This is a consultation document on an EU Policy Roadmap for addressing the Whole Life Carbon of Buildings being developed as part of the #BuildingLife project. Running until the end of 2022, #BuildingLife is supporting the ambitions of the EU Green Deal by outlining how EU and national building policy can move beyond a focus on operational emissions from buildings and start to consider both operational and embodied carbon - whole life carbon - in an integrated manner.

The project spans many different workstreams, including communication, education, data collection and sustainable investment. This EU-level roadmap, alongside ten national roadmaps being developed by Green Building Councils across Europe, forms a central part of the advocacy work of the #BuildingLife project.

The full EU Policy Roadmap will be published in Q1 2022. This will outline the key policy recommendations and the actions required by the buildings sector stakeholder community to deliver our vision of a decarbonised built environment by 2050. In advance of this, we hope to agree our key policy recommendations by November 2021 so that they can inform the publication of the Energy Performance of Buildings Directive in December 2021.

This consultation will run between 16 August and 17 September 2021.

How to respond to the Consultation

This consultation focuses on two key sections that will form part of the final Roadmap. Drafts of these two sections are presented in this consultation document. Section 1 provides a detailed overview of EU sustainable building policy, an analysis of the state of the market, barriers and opportunities to a whole life carbon approach, while also laying out the vision that guides our policy recommendations.

Section 2 sets out these policy recommendations in detail against each of the four 'policy routes' we have identified: Building Regulations, Waste and Circularity, Procurement and Sustainable Finance.
This consultation pack contains three key documents:

- Detailed draft of our policy recommendations (this document)
- Google questionnaire
- Powerpoint presentation

Please read through this document and then submit your feedback as follows:

- Follow the above link to fill in and submit your answers to the questionnaire which contains targeted questions about the policy recommendations - please focus your attention on the specific policy recommendations in Section 2

- Send through any further comments, not captured in the questionnaire, by email to europe@worldgbc.org

For associations and networks: You can edit and use the provided Powerpoint to run internal workshops with your own members to collect feedback for the consultation.

The consultation is open from Monday 16th August to Friday 17th September. If you would like to discuss the consultation in more detail, please contact mrowland@worldgbc.org.
Section 1

Introduction & Background

About #BuildingLife

#BuildingLife is a regional project by the World Green Building Council (WorldGBC) and ten green building councils across Europe. The #BuildingLife project is funded by the Laudes Foundation and the IKEA Foundation. WorldGBC is the world's largest global network driving action to deliver the ambitions of the Paris Agreement and UN Global Goals for Sustainable Development in the building and construction industry. #BuildingLife brings together a coalition of Green Building Councils across Europe - in Croatia, Finland, France, Germany, Ireland, Italy, the Netherlands, Poland and Spain and the UK - to drive decarbonisation of the building sector through private sector action and public sector policy.

Running until the end of 2022, the project aims to support the ambitions of the EU Green Deal by outlining how EU and national building policy can move beyond a focus on operational emissions from buildings and start to consider both operational and embodied (whole life carbon) in an integrated manner.

#BuildingLife follows WorldGBC’s systemic approach to driving impact, with activities taking place across six main work streams: Collaborate, Advocate, Communicate, Educate, Rate and Invest.

To drive collaboration as part of the project, a European Leadership Forum with diverse leaders across the built environment value chain has come together to build consensus and steer the direction of an EU Policy Whole Life Carbon Roadmap. In addition to the Leadership Forum, an ‘EU Whole Life Carbon Roadmap Technical Working Group’ has been established to provide technical input and analysis into the EU WLC roadmap. These organisations’ time, expertise and resource have been instrumental in developing this draft roadmap. A full list of organisations who have inputted into the development of the roadmap is included in Annex A.

In addition, ten Green Building Councils in WorldGBC’s Europe Regional Network have also established National Leadership Fora to work with diverse national stakeholders on the development of National Net Zero Whole Life Carbon Roadmaps, which will be released over the course of the project.

As a signal of the readiness of the market to take action on whole life carbon, WorldGBC’s Net Zero Carbon Buildings Commitment is undergoing an update that...
will see it incorporate targets and actions for signatories on whole life carbon. This leadership from industry provides a clear signal to governments at all levels that the time is right for ambitious policy on whole life carbon.

To complement this, the EU WLC Policy Roadmap will be a valuable resource to advocate for the full decarbonisation of the EU’s built environment, and set a clear route to delivering the EU Green Deal by harnessing the contribution of the buildings sector. The roadmap will set out a trajectory of policy interventions between now and 2050 to catalyse decarbonisation across the areas of: Building Regulations, Waste & Circularity, Procurement and Sustainable Finance. Progress along these dimensions will be enabled by greater building data collection and reporting as well as effective multi-level governance, policy integration and support to subnational policy makers.

The National Roadmaps being developed in ten countries will drive sustainable building advocacy on the regional scale, and a European Governments Working Group has been established to ensure alignment between the EU and national roadmaps. The Working Group has regular meetings with European Commission and national government representatives from across Europe.

As part of the #BuildingLife project, in June 2021 WorldGBC sent an open letter to European policymakers, signed by leaders representing over 4,500 organisations across the building sector value chain. The letter called on the European Commission to ensure the review of key legislative files, such as the Energy Performance of Buildings Directive (EPBD) will support a whole life carbon (WLC) approach.

To ensure that the #BuildingLife campaign communicates its message as strongly and widely as possible, a dedicated communications campaign has run since December 2020. A key goal of this element of the project has been to bring diverse stakeholders on board as campaign ambassadors. These individuals, who number over 100 and include MEPs, the CEOs of prominent organisations and national and local government representatives, have all endorsed the statement:

“We call on the European Commission and national governments to support #BuildingLife by committing to ambitious policies to tackle the TOTAL carbon and resource impact of our sector.”

A series of webinars, videos, op-eds and Europe-wide press releases have sought to disseminate the aims of the project and boost its messaging.

The #BuildingLife project will also serve to educate professionals across the public and private sectors in order to facilitate the transition to the whole life carbon approach advocated by the Whole Life Carbon Roadmap. To achieve this, an education programme is being developed and rolled out for professionals and construction companies on Life Cycle Assessment and Cost (LCA and LCC), product manufacturers on Environmental Product Declarations (EPDs) and public authorities on how to incorporate LCA and LCC into their public procurement processes.
Recognising that we cannot act on whole life carbon unless we have a clear and unified way to measure it, the Rate element of #BuildingLife (linked to the LIFE Level(s) project) will focus on incorporating a streamlined Level(s) Reporting Framework into major green building certification schemes. This will allow the buildings sector to access comparable performance data across the whole life cycle of projects and set more accurate benchmarks moving forward. Also linked to the LIFE Level(s) project, #BuildingLife will work on the availability of product level data - developing or supporting Open Source Product LCA Databases in countries with insufficient or no data for construction products. This element of the project builds on the evidence of leading markets such as Finland, Germany and the UK, where freely available embodied carbon and LCA data have been an important catalyst of industry action.

Finally, it is key to make sure that investment is channelled towards sustainable building practices that are in line with our vision for the built environment, detailed in the next section. As part of this, members of the WorldGBC network will provide ongoing Taxonomy support to the European Commission and key investor groups on how to implement the move towards embracing the whole life cycle perspective for the buildings sector.

**Our 2050 Vision**

At the heart of the #BuildingLife project is a desire to galvanise support from a broad and diverse coalition around a common vision for the built environment. The members of the European Leadership Forum have collaboratively developed the following vision statement:

Every European citizen lives in a totally decarbonised, circular, resilient and well-designed built environment that facilitates a high quality\(^1\) of life.

This means that by 2050

- **Decarbonisation**: All buildings, including existing buildings, are net zero operational carbon, and new buildings, infrastructure and renovations are net zero embodied carbon,

- **Resources and Circularity**: A built environment that does not contribute to resource depletion, while supporting restoration of resources and natural systems within a thriving and sustainable circular economy.

\(^1\)For example the The Davos Baukultur Quality System defines high quality as “well-designed places that change in line with societal needs while preserving their historical characteristics. It focuses on social needs and sustainable use of resources and adds economic value.”
• **Quality and Resilience**: The built environment is designed in a way that delivers quality, healthy, equitable and resilient communities, whilst eliminating air, soil, water and traffic pollution.

**Definitions**

These definitions are adapted from WorldGBC (2019) Bringing Embodied Carbon Upfront. They make reference to the lifecycle modules set out in European standard EN15978: Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method. It is noted that this standard is being reviewed by CEN Technical Committee 350 – Working Group 1 - Environmental performance of buildings. These definitions may be reviewed to ensure they remain aligned with a future update of the European standards.

**Carbon emissions**

Refers to all emissions of greenhouse gases. Their global warming potential (GWP) is quantified in units of carbon dioxide equivalence. A kilogram of carbon dioxide therefore has a GWP of 1 kgCO₂.e.

**Whole life carbon**

Emissions throughout the lifecycle of a built asset as defined in European standards (particularly EN15978 and EN15804). The lifecycle as defined within these standards (modules A-C) encompasses both embodied and operational carbon. The standards also describe module D, which contains important information concerning benefits and impacts from product reuse, material recycling and exported energy/energy recovery that has not been accounted for in modules A-C. Module D should always be reported but should be shown separately in the assessment for transparency. This is to ensure consistent accounting if these same reused products, recycled materials, or exported energy/energy recovery are assessed again as part of their subsequent use in the following system or next building life cycle, to ensure double accounting of loads and benefits can be avoided. There may be scope to count benefits beyond the system boundary towards a net zero carbon balance.

**Embodied carbon**

Because different greenhouse gases can remain in the atmosphere for different lengths of time, their GWP will change if a shorter or longer time period is used. It is best practice to report the time period used alongside results and divergence from the widely used GWP100 [years] should be explained.
Carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure. Embodied carbon therefore includes: material extraction and upstream production (module A1), transport to manufacturer/factory (A2), manufacturing (A3), transport to site (A4), construction and installation processes (A5), use phase (B1), maintenance (B2), repair (B3), replacement of building components (B4), refurbishment (B5), deconstruction (C1), transport to end of life facilities (C2), processing for reuse, recovery or recycling (C3), disposal of waste (C4). Benefits and loads from product reuse, material recycling and exported energy/energy recovery beyond the system boundary (D) should be reported separately to modules A-C according to EN 15978 and associated standards.

**Upfront carbon**

The emissions from the materials production and construction phases (Module A) of the lifecycle before the building or infrastructure begins to be used. In contrast to other categories of emissions listed here, these emissions have already been released into the atmosphere before the building is occupied or the 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. These are additional to operational carbon emitted due to heating, cooling and power etc.

**Operational carbon**

The emissions associated with energy used (module B6 under EN 15978) to operate the building or in the operation of infrastructure.

**Net zero operational carbon**

A net zero operational carbon asset (new or renovated) or infrastructure asset is highly energy efficient with all remaining energy from on-site and/or off-site renewable sources.

