unemployment. They are given professional training by the EAP programme and after an eight-month rotation as an energy advisor they can re-enter the job market. The initiative empowers local communities as a social enterprise and facilitates wider environmental goals.

20 *Initiative from Dublin's energy agency in partnership with local authority. See: https://libraries.dlrcoco.ie/events-and-news/library-news/home-energy-savings-kit-now-available-dlr-libraries; https://www.codema.ie/media/gallery/launch-of-home-energy-saving-kits-in-dlr-libraries*

APPENDIX A

Case studies

The following case studies provide a selection of best practices of city-led initiatives that align with the principles and lead actions of the Renovation Wave. This is not meant to be exhaustive, but rather, representative of how local government implemented bold projects to decarbonise construction and support inclusive local growth. This was achieved through the creation of partnerships, the use of funding and financial instruments and a continuous engagement with their communities and innovation ecosystems.

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Tobias Cornille - unsplash.com

A CIRCULAR ROADMAP TO ACHIEVE TRANSITION TO NET ZERO

Title: Circular Leuven

Location: Leuven, Belgium

Duration: 2019-ongoing

Background / Driver of change

Leuven's urban circular strategy outlines the city's plan to enhance circularity within its local economy. The strategy aims to broaden and accelerate circular practices in Leuven and reduce the city's carbon footprint inline with the EU's net-zero goals.

By embedding circular practices into the city's projects, the strategy presents a framework for transforming Leuven into a circular city that encourages sustainable consumption and production habits and provides opportunities for economic and social innovation.

Of relevance to the Renovation Wave, the city has launched a 'Circular Construction Action Plan', which specifically aims to support local construction industries in adopting circular principles within their business practices.

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The solution / project / initiative

In April 2022, the City of Leuven presented its 16-point action plan for establishing a circular construction system within the city. The strategy is supported by a platform of stakeholders comprising the city, universities, entrepreneurial organisations and private companies. The action plan aims to facilitate the creation of a circular ecosystem within Leuven through integrating circular construction practices with the municipality's own procurement processes. The plan also outlines several projects aimed at embedding circularity within the practices of external stakeholders, such as developing new value chains for waste and strengthening Leuven's existing materials bank, an online marketplace for collecting and redistributing used building materials.

Outcome and next steps

Several pilot projects have been launched to support the city's circular construction goals:

- the city acquired Van Orshoven mills, a former wheat mill complex in 2016, guaranteeing its use to Procirc, a circular procurement organisation, as a shared makerspace for circular construction. The space, which opened in 2020, is a place for designing and testing circular construction practices including: business models for temporary use, urban mining and determining residual value;
- AG City Development have recently tendered their investment for the circular renovation of three studio projects as part of a pilot project for the Flemish Green Deal Circular Construction and Interreg project 'Facilitating the Circulation of Reclaimed Building Elements' (FRCBE);
- Leuven Materials Bank continues to grow – approximately 40 tonnes of material were recycled and resold via the bank in 2021. The Material Bank's expansion has been key to enabling the integration of urban mining principles across all procedures concerning construction in the city;
- the Leuven Circuler project involved 18 workshops and events to enable companies, residents and experts to exchange knowledge about rethinking business parks into circular business parks. A final report entitled 'Toolbox for the redevelopment of circular business parks' presents a guide for those interested in getting started with circular area development;
- with support from the city, Leuven University have developed a system of integrated circular monitors to track the city's progress in enhancing its circular systems.

Funding and financing

Projects are being funded through both public and private mechanisms.

The circular construction action plan is funded by the city and aims to support private businesses that are interested in developing sustainable principles for the use of raw materials.

Many of the pilot projects are being funded by Interreg, an instrument cofounded by the European Union to support cooperation across EU borders through project funding.

Other projects are funded by intermunicipal cooperations such as Interleuven, an Intermunicipal Service Association which bring together various municipalities to realise complex projects.

Governance and delivery

- The overall circular strategy was launched by Leuven 2030, an open membership non-profit organisation made up of over 600 residents, civil society organisations, businesses, knowledge institutions, authorities and semi-public authorities, which aims to achieve climate neutrality in Leuven by 2030. While the organisation is separate from the City Council, the city is a founding member and provides significant funding to the organisation.

- The Leuven City Council is responsible for developing the construction-specific circular action plan, which aligns with one of the core objectives set out in the Leuven 2030 Circular Roadmap.
- The Leuven Material Bank is a joint project by Atelier Circulier, a local construction and carpentry company and OVAM, a public Flemish public waste agency.

Key challenges faced

Various different organisations, companies and programmes are currently undertaking projects to develop the city's circular construction system. Process-wise, the variety of projects and stakeholders involved in the project has presented challenges for coordination and collaboration.

Leuven's relatively small geographical size presents challenges for value chain creation. A lack of physical space has prompted the city to look to alternative solutions for value chain creation, such as setting up small, temporary materials banks near construction sites.

The city has experienced some capacity-related issues in engaging the private sector. While many private businesses have expressed interest in the programme and its aims, engagement has proved time-consuming and the city currently lacks the human resources required to expand private stakeholder involvement.

While community members are actively engaging with several aspects of the circular strategy, the circular construction action plan lacks incentives/financial support to encourage residents to adopt circular construction practices in their own lives.

Success factors

Integrating the circular action plan within the city's own construction projects has been critical to the strategy's success. By starting with municipal assets, the city has led the way by setting an example for other stakeholders about the steps required to embed circularity within their current construction processes.

The city's ongoing collaboration with the university has been essential in bringing together different stakeholders. The development of an urban lab has enabled the city and university to assist stakeholders in figuring out what they need to enhance circularity.

The cooperation and alignment between Leuven 2030 and the city of Leuven has enabled greater exposure for the project. The strategic vision, outlined by Leuven 2030 in their circular roadmap, has created a community-led framework for the city to follow in developing its circular projects.

The city is collaborating with several local social organisations to recruit employees to complete the operational work on circular projects. This collaboration provides dual benefits, enabling value chain expansion through increased labour supply, while simultaneously creating new employment opportunities for underrepresented workers.

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Rotterdam - Dennis Moller

A CITY-OWNED ENERGY TRANSITION FUND

Title: Rotterdam Circular – Energy Transition Fund

Location: Rotterdam, Netherlands

Duration: 2021-ongoing

Background / Driver of change

The Energy Transition Fund (ETF) is an investment fund established by the City of Rotterdam to support the city's ambition to become CO2-neutral and circular by 2050. The fund aims to accelerate Rotterdam's energy transition by providing financial support to sustainable projects that will strengthen the city's circular economy.

