

# Financing decarbonisation via innovative economic instruments based on Circularity and Sufficiency

Financial instruments, economic incentives and drivers for a sustainable built environment

May 2022



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## Financial instruments, economic incentives and drivers for a sustainable built environment

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# ACRONYMS

<b>BTR</b>	Built to rent
<b>EED</b>	Energy Efficiency Directive
<b>EPBD</b>	European Performance of Buildings Directive
<b>EPC</b>	Energy Performance Contracts
<b>EPD</b>	Environmental product declarations
<b>ESA</b>	Energy Service Agreement
<b>ESCO</b>	Energy Service Company
<b>ESG</b>	Environmental, Social, and Governance
<b>EU</b>	European Union
<b>LCA</b>	Life-cycle assessment
<b>LSB</b>	Living Space Bonus
<b>OSS</b>	One Stop Shop
<b>PACE</b>	Property Assessed Clean Energy
<b>RED</b>	Renewable Energy Directive
<b>SDG</b>	Sustainable Development Goals
<b>WLC</b>	Whole-life carbon

# GLOSSARY

**Carbon emissions, CO<sub>2</sub>e, CO<sub>2</sub>eq, greenhouse gas emissions (GHGs).** Shorthand terms for the emissions of any of the number of greenhouse gases (GHGs) that affect climate change. Carbon emissions are usually expressed as CO<sub>2</sub> equivalent (CO<sub>2</sub>e or CO<sub>2</sub>eq), which is a unit of measurement based on the relative impact of a given gas on global warming over a given time horizon i.e., the global warming potential (GWP).

**Embodied carbon.** Carbon emissions associated with materials and construction processes throughout the whole life cycle of a building or infrastructure. Embodied carbon includes material extraction and upstream production, transport to manufacturer/factory, manufacturing, transport to site, construction and installation processes, use phase, maintenance, repair, replacement of building components, renovation, deconstruction, transport to end-of-life facilities, processing for reuse, recovery, or recycling and disposal of waste. Benefits and loads from product reuse, material recycling and exported energy/energy recovery beyond the system boundary should be reported separately according to EN 15978 and associated standards.

**End of life carbon.** The carbon emissions associated with deconstruction/demolition, transport from site, waste processing and disposal phases of a building or infrastructure's lifecycle which occur after its use.

**Environmental, social and governance (ESG) criteria.** Refers to the three central factors in measuring the sustainability and ethical impact of an investment in a company or business. These criteria help to better determine the future financial performance of companies.

**European Taxonomy.** The EU Taxonomy is a classification system which establishes a list of environmentally sustainable economic activities. The EU Taxonomy is important to sustainable investments and the application of the European Green Deal. In particular, by providing companies, investors and policymakers with appropriate definitions for the economic activities that can be considered environmentally sustainable.

**Greenhouse gas emissions (GHGs).** A collection of gases that, when present in the atmosphere, trap infrared radiation in the form of heat, causing a warming process called the greenhouse effect.

**Life Cycle Assessment.** Life cycle assessment (LCA) is a cradle-to-grave or cradle-to-cradle analysis technique to assess environmental impacts associated with all the stages of a product's life, which is from raw material extraction through materials processing, manufacture, distribution, and use.

**(Net) zero embodied carbon.** A net zero embodied carbon asset refers to a new or renovated building that is highly resource efficient with upfront carbon minimised to the greatest extent possible and all remaining embodied carbon reduced or, as a last resort, offset to achieve net zero across the life cycle.

**(Net) zero whole life carbon.** A net zero whole life carbon asset (new or renovated) is highly energy efficient, with upfront carbon reduced to the greatest extent possible and all remaining carbon reduced or, as a last resort, offset to achieve net zero across the whole life cycle.

**Operational carbon.** Emissions associated with energy used to operate the building or infrastructure (module B6).

**Upfront carbon.** Emissions from materials' production and construction phases (module A) of the life cycle before the building or infrastructure begins operation.

**Use stage embodied carbon.** Emissions associated with materials and processes needed to maintain the building or infrastructure during use, such as for refurbishments.

**Whole life carbon.** Emissions throughout the life cycle of a built asset (modules A–C) as defined in European standards (particularly EN 15978 and EN15804). This life cycle encompasses both embodied and operational carbon. The standards also describe a module D, which outlines benefits and impacts from product reuse, material recycling and exported energy/energy recovery that is not accounted for in modules A–C. Module D should always be reported separately to ensure consistent accounting; separate reporting avoids double accounting of loads and benefits (if, for example, a product is reused and assessed twice in connection with the first and second use). There may be scope to count benefits beyond the system boundary towards a net zero carbon balance.



# EXECUTIVE SUMMARY

**Buildings use half of the raw materials and energy and one-third of the water in the EU. Rooted in cradle-to-grave thinking, they also generate a third of Europe's waste. In short, today's buildings are not fit for the future. Altering the status quo demands innovative policy-making across administrative levels and building lifecycle stages based on the principles of circularity and sufficiency.**

Reaching the EU targets of a 60% reduction in CO<sub>2</sub> emissions and a doubling of renovation rates by 2030<sup>1</sup> will require more than a carrot-and-stick approach. Transformative financial mechanisms will play a crucial role on the road to net zero, as acknowledged in the revised Energy Performance in Buildings Directive<sup>2</sup>:

*"Member States shall provide appropriate financing, support measures and other instruments **able to address market barriers and stimulate the necessary investments in energy renovations in line with their national building renovation plan** and with a view to the transformation of their building stock into **zero-emission buildings by 2050**".*

## TOWARDS A JUST AND SUSTAINABLE BUILT ENVIRONMENT

The EU will need to ensure that net zero transition facilitates environmentally and socially just livelihoods, considering the affordability, health and safety issues inherited from decades of urbanisation. A well-orchestrated policy mix will be essential for making these changes a reality.

The following report presents 22 instruments for much-needed change: financial schemes, economic incentives, setup examples and other tools for coordinated and multi-scale decarbonisation of the built environment in line with broader social and environmental aims.

Net-zero emissions buildings need to be managed across their lifecycle. Thus the proposed package aligns with the European standard EN 15978:2011<sup>3</sup>, circular economy thinking, one-step deep renovations approach and the SER<sup>4</sup> frameworks by combining **sufficiency** and **circularity** policy instruments catalysed via supporting **facilitator** instruments.

## SUFFICIENCY: LIVING WELL WITHIN LIMITS

Sufficiency policies help eliminate unnecessary energy, materials, land and water demand while enhancing wellbeing within the planetary boundaries<sup>5</sup>. They span beyond behavioural change and may, for example, include occupying empty buildings, promoting shared spaces or just space allocation. Sufficiency policy instruments prioritised within this report are presented below.

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**1** European Commission. Renovation Wave. Link: [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en)

**2** European Commission. Energy performance of buildings directive. Link: [https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive\\_en](https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en)

**3** EN 15978:2011 Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method. Link: [shorturl.at/ioLV8](http://shorturl.at/ioLV8)

**4** SER Framework is based on three intertwined pillars of Sufficiency, Efficiency and Renewables.

**5** Saheb, Y. (2021). Sufficiency and Circularity. The two overlooked decarbonisation strategies in the 'Fit for 55' Package. Brussels, Belgium: European Environmental Bureau (EEB)

## **OPERATIONAL SUFFICIENCY INSTRUMENTS\* (GEOGRAPHICAL SCOPE)**

GRANT OF USE for COOPERATIVES (LOCAL)

LIVING SPACE BONUSES through ONE-STOP SHOPS (OSSs) (LOCAL)

MULTIFAMILY HOUSING TAX EXEMPTION (LOCAL)

ENERGY SUFFICIENCY via PROPERTY TAXATION (LOCAL)

ESG based BUILD TO RENT MORTGAGES (NATIONAL)

(NET) ZERO EMISSIONS BUILDING CATALYST POLICY (LOCAL)

### **CIRCULARITY: ENABLING SMARTER RESOURCE FLOWS**

For the materials consumed, circularity policies help minimise the demand for raw materials and reduce solid waste throughout the life cycle of buildings. The financial schemes and economic incentives that can boost circular built environments are as follows:

## **OPERATIONAL CIRCULARITY INSTRUMENTS\* (GEOGRAPHICAL SCOPE)**

CIRCULAR BUILDING VALUATION (CROSS-CUTTING)

ADAPTABLE BUILDINGS (CROSS-CUTTING)

FLEXIBLE SPACES (CROSS-CUTTING)

ENVIRONMENTAL HIGH QUALITY STANDARD ACCREDITATION (EUROPEAN)

GREEN NEIGHBOURHOODS as a SERVICE (GNaaS) (LOCAL)

SERVITISATION: BUILDING PARTS AS A SERVICE (BPaaS) (CROSS-CUTTING)

While Operational Instruments are usually ready to use by themselves in the current market scenario, they would be more impactful and feasible once the Facilitator Instruments have been implemented.

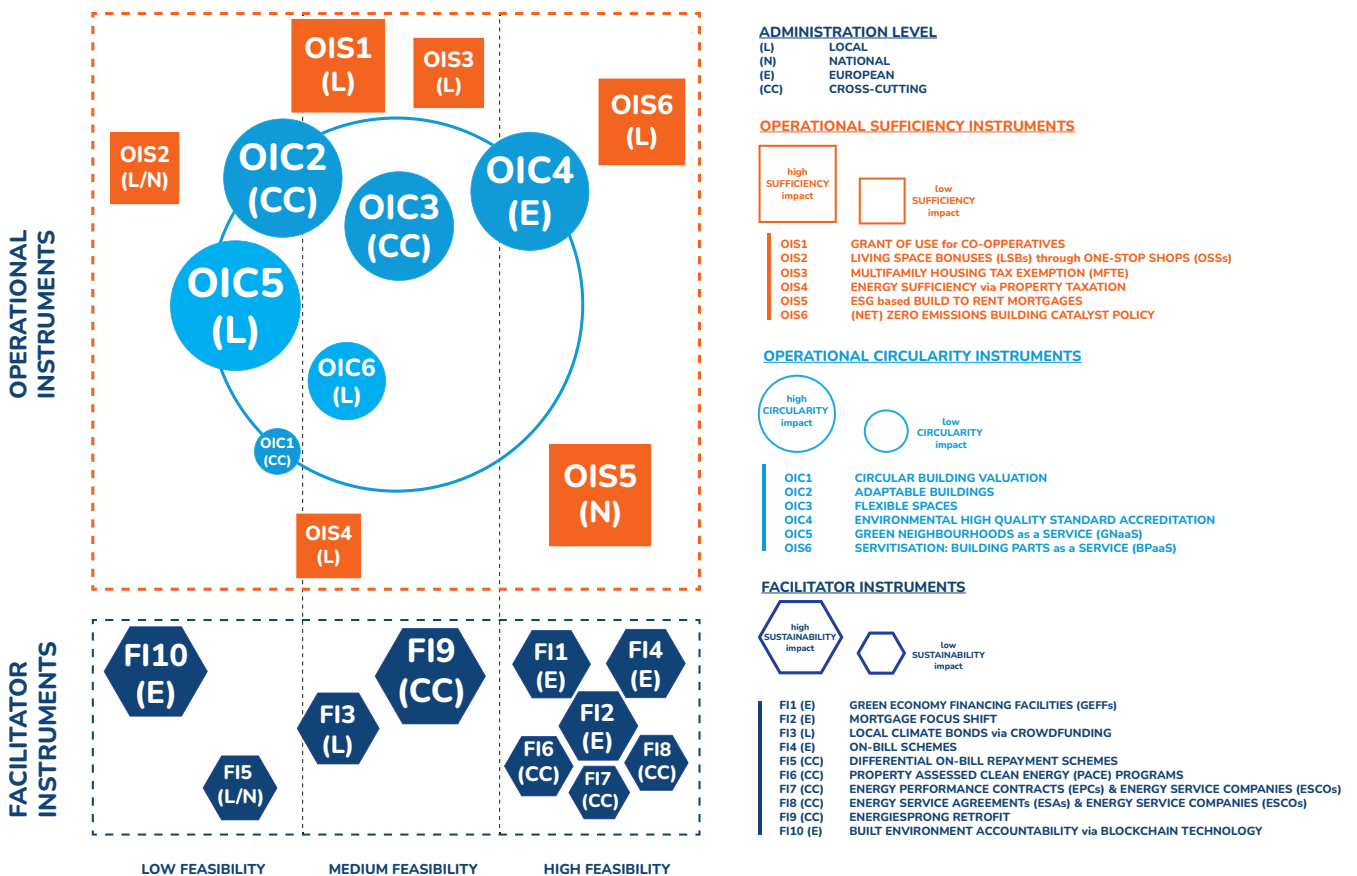
### **FACILITATION: CATALYSING CHANGE**

Facilitator Instruments are schemes and incentives that can support the implementation of sufficiency and circularity measures. They ease the application of the SER framework, one-step deep renovations and deep retrofitting of the built environment by enabling energy efficiency gains or the use of renewables to reduce the sector's operationally and embodied emissions.

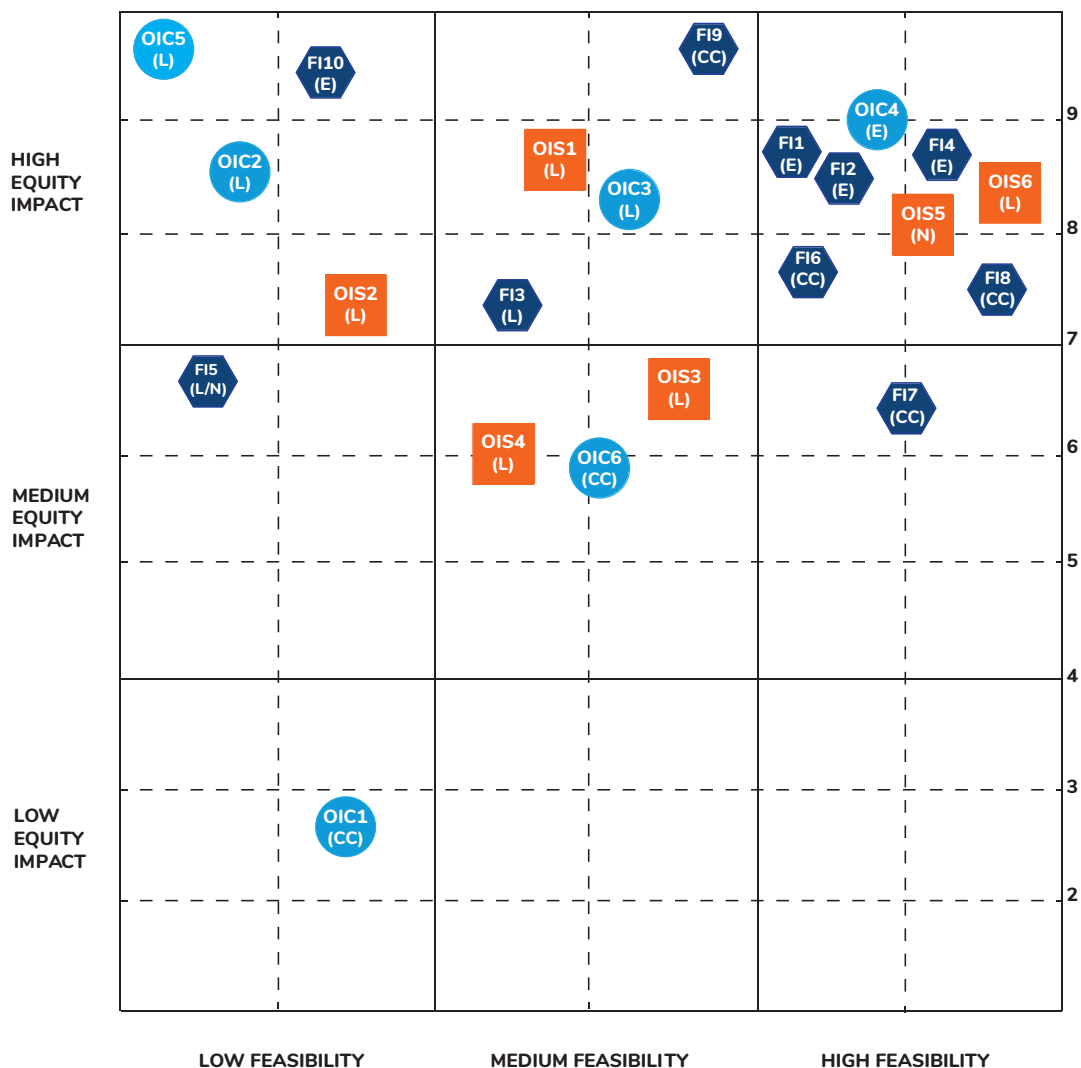
<b>FACILITATOR INSTRUMENTS (GEOGRAPHICAL SCOPE)</b>
GREEN ECONOMY FINANCING FACILITIES (GEFFs) (EUROPEAN)
MORTGAGE FOCUS SHIFT (EUROPEAN)
LOCAL CLIMATE BONDS via CROWDFUNDING (LOCAL)
O.N-BILL SCHEMES (EUROPEAN)
DIFFERENTIAL ON-BILL REPAYMENT SCHEME (CROSS-CUTTING)
PROPERTY ASSESSED CLEAN ENERGY (PACE) PROGRAMS (CROSS-CUTTING)
ENERGY PERFORMANCE CONTRACTING (EPCs)
and ENERGY SERVICES COMPANIES (ESCOs) (CROSS-CUTTING)
ENERGY SERVICE AGREEMENTS (ESAs)
and ENERGY SERVICES COMPANIES (ESCOs) (CROSS-CUTTING)
ENERGIESPRONG RETROFIT (CROSS-CUTTING)
BUILT ENVIRONMENT ACCOUNTABILITY via BLOCKCHAIN TECHNOLOGY (CROSS-CUTTING)

**PURPOSE MEETS CONTEXT**

Every instrument can be seen at its best within a specific context. **Figure ES.1** outlines how instruments vary according to their feasibility, implementation level and potential impact. Further, scenarios have been developed to identify the most feasible and impactful instruments, as presented in **Figure ES.2**.



**Figure ES. 1** Comparative assessment of all selected instruments according to their Sufficiency, Circularity and Facilitator capacity. Source: Own elaboration.



#### ADMINISTRATION LEVEL

(L)	LOCAL
(N)	NATIONAL
(E)	EUROPEAN
(CC)	CROSS-CUTTING

#### OPERATIONAL SUFFICIENCY INSTRUMENTS

OIS1	GRANT OF USE for COOPERATIVES
OIS2	LIVING SPACE BONUSES (LSBs) THROUGH ONE-STOP SHOPS (OSSs)
OIS3	MULTIFAMILY HOUSING TAX EXEMPTION (MFTE)
OIS4	ENERGY SUFFICIENCY via PROPERTY TAXATION
OIS5	ESG based BUILD TO RENT MORTGAGES
OIS6	(NET) ZERO EMISSIONS BUILDING CATALYST POLICY

#### OPERATIONAL CIRCULARITY INSTRUMENTS

OIC1	CIRCULAR BUILDING VALUATION
OIC2	ADAPTABLE BUILDINGS
OIC3	FLEXIBLE SPACES
OIC4	ENVIRONMENTAL HIGH QUALITY STANDARD ACCREDITATION
OIC5	GREEN NEIGHBOURHOODS as a SERVICE (GNaaS)
OIS6	SERVITISATION: BUILDING PARTS as a SERVICE (BPaaS)

#### FACILITATOR INSTRUMENTS

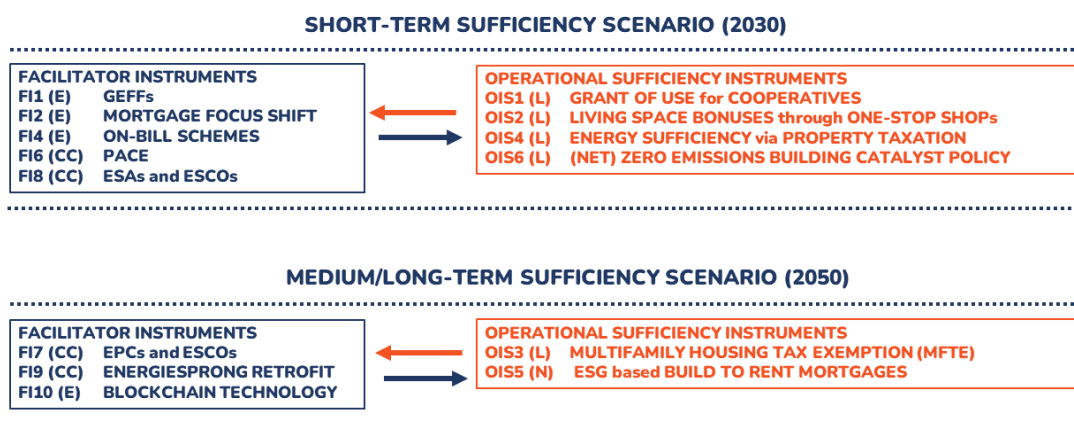
F11 (E)	GREEN ECONOMY FINANCING FACILITIES (GEFFs)
F12 (E)	MORTGAGE FOCUS SHIFT
F13 (L)	LOCAL CLIMATE BONDS via CROWDFUNDING
F14 (E)	ON-BILL SCHEMES
F15 (CC)	DIFFERENTIAL ON-BILL REPAYMENT SCHEMES
F16 (CC)	PROPERTY ASSESSED CLEAN ENERGY PROGRAMS (PACE)
F17 (CC)	ENERGY PERFORMANCE CONTRACTS (EPCs) & ENERGY SERVICE COMPANIES (ESCOs)
F18 (CC)	ENERGY SERVICE AGREEMENTS (ESAs) & ENERGY SERVICE COMPANIES (ESCOs)
F19 (CC)	ENERGIESPRONG RETROFIT
F10 (E)	BUILT ENVIRONMENT ACCOUNTABILITY via BLOCKCHAIN TECHNOLOGY

**Figure ES. 2.** Comparative assessment of all selected instruments according to the feasibility (low, medium or high) and socioeconomic impacts (1-10) used to construct the proposed scenarios. Source: Own elaboration.

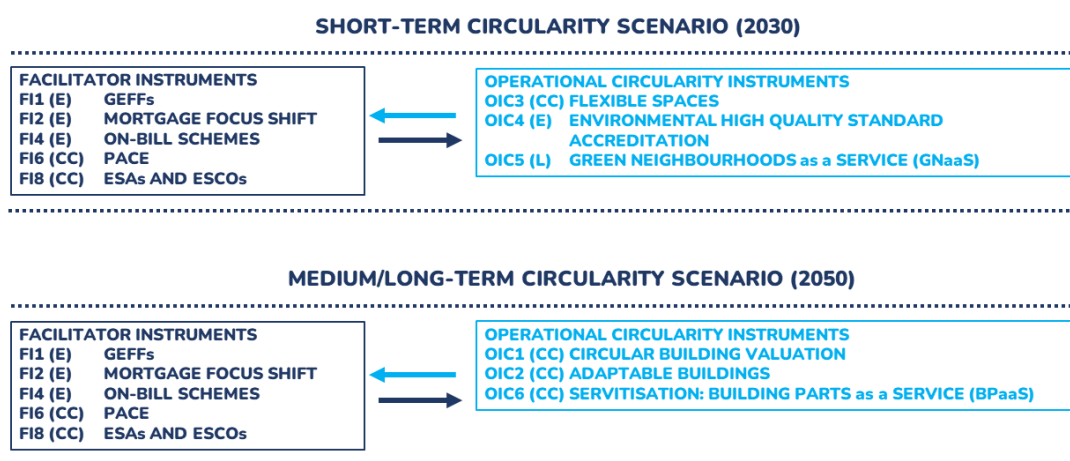
The following instruments have been identified as the most promising based on their feasibility and positive impact on household equity, which include:

- OIS1 Grant of Use for Cooperatives
- OIS2 Living Space Bonuses through One-Stop Shops (OSSs)
- OIS4 Energy Sufficiency via Property Taxation
- OIS6 (Net) Zero Emissions Building Catalyst Policy
- OIC3 Flexible Spaces
- OIC4 Environmental High-Quality Standard Accreditation
- OIC5 Green Neighbourhoods as a Service (GNaaS).

Different potential combinations between the three types of instruments (see **Figures ES.3** and **ES.4**) represent realistic and achievable cross-cutting scenarios that can foster decarbonisation of the built environment over the short and medium/long term.



**Figure ES.3. SUFFICIENCY SCENARIO.** Different possible combinations between Operational Sufficiency Instruments and Facilitator Instruments aiming both, short term and medium/long-term decarbonisation goals Source: Own elaboration.