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3 A forthcoming update of EN 15978 may include a new Module A0, encompassing activities pre-construction such as site preparation works.
Zero-carbon-ready building

A zero-carbon-ready building is defined by the IEA4 as “highly energy efficient and either uses renewable energy directly, or uses an energy supply that will be fully decarbonised by 2050, such as electricity or district heat. This means that a zero-carbon-ready building will become a zero-carbon building by 2050, without any further changes to the building or its equipment.”

Net zero embodied carbon

A net zero embodied carbon building (new or renovated) or infrastructure asset 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 in order to achieve net zero across the lifecycle.

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 in order to achieve net zero across the whole remaining lifecycle.

Our Goals

The main objective of this report is to outline a pathway for European policy to achieve a decarbonised, circular, resilient and well designed built environment by the year 2050, and establish the appropriate regulatory measures and tools to achieve this vision.

The wider goals of the report are to:

Demonstrate: the importance of supporting and implementing policies that address the total impact of the built environment. Demonstrate support for action from industry for ambitious European policies that take the whole life carbon impact of buildings into account. In doing so the

roadmap can inform forthcoming policy reviews - including the EPBD review, the Energy Efficiency Directive (EED) review and the EU Taxonomy, amongst others. This roadmap can also provide a blueprint for the European Commission to use as it begins work on its own whole life carbon roadmap as announced in the Renovation Wave, and potentially to inform a future EU strategy for a sustainable built environment.

Private sector leaders, MEPs, cities and NGOs alike have joined the #BuildingLife campaign as ambassadors to call for this, and many also signed a letter to the European Commission in June 2021. There is action being taken on whole life carbon already by governments across Europe, showing that achieving this vision is possible.

**Inspire: collaboration across the built environment value chain.** Leading organisations in the buildings sector have already taken action on whole life carbon, but this approach cannot work in isolation. Collaboration with all players involved allows businesses and organisations to identify and have confidence in the environmental, social and financial benefits of taking a leadership position in the transition to a decarbonised built environment.

This is a radical transition – driving it will require much greater demand from the market as well as rapid scaling of solutions by the supply chain. Large amounts of additional renewable energy are needed, and some of the solutions we will rely on are currently only at demonstration stage, including carbon capture for utilisation and storage. By stimulating market demand we will accelerate investment in actions that will lead to increased competitiveness, improved access to solutions and a wider range of strategies for achieving net zero embodied carbon.

**Educate: a critical mass of stakeholders about the carbon and environmental impact of buildings.** There is a communications gap in the industry where public and private sector actors are not always aware of potential solutions that take the whole life impact of our sector into account. We want this report to inspire stakeholders across the value chain - developers, manufacturers, building users, policymakers and designers - with our pathway to a better future that is rooted in the possible.

For this reason, the roadmap will detail a comprehensive set of actions and recommendations to ensure that the whole building and construction sector has the knowledge and capacity to deliver on these policy ambitions. This includes establishing the strong policy, regulatory and financial support that will be required for both demand-side and supply chain actors to fulfil this transition. The report will
also clarify the building sector’s role in achieving the wider climate neutral ambitions of the EU Green Deal.

**Scope**

This roadmap will outline the key policy interventions needed within the EU Policy Framework to decarbonise the EU’s building sector. The roadmap will specifically focus on measures to address whole life carbon at the building level, in particular four key complementary policy routes:

- Building Regulations
- Waste and Circularity
- Procurement
- Sustainable Finance.

Specific policy recommendations against the relevant EU regulations will be made for these ‘routes’, and how different levels of government can support and implement these recommendations.

The report stops short of making specific product, database or technology recommendations. Issues such as the Emissions Trading Scheme (ETS), Carbon Border Adjustment Mechanism and appliances within buildings are also outside the scope of the roadmap.

However, the roadmap will make reference to actions, voluntary initiatives and policies within the remit of EU, national and local authorities that can help accelerate the decarbonisation of the built environment.
State of the Market

Case for Action

The COP21 UN Climate Conference in Paris, in December 2015, agreed that governments and organizations should commit to reducing greenhouse gas emissions to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The call was received by 196 countries who have now disclosed their Nationally Determined Contributions (NDCs) required under the Paris Agreement.

Global awareness of the importance of specific environmental commitments has grown with increasingly regular extreme climatic events, and the adverse economic effects of the COVID-19 pandemic. Now, many countries see the response to climate change as an opportunity to recover and boost their economies in line with a sustainable future.

Buildings and the construction sector have and continue to contribute a great deal to carbon emissions and climate change. Consequently, there is great latent potential for the sector to also contribute to the decarbonisation of the global economy. In Europe the use or operation of buildings alone accounts for around 40% of energy consumption and 36% of CO₂ emissions⁵. Energy-efficiency improvements and decarbonisation of electricity and heat are the main routes to bring this figure down.

Beyond operational emissions, embodied carbon in the built environment contributes 11% of all carbon emissions globally. These 3.67 million tonnes of CO₂ emissions (2019) are created by the construction, renovation, refurbishment, deconstruction or demolition, and the wider supply chain of a building. Moreover, buildings are also responsible for around 50% of all extracted materials, 33% of water consumption, and 35% of waste generated⁶, all with associated emissions, and other environmental impacts including resource depletion (abiotic and biogenic), pollution of air, water and land and biodiversity loss.

Although there are figures available globally, the scarcity of reliable, intelligible, and comparable data across Europe means there is not yet a common consensus about the extent to which emissions can be attributed to embodied carbon in Europe’s building stock. However, what we do know presents a compelling case for action to prevent a ‘business-as usual’ scenario that risks the future of generations to come.

The following state of play report summarises the main global and European policy frameworks that guide the development of carbon neutral societies by 2050 and analyses the gaps and barriers to achieving this goal.

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⁶ https://www.worldgbc.org/sites/default/files/UNEP%20GABC_en%20%28web%29.pdf
Global Perspective

International Context

While embodied carbon currently accounts for 11% of emissions globally, as operational carbon is reduced and development accelerates in parts of the world including China and Africa; it is estimated that more than half of remaining total carbon emissions from all global new construction between 2020 and 2050 will be due to upfront emissions from new building construction and, to a lesser degree, from building renovations, in particular in Europe.

It is therefore imperative that we rapidly increase actions that achieve emissions savings early in the building lifecycle that already deplete our current carbon budget. This is sometimes referred to as the time value of carbon\(^7\) – it provides a compelling reason to address embodied carbon in addition to operational carbon and to prioritise upfront emissions from materials and construction urgently. Once a building or infrastructure enters operation, nothing more can be done about its upfront emissions. Nations are required then, to accelerate the transition to zero emissions by 2050 at latest, with substantial contributions required during this decade (approximately 50% reduction in global emissions by 2030)\(^8\).

Such goals will only be reached by taking a holistic and realistic approach, while maintaining a concerted focus on transformational pathways for both net zero embodied carbon and net zero operational carbon. An explicit focus on embodied carbon alongside operational carbon is essential to accelerate and scale up the rapid action needed through targeted regulatory requirements, policy tools, instruments, and methodologies. Bearing this in mind, several international frameworks and alliances have made a public call for harmonized and effective strategies to guide the actions at a local level, with a hierarchy that promotes resources optimization:

1. **Prevent**: the best way to reduce embodied carbon is avoiding unnecessary new construction. By prioritising renovation (as opposed to demolishing and newbuild), which reduces upfront embodied emissions, or by building nothing the potential for embodied carbon emissions is eliminated or dramatically reduced.

2. **Reduce and optimize**: with the support of databases and building simulation tools, building designs and renovations can be optimized to minimize the quantity of new material, and to foster circularity.

3. **Plan for the future**: new buildings and renovation need to respond to future conditions. Therefore, it is key to integrate circular economy principles, whole life cycle assessments, natural systems restorations, and other strategies to mitigate emissions at end of life.

\(^7\) Carbon Leadership Forum (2017): Time value of carbon.

\(^8\) https://www.iea.org/reports/net-zero-by-2050
4. **Offset:** as a last resort after the use of all existing techniques, technologies, and resources, residual carbon emissions must be offset through appropriate and effective means.

This path was highlighted by the WorldGBC and its report *Bringing Embodied Carbon Upfront* published in 2019. With a similar ‘hierarchy’ approach, the World Resources Institute published in the same year the working paper *Accelerating Building Decarbonization: Eight Attainable Policy Pathways to Net Zero Carbon Buildings for All*. This document explores a range of proven, feasible pathways to achieving zero carbon buildings in different countries.

Similarly, in 2020, the Global Alliance for Buildings and Construction published the *GlobalABC Roadmap for Buildings and Construction 2020-2050*, which shows that cost-effective energy efficiency and decarbonisation measures in buildings could represent one-third of the total reductions required to align with the IEA's Sustainable Development Scenario and achieve the goals of the Paris Agreement. This roadmap divides its action into eight categories and proposes mid and long-term goals and recommendations for different stakeholders.

**European Context**

These and other international frameworks have been taken as a reference to develop more specific and local guidelines to achieve a decarbonised built environment. At the European level, there are several initiatives that seek to accelerate the transition towards a totally decarbonised built environment based on the principles of sustainability, complete life cycle analysis, circularity and transparency. Among these initiatives, the reference frameworks of the European Commission's *Level(s)* and *EU Taxonomy* stand out, which seek to promote and achieve the goals of the Paris Agreement and the EU Green Deal.

*Level(s)* provides a set of common indicators and metrics for measuring the environmental buildings performance under a full life-cycle approach. The EU Taxonomy, for its part, aims to define and harmonize the criteria for sustainable investments, through specific activities and performance indicators.

In addition to these voluntary frameworks, key directives call for higher performance and more transparent processes. For instance, following its review as part of the European Commission’s ‘fit for 55’ package, the Energy Efficiency Directive (EED) has established a set of binding measures to keep the EU's primary energy demand 39% below projected levels in 2030. Under the directive, all EU countries are required to use energy more efficiently at all stages of the energy chain, including energy generation, transmission, distribution and end-use consumption. EU countries are also required to renovate at least 3% of the total floor area of buildings owned by all levels of public administration each year, as well as reduce final energy consumption by 1.5% a year between 2024-30.
The Energy Performance of Buildings Directive (EPBD) covers a broad range of policies aimed at helping national governments in Europe boost the energy performance of buildings and improve the existing building stock.

At the national level, EU member states have developed a range of strategies to aid the transition of their national buildings sector towards a decarbonised future. The main initiatives are summarized in Table 1. This summary reveals that there are stark differences in the level of ambition between different countries and not all of the examples listed go far enough yet.

Table 1: Summary of current targets and initiatives by country to reduce carbon emissions in Europe.