As Europe's largest port and a leading industrial centre, Rotterdam has relatively high annual carbon emissions and remains largely dependent on primary raw materials. The ETF is intended to support a major shift towards companies and projects that focus on clean energy, alternative fuel, lower waste and a reduction in the use of primary raw materials.

The solution / project / initiative

The €100 million ETF provides loans to sustainable projects, companies, residents and organisations in Rotterdam. Scale-ups can request financing up to €10 million to support projects that strengthen the circular economy. Broadly, projects should work towards one of the following goals: reducing CO2 emissions, making homes

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and business premises more sustainable, improving air quality and reducing the use of fossil fuels and raw materials.

The fund is aimed specifically at investing in innovative, capital-intensive companies that do not readily qualify for market funding, due to higher risk profile, higher capital requirements and longer payback periods. Bids are also assessed based on the expected impact on the business climate and local employment opportunities.

In addition to the €100 million for scale-ups, the ETF contains €30 million reserved for providing low-threshold loans to SMEs, owners and private individuals as a mechanism for stimulating various sustainability measures.

Outcome and next steps

- Umincorp (urban mining corporation) have received €15 million in funding to finance the construction of a new plastic recycling plant – the plant will enable a reduction in annual CO2 equivalent emissions of 30,000 tonnes.

Funding and financing

The fund is primarily financed by the City of Rotterdam. Partial financing is also provided by InnovationQuarter (IQ) and SVn, in addition to sales revenues from energy company Eneco.

Governance and delivery

- City of Rotterdam – municipal government, owners and financers of the fund;
- InnovationQuarter (IQ) – regional development agency for West Holland, acts as fund manager of the scale-up ETF;
- Eneco – independent energy company active in the Netherlands, Belgium, Germany and the UK, partially responsible for financing;
- SVn (Stimuleringsfonds Volkshuisvesting Nederlandse gemeenten) – independent non-profit foundation that provides sustainable financing loans to individuals and businesses, acts as fund manager for the €30 million and the SME ETF.

Key challenges faced

Currently there is only evidence of one company that has successfully received funding. It is possible that the criteria for investing is too stringent or logistically rigorous, preventing potential companies from successfully applying for funding.

Success factors

Identifying limited venture capital as a barrier for circular initiatives, the ETF creates an opportunity for companies to receive the necessary financial support that they would otherwise be unable to attain through traditional market funding.

The city's strategic partnerships with InnovationQuarter (IQ) are central to the success of the project. IQ are fund managers with long-term focus and an ongoing commitment to investing in 'disruptive technologies' such as circular projects which often have high capital intensity/return and long investment timescales.

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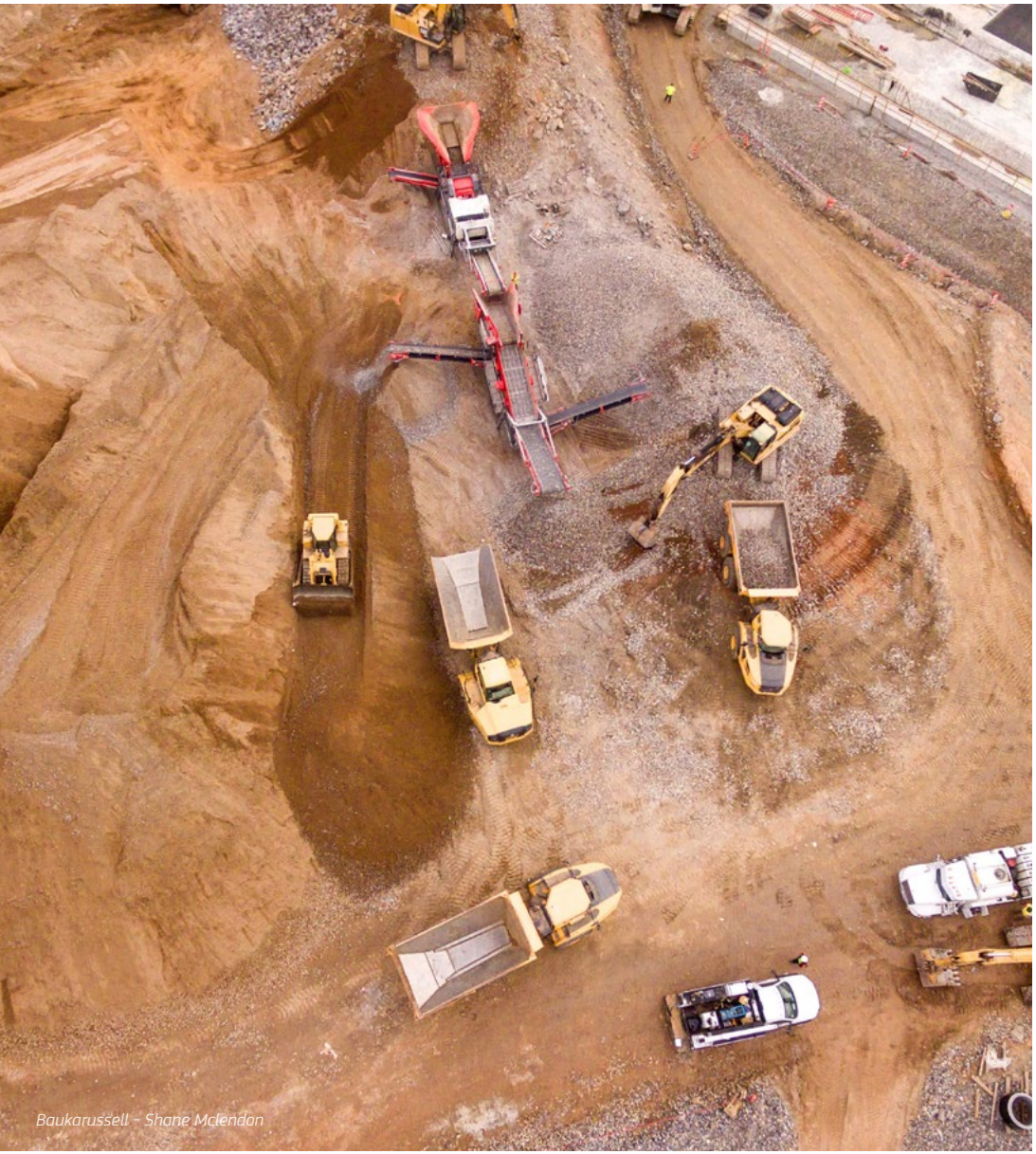

Baukarussell - Shane Mclendon

SCALING UP MATERIAL REUSE IN BUILDINGS

Title: BauKarussell

Location: Vienna, Austria

Duration: 2016-ongoing

Background / Driver of change

Austria has introduced progressive regulation to support the re-use of construction and demolition materials. BauKarussell, a consortium of six local organisations, was launched to assist in accelerating Austria's adoption of green construction practices, in line with new and emerging regulation.