**Figure ES.4. CIRCULARITY SCENARIO.** Different possible combinations between Operational Sufficiency Instruments and Facilitator Instruments aiming both, short term and medium/long-term decarbonisation goals Source: Own elaboration.

## **POLICY RECOMMENDATIONS**

Key policy recommendations based on report findings are as follows:

- Instruments for reducing operational emissions during the building use stage dominate current policies, requiring further research on sufficiency and circularity solutions to reduce embodied emissions while filling knowledge and implementation gaps.
- Local and regional authorities are the key players in decarbonising the built environment and must be involved in defining and articulating respective policies; local agencies should be focal points for one-step deep renovations.
- In setting up the ONE-STOP-SHOPS (OSSs), local agencies should be hubs of technical assistance and environmental awareness building of all user groups, including vulnerable households, via supporting their retrofit projects, promoting behavioural change, and engaging agents actors across the value chain.
- New business models promoting sufficiency should be reinforced with specific measures to enable new ways of living (such as co-living and housing cooperatives), supported by the updated regulatory framework at European and national levels to enable fiscal incentives that reward sufficiency in the building sector.
- Energy poverty prevention should be mainstreamed across the design and implementation of policies and programs to address distributional effects and ensure that the renovation wave does not negatively impact vulnerable groups.
- Blended and structured finance combining private and public investment through specific renovation or retrofitting schemes related to sufficiency, circularity and the SER framework should be reinforced.



# INTRODUCTION

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# 1.1 GUIDING PRINCIPLES

The EU aspires to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This goal, reflected in the European Green Deal and in line with the commitment to the Global Climate Action under the Paris Agreement, requires a fundamental transformation of the construction and building sectors. This report calls for a more systematic approach to sustainable buildings in line with the EU’s climate goals, and the targets of the United Nations’ Sustainable Development Goals.

This study aims to research, analyse, and provide recommendations for the setup of coordinated and multiscale implementation of financial instruments and economic incentives for a sustainable built environment (focusing on buildings). Presented instruments and proposals try to promote **(Net) Zero Emissions Buildings** (considering both operational and embodied emissions to achieve **Net zero whole-life carbon-built environment**), circular economy, one-step deep renovations and the **SER framework (Sufficiency, Efficiency and Renewables)** at both European and national/regional/local levels. The study covers the **whole life cycle** of the building sector.

The financial measures and economic incentives identified here are grounded on the following **guiding principles**:

### **To promote a whole life carbon emission approach, transforming the building stock into a (Net) Zero Emission Buildings stock (considering both operational and embodied emissions)**

The ongoing review of key policies and legislative acts, such as the Energy Performance of Buildings Directive (EPBD), the Energy Efficiency Directive (EED) and the Construction Products Regulation (CPD/CPR), provides a significant opportunity for the European Union to begin consistently integrating “whole-life carbon emission approach” in the building policy framework.

### **To promote the Sufficiency, Efficiency and Renewable (SER) framework to decarbonise the built environment**

Energy sufficiency is one of the three energy sustainability strategies, next to energy efficiency and renewable energies. There is a growing consensus on the need to couple technological solutions with lifestyle and behavioural changes, sometimes labelled under the term “sufficiency”. Appropriate policies and design principles are necessary to enable sufficiency options. Thus, energy efficiency measures to reduce consumption, as well as increase energy generation from renewable sources, together with the sufficiency approach, are key elements of present sustainability policies. City and building re-design should be implemented by combining SER framework opportunities (Erba et al., 2021).

### **To transform the current linear building sector into a circular sector and create a robust local market for secondary raw materials**

The accelerated development of cities involves important inflows and outflows of resources. The construction sector is one of the main consumers of raw materials and producers of waste. At EU level, buildings are responsible for 1/2 of all extracted materials, 1/2 of total energy consumption, 1/3 of water consumption and 1/3 of waste generation (European Commission, 2021). Due to its quantity and potential for recovery, the construction sector constitutes significant deposits and requires major action by bringing together different stakeholders to achieve the objectives of a circular economy. Consequently, it is crucial to understand the current knowledge of urban metabolism, deposits, and recovery practices (Tirado et al., 2022) as linear investments are largely still prioritised in the current system.

### **To promote one-step deep renovations in the context of the Renovation Wave and in the long term**

The EU Renovation Wave sets the objective to at least double the annual renovation rate of renovations by 2030 as well as to foster deep renovations to improve the energy performance of buildings. 85-95 percent of the buildings that exist today will still be standing in 2050. Most of the existing buildings are not energy efficient. Many rely on fossil fuels for heating and cooling and use old technologies and wasteful appliances. Therefore,

the EU needs to adjust its framework of renovation policies, advisory and financing measures by fully backing deep renovation. The revision of the EPBD provides the perfect opportunity to implement this paradigm shift. Deep renovation should achieve the 2050 target in one step or, when not possible, two/three steps for residential buildings. Deep renovation should lean towards a minimal carbon footprint for both operational and embodied emissions.

### **Ensure the affordability of the economic strategies so as to leave no one behind**

The world is not making enough progress to ensure access to affordable, reliable, sustainable, and modern energy for all. As times go by, it is critical to keep equity, justice, and inclusiveness as the centerpiece of the energy transition. Energy for development and ending energy poverty will be central to any pathway to net zero whole life carbon emissions. Efforts are better accepted if there is a sense that everyone takes their fair share, hence equity aspects must be considered in the design of these measures. To ensure a just transition will certainly be very challenging. Rearranging consumption could emphasize levels of inequity and hurt low-income communities and individuals while leaving the wealthiest relatively unblemished. Consequently, the final financial, economic, and policy recommendations must ensure social justice alongside environmental sustainability. To achieve this, it is not enough to address inequality by focusing on those left behind at the bottom. It is also necessary to address the concentration of wealth, income, and decision-making power at the top and break the link between economic and social exclusion and decision-making power.

### **To promote coordination on economic transition among stakeholders**

There is a need for solid multistakeholder collaboration and commitment to ensure that environmental, economic, and social equity are considered, driven, and implemented as part of the decarbonisation process. As the built environment is characterised by multilayer and multidimensional decision-making processes, this requires several tools depending on stakeholders, sectors, and the character of the intervention. National, regional and local governments, as well as citizens and stakeholder groups, now all need clarity and strong coordination from the European Commission in the form of a planning strategy to deliver a comprehensive and joined up approach to the sustainability of the built environment.

### **To promote urban incentive plans based on sustainable performance**

As urban populations increase, we know that compact and connected communities are the best way to preserve global resources and fragile biodiversity. Application of a circular construction seems to be the solution: the development, use and reuse of buildings, areas, and infrastructure without unnecessarily depleting natural resources, polluting the living environment and damaging ecosystems, using building methods that are economically justifiable and contribute to the welfare of people and animals, everywhere and continuously. This approach is the first step toward circular urbanism, a new concept, understood as the closure of the life cycle in land use.

Consequently, through the entire study, carbon emissions in the building and construction sector is focused on assessing the full life cycle of buildings, in particular, reflecting the framework provided by the European standard EN 15978:2014 .

It is also important to explain two core concepts for the decarbonisation of the built environment that were taken as theoretical framework for the compilation of instruments, schemes and incentives. Those two concepts that form the backbone of the research are: **SUFFICIENCY** and **CIRCULARITY**.

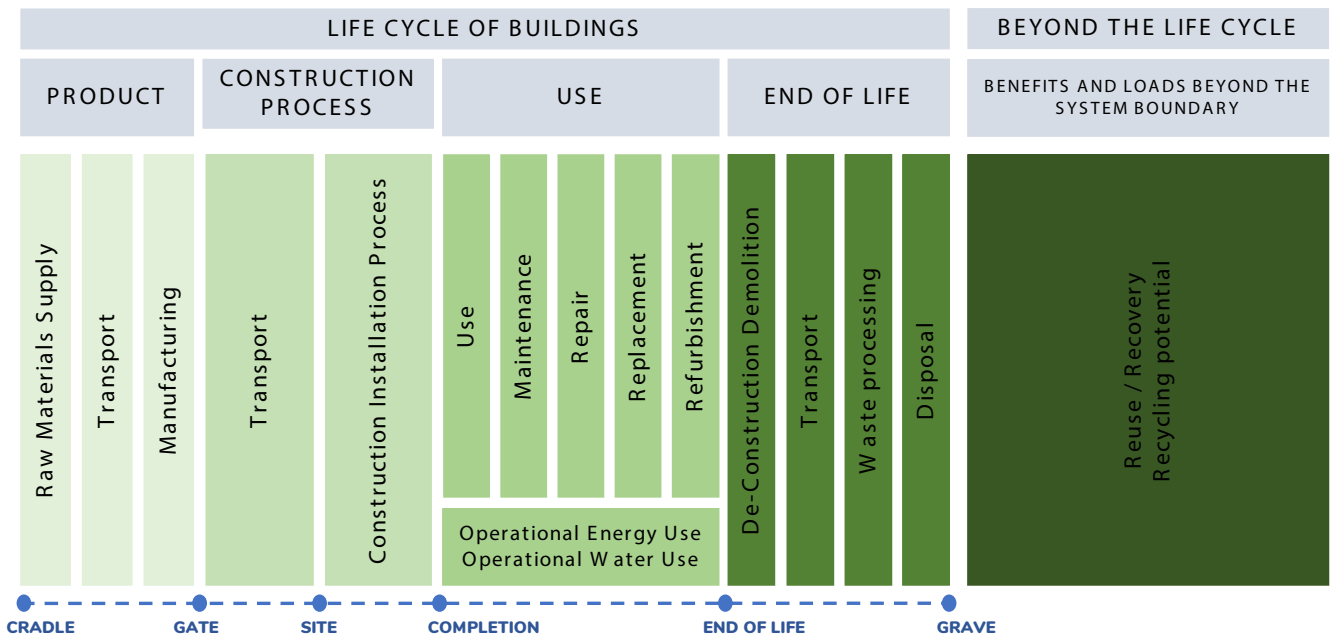
# 1.2 CONCEPTUAL FRAME

## 1.2.1 LIFE CYCLE APPROACH

Globally, the building industry is responsible for consuming over 32 percent of the world's resources. It also generates over 25 percent of the solid waste and emits about 35 percent of the total greenhouse gases (Soust-Verdaguer et al., 2017). At EU level, as seen in **Level(s) website**, buildings are responsible for 1/2 of all extracted materials, 1/2 of total energy consumption, 1/3 of water consumption and 1/3 of waste generation. As the urgency of the climate challenge increases, efforts to address carbon emissions in the buildings and construction sector is shifting from a focus almost exclusively on operations to the **full life cycle of buildings**. The carbon lock-in from decisions about building materials and recycling potential at the end of life is critical to meeting climate goals. In response, new building **life-cycle carbon emissions** regulations are emerging worldwide.

### Building Life Cycle Stages

Multiple standards already exist outlining how to measure whole-life carbon emissions. In Europe, the most relevant one is **EN 15978:2011**. It presents the general structure and definition of stages in the life cycle of buildings according to the European standard for the sustainability of construction works, and assessment of the environmental performance of buildings (Figure 1).



**Figure 1.** Life cycle stages in Construction works as per EN 15978: 2011. Source: Own elaboration based on EN 15978:2011.

All the substages refer to **embodied carbon emissions** of buildings, except for the carbon emissions derived from use related to energy and water consumption, which refer to the **operational carbon emissions**.

### Building Whole Life Carbon Emissions

A building's carbon footprint can be divided into two categories. First, **embodied carbon emissions** (this includes any CO<sub>2</sub> created during the manufacturing of materials, the transport of those materials, and the construction itself), and **operational carbon emissions** (encompasses all activities related to the use of the buildings, over its life span). While operational carbon can be reduced through improvements in energy usage and efficiency over time, embodied carbon is locked in at the construction, renovation, and maintenance stages.

Buildings and the construction sector are major drivers of energy consumption. Building construction—including the manufacturing of materials and products such as steel, cement, and glass—accounts for 6 percent of global final energy use and 11 percent of global carbon emissions. Once constructed, buildings are responsible for **30 percent of global final energy use and 28 percent of global carbon emissions** (International Energy Agency, 2019). These indicators reflect the necessity to reduce both operational and **embodied carbon emissions** of the built environment.

Regulations and policies play an important role in reducing energy use and carbon emissions of the buildings and construction sector. However, the regulations and policies to decarbonise buildings are **mainly focused on operational energy related to carbon emissions, leaving embodied carbon as a significant unaddressed issue**. Most of the existing energy consumption and carbon emissions-related standards in the buildings and construction sector do not cover the **materials, construction, maintenance, repair, demolition, and recycling of buildings**, which all generate significant carbon emissions. The lack of such standards in the building industry is mainly due to the fact that **carbon emissions in the production of building materials have been categorised as industrial emissions rather than building emissions**. It is essential that standards be developed and implemented to address the full life cycle of buildings.

### 1.2.2 SER FRAMEWORK (Sufficiency, Efficiency and Renewables)

Sufficiency is one of the three sustainability strategies to achieve the decarbonisation of the built environment, together with energy efficiency and renewable energies. However, this is meaningfully underrepresented in the policy and regulatory framework compared to efficiency and renewable. Beyond technological efficiency and massive development of renewables, **sufficiency policies, in conjunction with circularity policies**, are a set of measures and daily practices that avoid demand for energy, materials, land and water while delivering human wellbeing for all within planetary boundaries<sup>5</sup>. Sufficiency policy is often limited to a hypothetical future prospect of personal behavioural change so far. However, this approach is not enough, as decoupling economic growth from resource use, will only be possible if the actual take-make-waste linear model shifts towards **a regenerative by design circular model**. Circularity principles avoid the linear use of materials and goods by applying some of the sufficiency principles at the product and construction materials levels. The lack of requirements in EU policies to implement circularity principles in the construction sector combined with the lack of sufficiency measures have led to extensive use of virgin materials and to an increase in mineral waste.

Efficiency measures go hand in hand with high investment costs and sometimes, for example under the current supply chain crisis, could be impossible to implement. On the contrary, sufficiency strategies can be implemented with low or even without investment costs and thus are not only a tool to approach environmental goals but an effective way to save money. They can also help to win time for the challenging effort to refurbish the existing building stock within the next decade.

Sufficiency, efficiency, and renewables are complementary. It is possible for a building or a system to be highly energy-efficient while at the same time being highly energy-consuming. There is a hierarchy: **energy sufficiency > energy efficiency > renewable sources**. The energy transition comprises consuming less, then consuming more efficiently, and finally consuming from the least polluting sources, the renewable sources.

From now on, policymakers and political leaders should recognize consumption and the structure of demand as an important lever next to efficiency and renewables. This demand-side approach, closely linked to the circular economy, together with efficiency and renewable energy, will be necessary to achieve full decarbonisation of the EU

<sup>5</sup> Saheb, Y. (2021). Sufficiency and Circularity. The two overlooked decarbonisation strategies in the 'Fit for 55' Package. Brussels, Belgium: European Environmental Bureau (EEB).

building stock.

### 1.2.3 THE ROLE OF SUFFICIENCY

According to Eurostat data, in Europe the floor area per person has increased<sup>6</sup> in the last decade. Available information shows that wealthiest countries' square meter per person increased quicker and to a higher level than low-income Europeans. Furthermore, despite all efficiency improvements in the sector, the related energy consumption remains on a high level. On top of that, over the lifecycle of buildings, energy and resources are needed to build, equip, use, renovate, and finally deconstruct them. Each of these stages offer potential for the implementation of sufficiency strategies. Some of these strategies are: making effective use of buildings, readapting unused existing ones, proposing shared spaces, cohousing, co-living, coworking, prioritizing multi-family projects over single-family homes, and adjusting the size of buildings to the evolving needs of households by downsizing dwellings. This study focuses on proposing financial schemes and economic incentives to help implement these sufficiency measures.

Apart from **social changes, specific sufficiency based approach measures and associated regulatory framework changes** have been analysed and developed in the existing literature (e.g. dwelling size, maximum energy consumption, 'take back' obligations for buildings, promotion of teleworking to reduce office space). Furthermore, it is needed to apply several financial and economic instruments that would enable this full decarbonisation combined with redistributive measures aiming at leaving no one behind in this process.

New **models of ownership and usership** have also been examined by many authors. **Compared to individual ownership, cooperative houses and offices (cohousing, co-living, coworking) are a model which often allows for easier change of size and structure and thus it can be adopted to increase or shrink space requirements.** Some good examples of this, are based on the model of **grant of use** (e.g., La Borda in Barcelona<sup>7</sup>). This model eliminates property speculation and profiteering on a fundamental right like housing.

Municipal housing agencies and local authorities have also an important role to play in the metamorphosis of this type of building by **increasing the share of communal spaces**. This can result in intergenerational cohousing and interactions between people with different social backgrounds (e.g., 58 Social housing for young and elderly in Barañain, Navarra, promoted by the regional government's housing public agency).

Other ways of supporting sufficient living are **living space bonus** (e.g. housing cooperative Gewoba in Potsdam, Germany, offers a rent 10 percent below the normal level to tenants moving to smaller flats) and linear financial incentives linked to an environmental target (e.g. the higher the energy saving the higher the subsidy).

Key Performance Indicators (KPIs) for tracking decarbonisation have been identified through the report for most sufficiency related instruments, schemes and/or incentives. Thus, improving transparency through standardisation and reporting requirements, such as **EU taxonomy for sustainable activities** or **EU Non-Financial Reporting Directive**, will contribute to set up a common framework and it will boost private sector confidence to invest on 'sufficient' buildings.

### 1.2.4 THE ROLE OF CIRCULAR ECONOMY

The adoption of circular economy principles in the built environment offers a significant opportunity for the construction sector to deliver on decarbonisation commitments and other **Environmental, Social, and Governance (ESGs)** goals. Now, more than ever, the integration of circularity and ESG metrics can contribute to measuring a

<sup>6</sup> Data available at EUROSTAT. Average household size – EU-SILC survey: [https://ec.europa.eu/eurostat/databrowser/view/ILC\\_LVPH01\\_\\_custom\\_2361539/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/ILC_LVPH01__custom_2361539/default/table?lang=en)

<sup>7</sup> <http://www.laborda.coop/en/>

company's impact and identifying the changes needed to reach the objectives of the Paris Agreement and the **Sustainable Development Goals (SDGs)**.

Reducing the impacts of construction and associated emissions (both operational and embodied) requires a major shift from business-as-usual **cradle to grave** construction practices to **cradle to cradle** circular approach that establishes a multi-generational, continuous, and **closed-loop system**. However, for the transition to a Circular Economy several changes are required throughout the value chains, from product design to C2C (consumer to consumer) business and market models, and from new ways of turning waste into a resource, as well as to new modes of consumer behaviour (Smol et al., 2015).

**Upcycling** and **Design for Disassembly (DfD)** (or '*reversible construction*') strategies have a central role and promote buildings, construction materials and products to be intentionally designed for material recovery, value retention and meaningful next use when a building is renovated or deconstructed in the future (Pomponi, 2017). The **Circular Built Environment (CBE) system** created by the Faculty of Architecture and the Built Environment, Delft University of Technology, works to better understand the dynamics of circular construction projects and how these inter-organizational projects contribute to the transition toward a circular economy.

Additionally, several cities have already set targets and prioritized CE actions for reducing embodied carbon. **Amsterdam's Circular Strategy**<sup>8</sup> establishes a plan to make Amsterdam a circular city by 2025, by reducing the use of new raw materials significantly. All municipal procurement in the built environment should be circular by 2023. By putting circularity among the main selection criteria, new municipal buildings and retrofit projects will, for instance, increasingly include used building materials and promote adaptable design. Moreover, the city of Vienna launched a first pilot project aiming to use recycled concrete and insulation material in new buildings as part of the **DoTank Circular City Wien 2020-2030 strategy**.

Also, Budapest, Los Angeles, Mexico City and Oslo have joined forces to set collective targets through the **C40 Clean Construction Declaration** and have committed to municipal actions such as reducing embodied emissions in new buildings, major retrofits, and infrastructure projects by 2030, striving for at least a 30 percent reduction by 2025. They will also be requiring lifecycle assessments (LCAs) and the diversion of construction and demolition waste from disposal on all municipal projects, using municipal purchasing power to procure or demand zero-emission construction machinery in municipal projects from 2025, rewarding resource-efficient and **circular design, the use of low-carbon materials and low-to-zero-waste construction sites** for all new projects and major retrofits or approving at least one net zero-emission (operational and embodied) flagship project by 2025.

Identification of underused or vacant municipal assets can contribute to co-housing or cooperative based projects. Even short-term leases can help to revitalise neighbourhoods or disused lands (e.g. Barcelona's BUIITS Plan temporarily transferred municipal plots to non-profit organisations and associations for activities in the public interest). Leasing or repurposing assets can also raise funds and provide new forms of usership (e.g., **City of Toronto** launched an initiative to identify land and buildings appropriate for new affordable housing, which has led to the repurposing of 18 city-owned properties into almost 13.000 affordable rental homes).

Promoting new construction methods, rewarding or requiring approaches that are flexible, adaptable, reversible, and modular should be the norm for all European, regional, and local public governance authorities. Strategies should follow the construction hierarchy, prioritising the adaptive reuse of existing buildings, followed by the deconstruction of structures that must be removed alongside measures to create a thriving secondary market for these materials. A powerful example of

<sup>8</sup> Amsterdam Circular Strategy 2020-2025: [https://assets.amsterdam.nl/publish/pages/867635/amsterdam-circular-2020-2025\\_strategy.pdf](https://assets.amsterdam.nl/publish/pages/867635/amsterdam-circular-2020-2025_strategy.pdf)

applying this on a city level is the case of Vancouver, where the Vancouver Climate Emergency Action Plan promotes alternatives to traditional building demolition, such as relocation, deconstruction and salvage and reuse activities. Additionally, this action plan increases material salvage for city-owned building demolitions; supports the use of regional, sustainably sourced wood products, including training for contractors; and, finally, it develops a sustainable consumption strategy by supporting a shift to lower-carbon consumption patterns and the Zero Waste 2040 Plan, which has the reduction of waste from construction and demolition as a priority action and has integrated this into the city's Green Demolition By-law. Other good examples include Auckland's Cost Benefit Analysis of Construction and Demolition Waste Diversion from Landfill, led by Auckland Council, and The Economics of Residential Building Deconstruction in Portland, OR, led by Portland State University.

Ineffective use of non-renewable materials could cause significant natural resources depletion. Circular Economy can keep adding value to products for a longer time and virtually eliminate wastes (Smol et al., 2015). Also, when there are resources scarcity and a shortage in supply, industrial symbiosis should be promoted, as it plays a significant role lowering the environmental impact and promote green economic growth. Therefore, it is crucial to craft financial tools such as **Circular Building Valuation, Buildings as Mines of Materials** or **Building Material Stocks** (Oezdemir et al., 2017, Heinrich and Lang, 2019, Gepts et al., 2019, Ali, 2019, Ajayabi et al., 2019, Arora et al., 2019) that facilitate the creation of a robust local market for secondary raw materials.

This is in line with requiring material passports and **Environmental Product Declarations (EPDs)** for new construction and one-step deep renovations. However, the problem with EPDs is that they are not harmonised. Thus, each country and company could have its own method for measurement, and the data for the same products vary from country to country. The **Construct Product Regulation (CPR)** could solve this harmonisation problem. Digital Material passports gather a set of data describing defined characteristics of all the materials that are included in a project. Those digital material passports state the material's value for recovery, recycling, and re-use. Understanding the value of the materials and their potential for reuse will facilitate the implementation of a robust circularity secondary market (e.g., the City of Amsterdam calculated that the 2,6 million tonnes of building materials released each year through renovation and demolition had a value of €688 million). **Buildings As Materials Banks (BAMB)** has some useful (Europe-focussed) information on how to use material passports. The use of material passport, in conjunction with harmonised EPDs established by the CPR, ensures that a significant amount of a project's embodied emissions is quantified (e.g. Portland, Oregon requires EPDs for all concrete in municipal projects, while Trondheim, Norway requires EPDs for at least 15 materials per project.). Data gathered through EPDs can be useful to understand the range of carbon intensity of materials on the local market and identify appropriate GWP caps for each. Municipalities could ban the use of materials with values over these caps on this basis. Los Angeles has adopted the state-level **Buy Clean California Act** guidelines to reduce GHG emissions from building materials. It means that EPDs are required for all steel, flat glass and mineral-wool insulation that the city procures. From July 2021, municipal procurement of these materials should be aligned with the state-level GWP caps published in January 2021. Other carbon-intensive building materials will be included in future. Same thing could apply to bio-based materials.

