



HOUSEFUL

D 6.9 Policy recommendations

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0 Abstract

The HOUSEFUL demo buildings benefit from concentrated support, with multiple partners working together to deliver an innovation project. As such, the willingness and available resources to work to overcome obstacles and other barriers to the implementation of the circular solutions is significantly greater than what would normally be expected in a typical renovation project.

As a result, if the circular solutions being tested in HOUSEFUL are to be successfully upscaled, first in ten follower buildings, and later in additional circular building projects, policymakers and those responsible for the enforcement of regulations must work to better understand and remove existing implementation barriers. Policymakers have the power to adopt new legislation, or adapt existing legislation, in order to facilitate the upscaling of circular solutions in the built environment. Regulators have the capacity to adapt their practices, and improve their understanding of emerging trends in the built environment. At the same time, many non-regulatory barriers exist too; such as skills and knowledge gaps.

This deliverable reviews the various issues, barriers and obstacles encountered by partners in the HOUSEFUL project. As such, it will also put forward policy recommendations on how to minimise, or remove entirely, such barriers in the future. These recommendations can take many forms, from 'soft' measures, such as boosting knowledge and awareness, to 'hard' measures such as legislative or regulatory changes.

This deliverable is related to **Task 6.6 Policy recommendations to foster the circularity of housing sector** (Leader: *HOUSING EUROPE*; Participants: *LEITAT, AHC, NEUES LEBEN*).

The purpose of this deliverable is to provide policy recommendations that have the potential to increase the circularity of the built environment in the EU. Supply and demand side policies are not enough by themselves to achieve a circular economy, though they are of course important. Regulations and legislative measures, which can steer actors towards more circular outcomes, will also play an important role in the transition. Financing also has an important role to play, as it will take time for new innovative circular solutions to have the same, or even lower, implementation and maintenance costs as the linear alternatives currently on the market.

Existing policies that promote the use of renewable energy and energy efficiency in buildings need to be complemented with policies for resource efficiency, which look at a wider range of environmental impacts across the life-cycle of buildings.



Legislation and regulatory barriers identified in WP3, during the market study (T6.2) and lessons learned during the project will be used to provide policy recommendations and strengthen the legal framework towards a circular economy.

Information regarding legislation and regulatory barriers identified in WP3 and D6.1 will also be integrated. Policy recommendations related to the issue of financing and funding for HOUSEFUL-type projects, which were developed as part of *D4.8 Report on financial schemes and funding opportunities for all Front-runner buildings and replication activities (final update)*, will also be included.

A better use of existing policy instruments will be proposed to promote circular procurement and the launch of circular tendering processes for public and social housing, which will scale-up new business models.

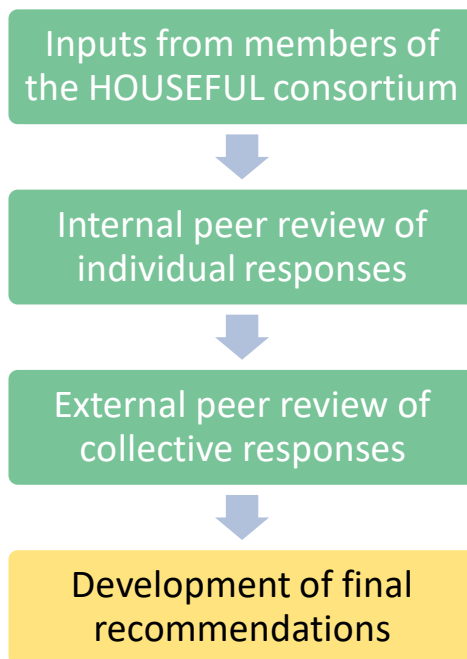


1 Introduction

1.1 Development of the deliverable

The development of D6.9 followed a four-step process, as set out in *Figure 1*.

Figure 1: Development of D6.9



Step 1: The feedback and experiences of all HOUSEFUL partners were collected via a detailed questionnaire. Where necessary, one-to-one follow-ups were conducted in order to clarify and expand on certain information provided by the partners.

In order to provide as clear and concise a document as possible, all of the replies of the HOUSEFUL partners were then “pooled” together under six broad headings²:

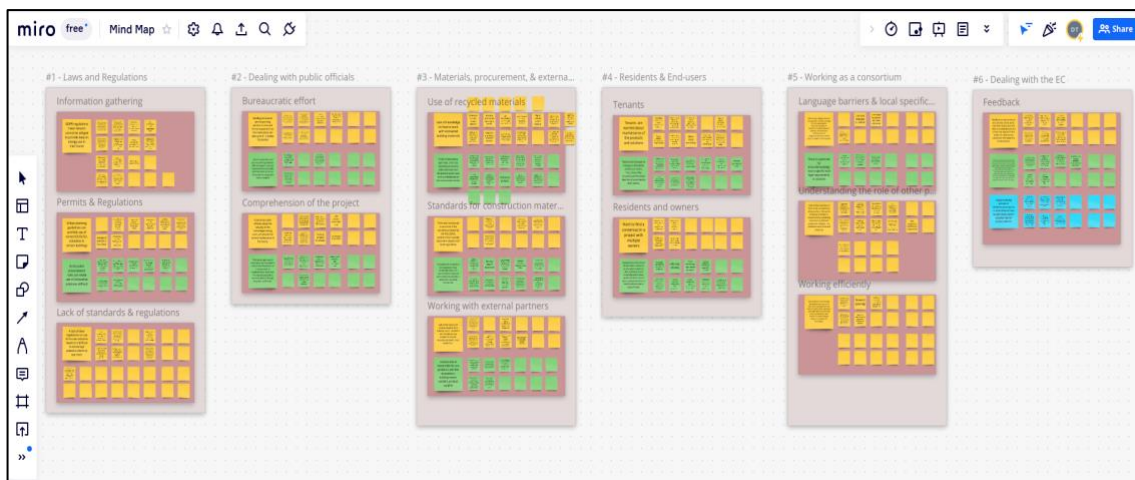
1. [Laws and regulations](#)
2. [Dealing with civil servants and public officials](#)
3. [Supply of materials, procurement, and implementation with external partners](#)
4. [Residents and end-users](#)
5. [Dealing with supporters of innovation projects](#)
6. [Reinforced policy changes for upscaling of circular solutions](#)

² This means that, for example, if multiple partners gave very similar feedback on specific issues, then the feedback was collected under one heading, rather than including the same general point multiple times.

In addition to this, the policy recommendations already developed as part of D4.8, which relate to finance and funding for circular building development and renovation, were included³.

Step 2: An online workshop was organised in June 2022 to present to the HOUSEFUL partners the information collected in Step 1 of the process, and to provide a forum for peer review of this information. This resulted in the collection of additional inputs from project partners, as well as clarification and refinement of certain points. Therefore, this internal peer-review process was invaluable to progressing the development of the policy recommendations.

Image 1: A view of the Miro used to collect feedback on policy recommendations⁴



Step 3: A summarised version of the policy recommendations developed in Step 1 and Step 2 was shared with external stakeholders, representing various types of building owners, industry experts, as well as policymakers. This external peer review allowed for the inclusion of feedback from 'independent' experts on the use of circular solutions in the built environment, whilst also providing a valuable 'sense check' for the draft policy recommendations developed by HOUSEFUL partners. The result of Step 3 was

³ D4.8 'Report on financial schemes and funding opportunities for all Front-runner buildings and replication activities (final update)' was submitted in M48 of the HOUSEFUL project. It took an in-depth look at different funding opportunities for the replication of the circular solutions. It also critiqued the current funding environment, including a lack of awareness by large sections of the EU financing system of the circular economy. As such, it made a series of policy recommendations related to financing for boosting circularity in the built environment. A summary of these recommendations is included in [Section 7](#) of this report.

⁴ Miro is an online platform that allows groups to brainstorm and work collaboratively. For Step 2, the initial feedback of consortium members was collected and then transformed into a platform that allowed for clear discussion and feedback from participants in the online workshop.

that some draft recommendations were modified, while new ones were added.

Step 4: The final step in the process was to conduct a final review of all collected inputs and materials. This was led by the deliverable leaders, Housing Europe, along with the other partners in the deliverable, i.e., LEITAT, Agència de l'Habitatge de Catalunya (AHC), and Neues Leben.



2 Laws and regulations

When dealing with the implementation of innovative solutions, though not just in the area of circular building practices, the laws and regulations of a country or region can sometimes not be adequate to facilitate new processes.

In many instances, the obstacle creating legislation simply fails to reflect technological progress, rather than being an intentional 'blocking mechanism'. In other words, the existing framework may simply reflect the reality from a different point in time. Aware that regulations can sometimes unintentionally stifle innovation, the European Commission has launched a number of what it calls 'Innovation Deals'; a process to review EU legislation and highlight areas in which it is undermining innovation⁵. This is part of the EU's 'Better Regulation' agenda, which has as one of its aims to remove "obstacles and red tape that slow down investments and building of 21st century infrastructure, by working with Member States, regions and local level and key stakeholders"⁶.

During the completion of the HOUSEFUL project, some consortium partners found that aspects of both EU and local legislation failed to fully support the development or the maximising of benefits being derived from the circular solutions used at the Demo Sites. This section reviews some of these issues, and proposes some potential mitigation strategies and policy changes that could be considered.

⁵ See : https://ec.europa.eu/info/research-and-innovation/law-and-regulations/innovation-friendly-legislation/identifying-barriers_en; One of the EU's first Innovation Deals was on the topic of "the shift from the conventional treatment of urban waste water to using it as a water resource".

⁶ https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en



2.1 Information gathering

Table 1: GDPR and consent

Problem or issue
<p>The application of the General Data Protection Regulation (GDPR) meant that the individual permission of each household would be required in order to install energy monitoring systems in all homes in the demo buildings. As consent was either not given or not sought, the result is that only building-level information is available. This is less efficient in terms of analysing energy use by individual households, which could help them to reduce their consumption and increase the sustainability of their homes.</p>
Solution or mitigation technique applied
<p>A temporary solution was found in the Demo 1 and Demo 2 buildings, where consent was given by most residents to provide data, but within the confines of the HOUSEFUL project only. This means that information about energy savings in apartments can be generated for the purposes of <i>ex-post</i> analysis of the renovations.</p> <p>However, the longer-term possibility to collect data is not sure at this point, as fresh negotiations with tenants will be required to renew their consent. There is also concern about the long-term maintenance of the systems to monitor consumption, which may be neglected by tenants or become damaged over time.</p>

Discussion: Putting detailed information about household energy use in the hands of experts can prove to be invaluable when it comes to helping individuals to reduce their energy consumption. Studies have found that when the data can be reviewed and turned into recommendations for individual households, energy savings can be significant⁷. Thus, efforts to promote so-called “energy coaches” seem to be a potentially valuable tool to reduce energy consumption. Of course, similar monitoring and feedback could be given in other areas, such as water usage and waste generation, though this is outside the scope of the current project.

The introduction of the European ‘General Data Protection Regulation’ (GDPR) [2016/679]⁸ enables users to control how their data is accessed and processed, requiring consent from users before any data manipulation is carried out on their (personal) data, for example by smart devices or cloud-hosted services. In certain cases, data gathering on individuals is permitted

⁷ For example: Yang, R., Pisharoty, D., Montazeri, S., Whitehouse, K., & Newman, M. W. (2016). How does eco-coaching help to save energy? assessing a recommendation system for energy-efficient thermostat scheduling. In Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing (pp. 1176-1187). <https://dl.acm.org/doi/pdf/10.1145/2971648.2971698>

⁸ [2016/679/EU] <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0679>



for the completion of necessary functions. For example, energy companies can periodically collect data on the energy consumption of their customers for the essential function of billing them for the use of their service (what the GDPR calls “performance of a contract”). However, the collecting of high-frequency (e.g., at one minute intervals) data on consumption would not be permitted, as it is not necessary for billing purposes. Although, some energy companies offer clients the possibility to provide their data at high-frequency intervals, in order to allow the client to better view and modify their own consumption habits. However, the choice is that of the client.

In the case of the HOUSEFUL project, those who would like to access the energy consumption data of the households are not energy companies, and access to the data is not an ‘essential function’. Furthermore, they would also ideally like to access high-frequency data, in order to see if energy use can be better optimised in terms of cost and efficiency. On both points, special and specific consent from households would therefore be required in order for building owners and other third parties to process the energy consumption data.

Concerns over the withholding of consent mean that collecting energy use data from individual households as part of HOUSEFUL is not possible; at least not over the long-term. As a result, it limits the extent to which building owners and other experts can work with residents and building users to help them to further reduce their energy consumption and their bills, and thus boost the environmental sustainability of the buildings and the economic benefits for end-users.

Table 2: Recommendations related to Section 2.1

<p>Legislative changes</p>	<p>Article 6 of the GDPR outlines cases in which the processing of personal data is lawful. In any future iteration of the Regulation, “<i>legitimate efforts to monitor and reduce carbon emissions by designated third-parties</i>”, or words to that effect, could be added.</p>
<p>Low effort approach</p>	<p>Building owners should collect building level data on energy use, and use anonymised outputs to produce general recommendations for all tenants/residents. This would avoid any conflicts with GDPR, though the energy saving impact would likely be more limited.</p>
<p>Anonymised data approach</p>	<p>Data could be collected in each home, though with the identities of households hidden behind a randomised username, known only to the households themselves. Households could then view recommendations on ways for them to reduce their costs and consumption without those behind such recommendations knowing specifically to which housing unit they relate.</p>



<p>Explain the economic benefits to households</p>	<p>In order to break down potential resistance to providing consent, households should be incentivised to comply. Clearly explaining the potential cost savings and reduction in bills associated with sharing data is one way to achieve this.</p> <p>In other words, energy coaches and others should be able to clearly explain how their monitoring of energy consumption can help households to reduce their monthly bills (e.g., through mentoring, training to use energy at less expensive times of day, switching appliances, etc.)</p>
<p>New leases</p>	<p>In buildings, and situations in which energy monitoring is feasible, the requirement to share data on energy consumption could be inserted into all new leases, as a prerequisite for taking up and maintaining residence. Although, the compliance, or not, of such an approach with existing EU regulations would need to be investigated.</p> <p>However, it must be noted that in some countries the activities of housing providers is strictly regulated, and such monitoring of consumption data would be outside the scope of what they are allowed to do. Thus, member states would need to establish 'Energy Advice Agencies' to take on the responsibility of working with households to reduce consumption.</p> <p>⇒ <i>For example, in Spain, public housing tenants have their own energy contracts, so management of these issues is not a competence of the housing provider, whose role is largely confined to that of a building manager</i></p>

2.2 Permits and regulations

Table 3: Incompatibility of solutions with local legislation

Problem or issue
<p>Project partners encountered legal problems related to the implementation of some of the HOUSEFUL solutions. This reflected their incompatibility with local regulations. However, it seems that these regulations were developed at a time when such circular solutions were not imagined, and are therefore 'out-of-date' more so than representing an attempt to stifle innovation.</p> <ul style="list-style-type: none"> • Demo 1: Legal barriers eventually prevented the development and implementation of S8 (<i>High quality fertiliser/compost of local origin</i>) • Demo 3: Austrian law forbade the connection of the toilets to use the solid fraction of the wastewater in the anaerobic digester. This was despite detailed discussions with local experts and civil servants during the planning phase of S7b. The uniqueness of this solution in the region meant that the legal impediment was only identified at an advanced stage of the project and also not at the beginning of the permit process, but only at the very end.
Solution of mitigation technique applied
<ul style="list-style-type: none"> • Demo 1: No solution was found • Demo 3: The S7b anaerobic digester of HOME BIOGAS will only be fed with food waste, while blackwater, the solid fraction from the wastewater from the toilets, will not be fed into it. As an alternative, also in view of S8, the solid fraction of the wastewater was suggested to be turned into valuable compost by the use of a sludge treatment wetland.