The platform, which addresses large-scale demolition, endeavours to establish circular loops across Vienna's construction industry. BauKarussell developed the concept of 'Social Urban Mining' – recovery-oriented facility demolition focused on reuse and recycling – as a mechanism for optimising deconstruction projects and promoting a circular deconstruction value chain. The platform also aims to create social added value by integrating social businesses in the operational activities of the local construction industry.

The solution / project / initiative

BauKarussel provides operational service packages to builders and project developers to optimise their deconstruction projects. During the pre-demolition deconstruction

phase, re-usable and recyclable materials are removed and secured for resale. Re-usable building components are displayed in an online catalogue to be sold to private and commercial buyers, creating circular material use patterns.

Revenues generated from re-use and high value material recycling are then used to finance the operational deconstruction work, which is carried out by local social enterprises. People with labour market disadvantages are employed, trained and qualified in deconstruction, creating regional employment opportunities for disadvantaged workers.

Alexandr Ivaschenko - stock.adobe.com

Outcome and next steps

- Between 2016-2020, over 550 tonnes of material were passed on for reuse (from 1100 tons of material);
- demolition activities have created over 21,000 social economy working hours;
- the programme has created over 100 jobs for individuals with labour market disadvantages;
- it was also granted 3rd place and €10,000 prize money for the 'Raw Materials and Circular Societies Prize 2020';
- BauKarussel's first project (dismantling the Vienna Coca-Cola plant) generated €100,000 in revenue from reselling material and prevented 450 tonnes of waste (corresponding to nearly 1% of total demolition mass).

Funding and financing

The project, initially launched as a private venture between local business partners with support from the city council, involves an innovative self-funding mechanism. Reusable materials recovered during the construction phase are advertised through an online catalogue for resale by local private individuals and businesses.

The revenues generated from the resale of high-value material are transferred to local social enterprises who find, train and employ disadvantaged workers to complete the operational work. This innovative mechanism combines resource conservation with social added value to finance future projects.

Governance and delivery

- Partners: Romm ZT (architecture firm), pulswerk GmbH (management consultancy specialising in sustainability), RepaNet (volunteer association for the promotion of resource conservation and employment in the environmental sector);
- operational work completed in cooperation with the following social and community non-profit employment agencies: Die KÜMMEREI (Job-TransFair), FAB, ISSBA, Schindel und Holz, TEAMwork and Volkshilfe SÖB;
- clients/promoters: non-profit property developers, federal real estate company Bundesimmobiliengesellschaft m.b.H (BIG), city of Vienna, Federal Ministry for Climate Action.

Key challenges faced

A key obstacle for the project is encouraging large owners to include re-use in their construction practices. This problem has been partially addressed with the introduction of new national regulations mandating greener construction practices across Austrian businesses. A second challenge, which concerns the social urban mining concept itself, is matching available recyclable components with demand, without the need for intermediate storage (building-to-building model).

Success factors

Timing has been key to the success of this project. By launching the platform alongside the rollout of new national green construction regulations, the consortium has benefitted from significant buy-in from local construction firms seeking support in conforming to the new rules.

A second winning strategy is the project's ability to combine resource conservation with social added value, providing dual payoff and benefits to customers and the wider community.

Yuttana Studio - stock.adobe.com

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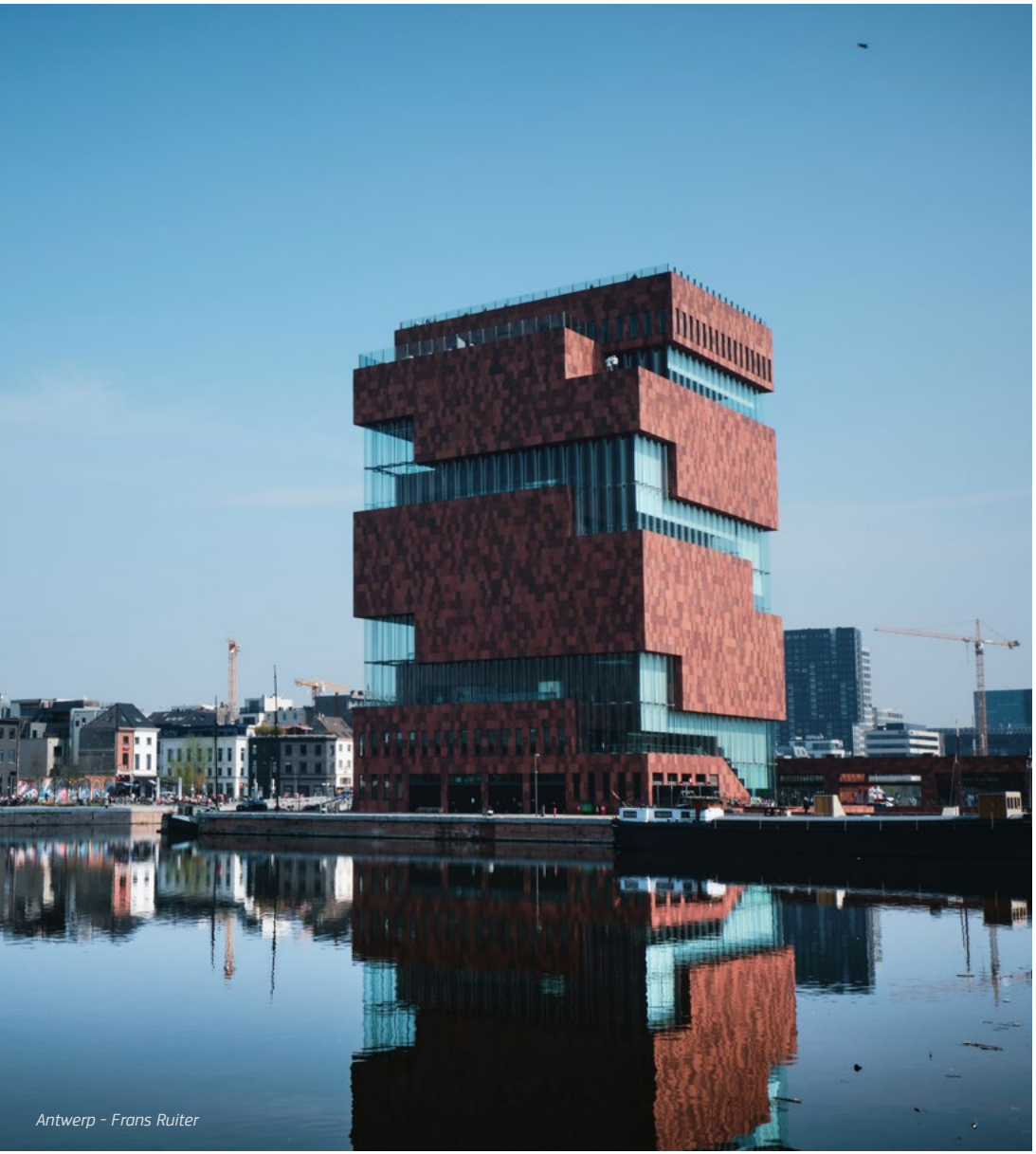