Guidelines and KPIs for circularity implementation to track decarbonisation should be homogeneous and shall be based on LCA, material flow analysis (MFA) and material flow cost accounting. For the purpose of supplying alternative materials from the secondary resources, recycling and reusing rates can be a good performance indicator for CE settings, as recycling rate (for both open and closed-loop recycling

systems) and reusing rate can provide useful information in quantifying the circulated materials (Haupt et al., 2017).

### 1.2.5 ONE-STEP DEEP RENOVATIONS

The **Renovation Wave Strategy** of the European Commission aims to at least double renovation rates in the next ten years and make sure renovations lead to higher energy and resource efficiency. Across the EU, deep renovations that reduce energy consumption by at least 60 percent are carried out only in 0,2 percent of the building stock per year and in some regions, energy renovation rates are inexistent. Considering that renovating or/and refurbishing existing buildings is more sustainable than demolishing or building new ones, a higher renovation rate is needed as the deep renovation is a key action to drastically reduce energy demand and achieve the EU vision of a decarbonised building stock by 2050.

As part of a revision of the Energy Performance of Buildings Directive (EPBD) last December, the European Commission introduced a legally binding Deep Renovation Standard. This is an important first step on the way to decarbonisation. However, it only considers the operational phase of emissions from buildings, so it **should be extended to whole life emission approach**. Although embodied emissions from deep renovations typically represent less than half of embodied emissions from new buildings<sup>9</sup>, they are still a key aspect to consider.

The proposal introduces a definition for staged deep renovation but fails to make deep renovation the new business standard. Renovation should be **one-step deep and integrated interventions, or when not possible, two/three steps maximum**. Furthermore, the percentage of refunded costs or the maximum amount of funding should increase with the level of the energy performance or with the achieved energy savings (e.g., deeper renovations that tend to nominal carbon footprint for both operational and embodied emissions and are on in line with climate neutrality by 2050, higher level of energy performance, higher energy certification label).

Cities should prioritise renovation (over demolition and new build), integrating such priorities into city-wide planning strategies (e.g. **The London Plan 2021**, includes principles to prioritise retrofitting and refurbishment projects). Making retrofit an attractive proposition for private funding is critical. One strategy to achieve this could be the implementation of a measured circular renovation process (standard metrics and KPIs to be developed). The circular renovation concepts will make both more attractive and more reliable to customers and potential private investors by tracking and reporting information on the total life-cycle performances of their renovated homes (e.g. **Plug & Play Envelope System, StepUP Heating Solution**, deep energy renovation with prefabricated modules, bio-based material and building integrated technologies as **Energiesprong programme in the Netherlands**).



# 2 ECONOMIC INCENTIVES AND FINANCIAL SCHEMES

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## 2.1

# SUFFICIENCY, CIRCULARITY AND FACILITATOR INSTRUMENTS AND ITS RELATIONSHIP TO THE WHOLE LIFE CYCLE OF BUILDINGS

In the collection of instruments, financial schemes and economic incentives for the decarbonisation of the built environment, two ways of organising the information were followed. On the one hand, the different stages of the life cycle of buildings were tracked. From planning to end-of-life, through use and life beyond decommissioning. On the other hand, the investigation focused on the search for instruments related to **SUFFICIENCY** and **CIRCULARITY**. Even though these are still largely neglected in the EU policy development, it is widely accepted that these two trends will drive the decarbonisation efforts of the built environment in the European context.

Once the guiding principles and conceptual framework was established, the research was carried out aiming at finding the most promising instruments for the decarbonisation of the built environment. Additionally, different instruments, schemes and incentives not directly related to the sufficiency and circularity concepts were selected and included as **FACILITATOR INSTRUMENTS**. These instruments set the ground for implementing the SER framework in a comprehensive way, introducing key instruments for the renovation or retrofitting of the built environment by enabling energy efficiency gains and/or the installation of renewable sources to reduce the operational and embodied emissions derived from the sector.

As a result, 22 financial schemes and economic incentives with a potential to foster decarbonisation of the built environment have been identified: six **Operational Sufficiency Instruments**, six **Operational Circularity Instruments**, and a set of ten **Facilitator Instruments**.

More detailed information about each instrument and measure can be found in the third part of the report, *Comprehensive overview of the Economic Incentives and Financial Measures to decarbonise the Built Environment* and in the annexes.

### 2.1.1 **OPERATIONAL SUFFICIENCY INSTRUMENTS** (GEOGRAPHICAL SCOPE)

**OIS1:** GRANT OF USE for COOPERATIVES (LOCAL)

**OIS2:** LIVING SPACE BONUSES (LSBs) through ONE-STOP SHOPS (OSSs) (LOCAL)

**OIS3:** MULTIFAMILY HOUSING TAX EXEMPTION (LOCAL)

**OIS4:** ENERGY SUFFICIENCY via PROPERTY TAXATION (LOCAL)

**OIS5:** ESG based BUILD TO RENT MORTGAGES (NATIONAL)

**OIS6:** (NET) ZERO EMISSIONS BUILDING CATALYST POLICY (LOCAL)

The **Operational Sufficiency Instruments** identified through the study are:

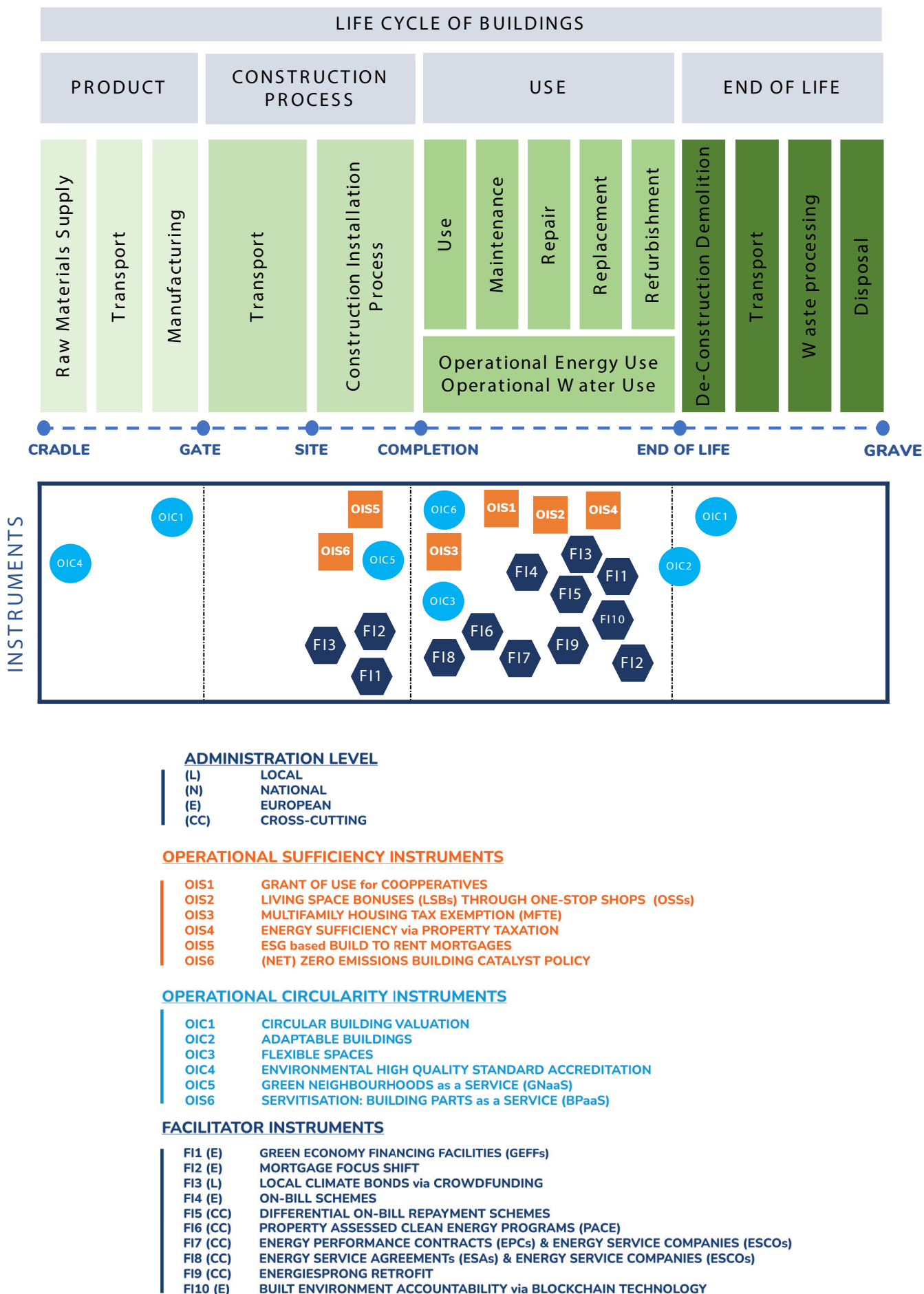
<b>2.1.2 OPERATIONAL CIRCULARITY INSTRUMENTS (GEOGRAPHICAL SCOPE)</b>	
<b>OIC1:</b>	CIRCULAR BUILDING VALUATION (CROSS-CUTTING)
<b>OIC2:</b>	ADAPTABLE BUILDINGS (CROSS-CUTTING)
<b>OIC3:</b>	FLEXIBLE SPACES (CROSS-CUTTING)
<b>OIC4:</b>	ENVIRONMENTAL HIGH QUALITY STANDARD ACCREDITATION (EUROPEAN)
<b>OIC5:</b>	GREEN NEIGHBOURHOODS as a SERVICE (GNaaS) (LOCAL)
<b>OIC6:</b>	SERVITISATION: BUILDING PARTS AS A SERVICE (BPaaS) (CROSS-CUTTING)

The **Operational Circularity Instruments** identified through the study are:  
After an exhaustive analysis and conceptual characterisation, the selected

<b>2.1.3 FACILITATOR INSTRUMENTS (GEOGRAPHICAL SCOPE)</b>	
<b>FI1:</b>	GREEN ECONOMY FINANCING FACILITIES (GEFFs) (EUROPEAN)
<b>FI2:</b>	MORTGAGE FOCUS SHIFT (EUROPEAN)
<b>FI3:</b>	LOCAL CLIMATE BONDS via CROWDFUNDING (LOCAL)
<b>FI4:</b>	ON-BILL SCHEMES (EUROPEAN)
<b>FI5:</b>	DIFFERENTIAL ON-BILL REPAYMENT SCHEME (CROSS-CUTTING)
<b>FI6:</b>	PROPERTY ASSESSED CLEAN ENERGY (PACE) PROGRAMS (CROSS-CUTTING)
<b>FI7:</b>	ENERGY PERFORMANCE CONTRACTING (EPCs) and ENERGY SERVICES COMPANIES (ESCOs) (CROSS-CUTTING)
<b>FI8:</b>	ENERGY SERVICE AGREEMENTS (ESAs) and ENERGY SERVICES COMPANIES (ESCOs) (CROSS-CUTTING)
<b>FI9:</b>	ENERGIESPRONG RETROFIT (CROSS-CUTTING)
<b>FI10:</b>	BUILT ENVIRONMENT ACCOUNTABILITY via BLOCKCHAIN TECHNOLOGY (CROSS-CUTTING)

**Facilitator Instruments** are:

The selected instruments and measures are positioned as follows with regard to the different stages of the life cycle of buildings (*Figure 2*). As shown in the graph below, there is a **higher concentration of financial schemes and economic incentives in the use phase of the building**. However, as far as the product, construction process and end-of-life phases are concerned, there are very few existing instruments. Some of the instruments are depicted multiple times as



**Figure 2.** Selected instruments and measures positioned with regard to the different stages of the whole life cycle of buildings in which they could be applied. Source: Own elaboration.

## 2.2 REPORT STRUCTURE

In order to facilitate reading and to organise the information in a way that is manageable for the reader, the different instruments will be presented following a predefined structure. Thus, each financial scheme or economic incentive selected through the research is explained in a small table as follows:

<b>Title</b>	In addition to the title, we also identified if this is an existing or proposed instrument/scheme		
<b>Time frame</b>	Long / Medium/ Short	<b>Administration level</b>	European / National/ Local
<b>Brief summary</b>	Key aspects		
<b>Socioeconomic impacts</b>	Possible social and economic pros and cons when applying it		
<b>Impact (ranging 1 to 10)</b>	0 - 10	<b>Feasibility (high, medium or low)</b>	High / Medium / Low
<b>Related to</b>	Any LCA stage, Sufficiency, Circularity and Renovation Wave		

Regarding the impact and feasibility of the schemes and incentives presented, the criteria used to assess every financial instrument are explained hereunder:

### Impact (net effect of an instrument, scheme or incentive on the environment and the well-being of individuals and families)

<b>Ranging 0-3</b>	Low impact, the instrument is very likely to fail in the objective of keeping the access to affordable housing and ensuring a significant positive environmental impact
<b>Ranging 4-7</b>	Moderate impact. The instrument, scheme or incentive contributes to reducing the carbon emissions produced by the construction sector while maintaining social equity
<b>Ranging 8-10</b>	High impact. The instrument triggers a significant or positive change that solves or at least addresses current environmental challenges and, in turn, contributes to reducing existing inequality through affordable access to housing

### Feasibility (the possibility that an instrument is being done or implemented)

<b>Low</b>	Low feasibility, meaning that the instrument is unlikely to be implemented because it requires many or difficult changes to current market conditions and/or legal and regulatory requirements
<b>Medium</b>	Medium feasibility, meaning that the instrument can lead to few but significant changes to current building sector conditions
<b>High</b>	High feasibility, meaning that the instrument could be implemented because it requires minor changes comparing with current practices

This part also compiles worldwide examples of the different incentives and measures to better contextualise the proposed instruments through concrete experiences. More detailed information about each instrument and measure can be found in the annexes.

## **2.3**

# **SUMMARY TABLE: FINANCIAL INSTRUMENTS AND ECONOMIC INCENTIVES AND DRIVERS FOR A SUSTAINABLE BUILT ENVIRONMENT**

**Table 1.** Summary Table: Financial Instruments and Economic Incentives and Drivers for a Sustainable Built Environment. Source: Own elaboration.

INSTRUMENTS	BRIEF SUMMARY	ADMINISTRATIVE LEVEL	TIME FRAME	SOCIOECONOMIC REPERCUSSIONS	IMPACT	FEASIBILITY	RELATED TO			
							SUFFICIENCY SER FRAMEWORK	CIRCULAR ECONOMY	RENOVATION WAVE	
<b>OSI1</b>	<b>GRANT OF USE for COOPERATIVES</b>	_ In the model of cooperative housing ruled by grant of use, the property will always be collective, while use is personal	Local	Short-term	_ New forms of ownership require a cultural shift _ Seniors and young people could vastly benefit	8	Medium	YES		
<b>OSI2</b>	<b>LIVING SPACE BONUSES (LSBS) through ONE-STOP SHOPS (OSSS)</b>	_ Living Space Bonuses are a set of blended (fiscal, regulatory and information instruments) that reward space-saving living measures	Local, National	Short-term	_Main target groups: elderly people living on more than 80m <sup>2</sup> and people with small children _ONE _STOP SHOPS should be created, for information and coordination municipally run and with a specil focus on low income citizens	7	Low	YES		
<b>OSI3</b>	<b>MULTIFAMILY HOUSING TAX EXEMPTION (MFTE)</b>	_ The Multifamily Housing Tax Exemption (MFTE) is a property tax exemption program that allows eligible cities to target specific areas for multifamily housing development	Local	Medium-term	_Stimulate refurbishment and renovation of multifamily housing	7	Medium	YES		YES
<b>OSI4</b>	<b>ENERGY SUFFICIENCY via PROPERTY TAXATION</b>	_ The solution is to change the methodology for measuring the efficiency of energy performance by introducing the consumption label where, besides the m2, the number of surfaces and the people living in the dwelling are considered	Local	Short-term	_ Additional regulatory measures to be taken to ensure positive socieconomic impacts _ Rental social housing should be built for the most vulnerable families	6	Medium	YES		
<b>OSI5</b>	<b>ESG based BUILD TO RENT MORTGAGES</b>	_ These mortgages seek to reward developers who include socially, environmentally or/and economically sustainable aspects in their Build To Rent projects	Local, National	Medium-term	_ESG indicators should be cleary defined and balanced between the three aspects of them not to benefit big corporations with focusing only in one of the axis _ ESG strategies are generally better run and less likely to default _ Climate-related disruption and social inequity should be avoided	8	High	YES	YES	YES
<b>OSI6</b>	<b>(NET) ZERO EMISSIONS BUILDING CATALYST POLICY</b>	_ A set of economic and regulatory measures to facilitate (net) zero emissions buildings that the City of Vancouver have been using since 2019	Local	Short-term	_ To guarantee more affordable sustainable projects, firm policies and regulations must be implemented in combination with the instrument: maximum price, built to rent oriented projects should be prioritize, minimum communal space etc. _ Green Building Certifications: BREEAM, LEED, WELL or Passivhaus will definitely help achieving decarbonisation goals	8	High	YES		YES

<b>OCI1</b>	<b>CIRCULAR BUILDING VALUATION</b>	<ul style="list-style-type: none"> <li>_ The Circular Building Valuation model involves the creation of a new contract against the future prices of the building materials</li> </ul>	Cross-cutting	Long-term	<ul style="list-style-type: none"> <li>_ Impacts on tenants' rights and the owner revenues.</li> <li>_ Buildings as mining materials need accurate quantitative information, so as to establish a reliable picture of what is available and how it is currently processed</li> <li>_ A strong raw materials secondary market</li> </ul>	2	Low	YES	YES	
<b>OCI2</b>	<b>ADAPTABLE BUILDINGS</b>	<ul style="list-style-type: none"> <li>_ Adaptable Buildings can accommodate more than one use during their lifetime through retrofit rather than demolition</li> <li>_ The model operates through a new investment partnership</li> <li>_ Support the development of mixed-use buildings, adaptable floor plates, integrated smart services, passive design, durable materials, monitoring ongoing building performance</li> <li>_ Lost value captured: Buildings demolished prematurely</li> </ul>	Local	Medium-term	<ul style="list-style-type: none"> <li>_ Suitable for non-residential buildings</li> <li>_ Office-to-residential conversions could be relatively common in some real estate contexts where planning regulation allows</li> <li>_ To avoid overcrowding or speculation in residential buildings, policy/economic measures such as proper densification strategies, maximum number of dwelling units, caps to rental prices, minimum number of social and affordable units etc., should be promoted</li> <li>_ A strong secondary raw materials market needed</li> <li>_ Easier to deliver new uses demanded by the market at lower cost</li> </ul>	8	Low	YES	YES	
<b>OCI3</b>	<b>FLEXIBLE SPACES</b>	<ul style="list-style-type: none"> <li>_ The Flexible Spaces model seeks to list existing, underutilised building spaces for short-term use through online platforms</li> </ul>	Local/ Regional	Short-term	<ul style="list-style-type: none"> <li>_ Increase revenue from additional tenants</li> <li>_ Reduce underutilized buildings</li> <li>_ Suitable for non-residential buildings</li> <li>_ To avoid overcrowding or speculation in residential buildings, policy/economic measures such as proper densification strategies, maximum number of dwelling units, caps to rental prices, minimum number of social and affordable units etc., should be promoted</li> </ul>	8	Medium	YES	YES	YES
<b>OCI4</b>	<b>ENVIRONMENTAL HIGH QUALITY STANDARD ACREDITATION</b>	<ul style="list-style-type: none"> <li>_ The introduction of environmental EU high quality standards combined with tax exemptions</li> </ul>	European	Short-term	<ul style="list-style-type: none"> <li>_ High social acceptance and the inclusion of all actors should be based on LCA analysis</li> </ul>	8	High	YES		
<b>OCI5</b>	<b>GREEN NEIGHBOURHOODS as a SERVICE (GNAAS)</b>	<ul style="list-style-type: none"> <li>A new model whereby a central entity, on a city or regional basis, oversees an area based retrofit programme</li> </ul>	Local,	Short-term	<ul style="list-style-type: none"> <li>_ Neighbourhood based Urban Planning helps achieving decarbonisation faster</li> <li>_ Energy positive blocks could be easily achievable</li> </ul>	9	Low	YES	YES	YES
<b>OCI6</b>	<b>SERVITISATION: BUILDING PARTS as a SERVICE (BPAAS)</b>	<ul style="list-style-type: none"> <li>_ With this model, the customer pays a fixed fee per unit of service consumed, while the ownership of the system remains with the technology provider, who remains responsible for all operation costs</li> </ul>	Cross-cutting	Long-term	<ul style="list-style-type: none"> <li>_ Difficult to apply to residential buildings as it requires a cultural shift</li> <li>_ More appropriate for tertiary buildings</li> <li>_ Lack of companies ready to implement it</li> <li>_ The whole value chain should be changed</li> </ul>	6	Medium	YES		



<b>FI1</b>	<b>GREEN ECONOMY FINANCING FACILITIES (GEFFs)</b>	_ Public investment banks would offer credit lines and technical assistance to local partner financial institutions for offering loans and/or leasing to small and mid-sized green projects. Credit lines are complemented with technical assistance	European	Short-term	_ Lower the cost of investment in sustainable projects _ Dialogue to remove institutional and market barriers to green-building investments _ Possible to reward end-beneficiaries who opt for advanced technologies _ Up to date it has been succesful with refurbishmentprojets	8	High	YES	YES	YES
<b>FI2</b>	<b>MORTGAGE FOCUS SHIFT</b>	_ Proposes to allow the banks to offer mortgages that would cover over 80 percent of the home price if the home is categorized as efficient, sufficient or "green" _ An European Framework to standardise green mortgages must be developed by the policy makers to bring certainty and clear investement opportunities within the real estate sector	European	Short-term	_ Consumers would benefit since their capacity of purchasing a home would be increased and at the same time they would be obtaining homes categorized as efficient, sufficient or "green" _ Relaxing the criteria for accessing mortgages categorized as green could lead to increased investor appetite for new housing production, which could lead to an environmental dilemma _ Wrongly applied could increase carbon emissions	8	High	YES	YES	YES
<b>FI3</b>	<b>LOCAL CLIMATE BONDS via CROWDFUNDING</b>	_ The local climate bonds are regulated investment products launched by City Councils to access cost-effective funding for specific decarbonisation projects	Local	Short-term	_ Absence of regulatory framework	7	Medium		YES	YES
<b>FI4</b>	<b>ON-BILL SCHEMES: ON-BILL FINANCING (OBF) and ON-BILL REPAYMENT (OBR)</b>	_ The on-bill scheme involves the utility company as an active agent, in energy renovation of residential buildings, supported by financing institutions	European	Short-term	_ Successful in resolving some of the typical barriers energy efficiency projects may face when implemented in residential buildings, notably split incentives' dilemma between tenants and owners	8	High	YES	YES	YES
<b>FI5</b>	<b>DIFFERENTIAL ON-BILL REPAYMENT SCHEME</b>	_ This scheme is based on Nash equilibrium, by creating a differential between a fixed bill paid by the consumer and the projected energy consumption cost	Local/ Regional	Short-term	_ Facilitate the accessibility to renovations to end-consumers besides this it would also generate a triangle of responsibilities that would have a positive impact on the environment	7	Low	YES	YES	YES
<b>FI6</b>	<b>PROPERTY ASSESSED CLEAN ENERGY (PACE) PROGRAMS</b>	_ PACE programs allow a property owner to finance the up-front cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment	Cross-cutting	Short-term	_ PACE financing is not yet available in the EU interest rates are higher than traditional loans, selling the property might be more challenging because of the assessment, the assessment is secured to the home	7	High	YES	YES	YES
<b>FI7</b>	<b>ENERGY SERVICES COMPANIES (ESCOs) and ENERGY PERFORMANCE CONTRACTING (EPCs)</b>	_ An EPC is a guarantee-based agreement between the client and an ESCO, with the participation of financial institutions, whereas the ESCO issues a performance guarantee, and their remuneration is directly linked to the savings achieved	Cross-cutting	Short-term	_ The remuneration of ESCOs is directly tied to the energy savings achieved. transaction costs are higher than in other financial instruments	7	High	YES	YES	YES

<b>FI8</b>	<b>ENERGY SERVICES COMPANIES (ESCOs) and ENERGY SERVICE AGREEMENTS (ESAs)</b>	Energy service agreements (ESA) are contracts between a third-party investor and an asset owner to deliver energy savings as a service	Cross-cutting	Short-term	<ul style="list-style-type: none"> <li>_ Third-party investor is required which could be complicated</li> <li>_ ESAs offer promise for retail energy retrofits because they limit risk while still providing an avenue for short-term energy and cost savings</li> </ul>	7	High	YES	YES	YES
<b>FI9</b>	<b>ENERGIESPRONG RETROFIT</b>	Energiesprong is an initiative that promotes the whole house refurbishment with funding support	Local, National	Short-term	<ul style="list-style-type: none"> <li>_ Cost-neutral business model for social landlords</li> </ul>	9	Medium	YES	YES	YES
<b>FI10</b>	<b>BUILT ENVIRONMENT ACCOUNTABILITY via BLOCKCHAIN TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>_ Blockchain technologies allows for instant sharing of information between users which guarantess efficient coordination between them</li> <li>_ From a business perspective, it would improve contract management and transparency as every contract would be recorded in the chain. This allows, for instance, for any validated user to check the situation of that contract and trace all the required payments attached to it</li> </ul>	European	Long-term	<ul style="list-style-type: none"> <li>_ Instant sharing of information between users</li> <li>_ This informational system would be able to reduce the emissions generated by the misallocation of resources, especially those related to indirect activities</li> <li>_ Extremely useful tracking the whole value chain of the construction process</li> <li>blockchain would avoid these misallocated resources derived from production and transportation stages, reducing the impact generated</li> <li>_ This entire process would allow reducing emissions caused by externalities during the decision process. Once the construction process is over, these "smart" buildings would be able to use these automations provided by the blockchain in order to analyze air quantity, monitoring energy use and occupancy</li> </ul>	9	Low	YES	YES	YES

# 3 COMPREHENSIVE OVERVIEW OF THE ECONOMIC INCENTIVES AND FINANCIAL MEASURES TO DECARBONISE THE BUILT ENVIRONMENT

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### 3.1

## INTERCONNECTING ALL THE PROPOSED ECONOMIC INCENTIVES AND FINANCIAL MEASURES

The economic incentives and financial incentives identified through the literature review were analysed on a comprehensive and multiscale basis to assess their **feasibility** (low, medium or high), **socio-economic impact** (ranging 1 to 10), **timeframe** (short, medium or long-term), and **administration level** (European, National, Local or Cross-cutting). Finally, 22 of these instruments were selected. Many others were discarded due to their lack of practical application, as well as the existing barriers to their implementation.