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<tr>
<th>Country</th>
<th>Targets</th>
<th>Roadmaps / Initiatives</th>
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| Belgium | Carbon neutrality by 2050. | - Mandatory National LCA requirement for state government buildings.  
- Net zero 2050 initiative. |
|         | Supporting policies: regulatory instruments for building envelope, heating fuel switch, appliances efficiency, renewable electricity, and materials including LCS reporting |
| Croatia | Reduce CO₂ emissions by 80% in the building construction sector 2050. | Integrated Energy and Climate Plan for the Period from 2021 to 2030.  
The plan introduces measurable indicators of energy renovation of buildings, to convert the existing stock into nearly zero-energy buildings, i.e. climate neutral. It promotes the nearly-zero energy standard in building construction and refurbishment. |
| Denmark | Reduce 70% emissions by 2030 and achieve carbon neutrality by 2050 (all sectors). | National Strategy for Sustainable Construction  
- The strategy introduces a number of initiatives to promote sustainable buildings, including CO2 limit values for new buildings from 2023.  
- Mandatory national life-cycle carbon limits on new buildings. It will be introduced in 2023 |
| Finland | Carbon neutrality by 2035. | Lifecycle (optimization) approach and assessment.  
- The Ministry of the Environment has developed an assessment method and will develop a generic emission database for products and materials, sources of energy, modes of transportation as well as other main processes such as site operations and waste management.  
- Mandatory national life-cycle carbon limits on new buildings starting in 2025. |
| France | Carbon neutrality by 2050. | 2050 carbon-neutral law  
- National Low Carbon Strategy. |
- Strategies: make energy production fully carbon-free by 2050; halve energy consumption through energy efficiency; increase and safeguard carbon sinks such as soils and forests, and promote carbon capture and storage (CCS) technologies and products from the bio-economy.
- Additionally, there will be mandatory national life-cycle carbon limits on new buildings starting in 2022.

| Germany | Reduce 70% buildings emissions by 2030 and achieve carbon neutrality by 2050. | - Climate action law.
- Climate Action Plan 2050.
- Ökobaudat: LCA platform for buildings.
- Voluntary national LCA requirement for federal government buildings |
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<td></td>
<td>- The Climate Action Plan contains a road map towards an almost climate-neutral building stock. It promotes the Passive House Standard, SECAPs, more stringent regulations to improve energy efficiency, and linking funding to heating systems based on renewable energy sources.</td>
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<td></td>
<td>- Since July 2021: Public funding for sustainability measures require meeting life cycle GHG emission and primary energy limit values.</td>
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- Draft: 2050 decarbonization strategy, so-called: Clean Growth Strategy |
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<td>Draft proposal: Increasing the budget of energy efficiency programmes for energy management in buildings and improving the effectiveness of their distribution of funds.</td>
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| Ireland | - Carbon neutrality by 2050.
- 7% annual average reduction in greenhouse gas emissions between 2021 and 2030. | National Energy & Climate Plan 2021-2030
Proposals: setting stricter requirements for new buildings and substantial refurbishments. Public sector buildings to have a B Building Energy Rating (BER) by 2030. One third of commercial (including mixed use) buildings to have a B BER (or carbon equivalent gains) by 2030. 600,000 heat pumps installed over the period 2021-2030. |
|---------|-------------------------------------------------------------|------------------------------------------------------------------|

| Spain | - Carbon neutrality and circular economy by 2050.
- Reduction of 23% of emissions by 2030. | - Climate law under review |
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<td>- Plan to make Spain’s electricity system 100% renewable by 2050, ban all new coal, oil and gas extraction projects.</td>
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<td>- Upcoming regulation with efficiency measures to reduce energy consumption by at least 35%, through the renovation of buildings and homes.</td>
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<td></td>
<td>- Upcoming regulation under review for carbon neutral new buildings.</td>
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| Sweden | Carbon neutrality by 2045. | - Upcoming regulation: Climate declaration of buildings including all LCA stages.
- Increase the requirements for EPDs (no specific % yet). |
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<tr>
<td>Country</td>
<td>Strategy and Priorities</td>
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<tr>
<td>Sweden</td>
<td>- Sweden’s long-term strategy for reducing greenhouse gas emissions.</td>
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<td></td>
<td>- Upcoming regulation of embodied carbon (preliminary limit values of 12 kg CO2e per m² from 2023).</td>
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<td></td>
<td>- Upcoming energy and carbon taxes for various sectors including homes and commercial buildings.</td>
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<td></td>
<td>- National carbon reporting for new buildings, limits by 2027.</td>
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<tr>
<td>Norway</td>
<td>Carbon neutrality and circular economy by 2050.</td>
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<td></td>
<td>- The property sector’s roadmap towards 2050.</td>
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<td></td>
<td>- Oslo’s new Climate Strategy to reduce emissions by 95% by 2030.</td>
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<tr>
<td>Norway</td>
<td>- Tighter limits of energy consumption in building code (TEK17): 100 kWh/m² for single houses, 95 kWh/m² for apartments and 115 kWh/m² for offices.</td>
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<tr>
<td>Norway</td>
<td>- Norway has also introduced a ban on fossil fuel (oil and paraffin) heating systems. This ban has been phased in since 2016 and will be in full force from 2020 onwards.</td>
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<tr>
<td>The Netherlands</td>
<td>Reduce 50% emissions by 2030 and achieve carbon neutrality by 2050.</td>
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<td></td>
<td>- Mandatory National life-cycle impact limits on new buildings.</td>
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<td></td>
<td>- Amsterdam aims to be fully circular in 2023 (new buildings and products. Renovations by 2025).</td>
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<tr>
<td>The Netherlands</td>
<td>- Environmental performance of new houses more stringent from 2021.</td>
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<td>- Upcoming uniform assessment method for circular measures</td>
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<td></td>
<td>- Performance requirements are more stringent step by step to be halved ultimately in 2030.</td>
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<tr>
<td>United Kingdom</td>
<td>Reduce emissions by 78% by 2035.</td>
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<tr>
<td></td>
<td>- Net Zero Whole Life Carbon Roadmap from the UKGBC.</td>
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<td>- Mandatory Greater London Authority requirement for new projects</td>
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<tr>
<td></td>
<td>- Industrial Decarbonisation Strategy.</td>
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<tr>
<td></td>
<td>Strategies include: resource and energy efficiency, that reduce demand for energy across the economy, societal choices that lead to a lower demand for carbon-intensive activities.</td>
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</tbody>
</table>

* Targets based on 1990 unless stated otherwise

**Opportunities to address embodied carbon**
An exhaustive list of strategies to address embodied carbon is beyond the scope of this roadmap and has been addressed in other reports and resources. A short synopsis is given here to provide context for the recommendations that follow in the next section.

With carbon addressed by many different international, regional and national frameworks, it is key to understand the time intervals and quantity of carbon emissions over the course of the complete lifecycle of a building. Several factors such as production processes associated with materials, resource use, and location influence the amount of carbon emissions by stage. However, in general and for new buildings, a great portion of these emissions come from the product and use stages, as shown by The Institution of Structural Engineers in Figure 1\textsuperscript{9}.

Figure 1: Life cycle stages and modules according to the Standard EN 15978 and the estimated distribution of emissions for a medium scale residential building.

Building products from structural elements and finishes often represent the biggest contribution because of the large volumes of material they use, but also because their production is highly carbon intensive at the extraction of raw materials, the product manufacturing and transportation between several locations.

\textsuperscript{9} The Institution of Structural Engineers. How to calculate embodied carbon: https://www.istructe.org/IStructE/media/Public/Resources/istructe-how-to-calculate-embodied-carbon.pdf
The materials most used in structural elements such as concrete and steel are responsible for approximately 20% of emissions in this stage. During the cement production, approximately 60% of the emissions come from chemical reactions during processing, and 40% from the burning of fossil fuels in the manufacturing process.

Other common construction materials such as aluminium, glass, plastics, inorganic insulation, and other metals are carbon intensive because of their energy-intensive production processes which typically require high temperatures during production to remove oxygen or transform, among other things.

Carbon emissions reductions in these industries is in part coming from increased energy efficiency in their plants from the use of new technology and/or materials, as well as the transition from fossil fuels to renewable energy, hydrogen, waste incineration, and biofuels. Products coming from natural elements such as wood or straw have also benefited from the introduction of low-carbon technologies and more efficient equipment in their manufacturing processes, as well as the recognition of the use of mature wood from sustainably managed forests in long-life products such as building fabric as a valuable carbon store.

The call for the implementation of greater energy and resource efficiency also comes from forecasts of population growth and housing needs with expected increased floor space demand. It has been estimated that by 2060, the total global floor area of buildings will double, with more than 50% of this anticipated within the next 20 years. The growth in new buildings will be particularly rapid in Asia and Africa, while Europe faces a different challenge – that of an ageing existing building stock and the expectation that up to 80% of buildings in use in 2050 already exist today. Currently about 35% of buildings in the EU are 50 years old or older, and 97% of the building stock is not efficient enough to comply with future carbon reduction targets. These buildings will require deep, energy efficient renovation, contributing to increased embodied carbon even as operational emissions are reduced, because of the need for more materials in deep renovation. Therefore, measures are needed to minimise use of virgin materials, such as the promotion of reuse and recycling.

All global markets will require sustainable solutions for new and existing buildings to become climate neutral, therefore this challenge also marks an opportunity for the private sector to be leading suppliers of solutions in the form of products and services that will alleviate the aforementioned environmental pressures of growth foreseen over the coming decades. There will also need to be a societal shift in terms of how resources are used, and the sufficiency of existing buildings, products, and materials in the economy to meet current and future needs.

The need for better data

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WorldGBC has called for at least a 40% reduction in embodied emissions based on the average performance of case studies around the world and giving designers the flexibility of using the available databases and LCA methods, until more information is gathered and a consensus on base lines is reached.

A recent report from One Click LCA (formerly Bionova) shows that current embodied carbon emissions in Europe are around 500 kg CO2e/m² (depending on the building type and the location)\(^1\), and several studies estimate that embodied emissions could account for 10% to 50% of the total life cycle emissions of conventional buildings\(^2\). Furthermore, as energy grids decarbonize and buildings become more energy efficient, the importance of embodied carbon only grows. If energy grids decarbonize, the embodied carbon of new buildings may be higher overall than operational carbon\(^3\).

One Click LCA compiled embodied carbon data on over 3700 buildings. The results suggest that introducing a voluntary embodied carbon limit for Europe-wide application of 750-800 kg CO²e/m² for lifecycle scopes A1-A4, B4-B5 and C1-C4, covering all building materials for a life-cycle of 50 or 60 years, would be feasible for all covered building types across Europe. Such results are summarized in Table 2 and Figure 2.