Table 4: EU Water Reuse Regulation⁹

Problem or issue
The EU Water Reuse Regulation sets out which analysis needs to be conducted and the frequency for sampling. The requirement of bi-weekly sampling is a barrier (logistically, financially, etc.) for using on-site or decentralised water treatment systems, even where reclaimed water reuse could be a major benefit for garden or agricultural irrigation, toilet flushing, street cleaning, etc.
Solution of mitigation technique applied
For the first year, alchemia-nova will take over the organising of the sampling and analysis as part of the HOUSEFUL project. It will also train interested community members to undertake the sampling and preparation for analysis, as well as operation and maintenance in the course of the year. If the one-year initial intense monitoring phase proves to be successful, and no problems are detected, local authorities may then permit less frequent testing, though this is not guaranteed.

Discussion: The EU is aware that current regulations can impede the development of some circular solutions, such as those outlined in the HOUSEFUL Grant Agreement. This relates particularly to the reuse of water and the on-site treatment of waste. Indeed, the EU launched an 'Innovation Deal'¹⁰ in 2017 entitled "Sustainable wastewater treatment combining anaerobic membrane technology and water reuse"¹¹ in order to investigate how to facilitate "the shift from the conventional treatment of urban waste water to using it as a water resource". This was with a view to "overcoming the challenge of water scarcity" in parts of the EU.

The overview of the Innovation Deal¹² notes that:

⁹ Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse: <https://eur-lex.europa.eu/eli/reg/2020/741/oj>

¹⁰ Innovation Deal (ID) is an instrument that can be used at the initiative of innovators and is designed to bring together innovators, national/regional/local authorities in Member States and European Commission services in a voluntary, cooperative, open and transparent exercise with the aim to study in-depth whether any perceived regulatory barriers really exist in EU legislation or Member States implementing measures that hinder innovative commercial or industrial development in the Circular Economy. The ID cannot derogate from existing EU legislation, but it may make use of the possible flexibility already allowed in such legislation.

¹¹ https://ec.europa.eu/info/research-and-innovation/law-and-regulations/innovation-friendly-legislation/identifying-barriers/signed-innovation-deals_en-wastewater

¹² The Joint Declaration of Intent for the INNOVATION DEAL on sustainable waste water treatment combining anaerobic membrane technology and water reuse. (2017). https://ec.europa.eu/info/sites/default/files/research_and_innovation/law_and_regulations/documents/ec_rtd_jdi_anmbr_042017.pdf



“Despite the obvious economic and environmental benefits of the Circular Economy approach in relation to wastewater, neither water reuse nor recovery of energy and nutrients has achieved large scale application in Europe. **There are a number of market failures and barriers that currently prevent water reuse and recovery** of energy and use of nutrients from wastewater. This in turn prevents a potential higher uptake of new technologies that might be more suitable for water resources recovery facilities than the conventional technology. Among other issues there may be regulatory barriers that discourage water reuse by farmers and other potential users, oblige wastewater treatment operators to perform treatment in certain specific ways or impose prohibitive costs on different actors”.

A recent independent review of policy and legislative barriers to closed water-related loops in innovative small water and wastewater systems in Europe¹³ noted that “[i]nnovative technologies and concepts for water and wastewater systems already exist, but they have been mostly implemented in pilot/demonstrative projects so far, mainly as a result of the institutional barriers they face”. The review also noted that for small or decentralised systems of water or waste treatment, including composting, that one of the main blockages is the “achievement of the quality standards, as set out in EU Directives, which may not be economically feasible for these systems”. This is largely echoed by the feedback of members of the HOUSEFUL consortium. Following discussions with both HOUSEFUL partners, and external experts, a number of potential policy solutions and mitigation techniques are proposed.

¹³ Cipolletta, G., Ozbayram, E. G., Eusebi, A. L., Akyol, Ç., Malamis, S., Mino, E., & Fatone, F. (2021). Policy and legislative barriers to close water-related loops in innovative small water and wastewater systems in Europe: A critical analysis. *Journal of Cleaner Production*, 288. doi.org/10.1016/j.jclepro.2020.125604



Table 5: Recommendation in relation to Section 2.2 (part 1)

Disconnected systems	<p>In places where there is no possibility to connection to a sewage system, it is suggested to have two independent systems for dealing with solid waste:</p> <ol style="list-style-type: none"> 1. food waste management 2. black water treatment
Easing obligations	<p>The obligation for sewage disposal and connection to the municipal sewage treatment plant should be eased and exceptions for certifiable and safe solutions to recover resources in wastewater should be accepted in this context.</p> <ul style="list-style-type: none"> ⇒ These exceptions should not only cover wastewater treatment plants, but also biogas systems, which could digest the solid fraction of the wastewater. ⇒ Biogas systems, once approved, should be applicable with a standard procedure to a building, like a CE mark. ⇒ Wastewater treatment and reuse systems, once approved, should also be applicable to buildings with a standard procedure like a CE mark.
Sandbox initiatives	<p>In order to better understand the risks, or lack thereof, of small-scale local systems of water and waste management, many additional 'lighthouse' projects are needed. These can be facilitated via so-called 'Regulatory Sandboxes'¹⁴.</p>
Online monitoring tools	<p>When it comes to water testing and analysis, reliable online monitoring systems should be promoted and permitted as a means for the completion of analysis. The use of biosensors without the use of toxic compounds or production of harmful residues should especially be investigated.</p> <ul style="list-style-type: none"> ⇒ Training programmes, mentoring and financial support for the monitoring of decentralised water treatment should be developed by each Member State

¹⁴ The European Supervisory Authorities (ESAs) define a regulatory sandbox as being: "a scheme set up by a competent authority that provides regulated and unregulated entities with the opportunity to test, pursuant to a testing plan agreed and monitored by a dedicated function of the relevant authority, innovative products or services, business models, or delivery mechanisms, related to the carrying out of financial services...The aim is to provide a monitored space in which competent authorities and firms can better understand the opportunities and risks presented by innovations and their regulatory treatment through a testing phase, and to assess the viability of innovative propositions, in particular in terms of their application of and their compliance with regulatory and supervisory requirements". See: https://www.esma.europa.eu/sites/default/files/library/jc_2018_74_joint_report_on_regulatory_sandboxes_and_innovation_hubs.pdf



Table 6: Taxes and charges for building permits

Problem or issue
Demo site leaders noted the high taxes and charges on building permits, despite the works being related to promoting environmental sustainability and innovative practices.
Solution of mitigation technique applied
No solution was found to resolve this issue. ⇒ Although, it was noted in Spain that some municipalities provide schemes to help cover the tax burden associated with renovating social housing.

Discussion: In order to encourage the use of circular solutions in the built environment, clear ‘benefits’ versus the traditional linear approach to building renovation and development need to be demonstrated. These benefits can appeal to stakeholders interested in environmental sustainability. For example, the energy and resource savings that will be demonstrated by the HOUSEFUL demo sites. However, many stakeholders will be more interested to see the benefits in terms of cost savings from adopting circular approaches.

Therefore, one way that public authorities and policymakers can help to “tip the balance” in favour of the use of circular solutions is by providing cost savings in the form of lower fees and levies for projects that meet certain environmental and resource efficiency criteria.

Table 7: Recommendation in relation to Section 2.2 (part 2)

Lower development costs	<p>Policymakers should reduce charges, taxes, and levies related to the development of construction and renovation projects that meet defined environmental and resource efficiency criteria.</p> <p>⇒ Other related benefits, such as the priority treatment of planning applications for such projects, could also be considered</p>
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Table 8: Laws on procurement for public providers (Spain)

Problem or issue
<p>In Spain, public procurement tenders are time and human resource intensive (by the several administrative documents generated and the multiple departments involved) and, in addition, require the development of highly-detailed development and execution plans before even moving to the sub-contracting phase.</p> <p>In addition, public tenders cannot specify the use of a particular product or service, so if you need a very specific product, it can be difficult to obtain it by a public tender procedure. Similar constraints exist in other EU member states when it comes to the involvement of public buildings. This can make working with innovative technologies and practices more difficult for some public providers, as there is limited tolerance for cost overruns, uncertainties, or scope for perceived 'risk taking'.</p> <p>⇒ However, it is important to highlight that the experience of the Spanish housing provider in HOUSEFUL is not universal, and other similar housing providers elsewhere in the EU have found potential solutions for incorporating innovative solutions in public procurement, e.g., use of "innovation partnerships"¹⁵</p>
Solution of mitigation technique applied
<ul style="list-style-type: none"> • For public contracts, a very detailed project plan was completed before works began, in order to strictly limit costs. This was time consuming and quite difficult to achieve, largely due to the constant increase in the cost of materials over the lifetime of the project. • The project also had to be divided into several "phases", in order to match the actions set out in the public tender with the timing of the completion of certain actions under the HOUSEFUL Grant Agreement, and because it was not possible to add new actions once the tender procedure was opened. This led to the duplication of work for the public housing provider involved.

Discussion: Most providers of public housing in the EU must comply with public procurement rules. This is because they are considered to be "contracted authorities" as per the EU Public Procurement Directive [2014/24/EU]¹⁶.

In the Spanish context, the provision of public rental housing (*vivenda protegida*) and its regulation, is highly decentralised in nature. This means that practices and procedures in one region or city, may differ from those in another. Thus, the experiences of AHC in the Catalan region may not be universal. Moreover, even in Catalonia there are several actors managing public rental housing (especially in the Barcelona Metropolitan area), who may have different practices.

¹⁵ EU Briefing on Innovation Partnerships: <https://ec.europa.eu/docsroom/documents/47178>

¹⁶ Directive 2014/24/EU : <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32014L0024>



Overall, public providers in Spain follow public procurement rules. The construction works are always developed with external companies selected through public procurement procedures. The external teams are selected following a public tender process where interested companies present their ideas for the energy renovation. An average of five companies tends to be pre-selected to design and develop the concept to leave room for innovation (pre-procurement conversation).

However, the situation in Spain can be contrasted with that in Austria, where so-called 'Limited-Profit Housing Associations' (LPHAs; *Gemeinnützige Bauvereinigung*), like Neues Leben, do not need to follow public procurement rules. This is because their legal structure means that they are considered to be private entities. Instead, Austrian LPHAs launch simplified tender processes to select the most appropriate companies, usually based on market research or previous history with contractors. The exception is of course when public subsidies for renovation are involved, in which case they are obliged to follow the public procurement rules. Usually, an in-house renovation department organises the tendering and commissioning of the services for construction companies.

Looking beyond the two HOUSEFUL demo site countries, we see that public and social housing providers that are obliged to follow public procurement rules have developed a number of approaches to working within this framework, whilst also managing to foster the use of innovative and environmentally sustainable practices.

- ⇒ **France:** Social housing providers must comply with public procurement procedures. New procedures such as **competitive dialogues**¹⁷ and **innovation partnerships** allow negotiation prior to the tendering process to encourage innovative or 'greener' outcomes. The competitive dialogue usually takes up to two years in France and is mainstreamed in the social housing sector. For smaller innovative projects, social housing providers tend to prefer engaging in Framework Agreements¹⁸ for four years.

¹⁷ A "competitive dialogue" is a flexible solution for public authorities wanting to award contracts for complex infrastructure projects. The conditions for establishing a competitive dialogue are set out under Art 26(4)(a), [Directive 2014/24/EU](#). Competitive dialogues can be used in circumstances in which the services or good being provided are not "off-the-shelf". This would be the case for many of the innovative solutions used in HOUSEFUL, which have a level of complexity and innovation that means they are not yet mainstreamed, and special adaptation must be made.

¹⁸ A "framework agreement" is an arrangement between the social housing provider and one or more suppliers that provide the terms governing a series of contracts to be established for a certain period of time, particularly regarding price and, where necessary, the quantity envisaged.



By 2025 the French government will put calculation tools at the service of public buyers (including social housing) to **perform life-cycle assessments in procurement** of renovation and construction (with no obligation liability). These tools can assist in investment decisions.

EU funds are often used to support innovation, but the eligible costs threshold is limited. Usually, those with enough capacity use EU funding sources to test technologies on small demo sites, granting an opportunity to collaborate with SMEs, universities, and NGOs on technologies that otherwise would be too risky to be considered as part of the normal business-as-usual activities of social providers.

⇒ **Germany:** Publicly owned social housing providers (municipal housing companies) follow public procurement rules. Other social providers are private entities and are therefore not obliged to comply. Medium and large social providers often count on in-house departments and teams responsible for overseeing the procurement process.

In early 2018, GdW (Germany Federation of Housing Companies) held a European wide call for proposals for high-quality modular and serial housing construction concepts with the following characteristics: single building for residential use, four floors, 24 apartments/units (varying in size), no lift/ elevator. The winning designs use unconventional processes and materials (e.g., timber).

Within the framework agreement, housing companies have been able to choose, from nine finalist model buildings, the most suitable for their needs and available property; and can save time as **the framework agreement anticipates tendering and procurement processes as well as the planning of the building itself**; realising the buildings in a straightforward fashion and at affordable costs.

Innovation in renovation is viewed favourably in Germany. Most municipal housing providers have collaboration agreements with each other and tend to **share experiences on preferred suppliers and technologies**. They also have linkages with research organisations, with whom they work in testing new solutions. The subsidy system for renovation of social housing has a calculation tool incorporated that sets the required targets of the renovation works. An external expert supervises and confirms compliance with the calculated standards.

⇒ **Sweden:** As public organisations, Swedish public housing providers follow public procurement rules. Competitive Dialogue is one of the most common methods for renovation procurement. The housing providers



focus on procuring the renovation works and assigning energy performance targets. It is the responsibility of the construction SME to use the technologies and systems necessary to achieve the agreed target. SMEs must submit an offer together with the building contractor in order to test technologies in housing.

Improved coordination between the municipal housing providers in the public procurement of housing construction and the **development of ready-to-occupy housing can help stimulate industrialised house building and reduction of construction prices**. *Sveriges Allmännytt*a (Swedish Federation of Public Housing Companies) uses framework agreements to speed up this process. At the moment they are offering the “Combo House”, a multi-family apartment block “turnkey contract”, that is available in three models varying in size, and with a fixed price per square metre. As the apartments are built large-scale across the country, reports show that **construction costs are cut by up to 25% and the time for completion is reduced**.

A new procurement portal is also being developed in Sweden, aimed at providing guidance to public housing companies on the legal processes with contractors, ways to involve energy consultants, and different methods to get improved energy performance results.



Table 9: Strategic public procurement approaches

Type of approach	Description
Sustainable Public Procurement (SPP) ¹⁹	A process by which public authorities seek to achieve the appropriate balance between the three pillars of sustainable development - economic, social and environmental - when procuring goods, services or works at all stages of the project.'
Green Public Procurement (GPP) ²⁰	Public authorities seek to purchase goods, services and works with a reduced environmental impact throughout their life-cycle compared to goods, services and works with the same primary function which would otherwise be procured.
Public Procurement for Innovative Solutions (PPI) ²¹	Fosters the uptake of innovative products and services by either buying the process of innovation (early adopter) or buying the outcomes of innovation. This in turn promotes research and development and benefits innovative businesses entering the market. It also promotes the modernisation of the public sector.
Pre-Commercial Procurement (PCP) ²²	A method used by the public sector to challenge the private sector to propose innovative solutions to achieve the objectives of the contractor. It encourages innovation and spurs competition for solutions.

