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MISSION CRITICAL – HOW MISSION INNOVATION CAN ADDRESS THE CHALLENGE OF DEEP BUILDING RETROFIT

SIMON SKILLINGS

Renovating the existing EU building stock to produce near zero energy buildings is ‘mission critical’ to achieving climate neutrality. There are no off-the-shelf approaches that achieve this objective and can be applied across the EU. An outcome driven process of place-based innovation is required.

Innovation is especially important in developing new financing and delivery models. Public funds are limited, and huge amounts of private capital must be leveraged. New approaches are required that aggregate individual projects to create scale and that provide a secure stream of earnings to payback the upfront investment. Promising new approaches are already being trialled.

The EU has already accepted the role of mission-based innovation in tackling the big challenges that face society. The European Commission is currently reviewing a proposal to adopt a specific mission aimed at creating 100 climate neutral cities across the EU by 2030. This proposal should be adopted and progressed with urgency since it is ideally positioned to provide the umbrella governance needed to deliver deep building renovation at the scale required.



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The mission process must be designed so that it can drive forward deep building renovation. It must provide deployment support where actionable solutions are available and initiate innovation programmes where new approaches are required. It must also be able to make recommendations to the European Commission and member state governments where promising solutions require changes to the legal or regulatory framework.

Deep building retrofit and climate neutrality

The European Commission (EC) states that ‘buildings in the EU are responsible for 40% of our energy consumption and 36% of greenhouse gas emissions’.¹ These emissions do not only arise from the energy required to maintain buildings as good living and working environments by meeting temperature and lighting needs, but in the production of the materials used in fabrication. Achieving climate neutrality goals requires that these emissions be eliminated using zero emissions energy sources, significant improvements in energy efficiency and the use of new building materials and construction processes. ‘Deep building retrofit’ – defined by the EC as achieving an energy demand reduction of at least 60% – is required to convert existing buildings into ‘nearly zero-energy buildings’ (see the Energy Performance of Building Directive). According to Article 2 of this Directive, this means buildings must have a very high energy performance with any residual energy requirements produced from renewable sources. The benefits of deep building retrofit schemes go beyond simply reducing emissions. Broader community renewal can improve wellbeing for residents and reduce fuel poverty, leading to better healthcare outcomes and educational attainment. It can also provide a significant boost to local employment.²

Progress in eliminating emissions from the existing building stock has been slow. Around 1% of building in the EU are energy-renovated every year with only 0.2% being deeply renovated which is far slower than the 3% rate required by 2030 to achieve climate neutrality.³ It is generally seen as the responsibility of the

¹ In focus: Energy efficiency in buildings | European Commission (https://ec.europa.eu/info/news/focus-energy-efficiency-buildings-2020-feb-17_en)

² See, for example, UK Community Renewal Fund, Prospectus 2021-22, May 2021

³ BPIE (May 2021) The Renovation Wave Strategy & Action Plan: Designed for success or doomed to fail?; EC (14/11/2020) A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives, COM(2020) 662 final



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individual property owner to initiate and fund the process based on the expectation that it will reduce future energy costs. However, the process is extremely complicated, requiring expertise in deciding what work to commission, project managing multiple activities, and applying for relevant subsidies. Also, in the rental sector, the landlord rarely pays the energy bills. These barriers could probably be overcome if there is a compelling financial benefit and technical assistance is provided, but that is not the case. Financial returns accumulate over many decades and, even if the building owner expects to retain ownership for a long period, these returns may still not be positive. Also, financial returns do not include any valuation of the wider social benefits. This is an important challenge that the EU needs to address.

Besides the direct reduction in emissions, improving the control over energy consumption in buildings will also be important in helping to integrate variable renewable energy sources. Therefore, the deployment of digital instrumentation and control technology will represent another important dimension of building renovation.

Around 72% of global greenhouse gas emissions arise from cities and other large urban areas.⁴ The EU has recognised the importance of cities in achieving climate neutrality and has launched an innovation mission to create climate neutral and smart cities as part of the Horizon Europe framework.⁵ The EC is currently considering adopting a specific mission to deliver 100 climate neutral cities by 2030. This mission can only be achieved if the challenge of deep building renovation is addressed and, if successful, this process would represent a critical step on the pathway towards climate neutrality.