**Table 2: Existing benchmarks and upcoming regulations on embodied carbon**

<table>
<thead>
<tr>
<th>Source</th>
<th>Data / Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIBA (UK)</td>
<td>Providing an embodied carbon target for all building types using RICS Whole Life Carbon methodology for the entire life cycle (A-C). The target, annualized for 60 years, in 2020 is &lt; 13,3 kgCO₂e/m²a and 2025 target is &lt;10,8 kgCO₂e/m²a.</td>
</tr>
<tr>
<td>Finland</td>
<td>Upcoming regulatory limits: preliminary values at 10-14 kg CO₂e/m²a from 2025 depending on the building type (whole life-cycle scope, including energy, over 50 years).</td>
</tr>
</tbody>
</table>

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\(^1\) https://www.oneclicklca.com/eu-embodied-carbon-benchmarks/


<table>
<thead>
<tr>
<th>Country</th>
<th>Upcoming regulatory limits:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>(from 2023 new buildings over 1000 m², and from 2025 all new buildings): 12 kg CO₂e/m²a and decreasing every two years (whole life-cycle scope, including energy, over 50 years).</td>
</tr>
<tr>
<td>France</td>
<td>Upcoming regulatory limits: drafted at between 12,8 and 14,8 kg CO₂e/m² per year and decreasing every three years (whole life-cycle scope, including energy, over 50 years).</td>
</tr>
</tbody>
</table>

Figure 2: One Click LCA – Embodied Carbon Benchmarks

To help closing the gap on data and resources to address circularity, various successful case studies and platforms are currently being developed to analyse, assess, enhance, and showcase the circular economy models. Among them stand out One Click LCA, a web-based tool that combines metrics for LCA, LCC, circularity and carbon optimization metrics[^14], and The Nordic Dialogue Forum for...

[^14]: https://www.oneclicklca.com
\textit{LCA}, which gathers information and methods to harmonize the life cycle assessment of climate emissions from buildings in the region\textsuperscript{15}.

\section*{Barriers and Opportunities}

Tackling whole life carbon and specifically embodied carbon requires overcoming a number of challenges, but it also presents opportunities. Green buildings represent a major global investment opportunity, with buildings making up the largest segment of the approximately €200billion energy efficiency market\textsuperscript{16}. By combining a better understanding of the current needs, the proven cost-effective practices, and the increase of financial incentives for green investments, organizations and cities have taken the opportunity to create more sustainable places while boosting their economy. To realise these opportunities, we must overcome barriers in key areas:

\subsection*{Policy and Regulation}

Voluntary and mandatory guidelines significantly influence the quantity of emissions from the buildings sector, in both the supply and the demand of products. Measures such as energy efficiency standards for industry, taxes on energy consumption and landfill waste, and carbon trading schemes shape the conception, design, and end of life of buildings. Current and past initiatives have promoted more ambitious targets and increased energy efficiency during operation, but further supply-side supportive policy measures are still needed for manufacturers to drive the necessary investment in technologies and processes. This includes financially incentivising the use of lower carbon innovative technologies and early-phase operational costs as well as incentives for reuse and recyclability and adequate facilities for processing to ensure the availability of secondary materials.

From the demand-side, further attention is needed to promote energy efficient and resilient deep renovations with whole life cycle assessments. Such measures are required to support accelerated actions, especially for the less advanced regions and sectors.

Key to the success of any policy and regulation is its implementation. Policy alignment across multiple levels of governance (ie EU, national and Local) is critical to the successful delivery of any new policies or regulations. As building policy and regulation evolves, it is crucial to address these barriers and opportunities to drive sustainable development.

\textsuperscript{15} https://www.lifecyclecenter.se/projects/nordic-working-group-for-harmonization-lca-climate-and-buildings/

regulations directly impact homeowners and end-users, their needs must also be considered when looking at policy implementation.

**Awareness Raising and Demand**

In general, tools and methods to calculate and address low carbon and energy efficient measures during the operational stage are widely used in current designs, while the usage of tools for embodied carbon is less widespread. Further, the development and publishing of environmental impact data of products (such as environmental product declarations or EPD) can be perceived as time demanding and costly. As a result, the supply chain struggles with the delivery of certified products while the demand-side often opts for familiar, traditional materials without consideration of climate impact. Reducing the cost of providing reliable, comparable and verifiable embodied carbon information is essential. Stimulating demand will require a major shift in awareness across all parts of the value chain combined with concerted action to create market, fiscal policy and regulatory demand drivers and incentives. It will also require the availability of conveniently located and adequate facilities for processing materials for reuse and recycling.

Such an increase in demand will also be positively affected by major investment in skills and capacity building across the value chain. Without the necessary knowledge and tools there is very limited scope to implement carbon reduction strategies successfully, whether for a material or an entire project. The industry in Europe has pockets of expertise, but the application of LCA data and methods and a whole life approach to carbon reduction needs to be urgently mainstreamed. The whole sector must become more open and transparent, sharing solutions and best practices collaboratively through networks such as the Green Building Councils.

**Finance**

For manufacturers, the cost of investing in low carbon technologies and certification processes has to be factored into their decarbonisation pathway. Estimates suggest the necessary capital investments for heavy industry such as steel and cement could be up to 60% higher than current levels\(^1\). Those looking to innovate with circular business models may also face barriers in accessing finance because they could be assessed as ‘higher risk’ by lenders and investors using traditional risk criteria\(^2\).

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Therefore, initiatives such as the EU Green Deal and the EU Taxonomy, together with local green loans, grants, subsidies, and carbon pricing, need to be promoted in order to reach more sectors of the building industry. Carbon pricing and carbon markets can enable and create demand for carbon products and services to compete with their conventional equivalents, provided they are well designed. In 2014 the Climate Policy Info Hub noted that ‘globally, 39 national and 23 sub-national jurisdictions have implemented, or are scheduled to implement, carbon pricing’. To be most effective, these mechanisms must be inclusive and flexible enough to account for ongoing technological advancements. They must also be designed and adequately monitored to avoid carbon leakage triggered by companies wanting to circumvent them by transferring production to third countries, where the mechanisms are not implemented.

To meet sectoral decarbonisation goals, the financing sector will play a key role by developing such financial products and services targeted at low embodied carbon projects from the buildings and infrastructure sector. Further research into the social cost of embodied carbon could strengthen the business case and help inform practice and trade-offs between lifecycle stages over time.
EU Policy Context

There are many European policies, regulations and initiatives that impact buildings and the built environment. The key policies of relevance are listed below:

EU Green Deal

The EU has set ambitious targets to progressively reduce its greenhouse gas emissions up to 2050. The EU Green Deal, published in December 2019, set out an action plan to boost the efficient use of resources by moving to a clean, circular economy whilst restoring biodiversity and cutting pollution.

Currently the key climate and energy targets are set out in the 2030 climate and energy framework which includes EU-wide targets and policy objectives for the period from 2021 to 2030.

As part of the European Green Deal, the Commission adopted a set of proposals in July 2021 to raise the 2030 greenhouse gas emission reduction target to at least 55% compared to 1990. This will help the European Commission realise its goal of a climate neutral Europe, as set out in the proposal for the first European Climate Law, adopted in June 2021.

The Green Deal set out a series of policy initiatives to ensure that Europe achieves climate neutrality by 2050. These include:

- **European Climate Law** - to turn the goal of climate neutrality into a legal obligation.

- **Fit for 55 Package** – set of proposals to help the EU reach its goal of reducing greenhouse gas emissions by 55% by 2030.

- **Renovation Wave** - this is a flagship policy of the Green Deal that aims to “at least double or even triple” the renovation rate of buildings, which currently stands at around 1%.

- **EU Biodiversity Strategy for 2030** – this includes measures to tackle soil and water pollution as well as a new forest strategy.

- **EU Strategy on Adaptation to Climate Change** - this was published in February 2021

- **Circular Economy Action Plan** – will ensure the EU is a global leader on circular economy
Under the Green Deal, the EU will also provide financial support and technical assistance to help those that are most affected by the move towards the green economy. This is called the **Just Transition Mechanism** (JTM). It will help mobilise at least €100 billion over the period 2021-2027 in the most affected regions. This will apply in particular to member states and regions with a high dependence on fossil fuels and carbon-intensive industries. The JTM will also support companies and sectors who are active in carbon-intensive industries. Finally, it will support people and citizens who are most vulnerable to the transition, with actions such as improving the energy-efficiency of housing and tackling energy poverty.

**EU Climate Law**

In March 2020, the European Commission presented its proposal for the first European Climate Law. In June 2021, this Law was adopted, legislating the EU Green Deal's goal that Europe's economy and society must become climate neutral by 2050, a collective target for the EU's 27 member states.

To achieve this ambitious target, the European Commission has committed to:

- Reducing EU greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels.
- Adopting a 2030-2050 EU-wide trajectory for greenhouse gas emission reductions.
- By September 2023, and every five years thereafter, assessing the consistency of EU and national measures with the climate-neutrality objective and the 2030-2050 trajectory.

**Circular Economy Action Plan**

The Circular Economy Action Plan (CEAP) aims to deliver a cleaner and more competitive Europe in part by ensuring that Europe leads global efforts on circular economy towards greater environmental sustainability, including decarbonisation. The CEAP is particularly focused on key sectors, including construction and buildings, and includes a commitment to publish a new comprehensive Strategy for a Sustainable Built Environment in 2021, although this is no longer expected. The aim was to ensure coherence across relevant policy areas including climate, energy and resource efficiency, management of construction and demolition waste, accessibility, digitalisation and skills. However, this has now been substituted by actions under the already published Renovation Wave strategy, and the more recent Recovery and Resilience Facility.

Alongside well known principles such as **Energy Efficiency First**, the Renovation Wave strategy promotes - Life-cycle thinking and circularity. However, it remains
unclear how this minimising the footprint of buildings through greater resource efficiency will be delivered. principles throughout the lifecycle of buildings by measures In parallel, revision of the Construction Product Regulation is expected to at least deliver a greater volume of data and information that will support circularity in the built environment, namely through details on product performance and essential characteristics.

The revision of the Waste Framework Directive (WFD) is also expected to foster circularity by setting minimum material recovery targets, although the level of detail and ambition remains to be seen. Insulation material is one product category where discussions are already underway in terms of viable recovery rates. Lastly, the use of levels for lifecycle assessment in public procurement, and potentially to support sustainable finance is also expected.

Further details on the CEAP can be found here.

Level(s)

The European Commission has developed a voluntary reporting framework, Level(s), to improve the sustainability of buildings. Level(s) provides a set of common indicators and metrics for measuring the environmental performance of office and residential buildings, which takes into account their full life-cycle. It focuses attention on six key areas: greenhouse gas emissions, resource efficiency, water use, health and comfort, resilience and adaptation, and cost and value.

Within the Level(s) framework, each indicator is designed to link the individual building’s impact with the priorities for sustainability at a European level. This focuses the Level(s) user on a manageable number of essential concepts and indicators at building level that contribute to achieving EU and Member State environmental policy goals.

The European Commission opened the testing phase for Level(s) in 2018 and a final version of the Framework was launched in 2020. It is this version of Level(s) that will be used to explore the appropriateness of carbon targets under the forthcoming Strategy for a Sustainable Built Environment.

EU Taxonomy

In June 2020, legislation on the uniform classification of sustainable investments (taxonomy) came into law. The legislation lays down various criteria across different categories (circular economy, climate mitigation and adaptation, …, and …) for determining which financial products and investments may be declared ‘sustainable’.
Within the buildings sector, the aim is to apply clearly defined taxonomy criteria to new buildings, renovation measures and the acquisition and ownership of buildings. By applying performance thresholds, investors can identify where performance needs to be improved and which activities are already environmentally friendly. This application will help to grow low-carbon sectors and decarbonise high-carbon ones.