Figures 3 and 4 below present in two different and complementary ways the multiscale assessment performed for these 22 instruments as well as how they refer to the core concepts that rule the report: Sufficiency and Circularity. The shapes (circle, square and hexagon) are related to the capacity to promote sufficiency and circularity, or facilitate its accomplishment, in the built environment. The size of these shapes is related to their socio-economic impact. The instruments have also been classified according to their suitable administration level. The ones with a transnational focus, whose scope of action is Europe, are identified by the (E), the ones implemented at the national level are differentiated by the (N), and those carried out at the local/regional level are distinguished by the (L); finally, those instruments with a cross-cutting character

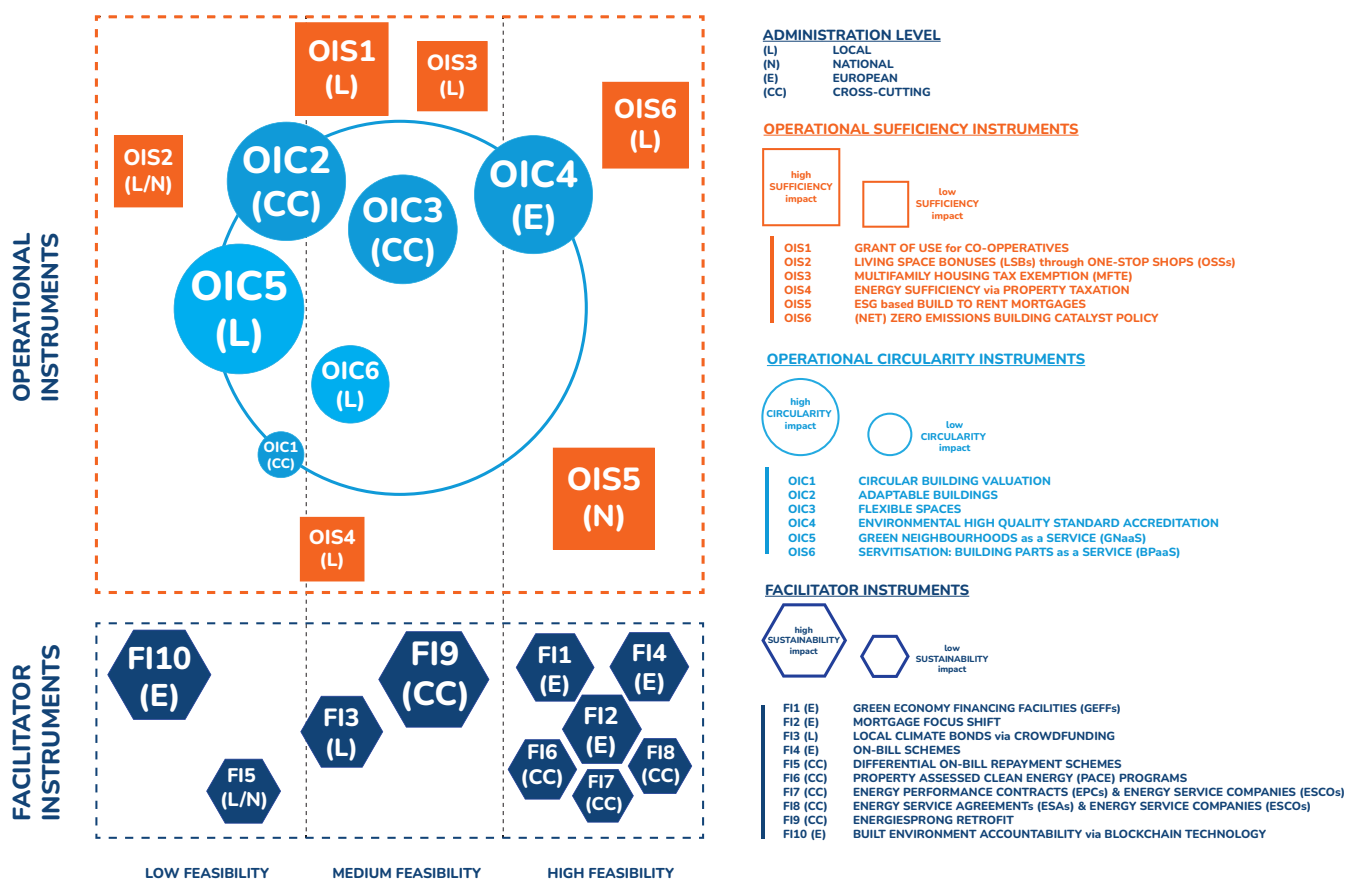
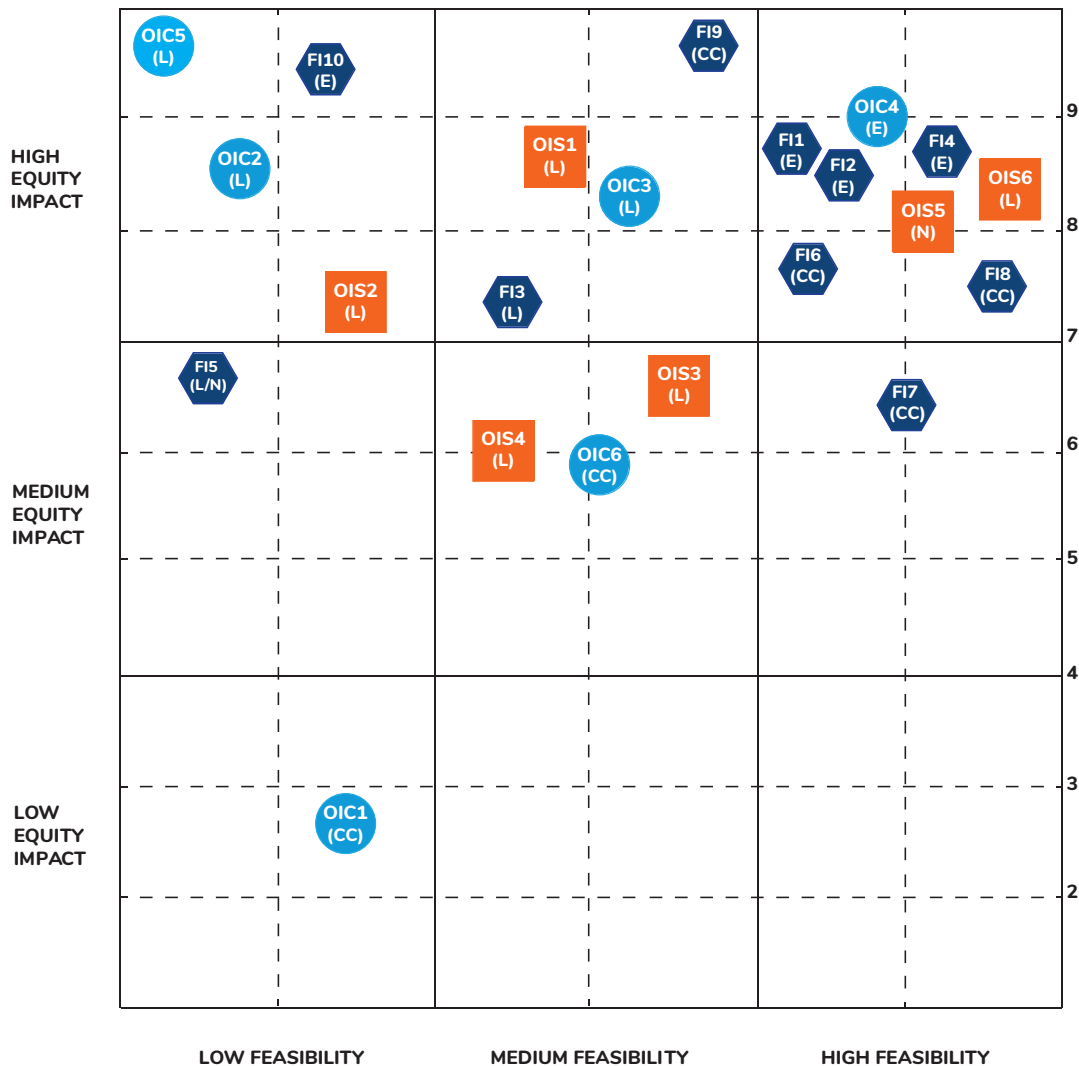


Figure 3. Comparative assessment of all selected instruments according to their Sufficiency, Circularity and Facilitator capacity. Source: Own elaboration.



**ADMINISTRATION LEVEL**

- (L) LOCAL
- (N) NATIONAL
- (E) EUROPEAN
- (CC) CROSS-CUTTING

**OPERATIONAL SUFFICIENCY INSTRUMENTS**

- OIS1 GRANT OF USE for COOPERATIVES
- OIS2 LIVING SPACE BONUSES (LSBs) THROUGH ONE-STOP SHOPS (OSSs)
- OIS3 MULTIFAMILY HOUSING TAX EXEMPTION (MFTE)
- OIS4 ENERGY SUFFICIENCY via PROPERTY TAXATION
- OIS5 ESG based BUILD TO RENT MORTGAGES
- OIS6 (NET) ZERO EMISSIONS BUILDING CATALYST POLICY

**OPERATIONAL CIRCULARITY INSTRUMENTS**

- OIC1 CIRCULAR BUILDING VALUATION
- OIC2 ADAPTABLE BUILDINGS
- OIC3 FLEXIBLE SPACES
- OIC4 ENVIRONMENTAL HIGH QUALITY STANDARD ACCREDITATION
- OIC5 GREEN NEIGHBOURHOODS as a SERVICE (GNaaS)
- OIS6 SERVICISATION: BUILDING PARTS as a SERVICE (BPaaS)

**FACILITATOR INSTRUMENTS**

- F11 (E) GREEN ECONOMY FINANCING FACILITIES (GEFFs)
- F12 (E) MORTGAGE FOCUS SHIFT
- F13 (L) LOCAL CLIMATE BONDS via CROWDFUNDING
- F14 (E) ON-BILL SCHEMES
- F15 (CC) DIFFERENTIAL ON-BILL REPAYMENT SCHEMES
- F16 (CC) PROPERTY ASSESSED CLEAN ENERGY PROGRAMS (PACE)
- F17 (CC) ENERGY PERFORMANCE CONTRACTS (EPCs) & ENERGY SERVICE COMPANIES (ESCOs)
- F18 (CC) ENERGY SERVICE AGREEMENTs (ESAs) & ENERGY SERVICE COMPANIES (ESCOs)
- F19 (CC) ENERGIESPRONG RETROFIT
- F10 (E) BUILT ENVIRONMENT ACCOUNTABILITY via BLOCKCHAIN TECHNOLOGY

**Figure 4.** Comparative assessment of all selected instruments according to the feasibility (low, medium or high) and socioeconomic impacts (1-10) used to construct the proposed scenarios. Source: Own elaboration.

Although proper financial schemes or economic incentives with high feasibility could be adopted as a single solution, producing a relevant leverage effect in stimulating private investment in combination with appropriate legal frameworks and public funding, in general, they should be used in combination with two or more in order to achieve the expected impact.

## 3.2 TRACKING INNOVATIVE INSTRUMENTS: PERUSING BEST SCENARIOS

are indicated by a (CC).

To conclude, two different possible scenarios have been identified: **SUFFICIENCY and CIRCULARITY scenarios**. For both, two additional sub-scenarios have been considered: short-term and medium/long-term scenarios. The timing for the adoption of a given scenario is defined by the feasibility of the instruments that make up the scenario. The most promising options combine high feasibility instruments with a positive impact on household equity.

Furthermore, different potential combinations between the **three types of instruments (Sufficiency, Circularity and Facilitator Instruments)** were included aiming at proposing realistic and achievable cross-cutting scenarios to contribute to the decarbonisation goals of the built environment sector by 2030 first and 2050 after.

The **Facilitator Instruments** selected in this report create the necessary conditions for sufficiency and circularity instruments to work. Besides, they aim to solve barriers like high upfront cost, minimum consumer access to credit, unavailability and poor quality of credit information to allow lenders to assess consumers' creditworthiness and/or lack of awareness of available credit options. Consequently, their implementation will enable successful amalgamation with Sufficiency and Circularity financial instruments and economic schemes.

## SUFFICIENCY SCENARIO

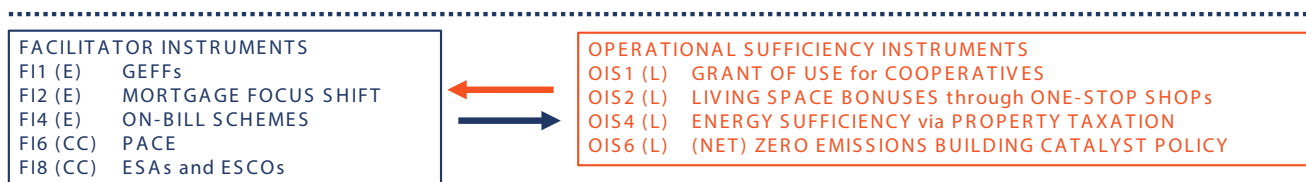
This scenario includes instruments, financial schemes, and economic incentives that promote sufficiency. It is recommended to combine these sufficiency schemes with some of the identified facilitator instruments (*Figure 5 and 6*).

### SHORT-TERM SUFFICIENCY SCENARIO

The short-term sufficiency scenario includes instruments with high or medium feasibility and a positive impact on households' equity.

The following instruments set the conditions for implementing sufficiency instruments on a short-term basis: OIS1 Grant of use for cooperatives, OIS2 Living Space Bonuses through ONE-STOP SHOPS (OOSs), OIS4 Energy Sufficiency via

#### SHORT-TERM SUFFICIENCY SCENARIO (2030)



**Figure 5. SHORT TERM SUFFICIENCY SCENARIO.** Proposed combinations between Operational Sufficiency Instruments and Facilitator Instruments aiming both, short term decarbonisation goals Source: Own elaboration

Property Taxation and OIS6 (Net) Zero Emissions Building Catalyst Policy.

The **OIS4 Energy Sufficiency via Property Taxation** solution proposed by Griet Verbeeck (UniHasselt) seeks to change the methodology for measuring the efficiency of energy performance by replacing the energy label where kWh/m<sup>2</sup>\*yr is measured, with the consumption label where, in addition to the m<sup>2</sup> of the dwelling, the number of surfaces and the number of people living in the dwelling are considered. The new calculation formula for taxation would be kWh/pp.yr, which would have an impact on the size of the house and the household. A bonus/malus system in the tax tariff should be implemented to incentivise this instrument. For that, the neutral consumption label should be defined. A reduction (bonus) on tax tariff would be applied if consumption is less than neutral, and a penalty (malus) would be charged if consumption is over the neutral consumption label. It is recommended to set up a roadmap for stepwise strengthening neutral labels towards long-term goals and communicate the roadmap towards long-term goals from the start.

This progressive property taxation instrument could be combined with an **OIS6 (Net) Zero Emissions Catalyst Policy** launched by the local/regional authorities enabling flexible measures for developers to access funding for increasing density and promoting re-use of the built environment. This policy makes it easier to achieve financially balanced developments while providing more affordable, sustainable houses. The City may consider using discretion to ease some existing regulations, policies and guidelines and relax or vary height, area, uses, the number of units, density and other built form guidelines. The most applicable one is the relaxation of the allowed floor area up to 5 per cent more and increasing density to facilitate more and smaller dwelling units. Further legislation and regulations on maximum price, dwelling size, density, communal space area etc. should be implemented in order to avoid overcrowding and property speculation. This instrument could be applied for both deep renovations (maximum 4 steps) or in Build to Rent new developments. Consequently, customers have more variety of choices, less expensive options and better performing houses in the market.

These two instruments could be reinforced with specific measures to enable new models of communal organization. In the **OIS1 Grant of Use for Cooperatives** model, the property will always be collective, while use is personal. Residents have the status of cooperative partners and can live there for life. The General Assembly is the main sovereign institution where the decisions are made. This model eliminates property speculation and profiteering on a fundamental right like housing. Members cannot sell or rent the flat. It is an alternative model of housing access to the traditional ownership and rent, with a strong commitment to the use-value above exchange value. Through this model, efficient use of living space and the reduction of the floor area per capita are achieved. The ability to choose an adequate (neither too limited nor oversized) per capita living size is one of the most important steps towards sufficiency. Several stakeholders are needed to find the most affordable land. Agents like Municipal Living Space agencies or Real Estate agencies should be implemented at the local level to facilitate these operations.

**OIS2 Living Space Bonuses** are a set of blended (fiscal, regulatory and information) instruments that reward space-saving living measures and facilitate housing that meets the varying needs of households at different stages of their lives without a considerable rent increase. Fiscally, it is a tax deduction amounting from 10 to 20 per cent of the rent per year to individuals that move to smaller apartments and/or exchange apartments and reduce the living space area per capita and area of unused space. In general, instruments seeking efficient use of space require increased flexibility in building use regulations. This can happen, for example, by allowing for building micro-apartments, lock-off units, infills or regulating density, number of dwelling units or number of rooms per unit. A shift from ownership to usership should also be implemented. Also, the right to exchange apartments should legally be introduced. Additionally, a municipal contact point, **ONE-STOP SHOP (OSS)**, should provide citizens with low-threshold access to information and moving, sublease and home exchange advice that contributes to the efficient

use of buildings (e.g., financial and legal advice, building code consultancy, support for relocation, search for smaller flats, leasing and exchange facilities, monitoring vacancies).

In parallel, instruments promoting sufficiency criteria should be accompanied by facilitator instruments that enable the adoption of the SER framework (Sufficiency, Efficiency and Renewables) into the built environment for both building to rent projects and one-step deep renovation schemes.

On one hand, **FI1 Green Economic Financing Facilities (GEFFs) and FI2 Mortgage Focus Shift (new proposed instrument) will allow the local banks to offer loans and/or mortgages with better conditions when adopting** more sustainable approaches. This solution will reward developers and eventually end beneficiaries who promote the construction of new buildings to rent or deep renovation projects that promote sufficiency through previously explained OIS1 Grant of use for cooperatives and OIS6 (Net) Zero Emissions Building Catalyst Policy.

On the other hand, in order to reach an ambitious building renovation target, the use of **FI4 On-Bill schemes, FI6 Property Assessed Clean Energy Programs (PACE), and FI8 Energy Service Agreements (ESAs) and Energy Services Companies (ESCOs)** would solve the problem, in three different ways, of high upfront investment costs for deep renovations. They would contribute to implementing comprehensive projects that encourage energy efficiency projects and the installation of renewables that could be complemented with short-term sufficiency approaches by combining them with OIS1 Grant of Use for Cooperatives, OIS2 Living Space Bonuses, OIS4 Energy Sufficiency via Property Taxation and/or OIS6 (Net) Zero Emissions Building Catalyst Policy.

### MEDIUM/LONG-TERM SUFFICIENCY SCENARIO

Medium/Long term sufficiency scenario includes instruments with medium-high feasibility, but that require several changes for implementation as they could negatively impact on households' equity. These are OIS3 Multifamily Housing Tax Exemption (MFTE) and OIS5 ESG based BUILD TO RENT MORTGAGES.

#### MEDIUM/LONG-TERM SUFFICIENCY SCENARIO (2050)



**Figure 6. MEDIUM/LONG-TERM SUFFICIENCY SCENARIO.** Proposed combinations between Operational Sufficiency Instruments and Facilitator Instruments aiming both, medium-long term decarbonisation goals  
Source: Own elaboration

With regard to the **OIS3 Multifamily Housing Tax Exemption (MFTE)**, this instrument eases Horizontal and Vertical densification as part of sufficiency strategies. However, despite its benefits, this instrument, which was launched in several Canadian cities to address the sprawl phenomena, faces regulatory barriers related to land use to be implemented in the European context. In order to overcome this barrier, it will be necessary to propose a Community policy that establishes the obligation for member countries to promote the densification of the suburbs of large European cities, favouring the adoption of measures that allow the division of single-family dwellings into multi-family dwellings depending on decarbonisation achievements in large metropolitan areas. Further legislation and economic regulations on maximum dwelling price and minimum percentage of units as affordable housing should be implemented in order to avoid overcrowding and property speculation.



**OSI5 ESG based Build to Rent Mortgages** seeks to reward developers who include socially, environmentally or/and economically sustainable aspects in their BTR projects by offering them a lower interest rate than they might otherwise pay. The rate these developers/customers pay is adjusted as a result of them achieving their agreed sustainability targets. These projects seem to have a lower risk, so banks or other institutions could offer more affordable conditions. However, the ESG framework could be hard to measure if adequate indicators are not previously established. There is a possibility of impact-washing (purpose-washing), so a third-party verification or a public oversight agency should be included. The idea of linking them to rental projects could provide more affordable houses for low-income households as well as provide housing access to young families. This scheme, supported by a widespread **FI2 Mortgage Focus Shift** could set up the ground for boosting the renovation wave at a European level by promoting affordable financing for purchasing sufficient, efficient and renewable-based houses.

To harness the potential of these medium/long-term sufficiency instruments, both should be combined with facilitator instruments such as the **FI9 Energiesprong retrofit** and **FI10 Built Environment Accountability via Blockchain Technologies**, reinforcing the SER approach to the decarbonisation of buildings by leveraging energy efficiency and renewable projects. The **FI9 Energiesprong retrofit** introduces a new role for the landlords through a cost-neutral business model. The cost of installation is offset by long-term savings and income equal to or greater than the value of the work. This makes Energiesprong an extremely cost-effective route to achieve decarbonisation as well as delivering multiple other benefits including eliminating fuel poverty and providing resilience to future temperature rises. Large amounts of homes could benefit directly from Energiesprong retrofits. The approach could indirectly benefit many other homes through multiplying effects such as cost reduction of components and innovations in business models.

Landlords would be the new energy provider, which could create an additional problem. It could be challenging for individuals to act as an energy provider company. In this sense, the regulatory framework should be improved to incentivise landlords to take this role. For tenants, it could be challenging as well as the landlord would be their only option for energy supplier. Therefore, a change in mindset is required to introduce this scheme as a real alternative. Thus, this instrument is recommended to be implemented on a long-term basis.

In the case of **FI10 Built Environment Accountability via Blockchain Technologies**, its applied development and implementation on sectors as the construction is still in its infancy. Therefore, its implementation is also recommended on a long-term basis once the fintech sector reaches its maturity.