Delivering deep building retrofit at scale

Delivering deep retrofits to more than 220 million buildings across Europe is a huge task. Only part of the funding required could possibly come from public sources and it will be necessary to leverage a significant proportion of private finance. However, the costs are fragmented in numerous small-scale projects - too expensive for individuals but too small to attract major investors, and the readiness of financial systems to invest, whatever the project scale circumstances, varies considerably from country to country. Nonetheless,

⁴ Proposed Mission: 100 Climate-neutral Cities by 2030 – by and for the Citizens, Report of the Mission Board for climate-neutral and smart cities, September 2020

⁵ See: https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/missions-horizon-europe/climate-neutral-and-smart-cities_en



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potential returns are available through ongoing energy and maintenance cost savings and increases in property value. New approaches are required to capture these returns in a way that attracts the levels of investment required and ensures the full engagement and support of property owners.

New investment propositions and financing mechanisms must, therefore, address the issue of fragmentation and find ways to generate a predictable return. Individual property retrofits must be aggregated to create an attractive financial proposition. Where the scheduling and commissioning of works are co-ordinated centrally it will be possible to gain additional advantages through economies of scale and ensuring plans are integrated with other elements of energy system design. Also, some form of long-term contractual arrangement will be necessary to guarantee returns to the investor.

Figure 1: Contractual options for building retrofit

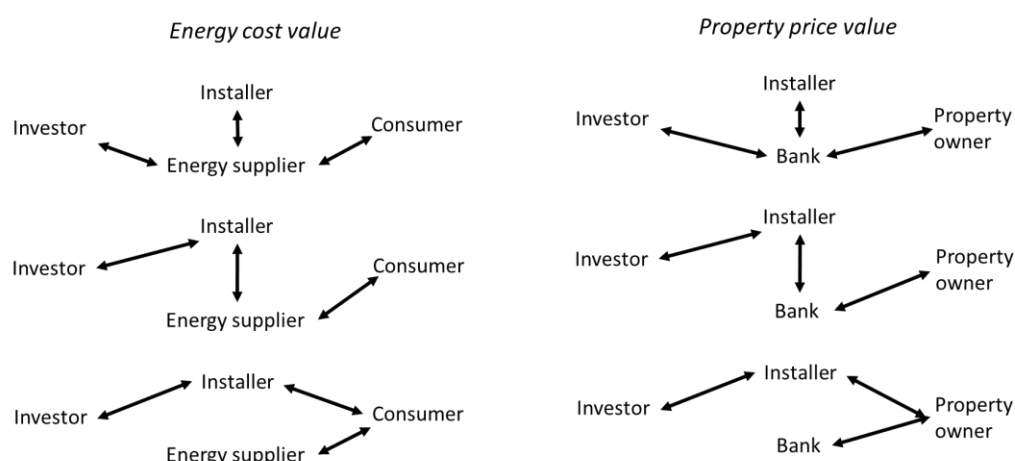


Figure 1 sets out a range of contractual options that could be deployed where the arrows represent direct contractual relationships.⁶ For example, the top-left ‘energy supplier hub’ model involves the energy supplier obtaining funding, subcontracting installation and securing the return through energy supply contracts with the consumers. In the left-hand column, the return is created through reductions in energy costs whilst in the right-hand column, the return arises from increases in property value (hybrid models are also possible).

⁶ Where properties are owned by multiple individuals, such as apartment blocks, a single virtual consumer or property owner could be created through a multi-party agreement. This illustrates the variety of situations that will need to be addressed.



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Each of these options has advantages and disadvantages. For example, energy suppliers or banks can generally only provide scale by aggregating customers who are dispersed across a wide geographical area, whilst models where installation is co-ordinated by a local authority could focus on whole streets and districts. In addition, geographically focused deployment creates a locally qualified workforce and allows a managed distribution of employment benefits. Maintenance of social equity will be difficult if funding is directed to consumers or property owners who are engaged and financially secure. Indeed, all models based on property price value are problematic given the geographical variations in prices and the broadly fixed renovation costs. This means that the loan required for renovation represents different proportions of property values leading to lower borrowing costs for owners of expensive houses than those of cheap houses. A potential difficulty with models in which the contract is between the consumer and the energy supplier is the duration of the contract that is likely to be required. The statutory right of consumers to switch between suppliers does not preclude long-term contracts, but they would need to involve hefty exit fees which might act as a deterrent for consumers.