Source: [European Parliament Briefing](#)

A recent briefing produced for the European Parliament²³ on public procurement rules and their contribution to the EU Circular Economy Strategy concluded that: "further action is needed to promote strategic public procurement and in particular Green Public Procurement requiring low carbon, life-cycle and circular approaches in public purchases". It also included some policy recommendations, some of which align with the recommendations of HOUSEFUL partners, and which are included in Table 10.

Other important points set out in the Briefing document include:

- The value of public procurement, from over 250,000 public authorities in the EU, is 14% of EU GDP, or two trillion euro a year
- Given the importance of public procurement contracts in the economy, **procurement standards have a significant influence on the practices of private contracting parties and their**

¹⁹ See : https://ec.europa.eu/environment/gpp/versus_en.htm

²⁰ *Ibid.*

²¹ See : [https://ec.europa.eu/transparency/documents-register/detail?ref=C\(2018\)3051&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=C(2018)3051&lang=en)

²² See : <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0799:FIN:EN:PDF>

²³ "The EU's Public Procurement Framework - How is the EU's Public Procurement Framework contributing to the achievement of the objectives of the Paris Agreement and the Circular Economy Strategy?" - [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/648770/IPOL_BRI\(2020\)648770_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/648770/IPOL_BRI(2020)648770_EN.pdf)



- subcontractors**, and thus a significant indirect influence on the private sector as a whole
- Not enough progress has been made where Member States and local authorities have been left to determine voluntarily whether and how to set up public procurement systems that aim at decarbonisation and follow a circular economy strategy.
 - It may be that authorities are concerned to introduce criteria beyond the mandatory level to avoid technical or legal mistakes. Without clear specifications, good guidance and prior capacity building, the barriers to mobilise the full power of public procurement remain high²⁴.
 - Circular procurement is described in the non-binding brochure "Public Procurement for a Circular Economy"²⁵. While there are some examples of circular procurement practices, **for many administrations setting up a circular procurement without a clear definition and methodology is far from straightforward.**

²⁴ In the case of AHC, they noted that sustainability can find its way into their tenders via two avenues:

- Optional requirements: To select the best offer, primarily based on cost considerations, but also other ones (social, environmental or speed). This other criteria are not compulsory, but companies receive points for accomplishing, increasing their options to obtain the contract.

- Punctuation system: For construction works, normally there at least two environmental requirements proposed (10%-20% of total requirements)

²⁵ European Commission – DG Environment (2017). Public Procurement for a Circular Economy.

https://ec.europa.eu/environment/gpp/pdf/Public_procurement_circular_economy_brochure.pdf



Table 10: Recommendation in relation to Section 2.2 (part 3)

<p>Simplify public procurement procedure for projects using innovative solutions</p>	<p>Simplify the procurement tender procedures for construction works that include new solutions (to be less time consuming and less restrictive regarding increases of costs).</p> <p>For example, the tender procedures could be less ‘closed’ regarding technical specifications or economic costs, so the detailed executive project for the renovation could be developed in parallel to the tender procedure for the selection of construction companies. This would save significant time.</p>
<p>Including circularity in the tender</p>	<ul style="list-style-type: none"> • Tenders could include a list of circularity criteria, which can be ranked and used as a virtual discount on the bid • Include cost of not using circular solutions in the evaluation – e.g., take a life-cycle approach to show savings, show environmental impact of different tenders <ul style="list-style-type: none"> ⇒ In the Region of Valencia the “Guia Verde” guides the regional authority and the public housing provider in adopting green and innovative criteria in the public procurement process. ⇒ In France, a recent requirement for social housing providers is to include in the contracting obligations for the inclusions of a waste management strategy for projects
<p>Use of framework agreements</p>	<ul style="list-style-type: none"> • Framework agreements for ‘model’ circular homes could be developed; reducing the cost and timeframe for delivery of new circular homes • A similar package could be developed for ‘deep circular renovations’, provided a standard package of circular solutions could be agreed
<p>Adapting EU rules</p>	<p>The EU should promote the use of green procurement schemes and explore how it could be strengthened by future legislation</p>
<p>Professionalising public procurement</p>	<p>From the recent EU Parliament Briefing²⁶:</p> <ul style="list-style-type: none"> • “Member states should in turn professionalise the public procurement authorities and establish central purchasing bodies or national competence centres”. • “There is a need for many member states to invest in professionalisation, training and ICT tools to mainstream strategic public procurement and in particular Green Public Procurement”.
<p>Support for those engaged in public procurement</p>	<p>Changes in guidelines or procurement requirements can take time to be absorbed at the national or local level. Thus, national agencies charged with developing clear and up-to-date procurement guidelines and digital procurement tools need to be established. These agencies should put a particular focus on maximising the potential for public procurement to meet the EU’s broad strategic goals, including on tackling climate change.</p>

²⁶ *Ibid.*



Create economies of scale	By bringing multiple contracted authorities together to purchase at scale, it can help to create a meaningful market for circular products and solutions, as well as generating economies of scale for the purchasers (i.e., economies of scale).
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2.3 Lack of standards and regulations

Table 11: Lack of reference regulatory frameworks

Problem or issue
<p>The principles and methods of the 'Circular Economy' are not yet internalised or mainstreamed within the construction sector. Therefore, there is a lack of reference regulatory frameworks for frontrunner circular projects.</p> <p>This lack of accompanying regulations related to circular principles in buildings makes use of circularity tools (CT) or decision-support systems (DSS)²⁷ difficult.</p>
Solution of mitigation technique applied
<p>No solutions were found for this issue, as the legislative and regulatory framework is beyond the control of the solution providers.</p>

Table 12: Lack of regulations on circular products, BIM and materials passports

Problem or issue
<p>The lack of legislative requirements in terms of the use of circular materials and material passports could be an obstacle for a better supply chain delivery. A lack of lighthouse circular buildings was also an issue in this regard.</p>
Solution of mitigation technique applied
<p>For the solutions with an absence of clear technical regulations, the support of qualified local experts and municipal authorities was required in order to verify and justify that the solutions are not dangerous for users. However, this was extremely time consuming for the demo leaders, and would not be practical to replicate in a more typical renovation project.</p>

²⁷ A DSS is a tool, usually in the form of software, that helps to gather and analyse data in order to support decision making and strategy development. For example, a DSS could take supply-chain information from previous circular renovation projects in order to analyse potential problems that could add extra time or cost to future projects, and then allow DSS users to adjust their procurement strategy. It could also account for regulations in decision making.



Table 13: Integrating material passports

Problem or issue
<p>To reuse building materials at scale, material passports are a necessity for the housing sector. At the moment these passports are made on a voluntary basis only. While this is not an obstacle <i>per se</i> within HOUSEFUL, the prior mainstreaming of this concept would have helped the project to provide passports at a lower cost, and increase their impact.</p> <p>However, in the case of existing buildings, demo leaders noted that there were some issues with materials passports, which may not be able to account for all materials, such as cables and other materials hidden in walls.</p>
Solution of mitigation technique applied
N/A

Discussion: When we discuss ‘circular’ building and renovation projects, we quickly find that most of the projects that have been developed in the EU to date to which we can attach that label are some form of ‘project’, ‘pilot’ or ‘demo’; as is the case with the HOUSEFUL project, for example. Thus, most circular solutions has not yet become mainstream; though some solutions like passive building standards, rainwater capture, and solar PV arguably have.

Discussions with HOUSEFUL partners show that **the lack of mainstreaming means that regulatory frameworks for circular activities in the construction sector are also lacking**. While this prevents economies of scale from developing, on the one hand, it also serves to raise doubts about the future use of some of the solutions, on the other. In other words, there are concerns that solutions may not be scalable, given the possibility that future regulations may emerge to undermine their use. Future regulations may also retrospectively undermine solutions that have already been implemented in circular demo sites (e.g., water reuse, on-site biogas generation). Such uncertainties are not conducive to promoting the upscaling of innovative practices.

At the same time, **the lack of existing regulations has also meant that significant additional time, effort, and cost has had to be expended in order to consult with third-party experts, in order to try to establish what solutions are, or are not, compatible with current regulations**. This has delayed the implementation of some solutions. In addition, the extra time and effort will be too much for many potential follower buildings to accept, meaning that they would either scale back their circular ambitions, or simply complete a more ‘traditional’ linear renovation.

Moving on, **the lack of ‘lighthouse’ circular projects has been an issue raised by many HOUSEFUL partners**. It has also been an issue that has been encountered as part of the process of attracting potential “Follower buildings”, which is required for the successful completion of HOUSEFUL Task



7.4.1 'Replication between Frontrunner and Follower buildings'. A lack of peer circular buildings means that the unknowns for potential followers might simply be too great in many cases for them to seek to replicate HOUSEFUL-type solutions.

A recent review of lighthouse innovation projects by McKinsey stated that: "**Lighthouses serve as real-world evidence to dispel widespread myths and misunderstandings** posing obstacles to innovative technology adoption at scale; in addition, these beacons shed light on the characteristics, differentiators, and success factors that realise optimal scaling"²⁸. While the HOUSEFUL project is a lighthouse, many more similar projects will be need, spread right across the EU, in order to build sufficient confidence in the circular processes involved, and prompt policymakers to develop the necessary enabling frameworks that are currently lacking.

Finally, material passports are digital tools for creating a catalogue of all of the materials contained within a product, or in the case of HOUSEFUL, a building. Thus, every brick, board, and pain of glass is catalogued in order to evaluate it, and to facilitate the future recovery of materials as they reach the end of their life in their current building. Material passports also help to assess the residual value in a product, facilitating its resale on the secondary market. Thus, **material passports are essential in avoiding both the wastage of existing materials, as well as the need for extraction and processing of additional 'virgin' materials.**

This is essential, as according to the EU:

"The built environment has a significant impact on many sectors of the economy, on local jobs and quality of life. It requires vast amounts of resources and accounts for **about 50% of all extracted material**. The construction sector is responsible for **over 35% of the EU's total waste generation**. Greenhouse gas emissions from material extraction, manufacturing of construction products, construction and renovation of buildings are estimated at 5-12% of total national GHG emissions. Greater material efficiency could save 80% of those emissions"²⁹.

However, at present only a small number of buildings in the EU have material passports. As a result, the critical scale needed to deliver the evaluation process more efficiently and cheaply has not been reached. This means that those few buildings which do avail of material passports do so despite the

²⁸ De Boer, E., Leurent, H., & Widmer, A. (2019). [Lighthouse manufacturers lead the way- Can the rest of the world keep up](#). *McKinsey Quarterly*, 1, 1-8.

²⁹ EU Circular Economy Action Plan : https://ec.europa.eu/environment/pdf/circular-economy/new_circular_economy_action_plan.pdf



costs; though this will clearly be a barrier for many other building owners, even if they support material passports in principle.

Finally, material passports could also be useful in navigating another issue created by existing EU legislation. The EPC (Energy Performance Certificate)³⁰ regulation does not explicitly prohibit the use of reusable materials, for example, but “pushes building owners to choose new products and materials because these are accompanied by the necessary technical data sheets for the EPC”³¹. The default performance values of materials described in the regulations are “sometimes too penalising and require potentially very expensive tests to meet the requirements, which discourages the use of reusable materials and construction elements”³². However, material passports can help to improve this situation, as they can increase the “traceability of materials and the maintenance of information on their performance will make it easier to guarantee the quality and performance of reused materials in the future”³³.

Table 14: Recommendations in relation to Section 2.3

Fostering circular activities in construction	<p>If the pace of adoption of circular practices in the built environment remains slow, then efforts need to be made to artificially boost them. This could include:</p> <ul style="list-style-type: none"> i. Mandate the inclusion of assessment criteria such as life-cycle costs, embedded carbon, reparability, and reversibility in all public tenders for construction and renovation/adaptation of buildings – <i>the eventual goal should be to extend the same requirements to private buildings too</i> ii. Mandate the use of building material passports for all new buildings of a certain scale, in both the public and private sectors iii. Mandate the use of a certain (minimum) percentage of recycled/recovered materials in new buildings – and in renovation works throughout the building’s life-cycle
EU Standards on Material Passports	<p>The EU needs to adopt a regulation on Material Passports to ensure that standards are uniform across all member states, and also to chart the path to their mandatory use in all new building and demolition projects.</p>

³⁰ Guide on EPC system: <https://www.bpie.eu/publication/energy-performance-certificates-across-the-eu/>

³¹ ICEDD (2020). *Circular construction and renovation Actions and recommendations to the Federal government for accelerating the circular economy in construction*. Brussels: Institut de Conseil et d'Etudes en Développement Durable. https://www.frdo-cfdd.be/sites/default/files/content/download/files/ecocircons_rapportfinal_icedd_202011_06_eng.pdf

³² *Ibid.*

³³ *Ibid.*



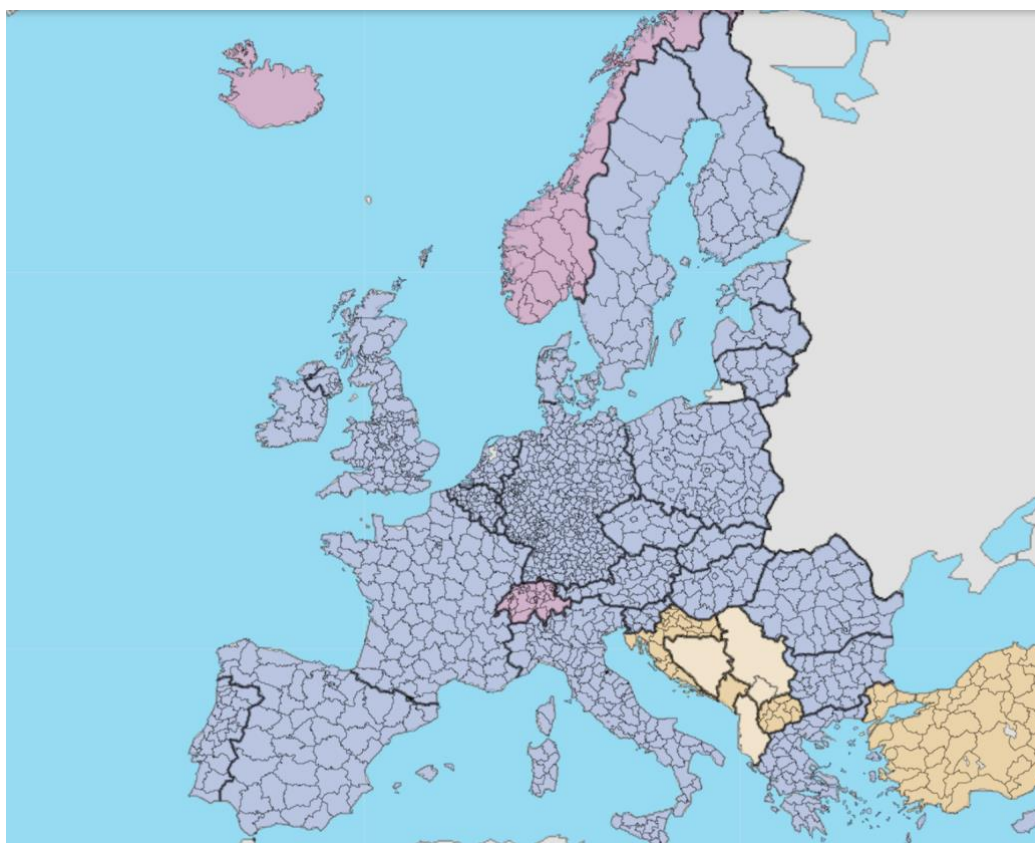
<p>Material passports as a tool for traceability</p>	<p>As discussed, the EPC system can push consumers towards using new construction materials. A well-regulated and transparent material passport system can increase the traceability of materials and help to improve confidence in their reuse. Thus, steps need to be taken to promote their use, especially for building owners who may lack the financial means to pay for their use.</p>
<p>Circular one-stop-shops</p>	<p>Regional advice and circularity innovation hubs, based on the one-stop-shop model³⁴, should be established in order to assist local stakeholders (e.g., engineers, architects, building owners) to develop more sustainable, circular projects.</p>
<p>Dynamic product regulations</p>	<p>As new products and solutions offered as part of circular building renovations are being developed all the time, the EU and its Member States need to find a 'dynamic' approach to regulation. For example, rather than regulating specific products, regulations could be based on outcomes. Thus, new products that could be shown to deliver certain outcomes could more quickly gain the confidence of potential clients.</p>
<p>Target for circular lighthouse buildings</p>	<p>There are 242 regions at NUTS 2 and 1,166 regions at NUTS 3 level in the EU³⁵. It should be the short-to-medium-term goal of the EU to have at least one circular lighthouse building in each NUTS 2 region, and the medium-to-long-term goal to have one lighthouse in every NUTS 3 region. These lighthouses will serve to define better regulations, and inspire follower buildings.</p>

³⁴ According to [Directive 2018/844/EU](#): “Member States shall facilitate access to appropriate mechanisms for... accessible and transparent advisory tools, such as one stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments”. The EU Joint Research Centre (JRC) has published a series of useful briefings on the use of one-stop-shops in the EU: <https://e3p.jrc.ec.europa.eu/publications/one-stop-shops-energy-renovations-buildings>

³⁵ The NUTS (Nomenclature of territorial units for statistics) classification is a hierarchical system for dividing up the economic territory of the EU. See: <https://ec.europa.eu/eurostat/web/nuts/background/>



Image 2: NUTS 3 Regions in Europe



Source: Eurostat

3 Dealing with civil servants and public officials

3.1 Bureaucratic effort

Table 15: Duplication of efforts and heavy weight of bureaucracy

Problem or issue
It was noted by demo site leaders that there was a lack of joint-up thinking between different layers and sections of government and the civil service. This meant that similar applications and information had to be provided to different agencies, costing time and staff resources.
Solution or mitigation technique applied
Demo leaders had to spend significant time dealing with bureaucracy related to the realisation of the projects; often at significant cost in terms of time and resources.