In future, finance and investments that are marketed as ‘green’ will need to be explained in terms of the Taxonomy criteria. Such disclosures will help the market determine whether the environmental performance of an underlying economic activity is contributing to climate objectives.

The Commission adopted the delegated act supplementing Article 8 of the Taxonomy Regulation in July 2021.

**Current EU Regulations and Laws**

**Fit for 55 package**

The Fit for 55 package is a package of proposals to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

**Energy Efficiency Directive**

The Energy Efficiency Directive (EED) establishes a set of binding measures to help the EU reach its 30% energy efficiency target by 2030. Under the directive, all EU countries are required to use energy more efficiently at all stages of the energy chain, including energy generation, transmission, distribution and end-use consumption.

As part of the EU's commitment to climate neutrality, there was a review of existing legislation to ensure that it is sufficiently ambitious to meet the 2030 greenhouse gas emission target. The public consultation on the revision of the EED closed in February 2021, and the revised Directive was adopted in July 2021 as part of the Commission’s set of proposals to help the EU reduce its emissions by 55% by 2030. Changes include:

- A binding target for the reduction of the EU’s primary energy demand by 39% by 2030.
- EU countries are required to renovate at least 3% of the total floor area of buildings owned by all levels of public administration each year.
- Member states to reduce final energy consumption by 1.5% a year between 2024-30.
- The establishment of the first EU-wide definition of energy poverty.
A provision that contracting authorities may require that tenders disclose a Global Warming Potential of new buildings for each life cycle (in particular for new buildings above 2000 square meters). This is linked to another provision aimed at increasing awareness of circular economy and the whole life-cycle of carbon emissions in public procurement practices.


The Energy Performance of Buildings Directive (EPBD) covers a broad range of policies aimed at helping national governments in Europe boost the energy performance of buildings and improve the existing building stock. Such policies include:

- **Renovation strategies** - EU countries must establish strong long-term renovation strategies, aimed at decarbonising the national building stocks by 2050. The strategies should contribute to achieving the national energy and climate plans (NECPs) energy efficiency targets.
- **Performance requirements** - EU countries must set cost-optimal minimum energy performance requirements for new buildings and for existing buildings undergoing major renovation.
- **Nearly zero-energy buildings (NZEB)** - from 31 December 2020, all new buildings are nearly zero-energy buildings (nZEB).
- **Energy Performance Certificates** - must be issued when a building is sold or rented, and inspection schemes for heating and air conditioning systems must be established.

In addition to the EPBD, the Commission has also published a series of recommendations on building renovation (EU)2019/786 and building modernisation (EU)2019/1019. The updated EPBD will be published on the 14 December 2021 to ensure it meets the additional requirements set out in the EU Green Deal and the Renovation Wave.

Renewable Energy Directive

The Renewable Energy Directive (RED) establishes an overall policy for the production and promotion of energy from renewable sources in the EU. It requires the EU to fulfil at least 32% of its total energy needs with renewable energy by 2030. A specific target of 1.3% increase per year has been set for the share of renewables used for heating and cooling, which includes the use of waste heat in buildings.
As part of the EU’s commitment to climate neutrality, there is currently a review of
existing legislation to ensure that it is sufficiently ambitious to meet the 2030
greenhouse gas emission target. The public consultation on the revision of the RED
closed in February 2021, and the revised Directive was adopted in July 2021 as part
of the Commission’s set of proposals to help the EU reduce its emissions by 55% by
2030. The RED revision proposal will increase the 2030 target for renewables from
32% of the EU energy mix to 40%.

**Construction Products Regulation (CPR)**

The [Construction Products Regulation (CPR)](https://eur-lex.europa.eu) lays down harmonised rules for the
marketing of construction products in the EU. The Regulation provides a common
technical language to assess the performance of construction products. However,
the current regulation does not directly set minimum requirements for environmental
information or performance, only allowing for the possibility of this to be established
through harmonised European Standards (hEN).

The aim of the current regulation is to ensure that reliable information is available to
professionals, public authorities, and consumers, so they can assess and compare
essential characteristics of products from different manufacturers in different
countries.

The CPR is under review, and a consultation process concluded in December 2020,
with the results to be available soon.

**Other laws of relevance to the building and construction sector include:**

The [EU Governance Regulation](https://eur-lex.europa.eu) sets out requirements for establishing national
energy & climate plans (NECPs), long-term strategies, multilevel climate and energy
dialogue, reporting and monitoring of energy and climate goals.

The [Energy Taxation Directive (ETD)](https://eur-lex.europa.eu) lays down a minimum tax rate for energy
carriers such as heating fuels and for electricity. The ETD has been revised as part
of the Fit for 55 package. This revision has introduced a new structure of tax rates
based on energy content and environmental performance of fuels and electricity. It
has also broadened the taxable base by including more products in the scope and by
removing some of the current exemptions and reductions.

The [EU Emissions Trading Scheme (ETS)](https://eur-lex.europa.eu) sets a price on carbon emissions
through a cap-and-trade system for industrial producers, including electricity
generators. As part of the ‘Fit for 55’ set of proposals adopted by the Commission, a
parallel ETS will be established for buildings and transport. This ETS will be based
on a fully auction based system, and will ultimately aim to cap emissions from
buildings and transport at 43% below 2005 levels by 2030.
The **Effort Sharing Regulation** (ESR) sets national, binding, annual GHG emission reduction targets for sectors outside the scope of the EU ETS, including buildings.

The **Ecodesign Directive** sets minimum mandatory requirements for the energy efficiency of numerous product groups, including for heating, cooling and electrical appliances. These requirements not only include energy-efficiency, but also include requirements on water-use, noise, air quality (e.g., emissions of space heaters), repairability and recyclability, as well as durability (hardware and software). The directive aims to deliver continuous improvement in environmental impact of products without entailing excessive cost for manufacturers (in terms of competitiveness) or users (in terms of product functionality, health & safety, affordability). This has been [under review in 2020 and 2021](#) and the revised Directive is expected to be adopted as part of the Commission’s draft legislation for its circular economy package in Q4 2021.

The **Energy Labelling regulation** prescribes energy labels for household and commercial product groups. The aim of this regulation is to encourage consumers to buy more efficient products through an easy comparison between their respective environmental performance.
Section 2

Defining a Policy Route for Whole Life Carbon

Introduction

The policy recommendations set out in this section are designed to support the transition to a fully decarbonised, circular, resilient and integrated built environment in the EU by 2050. Achieving the vision laid out in Section 1 requires major adjustments to the design, construction, operation and end of life phase of all buildings. There is no one policy lever that can implement this shift, which necessitates systemic change that brings along all actors of the buildings sector value chain in a coordinated manner.

The policy recommendations here are split into several “routes”, outlined in the next section. However, there are clear overlaps and this roadmap also explores these synergies and crosscutting approaches.

It is clear the the vision articulated in this paper and the wider EU climate and energy goals can only be achieved if European policymakers to embrace a whole life carbon approach: by developing and mainstreaming common assessment and reporting tools, and enforcing standards on both the embodied and operational carbon of buildings in an integrated manner. EU policy must also accelerate a move towards a circular built environment by prioritising the reuse and recycling of construction materials and resources. The renovation of Europe’s existing buildings must be prioritised over the construction of new buildings, and where new construction cannot be avoided, the ambition must be to reduce energy demand to zero operational energy, to optimise use of space and to maximise buildings’ useful life span.

Finally, we must move beyond the level of individual buildings and encourage planning that addresses sustainability performance in a cross-sectoral manner, at the district level and urban scale.

Overview of the Potential Policy Routes

There are many mechanisms to achieve the vision of a decarbonised built environment set out in Section 1. The recommendations in this report have been broken down into four cross-cutting and complementary policy routes:

1. Building Regulations
The update of building regulations to tackle the full environmental impact of the built environment is a crucial way to mandate low carbon construction for newbuilds and renovation. There is a particular emphasis in this route on how the Energy Performance of Buildings Directive (EPBD) must be reformed to support reduction in operational and embodied carbon. It should radically boost building renovation, mandate the disclosure of embodied as well as operational emissions from buildings, and ultimately set whole life carbon targets. This regulated move to a WLC approach would transform how all actors within the building value chain plan and deliver projects.

2. Waste and Circularity

With a waste footprint that accounts for a third of Europe’s total, EU policy must also go further to tackle this aspect of the building sector’s environmental impact. Central to this will be developing policies that enforce and encourage greater circularity which is a major tool for decarbonisation of the entire lifecycle through increased resource efficiency, of which waste prevention and use of secondary resources is a major part. This should enable and catalyse a major increase in the reuse and recycling of building materials, with the end goal of designing waste out of the construction value chain and ending the sector’s damaging reliance on the consumption of finite materials. This transition will require conveniently located and adequate recycling facilities and measures to stimulate market demand so that these secondary materials are accepted. It will also involve optimising building material standards and legislation for how materials are dealt with onsite, with implications for how designers and construction companies approach projects and how manufacturers create building products.

Recommendations on how other relevant policies can foster circularity can be found in the corresponding policy route due to the ‘location’ of the recommendation in the overall EU buildings framework.

3. Procurement

This policy route recognises that decisions about the sustainability of many building projects rest with public procurers. EU policy should stimulate a scenario where these entities are the trendsetters for the rest of the buildings sector to follow, and public procurers lead the way in the adoption of the innovative tools and methods that will be crucial to decarbonising the built environment. Indeed the updated EED highlights the opportunity Public procurers have to assess whole life carbon based on the Level(s) metrics. This is the first step in driving market demand for these new solutions but more is needed. Designers, construction companies and manufacturers who have already embraced a whole life carbon approach would stand to benefit.
4. Sustainable Finance

As financial assets, buildings are at serious risk from climate change, both physically and from the potential economic impact of new building regulations. The introduction of policies that financially support sustainability is therefore a powerful tool to improve the environmental and economic sustainability of Europe’s building stock. A key element of this is the EU Taxonomy for Sustainable Finance, which will include ambitious criteria to classify economic activities and sectors that make a substantial contribution to climate change mitigation and adaptation as well as circular economy, biodiversity, water and pollution. Criteria from the Taxonomy are expected to be integrated into many new building projects, with investor appetite likely to be geared increasingly towards more sustainable opportunities as a result, and a knock-on market demand for sustainable building solutions across the value chain.

Importance of an Integrated Approach

The evolution of the EU Policy Framework to consider circularity and WLC must recognise the synergies and interdependencies across the policy routes outlined in this roadmap. It is only by looking at the built environment in a truly systemic way that its full impact can be addressed.