## CIRCULARITY SCENARIO

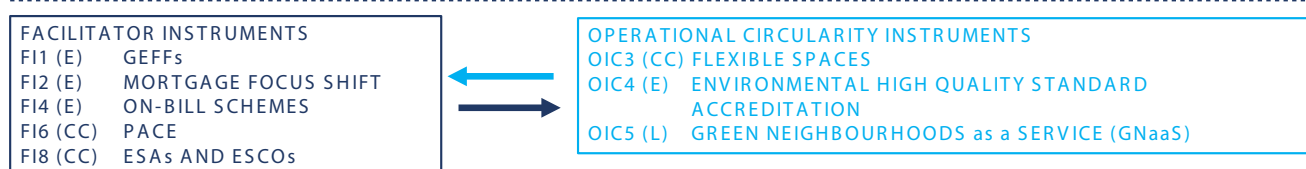
This scenario includes instruments, financial schemes, and economic incentives that promote circularity into the built environment sector. It is recommended to combine these sufficiency schemes with some of the identified facilitator instruments (*Figure 7 and 8*).

### SHORT-TERM CIRCULARITY SCENARIO

Operational circularity instruments considered in this scenario are those whose feasibility is medium or high. Short-term circularity scenario includes facilitator instruments with high feasibility and a positive impact on the households' equity circularity instruments.

The following instruments set the conditions for the implementation of circularity instruments on a short-term basis: **OIC3 Flexible Spaces**, **OIC4 Environmental High Quality Standard Accreditation**, **OIC5 Green Neighbourhoods as a Service (GNaaS)**.

## SHORT-TERM CIRCULARITY SCENARIO (2030)



**Figure 7. SHORT TERM CIRCULARITY SCENARIO.** Proposed combinations between Operational Circularity Instruments and Facilitator Instruments aiming both, short term decarbonisation goals Source: Own elaboration

**OIC5 Green Neighbourhoods as a Service (GNaaS)** envisages the establishment of a central entity in a city or region that designs, commissions, manages and funds deep energy retrofit on a street-by-street scale with incremental community investments at no cost to the property owners regardless of ownership and usage typology. Contracting all the energy and maintenance savings to the GNaaS organisation would maximise the potential for return-based finance in the funding model. This instrument must be combined with financial schemes enabling financing access on favourable conditions for central entities. Thus, the establishment of Green Economy Financing Facilities (GEFFs) through the European Investment Bank or the establishment of advantageous interest rates by the European Central Bank for those financial institutions that facilitate access (Mortgage Focus shift) to purchase and renovate with circular criteria through financing would complement the GNaaS.

Additionally, GNaaS will enable, through the central entity (operating as a central purchasing office or one-step deep renovation focal point), a secondary raw materials market at a district or neighbourhood level, setting the baseline to spread a built environment circular market between different GNaaS. To do so, an additional provision requiring the purchase of a certain percentage of refurbishment material directly from the central entity should be included as part of the contract between the parties. Finally, this circularity instrument must be implemented with specific governance structures that include public participation aiming at aligning the decision-making processes with the overall goals of the city, by creating a mechanism for social outcome goals to be included in contractual terms.

In order to boost circularity in the built environment at a local level, the implementation of GNaaS should be accompanied by an **OIC4 Environmental High-Quality Accreditation** scheme. Real study cases showed a high social acceptance as well as the inclusion of all actors towards improving the energy performance of buildings. Furthermore, the use of resource efficiency criteria in the building sector is well-considered among users. Moreover, these standards were tested and proven to be efficient in different scenarios and sectors. In Switzerland, the MINERGIE label is a success, and its widespread application covers the entire building market. To be applied to the European context, some minor barriers must be overcome through specific policies and regulations in order to achieve full development, broad dissemination, and a clear pathway to adapt to the current market must be implemented. There are notably: a lack of studies on the potential uses of secondary materials and a lack of confidence of the consumers and the market to use secondary raw materials or reused components. Thus, applied research on establishing a strong secondary raw materials market and regulatory changes should also be considered.

The implementation of **OIC3 Flexible Spaces Business Models** seeks to list existing, underutilised building spaces for short-term use through online platforms. The spaces could be completely unused or in use but under-occupied. This instrument relies on the need for land use flexibilization to permit different ways of filling the buildings. Without that, zoning regulations will pose significant challenges to carrying out this scheme. Depending on the lease agreements, either one of the following three parties could be responsible for arranging additional tenants to rent one space: landlords, anchor tenants and third party operator.

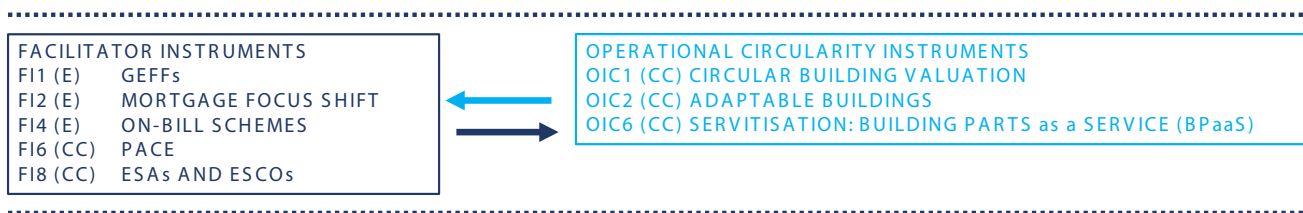
If existing spaces are used more smartly and to their full potential using new circular business models, there is no need to built new spaces. The scheme provide people in need of short-term spaces with the opportunity to access livable spaces. Ifthe already existing vacant places need deep renovations, should also be accompanied by instruments like **FI4 On-Bill schemes**, **FI6 Property Assessed Clean Energy Programs (PACE)** and **FI8 Energy Service Agreements (ESAs) and Energy Services Companies (ESCOs)** that enable high upfront funding solutions.

As happened in the Sufficiency Scenario, the implementation of **FI1 Green Economy Financing Facilities (GEFFs)** and **FI2 Mortgage Focus Shift** (new proposed instrument) will both allow the local banks to offer loans and/or mortgages with better conditions when adoption of more sustainable approaches. This solution will guarantee enough funding and credit possibilities when combined with **OIC3 Flexible Spaces**, **OIC4 Environmental High Quality Standard Accreditation**, and/or **OIC5 Green Neighbourhoods as a Service (GNaaS)**.

### MEDIUM/LONG-TERM CIRCULARITY INSTRUMENTS

The medium/Long-term circularity scenario includes circularity instruments with a positive or medium impact on household equity but with low or medium feasibility requiring major changes to be implemented. In contrast, facilitator instruments remain identical to the short-term scenario. The following instruments set the conditions for the implementation of circularity instruments on a long/medium-term basis: **OIC1 CIRCULAR BUILDING VALUATION**, **OIC2**

#### MEDIUM/LONG-TERM CIRCULARITY SCENARIO (2050)



**Figure 8. MEDIUM/LONG-TERM TERM CIRCULARITY SCENARIO.** Proposed combinations between Operational Circularity Instruments and Facilitator Instruments aiming both, short term decarbonisation goals Source: Own elaboration

ADAPTABLE BUILDINGS and OIC6 SERVICITISATION: BUILDING PARTS AS A SERVICE (BPaaS).

**OIC6 Servitisation: Building Parts as a Service (BPaaS)** is a financial scheme where the customer pays a fixed fee per unit of service consumed, while the ownership of the system remains with the set provider, who continues to be responsible for all operational costs. This model incentivises the equipment owner to think long-term when designing and selecting the materials and the technology applied. Servitisation should also be accompanied by circularity criteria, such as the obligation for the technology provider to employ a certain percentage of materials coming from circular markets. However, it presents multiple behavioural barriers as servitisation values awareness among the final clients and having the right skills, people, and technology on the ground to implement servitisation or gain customers’ trust in the contract.

Besides the difficult implementation of Servitisation, the Circular Building Valuation and the Adaptable Buildings instruments also have major barriers to be implemented in the short-term. These two additional business models, despite their promising effects on reinforcing circularity to decarbonise the built environment, present low feasibility due to the regulatory and behavioural barriers from the users that the real estate market presents to the adoption of such schemes. Thus, regulatory and behavioural changes are needed, as well

as changes in the organisation and development of the real estate sector itself.

The **OIC1 Circular Building Valuation** reinforces the secondary building raw materials market by involving the creation of a new contract against the future prices of those materials. It is designed to ensure that the true value of building materials is captured and recovered when they are removed from a building, thus creating an incentive to keep those materials in use as long as possible. Prior to the development of this complementary business model, regulatory and operational major changes in the industry are needed to lay the groundwork for its implementation. These include material passports, provenance rules, blockchain and digital twins.

Finally, the **OIC2 Adaptable Buildings** scheme rewards space-saving living conditions and facilitates housing that meets the needs of households at every moment of their lives. There are enormous advantages of introducing these schemes in the real estate market from a circularity perspective. For this reason, its application should be encouraged. However, it might take some time, as it introduces significant changes in the current state of the market because it challenges part of the logic of the sector, which favours the construction of more square metres to maximise the profitability of the investment.

In summary, the application of Servitisation in combination with the Circular Building Valuation scheme will be appropriate on a long-term basis. These two circularity instruments should also be accompanied by facilitator instruments such as **FI1 Green Economy Financing Facilities (GEFFs)** and **FI2 Mortgage Focus Shift** or additional instruments like **FI4 On-Bill schemes**, **FI6 Property Assessed Clean Energy Programs (PACE)** and **FI8 Energy Service Agreements (ESAs)** and **Energy Services Companies (ESCOs)** that contribute to the

## 3.3 POLICY RECOMMENDATIONS

decarbonisation of the built environment.

Several policy recommendations emerge as a result of this research and analysis. Many of them correspond to regulatory aspects that allow the adaptation of the construction sector to new production models. Still, many others are based on changes in the behavioural model, in the incentives existing in the real estate market or in other aspects. The following policy recommendations are proposed as a result of this study.

### REAL ESTATE SECTOR

- Policymakers must start focusing on scientifically translating climate pledges into meaningful carbon reduction pathways for real estate owners and investors. A certain and clear roadmap for the real estate sector with stable targets would guide investors in their mitigation measures and enable strategic planning of associated budgets and resources. Such pathways must be (1) science-based/reliable, (2) enable long-term planning, (3) differentiate between countries, sectors and use types.
- Establishment of meaningful milestones for the deployment of sufficiency and circularity business models into the real estate market. Setting medium and long-term targets for using secondary materials directly linked to the real estate sector or setting reference criteria (e.g., m<sup>2</sup> by dwelling) for considering a sufficient surface per person will be essential to help the sector to adapt to the SER framework. Additionally, efforts to set a coherent and unified discourse on sufficiency, efficiency, circularity and renewables must be put in place through a joint and systematic SER framework.

- The policy landscape for the decarbonisation of existing buildings is fragmented and often contradictory to reaching the targets of the Paris Agreement. Currently, the attainments of the sector have come about more because of self-governance (private environmental standards as BREEAM or LEED) rather than regulation, and on the back of actions by investors and owners, who have actively embraced their environmental responsibilities. A more joined-up approach is needed (through a joint framework), and a clear pathway must be implemented. One possible way to achieve a joined-up and holistic approach to the sector could be to adopt and refine private sector initiatives by regulators for public-private collaboration.
- To leverage private investment, blended and structured finance should be reinforced, combining private and public investment through specific schemes pursuing renovation or retrofitting projects related to sufficiency, circularity and the SER framework. This is also a way of addressing undesirable risks derived from the novelty of the built environment decarbonisation approaches.
- Efforts must be put in place to develop financial schemes and economic incentives through the entire life-cycle of buildings. After carrying out this research, one of the main findings has been the lack of instruments on the product, construction and end of life stages. There is a higher concentration of financial schemes and economic incentives in the use phase of the building. This may be because the vast majority of financial schemes and incentives privilege efficiency over circularity and sufficiency. Therefore, research and development of schemes and incentives that promote the adoption of sufficiency and circularity criteria in the sector during not-use phases of the life cycle of buildings should be strengthened.

#### DATA STANDARDISATION

- Introducing data collection standards and methodological consistency is essential. Enhanced real estate data standardisation is needed to provide robust and credible evidence of carbon emissions and transitional risks attributable to decarbonisation. Future data collection methodologies must address all emissions related to the built environment. This includes the embodied carbon of new buildings and major retrofit works. Policymakers must strive to improve data capture pertaining to embodied carbon emissions and initiate consistent and robust methodologies to allow for meaningful impactful analysis over the lifecycle of buildings. Additionally, controlling and measurement aiming at avoiding relying on purely modelled data must be improved.
- There is a lack of studies on the potential uses of secondary materials and a lack of confidence in the consumers and the market. Thus, applied research on the establishment of a strong secondary raw materials and reused products market and regulatory changes to reinforce the legitimacy of the reused and recycled materials standards should be implemented in order to boost secondary raw materials markets.
- The standardisation of European Mortgages with the Paris Agreement using Mortgage Portfolio Standards must be accomplished. For this purpose, the Energy Performance Building Directive must be revised to introduce compulsory publication of energy performance certificates and real energy consumption data in property assessment, as well as including Mortgage Standards for all mortgage lenders. Furthermore, specific standardisation to sufficiency and circularity must be accomplished by including the SER

framework comprehensively at the EU policy level, including the EPBD.

### CITY-SCALE DECARBONISATION

- Local and regional authorities are key in the process of decarbonising the built environment as it is at this level of government that economic incentives and housing policies are enacted. However, these authorities may not be taking a sufficient lead in the development of such processes, which have been reserved in many cases to the state so far. The articulation of local policies to deepen the role of this level of administration in the process of decarbonisation of the built environment is recommended. Specific measures could include the creation of public or public-private agencies acting as one-step deep renovation promoters aiming at fostering renovation, rehabilitation and improvement projects in accordance with the SER framework and circularity criteria.
- Decarbonisation of the built environment needs to be fully immersed within future local development and urban plans and associated infrastructure provisions. Municipalities have a key role to play in creating an enabling landscape for decarbonisation through economic incentives such as living space bonuses through ONE-STOP SHOPS (OSSs) or the development of ambitious renovation plans (GNaaS, (Net) Zero Emissions Building Catalyst policies, etc), as well as positioning themselves as “ iconic examples of best practice” in order to attain a competitive edge in attracting business and investment for the decarbonisation of the built environment.
- Local authorities need to support the upscaling of green retrofit solutions through the assembly of public sector asset portfolios and the development of long-term finance plans. Enhancing investment in research and development and innovative retrofit solutions requires economies of scale and a pipeline of project opportunities. Municipalities also have a key role in exploring innovative ways to borrow and invest in deep retrofit projects alongside the private sector.

### SUFFICIENCY

- New innovative business models promoting sufficiency criteria should be reinforced with specific measures to enable new ways of living. Aiming at reducing surface per capita and spreading the benefits of sufficiency, efforts to find new ways of living (shared dwellings, co-ownership, etc) according to the specific needs of the dwellers should be posed. Thus, compared to individual ownership, cooperative houses and offices (cohousing, co-living, coworking) are a model which often allows for easier change of size and structure and thus it can be adapted to increase or shrink space requirements.
- There is widespread lack of awareness of the concept of sufficiency and criteria associated among the main players in the real estate sector. Some of the business models proposed by this sector are in line with sufficiency criteria, but there are no reference values that serve as clear guidelines for the development of this type of practices. Thus, efforts must be made in two directions: on the one hand, sufficiency must be made known within the sector through communication policies that establish ambitious dissemination objectives and, on the other hand, technical criteria must be developed (m<sup>2</sup> per person of reference according to certain variables, common spaces, redensification policies, etc.).
- Implement a progressive property taxation scheme replacing the baseline in kWh/m<sup>2</sup>\*yr with a consumption baseline where, in addition to the m<sup>2</sup> of the dwelling, and the number of people living in the dwelling are considered, to achieve an efficient use of living space through sharing spaces and new ways of living. One of the main challenges facing the sufficiency instruments is related to behavioural change in the real estate sector. In order to achieve a change in the mindset of the real estate sector, clear and durable policies

are needed to avoid uncertainty and provide clear and stable guidance to incentivise asset portfolio shifting.

### CIRCULARITY

- Increase flexibility of use in zoning (urban plans) rules will bring new business models for the real estate sector allowing the mixed uses in the existing vacant slots and spaces, which otherwise could not be used. Land flexibilisation could have significant negative effects, so it will be necessary to limit such flexibilisation to the built-up city through the establishment of boundaries in order to avoid gentrification and property speculation. To this end, limits will be set according to criteria related to density, compactness and metropolitan character.
- Economic and fiscal incentives should only be available for new buildings that fulfil criteria above standard, such as positive energy buildings, buildings with high percentage of secondary raw materials, high use of renewable resources and buildings designed to be adaptable and reversible.
- Financial support for buying shares in cooperative schemes should be implemented. Investment grants for housing cooperatives are necessary because they do not profit from depreciation rates like the commercial housing construction. The grants must include an upper limit for living space measured in m<sup>2</sup>/person (e.g. 30m<sup>2</sup> for a single person and 15m<sup>2</sup> for every additional one).

### TACKLING ENERGY POVERTY

- The issue of energy poverty and vulnerable households should be streamlined into every aspect of the policies and programmes' design and implementation to address distributional effects and ensure that consumers in vulnerable situations are not negatively impacted. Green mortgages and green loans must be available to consumers clearly, easily accessible, comprehensible, and coherent. Additionally, vulnerable households must benefit from specific financial products, especially designed and easily available. The introduction of an EU renovation loan through the EIB, to achieve a fair and cheap deep renovation funding to all.

### ONE-STEP DEEP RENOVATIONS

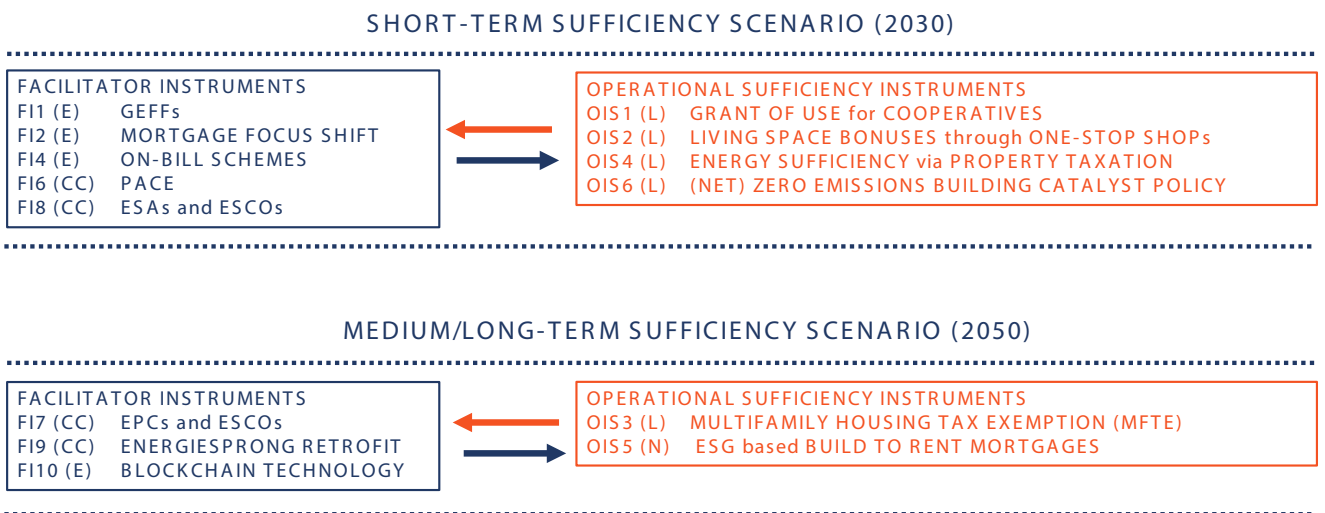
- Improve the regulatory framework that complicates the application of innovative formulas to achieve public-private blending financing approaches that cover high upfront capital expenses and transaction costs. While grants and subsidies can provide additional incentives, they may not be enough to completely alleviate the first-cost barriers of one-step deep renovations.
- Make deep renovation the business-standard. Renovations should be one-step (or as few as possible) deep renovations with integrated interventions.
- ONE-STOP SHOPS' organisations should be based on front-office (information and advice) and back-office (streamlined and interconnected processes mutualised by financial institutions, utilities companies, clients, etc.) services.
- The ONE-STOP SHOPS should focus on providing technical assistance capacities to the potential users, addressing all user profiles, including vulnerable households, via specific support for their retrofit project. The one-stop-shops should also take a more active role in changing the behaviour of the stakeholders within the building sector through consultation, co-construction of scenarios, participation and social awareness at a neighbourhood level.
- The funding of ONE-STOP SHOPS should be addressed at a regional or local level to be operational during the development of urban plans and deep neighbourhood renovations.

# 3.4 CONCLUSIONS

The objective of this research has been to map, analyse series of financial instruments and economic incentives that promote (Net) Zero Emission Buildings (considering operational and embodied emissions) and facilitate the achievement of the Paris climate goals and provide different scenarios to establish a roadmap for the decarbonisation of the building sector. Additionally, through the documentation of the different instruments, key concepts for the decarbonisation of the built environment have been presented around circularity and sufficiency approaches at European, national and regional/local levels.

The report provides recommendations upon the existing conditions and implications for implementing circularity and sufficiency-based solutions to complement energy efficiency and renewable actions in the built environment according to a more comprehensive SER framework: Sufficiency, Efficiency and Renewables. The incentives and schemes presented also focused on key aspects of circularity, such as the extension of life span, reuse and reparability of materials, and adaptability and reversibility of buildings. To accompany sufficiency and circularity oriented instruments, facilitating tools have also been described as necessary components of the scenarios to unleash sufficiency & circularity measures to decarbonise the building stock.

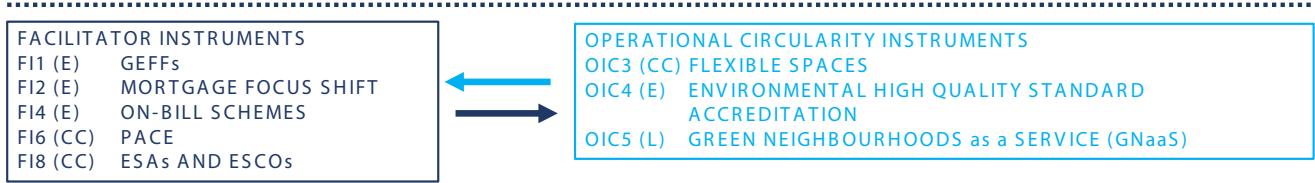
Having gathered the main instruments resulting from the research and classified them according to their thematic approach, feasibility, socioeconomic impact and geographical scope; we proposed 4 scenarios (short-term sufficiency scenario, medium/long term sufficiency scenario, short-term circularity scenario and medium/long term circularity scenario) that contribute to the decarbonisation of the built environment. Feasibility and the impact of these instruments on households' equity have been taken as the main factors when assessing the time horizon of the four scenarios.



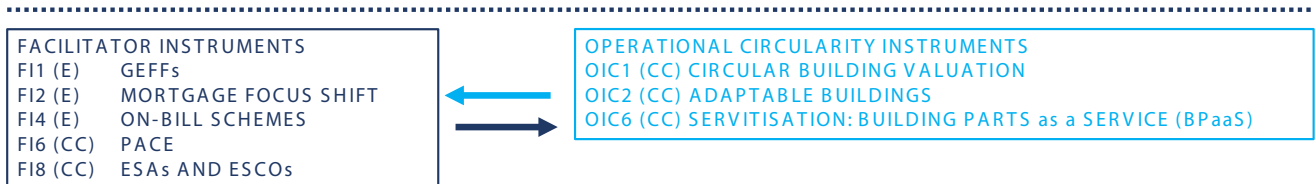
**Figure 9. SUFFICIENCY SCENARIOS.** Proposed combinations between Operational Sufficiency Instruments and Facilitator Instruments Source: Own elaboration



## SHORT-TERM CIRCULARITY SCENARIO (2030)



## MEDIUM/LONG-TERM CIRCULARITY SCENARIO (2050)



**Figure 10. SCIRCULARITY SCENARIOS.** Proposed combinations between Operational Circularity Instruments and Facilitator Instruments Source: Own elaboration

The first scenario includes those instruments whose feasibility is high or medium and whose impact on the social equity of the households is positive. The instruments proposed under this scenario can be carried out in the short term with minor changes to overcome some barriers. These instruments are Grant of Use for Cooperatives, Living Space Bonuses, Energy Sufficiency through Property Taxation and (Net) Zero Emissions Buildings Catalyst Policies. As happens with instruments that promote circularity in the short term, those promoting sufficiency criteria in the built environment should be accompanied by the following facilitator instruments to reach their full potential: Green Economy Financing Facilities, Mortgage Focus Shift, Property Assessed Clean Energy Programs, On-Bill schemes and Energy Service Agreements.