Discussion: Inefficiencies in public administrations exist. This can take many forms, from slow response times, to the use of outdated administrative systems and processes. Although, these issues are often related to a lack of resources. In the case of HOUSEFUL, the duplication of work as a result of the requirement to submit similar documentation or requests to multiple public bodies was identified by a number of partners.

The European Commission is aware of the issues that these sorts of inefficiencies can create, and is engaged in a constant dialogue with the member states on this topic; primarily through its European Semester (ES) process³⁶. A key part of the ES is the production of 'Country-specific recommendations' (CSRs), i.e., areas where the European Commission believes member states need reforms in order to achieve better outcomes. Fittingly, given the experiences of certain HOUSEFUL partners, the Commission recently used the CSRs to recommend to Spain to "[i]mprove coordination between different levels of government"³⁷. The EU also provides funding and support to member states to accelerate such reforms under its 'Technical Support Instrument' programme³⁸.

³⁶ The European Semester is the framework for integrated surveillance and coordination of employment policies across the European Union. Since its introduction in 2011, it has become a well-established forum for discussing EU countries' fiscal, economic and employment policy challenges under a common annual timeline.

³⁷ See : <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0509&from=EN>

³⁸ See : https://ec.europa.eu/info/funding-tenders/find-funding/eu-funding-programmes/technical-support-instrument/technical-support-instrument-tsi_en; and https://reform-support.ec.europa.eu/accelerating-permitting-renewable-energy_en



Table 16: Recommendations in relation to Section 3.1

<p>A coordinated approach to the Renovation Wave</p>	<p>Each member state should conduct a holistic review of its processes in public administration vis-à-vis meeting its objectives as part of the Renovation Wave. The goal should be to walk through the process of applying for the necessary permits and licences in order to see where there is scope for improvements in efficiency.</p>
<p>One-stop-shop for innovative circular projects</p>	<p>As already discussed in Table 14, one-stop-shops have been shown to be an effective model for bringing together all stakeholders in order to provide a unified destination for those seeking to develop ambitious, multi-stakeholder renovation projects. The one-stop-shop therefore simplifies the process, and cuts back on time spent dealing with public administration.</p>
<p>Cross departmental planning</p>	<p>Local sustainability plans should be developed with cross departmental planning between different public stakeholders. Within these plans should be hard targets for renovations and increasing circularity within the built environment.</p>

3.2 Comprehension of the project

Table 17: Lack of comprehension of the project

<p>Problem or issue</p>
<p>Some public agencies, and members of the public, expressed a lack of confidence in some of the circular solutions used in the demo sites.</p> <ul style="list-style-type: none"> ⇒ Future maintenance of the solutions was a particular concern. ⇒ Providing “community” benefits from the solutions was also queried. For example, extending the impact of S5 (‘Efficient treatment and reuse of rainwater and greywater’) in Demo 1 to other public buildings in the area. <p>Concerns were exacerbated by issues such as the fact that information available about some solutions was not available in the local language, i.e, Catalan/Spanish, or German, and English is an unknown language for many local technicians or administrators.</p>
<p>Solution or mitigation technique applied</p>
<p>Project partners spent significant time communicating with public officials and the local community on the proposed solutions in order to better inform them. It was necessary to engage in communication and information activities, organise visits to the buildings, as well as include stakeholders in the co-creation workshops, which included the interventions of independent experts in order to increase trust in the technologies. Crucially, some modification of the original plans was required in order to placate those who raised concerns.</p> <p>In addition, much time was spent to translate technical information into local languages.</p>

Table 18: Lack of understanding of new processes and technologies

Problem or issue
<p>Public officials did not always understand the new technologies being used in the demo sites. This issue also extended to their comprehension of how these circular solutions aligned with local legislation, with at least one solution being abandoned late in the project after a regulatory conflict was discovered.</p> <p>In addition, nuances between the solutions being used in the demo sites, and similar solutions used in unrelated projects were not well appreciated.</p> <p>⇒ For example, regarding legal requirements for integration of the Homebiogas system in Austria, the safety requirements are the same as those for industrial-scale plants, despite the significant difference in scale and risk of what is being implemented by HOUSEFUL. Thus, the regulatory demands are simply not proportional.</p>
Solution or mitigation technique applied
<p>Significant time was invested working with public officials to plan and implement the solutions. This included drafting in third-party legal experts. However, this did not always help, as even with significant efforts from project partners, officials were not able to give clear or timely replies to queries. This negatively impacted on the timing and delivery of some solutions.</p>

Discussion: The willingness, or capacity, of a society to embrace new technologies and practices depends on a multitude of factors. This includes, but is certainly not limited to, awareness, geography, language, existing economic structures, the influence of peers, and culture³⁹. Thus, efforts to convince people to move from a linear to a circular economy, which would represent a significant change to many day-to-day practices, must be sensitive to all of these factors.

The experience of HOUSEFUL shows that for innovators, initial progress can be slow and hard won. Although, by taking the time to have the conversations and engage with all stakeholders, it is possible to arrive at a point of informed acceptance. HOUSEFUL also shows that flexibility on the part of project managers, including the possibility to change designs to satisfy peoples’ concerns, not to mention local regulatory barriers, is important.

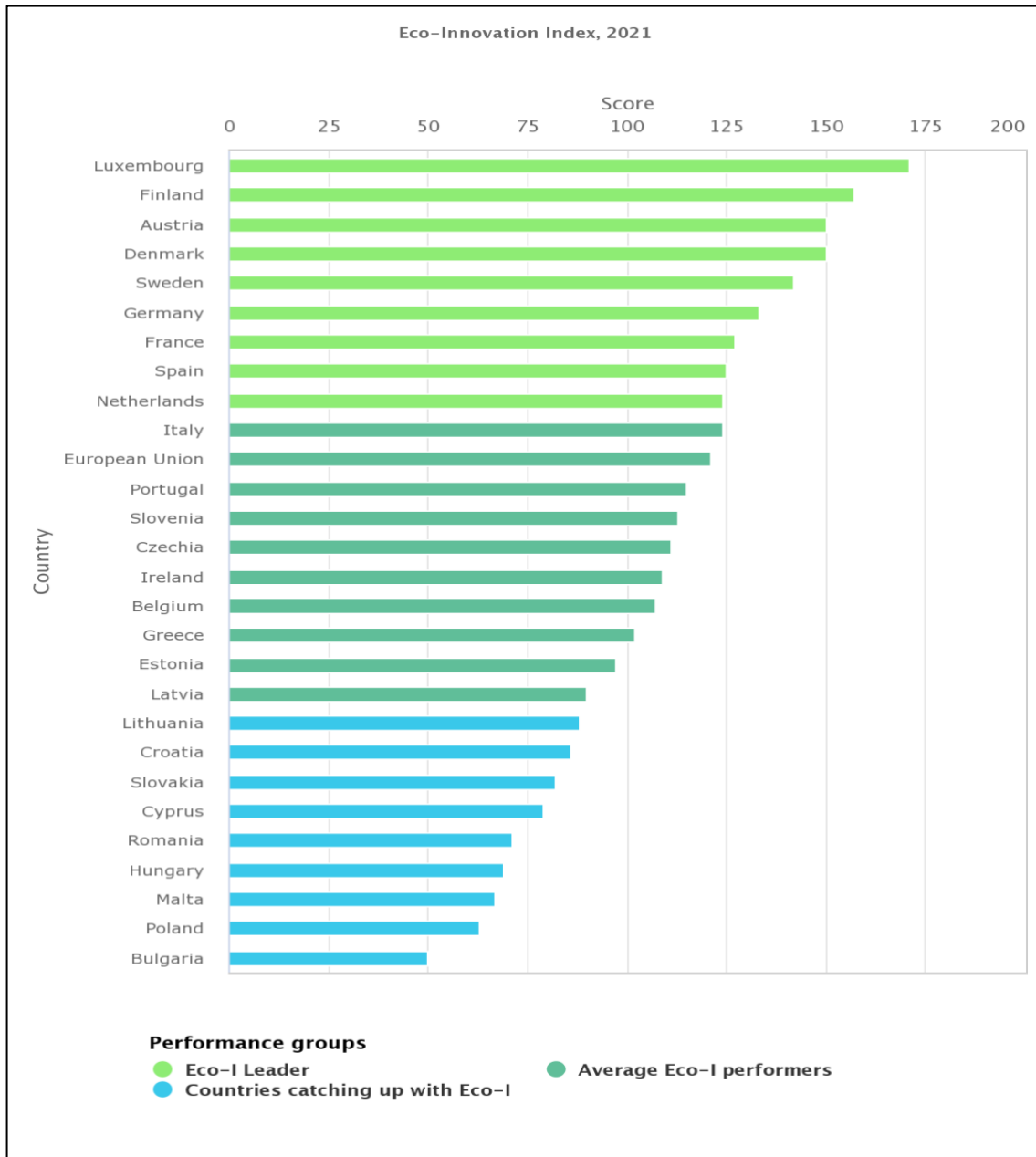
A key success factor for HOUSEFUL was the co-creation workshops organised as part of the project. These allowed all local stakeholders to come together in order to air their concerns, and hear from independent experts. The ‘tasks’ for the HOUSEFUL consortium that have resulted from the co-creation events (covered under Work Package 3), have also been important in turning the views of stakeholders first into a series of asks, and more recently into tangible results. This shows those with concerns that their opinion is

³⁹ Ecorys (2011). [Lags in the EU economy's response to change – Final report](#). Report for DG Environment under framework contract: DG ENV.G.1.FRA/2006/0073



important, and that they do have the power to directly impact the circular renovation projects.

Figure 2: European Eco-Innovation Index⁴⁰



Source: [European Commission – DG ENER](#)

⁴⁰ The Eco-Innovation index is based on an annual report from the European Commission. The index is a composite indicator obtained by taking an unweighted average of 16 national indicators. This includes employment in 'eco' industries, water and material productivity, and spending by governments on environmental measures and research.

When it comes to the uptake of energy efficiency products, a review produced for the European Commission⁴¹ notes that: “evidence suggests that the most energy efficient products and processes are not always immediately adopted, even if there are clear and demonstrable financial benefits”.

For residential consumers, a major factor is that they “are in general ‘satisfiers’, meaning that as long as they are happy and satisfied, they do not engage in risky actions that could potentially make them better off”.

Another important point is that consumers prefer innovative products that are perfect substitutes for older, outdated technologies. This means they prefer that the new product perfectly replicates the required inputs and general functionality of the old products. A simple example of this is upgrading to a new model of smartphone, where the same basic functionality and user interface is retained, but with a few upgrades.

Likewise, it is easy for a consumer to move from gas-based heating with radiators, to electricity-based heating with radiators. In contrast, moving from a gas-based radiator heating system to a heat pump system requires a greater leap, with a requirement for all new (and costly) hardware and a (seemingly) more complicated and uncertain system for heating and cooling.

Interestingly, one of the main asks by participants at the HOUSEFUL co-creation events has been for the project partners to put greater emphasis on clearly and simply explaining the benefits of the innovative solutions being used in the demo sites. The view of many stakeholders is that clear benefits, especially in terms of cost-savings, will be key to breaking down mental barriers, and convincing both policymakers and potential consumers to adopt more circular approaches.

⁴¹ Ecorys (2011). [Lags in the EU economy's response to change – Final report](#). Report for DG Environment under framework contract: DG ENV.G.1.FRA/2006/0073



Table 19: Recommendations related to Section 3.2

Designated legal experts	<p>In the Demo 3 site, a legal impediment to the use of certain solutions was only identified by regional officials at an advanced stage of the project.</p> <p>Therefore, regional governments should have dedicated bureaus to handle the implementation of innovative technologies. Staff should be experts in local environmental, planning, and procurement regulations.</p> <p>As well as working to provide guidance on the compatibility of proposed projects with regulations, they should also work to produce independent feedback for policymakers on how processes, like permitting, can be improved.</p>
Co-creation templates	<p>Developing co-creation frameworks for each circular project could be both time-consuming and expensive. Therefore, national environmental agencies, such as those who are members of Eionet⁴², should work to develop locally appropriate co-creation templates that can in turn be used by project leaders.</p>
Lighthouse projects	<p>As discussed in Table 14, lighthouse circular projects can play a key role in building understanding and acceptance for circular solutions.</p>
CE markings	<p>There is a need to adapt CE marking for construction products in order to more clearly highlight the benefits of certain products over others, in terms of life-cycle costs, and repairability, replaceability. This will help project managers to more easily explain the benefits of circular approaches to end-users and policymakers.</p> <p>This will be discussed in more detail in Section 4.2</p>

⁴² Eionet is the European Environment Information and Observation Network. It is a partnership network of the European Environment Agency (EEA) and includes members in each EU member state.