Furthermore, currently policies that impact buildings are often targeted to different points in the building lifecycle, overlooking how the interdependencies that exist between them. This can be seen in the diagram below.
It is clear there is no single solution or silver bullet to achieving a decarbonised built environment. The future EU policy framework must consider policies (and enabling tools) that can address the impact of buildings in a more systematic way.

The key role that local and subnational governments can play in securing a climate neutral and resilient transition for Europe’s built environment must not be overlooked. Local governments act as policy makers, service providers, procurers, architects, planners, regulators, engineers, among others. They can drive change and accelerate decarbonisation in the building sector, whilst also enforcing building regulations and monitoring impacts. Local governments furthermore play a key role in awareness raising, fostering social acceptance, activating citizens as well as the private sector to accelerate building renovations, and embracing increasingly holistic and ambitious standards.

However, they often still lack clear mandates, stable regulatory frameworks, as well adequate access to resources and support to implement and scale up ambitious climate and energy measures. Effective multi-level governance is key to unlock solutions to these challenges, and to tap the full potential of local action, by allowing the integration of subnational contributions into overarching goals and strategies, and optimising vertical and horizontal institutional arrangements.

Table 1: Scope of various EU regulatory and non-regulatory measures against the building lifecycle.

<table>
<thead>
<tr>
<th>Lifecycle stages</th>
<th>Modules</th>
<th>EU policy instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCTION</td>
<td>A1 Raw material supply</td>
<td>EPBD, EED, CPR, Ecodesign, WFD, ETS, Taxonomy</td>
</tr>
<tr>
<td></td>
<td>A2 Transport</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>A3 Manufacturing</td>
<td>-</td>
</tr>
<tr>
<td>CONSTRUCTION</td>
<td>A4 Transport</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>A5 Construction</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>installation process</td>
<td>-</td>
</tr>
<tr>
<td>USE</td>
<td>B2 Maintenance</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B3 Repair</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B4 Replacement</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B5 Refurbishment</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B6 Operational energy use</td>
<td>-</td>
</tr>
<tr>
<td>END-OF-LIFE</td>
<td>C1 Deconstruction</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>C2 Transport</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>C3 Waste processing</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>C4 Disposal</td>
<td>-</td>
</tr>
<tr>
<td>BEYOND LIFE</td>
<td>D Reuse/recycle</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: (BPIE - Whole-life Carbon: Challenges and solutions for highly efficient and climate-neutral buildings)
The #BuildingLife recommendations outline how both national and European policymakers can ensure that the local level is provided with access to the needed technical and financial resources as well as capacities to fulfil this broad spectrum of obligations, and deliver effective co-designed and co-implemented regulations, policies and initiatives contributing to Europe’s aim to become the world’s first carbon neutral continent by 2050. The following sections aim to outline the recommendations and tools that can help deliver this systemic change.
Building Regulations

Role of Building Regulations in delivering a decarbonised built environment

Building regulations are an effective policy route to mandate a low carbon trajectory for new construction and the renovation of existing buildings. At the EU level, the Energy Performance of Buildings Directive (EPBD) is the single most important legislative tool available to tackle the environmental impact of the built environment. The EED is also an important legislative tool as it requires renovation of public sector buildings, a sector that can show the way to a low-carbon building stock. These directives should rapidly evolve to include additional requirements on minimising the whole life carbon footprint of buildings.

Policy efforts to decarbonise Europe’s building stock have primarily focussed on energy efficiency and measures to decarbonise heating and cooling. Furthermore, the EU regulatory framework focuses mainly on the performance of new buildings. With regards to the existing stock, Member States are required to develop long term strategies to renovate existing buildings, but mandatory performance requirements only apply to major renovations, resulting in very low average performance improvement rates of just 9% and 16% for residential and commercial renovations, respectively.\(^\text{19}\)

Yet to achieve a climate neutral Europe, regulation must also tackle sources of building emissions from other parts of the lifecycle. This involves quantifying the environmental impact of the manufacturing, transportation, construction, and end-of-life phases of built assets – often called embodied carbon, and setting targets to reduce these emissions. For new buildings built to the highest energy efficiency standards, the low operational energy needs mean that embodied carbon becomes the most significant area of carbon emissions over the lifetime of the building.

EU policymakers must implement whole life carbon metrics and thresholds, which will bring building policies in line with long term carbon neutrality goals. This also reflects the fact that while there is an overlap between energy and carbon, they are not interchangeable metrics. Not all carbon emissions are related to energy, and as a result simply making a building energy efficient will not necessarily mean it is a ‘zero emissions building’. Embodied emissions from the manufacturing, transport, construction and renovation processes must be accounted for at building level - a move that would create greater demand for low carbon materials.

## Detailed Policy Recommendations

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Policy Recommendation</th>
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</table>
| 2022     | ● Set out a **robust definition of ‘zero emission buildings’**. This definition must respect the principle of energy efficiency first and should evolve so that carbon metrics (based on the Level(s) framework) are complementary to energy metrics so that by 2050 all new buildings, infrastructure and renovations are net zero embodied carbon, and all buildings, including existing buildings, are net zero operational carbon.  
● Specify how the definition of **Nearly Zero Energy Building** (NZEBs) will be updated to reduce energy demand of buildings but also consider how NZEBs can evolve to integrate **whole life carbon** and align with 2050 climate goals.  
● Provide a **clear articulation of the role of the building stock** in meeting EU climate goals, alongside supporting milestones at the EU, Member State, regional and local level.  
● Set out a staged approach for the introduction of **mandatory minimum energy performance standards** (MEPS) and a timetable to achieve specific energy performance levels.  
● Indicate a clear process for updating **Energy Performance Certificates** (EPCs) to facilitate harmonisation and performance validation to increase reliability, enabling reconciliation of asset rating calculation with measured performance of the building.  
● Specify the role of **Building Renovation Passports** (BRPs), i.e. individual renovation roadmaps, in articulating how progressively tightened minimum energy performance standards can help operationalise the pathway to climate neutrality in the building sector. The final step of the BRPs should be aligned with the net zero 2050 target. |
Give clarity on how **Digital Building Logbooks** can support BRPs and act as a common repository for all relevant building data based on EPCs, Level(s), material passports etc. This must include information about the quality, origin and location of materials and products, providing insight into the material, circular and financial (residual) value of a building.

Give clarity on the role of **Level(s)** - and a timeline - for reporting, and setting carbon limit values for both operational and embodied carbon (whole life carbon). Such limit values to be backcasted against 2050 goals, with earlier timelines for procurement of public buildings.

Signal that Member States will be **required to develop open source databases** on the calculated and measured energy performance and GHG emissions of the building stock - to inform a common database for all buildings in the EU. At the same time, determine how data from Building Renovation Passports (supported by digital building logbooks) and Level(s) will be used to populate whole life carbon databases at national level and inform benchmarks on whole life carbon that are aligned and comparable across the EU.

The **EU Strategy for a Sustainable Built Environment** should be delivered as proposed. Along with the **Green Public Procurement Criteria for Office Buildings**, these should both align with the proposals in the WLC roadmap.

<table>
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<th>By 2025</th>
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- The EPBD mandates that **Long Term Renovation Strategies** (LTRS) should make clear that the 2050 target means net-zero emissions over the whole lifecycle. These LTRS need to encompass measures to reduce both operational and embodied carbon emissions.

- EPBD mandates that LTRS are compatible with the EU’s goal of climate neutrality by 2050, with intermediate climate milestones for 2030 & 2040. All Member States to align LTRSs with their targets for new buildings and long term climate objectives, with dedicated transparent monitoring mechanisms at national level to ensure that targets are met.
EPBD mandates that LTRS must be continuously monitored so that they are helping increase the rate and depth of renovation. The framework of indicators developed via the BUILD UPON\textsuperscript{2} project should be the blueprint for the common template of specific data and indicators, to analyse comparability across the EU.

The EPBD (in particular Article 6 and 7) is updated to facilitate a pan-European approach - based on Level(s) - for reporting on both operational and embodied carbon metrics:

- Operational carbon metrics should be based both on high quality asset ratings and in-use verified energy consumption data, if available, or on realistic estimates of operational energy consumption of the building.
- Embodied carbon metrics can be based on estimates of quantities of material, products and processes in the building as well as their respective environmental coefficient (preferably using harmonised and third-party verified data) for each lifecycle stage of the building.

The EPBD requires new constructions, public buildings and large renovations to assess and disclose information on WLC metrics.

The EPBD mandates the reporting on final energy demand, primary energy demand and whole life carbon in EPCs.

The EED ensures that the 3% renovation rate requirement for all public buildings (including national, regional and local buildings) integrates whole life carbon considerations.

BRPs are established as a tool to support the implementation of MEPS, to phase out worst performing buildings and facilitate low-carbon refurbishment over the whole lifecycle and avoiding lock-ins.

Provide guidance for how whole life carbon limit thresholds for building types align with science-based decarbonisation pathways, and the trajectory for these limit values up to 2050.
- Signal how - based on learnings from the integration of circularity into the Procurement Regulation - the 2026 update to the EPBD will integrate circularity.

- The EPBD mandates that Member States have released open source databases based on the information contained within updated BRPs (EPCs, Level(s) etc). These databases will be linked to a common database for all buildings in the EU to facilitate a harmonised and open data system to enable comparability of whole life/embodied figures across the EU.

<table>
<thead>
<tr>
<th>By 2030</th>
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<tbody>
<tr>
<td>The EU delivers a legislative proposal for a <strong>framework directive for Sustainable Buildings</strong> which acts to guide a range of policies in addressing WLC of buildings, and broader sustainability issues.</td>
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<tr>
<td>NZEBs are net zero operational carbon and clear parameters outline their evolution to align with 2050 goals.</td>
</tr>
<tr>
<td>Scope of BRPs extended to cover whole life carbon and BRPs are key tools to deliver on strengthened requirements for MEPS (aligned with 2050 goal)</td>
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<tr>
<td>The 2026 update to the EPBD requires Member States to set <strong>national targets and WLC limit values</strong> (per sq metre) for new buildings and renovations, aligned with EU WLC Roadmap and national goals.</td>
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<tr>
<td>The 2026 update to the EPBD has <strong>stipulated circularity requirements</strong> including:</td>
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<td>o Minimum requirements so that following dismantling/deconstruction in new construction and renovations an increase in the use of reused/reusable and recycled/recyclable products/materials is achieved.</td>
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<tr>
<td>o Minimum requirements for products/materials used in the Renovation Wave to be reused/reusable and recycled/recyclable.</td>
</tr>
<tr>
<td>o How building regulations should include mandatory pre-demolition/deconstruction audits and data-sharing across the value chain.</td>
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</table>
- Data from BRPs(supported by digital building logbooks) and Level(s) is being used to **increase reliability of Member States building level databases** and feeding into EU databases.