The Facilitator Instruments that have been selected in this report create the necessary conditions for sufficiency and circularity instruments to work. Besides, they aim to solve barriers like high upfront cost, minimum consumer access to credit, unavailability and poor quality of credit information to allow lenders to assess consumers' creditworthiness and/or lack of awareness of available credit options. Consequently, their implementation will enable successful amalgamation with Sufficiency and Circularity financial instruments and economic schemes.

The second scenario includes instruments related to sufficiency with low feasibility and a medium or negative impact on households' equity. These are proposed to be implemented on a medium/long term basis due to the need first to overcome their multiple operational barriers (regulatory, behavioural and sectorial).

The third scenario includes those instruments related to circularity with high feasibility and a positive impact on households' equity and whose implementation is proposed for the short term due to the lack of significant barriers to their implementation and their potential to impact sufficiency and circularity variables. Among the instruments included in this scenario are: Flexible Spaces, Green Neighbourhoods as a Service (GNaaS) and Environmental High-Quality

Accreditation.

Regarding the long-term scenario related to circularity, the following instruments are proposed: Circular Building Valuation, Adaptable Buildings and Servitisation: Building Parts as a Service. They are proposed for a medium/long term implementation due to the existing regulatory and behavioural barriers to their implementation. Compared to the third short term scenario, these instruments require a more radical change of mindset in the real estate sector before being put in place.

As a result, the integration of circularity and sufficiency in short term scenarios should be encouraged, as they could mutually reinforce and are associated with the same facilitator instruments. Whatever the scenario, efforts to address circularity and sufficiency awareness of the real estate sector must be implemented.

Among the main policy recommendations obtained through the research, the need to further explore the development of schemes related to sufficiency and circularity in the early stages of the life cycle of buildings must be highlighted. Existing instruments only cover the use phase of the building and do not consider embodied emissions. To this end, clear targets and pathways should be established to encourage the emergence of new business models in these phases. The integration of certain circularity and sufficiency approaches in the existing regulatory framework, and its future revisions (EPBD, CPR, The Waste Framework Directive) to the current EPBD should be a priority.

Although circular and sufficiency schemes and incentives have been attempted to be applied through a holistic conception of the building life cycle, from product planning and manufacturing to the end-of-life phase, the research conducted has proven to be unsuccessful in identifying these instruments in the initial phases of the building life cycle, as well as beyond the end of the building's life.

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# ANNEXES

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# A.1 OPERATIONAL SUFFICIENCY INSTRUMENTS

**OSI1:**

## GRANT OF USE for COOPERATIVES

<b>Title</b>	Grant of use, Free Lease Agreement (United Kingdom and Commonwealth) or Assignment for Use (USA) for Co-op		
<b>Time frame</b>	Long -term	<b>Administration level</b>	Local

### Brief summary

In the model of cooperative housing ruled by grant of use, the property will always be collective, while use is personal. Residents have the status of cooperative partners and can live there for life. The General Assembly is the main sovereign institution where the decisions are made. This model eliminates property speculation and profiteering on a fundamental right like housing. Members cannot sell or rent the flat. It is an alternative model of housing access to the traditional ownership and rent, with a strong commitment to the use value above exchange value. Several stakeholders are needed to find the most affordable land. Agents like Municipal Living Space Agencies or Real Estate agencies should be implemented at the local level.

### Socioeconomic impacts

Everyone, no matter the socioeconomic position or age, will profit from this form of organisation as share and communal spaces have a great interest on them.

Promotion of the acquisition of cooperative shares should be improved. Since cooperatives are not taxable, unlike commercial housing, they cannot benefit from the high depreciation rates in new rental housing and should therefore receive an investment allowance to compensate it .

<b>Impact (ranging 1 to 10)</b>	8	<b>Feasibility (high, medium or low)</b>	Medium
<b>Related to</b>	Sufficiency. Through this incentives efficient use of living space and reduction of the floor area per capita are achieved. The ability to choose an adequate (neither too limited nor oversized) per capita living size is one of the most important steps towards sufficiency.		

### Study Case

#### Case 1. La Borda in Barcelona.

The la Borda process was launched in 2012, within the context of a program to recover Can Batlló, where a group of neighbours set up a group to collectively address the issue of access to housing through a cooperative system.

The architects' cooperative got involved from the beginning with the idea of providing an alternative to the severe housing crisis in Barcelona. This involvement brought along the opportunity to rethink the production of affordable housing from the bottom up and with future users as active participants in the process.

Deciding on a community model instead of state or private developments makes it possible to overcome some of the limitations common to these. In the case of state promotions, not knowing who the future user will make it impossible to implement variations on standard lifestyles; and the market logic rules in the case of private housing, designed to become a commodity. The innovation in the promotion process has been essential to developing the architecture beyond its form. Two features of the model have a direct effect on the project.

The first is self-promotion. The members of the association direct, control, and develop the whole process by means of an internal structure that favours direct participation. The involvement of users is one of the main strengths of the project and its starting point.

The second is the assignment for the use of the property. The building belongs to the cooperative, and the plot is publicly owned, so only the actual use of the dwelling has a value, and speculative interests are kept at bay.

Title	Living Space Bonus: Moving Bonus and Living Space Bonus: Exchange Bonus		
Time frame	Medium-term	Administration level	Local and regional implementation (National support needed for fiscal and regulatory framework)

**Brief summary**

Living Space Bonuses are a set of blended (fiscal, regulatory and information instruments) that reward space-saving living measures and facilitate housing that meets the needs of households at every moment of their lives without a considerable rent increase.

**01 Fiscal:**

LSB: Moving Bonus is tax deduction amounting from 10 to 20% with a maximum of € 1,500 of the rent per year to individuals that move to smaller apartments and reduce the living space area per capita, which means that the tax burden is reduced by up to € 1,500 per year. The tenant could move to another unit or a lock-off unit or room (subleasing) within another household.

LSB: Exchange Bonus is tax deduction amounting from 10 to 20% with a maximum of € 1,500 of the rent per year to individuals that exchange apartments and reduce the living space area per capita and area of unused space, which means that the tax burden is reduced by up to € 1,500 per year.

**02 Regulatory:**

In general, instruments seeking efficient use of space require an increase flexibility in building use regulations. This can happen for example through allowing for building micro-apartments, lock-off units, infills or regulating density, number of dwelling units or number of rooms per unit. A shift from ownership to usership should also be implemented. The right to exchange apartments should be introduced in the tenancy law section of the Civil Code. This will legally allow exchanging flats between the tenants of two different flats without rise of rent (except flats where the land-lord lives in the same house with not more than two flats).

**03 Information:**

A ONE-STOP SHOP (OSS) should be created. A municipal contact point should provide citizens with low-threshold access to information and moving, sublease and home exchange advice that contributes to the efficient use of buildings (e.g., financial, and legal advice, building code consultancy, support for relocation, search of smaller apartments, leasing and exchange facilities, monitoring vacancies.)

**04 Similar instruments:**

Fiscal Relief for subletting: tax reduction for long-term subleasing room in the own household not for touristic leasing.

Subsidies for small flats: fiscal benefits and subsidies for developers when building small flats (average of 40 m<sup>2</sup>) if communal facilities are provided. There are bigger advantages for built to rent and/or affordable houses.

## Socioeconomic impacts

To be able to reach this target group, the action point must be local and easily accessible, which is why the municipal/regional level is particularly suitable for implementation. The national government should support this financially, though.

Main target groups: elderly people living on more than 80m<sup>2</sup>, young families or students. Older people living alone could swap their apartment, which they felt was too big, with young families without increasing rent. Students and the elderly could share apartments. So far, this has already been done voluntarily, primarily within housing associations.

Oriented for rental housing more than for ownership, this tax credit will mostly have a positive impact as it serves to improve floor area per person, the main sufficiency indicator, while adaptable building use regulations could bring more and more affordable flats on the market.

The difficulty of finding free, smaller apartments and the costs of moving (double rent payments due to time overlaps) might be additional obstacles. This instrument solves both the economic barriers and the current lack of information. It could be very appealing for couples with children. However, one fundamental problem remains: many older people do not want to give up their homes. Loans or subsidies for splitting houses could be an alternative in this case.

This measure should be the beginning of a new rental oriented Real Estate Sector, able to provide housing that meets the needs of households at every moment of their lives without considerably increasing rent.

It is more likely that wealthier population groups will benefit from this measure; however, having it in place does not harm lower-income groups. As an additional side effect, this would bring bigger apartments/houses on the market again for larger families or shared housing. Benefitting households that move to smaller dwellings can be an important signal to take up societal debate on per capita living space.

<b>Impact (ranging 1 to 10)</b>	7	<b>Feasibility (high, medium or low)</b>	Low
<b>Related to</b>	By means of these Living Space Bonus scheme, a more efficient use of living space is incentivised, and additionally, a reduction of the floor area per capita is enabled. Thus, this instrument facilitates housing sizes that meets the needs of households at every moment of their lives without a considerable rent increase.		

## Study Case

### Case 1:

The Interim Center ZZZ - ZwischenZeitZentrale in Bremen already acts as a Municipal Coordinator Office (MCO) and manages a database and offers legal and financial advice for temporary use of vacant buildings and brownfield sites. It has been very successful as the owners generate income again, their property is cared for and gets a new positive charisma. Unused areas, on the other hand, cause unnecessary costs, attract vandalism, and have a negative impact on the outside world. The entire district can therefore benefit from temporary uses. Vacancies, Brownfield + idea - low rent = maintenance of the property + career opportunity + revitalization

### Case 2:

The city of Frankfurt am Main has already implemented a bonus program for tenants of under-occupied social housing when moving out of social housing if the current apartment is too large and the new apartment is smaller. In Frankfurt am Main, many tenants live in social housing that has become too big for them, for example, when their children have moved out. These tenants agree to move to a smaller apartment. On the other hand, several thousand families with children are waiting for a 3-, 4- or 5-room apartment, who currently must live in apartments that are far too small. This program helps tenants who are willing to move from the so-called "under-occupied" apartments.

### Case 3:

In North Rhine-Westphalia, Berlin and in Vienna, state-owned housing companies offer internal exchange opportunities. The six state-owned companies have a joint internet portal coordinated by the Association of Berlin-Brandenburg Housing Companies, BBU for short. A total of 310,000 apartments that keep the rental conditions of the previous tenant are available for exchange. So far, there have been around 30,000 exchange suggestions, but only 163 times did both sides agree to an exchange. Of these 163 registered exchanges, 114 have been processed so far, of which 60 have led to an exchange. Swapping an apartment, in theory, sounds easier and more promising than it often is in practice. Senior citizens, for example, hardly use these instruments, even if it is cost-neutral. Because they are very attached to their own apartment, where they have lived in some cases for 20 years or more. There is no panacea; however, it is one of many small measures that can help in individual cases and must therefore be advertised more intensively. As a solution to this, an alternative being studied is dividing the big apartments. If this is the case, strong policies and regulations should be promoted (addressing livability aspects, dwelling sizes, communal space etc. ) to avoid real state speculation.



Title	Multifamily Housing Tax Exemption (MFTE)		
Time frame	Medium-term	Administration level	Local - Regional

**Brief summary**

**01 Fiscal:**

The Multifamily Housing Tax Exemption (MFTE) is a property tax exemption program that allows eligible cities to target specific areas for multifamily housing development. Property owners may apply for an 8-year or 12-year property tax exemption for building or rehabilitating multifamily housing. The 12-year exemption requires owners to offer at least 20 percent of their units as affordable housing, as de-fined by statute.

**02 Regulatory:**

Cities can use discretion to increase permitted floor area, density, and number of dwelling units if social and environmental sustainability is achieved (measuring and reporting methods to be unified)

Also, for horizontal densification, reduce requirements for minimum distance in case of retrofits, securing legal compatibility with neighbour rights, technical and urban development

Cities have the authority to approve and reject individual projects.

**Socioeconomic impacts**

The preference is intended to stimulate the development of new and rehabilitated multifamily housing – including affordable housing. Models indicate that the preference can increase the financial performance of developments. It’s unclear how often MFTE provides an incentive to projects that would not otherwise be built.

Impact (ranging 1 to 10)	7	Feasibility (high, medium or low)	Medium
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**Related to**

This instrument eases Horizontal and Vertical densification as part of sufficiency strategies. Efficient use of living space is also encouraging as multi-family dwelling are prioritise over single-family houses.

**Other related efficient use of living space instruments**

**Property tax exemption, permit fee and expedition timing reduction for Additions, Infill, and multiple conversion dwelling in association with the Retention of a Character House:** pertain to the approval of conditional floor area for additions to a character house, the approval of the conditional uses of infill and multiple conversion dwelling, and the approval of certain development relaxations, when associated with the retention of a qualifying character house.

**Tax advantages for vertical densification:** support vertical densification by tax advantages (e.g. increase depreciation percentage).

**Bonus for house-top storey addition for an additional unit space:** investment support + incentives for energy efficient building.

Title	Energy sufficiency via property taxation		
Time frame	Long -term	Administration level	Local

**Brief summary**

The solution proposed by Griet Verbeeck (UniHasselt) is to change the methodology for measuring the efficiency of energy performance by replacing the energy label where kWh/m<sup>2</sup>\*yr is measured by the consumption label where, in addition to the m<sup>2</sup> of the dwelling, the number of surfaces and the number of people living in the dwelling are considered. The new calculation formula for the progressive taxation would be kWh/pp.yr, where house size and household do impact.

How to incentivize? ---> bonus/malus system on tax tariff

1. Define neutral consumption label
2. Reduction (bonus) on tax tariff if consumption < neutral;  
penalty (malus) if consumption > neutral
3. Set up roadmap for stepwise strengthening neutral label towards long-term goal

This scheme complements the term efficiency by sufficiency aiming at measuring the energy performance of a building. This shift on the measurement implies a reduction (bonus) on tax tariff if consumption < neutral; penalty if consumption > neutral. Thus, households have the opportunity and time to adapt and to anticipate to the retrofiting needs.

**Socioeconomic impacts**

If no additional measure is taken, the cost of adaptation is borne by households. In case no measures are designed to support the most vulnerable families, this scheme could deepen inequalities to access retrofiting. To avoid this, rental social housing for the most vulnerable families should be built with the money collected from this measure. Additionally, this taxation should be balanced with a bonus related to the dwelling size. Also, local authorities should guarantee a percent of dwellings of affordable housing for vulnerable families.

Furthermore, aiming at reducing sprawl, cities should change their zoning regulations in order to introduce barriers to single-family homes. Permitted uses should prioritize mixed-uses and multiple-family dwellings.

Impact (ranging 1 to 10)	6	Feasibility (high, medium or low)	Medium
Related to	This scheme could be related to boosting energy sufficiency in the households by introducing incentives to promote lower energy consumption rates. Additionally, this scheme supports the introduction of urban planning incentives to fight against urban sprawl and energy loss, and also make it possible to revitalise city centres, to design urban development in a global way by harmonising guidance documents and planning documents drawn up at conurbation level as well as preserving biodiversity, ensuring efficient management of resources and space and creating a link between density and public transport service levels.		

Title	ESG (Environmental, Social and Governance) based Build to Rent Mortgages as a type of Sustainability Linked Loans (SLL)		
Time frame	Short-term	Administration level	Local, National
Brief summary	<p>ESG stands for environmental, social, and governance, and it refers to the three most important variables to consider when assessing the long-term viability and ethical effect of projects.</p> <p>Build to Rent (BTR) is property development that is designed with the sole intention of appealing to the rental market as opposed to long-term home ownership.</p> <p>ESG based Build to Rent Mortgages seek to reward developers who include socially, environmentally or/and economically sustainable aspects in their BTR projects by offering them a lower interest rate than they might otherwise pay. The rate these developers/customers pay is adjusted as a result of them achieving their agreed sustainability targets. These projects seems to have a lower risk, so more affordable conditions could be offered by banks or other institutions.</p>		
Socioeconomic impacts	<p>Banks argue that businesses with clear ESG strategies are generally better run and less likely to default on their loans.</p> <p>Companies can leverage their ESG performance to improve their bottom line and their company's overall ESG performance through Sustainability Linked Loans (SLLs). SLLs give borrowers the opportunity to apply the loan toward general business purposes as the terms are tied solely to the borrowers ESG-related performance and not the use of proceeds or the projects financed. This flexibility has made the SLL a popular alternative to traditional capital raising and debt.</p> <p>ESG framework focuses against climate-related disruption and social inequity but could be hard to implement due to the lack of instruments to measure real environmental goals. There is a huge possibility of impact-washing (purpose-washing), so a third party verification should be included in the equation. The idea of linking them to rental projects could provide more and more affordable houses for low income households as well as proving housing access to young families.</p>		
Impact (ranging 1 to 10)	8	Feasibility (high, medium or low)	High
Related to	<p><b>Circularity.</b> ESG (Environmental, Social and Governance) and Circular Economy are both interconnected as all the novel sustainable ideas and innovations that investors are seeking are possible to move faster towards circular economy. Global and homogeneous circular KPIs should be implemented to achieve equity in all projects.</p> <p><b>Sufficiency.</b> Through application of ESG mortgages sufficiency actions like efficient use of living space, reduction of the floor area per capita could be achieved. Identifies sufficiency KPIs identified to measure ESG performance could be m<sup>2</sup> living space/capita, m<sup>2</sup> unused living space, density capita/area. Also there is a clear switch from ownership to usership with this approach.</p> <p><b>Renovation Wave.</b> These ESG based mortgages could also achieved a one-step big renovation as the conditions for the mortgage are favorable for a life cycle whole carbon approach reducing both, operational and embodied emissions.</p>		

### Case 1. Vancouver. Six-storey rental housing on major streets.

As part of Secured Rental Policy (SRP), the City of Vancouver recently approved policy for six-storey rental housing on major streets. The streamlined policy enables the municipal government's use of rental housing zoning — previously granted by the provincial government — to allow low- and mid-rise rental housing buildings on purely commercial districts on arterial streets.

These rental housing buildings fronting major roads can reach six storeys, as long as at least 20% of the residential floor area is dedicated for below-market rental housing or 100% social housing. As well, six-storey buildings on commercial zoning must have at least 35% of the units sized on specific living space/capita, and the structures must be designed to a Passive House green building standard or comply with other green building policies.

City staff forecast the SRP could help catalyze 4,700 secured purpose-built rental homes over 10 years — an average of 470 rental homes per year.

Canadian Banks are already offering Advantageous mortgage conditions related to this policy as substantial sustainable goals will be achieved.

### Case 2. ESG-likend loans

ESG loans are becoming more common in the construction industry too. In July, French construction equipment rental giant Kiloutou arranged a €10 million banking facility, linked to its performance on sustainability goals including investment in low-emissions equipment and the representation of women in its management. In May, UK contractor Wilmott Dixon agreed a £50 million sustainability-linked loan facility coordinated by HSBC with an interest rate which varies depending on the firm hitting a series of targets based around the firm's net-zero carbon commitments. French contractor Eiffage agreed a €2 billion five-year ESG-linked loan with a syndicate of twenty institutions in 2019. And a number of other contractors including Skanska are aiming to take out ESG-linked facilities when they next refinance.

<b>Title</b>	(Net) Zero Emissions Building Catalyst Policy (considering operational and embodied emissions)		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Local

**Brief summary**

The (Net) Zero Emissions Building Catalyst Policy is a set of economic and regulatory measures to facilitate (net) zero-emissions buildings that the City of Vancouver have been using since 2019. The City may consider using discretion to ease some of the existing regulations, policies and guidelines and relax or vary height, area, uses, a number of units, density and other built form guidelines. The most applicable one is the relaxation of the allowed floor area up to 5 percent more and increasing density to facilitate more and smaller dwelling units.

Applicable for new buildings and retrofit.

**Socioeconomic impacts**

For developers seems easier to achieve financially balanced developments while providing more affordable sustainable houses. Customers have more variety of choices and better performing houses in the market.

Further legislation and regulations on maximum price, dwelling size, density, communal space area etc should be implemented in order to avoid overcrowding and property speculation

<b>Impact (ranging 1 to 10)</b>	8	<b>Feasibility (high, medium or low)</b>	High
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**Related to**

This package of measures implemented in Vancouver keeps strong relation with the concept of sufficiency. Aiming at re-densifying the city, these policies were implemented to allow more units in Vancouver’s single-family neighbourhoods where only detached housing is allowed.

**Other related efficient use of living space instruments**

- City of Vancouver has been implementing a combination of this kind of incentives in the last 5 years:**
- Character Home Retention Incentives Program**
  - Laneway House implementation Policy**
  - Zero emissions building tool**

# A.2 OPERATIONAL CIRCULARITY INSTRUMENTS

**OCI1:**

## CIRCULAR BUILDING VALUATION

<b>Title</b>	Circular Buiding Valuation (Residual Value)		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Cross-cutting
<b>Brief summary</b>	<p>The Circular Building Valuation model involves the creation of a new contract against the future prices of the building materials. The futures contract, which contains detailed information about the recoverable materials from the building, would first be placed on the market by the construction client after the building is constructed. It is designed to ensure that the true value of building materials is captured and recovered when they are removed from a building, thus creating an incentive to keep those materials in use at their highest value for as long as possible.</p>		
<b>Socioeconomic impacts</b>	<p>This scheme will produce cross-incentives between tenants rights and the owner revenues. If no additional measure is taken, the introduction of a new contract between the developer and an additional investor will reduce tenants' control over the property they occupy. This circumstance could allow housing price speculation. Thus, this instrument should be accompanied by evaluation and control measures (e.g., the creation of an independent regulatory agency to monitor this new form of contracting) to ensure that tenants' rights are not breached.</p>		
<b>Impact (ranging 1 to 10)</b>	2	<b>Feasibility (high, medium or low)</b>	Low
<b>Related to</b>	<p>This model envisages the development of new relationships in the building value chain. This means a new market for financial instruments linked to the future value of materials. The Residual Value instrument is strongly dependent on other information and transfer instruments such as material passports, provenance standards, blockchains and digital twin.</p>		

Title	Adaptable Buildings		
Time frame	Medium term	Administration level	Local

**Brief summary**

Adaptable Buildings can accommodate more than one use during their lifetime through retrofit rather than demolition. The model operates through a new investment partnership: a long-term investor invests in the skin and structure that can accommodate multiple functions, while a short-term investor rents the shell (or envelope) to adapt it for a specific use. Thus, office-to-residential conversions are relatively common in some real estate contexts where planning regulation facilitates it, for example, under permitted development rights in the UK.

This model incentivises a long-life, loose-fit design to ensure the opportunity cost of adaptation (or conversion) does not exceed demolition and reconstruction. The skin and structure of the building can account for over half the construction costs, so designing it for adaptability is an insurance policy against market risk for these high-cost elements.

**Socioeconomic impacts**

This model is particularly suitable for non-residential buildings as they could accept more flexibility, especially in office buildings. Due to the global COVID-19 crisis and rising prices, real estate trends have significantly change, so the adoption of this instrument could, to large extend, solve problems of early demolitions or vacant places. Designing circular multifunctional buildings will lead to lower costs in converting the identified spaces while ultimately creating less waste. Also, it foresees in advance the possibility of a downturn. This perspective allows for more of a loose-fit during the building’s construction which is easier in non-residential buildings. So, as the structure gradually begins to depreciate, the building adapts the space for micro logistics use. The modifications only affect the building’s services and fittings. This involves only minor work, such as removing the partition walls to create a single open space on each floor; or adding a more useful lift that allows larger items to enter and exit the building. In this perspective, the structure maintains its foundations and building envelope.

Despite the benefits that non-residential adaptable buildings could bring, when it comes to residential buildings, some potential issues could be generated, such as overcrowding or speculation. Therefore, proper policy/economic measures that avoid these side effects should be promoted such as proper densification strategies, maximum number of dwelling units, caps to rental prices, minimum number of social and affordable units etc., ensuring the environmental and social positive effects of adaptable buildings.

Impact (ranging 1 to 10)	8	Feasibility (high, medium or low)	Low
Related to	This innovative business model is related to addressing circularity schemes in the built environment sector. Aiming at applying this kind of instruments, a strong raw materials secondary market must be established.		

## Study Case

*We did not find any real business case. Instead, we present the testbed developed by ARUP based on an example from the Netherlands*

### **Aarhus Adaptable Buildings Testbed, DENMARK**

The testbed chosen for the Adaptable Building model is a five-floor, 15-unit residential block in Aarhus (Denmark) located within a larger masterplan. The baseline development has elements designed for adaptability, a particular challenge given the low floor-to-floor heights, low structural loading and constrained riser capacity typical of housing as a building typology.

A reasonable assumption for an investor is that demand for housing will remain steady, ensuring income from the 15 residential units over a 50-year operational period. If demand was expected to fall, the investment may not be viable.

The discounted cash flow has been developed assuming the steady demand assumption was wrong and, due to economic and demographic changes, residents start moving out. The resulting vacancies warrant a change of use, one that would require an extensive engagement programme with any remaining residents.