4 Supply of materials, procurement, and implementation with external partners

4.1 Use of reused/recycled materials

Table 20: Lack of familiarity with and reluctance to working with reused materials

Problem or issue
<ul style="list-style-type: none"> When materials were being reused, there were cases of a lack of familiarity with the processes involved. This led to problems with the delivery of the building materials and also with project execution. <ul style="list-style-type: none"> ⇒ In the case of Demo 3, this resulted in long delays, as well as defects in the initial execution of elements of the project, and conflicts over the costs. Architects and static assessors are still quite hesitant to work with recovered materials. It is still very uncommon to plan a building or construction including reused materials. The whole planning process is quite different (coordination of material availability and construction schedule, storage, safety checks and potential necessary modifications etc.). <p>Besides questions around the 'quality' or the 'reliability' of the materials, architects might also perceive limitations in their design freedom for planning the building from scratch.</p> <ul style="list-style-type: none"> The understanding for reusing materials on site and working with the already existing structures in renovations needs a new skillset to be learned (and taught in architecture schools for example). Consequently, at the moment the savings in material costs from reusing materials can be all but eliminated by the cost of the extra time and efforts required to manage their use in projects. At present, the issue of building insurance for projects that use reused elements is something of a 'grey area'. In practice, reused materials in forerunner circular projects serve largely aesthetic functions, as opposed to being related to the structural integrity. Without expensive testing and recertification of reused materials, the potential (in volume terms) for the reuse of materials seems to be limited, as new materials and products will always be used to ensure the structural integrity of buildings, and to avoid any difficulties with insurance providers.
Solution or mitigation technique applied
<ul style="list-style-type: none"> Significantly more meetings were held with the companies, architects, engineers and others than had been initially planned. The construction company received substantial support from the architectural office in the detailed work. Considerable amount of additional work and effort by the project team in research on available reusable material as well as material property needs.

Discussion: The European Commission is currently developing an EU Roadmap for the reduction of whole life carbon of buildings. Life cycle emissions are also addressed in proposals to revise the Construction Products Regulation (see below) and the Energy Performance of Buildings Directive.

A significant part of the EU plan will involve circular renovation strategies, including the reuse of construction materials. It is estimated that circular renovation strategies, such as using materials that are recycled or designed



for disassembly, could cumulatively reduce approximately 650 million tonnes of materials and save substantial amounts of CO₂ from 2022 to 2050, as part of member state renovation programmes⁴³.

However, these estimates are based purely on what is technically possible (*based on potential recovery and reuse rates, as set out in Table 21*), while ignoring potential constraints such as “financing, skills requirements, people’s preferences or economic cost”⁴⁴. In other words, the estimates are based on what might be ‘possible’ in an abstract sense, not what may actually be ‘feasible’ in a concrete sense once we allow for human ignorance, stubbornness, and issues around available labour resources and supply-chain systems.

Table 21: Secondary material use; current standard and technical maximum; in Western Europe

Material	Current standard secondary material use	Technical maximum secondary material use
Concrete	3%	30%
Sand lime brick	20%	40%
Brick	0%	25%
Wood	15%	30%
Insulation	10%	50%
Glass	8%	100%
Gypsum	5%	30%
Ceramics	8%	25%
Plastic	17%	75%
Steel & Iron	95%	95%
Aluminium	95%	98%
Copper	95%	98%

Source: [Metabolic \(2022\)](#)

An important feasibility gap, when it comes to upscaling the reuse of construction materials, that has been identified by HOUSEFUL is the readiness and/or willingness of architects, engineers and construction workers to adapt to such circular methods. This is confirmed by independent reviews from outside Austria and Spain.

For example, a recent review from the Brussels-Capital Region in Belgium concludes that despite the fact that the government there “has put considerable effort into leading the transition from a linear to a circular model of economy”, including producing a roadmap towards a circular construction

⁴³ See : <https://www.eea.europa.eu/highlights/circularity-can-enhance-greenhouse-gas>

⁴⁴ European Environment Agency (EEA) briefing on renovation and circularity: <https://www.eea.europa.eu/publications/building-renovation-where-circular-economy/building-renovation-where-circular-economy>



sector⁴⁵, circular principles and practices in construction projects “are not yet broadly understood and applied”⁴⁶. A lack of “training” and “knowledge” are the main reasons cited by local experts for this. The report also highlights that while the ‘terminology’ of the circular economy (e.g., waste management, material passports, reuse of materials) is being used more and more, what is meant by this terminology in concrete terms is still not clear to many practitioners⁴⁷.

Elsewhere, a recent review of the use of circular economy (CE) principles in Denmark concluded that: “Although CE initiatives are proliferating within the industry, wide-scale adoption of CE is still lacking, and the current development and implementation of CE building design and construction strategies is fragmented”⁴⁸. It concludes that: “An important gap preventing a greater CE uptake within the [construction] industry was found to include the lack of knowledge about the environmental performance and related benefits of the various building design and construction strategies”.

With regard to the issue of being able to plan projects that will use recovered materials, it is clear that from a supply-chain standpoint, this can present a problem, as it may not be possible to know in the planning and design phases what materials will be available when it comes to the construction phase. This is in contrast to the current model where construction materials providers have catalogues of products that are familiar to architects and engineers.

Turning to the issue of quality standards, while ‘traditional’ construction products can rely on CE markings, which is at present not the case for recovered materials⁴⁹. For example, if a project wanted to use windows that

⁴⁵ See : <https://www.circulareconomy.brussels/decouvrez-la-feuille-de-route-des-acteurs-de-la-construction-vers-une-economie-circulaire/>

⁴⁶ Bertozzi, C. (2022). How is the construction sector perceiving and integrating the circular economy paradigm? Insights from the Brussels experience. *City, Culture and Society*. <https://doi.org/10.1016/j.ccs.2022.100446>

⁴⁷ A quote from an interviewee in the report : “Discussions on Circular Economy are quite abstract: key-words like flexibility, adaptability, reuse are put on the table (...) principles seem clear enough but the concrete solutions for implementation in the specific project are not”; “no one truly masters the topic”.

⁴⁸ Eberhardt, L. C. M., Birkved, M., & Birgisdottir, H. (2022). Building design and construction strategies for a circular economy. *Architectural Engineering and Design Management*, 18(2), 93-113. <https://doi.org/10.1080/17452007.2020.1781588>

⁴⁹ The Construction Products Regulation (CPR) EU 305/2011 sets harmonised conditions for the marketing of construction products on the EU market. The reference documents for the CE marking of a product are the harmonised technical specifications, i.e., harmonised standards (hENs) and European Assessment Documents (EADs). When a product is covered by a harmonised standard the manufacturer shall draw up a Declaration of Performance (DoP) when the product is placed on the market (CPR, Art. 4). Through the DoP, the manufacturer assumes responsibility for the conformity of the



had been recovered from an existing building, the project manager would have to organise for an independent expert to test the windows and certify that they conform to a given member state's standards for fire safety, load bearing, and other performance standards. This may not only require additional time, compared to simply buying new windows, but it also poses a potential cost risk for the project manager. In the event that the windows, or other recovered material, do not conform to minimum standards, the cost of conducting the tests must still be borne, and additional cost to source conforming products must now also be incurred. Alternatively, if the products are certified potential delays in certification, on top of the costs of testing, may negate the economic rationale for using the recovered materials in the first place. This was the experience of some partners in the HOUSEFUL project.

Likewise, when it comes to the issue of 'architectural freedom' representatives from the profession⁵⁰ are not opposed to using reused materials. However, there are still important issues that could mean that they prefer to use new construction products when designing a building or planning a renovation.

For example, it was noted by one architect that: "using a small amount of non-circular material that lasts for a long time can be better than using a lot of material with less environmental impact but a shorter lifespan". In other words, reused materials may not be the most durable or even the most environmentally friendly, all things considered.

When it comes to the issue of "choice" of materials, it was noted that: "Designers do like to have a choice and they do like to have good information about materials. One key challenge is the lack of choice when it comes to circular and low-impact materials that actually perform the multiple tasks they need to, to last, and to please. Materials in buildings need to do more than meet specific thermal, structural, and fire criteria in order to stand the test of time".

Again, the point is not that architects or designers are opposed to using reused materials, but rather that the reused materials available may simply not be up to the standard required in modern buildings.

Finally, on the topic of insurance, circularity and reused building materials is a new topic for insurance providers. Recertifying reused materials before their use is an important step in assuaging any concerns that might arise. At the same time, amongst the circular projects reviewed in the preparation of this

product with the declared performance values, which are assessed according to the methods reported in the specific harmonised standard.

⁵⁰ Based on interviews conducted by Housing Europe for the purposes of this deliverable



deliverable⁵¹, reused materials tended to serve functions unrelated to ensuring critical structural integrity. In practice, their role was often aesthetic or related to thermal insulation, rather than making sure that the building would ‘stay standing’. Such non-structurally integral roles for reused materials can also offer certain assurances to insurers, as any ‘malfunctions’ are less likely to lead to serious negative cost implications for building owners, or potential health and safety risks for tenants.

The obvious downside of such limitations on reused materials is that they reduce the overall volume of such materials that can be used in any one building or renovation project. This highlights the importance of boosting efforts to make sure that new buildings are designed in such a way as to ensure that they are fully able to be disassembled, with minimum depreciation in the integrity and functionality of individual components over time⁵².

Table 22: Recommendations related to Section 4.1

<p>Use of public tenders</p>	<p>As significant investors in capital projects, the public sector, through its various forms, should become a driver of change in the broader construction sector. By including circularity goals in its tenders, it can challenge the private sector to adapt and acquire new skills and perspectives. This can then form the basis for broader knowledge acquisition by the various actors in the construction value chain, who could otherwise see their ability to tender for lucrative public contracts effectively blocked.</p> <p>⇒ NOTE: As outlined in Section 4.3, the highly innovative nature of some circular solutions could reduce the number of companies tendering for the completion or works – which could reduce competition and thus, reduce value for money</p>
<p>Development of training programmes</p>	<p>Member states should work with national representative bodies to co-design training modules and tools for key workers in the upscaling of the circular economy in the built environment; e.g., architects, engineers, construction workers.</p> <p>⇒ “Representative bodies” could include, for example, national accreditation bodies or unions representing the abovementioned key workers</p> <p>⇒ In order to maintain a ‘licence’ to work as an architect, practitioners are required to complete a certain number of ‘Continuing Professional Development’ (CPD)⁵³ hours each year. This is how those no longer in education keep up to date with new developments in the sector.</p>

⁵¹ Housing Europe conducted a review of frontrunner circular buildings in Europe

⁵² The EU is making efforts to improve the selection of construction products designed for disassembly and reuse. One way it is doing this is through EU-funded innovation projects. For example: <https://www.drive0.eu/>

⁵³ Guide on CPD from the Architects’ Council of Europe - <https://www.ace-cae.eu/access-to-the-profession/continuing-professional-development/>



<p>Have a clear training national strategy</p>	<p>Each member state should be obliged to develop a clear national strategy for ensuring that key workers in the construction and renovation sectors receive adequate training to support the transition to a circular economy. This should include both the training of new workers, through education and apprenticeships, as well as reskilling existing workers.</p> <p>⇒ A multi-stakeholder national strategy has already been developed in the Netherlands, and could help to inspire other member states⁵⁴</p>
<p>Progressive targets for reused materials</p>	<p>The EU needs to have a clear strategy for ensuring that reused or recovered materials are used in future building and renovation projects. The result of this will be to oblige key workers to develop the skills required.</p> <p>However, as skills are currently lacking, requirements should be progressively phased in, in order to ensure that the capacity of the construction sector to use circular methods increases at a progressive and realistic pace.</p>
<p>Certification of recovered materials</p>	<p>If certifying recovered building materials (e.g., acquiring a new DoP) effectively eliminates the cost advantage of using such materials, then this create a real barrier to the mainstreaming of the use of reused materials.</p> <p>This is an issue that needs to be considered by the EU, with the possibility of special grants or tax incentives to cover the cost of testing perhaps being one important solution.</p>
<p>Expanded catalogue of new materials for reuse</p>	<p>There needs to be improved impetus on making sure that new building materials being used are designed for full disassembly and reuse from day one. At present, the selection of such building materials is limited, and linear based materials and products, which are destined to become waste in the future, continue to dominate in building and renovation projects.</p>
<p>Better understanding of reused materials</p>	<p>There are concerns from some industry experts that reused materials may be of a lower standard and may actually be less environmentally sustainable over the long-run than simply using new high-quality materials. If so, this severely undermines arguments in favour of reusing meaningful quantities of materials.</p> <p>As such, a better understanding of the possible uses and limitations of common building components (e.g., bricks, pipes, tiles, steel beams, etc.) needs to be developed, and then communicated to architects and designers. This would help to provide assurances regarding performance, as well as provide new perspectives on potential ways in which individual components and materials can be reused in buildings.</p>
<p>Insurance</p>	<p>The EU institutions need to work with member states and national insurance providers to better understand the perceived risks</p>

⁵⁴ See : <https://hollandcircularhotspot.nl/wp-content/uploads/2019/09/Circular-Construction-Economy.pdf>



	<p>associated with insuring a building that includes a high volume of reused building materials.</p> <p>⇒ At present, many insurers in the EU struggle to evaluate if and how reused materials might impact on the likelihood that a building owner will make a claim.</p>
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4.2 Standards for construction materials and products

Table 23: Differences in national standards for construction products

Problem or issue
Some of the partners noted that additional work had to be done to verify if products that were mandated by the HOUSEFUL grant agreement were compatible with local building materials and products regulations. This was particularly the case for the Spanish Demos.
Solution of mitigation technique applied
This problem was eventually resolved, though after significant additional work and allocation of resources . This would not be usual for procurement during a typical renovation project where products would be chosen from proven local suppliers. These suppliers are the ones to absorb the burden of verifying the compatibility of products with national legislation.

Table 24: Incomplete labelling of construction products

Problem or issue
In order to move to a more circular built environment, greater knowledge and transparency of the environmental impact of each construction product is necessary. However, at present, the labelling and accompanying information provided with products does not provide this. Thus, consumers who are motivated to become more sustainable, including in HOUSEFUL, are required to do significant additional research, costing time and effort for them. The majority of consumers will not make these extra efforts.
Solution of mitigation technique applied
Need for clear environmental labels and more detailed information on life-cycles, reusability and recyclability of products in the construction sector.

Discussion: The EU does not yet have a fully harmonised and frictionless common market for building materials. As a result, the sale of a product which is being use in one member state might not be possible, or require additional documentation, in another. This, in effect, creates certain barriers and uncertainties for consumers, as was the case in the HOUSEFUL project.



Under the current Construction Products Regulation (CPR) (305/2011/EU)⁵⁵, Member States retain a competence to set technical requirements for the performance of construction products, in particular for specific uses of the products in a building or civil engineering work (e.g., fire safety requirements). Although, in the event that these national technical requirements imply limits to the use of CE-marked construction products, these limits need to be justified and proportionate.

A recent review by the European Commission regarding how national legislation makes use of information created by the CPR found that:

“Member States’ regulatory needs vary significantly depending on how their building codes, their legislation applicable to public works contracts for civil engineering works, or their legislation applicable at control level refer to the performance of construction products. In some Member States, legislation would refer to the performance of individual construction products (the information contained in the Declaration of Performance, the DoP) when setting legal requirements for buildings or infrastructures. In others, regulation would take place at the level of systems, setting requirements at the level of buildings or infrastructures and leaving to the engineer/ architect/ contractor the responsibility to consider the specific products’ performances when calculating the performance of the building or infrastructure in order to ensure compliance with national requirements”.⁵⁶

The EU is aware that the market for materials is not frictionless, and that differing national approaches and building regulations do impact on the sale of certain products or services in some member states, although factors like climate, proximity to suppliers, and language are also important factors that can reduce the reach of certain products or suppliers.