Notwithstanding these challenges, there are promising solutions available. Bankers without Boundaries have proposed a model entitled ‘Green Neighbourhoods as a Service’ which most closely relates to the bottom option in the left-hand column in Figure 1.⁷ This envisages ‘a central entity in a city or region which designs, commissions, manages and funds deep energy retrofit on a street-by-street scale’. The long-term contract would be struck between this central entity and the resident and be embedded into the property deeds so that it automatically transfers to whoever owns the property. The consumer would continue to contract separately with an energy supplier. One of the big advantages of this model is that the delivery governance structures can ensure the overall goals of the city, such as social outcomes, are met.

It is extremely unlikely that one solution will suit all situations. However, this analysis does illustrate the innovation in finance and delivery mechanisms that will be required to achieve wide citizen engagement and the quantity of deep building retrofits that are required. The timescales involved in meeting climate targets means that we must move quickly to the stage where the focus of innovation is on delivering large-scale upgrades of the built environment rather than small, local pilot projects.

⁷ <https://www.bwbuk.org/post/green-neighbourhoods-as-a-service>



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The role of the cities mission

There is a clear need to inject a sense of urgency into the process to upgrade European building stock alongside a willingness to think creatively. Moreover, the time is not available for each city, or even each member state, to independently explore potential solutions. Cities have all been financially squeezed over the last decade following the Great Financial Crisis and especially post-Covid. They commonly lack capacity and expertise in planning, finance, and citizen engagement. They also struggle to find the resources to engage with outside experts. The mission to create 100 climate neutral cities by 2030 is explained further in the box below. It presents the ideal vehicle to provide the necessary support and deliver the accelerated learning that is required. Considering how to address the challenge of deep building retrofit provides important insights for those designing the cities mission process.

Box 1: EU mission for 100 climate neutral cities by 2030

Innovation missions have been adopted as an integral part of the Horizon Europe framework programme beginning in 2021. They aim to deliver solutions to some of the greatest challenges facing the planet by focusing expertise and funding on achieving a common shared goal. One of the mission areas involves the creation of climate neutral and smart cities which will be essential to meet the goals and targets set out by international policy frameworks such as the COP21 Paris Agreement and the UN's Sustainable Development Goals. If done well, this process has the potential to accelerate the economic development of cities across the EU whilst also improving the health and wellbeing of citizens.

The EC has appointed a Board to oversee the cities mission process. In September 2020, the Cities Mission Board recommended that the EU should adopt the objective to create 100 climate neutral cities by 2030. This would be a major undertaking for the cities involved and would require a systemic transformation in the way energy, transport, food, water, and materials are used. The aim would be to establish leading cities to act as innovation hubs to support subsequent change in all cities across the EU. It would, therefore, represent an important component of delivering the European Green Deal and establish a new mechanism for delivering EU support in the form of more innovation, better regulation, and integrated financing.

The extent of the challenge in achieving climate neutrality will vary greatly amongst cities across the EU due to different legacy conditions. However, the cities mission process can only credibly claim to achieve EU-wide benefits if it is open and accessible to the full range of city contexts, creating exemplars to



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which all cities can aspire. It would need to attract and select cities of all sizes, contexts, types, and level of preparedness provided, they demonstrate high ambitions. Indeed, the Mission Board has suggested that cities may limit the scope of their application to a specific geographical district, if they present an ambitious longer-term strategy for climate neutrality for the larger urban area.

Despite the importance of attracting many applications from cities across the EU, the commitments involved mean that this will only happen where the benefits are significant and achievable. The transformation to sustainable and circular approaches is expected to deliver an economic dividend for citizens, in addition to other benefits such as clean air. However, cities will not be able to embark on this journey at the pace required without significant additional support. The mission process would be able to assist in three key areas:

1. *Funding*: The Mission Board has estimated an upfront investment of €10,000 per citizen beyond business as usual spend to achieve net zero emissions (scope 1 and scope 2). Whilst the bulk of the funding will be provided through private investments, there will still be the need for considerable public funding. The EC would need to ensure funding from EU sources are channelled and co-ordinated to support delivery of the mission.
2. *Innovation*: Significant technology-based innovation, as well as social, creative, organisational, and financial innovations, will be needed to transform cities. Digital technologies will play a major role in stimulating economic development and boosting economic activity. It is likely that cities participating in the mission process will be prioritised as venues for EU-funded innovation projects and technical and other capacity support will also be provided.
3. *Learning and exchange*: Whilst cities have their own specific needs, many challenges will be common. The Mission Board has suggested that the EC must devote significant resources to ensuring cities involved in the process support and learn from each other.