A horizon scanning exercise for this location could have anticipated this change in demand, arising from the following site-specific emerging trends:

- decrease in population can create oversupply and lower prices
- increase in demand for local, last-mile logistics hubs or micro-depots, creating opportunity costs
- changing ideas of the most desirable mix of functions in development

The following scenario has been developed representative of a medium-term downturn. Under the linear model, it is assumed that the building is demolished when it reaches 60% vacancy (40% occupancy) in the face of falling residential demand. The investor (or construction client) evicts the remaining residents, demolishes the building and redevelops it into logistics use.

In the circular model, the possibility of a downturn is acknowledged during brief development, and passive provision for this is provided in the design from the beginning. As the downturn takes effect and the vacancy increases, the building adapts the space to micrologistics use - a decentralised distribution centre located close to customers.

This adaptation happens progressively, floor-by-floor, as occupancy gets consolidated and whole floors become unoccupied. This adaptation process retains the foundations, structure and envelope of the building, while requiring changes to the building services and fit out. For example, the partition walls may be removed to create a single open space on each floor, with racking added to store parcels. An upgrade to the lift may be needed to allow larger or heavier items to move in and out of the building. As the cost of conversion is unknown, it is not considered directly for the circular base case but rather tested in the sensitivity analysis.

For the purposes of modelling, the cash flows of the long-term investor and short-term investor have been combined into a single cash flow model. Therefore, cash flows exchanged between them, such as the rent paid by the short-term investor to the long-term investor for use of the adaptable shell and core, is not accounted for.

The starting assumption where residential income is maintained over the 50-year operational period gives an Internal Return Rate of 3.7%. The linear model where the building would be demolished and rebuilt into a logistics centre gives an IRR of 0.3%. The circular model where each floor is progressively converted into micrologistics use gives an IRR of 3.6% (circular base case).



Title	Flexible Spaces		
Time frame	Short-term	Administration level	Local/Regional

**Brief summary**

The Flexible Spaces model seeks to list existing, underutilised building spaces for short-term use on online platforms. The spaces could be completely unused or in use but under-occupied. Depending on the lease agreements, either one of the following three parties could be responsible for arranging additional tenants to rent the space:

1.Landlord: The core tenant signs a lease which includes provisions allowing the landlord to advertise unused space through agreed processes. The landlord leads on finding additional tenants in parallel with the anchor tenant. The landlord controls who access the space.

2.Anchor tenant: An anchor tenant will sign a lease with a typical lease period, but with clauses that allow them to maximise the use of their spaces. The tenant leads on finding additional tenants and controls who accesses the space.

3.Third party operator: The anchor tenant and/or landlord work with a third-party space sharing platform operator who run their business model on a portfolio of underutilised space. The third party leads on finding additional tenants and controls who accesses the space, with oversight from the anchor tenant and / or landlord.

**Socioeconomic impacts**

This model is particularly suitable for non-resident buildings as they could accept more adaptability and versatility, especially in office buildings. Due to the global COVID-19 crisis and rising prices, real estate trends have significantly change, so the adoption of this instrument could, to large extend, solve problems of early demolitions or longtime vacant places. Designing circular multifunctional buildings will lead to lower costs in converting the identified spaces while ultimately creating less waste.

Despite the benefits that non-residential flexible spaces could bring, when it comes to residential buildings, some potential issues could be generated, such as overcrowding or speculation. Therefore, proper policy/economic measures that avoid these side effects should be promoted such as proper densification strategies, maximum number of dwelling units, caps to rental prices, minimum number of social and affordable units etc., ensuring the environmental and social positive effects of flexible buildings.

Impact (ranging 1 to 10)	8	Feasibility (high, medium or low)	Medium
Related to	This innovative business model is related to the full life-cycle of buildings. including specific projects addressing circularity tools or sufficiency issues.		

## Study Case

*We did not find any real business case. Instead, we present the testbed developed by ARUP based on an example from the Netherlands*

### **Milan Flexible Spaces Testbed, ITALY**

As a testbed for this model, we selected a tenanted office in Milan with the tenant organisation looking to expand into a 270m<sup>2</sup> extension to their existing office space. The tenant organisation decided to extend the office (with agreement from the landlord) in anticipation of future growth in headcount. By applying the Flexible Spaces model to the testbed project, the additional net income earned would increase by 18% over the remaining 12-year lease term (circular base case) compared to the linear model.

A sensitivity analysis has been undertaken for:

1. the extent of additional space use
2. the additional cost of designing for flexibility

The additional tenant rent received remains the largest source of uncertainty. Optimistic and pessimistic additional space use scenarios have been developed to compare their financial performance with that calculated for the circular base case. The optimistic scenario considers a greater uptake of co-working from 75 percent to 90 percent of unoccupied desks, while the pessimistic scenario considers an uptake of 50 percent, as well as a reduction in out-of-hours activity.

The quantum of savings in the circular base case could support a 58 percent increase in extension costs associated with making the space more flexible to break-even with the linear model. In reality, the costs associated with making the space flexible is unlikely to be this high. It should be noted that if additional investment was made in making the testbed project more flexible, the extent of additional space use, and therefore revenue earned from it, would likely be greater.

### **Amsterdam Flexible Spaces Testbed, NETHERLANDS**

Elements of the technology needed to deliver this model are proven in the marketplace. In Amsterdam, space availability information is already available through a city scale pilot project called "Vacant Space Finding". Registered users of the platform can book and use those spaces for a fee, increasing space utilisation and boosting revenue for the building owners. Also in Amsterdam, The Edge building developed by architecture studio OVG and occupied by Deloitte, has a smart building system that allocates space in the building each day to every employee based on their work schedule.

<b>Title</b>	Better Environmental High Quality standard accreditation		
<b>Time frame</b>	Short-term	<b>Administration level</b>	European

**Brief summary**

The introduction of environmental EU high-quality standards through, combined with tax exemptions could be an important incentive to reach a high-level environment, economic and energy performance of buildings while boosting circularity.

The UE standards on circular economy are under development. It is expected that these standards will be launched in 2023 by the Circular Economy in Buildings Committee under the CEN 350/sc1 (Standardization in the field of circular economy in the built environment). In this sense, the introduction of European labels must lead the momentum for establishing a strong secondary raw materials market with tax exemptions for every sustainable certified building. This initiative could be an important incentive to reach a high-level environment, economic and energy performance of buildings.

Introducing data collection standards and methodological consistency within the real estate market will allow investors and financial institutions for meaningful, impactful analysis over the buildings lifecycle.

**Socioeconomic impacts**

Study cases showed a high social acceptance and the inclusion of all actors toward improving energy performance of buildings, as well as the use of resource efficiency criteria in the building sector. Besides of the economic incentives, these labels could be also communication strategy labels, where construction sites display labels and communicate about their environmental management and engagement, circular economy practices and the use of eco-profile products (recycled aggregates, recycled concrete) that reduce environmental impacts in the construction sector. These standards will improve the circularity of the building’s materials once a real estate asset reaches its end of life.

<b>Impact (ranging 1 to 10)</b>	8	<b>Feasibility (high, medium or low)</b>	High
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**Related to**

This scheme is related to the concept of circularity. By introducing European labels we are laying the ground for a strong secondary raw materials market. This initiative could be an important incentive to reach a high-level environment, economic and energy performance of buildings.

**Study Case**

**MINERGIE LABEL, SWITZERLAND**

The Minergie label has been issued for the first time in Switzerland in the 1990s. Since then, it has been developed from a pioneer idea to one of the most climate-conscious building standards in the world. As a Swiss building standard for new and modernised buildings, the brand is jointly supported by the economy, the cantons and the federal government and is protected against misuse. The purpose of Minergie is to higher the valuation of energy-conscious construction that pursues a superior living comfort.

The Minergie building standard enjoys broad acceptance. There are many reasons for this, the most important of which is that building owners, architects and planners have complete freedom in the design, choice of materials and internal and external structure of a building.

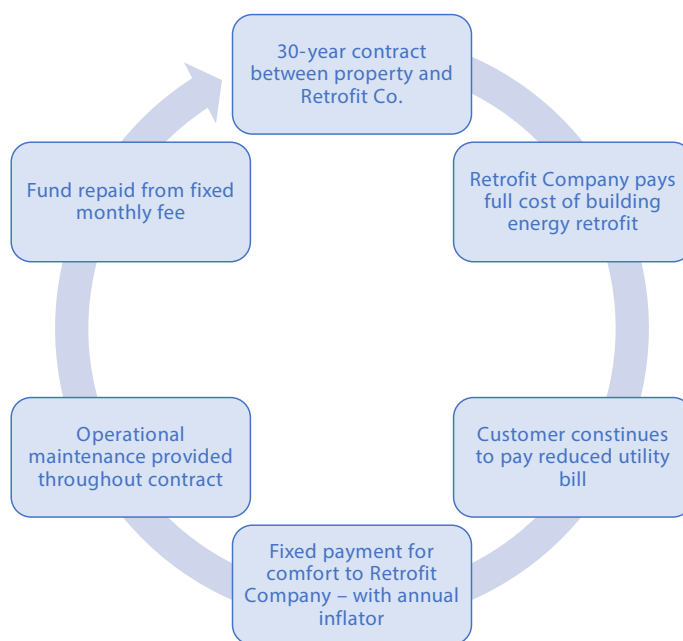
The Minergie Association is the worldwide owner and authorised user of the Minergie quality mark. It is therefore entitled to defend the various Minergie labels against infringements by third parties. The Minergie quality mark designates and qualifies goods and services that enable the rational use of energy and the widespread use of renewable energies while at the same time improving the quality of life, ensuring competitiveness and reducing environmental pollution. The primary objective of the label is to strengthen public confidence in these goods and services.

<b>Title</b>	Green Neighbourhoods as a Service (GNaaS)		
<b>Time frame</b>	Long-term	<b>Administration level</b>	Local

**Brief summary**

Bankers without Boundaries (BWB) are currently exploring Green Neighbourhoods as a Service (GNaaS), a new model whereby a central entity, on a city or regional basis, oversees an area based retrofit programme. Works are funded through a long-term (30 year+) comfort and maintenance contract with the residents with anticipated reductions in energy demand and efficient use of local heat and electricity generation then offsetting the proposed comfort and maintenance fee. Community benefits can also be increased through this neighbourhood approach to regeneration and investment. Pilot projects are currently underway in Milan and Zagreb with plans to extend to other cities, including Edinburgh.

Proposed operating mechanism:



**Socioeconomic impacts**

The Green Neighbourhoods as a Service (“GNaaS”) concept which establishes a central contracting entity in a city or region that designs, commissions, manages and funds deep energy retrofit on a street-by-street basis with incremental community investments at no cost to the property owners, regardless of ownership and usage typology.

<b>Impact (ranging 1 to 10)</b>	9	<b>Feasibility (high, medium or low)</b>	Low
<b>Related to</b>	By applying this scheme at the neighbourhood/district level, the central entity in charge of implementing it will be able to take advantage of the development of scale economies in the deployment of district energy retrofitting plans. This means taking advantage of the benefits of large-scale services and goods procurement and, in turn, facilitating through green public procurement the development of a secondary materials market that will lay the foundation for the deployment of a secondary market for goods for the construction and retrofitting of buildings. Thus, through this instrument, circularity and SER framework factors are enhanced.		

Title	Servitisation: Building as a service		
Time frame	Long-term	Administration level	Cross-cutting

**Brief summary**

With a servitization model, the customer pays a fixed fee per unit of service consumed, while the ownership of the system remains with the technology provider, who remains responsible for all repair and maintenance costs. As such, the model strongly incentivises the equipment owner – that is, the service provider – to think long-term when designing and selecting the technology. By offering state-of-the-art maintenance, the provider can minimise operating costs, in particular energy use, which is the largest cost component over the life cycle of the equipment. Keeping ownership of the equipment also encourages service providers to rethink the development of modular systems, which is key to a circular economy.

In a building, the skin (facades and roof) , the structure (skeleton), the services (pipes, wires, energy and heating systems), the internal fit-out (walls and floors) and the rest of the added things such as furniture, lighting, elevators etc. could be gradually servitised. Doing it with the entire building might be difficult, but it could be achieved in phases.

**Socioeconomic impacts**

Although energy-efficient technologies are available and their economic benefits are clear, there are several barriers that prevent these from being deployed, including high up-front costs, lack of confidence from the users of products’quality, and other investment priorities. The servitization business model overcomes these barriers. It represents an effective way to accelerate the investments in energy-efficiency needed to deliver the Paris Agreement goals.

Barriers to implementation: educating customers on the values of servitisation; having the right skills, people and technology on the ground to implement servitisation; and gaining customers’ trust in the contract; diversifying risk; and finding the right financial partners with appealing commercial debt to help accelerate the upscale of the service model.

Impact (ranging 1 to 10)	6	Feasibility (high, medium or low)	Medium
Related to	Circular economy. The servitization model is a key contributor to the systemic efficiency approach to attain global energy decarbonization. the deployment of energy efficient and state-of-the-art assets at scale stimulated by this pay-per-use model strengthens the existing synergies with renewable solutions and enables their accelerated deployment: peak demand on the electrical grid is curved by lower demand from more efficient equipment, while the latter increases the feasibility of renewables in comparison to fossil-fuel sources of energy.		

### Case 1.

SunEdison has pioneered power purchase agreements (PPAs) for solar photovoltaics (PV); this enables rapid uptake of solar PV by allowing customers to purchase solar energy instead of investing in the panels themselves.

### CaaS. Cooling as a Service.

To tackle the latter, BASE - Basel Agency for Sustainable Energy, a Swiss not-for-profit foundation and a specialised partner of the United Nations Environment Program, launched the Cooling as a Service (CaaS) Initiative in collaboration with the Kigali Cooling Efficiency Program (K-CEP) in 2018. The initiative aims to mainstream the pay-per-use model around the world to accelerate market adoption of sustainable cooling solutions. In 2019, the model was endorsed by the Global Innovation Lab for Climate Finance as one of the most innovative tools for climate finance.

Through CaaS, the cooling industry is on the brink of a revolution that will help achieve global climate targets and sustainable economic growth. CaaS enables customers to leap-frog to the best solutions available in their markets. It can be applied to a wide spectrum of sectors from the manufacturing industry, real estate, hospitality and healthcare to the cold-chains necessary for food and health. In fact, its application has already demonstrated the significant benefits of the model. In Nigeria, the implementation of CaaS in solar off-grid refrigeration for the agriculture sector is providing cooling services to local farmers, yielding a 50% reduction in food waste, increased revenues and saving 460 tonnes of CO<sub>2</sub> per year by removing the need for diesel generators and the bad refrigerants typically used in the region. Meanwhile, in India, CaaS enabled a large real estate complex to access state-of-the-art cooling services while reducing their energy consumption by more than 30% without upfront investments.

Today, CaaS is saving more than 68 GWh of electricity and saving 36,000 tonnes of CO<sub>2</sub> emissions annually - equivalent to more than 50,000 return flights from London to New York. This equates to more than 500,000 tonnes of CO<sub>2</sub> equivalent over the 15-year contractual lifetime of these projects. Interest in the model has been growing significantly, and the CaaS Alliance - a group of organizations committed to pursuing the implementation and mainstreaming of the CaaS model worldwide - has today over 50 members, including major technology providers.

# A.3 FACILITATOR INSTRUMENTS

**F11:**

## GREEN ECONOMY FINANCING FACILITIES (GEFFS) through partner financial institutions (New proposed instruments)

<b>Title</b>	GREEN ECONOMY FINANCING FACILITIES (GEFFS) through partner financial institutions		
<b>Time frame</b>	Short-term	<b>Administration level</b>	European
<b>Brief summary</b>	Through GEFFs, the European Investment Bank (EIB) would offer credit lines to local partner financial institutions for on-lending to small and mid-sized green projects with loans or leasing. Credit lines are complemented with technical assistance for partner financial institutions capacity-raising and project assessments, and occasionally with low-intensity grants to reward end beneficiaries who opt for advanced technologies or promote sufficiency reducing energy consumption through changes in behaviour.		
<b>Socioeconomic impacts</b>	This financial scheme would lower the cost of investment in this type of project by offering the backing of the EIB and facilitating access to cheaper financing costs, resulting in greater access to green finance for small developers.		
<b>Impact (ranging 1 to 10)</b>	8	<b>Feasibility (high, medium or low)</b>	High
<b>Related to</b>	This scheme could support the decarbonisation of the full life cycle of buildings, including specific projects addressing circularity tools or sufficiency issues. To do so, the EIB must focus its priorities on achieving the decarbonisation of the built environment through specific priority streams funding circularity, efficiency, sufficiency and the introduction of renewables as part of the built environment sector.		

### Study Case

#### RESIDENTIAL ENERGY EFFICIENCY CREDIT LINE, BULGARIA

The first residential GEFF was the Residential Energy Efficiency Credit Line (REECL) in Bulgaria. REECL provides loans to Bulgarian banks to on-lend to individuals, homeowners' associations, utility companies and energy-service companies for energy-efficiency, sufficiency, circularity and renewable-energy improvements in residential buildings. The credit line of over €100 million is the result of cooperation between the European Bank for Reconstruction and Development, the Bulgarian government and the Kozloduy International Decommissioning and Support Fund (an assistance programme of the European Commission and other European contributors to help the Bulgarian government in the energy sector). Launched in 2005, REECL has achieved significant outcomes in Bulgaria's carbon-intensive and fragmented residential sector, including annual cost savings of €19 million, energy savings of 240,132 MWh and reductions of 249,680 tonnes of CO2 equivalents.

<b>Title</b>	Mortgage focus shift		
<b>Time frame</b>	Short-term	<b>Administration level</b>	European
<b>Brief summary</b>	<p>Mortgage focus shift changes the focus from the offered interest rates to the initial required payment when purchasing a home or developing built to rent initiatives . This instrument proposes to allow the banks to offer mortgages that would cover over 80 percent of the home price if the home is categorized as efficient, sufficient or “green”. Additionally, an European Framework to standardise green mortgages must be developed by the policy makers to bring certainty and clear investment opportunities within the real estate sector.</p> <p>Its implementation would be based on the credit risk assessment methods established by the European Banking Authority, such as the IRB method (Internal ratings-based approach), making it feasible for those clients who are approved to obtain a higher percentage of the value of the house as a mortgage, the instrument would be implemented.</p>		
<b>Socioeconomic impacts</b>	<p>Buyers or consumers would benefit since their capacity of purchasing a home would be increased and at the same time they would be obtaining homes categorized as efficient or sufficient. However, relaxing the criteria for accessing mortgages categorized as green could lead to increased investor appetite for new housing production, which could lead to an environmental dilemma, as this could boost new housing construction versus renovation while increasing carbon emissions.</p>		
<b>Impact (ranging 1 to 10)</b>	8	<b>Feasibility (high, medium or low)</b>	High
<b>Related to</b>	<p>This instrument will enhance the access to individuals to funding to acquire a property while ensuring the funds needed to transform a specific real estate asset into an efficient, sufficient or “green” property through building retrofitting. Attention must be paid to the conditions required to consider an asset as efficient, sufficient or “green”. Those should be validated by an independent third party accredited by a European agency.</p>		



<b>Title</b>	Local Climate Bonds via Crowdfunding		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Local
<b>Brief summary</b>	<p>The local climate bonds are regulated investment products launched by City Councils to access cost-effective funding for specific decarbonisation projects, offering local people an opportunity to invest in their area via specific crowdfunding by offering local tax benefits. Thus, community municipal Investments can be issued as regulated bonds and also as regulated peer to peer loans. Peer to peer loans give the opportunity for the investment to be held in an innovative way of leveraging the individual savings accounts. This scheme could allow residents to access individual savings account tax benefits, enabling councils to reach new investors and begin to tap into the individual savings account market.</p> <p>These bonds must be part of ambitious local development plans, aiming at retrofitting the existing and future infrastructure provision of a city.</p>		
<b>Socioeconomic impacts</b>	<p>The absence of a regulatory framework increases risks for the local investors. The lack of a European legal framework to regulate this type of mechanism may reduce investor appetite, given that without legal backup, investing in this type of product can be very risky.</p> <p>Additionally, this innovative scheme could boost the competition between regions and municipalities, deepening regional and local gaps among those regions with higher savings capacity and those with reduced savings capacity, contributing to widening the existing divisions between the different European regions.</p>		
<b>Impact (ranging 1 to 10)</b>	7	<b>Feasibility (high, medium or low)</b>	Medium
<b>Related to</b>	<p>This instrument will enhance the access to funding for small developers and promoters to carry out a “green” project. This scheme will face the upfront barriers faced by the small developers to start “green” projects. Attention must be paid to the fact that there is no specific legislation to provide legal support for this type of practice. Thus, upfront barriers are replaced by legal barriers to performing these schemes, preventing individuals from investing through these alternative financing mechanisms based on the crowdfunding.</p>		

### LA BOLSA SOCIAL, SPAIN

Bolsa Social is the first crowdimpacting platform in Spain for investors and businesses who want to create a positive social impact. Bolsa Social connectS social impact investors and businesses who want to create a positive social impact. It offers two different ways of investing, through sustainable loans or equity investment.

There are three different kinds of sustainable loans: ordinary or senior loans (similar to those made by banks, with a repayment term, an interest rate and collateral in each case; and they have a lower profitability because the risk in this type of project is lower for the investor), equity loans (with a fixed interest rate and a repayment period, but they can also have a variable rate depending on the company's results; they have a higher risk than ordinary loans), and convertible loans (they have the particularity of being converted into shares in the company in certain cases, with special repayment conditions)

Regarding the equity investment, it has been created to invest in early-stage companies with growth potential and a positive impact on society and the environment. There are two different ways of equity investment: seed line (promising businesses that need support to make their first leap. These investments have higher risks, as companies are younger and with little track record), and growth line (companies who already validated their business models, with capital needs from 100,000 euros. to finance their first major expansion).

Bolsa Social serves as a intermediary to finance real estate developers as Distrito Natural, a developer of ecological housing pursuing a mind shift on the real estate market, and that pursue shareholders to invest in green housing in Spain. Founded in 2020, Distrito Natural has 6 developments underway (four urban and two rural) and 132 homes based on two business models:

1. Build To Sell (BTS), where the investor, either institutional or a cooperative, commissions Distrito Natural to build a residential building for its end users, who either buy it or are awarded it by the cooperative.
2. Build To Rent (BTR), where a real estate investor entrusts Distrito Natural with the construction of a residential building to be operated on a rental basis. A lease can be short, medium or long term.

Despite its commitment to the development of green housing, one area for improvement in this type of model is transparency, as there is little public data on the emissions reductions involved in the acquisition of these homes.

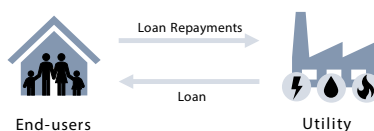
Title	ON-BILL SCHEMES: On-Bill Financing (OBF) and On-Bill Repayment (OBR)		
Time frame	Short-term	Administration level	European

**Brief summary**

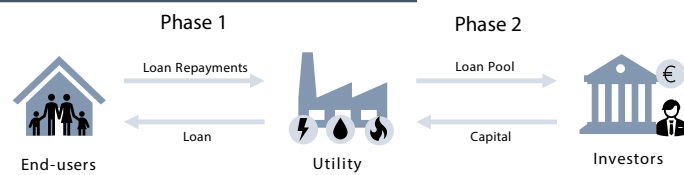
The core feature of an on-bill scheme is the involvement and active role of the utility company supported by financing institutions in the energy renovation of residential buildings. The cornerstone of on-bill schemes is using the utility bill as the repayment vehicle for retrofitting or renovating residential buildings.

Based on the source of financing, there are two main mechanisms applicable to on-bill programmes: on-bill financing (OBF) and on-bill repayment (OBR). A typical On-bill Financing scheme represents an On-bill Repayment scheme where the utility company takes the role of the investor. Furthermore, there are two types of On-bill Repayment schemes, type A, where the utility uses its own funds to finance the interventions, selling these loans to financial institutions in the second phase of the project, and type B, where the utility raises private capital upfront.

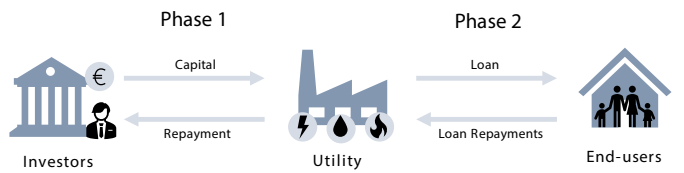
**On-Bill financing scheme**



**On-Bill repayment scheme (TYPE A)**



**On-Bill repayment scheme (TYPE B)**



Despite on-bill schemes can be structured to ensure “bill neutrality” (meaning that the projected energy savings offset the fixed monthly loan or tariff instalment) the BEUC (the European Consumer Organisation) recommends that the amount of the repayment should not exceed the savings or, instead, be compensated by increased comfort.