A report on internal trade in construction materials commissioned by DG GROW has stated that:

“the major obstacle to trade derives from national quality marks. Despite the effort to replace national rules with harmonised European ones, national product requirements among Member States are still existing and have limited so far the potential effectiveness of the CPR...Different interpretation of some requirements of the CPR, not fully uniform testing criteria used by certification bodies across different countries, and the lack of

⁵⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011R0305>

⁵⁶ <https://ec.europa.eu/docsroom/documents/31941>



effective market surveillance are seen as further obstacles to the circulation of harmonised construction products”.⁵⁷

The report also noted that:

“Some countries, like Germany, France, Belgium, Latvia and Estonia, tend to impose additional requirements on the characteristics of construction products entering the national market which raise the certification cost for foreign firms. They may be mandatory or voluntary, but in either cases they are perceived as real challenges for exporting firms”.⁵⁸

The report continues:

“[D]ifferences in the interpretation of the CPR also raise barriers to cross-border trade. Some countries may interpret some provisions more strictly than others. In this way they in fact make more difficult for foreign companies to export in their national market...[C]ertification bodies in different countries may interpret and apply the testing criteria more or less strictly. As a result, “certification bodies may not ensure the same level of certification of the same products across the EU. [Thus, m]ore time is needed before getting to a common, harmonised European certification system”⁵⁹.

It is important to state that, at the time of writing, the European Commission is reviewing the CPR⁶⁰. The proposed revision will mean that manufacturers of construction materials and products will have to deliver environmental information about the life-cycle of their products. Moreover, they will have to comply with several obligations, including:

- Design and manufacture a product and their packaging in such a way that their overall environmental sustainability reaches the state of the art level;
- Give preference to recyclable materials and materials gained from recycling;
- Respect the minimum recycled content obligations and other limit values regarding aspects of environmental sustainability;

⁵⁷

p.9,
<https://ec.europa.eu/docsroom/documents/27301/attachments/2/translations/en/renditions/native>

⁵⁸

p.53,
<https://ec.europa.eu/docsroom/documents/27301/attachments/2/translations/en/renditions/native>

⁵⁹ Ibid .

⁶⁰ See: <https://ec.europa.eu/docsroom/documents/49315>



- Make available, in product databases, instructions for use and repair of the products;
- Design products in such a way that re-use, remanufacturing and recycling are facilitated.

In terms of specific changes that have the potential to drive investment towards circularity, the revised CPR proposes that construction sector products should include the following information at the time of purchase⁶¹:

“2.1. Products shall be designed, manufactured, and packaged in such a way that the following inherent product environmental aspects are addressed in accordance with the state of the art:

- (a) maximising durability in terms of the expected average life span, the expected minimum life span under worst but still realistic conditions, and in terms of the minimum life span requirements;
- (b) minimising whole-life-cycle greenhouse gas emissions;
- (c) maximising recycled content wherever possible without safety loss or outweighing negative environmental impact;
- (d) selection of safe, environmentally benign substances;
- (e) energy use and energy efficiency;
- (f) resource efficiency;
- (g) identification which product or parts thereof and in what quantity can be reused after de-installation (reusability);
- (h) upgradability;
- (i) reparability during the expected life span;
- (j) possibility of maintenance and refurbishment during the expected life span;
- (k) recyclability and the capability to be remanufactured;
- (l) capability of different materials or substances to be separated and recovered during dismantling or recycling procedures”.

While this is very encouraging, and would certainly have been of use to the HOUSEFUL project, the recommendations in this document are based on the lived experiences of those working on the project. Therefore, the recommendations in Section 4.2 are made in isolation, and do not take into account what may be included in the revised CPR. Of course, some of the points raised in this section, as well as the resulting policy recommendations, do seem to validate aspects of what is being proposed by the European Commission.

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<https://ec.europa.eu/docsroom/documents/49315/attachments/3/translations/en/renditions/native>

p.7,



Even in the absence of timely CPR reform, the EU has already completed meaningful and important work in the area of creating a common understanding of the sustainability of the built environment. For example, its Level(s) framework⁶² provides a means to test all buildings in the EU and assess their performance in relation to issues like energy, material use and waste (including circularity factors), water, indoor air quality and resilience to climate change. Results are comparable between buildings and member states, and thus create a common understanding of the performance of our buildings. However, the framework has so far not become a standard part of business practices in the development, construction, and renovation of buildings.

Table 25: Recommendations related to Section 4.2

<p>Promote knowledge of faster routes to market for innovative circular products</p>	<p>Work with The European Organisation for Technical Assessment (EOTA)⁶³ and European and national federations involved in the development, marketing, and supply of construction products to promote the European Technical Assessment route (ETA route)⁶⁴ to CE marking for innovative and non-standard construction products.</p> <p>The ETA route provides an independent Europe-wide procedure for assessing the essential performance characteristics of non-standard and innovative construction products. The ETA offers manufacturers a voluntary route to CE marking, when the product is not or not fully covered by a harmonised standard (hEN) under the Construction Products Regulation (EU) 305/2011.</p> <p>CE marking based on the ETA allows manufacturers to freely market their product on the entire European internal market and introduce innovative products and new product features with short lead times. Thus, it can bring innovative circular products to the EU market more quickly.</p>
<p>Greater transparency in existing CE marking</p>	<p>In order to promote the use of circular products and solutions, the CE markings regime should be modified in order to offer greater transparency for consumers. Construction products should clearly set out additional information, such as the embedded carbon in the products, their expected life-cycle, their repairability, and other factors that can help to offer more information about the 'sustainability' of products.</p> <p>⇒ However, this information must be reviewed at frequent intervals, as it could lead to unintended consequences. For</p>

⁶² https://environment.ec.europa.eu/topics/circular-economy/levels_en

⁶³ EOTA is a Europe-wide association of Technical Assessment Bodies for construction products established under the Construction Products Regulation (CPR). It provides the framework for the European Technical Assessment (ETA) of construction products to ensure consistent product performance information throughout Europe. The EOTA network is the only platform which allows European manufacturers of innovative or non-standard construction products to bring their products to the European market with CE marking.

⁶⁴ See : <https://www.eota.eu/what-is-an-eta>



<p>Provide fresh impetus to industry on Level(s)</p>	<p>example, if information on embedded carbon is included in the future, it could push consumers to choose low-embedded-carbon products. However, these alternatives may be detrimental to climate sustainability in other ways, such as through the water or other natural resources required to produce them. Thus, the CE marking regime must be agile enough to prevent simply moving consumers from one product that is unsustainable to another product that is equally unsustainable, but in a different way.</p>
<p>Provide fresh impetus to industry on Level(s)</p>	<p>The Level(s) framework could help to drive better knowledge and transfer of good practices in term of the circularity and sustainability of buildings, by providing a common language and assessment method for the sustainability of buildings. Those who are interested in circularity in buildings could use Level(s) as a tool to highlight best practices from across the EU, which would speed up knowledge acquisition and the use of innovative circular construction products.</p>

4.3 Working with external partners

Table 26: Dealing with construction companies and contractors

Problem or issue
<ul style="list-style-type: none"> • Generally speaking, construction companies are not used to the implementation of Circular Economy practices, and still see them as an extra burden and work. • There was confusion and some arguments between demo leaders, solution providers, and construction companies about who would be responsible in the event of there being a problem with the installation of the circular solutions. • Complexity to coordinate the materials/products provided by the Consortium partners with the subcontracted construction company that carries out the renovation.
Solution of mitigation technique applied
<p>In order to overcome some of these challenges, demo leaders were required to increase the personal hours dedicated to supervising the execution of the project and the renovation works (e.g., <i>doing market research, studying the characteristics of different products in more detail</i>) or by assuming more risks themselves in the case of problems with the implementation of the project. This would be hard to replicate in future projects; especially in publicly funded projects where detailed <i>ex ante</i> planning leaves little scope for cost uncertainties and related uncertainties in delivery.</p>



Table 27: The tendering process

Problem or issue
<p>Applying a highly circular ethos to the renovation of buildings is quite new, and remains rare. The lack of knowledge in this regard on the part of construction companies, including a lack of experience with similar projects, definitely impacted on the tendering process for contracts to actually carry out works in the demo sites.</p> <p>⇒ For example, in the Demo 2 site, at least nine companies were initially interested in tendering for the project, but in the end, only one company tendered. The lack of previous circular projects to use as a reference point, and difficulty to define and accurately assess the likely cost of the renovation works, together with the risk of higher-than-expected materials costs, were significant factors in the lack of interested parties for the contract.</p>
Solution of mitigation technique applied
<p>In order to overcome some of these challenges, demo leaders were required to increase the personal hours dedicated to supervising the execution of the project and the renovation works (e.g., <i>doing market research, studying the characteristics of different products in more detail</i>) or by assuming more risks themselves in the case of problems with the implementation of the project. This would be hard to replicate in future projects; especially in publicly funded projects where detailed <i>ex ante</i> planning leaves little scope for cost uncertainties and related uncertainties in delivery.</p>

Discussion: As already set out in [Section 4.1](#), gaps in skills and knowledge exist along the construction value chain when it comes to working with certain circular products and solutions.

At the same time, for some companies, it may be difficult to upskill or modify their processes in order to transition to more circular activities. This is particularly the case for SMEs, which “have very few resources to cope with these changes. It would therefore be necessary to develop specific actions exclusively aimed at supporting [them]..., particularly with regard to worker training (e.g. coverage of training costs by the competent authorities, etc.)”⁶⁵.

On the other hand, there is a general unwillingness by some actors in the construction sector to embrace circular principles. For example, one recent review of stakeholders from a number of EU member states noted that the “building industry was considered to be very conservative” and that “...there

⁶⁵ ICEDD (2020). *Circular construction and renovation Actions and recommendations to the Federal government for accelerating the circular economy in construction*. Brussels: Institut de Conseil et d'Etudes en Développement Durable. https://www.frdo-cfdd.be/sites/default/files/content/download/files/ecocircons_rapportfinal_icedd_202011_06_eng.pdf

is a lack of flexibility to do things differently because it might be considered a higher financial risk”⁶⁶.

Linked to this is an unwillingness on the part of those who commission building and renovation projects. For private actors, in many instances buildings will be sold after works have been completed, and as such, factors like life-cycle costs and long-term sustainability are not considered to be important⁶⁷ as the additional cost, or the perception that there will be an additional cost, is unlikely to be compensated for in the sale or rental value.

In the specific case of HOUSEFUL, there was confusion and some arguments between demo leaders, solution providers, and construction companies about who would be responsible in the event of there being a problem with the installation of the circular solutions. This issue is seen in other circular projects, with a recent report from Belgium noting that: “The responsibility for marketing or quality assurance of recovered and reused or resold materials is also a subject to be specified. The absence of a manufacturer's guarantee pushes some installers or project managers to refuse to reuse products unless the architect takes responsibility, which creates great pressure on this actor”⁶⁸.

With regard to the issue of tendering, in the small sample of the three active renovations (Demo 1, Demo 2, and Demo 3) that took place as part of HOUSEFUL, it is clear that the degree of innovation and the perceived risks that this created discouraged some companies from tendering for contracts to complete the renovations works. Indeed, public housing providers in the project reported that increasing the environmental requirements in future tenders may be difficult, as the additional complexities of these projects, including the burden of public administration, may put off many potential construction companies from making bids.

⁶⁶ Kanters, J. (2020). Circular building design: an analysis of barriers and drivers for a circular building sector. *Buildings*, 10(4), 77. <https://doi.org/10.3390/buildings10040077>

⁶⁷ *Ibid.*

⁶⁸ ICEDD (2020). *Circular construction and renovation Actions and recommendations to the Federal government for accelerating the circular economy in construction*. Brussels: Institut de Conseil et d'Etudes en Développement Durable. https://www.frdo-cfdd.be/sites/default/files/content/download/files/ecocircons_rapportfinal_icedd_202011_06_eng.pdf



Table 28: Recommendations related to Section 4.3

<p>Training and strategies</p>	<p>As already outlined in Table 22:</p> <ol style="list-style-type: none"> 1. Member states should work with national representative bodies to co-design training modules and tools for key workers in the upscaling of the circular economy in the built environment; e.g., architects, engineers, construction workers. 2. Each member state should be obliged to develop a clear national strategy for ensuring that key workers in the construction and renovation sectors receive adequate training to support the transition to a circular economy. This should include both the training of new workers, through education and apprenticeships, as well as reskilling existing workers.
<p>Minimum requirements for construction companies</p>	<p>In order to better guarantee adequate competition and tenders for (public) contracts that place a strong emphasis on circularity, large construction companies should be obliged to meet certain 'averages' in relation to the environmental sustainability of their project portfolio⁶⁹.</p> <ul style="list-style-type: none"> ⇒ A "large" company could be defined in line with the definitions set out in the EU's Accounting Directive ⇒ The EU Environmental Taxonomy could be used as a benchmark for "environmentally sustainable" projects ⇒ Member states could be given autonomy to define workable quotas, with the objective to increase these over time.
<p>Supporting SMEs</p>	<p>While some companies may be able to invest in new processes, training programmes and other capital required to shift to align their activities with the circular economy, many companies will not. This may be particularly relevant for SMEs. Funding schemes (loans, grants, tax benefits, etc.) need to be offered to such firms to make sure that they can play their role in improving the circularity of the built environment.</p>

⁶⁹ The EU already adopts a similar approach when it comes to car manufacturers. Under [Regulation \(EU\) 2019/631](#) manufacturers are obliged to ensure that the average CO₂ emissions from their fleet is capped at a defined level. This means that if they produce large, more polluting cars, then they must also produce less polluting cars to offset this. Likewise, if a construction company worked on a highly resource intensive and polluting project, it would have to work on a low-impact, resource efficient project to compensate for this.



5 Residents and end-users

5.1 Tenants

Table 29: Impact on rents

Problem or issue
Some of the social and public housing tenants expressed concerns about some of the circular solutions, especially in the context of their potential to increase renovation costs, and thus, rents.
Solution of mitigation technique applied
<p>The co-creation workshops helped to develop a constructive dialogue with tenants. Thus:</p> <ul style="list-style-type: none"> • Clear communication was key • Subsidies to keep the cost of implementation affordable was also important in mitigating concerns of tenants • Agreement that some solutions would be implemented during a "trial" period, with the possibility of removing them if they did not function well for residents was also key to obtain their approval in Demo 1 and 2

Discussion: There are many ways in which providers of social and public housing determine the rent that their tenants must pay. This can broadly be broken down into four categories: income (i.e., rent based on the financial means of the tenant); market (i.e., rent charged in relation to a discount on the market rent); utility (i.e., rent based on the quality and characteristics of the home); and cost (i.e., rent based on the cost of provision).

In the latter two categories, increases in the quality of homes, including via renovations, will in turn push up the rent that tenants must pay. This means that some tenants may be reluctant to see improvements to their home, even if it means an increase in quality and comfort, as affordability might be more important for them.

However, some member states have developed effective ways of dealing with this issue. For example, in the Netherlands, social housing providers operate a principle that the increases in rents from renovation projects must be equally compensated by a decrease in utility bills for tenants (e.g., via greater energy efficiency). As such, the net impact on the social tenants is neutral.

In Austria, social housing providers are obliged to develop renovation funds for each of their buildings. In practice, tenants pay a small monthly contribution into the renovation fund. Over time, the fund accumulates the required capital to cover normal renovation projects (every 15-20 years). This means that the requirement for additional borrowing to finance such works is



reduced, and thus the impact on the rent paid by tenants is much lower than would otherwise be the case⁷⁰.

However, in instances in which such solutions are not available, ‘renovation’ and ‘rent increases’ are unfortunately seen by tenants as synonyms. In instances where the cost savings are not enough to compensate for the higher rents, this can put additional financial stress on low-income households.

Table 30: Recommendations related to Section 5.1 (part 1)

Public grants	In cases where there is a gap between the savings for social tenants and the required increase in their rent, public grants should be offered to bridge this gap; making sure that the impact on the disposable income of low-income households is neutral.
Long-term planning by social providers	Social housing providers should consider establishing renovation funds to spread out the cost of renovations over a long period of time. This avoids the need for sudden increases in rents related to renovations.