Antwerp - Frans Ruiter

A COMMUNITY-LED APPLICATION OF TECHNOLOGY TO ENABLE CIRCULAR BEHAVIOURS

Title: Antwerp Circular South

Location: Antwerp, Belgium

Duration: 2018-2020

Background / Driver of change

Given its dense urban context and rapidly increasing population, the City of Antwerp is experimenting with a series of neighbourhood-level initiatives to enhance circularity in resource use.

The Circular South initiative was a community-engagement project that aimed to enhance the efficiency of energy, water and waste material practices among residents in Antwerp's New South district. By investing in new resource management tools and combining blockchain technology with behavioural nudging, the project sought to promote sustainable habits to guide the new community in co-creating their local circular economy.

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The solution / project / initiative

Over 3.5 years, a group of residents from the New South neighbourhood in Antwerp were supported and encouraged by the city council to undertake energy renovations within their own homes to enhance their quality of life through adopting circular renovation practices.

As part of the project, smart meters were installed in residents' homes to inform participants about their daily energy, waste and water use. This information was then made available through an online app that displayed a personal dashboard for each resident. Residents received behavioural nudges via text message and were rewarded for their behaviour with 'circules', a digital currency enabled by blockchain technology that could be spent in local shops, or used collectively to invest in new renewable energy facilities for the district.

The programme also established a neighbourhood energy cooperation, enabling residents to invest in solar panels and use revenues to invest in new circular and sustainable projects.

Outcome and next steps

- 61 resident homes were upgraded with smart sockets and sensors to measure their use of heat and electricity, as well as household waste production.
- A range of legacy factors have been proposed for the programme, including:
  - a group-purchase platform to enable the community to make sustainable group purchases for future energy retrofit projects;
  - a new version of the app that will continue to be available for all residents;
  - continued support for the cooperative neighbourhood energy group (via Ecopower).

Funding and financing

The initial programme was funded by grants provided by the European Urban Innovative Actions Programme. This included funding for the app development, smart meters and solar PV panel installations.

The solar panel cooperative provides a self-funding mechanism for future projects. All income from the sale of excess energy flows back to the cooperative in the form of a sustainability budget for new projects.

anatoliy_gleb - stock.adobe.com

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Governance and delivery

- Public Sector: **The project was kickstarted by the City of Antwerp.**
- Community: **Residents of New South.**
- Private Partners:
  - Imec: Higher education and research institute;
  - EnergieID: a cooperative collecting household and business energy consumption data for future monitoring;
  - Ecopower: A Belgian energy cooperative who advised the cooperative neighbourhood energy group on efficient energy-reducing projects and practices;
  - VITO/EnergyVille: provided information to the project;
  - Digipolis Antwerpen: IT partner of the city of Antwerp group, providing IT infrastructure and services provision to startups;
  - Pantopicon: Foresight and design studio, assisting the city with various urban innovation projects;
  - Third Sector: De Kringwinkel - Charity shop that is now responsible for the circular community experience centre.

Key challenges faced

COVID-19 presented several challenges for the project, particularly relating to solar panel and smart meter installation. Delays in implementation and the effects of COVID-19 made actual engagement lower than planned. Interest in joining the solar panel cooperative was also low, with several residents expressing that the financial return was too low to encourage them to become involved.

Success factors

The development and deployment of a user-app enabled residents to observe and understand the benefits of smart meter technology in allowing data to be collected consistently and immediately. Given the success of the nudging mechanisms in encouraging residents to reduce their energy and water use, the project presents a winning strategy for stimulating behavioural change. Residents were stimulated by competition and the ability to monitor their own use patterns.

The project presented a unique digital solution for rewarding positive behaviour and encouraging future energy renovations. The introduction of 'circule' currency allowed for the value of energy saved to be reinvested in future community circular construction projects while simultaneously reducing energy consumption.

Monkey Business - stock.adobe.com

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Barcelona - Monica Melton

TACKLING ENERGY POVERTY THROUGH FREE ADVISORY AND TRAINING

Title: Energy Advisory Points

Location: Barcelona, Spain

Duration: 2020-ongoing

Background / Driver of change

According to the Barcelona 2030 Climate plan, approximately 10.6% of Barcelona's population are at risk of energy poverty. Many families, particularly those residing in underprivileged districts of the city, struggle to pay their bills and are at risk of their electricity being cut off.

The Energy Advisory Points (EAP) programme aims to defend the energy rights of those at risk of energy poverty in Barcelona. The programme aids families in reducing their overall energy costs, by helping them understand their rights to money, making their homes more energy efficient and reducing their overall emissions. The scheme also serves to provide employment opportunities to those that lack access to the energy market.

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The solution / project / initiative

Under the scheme, 40 energy advisors are distributed across 11 points around the city. Households can inquire, via phone, email or in-person, to receive advice about their energy rights. Specific services offered include: advice about optimising household energy consumption, information about applying for social discounts, exemptions and recommendations for alternative energy solutions i.e. solar energy self-generation.

The programme also provides professional training to 20 people on 8-month rotations. Individuals are trained to become energy advisors, after which they can move into other roles within the energy market.

Outcome and next steps

- The service has been rated as excellent (9.5/10) in terms of citizen satisfaction and has been recognised by the C40 global network of cities as one of the 100 most ambitious climate initiatives in the world.
- The following outcomes have been achieved to date:
  - 1,108 people are helped each month by the EAP;
  - the EAP have handled nearly 155,500 inquiries (60,500 households) as of June 2022 - approximately 1108 people are helped each month;
  - the programme has prevented energy cut-off in 107,960 cases;
  - support provision has grown 55% since being launched;
  - over €70,000 in savings linked to energy advice;
  - to date, 80 people have been trained to be energy advisors.

Funding and financing

The project is funded by the Barcelona City Council.

Governance and delivery

- The project was kickstarted by the Barcelona City Council as part of their Public Services provision portfolio.
- Referrals typically come from Social Services Centres, Housing Offices and various social organisations.