The precise nature of the support provided will be defined when the EC formally responds to the Mission Board recommendations.

Cities participating in the mission process will be required to set out their plan for achieving climate neutrality.⁸ These plans must avoid focusing only on the

⁸ It is not expected that all cities will reach this stage by 2030, but they must be well on track and demonstrate how the goal will be achieved shortly thereafter.



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‘low hanging fruit’ of measures that are relatively easy to deliver but also explain how the entire built environment will be upgraded to the necessary level. In other words, cities must be prepared to set out the actions they do not currently know how to deliver within the tight limitations of public funding. The cities mission governance must set out how it will provide the help that is needed to allow cities to make rapid progress towards climate neutrality. Likely requirements include advice on funding, expertise in overcoming regulatory obstacles, and capacity support required to create coherent joined-up plans.

Many of these ‘delivery gaps’ do not have readily available solutions. However, several cities leading the charge towards climate neutrality are already grappling with these issues. A mission-based approach encourages cities to innovate and test new ideas to see how they play out in the real world. This ‘sandboxing approach’ can potentially unlock truly audacious, unprecedented, and impactful solutions. The cities mission must establish a knowledge hub that is tracking all relevant initiatives and maintaining a latest best view on the most promising solutions and approaches. A ‘one-stop-shop’ that makes it easy for cities to access funds from a range of public sources, alongside advice of leveraging private capital, will be an essential component if it is to address the complex financing requirements set out above.⁹ The mission should, therefore, pool together, and add value to, the often-disparate resources and technical assistance already available.

It must be recognised that solutions to the challenges of delivering deep building retrofit may not exist within the current legal and regulatory framework and the mission governance must be able to raise urgent requests for policy change. For example, it might be necessary to change the way that choices are presented to property owners through an upgrade to standards and regulations.¹⁰ A systematic identification of these issues should inform the development of support mechanisms, policy and legislation relating to retrofit at both EU- and member state-levels.

It is likely that the challenges faced by cities that do not have ‘off-the-shelf’ solutions will have many common themes. These can be grouped together to create a series of sub-missions within the overall mission and tackled by focused

⁹ The cities themselves will need to provide similar easy-to-access services to their citizens to support the buy-in that is required.

¹⁰ It should be possible to test how the requirement to reduce embedded emissions in construction materials can be addressed through city procurement and specification approaches and where regulatory change is required at national or EU level.



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innovation programmes within the Horizon Europe Framework, including by drawing on the wealth of accumulated experience and knowledge still live under Horizon 2020. Ensuring complementarity with the EC's plans for social and cultural innovation will also be significant to the mission. On the social innovation side, the EC's Affordable Housing Initiative – part of the Renovation Wave – will deliver 100 'lighthouse' renovation districts focused on creating quality, liveable, affordable homes. On the cultural innovation side, the 'New European Bauhaus' initiative can make a significant contribution to the mission.

It is by drawing out the core innovation needs of mass deployment that the cities mission can add huge value in expediting the journey to climate neutrality.

Key conclusions

- > Delivering deep building retrofit at scale will be critical if climate neutrality is to be achieved. However, we do not currently know how to do this at the scale required. Significant innovation will be required, especially relating to raising private finance.
- > The proposed mission to create 100 climate neutral cities by 2030 is an opportunity for the EU to address this challenge. Without this co-ordinated approach, progress will be left to independent initiative by local and national actors, each trying to solve the problem from first principles.
- > Cities signing up to the mission must set out clearly where they need help in achieving climate neutrality. Mission governance must be able to provide deployment support where actionable solutions are available, and initiate innovation programmes where solutions need to be found. It should also be able to make recommendations to the EC and member state governments where solutions involve changes to the legal or regulatory framework.