Table 31: Impact of the solutions

Problem or issue
<ul style="list-style-type: none"> • Some tenants were worried about maintenance of the products and solutions over the long-term • The extra space required to ‘house’ some of the solutions, which had to take from communal spaces was also an issue • Issues around potential health impacts from the water vector were a particular concern for some tenants. • Social tenants are largely focused on having an affordable and secure home. Thus, issues like circularity are far down their list of priorities for their homes.
Solution of mitigation technique applied
<ul style="list-style-type: none"> • Co-creation events and training workshops were essential to inform tenants • Working and co-creating with the end-users (tenants), by considering their point of view about the solutions, was important to improve their ‘buy-in’ and commitment to the circular project. This eventually led to the adaptation of some of the solutions to better align with the demands of the end-users. • Communication with the end-users during the whole process, especially the benefits after the renovation works (e.g., lower heating, water, and electricity bills) • Development of training and self-governance strategies to promote responsibility and sense of community.

Discussion: The degree, or not, to which someone might be willing to ‘buy into’ the circular economy has been shown to be dependent on a number of

⁷⁰ Housing Europe (2021). Cost-based social rental housing in Europe. Brussels: Housing Europe. Available at: <https://www.housingeurope.eu/resource-1651/cost-based-social-rental-housing-in-europe>



“micro-level factors”, such as their age, level of education, and income⁷¹. This shows that social conditioning plays a role in acceptance, or not, for circular products and solutions.

Therefore, for groups or individuals who may have a natural reticence when it comes to the circular economy, communication is essential in order to tackle misconceptions and better inform stakeholders.

The experience of HOUSEFUL was that this was essential in order to gain the trust and support of tenants; many of whom were initially sceptical of the renovations. This required significant time and effort, especially in the organisation of the co-creation workshops, as well as the coordination and delivery of the various ‘Co-creation Ideas’ under WP3. The work of better communicating the impacts of the circular solutions under WP7 was also important.

Of course, it will be necessary to use a ‘hands-on’ approach to working with end-users so long as the circular solutions remain niche, and relatively unknown by the general public. This includes training households on how to correctly and best use the solutions in their homes, in order to maximise their impact. However, it is reasonable to expect that as the solutions make their way into the mainstream, the need for co-creation workshops and other time-consuming practices related to implementing the solutions will decrease. Although, at present, it is fair to say that we remain a long way off from mainstreaming most of the circular solutions used in HOUSEFUL. This means that in the follower buildings that will proceed the HOUSEFUL project in the coming years, much work may still need to be done by project partners in order to build the trust and develop the understanding of end-users.

⁷¹ See : Hazen, B. T., Mollenkopf, D. A., & Wang, Y. (2017). Remanufacturing for the circular economy: An examination of consumer switching behavior. *Business Strategy and the Environment*, 26(4), 451-464. <https://doi.org/10.1002/bse.1929>



Table 32: Recommendations related to Section 5.1 (part 2)

Develop lighthouse buildings	In order to accelerate the process of building knowledge, and thus acceptance of the circular solutions, it will be necessary to have local lighthouse projects. These projects will serve to inspire greater confidence in the solutions.
Develop locally specific information programmes	In order to facilitate greater uptake of the circular solutions, simple and impactful information on their benefits needs to be available. This information should be locally specific, and include information such as cost savings for users, the environmental impact, and what impact (if any) the solutions might have on the day-to-day activities of households.
Maintenance fund	<p>One of the major concerns of residents in the HOUSEFUL Demos was on the future maintenance of the solutions, which it was perceived might be more costly and complex than more 'traditional' options.</p> <ul style="list-style-type: none"> i. For EU- or publicly-funded schemes, consideration should be given to the establishment of a 'legacy fund' for future upkeep of circular solutions, where required ii. For other schemes, building owners should consider establishing a maintenance fund, which will help to spread out the cost of future repairs; reducing the potential for a future cost shock
Self-governance programmes	In the case of solutions being implemented in residential buildings, 'self-governance' schemes should be developed in order to ensure that some of the residents have a more detailed knowledge of the functioning of the solutions, and, where appropriate, can manage simple maintenance issues themselves. This will help to inspire greater confidence on the part of the other residents, who may otherwise be worried about service outages in the event that repairs/maintenance by external contractors cannot be carried out in a timely manner.



5.2 Residents and owners

Table 33: Finding consensus in multi-owner buildings

Problem or issue
<p>Demo 3 is a community project with very high demands on democratic decision making. Thus, finding a consensus among the residents (and owners) group was a long and drawn-out process. For example, the position of the winter garden in which the sewage treatment plant is located had to be changed five times until a consensus was eventually reached. These sorts of issues around decision making would be common in buildings with multiple owners, as opposed to social or public housing buildings that typically only have one owner.</p>
Solution of mitigation technique applied
<p>Patient and detailed consultation with building stakeholders was necessary to reach consensus. The development of a number of alternative development plans, with clearly explained benefits and drawbacks for each, was necessary to provide confidence to residents and owners that the plan being adopted was the best approach.</p>

Table 34: Concerns over the use of specific solutions

Problem or issue
<p>Residents are often afraid of bad odours or quality issues related to on-site water treatment. Also, there is a lack of knowledge about water quality needs for service water and potential fear of health problems due to reuse of water.</p>
Solution of mitigation technique applied
<p>Co-creation activities allowed the feeling of ownership of end users and enabled exchange of related information between developers and users.</p>

One of the potential ‘benefits’ of working with social or public housing providers in projects like HOUSEFUL is that the buildings only have one owner, and thus decision making can be done more efficiently. Of course, this is not to say that social tenants do not have a voice, and indeed, we saw during HOUSEFUL how plans in Demo 1 and 2 had to be modified to take on board the views of tenants. In addition, social providers are already accustomed to working with their tenants on collective actions, and are thus able to guide them through processes like renovation projects more easily, though with the knowledge that the ultimate decision making capacity still remains with them as the building owner.

In contrast, in many cases privately owned buildings or housing estates bring many voices, all with equal standing. In addition, unless required to by law⁷²,

⁷² For example, in Estonia, residents in privately owned multi-family buildings are legally required to form condominium associations (cooperative structure) in order to manage common spaces and adopt structures for collective action. This has facilitated the mass renovation of such buildings during the past 10-15 years. The condominium associations



private residents may not have any formal structures for collective decision making. As was the case in HOUSEFUL, this can make finding a common position more challenging than for a single-owner residential building or estate.

At the member state level, many organisations representing private owners are trying to find ways to improve and streamline collective decision making. For example, in Belgium the representative body for condominium owners, the SNCP⁷³, developed the ACE-Retrofitting tool, as part of an InterReg North-West Project. ACE is about “accelerating condominium energy retrofitting”⁷⁴. The tool is designed to create clear frameworks to develop renovation strategies, search for available finance, and create governance frameworks for decision making in multi-owner buildings. This includes establishing voting systems that allow for streamlined decision making. A common issue in condominiums is that even finding a framework around which agreement can be developed is a challenge, thus tools like ACE can play an important role in mediating between residents and moving towards agreement on renovation activities.

are represented at a national level by The Estonian Union of Co-operative Housing Associations (EKÜL), which provides training and other services to help improve decision making. See : <https://ekyl.ee/en/>

⁷³ See: <https://www.snpc-nems.be/>

⁷⁴ <https://www.nweurope.eu/projects/project-search/accelerating-condominium-energy-retrofitting-ace-retrofitting/#tab-6>



Table 35: Recommendations related to Section 5.1 (part 3)

Collective decision making structures	<p>Member states could consider enacting legislation that would require private homeowners to create associations to manage their shared interests, such as renovations and maintenance of shared spaces. This would have the benefit of formalising decision making structures. It could also provide a vehicle for the mutualisation of borrowing for the purposes of financing renovations and other works required to promote less carbon intensive dwellings in the private sector.</p> <p>⇒ This model has proven to be very successful in Estonia, where the number of people living in sub-standard housing has fallen sharply since the mid-2000s⁷⁵.</p>
Use of digital frameworks	<p>Ready-made project development and decision making frameworks for renovation projects in multi-owners buildings or estates can help to provide structure and transparency to deliberations amongst residents, and help to streamline the decision-making process.</p>

⁷⁵ In Estonia, residents in privately owned multi-family buildings (the majority of the residential building stock) are legally required to form condominium associations (cooperative structure) in order to manage common spaces and adopt structures for collective action. This has facilitated the mass renovation of such buildings during the past 10-15 years. The condominium associations are represented at a national level by The Estonian Union of Co-operative Housing Associations (EKÜL), which provides training and other services to help improve decision making. See : <https://ekyl.ee/en/>



6 Dealing with supporters of innovation projects

6.1 Feedback from supporters

Table 36: Providing timely feedback

Problem or issue
Feedback from the European Commission on the development of various aspects of the project and the deliverables sometimes came a number of months after their development. This meant that potential issues were not always flagged in a timely manner, meaning that there were cases where work was involved to go back in the project and attempt to resolve the issues. Such retrospective revisions are not typical in standard renovation projects.
Solution of mitigation technique applied
No particular solutions were found in the project. The project leader kept a continuous dialogue with the Commission, in line with standard procedure.

Discussion: As already discussed in this report, **further HOUSEFUL-type lighthouse buildings are going to be required** in order to mainstream the circular solutions that have (and will be) developed. **The EU is likely to play an important role in this, through funding initiatives such as Horizon Europe.** While, as is set out in the next two paragraphs, the overall relationship between innovation projects and the EU is strong, there are always ways in which they could be improved in such a way as to improve the efficacy of project implementation, including in any future HOUSEFUL-type projects.

A mid-term review of Horizon 2020 carried out with thousands of stakeholders in 2017 concluded that 88% of respondents who were involved in a Horizon project were “satisfied” or “very satisfied” with the programme⁷⁶. Meantime, for “73% of the respondents, the support provided by the EC services (including agencies) during grant preparation and implementation was either “very good” or “good”...However some of the respondents...underlined the delays they experienced in receiving answers to their request from the project officers, while a few others asked for more personalised support from the agencies”.

Overall, **this suggests that the general relationship between project partners, project officers, and the broader European Commission infrastructure is good**; though some room for improvement remains.

⁷⁶ DG RTD (2018). Results of Horizon 2020 stakeholder consultation: Interim evaluation of Horizon 2020. Brussels: Directorate General for Research & Innovation. <https://op.europa.eu/en/publication-detail/-/publication/cd9586b5-db2d-11e8-afb3-01aa75ed71a1/language-en>



Table 37: Recommendations related to Section 6.1

A hierarchy of requests	The EU should consider developing a hierarchy of requests for project officers; similar to a green, amber, and red traffic-light system. This would allow urgent or time-sensitive requests to be dealt with more quickly.
Transparency in processing requests	<p>Greater transparency in processing requests would help participants to better adapt to in the event of questions arising.</p> <ul style="list-style-type: none"> i. Using digital tools to provide estimated or indicative 'waiting times' for the processing of requests: to give participants a sense of how long they may have to wait for a reply ii. A ticketing (queueing) system: would allow participants to monitor how close they are to having the request dealt with

6.2 Dealing with increasing costs

Table 38: Legitimate increases in costs

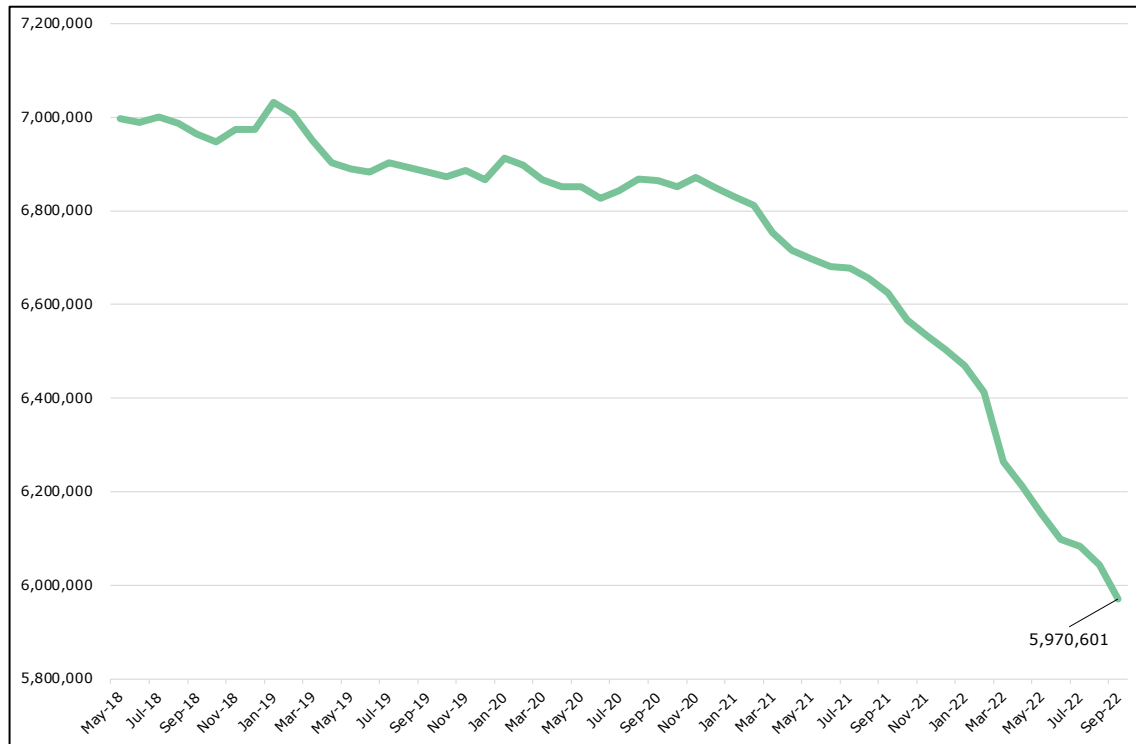
Problem or issue
<p>In research and innovation projects like HOUSEFUL, partners have to work within certain "intervals of uncertainty" about the final real cost of the project (personal cost due to extension of project or material costs due to increase of its prices...). However, it is difficult to receive any increase of budget when these extra costs appear.</p> <p>The financing for HOUSEFUL, especially the purchase of materials, was approved a long time in advance of the actual purchase in many cases. With strong rises in the cost of many materials and related services during the lifetime of the project, it shifted an increased cost to the owners of the Demo sites.</p>
Solution of mitigation technique applied
Demo leaders were required to assume the risks and assume any extra costs.

Discussion: Current rates of inflation in Europe are at multi-decade highs in many member states; with the EU-27 average rate of 10% in September 2022⁷⁷. This means that, in real terms, the funding allocation received for the completion of the works at the four demo sites has declined since the project began in May 2018.

⁷⁷ Eurostat 'HICP - monthly data (annual rate of change)[prc_hicp_manr]'



**Figure 3: Change in real value of HOUSEFUL funding
(in May 2018 prices)**



Source: Housing Europe, Eurostat, CORDIS

As demonstrated in Figure 3, the original €6,997,229 funding allocation from the EU to the HOUSEFUL project⁷⁸ has declined in real terms, especially since HICP inflation began to pick up in early 2021⁷⁹.