European Commission

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Key challenges faced

The project is currently facing supply pressures due to a surge in the number of families at risk of energy poverty in Barcelona amidst the ongoing energy crisis. The number of warnings sent out to those unable to pay for their utilities increased by 334% between 2020 and 2021. This is likely to continue to grow as energy supply issues persist throughout Europe. There is currently a long waiting list for receiving support as the programme awaits the cooperation and coordination of social enterprises to supply the necessary employees to expand the service.

Success factors

A key success factor of the EAP programme has been the use of physical office spaces as service provision points. The points are geographically dispersed around the city to enable ease of access for individuals living in different districts and each service point is employed with locally sourced workers and thus is entirely community-based. The service points have been purposefully integrated alongside other local government departments to reduce the stigma associated with applying for welfare and social support.

Partnering with local social enterprises to hire and train underrepresented workers creates a dual benefit by enabling the programme to expand its own support and assistance offerings, while simultaneously creating employment opportunities for individuals that previously lacked access to the energy market.

While the programme itself has been successful in supporting residents to understand their energy rights, there are several additional benefits that emerge out of empowering vulnerable communities. Wider positive impacts of the programme include improved health (through lower risk of being cut off from heating), higher overall savings and better personal consumption behaviours which facilitate the city's wider environmental goals.

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Limerick -Coachcopor - Milivoj Kuhar

CREATING A POSITIVE AND SMART ENERGY DISTRICT IN A HERITAGE NEIGHBOURHOOD

Title: +CityXChange

Location: Limerick, Ireland

Duration: 2018-ongoing

Background / Driver of change

Limerick City faces the challenge of adapting their energy system for a low carbon future. Within this context, new technologies and resources can be utilised to improve efficiencies and streamline services in the energy market.

+CityXChange is a smart city project that explores how cities can lead the integration of smart, positive energy solutions. Traditionally energy production uses a production-consumption model in which energy companies provide for the community. Reducing carbon emissions of the energy market by incorporating elements such as renewable sources, energy storage, smart grids and producers-consumers (prosumers) requires a new model that can adapt to the complexity. Management and distribution of energy in this new model has not been adopted by the sector, thus the project provides an opportunity to assess in practice.

The solution / project / initiative

The initiative aims to understand how the electricity supply network is consumed, how the grid can be managed and how surplus energy can be traded in a common energy market.

A pilot scheme of five core buildings in the Georgian district of Limerick is anchored around the Gardens International building, developed to LEED Gold standard efficiency. Four other buildings in the 'Georgian neighbourhood' of Limerick are also in the pilot – Limerick Chamber of Commerce, Rooney Auctioneers, Limerick General Post Office and Limerick Youth Services.

The pilot's objective is to use technology services to create positive energy districts. Firstly, data are collected around energy usage/consumption and analysed for the period that the programme runs. Secondly, the older buildings will be retrofitted with heat pumps, solar panels, energy storage solutions and EVs. By retrofitting and monitoring the buildings' energy production and consumption, the cluster has potential to become a net producer of energy.

Outcome and next steps

- Eleven demo projects have been established in two Lighthouse cities (Limerick and Trondheim) and five Follower cities between 2018 and 2021, with the project reaching scaling phase between 2021-2023. Monitoring is ongoing for the duration, but no evaluation has been reported from it.
- Projections for energy sources efficiency, storage and integration are estimated to increase. Also, a reduction in energy grid investments compared to regular planned investment is projected. Other expected outcomes are a reduction in GHG emissions and improved air quality.
- In terms of citizen engagement, the project supports five innovation labs, champions skills and development and influences up to sixty organisations' approach to sustainable energy with extensive community participation events.

Funding and financing

European Union's Horizon 2020 research and innovation programme - €24.2 million is the project budget under the Smart Cities and Communities call.

Governance and delivery

- The Norwegian University of Science and Technology (NTNU) is the host and leads the consortium with the Lighthouse Cities of Trondheim and Limerick.
- The Limerick City and County Council works in partnership with the consortium to develop solutions.
- The consortium comprises 32 partners covering the entire value chain for the project while the cities are involved in all aspects of the project.

Key challenges faced

The Limerick pilot of +CityxChange faces the specific challenge of operating in a historic district, which increases the complexity of both diagnostics and design. Conversely, this project has the potential to become a demonstrator for the New European Bauhaus' principles, combining the need to respond to functional, sustainability and aesthetic requirements.

Success factors

A key success factor, noted by a member of LCCC, is to ensure the alignment of the City's wants and capabilities with what the Horizon project is asking. This avoids initiating a project that misaligns with the city's business plan or vision, as ultimately the Horizon projects are a contract that have to be finished.

Enterprise Ireland is a government agency supporting Irish businesses with support and advice. Their broad view of similar projects happening in Europe was noted to be useful when applying for funding.

European Commission

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Behzad Ghaffarian - unsplash.com

A ONE-STOP SHOP FOR ACCELERATING THE UPTAKE OF ENERGY RETROFIT IN COLLECTIVE HOUSING

Title: CoachCopro

Location: Paris, France

Duration: 2014-ongoing

Background / Driver of change

CoachCopro is a city-wide programme that is supporting the mission to retrofit the entire housing stock of Paris within 30 years. It was established by the Paris Climate Agency to increase connections between condominium owners and building/ construction professionals to support the development of renovation plans. As a large portion of the city's carbon emissions comes from energy use in homes, energy efficiency improvements are highly prioritised. 87% of the city's private housing stock is made up of, condominiums thus supporting this segment in the uptake of energy retrofits has the potential for significant impact.

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The solution / project / initiative

CoachCopro is a free and independent collaborative platform which works on both sides of the retrofitting transition, linking the supply and demand sides to accelerate the renovation process. Affiliated companies and building professionals are linked with condominium owners by the platform, which shares information, resources and trainings (for owners). Peer-to-peer as well as professional knowledge exchanges are facilitated, with a focus on technical questions. Firms signed to the platform have also agreed to a charter of high social and environment standards. The offerings of the platform work to streamline the process for both sides.

Outcome and next steps

- To date, 839 buildings (55,865 dwellings) have been renovated in Paris which has generated significant revenue for local businesses involved in the retrofit (€186 million)[21].
- In 2022, the city of Paris announced the launch of the Éco-rénovons Paris+[22] service, which provides free technical assistance and additional grants for co-owners interested in renovation.
- The product from the programme is a platform that is web-based, which requires only a small operations team monitoring and maintaining the platform. This is a highly-scalable model and has been rolled out to 22 other regions and cities in France.

Funding and financing

'CoachCopro' is supported by the Paris Climate Agency and co-funded by a number of organisations: ADEME (French national energy agency), City of Paris, Local territory contributions – climate and energy agencies, Ericsson, Nexity (real estate).