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<thead>
<tr>
<th>By 2040</th>
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<tbody>
<tr>
<td>● Continually review and lower embodied and operational carbon limits in line with the 2050 WLC roadmap and national goals.</td>
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<tr>
<td>● Strengthened MEPS and circularity requirements in the EPBD, particularly increasing the percentage of products/materials that are reused/reusable and recycled/recyclable.</td>
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<tr>
<td>● Definition of NZEBs updated to align with 2050 trajectory.</td>
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<table>
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<tr>
<th>By 2050</th>
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<tbody>
<tr>
<td>● Continually review and lower embodied and operational carbon limits in line with the 2050 WLC roadmap and national goals.</td>
</tr>
<tr>
<td>● The entire building stock will be net-zero carbon across the entire lifecycle</td>
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**Synergies**

As building regulations evolve to regulate and mandate for WLC, the synergies and interdependencies with the other policy routes increases. For example, under Procurement & Sustainable Finance, mandatory reporting of WLC and eventual setting of targets is required. Procurement is key to ensuring the market is ready for the implementation of this recommendation. The reporting of WLC, to be deployed as part of the Taxonomy reporting requirements referenced via the Sustainable Finance policy route, based on the Level(s) framework, will also help prepare the ground for wider uptake.

There must also be coordination between how the Taxonomy criteria referenced in Sustainable Finance can support the aims of the Renovation Wave. The integration of circularity requirements into BRPs will also be an enabler of requirements on circularity in the Taxonomy. Further, the databases referenced here will also be used to fulfill Taxonomy requirements.
A key aim of the Waste and Circularity recommendations is to recognise the potential of circularity in reducing, or even eliminating emissions associated with material use. Expanding the scope of BRPs to contain key information on the circularity of materials helps facilitate this. Further the inclusion of circularity requirements into the EPBD bridges the current gap between whole life carbon reporting and circularity requirements.

**Waste and Circularity**

**Role of Waste and Circularity in delivering a decarbonised built environment**

The buildings sector produces a large amount of waste, including leftover construction materials, the remnants of demolished buildings, packaging and other types of debris. This accounts for one third of all waste generated in the EU, meaning that to achieve our vision of a decarbonised built environment, European policies must go much further over the coming years to address this impact. To implement this shift, regulation needs to enforce an approach that moves sharply away from the current ‘take-make-waste’ model that is widespread in the construction sector, and embraces circularity. By incentivising reuse and recycling of materials and disincentivizing unsustainable practices such as landfill - and by ensuring the availability of conveniently located and adequate reuse and recycling facilities - policy can encourage a circular approach that breaks the link between the buildings sector and the consumption of finite resources, thereby designing waste out of the value chain.

The regulatory tools that can be reformed to encourage circularity in the buildings sector include the **Waste Framework Directive** (WFD), which can gradually phase in tighter standards in areas such as waste reduction and material recovery that help preserve closed material cycles as much as possible. Elsewhere, the **Construction Products Regulation** (CPR) offers the opportunity to create requirements for the reusability and recyclability of construction products, ensuring that value chains are inherently circular from the material level upwards. Finally, measures can be taken to ensure greater digitisation in the built environment, which will allow the storage of essential data about products and buildings that will make their reuse and circularity more feasible.
Detailed Policy Recommendations

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Waste &amp; Circularity</th>
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<tbody>
<tr>
<td>2022</td>
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<td></td>
<td>● The <strong>EU Strategy for a Sustainable Built Environment</strong> is delivered as proposed and outlines how an integrated EU policy framework - considering climate, energy and resource efficiency, management of construction and demolition waste, accessibility, digitalisation and skills - can deliver a sustainable Built Environment.</td>
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<td></td>
<td>● There is ongoing review of the <strong>Construction Products Regulation (CPR)</strong> to ensure that products and associated information foster buildings to be designed for circularity i.e., during use and at the end-of-life, products can be easily and effectively extracted, reprocessed, reused or recycled for future use. This includes mandatory provision of functional, environmental, and relevant circular product information (third-party verified environmental impact data). The CPR should also establish a regime for validating the reusability of products and materials.</td>
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<tr>
<td></td>
<td><strong>Waste Framework Directive (WFD):</strong></td>
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<td>● Establish minimum requirements for construction product and material recovery targets that are aligned with the ambitions of the circular economy action plan and 2050 climate neutrality goals to ensure waste generated on the construction site is appropriately prepared for safe and sustainable re-use or recycling. Separate targets for re-use and recycling also need to be established, rather than just one overall recovery target, to help implement and realise a waste hierarchy.</td>
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<td></td>
<td>● Implement a <strong>landfill ban</strong> for construction and demolition waste (exception: hazardous waste).</td>
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<td></td>
<td>● Establish complementary material specific recycling, recovery and waste reduction targets for key waste streams (e.g., wood, mineral fractions (concrete, bricks, tiles, ceramics, stones and mineral wool), metals, glass, plastic, plaster, and other synthetic or composite materials).</td>
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<td></td>
<td>● Increase the availability of guidance and training on sorting, separation, and collection of construction and demolition waste.</td>
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<td></td>
<td><strong>Essential tools for circularity:</strong></td>
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<td></td>
<td>● <strong>Digitisation:</strong> Ensure that EU proposals for harmonised digital building logbooks include sufficient building, system, product, and</td>
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material information to support maintenance, reuse, and repair of these respectively. Ensure links between digital building logbooks, renovation passport, and the circular economy dataspace proposed under the CEAP.

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<tr>
<th>By 2025</th>
<th>Waste Framework Directive:</th>
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<tbody>
<tr>
<td></td>
<td>● Make mandatory implementation of the EU Construction and Demolition Waste protocol at national level as part of WFD implementation</td>
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<td></td>
<td>● Implementation of construction and demolition waste prevention requirements under development including mandatory disclosure of waste product and material information regarding reusability and recyclability based on functionality, emissions savings, composition, condition, and feasibility to reprocess within reasonable proximity to location of recovery to be defined by Art. 16 of the WFD.</td>
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<tr>
<td></td>
<td>● Develop <strong>EU end-of-waste and by-product criteria</strong> to ensure that secondary input materials and products are safe and sustainable to use in buildings.</td>
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<td></td>
<td>● Require <strong>Member State sorting systems</strong> to process 100% of recovered hazardous and non-hazardous construction and demolition waste streams not processed by industry. In support, establish an EU-wide harmonised model for <strong>sorting, separate collection and labelling</strong> of construction and demolition waste to facilitate separate collection.</td>
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<td></td>
<td>● Establish mandatory product and material <strong>takeback schemes</strong> for unused construction materials applicable to producers, suppliers, and developers within reasonable proximity to location of recovery, to be defined by Art. 16 of the WFD, (requires that reuse in new building material is made possible through revisions of product and building norms).</td>
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<td></td>
<td>● Establish national and regional <strong>Extended Producer Responsibility</strong> systems in the construction sector to ensure the cost of product and waste management is sufficiently funded, for example using fee schemes that are linked to produce environmental performance (eco-modulated fees).</td>
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**Waste Shipment Regulation**

- Revision of waste shipment rules to reduce or prevent export of recovered waste streams, and increase supply of secondary products and materials.

**Essential tool for circularity:**
### Voluntary sectoral standards
Use Level(s) as a basis to harmonise and establish circularity in the construction sector, including but not limited to standards on: design for resource efficiency to minimise raw material use, deconstruction, repairability, adaptability, and durability; resource mapping; assessment methods for reusability and validation of recyclability; and end-of-life product & waste management practices.

### Certification
Promoting circularity in the insurance market through the establishment and promotion of certificates for responsibly sourced, reused and recycled materials, ensuring a quality inspection and their suitability for reuse.

### By 2030

**Waste Framework Directive:**
- Member States are implementing the EU Construction and Demolition Waste protocol.
- Strengthening construction and demolition waste prevention requirements under Art. 16 of the WFD.
- **EU end-of-waste and by-product criteria mandates** that secondary input materials and products are safe and sustainable.
- EU-wide harmonised model for **sorting, separate collection and labelling** of construction and demolition waste to facilitate separate collection implemented in Member States.
- Mandatory product and material **takeback schemes** for unused construction materials defined by Art. 16 of the WFD.
- **Extended Producer Responsibility** systems in place at national and regional level.

**Waste Shipment Regulation**
- Strengthening of waste shipment rules to prevent all export of recovered waste streams, and increase supply of secondary products and materials.

### Essential tool for circularity:
- **Voluntary sectoral standards:** Further harmonisation of EU standards.
- **Certification:** Certificates for responsibly sourced, reused and recycled materials, ensuring a quality inspection and their suitability for reuse established in the insurance market.

### By 2040

**Waste Framework Directive**
- Further strengthening of the Waste Framework Directive and Waste Shipment results in circular value chains which keep...
materials and resources in use for as long as possible, and which facilitates the use of secondary materials from construction and demolition waste.

| By 2050 | Robust regulation on the Waste Framework Directive has eliminated construction and demolition waste, and demand for building materials is satisfied to the greatest degree possible by efficient use of existing resources and circular use of materials already in the economy. |

**Synergies with other policy routes**

Circularity and waste prevention are key levers for the decarbonisation of buildings by helping to eliminate embodied emissions associated with material use. Naturally, recommendations for enabling circularity and preventing waste must also be reflected in other policy routes and recommendations. Building Regulations and Procurement requirements can ensure that design and construction facilitates the recovery and use of secondary products and materials.

Sustainable Finance criteria can direct private investments towards the most environmentally sustainable and circular projects. While multi level governance and planning can ensure local and regional systems foster circular value chains.
Procurement Policy Route

Role of Procurement in delivering a decarbonised built environment

Procurement provides an excellent route for a top-down shift in the way and terms on which the buildings sector is engaged in construction projects by public authorities - from designers to the entire supply chain. European procurement must move towards a model that places sustainability and circularity as core concerns, enforces the disclosure of whole life carbon emissions and sets progressively strict emissions targets. This vision set out in section 1 requires that all publicly procured projects are zero whole life carbon well before 2050.

In this vision, public authorities will forge the way as role models by serving as first adopters, embracing tools such as the Level(s) Framework and third party verified environmental data for products and facilitating the multi-actor collaboration and large-scale thinking necessary to deliver a net zero carbon built environment. Public procurement is an important driver for broader market transformation and the policy recommendations in this section aim to harness its clear leadership role towards sustainable best practice. Multi-level action is required, with a particular focus on revising the EU Procurement Directive and drawing inspiration from some of the impressive best-practices developed by leading countries and cities across Europe.

Detailed Recommendations

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Policy Recommendation</th>
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</table>
| 2022     | ● Scope of revision of Green Public Procurement Criteria (GPP) for Office Buildings should be expanded to cover all public buildings and consider:  
          | ● How the Level(s) framework - particularly indicators on whole life carbon and circularity can be integrated into GPP.  
          | ● How to support EU and national efforts to build procurers capacity through GPP training.  
          | ● How the carbon limit values for public buildings proposed under the WLC Roadmap (see 2022 recommendations for building regulations policy route) can be integrated into EU procurement rules.  
          | ● How public procurers should support establishment of secondary material markets by their own demand. |
- All public tenders should require **third-party verified environmental data** of key materials to start building databases and enable setting of benchmarks.
- **MEPS should be introduced** for public buildings with an obligation to achieve progressively more ambitious levels over time.