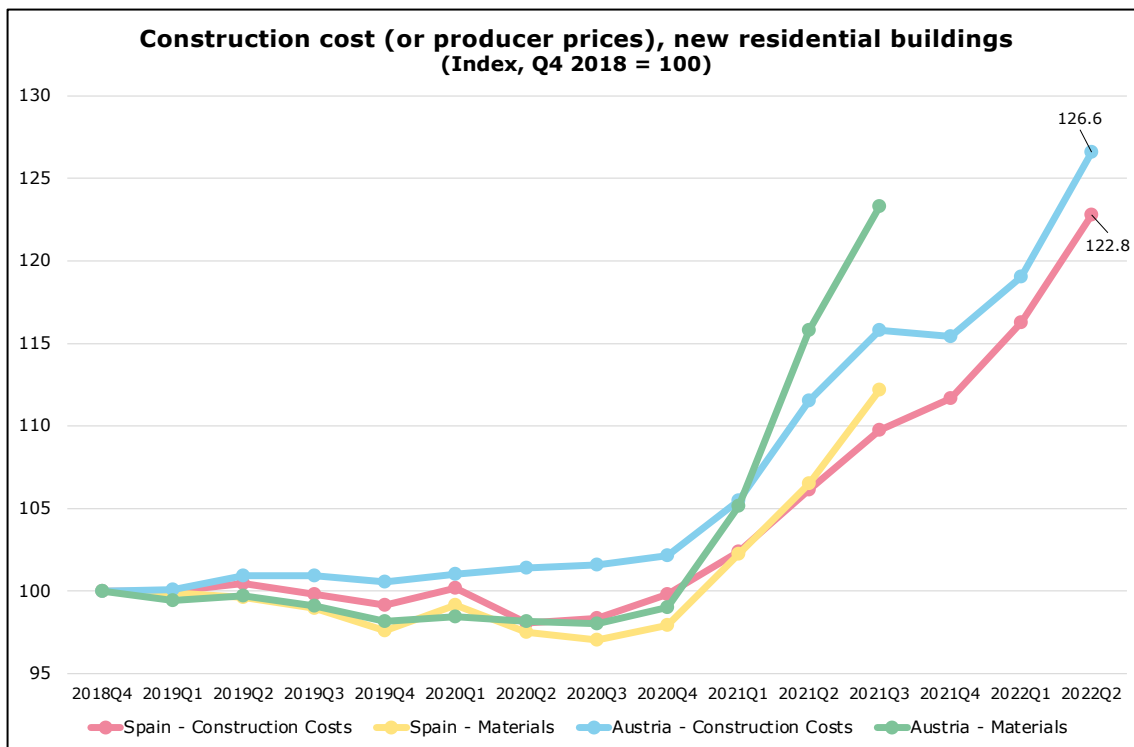
While much of the costs for development of the solutions were frontloaded in the project, the result remains that for some project partners, a funding gap has opened between what has been allocated, and what the actual cost of delivering some elements of the project will be. This is especially true for the Demo site leaders.

⁷⁸ As per : <https://cordis.europa.eu/project/id/776708>

⁷⁹ The chart shows the original €6,997,229 allocation over time, but always in May 2018 prices. This is based on the HICP measure of general EU-27 consumer price inflation, as produced by Eurostat.



Figure 4: Changes in construction costs - Austria & Spain



Source: Housing Europe, Eurostat

However, as indicated in Figure 4, the increase in prices in the construction sector has been more pronounced than in the general consumer economy. This means that, as far as a capital-cost-heavy project like HOUSEFUL is concerned, the potential decline in funding in real-terms is more pronounced than simple HICP inflation might suggest. Any difference between allocated funding and final costs must be absorbed by the project members.

While some increase (or even decrease) in prices can be expected over the lifetime of a project like HOUSEFUL, increases of the order of magnitude currently seen are clearly abnormal, and had the project been less advanced in terms of its capital expenditure, could have jeopardised its sustainability. Therefore, it may be advisable that legitimate increases in costs of projects, which are unrelated to underestimates in the initial application for funding or other factors controlled by the project partners, should be compensated, at least in part, once they exceed a pre-defined threshold.

Table 39: Recommendations related to Section 6.2

Funding failsafe mechanism	While some marginal decreases (or increases) in EU funding in real terms are to be expected over the lifetime of a project, beyond a certain point, it should be possible for additional funding to be granted to avoid excessive transfer of liability for price increases to project partners. The EU could, of course, attach certain criteria to the release of such funding.
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7 Finance and funding

As part of *D4.8 Report on financial schemes and funding opportunities for all Front-runner buildings and replication activities (final update)* a set of detailed policy recommendations in the area of improving access to finance and funding were developed. As they are relevant for the present deliverable, the main recommendations arising from D4.8 are summarised below⁸⁰.

Table 40: Summary of policy recommendations developed in D4.8

Policy Recommendation	Specific Recommendation
7.1	<p>Each member state should, working to a common structure, establish 1) a centralised interactive online funding database, and 2) a national funding agency.</p> <p>→ The funding database should take information provided by project managers (e.g. scale, type of building, works to be completed) to auto-generate a list of potential funding options. This is preferable to simply providing a catalogue of all options.</p> <p>→ The funding agency should act as a one-stop-shop for project managers, providing not only advice on suitable funding options, but also explaining application processes and making links with those who actually provide funding.</p>
7.2	<p>Governments should work to create online tools that will take available information (cost of 'linear' approach versus cost of 'innovative'/'circular' approach, expected climate impacts, available funds, beneficiaries) and use them to simply and quickly generate standardised and acceptable counter-factual analysis. This will help to justify the use of state-aid to finance such projects</p>
7.3	<p>In order to better meet obligations under the Paris Agreement, states must be more proactive in raising awareness of available financing – for example, through advertising, placing obligations on banks to provide certain information</p>
7.4	<p>Projects over a certain size (perhaps defined in number of housing units or m²) ought to be obliged to estimate the life-cycle costs associated with the different components used. However, this would likely require an EU Directive in order to implement. This will better highlight the true costs of buildings and favour the use of more sustainable circular solutions; even if the 'up-front' cost of investment may be higher.</p>
7.5	<p>In order to minimise uncertainty the availability of pre-financing (before the implementation or in different stages of the implementation) should be considered. This is particularly the case for projects with an observable funding gap between use of linear and circular solutions.</p>

⁸⁰ These policy recommendations are outlined in greater detail, and with accompanying context and justifications in D4.8 '*Report on financial schemes and funding opportunities for all Front-runner buildings and replication activities (final update)*'



7.7	Life-cycle maintenance costs should also be considered when the EU grants funding for the use of innovative solutions. Funds could be set aside to help meet these costs over time. EU innovation funding (including Horizon Europe) could also be allocated to projects seeking to develop new technologies that are easier to maintain.
7.8	The Corporate Sustainability Reporting Directive (CSRD), currently under review by the EU, could be an opportunity to oblige providers of finance to report on how they will directly support the transition to a circular economy , including through offering specific financial products aimed at achieving this goal.
7.9	The use of financial intermediaries can help to unlock financing from lenders who only provide financing at scale, such as the EIB. Where such intermediaries do not exist, or are under-resourced, efforts should be made to increase their role.
7.10	The state can act as a form of intermediary between the banks and the recipient of funds. If the State achieves this via the use of guarantees, then it will not have to provide any actual funds in most cases. This will help to make more projects viable, and provide improved borrowing terms for smaller housing providers.
7.11	Tradable futures contracts for materials in buildings would provide an additional source of funding for construction and renovation, while also incentivising building techniques that favour the recovery and reuse of scarce resources
7.12	To guarantee the value preservation of materials in the end of a buildings life cycle, a new institution or agency should be established covering standards and liability regarding reused materials. This could happen in tandem with new requirements for construction materials, as proposed by the revision of the Construction Products Regulation (CPR)
7.13	With recent EU rule changes allowing for lower VAT rates for a host of goods and services related to building renovation and the generation of renewable energy, member states need to have a clear strategy for maximising the pass-through of any VAT cuts to final consumers.

8 Reinforced policy changes for upscaling of circular solutions

The consultation with members of the HOUSEFUL consortium in relation to their experiences in the project, as well as potential solutions to issues they encountered, was grounded firmly in what was seen to be 'realistic' or 'achievable' in the current European policy climate.

However, partners were also given the opportunity to imagine a world in which there was significantly greater political and societal will (as well as capacity) to quickly upscale the use of circular solutions in the built environment. As such, below are a number of short "reinforced" policy recommendations based on this hypothetical scenario.

These reinforced proposals can be broadly categorised under three headings: financing and tax incentives; regulations; and replication.

Financing and tax incentives

1. Member States should **reserve a significant share of public financing and subsidies** available for renovation and construction projects, including funds coming from EU sources, for the implementation of circular solutions. This would force key stakeholders right along the construction and renovation value-chains to engage with such solutions in a proactive and serious manner; something which is noted as not being the case today, with circularity still seen as a niche by many actors.
2. **Tax reductions or credits should be offered to citizens who implement on-site organic waste management solutions.** In this way, municipalities will reduce local waste management costs, as well as their requirement for landfill and waste processing facilities, which lead to environmental issues and often take up much needed land. Besides that, once organic waste is separated, the rest of the waste is considered to be "dry", enabling its recycling.

Regulations

1. A system needs to be established to **'fast-track' the approval of innovative products and solutions aimed at reducing the environmental impact and the overall sustainability of the built environment.** At present, the struggle to use innovative products is such that it can act as a significant deterrent to many potential users.
3. **The cost of disposing of construction waste needs to increase substantially.** This will help to support a business case even for the reuse of construction materials in older buildings, including cement,



bricks and other materials that are currently much more expensive to reuse than virgin construction materials. Of course, increased costs also need to be accompanied by increased monitoring of the construction sector, in order to make sure that it does not lead to a rise in illegal and improper disposal of construction waste. For this, a digital certification system that allows public authorities to track if waste has been properly disposed of could be established, perhaps linked to the widespread rollout of the use of material passports.

2. **All new construction projects should have to explain how they will deal with waste from the building, especially during the end-of-life phase.** Objectives for reuse or recycling of components should be extremely high (i.e., as close to 100% as possible) in order for new developments to receive a building permit.
3. There needs to be **very strong regulations at the EU level to mandate expanded and more detailed labelling of construction products.** This would include detailed information on embedded carbon, repairability, recyclability, and reusability, the percentage of bio-sourced materials in a product, and expected life-cycle costs, amongst other information. This would have the effect of increasing transparency for purchasers, enabling them to choose not only more sustainable products, but also products which may have higher initial costs, but lower life-cycle costs. This would incentivise a 'race to the top' when it came to maximising the durability and adaptability of products.
4. For **all new buildings in the EU should be legally obliged to incorporate on-site water treatment and reuse systems,** once they reach a certain size or expected water usage. This could be done at the building level, or on a larger local scale (i.e., district water treatment).
5. It should be easier for **special exemptions from normal public procurement procedures** to be applied in cases where the products meet certain environmental and sustainability criteria. This would help to speed up the adoption of innovative circular solutions by public agencies, including the providers of public housing.

Replication

1. Having now established a proof of concept, **EU authorities should work with member states to develop HOUSEFUL follower buildings across the EU.** These buildings would be supported by generous financing from public authorities, and in turn act as local lighthouse projects for ambitious circular building renovation and development.



2. There needs to be a real demand from households for circular products and solutions. In order to achieve this, they need to be informed of the benefits, which is very far from being the current case. As such, **governments need to drive awareness campaigns to inform the 'clients' of architects, manufacturers, and construction workers, and create a demand.**
3. Once households are informed of the possibilities, **national or regional agencies (such as a network of local one-stop-shops) need to be established to help households and building owners to design and implement their own circular renovation or development.** These agencies could also provide important economies of scale for consumers by pooling orders for products. They should also be capable of assisting with permitting and other legal issues. They would also serve to feed information and trends from the local level to national and EU policymakers, creating a more reactive and dynamic environment for the upscaling of the use of circular solutions.
4. **Water and waste management directives need to be reimaged, with the idea of maximising circularity being the starting point,** with the resulting legislation being a product of that core ambition. Current regulations are often not fit for purpose when it comes to creating local closed loops, and waste and water management systems.
5. **Policymakers need to fully internalise the external benefits associated with developing a more circular and sustainable built environment.** For example, using nature based solutions in the treatment of water can help to promote biodiversity, as well as supporting local agriculture through the production of fertilisers.



9 Conclusions

This report contains around 70 recommendations on how circular solutions in the built environment, like those used in the HOUSEFUL project, can be upscaled and promoted in future projects.

These recommendations are based on the experiences of the HOUSEFUL partners during the project, in terms of the barriers and other obstacles that they faced, and the methods that they employed to mitigate or overcome them. Although, in some cases no mitigation was possible, meaning either plans had to be changed after the project had already begun, or else significant additional time and effort was required by partners to try to find alternative options for implementation.

As discussed in the introduction to this report, the HOUSEFUL project benefited from resources, in terms of grant funding and expertise, that a typical renovation project could simply not even dream of. As discussed, the existence of barriers and obstacles creates extra demands in terms of cost and time that most building owners will simply not be able to bear; at least if the *status quo* persists and the barriers and obstacles are not addressed in some way.

In addition, the number of unknowns for those involved in the whole building and renovation value-chain, from owners to architects, engineers, construction workers, suppliers, and end-users is significant. Again, the uncertainties associated with circular projects, especially in terms of likely final costs or practical issues like insurance, may significantly deter the use of HOUSEFUL-type practices in building projects. At the same time, it is important to reiterate that existing barriers are not simply regulatory or systemic in nature. Rather, more intangible factors like 'awareness' and 'perception' need to be given equal priority in terms of developing credible roadmaps to move the built environment towards a more circular future.

As highlighted in this report, potential policy options do exist. If implemented, the recommendations in this report, at least based on the experience of HOUSEFUL partners, could fundamentally help to improve the sustainability and circularity of the building stock in the EU.

However, it is important to be pragmatic in our assessment. For the most part, the policy recommendations included in this report would require both time and public resources to implement. Thus, they do not represent a "quick fix" to the current obstacles that have been identified. Instead, they offer a progressive pathway towards gradual improvement and mainstreaming of circularity in the built environment.



While this report makes many recommendations, one that particularly stands out is the 'Target for lighthouse circular buildings' (Table 14); which recommends that:

"There are 242 regions at NUTS 2 and 1166 regions at NUTS 3 level in the EU . It should be the short-to-medium-term goal of the EU to have at least one circular lighthouse building in each NUTS 2 region, and the medium-to-long-term goal to have one lighthouse in every NUTS 3 region. These lighthouses will serve to define better regulations, and inspire follower buildings".

This is because a great many number of the obstacles that have been identified relate in some way to a lack of knowledge, trust, awareness, or skills in relation to the use of HOUSEFUL-type circular solutions, with all projects partners in agreement that the lack of front runner lighthouse buildings was an impediment.

As the leader of T7.4.1 'Replication between Frontrunner and Follower buildings', Housing Europe has seen first-hand how interest in replicating the HOUSEFUL solutions in future projects is extremely high in or near the vicinity of the four demo sites in the project in Spain and Austria. The experiences of those frontrunner circular buildings have been instrumental in demystifying the processes involved, establishing a clearer business case, and providing a valuable network of local contacts that can help to drive forward replication.

Therefore, if the EU is serious in meeting its ambitious agenda for the renovation wave and boosting circularity, then building trust in the processes and technologies will require meeting potential early adopters at their level, adapting to their local circumstances, needs, and putting an emphasis on locally available resources⁸¹.

Overall, this report suggests that while increasing circularity in the built environment is gaining more traction at an EU level, as well as in some member states, existing barriers and obstacles mean that the challenge of progressing towards a situation in which circular solutions, such as those used in HOUSEFUL, become part of the 'mainstream' from a building renovation or design point of view remain significant.

Therefore, policymakers and other stakeholders must act to accelerate the process already underway. The policy recommendations in this report, if implemented, may go some way to doing that.

⁸¹ This was the main outcome from a workshop with different regional housing experts that Housing Europe conducted in June 2022. The report from this workshop can be viewed online at: <https://www.housingeurope.eu/resource-1717/how-can-we-use-circular-principles-to-drive-innovation-and-sustainability-in-the-housing-sector>