€100,000 per year are dedicated to the national platform's development, without staff costs.

Governance and delivery

- Paris Climate Agency (Agence Parisienne du Climat) initiated the project.
- Stakeholder involvement is largely from the various municipalities that are local partners and have supported the scaling of the project across France.
- Other stakeholders are energy agencies and non-profits such as FLAME (Federation of Local Energy and Climate Management Agencies) which supports local actors with information and technical assistance.

Key challenges faced

The recruitment and matchmaking of owners and stakeholders from the retrofit supply chain is the core challenge of CoachCopro – this has been addressed through a diversified outreach strategy based on virtual and in-person campaigns, as well as the production of support materials, databases and events.

Quality control (hence reliability) of contractors was ensured by introducing a chartership scheme for affiliation, which sets out objective eligibility criteria.

Success factors

The project offers a very specific service and targets specific obstacles for condominium owners and suppliers to accelerate energy efficiency renovations. Its format provides help to owners and suppliers, with human interventions only when necessary, which minimises costs and maximises scalability while meeting targets.

Condominiums are encouraged to elect 'energy leaders' to steer and represent local communities' needs through the renovation process.

21 https://paris.coachcopro.com/pages/les-chiffres-cles-en-France
22 https://www.paris.fr/pages/plan-1000-immeubles-pour-la-renovation-thermique-3136

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LEMON - Sterling Lanier

SOCIAL HOUSING RETROFIT-AT-SCALE

Title: LEMON - Less Energy More Opportunities

Location: Emilia-Romagna Region, Italy

Duration: 2016-2020

Background / Driver of change

Inefficient building impacts people's wellbeing, whereby socio-economic factors can make them more vulnerable. Energy efficiency improvements in social housing offers economic, social and environmental security to those who may suffer more directly from climate change.

Emilia-Romagna Region developed a project to further implementation of energy retrofits in the social housing sector. Social housing companies (ACER) in the region own approximately 79,000 homes. This presented an opportunity to address energy poverty and the economic and environmental sustainability in a significant portion of housing in the region. By making buildings more sustainable and investing in energy efficiency, it can reduce bills for low-income families and improve their health. There was also a strong focus in the project on mobilising investments and creating a model that can fund energy retrofits.

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The solution / project / initiative

LEMON is a pilot energy programme that provides technical assistance to 622 private and public social dwellings entities. The programme supports a new financial model for energy retrofit and develops a new instrument for energy contracts.

Firstly, the project will supplement regional and national loans and offer financial incentives to invest in retrofit and ensure the redevelopment of building stock. Secondly, instruments were developed whereby LEMON created contracts between the tenants and the ACERs and the energy supplies and the ESCOs (Energy Services Companies).

Four instruments were developed:

1. Energy Performance Contracts (agreements between tenant/owner and supplier to repay investments through savings generated by increased energy efficiency);
2. Energy Performance Tenancy Agreement (a regulation to share the energy savings between tenant and ACER);
3. Instrument for the Tenants (developed a tenants manual to understand how to reduce energy consumption);
4. Instrument for Policy Makers (improved the capabilities of the public sector to draft and manage EPCs and the risks associated).

Outcome and next steps

- 622 dwellings were retrofitted in the Emilia-Romagna Region using a contractual model that can be scaled and replicated in other regions.
- The end goal for energy retrofitting is to have 5.74 GWh/year energy savings, with a yearly reduction of 1,159 tons CO2 emissions.
- Two project impacts were monitored and the results are as follows:
  - reduction of GHG emissions at 794 ton CO2/year;
  - energy savings of 4,039 MWh/year.
- Capacity building was supported in the policy developed to supplement the retrofits and the practical manuals were developed for the tenants of the buildings to continue learning about energy saving.

Funding and financing

Funding for the programme that developed the project came from the EU's Horizon 2020 programme, while further funds were raised to progress the retrofit.

EU Horizon 2020 funded €623,000. The social housing companies ACER Reggio Emilia and ACER Parma delivered an investment programme of €9,453,000.

Two innovative financing schemes that were created are the *Energy Performance Contract* which repays the investment within 15 years and the *Energy Performance Tenancy Agreement* which reflects the improvements made leading to reduced energy costs in the lease.

Governance and delivery

- Emilia-Romagna Region led the programme, with the support of a number of stakeholders during delivery:
  - ACERs and Public Authorities - Region, Province and Municipalities, Local Government Association;
  - companies which accomplish energy investments (ESCo - Energy Service Company);
  - tenants trained and engaged in awareness campaigns to help understand their energy consumption and to teach better management in the long term.

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Key challenges faced

A key challenge faced by LEMON was the development of a financial business plan that accounted the different incentives and funding available. In the second phase of tenders, the project design of the interventions and investment costs for the retrofits were better defined by ACER.

Success factors

Securing funding for the initiative was difficult due to the risk perceived by private landlords and the lack of profitability for contractors. Lessons learnt from the first phase of awarding Energy Performance Contract (EPC) tenders were rectified in phase two and a number of changes were made. To reduce the risk for private landowners, ACER Reggio Emilia set-up a social fund that supported retrofit investments, which they then pay back over time.

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Vilawatt - FORTYTWO

AN INNOVATIVE PARTNERSHIP MODEL FOR ENERGY COMMUNITIES

Title: Vilawatt

Location: Viladecans, Spain

Duration: Programming 2014-2020 (Project 2017-2020)

Background / Driver of change

The town of Viladecans, Spain, faces the challenge of meeting low carbon targets which can be achieved by engaging in an energy transition process, despite the high cost barriers. Ambitions to bring about the change in a socially-just way, to support a community where citizens are engaged and play an active role in bringing about the change, is integral to the project. Vilawatt focuses largely on enabling and delivering deep energy retrofit of residential buildings, which have not been an attractive investment for the private sector due to perceived risk. The project addressed the challenge in a low income area where residents are at the risk of fuel poverty, so in improving efficiency it supports a socially just transition.

The solution / project / initiative

Vilawatt's project created a new governance structure for energy management in order to facilitate citizen engagement. A public-private-citizen partnership (PPCP) was formed between the City Council, the energy companies and the citizens.

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The PPCP had the following objectives: to provide energy supply from a renewable origin, to consult and train residents to increase energy awareness through monthly learning programmes, to deliver energy retrofit of residential buildings, to develop a new local currency, the Vilawatt and to encourage energy savings and to stimulate the local economy. The PPCP managed the programme through a local energy operator (LEO), which in turn coordinated the energy transition.

The LEO was responsible for: installing renewable energy generation points (e.g. solar panels), delivering energy retrofits supported by municipal companies VIGEM and VIMED, the roll-out of devices such as smart meters and educating residents on energy efficiency. Residential units were retrofitted to improve energy efficiency and promote low carbon power sources.