**Socioeconomic impacts**

On-bill schemes are successful in resolving some of the typical barriers energy efficiency projects may face when implemented in residential buildings, such as: 1) High upfront investment costs, 2) Increased debt burden for families by overcoming upfront barriers, 3) Low credit capacity and loan securitisation issues among end-users, 4) Mobilising private capital, and 5) Owner-tenant dilemma.

However, these schemes introduce end-user barriers as the split incentives dilemma between tenants and owners, where the benefits and costs of energy renovation are unevenly distributed (in short, owners tend not to invest in energy savings measures that primarily benefit tenants, while tenants are not willing to make investments in residential units they do not own). A way of overcoming split incentives for the utilities is to scale up this approach aiming at offering lower prices without diminishing sales targets.

Impact (ranging 1 to 10)	8	Feasibility (high, medium or low)	High
Related to	<p>This scheme will increase the available funds for retrofitting and renovation projects as part of the life cycle of buildings. This scheme overcomes upfront barriers faced by the owners of a real estate property. Aiming at solving the owner-tenant dilemma, the EU member states should introduce owner-tenant laws that enhance the fair distribution of the investment costs, for example by using a share of the energy benefits for investment repayments and making the renovation investment equally appealing for both groups.</p> <p>Provisions for protecting investors from default on the repayment of renovation costs while maintaining consumer protection should also be considered. Increasing credit protection would allow investors to relax their lending criteria, allowing much easier and more efficient uptake of on-bill schemes. For vulnerable groups of people, public authorities must act as guarantors in case of end-user default by implementing loan loss reserves and guarantee funds; this would replace potentially undesirable means of securitisation, such as grid disconnections.</p>		

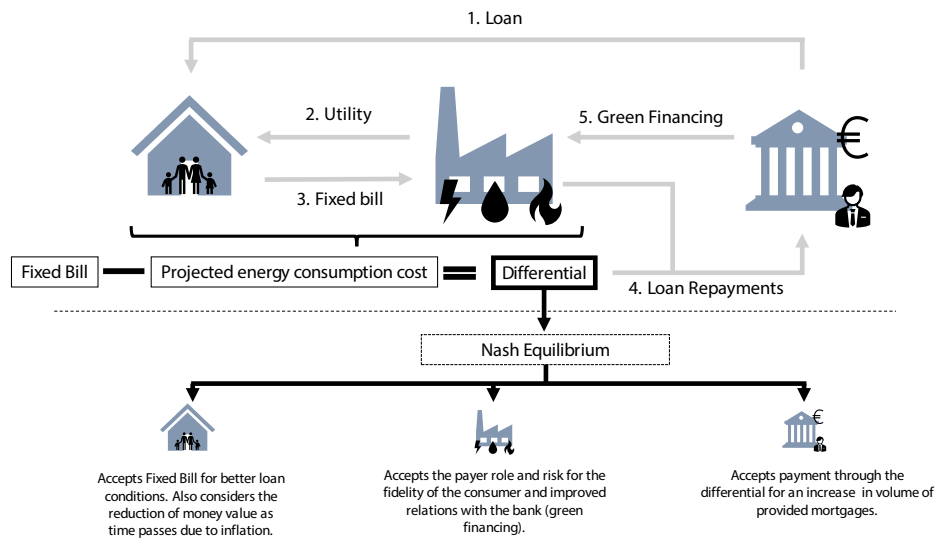
<b>Study Case</b>
<p><b>MANITOBA HYDRO POWER SMART RESIDENTIAL LOAN PROGRAMME, CANADA</b></p> <p>Manitoba Hydro offers its residential customers Pay-As-You-Save (PAYS) financing for eligible energy efficiency upgrades, notably space heating, insulation, and water heating equipment. Monthly payments are added to the utility bill and are transferable to the next homeowner. Launched in 2005, this program supports around 5.000 participants per year, with approximately 6.000 USD of investment. Besides this, the program has a loan default rate equal to 0,48%, and on average a project saves 825 kWh/year, or 7,5% of energy used.</p> <p>Among the supported interventions, those are: Residential space heating equipment, insulation and residential water heating and conservation (drain water heat recovery systems and water efficient toilets. The potential beneficiaries are residential customers of the Manitoba Hydro, with homes where energy improvements are made and have an active Manitoba Hydro account in good standing.</p> <p>In this case, the capital for the on-bill programme comes from public money of the Manitoba government and lend to the Manitoba Hydro at low cost. The Manitoba government does not back any of the loans. The maximum term depends on the upgrade, but the most common terms go up to 20-25 years. The interest rate charged by Manitoba Hydro sits at 4,8%.</p> <p>Key strengths were found upon this specific case: 1) Relaxed underwriting criteria resulting in rejection rate of 5%, interest rates were kept relatively low, and a quick turnaround time for approval of around 48 hours. By opposite, this business model supported a limited range of interventions.</p>

<b>Title</b>	Differential on-bill repayment scheme		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Local/Regional

**Brief summary**

The differential model is based on Nash’ equilibrium. This game theory based instrument creates a differential between a fixed bill paid by the consumer and the projected energy consumption cost as consumption reduces due to efficiency. This differential is what would be used in order to pay back the loan provided from the bank to the family.

The main goal by this alternative type of on-bill scheme is the creation of a coordinated process between investors, utility providers and end-consumers that would promote renovations. Through this novel scheme, every agent knows how others should behave in order for the goal to be achieved and this is why it would only be possible if all agents cooperate. The process would unfold as follows:



At first, the end user must accept a fixed rate for the energy bill paid to the utility provider. Then, as the consumption of the building reduces due to sufficiency and efficiency, a differential is generated with the fixed bill. This differential is what the utility provider would use to pay back the loan given by the investor. It is true that the utility provider is paying back the loan given to the end-user, however there are benefits as a consequence of this behaviour that are explained in the following table alongside the risk and benefits for all agents. Thus, every agent involved takes on a risk that would only become reality if any of the other agents fail to behave the “correct” way.

Agent	Risk	Benefit
End user	Accepts fixed Bill	Better loan conditions + Reduction of money value as time passes
Utility provider	Accepts the payer role	Consumer Fidelity + improved relations with the investor
Investor	Accepts payment through the differential	Increase in volume of provided mortgages

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**Socioeconomic impacts**

This alternative scheme would facilitate accessibility to renovations to end-consumers, besides this it would also generate a triangle of responsibilities that would boost retrofitting and renovation plans at a local level. By making this game theory scenario possible, every agent commits not only to accept the mentioned risks, but also to generate positive externalities for the environment. Investors would promote renovation by facilitating credit to end users, end users would find environmentally proven renovations more attractive due to credit facilities and utility providers would increase their market share, which will be filled by environmentally friendly projects.

<b>Impact (ranging 1 to 10)</b>	<b>7</b>	<b>Feasibility (high, medium or low)</b>	<b>Low</b>
<b>Related to</b>	As the traditional on-bill schemes, this instrument will increase the available funds to retrofitting and renovation projects as part of the life cycle of buildings. This scheme overcome upfront barriers faced by the owners of a real estate property. Furthermore, it solves the owner-tenant dilemma, introducing the Nash equilibrium as a way of overcoming this dilemma.		

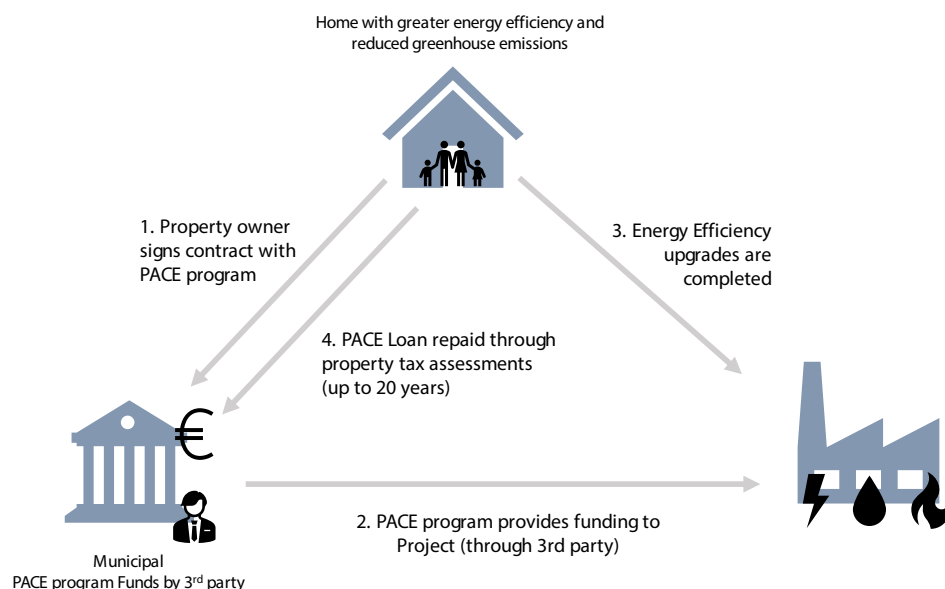
<b>Title</b>	Property Assessed Clean Energy Programs (PACE)		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Cross-cutting

**Brief summary**

Mortgage focus shift changes the focus from the offered interest rates to the initial PACE programs allow a property owner to finance the up-front cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment. The unique characteristic of PACE assessments is that the assessment is attached to the property rather than an individual. 100% of upfront costs are covered and it does not require personal credit. PACE is effectively a form of debt, with a lien attached to the property.

PACE requires a property ownership to participate, eligible improvements are based on the value of the property. and it is assessed on taxes (paid twice a year in large sums).

The process would unfold as follows:



**Socioeconomic impacts**

Some of the **advantages** that PACE program show are: secure financing of comprehensive projects over a longer term, making more projects cash flow positive; spread of the repayment over many years, seldom requirement of an upfront payment, and removal of the requirement that the debt be paid at sale or refinance, deductible payments from income tax liability, allowance of municipalities to encourage energy efficiency and renewable energy without putting general funds at risk. But there are also some **disadvantages**: interest rates are higher than traditional loans, selling the property might be more challenging because of the assessment, the assessment is secured to the home, increasing the risk of foreclosure. Financing can be public or private or (large sources of private capital).

PACE financing is not yet available in the EU. Some impeding factors include complex legal processes and first-lien complications which must be best addressed at the EU level. In addition, PACE is normally based on bond issued by cities, which is not common in EU cities, especially small ones. However the pilot EUROpace is currently being developed.

<b>Impact (ranging 1 to 10)</b>	7	<b>Feasibility (high, medium or low)</b>	High
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## Related to

Renovation Wave. For one-step deep renovation this instrument could be suitable as these retrofits are usually very expensive.

SER framework. Until now this instrument has been implemented for Efficiency and

## Study Case

### **EUROPace in Spain.**

The pilot project, EuroPACE is testing the concept in a municipality in Spain. EuroPACE adopts best practices from the US PACE market and intends to further enhance its impact. The project aims at addressing several fundamental challenges to EE investment. The first ambition is to deploy private capital as up-front financing to homeowners (IEA-RETD), that is, reduce reliance on grants and subsidies; a de-risk approach to EE investments is the second aim. To optimize the decision-making processes for homeowners, the project includes the training of energy service contractors (technical assistance) and finally, it provides design standard underwriting requirements and project performance guidelines to facilitate the project aggregation and the issuance of Green Bonds.

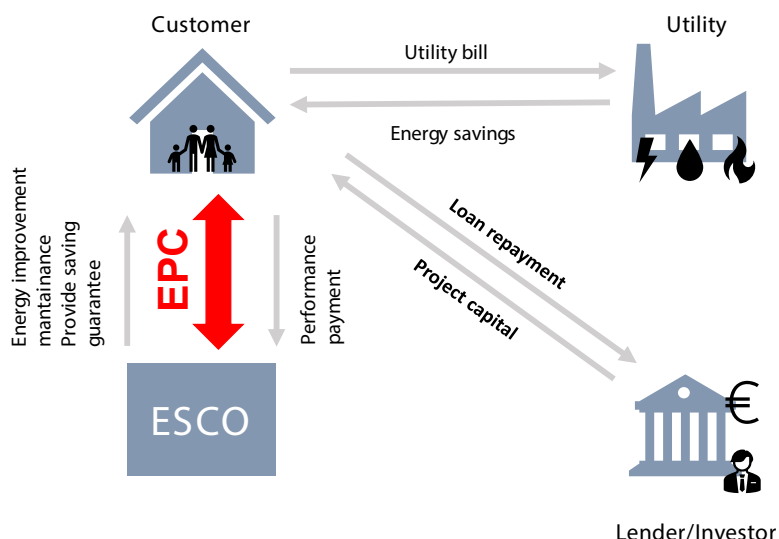


<b>Title</b>	Energy Performance Contracting (EPCs) and Energy Services Companies (ESCOs)		
<b>Time frame</b>	Long-term	<b>Administration level</b>	Cross-cutting

**Brief summary**

An ESCO is a company that offers energy services which may include implementing energy-efficiency projects on a turn-key basis. ESCOs finance the up-front costs of an energy performance improvement project from the energy cost savings during operation. An ESCO may substitute the traditional utility provider, or contract the client only for the implementation of a set of measures agreed together. (Robinson et al., 2015).

An EPC is a guarantee-based agreement between the client and the ESCO, often with the participation of third-party, such as a bank, whereas the ESCO issues a performance guarantee, and their remuneration is directly linked to the savings achieved. (Bertoldi & Boza-Kiss, 2017; Pätäri & Sinkkonen, 2014). Essentially, the ESCO will not receive its payment unless the project delivers energy savings as expected. Alternatively, the guarantee ensures that the energy savings resulting from the investment will be sufficient to repay monthly debt service costs.



**Socioeconomic impacts**

The ESCO assumes the performance risk, so an ESCO-implemented investment helps the end-user to invest without major risks in an unknown field. After the operation, the end-user has a better performing building and lower energy costs. As ESCOs assume the technical and sometimes even the financial risks that normally an end-user would have to bear, transaction costs are higher than in other financial instruments.

The remuneration of ESCOs is directly tied to the energy savings achieved. This instrument is dedicated to investing only in energy efficiency projects seeking a return based on savings achieved.

EPC is a means to deliver infrastructure improvements to facilities that lack energy engineering skills, manpower or management time, capital funding, understanding of risk, or technology information. Cash-poor, yet creditworthy customers are therefore good potential clients for EPC.

<b>Impact (ranging 1 to 10)</b>	7	<b>Feasibility (high, medium or low)</b>	High
<b>Related to</b>	This scheme is related to the energy efficiency investments such as: energy management equipment, equipment for lighting, heating, ventilation and cooling, building envelope isolation, renewable energy systems as well as urban infrastructures like traffic and street lighting. Thus, EPC is also related to the SER framework enabling the adoption of renewable energies for every household, besides the reduction of operational emissions derived from the installation of energy efficiency measures.		

### **Case 1. LEMON project in Italy.**

The LEMON project in Italy promotes new contracting models, including EPCs for social housing retrofit. It provides technical assistance to public and private entities for the preparation of tenders for the energy retrofitting of social housing units in the provinces of Reggio Emilia and Parma.

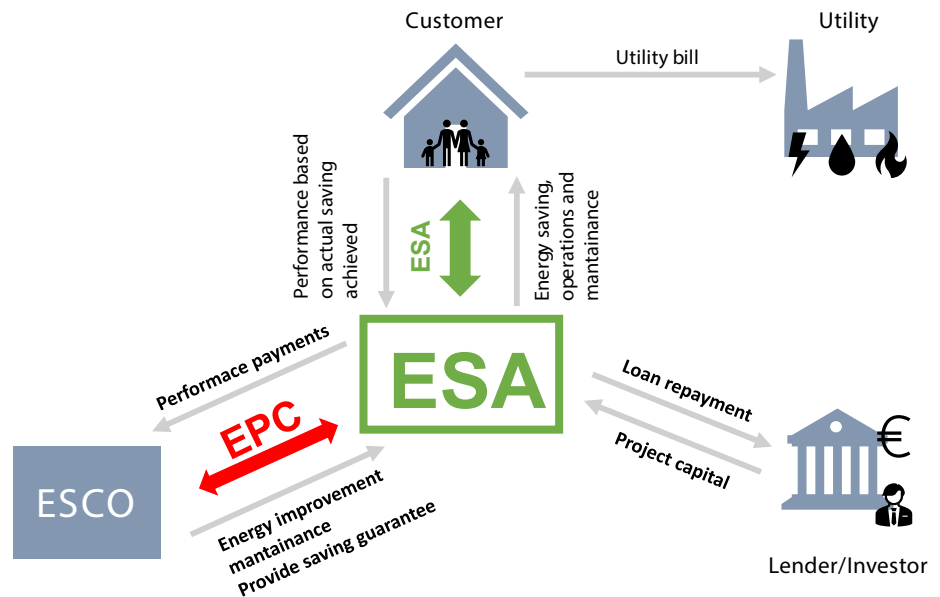
### **Case 2. LABEEF program in Latvia.**

In Latvia, the LABEEF program was introduced to repurchase the long-term investments necessary for multifamily building renovation. The Latvian experience proved that ESCOs could solve and eliminate many of the previously hindering technical and financial barriers of projects, even in sectors previously considered difficult (Augustins et al., 2018). The tertiary sector holds a huge potential of energy savings through EPC, and the Trust EPC South8 project implemented in the southern EU countries (improves the financing access and conditions of sustainable energy solutions in this sector, by improving trust and confidence in the financing parties (Frangou et al., 2018).

<b>Title</b>	Energy Services Companies (ESCO) and Energy Service agreements (ESAs)		
<b>Time frame</b>	Short-term	<b>Administration level</b>	Cross-cutting

**Brief summary**

Energy service agreements (ESA) are a contract between a third-party investor and an asset owner to deliver energy savings as a service; it is an evolution of the traditional shared-savings model provided via EPC but structured more like Power Purchase Agreement (PPA). Basically, the investor invests in energy efficiency opportunities and operates the energy equipment to provide services to the asset owner who in exchange agrees to pay their historical utility bills to the investor. When the ESA contract ended, the project costs have been paid, the building owners continue to pay reduced bills, and energy saving become their profits.



**Socioeconomic impacts**

ESAs offer promise for retail energy retrofits because they limit risk while still providing an avenue for short-term energy and cost savings. These instruments are dedicated to investing only in energy efficiency projects seeking a return based on savings achieved. Some of these Socially Responsible Investment (SRI) funds have partnered with governments.

<b>Impact (ranging 1 to 10)</b>	7	<b>Feasibility (high, medium or low)</b>	High
<b>Related to</b>	This instrument will enhance the access to individuals to funding to acquire a property while ensuring the funds needed to transform a specific real estate asset into an efficient, sufficient or "green" property through building retrofitting. Attention must be paid on the conditions required to consider an asset as efficient, sufficient or "green", those should be validate by a independent third party accredited by an European agency.		

### ESA examples through the US

In the past few years, a growing number of ESA projects has been implemented in the US, mainly targeting large buildings, such as Metrus Energy, mostly involving the installation of LED lighting. More recently, ESAs are also available to single-family housing and are offered by several EE service providers and financial organizations. For example, in New York, there is the Home Advance financing program for single-family homes that offers energy efficiency retrofit packages, with a reduction in electricity use up to 5% and in heating fuel use up to 20–25%. To date, ESAs have not been used for deep retrofits that save at least 30%. The execution of larger projects with larger savings could be addressed by combining ESA financing with utility incentives (ACEEE).

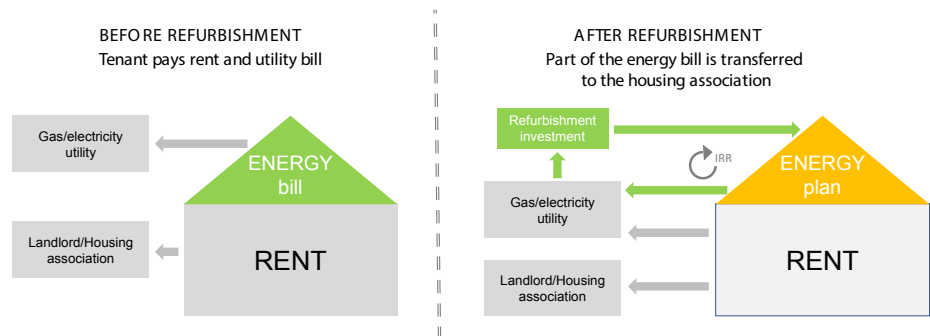
<b>Title</b>	Energiesprong retrofit		
<b>Time frame</b>	Long-term	<b>Administration level</b>	Local, national

**Brief summary**

Based on a successful Dutch energy transition program, Energiesprong is an initiative that promotes the whole house refurbishment with funding support. The initiative eases high quality and net zero retrofits and new built houses in a market while creating proper financing and regulatory conditions at the same time.

The renovation or new build is financed by future energy cost savings plus the budget for planned maintenance and repairs over the coming 30 years. This allows tenants to keep the same expenses. In the case of housing associations, residents pay the housing association an energy service plan which is the equivalent of their previous energy supplier bill. The housing association can use this new income stream to partly fund the renovation works.

Energiesprong UK is being more innovative in this approach. Their model involves whole house retrofit, with an innovative mechanism for the landlord to recover the investment through charging a separate 'energy service plan' alongside the rent. Tenants get the benefit of improved comfort for the same cost, but most importantly landlords get access to a new revenue stream. However, this only works when the landlord keeps the property long enough to be profitable.



**Socioeconomic impacts**

The key innovation behind Energiesprong is a cost-neutral business model for social landlords. The cost of installation will be offset by long-term savings and income equal to or greater than the value of the work. This makes Energiesprong an extremely cost-effective route to heat decarbonisation as well as delivering multiple other benefits including eliminating fuel poverty and providing resilience to future temperature rises. Large amount of homes could benefit directly from Energiesprong retrofits, and the approach could indirectly benefit many other homes through cost reduction in components and innovations in business models. Landlords would be the new energy provider, and this could create an additional problem. The regulatory framework should improve here to incentive landlords to do so. For tenants could be challenging as well as the landlord would be their only option for energy-providing. A possible change in mindset would be required.

<b>Impact (ranging 1 to 10)</b>	9	<b>Feasibility (high, medium or low)</b>	Medium
<b>Related to</b>	<p><b>Renovation wave.</b> This evolution of this innovative instruments that UK is exploring could lead to one-step deep renovations what would be a huge improvement In the desaacarbonisation progress.</p> <p><b>Sufficiency.</b> If a SER framework is establish for integral retrofits, including sufficiency on top of efficiency and renewables, it could lead to a new real estate market.</p> <p><b>Circular Economy.</b> New technologies and links will be developed. These will ease the transition from linear economy to circular economy.</p>		

<b>Title</b>	Built Environment accountability via blockchain technologies		
<b>Time frame</b>	Long -term	<b>Administration level</b>	European
<b>Brief summary</b>	<p>Due to the complexity of the sector and the high transaction costs derived from asymmetric information, including the involvement of multiple stakeholders, blockchain allows for efficient coordination between them. This informational system would be able to reduce the emissions generated by the misallocation of resources, especially those related to indirect activities.</p> <p>For this purpose, funding fintech initiatives aiming at introducing block-chain technologies to drive data transparency within the building sector must be enhanced.</p>		
<b>Socioeconomic impacts</b>	<p>From a business perspective, it would improve contract management and transparency as every contract would be recorded in the chain. This allows, for instance, for any validated user to check the situation of that contract and trace all the required payments attached to it.</p> <p>Currently low due to the fact that the development and implementation of this technology are still in their first steps.</p>		
<b>Impact (ranging 1 to 10)</b>	9	<b>Feasibility (high, medium or low)</b>	Low
<b>Related to</b>	<p>Blockchain allows for instant sharing of information between users. When applying this concept to the built environment, this technology would reduce embodied emissions resulting from the misallocation of resources during the entire cycle of life of the building. Communication failures trigger efficiency losses in the building sector that contribute to increased embodied emissions. In this sense, blockchain would avoid these misallocated resources derived from production and transportation stages, reducing the impact generated. This entire process would allow reducing emissions caused by externalities during the decision process. Once the construction process is over, these “smart” buildings would be able to use these automations provided by the blockchain in order to analyze air quantity, monitoring energy use and occupancy.</p>		

# Financing decarbonisation via innovative economic instruments based on Circularity and Sufficiency

Financial instruments, economic incentives and drivers for a sustainable built environment