Paul Bradbury/KOTO - stock.adobe.com

Outcome and next steps

- A new approach to energy governance that empowers citizens, encourages engagement with the local authorities and the energy sector and facilitates a mindset change in the local population.
- Deep renovation of 60 residential buildings, supported by a participative scheme and made visible through campaigns to encourage further renovations – expected to achieve a 60 % reduction in energy consumption in homes.
- An energy currency operates in the Montserratina District, having been adopted by PPCP associates and local businesses (450 households, 100 local shops).
- Electricity savings are monitored and recorded via sensors. LEO used the aggregate demand of users to negotiate more competitive electricity prices with suppliers, signing 500 contracts (March 2020) for electricity from renewables.

Funding and financing

Total investment was €5.3 million from the European Regional Development Fund who granted €4.2 million (80%) through the Urban Innovative Actions (between 2014 and 2020). €1.4 million was dedicated to retrofitting homes in Viladecans.

Governance and delivery

- The PPCP (an arrangement between public authorities and a private partner to deliver infrastructure or services under a long-term contract) is formed by public and private partners:
  - Municipality of Viladecans (promoter of the project);
  - Barcelona Metropolitan Area;
  - Barcelona Urban Ecology Agency (supported the LEO);
  - CICLICA SCCL (cooperative supporting citizen engagement);
  - ICAEN (research centre).

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- Four private companies:
  - LIMA (promote sustainable construction);
  - UBIQUAT TECHNOLOGIES S.L (co-designed the local currency);
  - CERCLE GESPROMAT S.L. (managed social, legal, financial and technical aspects of the renovation);
  - EGM (local energy consultant analysing data).

Key challenges faced

The relative complexity of Vilawatt's governance model (PPCP) and of the delivery structure may present challenges to replicating the initiative elsewhere and to scaling up.

Success factors

Setting up a PPCP was key to the initiatives success, whereby it created a hub to manage knowledge and tools for the transition of the community. The entity united key stakeholders in the municipality, as well as citizens and businesses in the delivery.

The creation of a digital currency, to be spent locally by residents, was another success factor. This increased the spending power of vulnerable groups and supported the neighbourhood's economy.

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Buurzame Stroom

DEVELOPING AND INCLUSIVE ENERGY COMMUNITY PILOT

Title: Neighbourly Power

Location: Ghent, Belgium

Duration: 2018-2020

Background / Driver of change

The city of Ghent trialled an energy community pilot in the neighbourhood of Sint Amandsberg-Dampoort, Ghent. The aim was to increase the production of local renewable energy with the installation of solar panels and to distribute the costs and revenues fairly in the community.

By trialling the energy community scheme, the city of Ghent sought to gain insights to inform future policy recommendations in the roll-out of a large-scale, social, solar energy and to identify subsequent barriers. The project presented an opportunity to explore the framework and business model of affordable and renewable local energy production.

The solution / project / initiative

'Neighbourly Power' was a pilot scheme that had three objectives: install as many solar panels as possible, include vulnerable families in the scheme and develop the future energy grid.

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Financial tools in the form of subsidies were provided for heat pumps, underfloor heating and hybrid systems. For the solar panels, residents could invest themselves, partake in a group purchase, or low interest loans were available. A focus was placed on reaching families with limited resources who could benefit from the solar panels and reduced energy bills. Additionally, the scheme looked at the possibilities of local productions, consumption and storage for the future electricity grid.

Outcome and next steps

- The project installed 2,535 solar panels on 102 family homes, as well as two apartment buildings, two schools and eight company buildings, supplying 720kWp at peak production.
- The variation in buildings and ownership allowed for the exploration of types of loans and energy contracts.
- The energy generated by the solar panels was used in the district, while additional projects were developed to use excess energy and avoid destabilising the grid e.g. charging for electric vehicles being installed to capture capacity.
- With further EU funding, smart meters were installed in houses with residents who chose not to install solar panels, but still wanted to participate in the energy experiment. WiseGRID was a supplementary project that explored how residents can be independent from the grid altogether.

Funding and financing

The following funding mechanisms were used: public loans via a Flemish energy loan or the City of Ghent, private loans, rental of solar panels (tested with 6 families with limited resources), private rolling rental fund with opportunity to buy the solar panels and crowdfunding.

Governance and delivery

- The project was an engagement with multiple stakeholders developing an energy district through a participatory approach involving:
  - the City of Ghent, which led the coordination and acted as facilitator and as a full partner;
  - energy cooperatives - Ecopower playing the role of aggregator, empowering households to improve their knowledge on their energy consumption while EnerGent sells solar panels to the residents and supporting them in investing in solar power production;
  - Ghent University (research partner exploring the optimisation of solar panel positioning);
  - Fluvius (local grid operator);
  - Partago (citizen cooperative).

Key challenges faced

The conclusion of the project suggests two identified obstacles were addressed in the pilot, with regards to the ability and incentive to finance the installation of solar panels.

Families with limited resources were not positioned to invest in the scheme and the likelihood of their building being unsuitable for installation was higher. On the other hand, the incentive for landlords to invest was limited as their tenants reaped the benefits in lower energy bills, but they did not see reduced costs. The financing framework set up looked to address these challenges.

Success factors

A success factor for the project was to ensure a straightforward and smooth financing process by making available public loans.

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APPENDIX B

The Renovation Wave Enabling Environment

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THE RENOVATION WAVE ENABLING ENVIRONMENT

Overarching Policies

- **EU Green Deal** - The European Green Deal, published by the EU Commission, is an action plan with the aim of achieving EU climate neutrality by 2050. The Green Deal strives for a socially just transition and is centred around the following action themes: climate, energy, agriculture, industry, environment and oceans, transport, finance and regional development, as well as research and innovation.
- **EU Fit for 55 Package** - Collectively, the package aims to reduce the EU's greenhouse gas emissions by 55% by 2030, relative to 1990 levels. It comprises a mix of existing and new policies, using the following instruments: carbon pricing, regulation, changes to standards and creation of funds.
- **Effort Sharing Regulation** - The Effort Sharing legislation establishes binding annual greenhouse gas emission targets for Member States from Non-ETS Sectors, most sectors not included in the Emissions Trading System (ETS). These sectors, including transport, buildings, agriculture, non-ETS industry and waste, account for almost 60% of total domestic EU emissions. It sets national emission reduction targets for 2030 for all Member States.

Sectoral Policies

- **Energy Performance of Buildings Directive** - To boost energy performance of buildings, the EU established a legislative framework that includes the Energy Performance of Buildings Directive (EPBD) 2010/31/EU and the Energy Efficiency Directive 2012/27/EU. In particular, Article 7 of the EPBD recast envisages that the life-cycle Global Warming Potential (GWP) of new buildings will have to be calculated as of 2030 in accordance with the Level(s) framework, thus informing on the whole-life cycle emissions of new construction. Whole-life cycle emissions are particularly relevant for large buildings, which is why the obligation to calculate them already applies to large buildings (with a useful floor area larger than 2 000 square metres) as of 2027.

  Together, the directives promote policies that will help achieve a highly-energy efficient and decarbonised building stock by 2050, create a stable environment for investment decisions and enable consumers and businesses to make more informed choices to save energy and money.
- **Energy Efficiency Directive Recast** - The Energy Efficiency Directive, created in 2012 and amended in 2018, sets rules and obligations for achieving the EU's 2020 and 2030 energy efficiency targets. Key obligations relevant to the Renovation Wave include annual reduction of energy consumption of 1.7% in the public sector, annual renovation of 3% of useful floorspace of public buildings above 250 metres squared, as well as a requirement to take into account energy efficiency requirements and focus on energy efficiency first in public procurement for all public administration levels.
- **Energy Taxation Directive** - This Directive sets minimum rates of excise duty with the intention of encouraging a low-carbon and energy efficient economy.
- **REPowerEU** - The REPowerEU plan sets out a series of measures to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition, while increasing the resilience of the EU-wide energy system.
- **The Recovery and Resilience Facility** - To mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.

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- **InvestEU** - The InvestEU Programme supports sustainable investment, innovation and job creation in Europe. It aims to trigger more than €372 billion in additional investment over the period 2021 and 2027.
- **EU Taxonomy** - The EU Taxonomy is a framework and classification system that aims to systematically define sustainable economic activities (EAs) across all industries in the EU, therefore reducing the potential for greenwashing. EAs currently in scope include activities in the following sectors: energy, transport, agriculture, manufacturing, ICT and real-estate.
- **Sustainable Finance Disclosure Regulation** - A European regulation introduced to improve transparency in the market for sustainable investment products, to prevent greenwashing and to increase transparency around sustainability claims made by financial market participants. It sets out pre-defined metrics for assessing the environmental, social and governance (ESG) outcomes of the investment process.
- **Level(s) – EU Sustainable Buildings framework** - Level(s) is the EU initiative that joins up sustainable building thinking across the EU by offering guidance on the key areas of sustainability in the built environment and how to measure them during design and after completion.

  Its aim is to promote the use of life cycle assessment (LCA) and life cycle costing (LCC) to help understand the quantities and timings of environmental impacts (LCA) in parallel with the most cost-effective approaches to reducing them (LCC).
- **Minimum Energy Performance Standard** - A minimum energy performance standard (MEPS) is a specification, containing a number of performance requirements for an energy-using device, that effectively limits the maximum amount of energy that may be consumed by a product in performing a specified task.

Funding, Financing and Technical Assistance Programmes

- **Horizon Europe** - Horizon Europe (2021-2027) is the EU's key funding programme for research and innovation, with a budget of more than €95 billion. The programme is built around three main pillars – excellent science, global challenges and industrial competitiveness and innovative Europe.

  In the context of supporting circular economy at the local and regional level, the 2024 calls include funding for project development assistance to bring together technical, economic and legal expertise to prepare circular investment projects, such as feasibility studies, stakeholder and community mobilisation, business plans and preparation for tendering procedures or setting up a specific financing scheme/financial engineering.

  In particular, under Cluster 5 on 'Climate, Energy and Mobility', the programme actively contributes to a more efficient use of energy in buildings (Cluster 5, Destination 4 'Efficient, Sustainable and Inclusive Energy Use').
- **European Local Energy Assistance (ELENA)** - ELENA is a joint initiative by the EIB (European Investment bank) and the European Commission under the Horizon 2020 and InvestEU programmes. ELENA provides grants for technical assistance focused on the implementation of energy efficiency, distributed renewable energy and urban transport programmes.

  The grant can be used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units.
- **Private Financing for Energy Efficiency (P4EE)** - PF4EE aims to address the limited access to adequate and affordable commercial financing for energy efficiency investments. The instrument targets projects that support the implementation of National Energy Efficiency Action Plans or other energy efficiency programmes of EU Member States.

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- **LIFE Programme – LIFE Clean Energy Transition Sub-Programme** - The LIFE programme is the EU's funding instrument for the environment and climate action. It has been running since 1992 and has co-financed more than 5,500 projects across the EU and countries outside the EU. The LIFE programme funding for the 2021 – 2027 period stands at €5.4 billion.

  LIFE has four new sub-programmes: nature and biodiversity, circular economy and quality of life, climate change mitigation and adaptation, and clean energy transition. The new LIFE Clean Energy Transition (CET) sub-programme in particular will continue the previous Horizon 2020 Coordination and Support Action to accelerate energy renovations in buildings.

  LIFE CET supports, in particular, the development of innovative solutions, building energy performance tools (EPCs, BRPs, SRI) and skills to deploy the enabling framework to deliver the Renovation Wave, as well as deployment of Integrated Home Renovation Services, project development assistance and innovative financing to mobilise investments in building renovations in line with the Renovation Wave objectives.

- **European Social Fund** - The European Social Fund + (ESF+) is the European Union's main instrument for investing in people. With a budget of almost € 99.3 billion for the period 2021-2027, the ESF+ will continue to provide an important contribution to the EU's employment, social, education and skills policies, including structural reforms in these areas.

- **Just Transition Fund** - Support provided through the Just Transition Fund is focused on the economic diversification of the territories most affected by the climate transition as well as on the reskilling and active inclusion of their workers and jobseekers.

  Its main objectives are to alleviate the impact of the transition by financing the diversification and modernisation of the local economy and by mitigating the negative repercussions on employment.

- **Smart Cities Marketplace** - The Smart Cities Marketplace (SCM) is a hub that brings together cities, industries, SMEs, investors, researchers and other smart city actors to help citizens, cities, research institutions and industry to deliver more sustainable, resilient and smart urban areas.

  The SCM is tasked with offering its services in close collaboration with other EU level initiatives, to mainstream best practices/solutions across sectors using its integrated Explore-Shape-Deal process. It focuses on small and medium-sized municipalities (alongside their respective local SMEs and start-ups).

- **Positive Energy Districts Approach** - A Positive Energy District combines built environment, sustainable production and consumption and mobility to reduce energy use and greenhouse gas emissions, creating added value and incentives for the consumer. The approach has been recently demonstrated by the H2020 SCC Lighthouse Projects, as well as by JPI Urban Europe and the Driving Urban Transitions Partnership.

APPENDIX C

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