**By 2025**

**EU Procurement Directive** updated to:

- All new public buildings to be ‘**positive energy**’ (in operation) - with service-/ performance-based energy contracting and district integration where possible. Procurement criteria incentivise take-back schemes for building systems, lighting, furniture or technology systems as a service and energy performance contracting).
- Stipulates a minimum proportion of tenders to include sustainability/ circularity criteria, based on **Level(s)**.
- Require **mandatory reuse assessment** to encourage reuse/refurbishment over demolition.
- Require **mandatory pre-demolition/deconstruction audits** and data-sharing across the value chain.
- Introduce **minimum requirements** so that following dismantling/deconstruction in new construction and renovations a percentage of products/materials is reused/reusable and recycled/recyclable.
- **Minimum requirements for products/materials** in public projects to be reused/reusable and recycled/recyclable.
- Require **minimum requirements on new building design** and large renovations to promote adaptability, flexibility and reversibility.
- Mandate that **environmental performance criteria** (based on Level(s)) is to be reported and checked including design, delivery and in use calculations for verification to close the ‘performance gap’.
- Outline criteria to award contracts based on **Life-Cycle Cost (LCC)** or **Total Cost of Ownership (TCO)** instead of the conventional upfront price criterion.
- Outline award criteria that encourages use of **regionally - and sustainably- sourced secondary material** and/or minimised heavy transport.
- Outline criteria to award contracts through **lower embodied carbon** of construction works through transition towards zero-emission construction machinery and material transport.
- Mandate **carbon limit values** for all public buildings for new construction and large renovations (based on WLC roadmap).

**By 2030**

EU Procurement Directive updated to:
- Increase targets on minimum proportion of tenders including sustainability/circularity criteria.
- Ensure award criteria based on Level(s) circularity indicators is more heavily weighted.
- Tighten the carbon limit value for all public buildings inline with 2050 goals.

**Enabling Guidance**
- EU and National procurement strategies account for trade-offs and **weigh environmental performance and quality** in an integrated way (considering materials, health & wellbeing, water/air/energy, multi-functional spaces for inclusivity and accessibility, civic engagement, mobility, etc.).
- Standardise a goal of **on-site mass balance** (local mass coordination for construction sites can avoid unnecessary excavation, trucking of heavy loads and landfilling of soil/aggregates/mixed construction waste).

**By 2040**

EU Procurement Directive updated to
- Mandate that public buildings be **zero whole life carbon** (embodied and operational, new and existing).
- Whole life carbon and material circularity (based on Level(s)) are **fundamental focal points in the environmental criteria**, which are weighted heavily (>30%) as a key decisive factor in awarding tenders.

**National Policies**
- National and regional procurement policies stipulate that building systems (e.g. energy production, material stocks) are well-integrated into their urban districts and the wider built environment, with distributed risks/responsibility and widespread servitisation/performance-based contracting, effective maintenance and information management.
## Synergies with other Policy Routes

Procurement is a powerful tool for experimentation and market development to accelerate innovation. The recommendations set out here can help prepare the market for future regulation. For example, the integration of carbon intensity limits on public buildings will help prepare the market for the implementation of carbon intensity limits for all buildings, outlined under Building Regulation.

The use of the indicators of the Level(s) framework will help prepare the wider market for the implementation of Waste and Circularity recommendations, particularly those focused on disclosure of waste product material information regarding reusability, recyclability etc.

Lastly, public procurements present a unique contribution of being able to stipulate performance (design, materials, methods) and verify it - thereby closing the performance gap and ensuring on the ground success.
Sustainable Finance

Role of Finance in delivering a decarbonised built environment

Sustainable finance is a powerful tool to improve the standard of Europe’s building stock. In recognition of the important role of the financial sector and the urgent need to channel capital flows into more sustainable activities, the EU Taxonomy is being developed. The Taxonomy enables the classification of economic activities and sectors that make a substantial contribution to climate change mitigation and adaptation as well as circular economy, biodiversity, water and pollution.

As a key pillar of the EU Sustainable Finance Strategy, the Taxonomy impacts directly on other important aspects of the EU policy in this area, including the EU Green Bond Standard, the Sustainable Finance Disclosure Regulation and the Corporate Sustainability Reporting Directive. In light of its significance, it provides a focal point for the recommendations set out below.

The Taxonomy is intended to be both science based and dynamic, meaning that criteria will be reviewed and updated as needed - following scientific evidence - at least every three years. The first years of development and implementation of the Taxonomy will be key in shaping the criteria and measures with the greatest impact on reducing emissions and restoring ecological systems. It is expected that these indicators will gradually be embedded in all new projects, and therefore the taxonomy will be continuously upgraded accordingly.

Detailed Recommendations

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<thead>
<tr>
<th>Timeline</th>
<th>Policy Recommendation</th>
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<tbody>
<tr>
<td>2022</td>
<td>● EU Recovery Funds should be channelled into renovation programmes to support <strong>tackling energy poverty</strong> and addressing the worst performing buildings.</td>
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<tr>
<td></td>
<td>● A review of financial mechanisms needed to support the <strong>Renovation Wave</strong>, facilitate a just transition and maintain social cohesion is undertaken.</td>
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<tr>
<td></td>
<td>● The decarbonisation of building stock will require the <strong>de-risking</strong> of private finance, tailoredgrant and subsidy schemes to tackle worst performing buildings and support vulnerable groups,</td>
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20 The CSRD replaces the Non Financial Reporting Directive (NFRD)
innovative new financing solutions (e.g. PACE, on-bill finance, blended public-private offerings, etc.) Moreover, local governments will require direct access to funds to establish and maintain programs and campaigns.

- Evaluate the feasibility of a green supporting factor in EU capital requirements for lenders linked to Taxonomy criteria.
- All Taxonomy eligible new buildings provide lifecycle Green Gas House (GHG) emissions calculations (as built, and including reporting of demolition when appropriate) and measures to reduce CO₂ emissions and support circularity.
- All renovations provide lifecycle GHG emissions calculations for renovation measures including the reduction of CO₂ emissions through circularity measures.
- The EU Taxonomy should be aligned with the sustainability disclosure regulations such as the Sustainable Finance Disclosure Regulation (SFDR) and the Corporate Sustainability Reporting Directive (CSRD).
- Appropriate WLC thresholds have to be met to demonstrate taxonomy alignment.
- GHG supplements Primary Energy in climate mitigation criteria.
- A review should be carried out of how the Taxonomy criteria can support the aims of the Renovation Wave by ensuring that renovation has a level playing field versus new construction in the taxonomy. Specifically, the treatment of renovation as a transitional activity makes it less appealing and should be addressed as a priority so that revenues from renovated assets can be claimed as taxonomy aligned.
- Through the Taxonomy or other financial incentives, promote the creation of local markets for reused and recycled materials. This could include financial support for companies with circular solutions or services that support circularity and offering fiscal incentives, such as tax reductions, for recycled and reused materials to make them more competitive.
- Promote full Life Cycle Assessments in order to incentivise retrofitting and renovation processes rather than the construction of new assets when appropriate. (In case of demolition, provide validation of improved performance of emissions, based on LCA calculations).
- Promote programmes of Fairtrade for Finance to accredit standards in responsible investment, so fund managers can
demonstrate their credentials as responsible investors and investors can choose investment products that are truly sustainable.

- Announcement that **private sustainable improvement loans / sustainability linked loans** that are strictly transferring Paris-aligned climate targets to loans to improve real estates will be included into the Taxonomy to support the transformation.

| By 2025 | All eligible buildings including new construction, renovations and acquisition and ownership categories (NC, REN, A&O) have to provide a **Paris-aligned climate pathway**, targeting a net zero carbon balance in operation by latest 2045.  
- All eligible new buildings have to provide evidence to have a **“low embodied carbon footprint”** (e.g. 50 % below defined country specific reference values) and all eligible renovations apply low embodied carbon footprint renovation strategies.  
- An expanded Taxonomy that includes criteria for significantly harmful activities integrates **criteria for the worst performing public and non-residential buildings**.  
- A clear signal is sent that from 2030, new construction which is not net zero in operation and does not meet specified maximum embodied carbon thresholds will be classified as **substantially harmful** (this requires alignment with building regulations to ensure legally compliant buildings are not breaching substantial harm criteria).  
- Promote **financial literacy** at every level to promote long term, sustainable thinking and demand for sustainable finance.  
- Sustainable investment loans / sustainability linked loans are Taxonomy eligible if strict Paris-aligned targets are followed and stringent and transparent control mechanisms are in place. |

| By 2030 | EU Taxonomy will have an **integrated LCA** in its DNA, leading the financial market participants and corporates to approach the built environment through the LCA and making adjusted investment.  
- The Taxonomy criteria have been updated to consider real, in-use energy and carbon performance (in addition to calculated energy reflected in EPCs).  
- The taxonomy criteria for circularity require buildings to be **net zero embodied carbon**. |
By 2040

- All eligible buildings (NC, REN, A&O) are net zero operational and net zero WLC.
- Taxonomy criteria for climate mitigation, adaptation, and circular economy are merged so that all three must be met for a building to be considered to make a substantial contribution.
- To make a substantial contribution to climate mitigation, all new buildings should be energy and climate positive across the whole lifecycle.
- Acquisition and ownership of buildings that are not net zero in operation is classified as significantly harmful, except where clearly defined and limited exclusions, such as for cultural heritage, apply.
- All new construction and major renovations that is not net zero whole life carbon will be classified as substantially harmful

Synergies with other Policy Routes

The recommendations under Sustainable Finance have strong links with all the policy routes, particularly Building Regulations and Waste and Circularity. For example, the reporting of WLC metrics being reported under the Taxonomy are aligned with the WLC carbon metrics recommended via Procurement and Building Regulations. Where the proposals above include elements related to a future substantial harm taxonomy category, this must be aligned with regulation, since the taxonomy must not penalise buildings that would be legally compliant.

The implementation of the recommendations on EPCs under Building Regulations is required to update the taxonomy criteria to consider real, in-use energy and carbon performance requires enabling tools, particularly EPCs and BRPs. The databases discussed under Building Regulations are crucial to delivering and monitoring taxonomy aligned construction activities.

The requirements on circularity cannot be fulfilled unless stakeholders have access to information on circularity contained in BRPs (under Building Regulations) and stipulated via the recommendations in Waste and Circulatory routes.
A multilevel governance approach

Role of national and local government in delivering the policy recommendations

In order to realise the vision of every European citizen living in a totally decarbonised, circular, resilient and well-designed built environment, it is crucial that subnational and local governments are engaged in the process. Local governments are the entities that understand the realities on the ground and their voice must be represented when policies are being developed.

As procurers, policymakers and as entities with the ability to channel and utilise considerable amounts of EU financing, local governments can ensure the appropriate enabling frameworks are in place locally to deliver on the policy ambition. Despite their crucial role as delivery partner for ambitious policy reforms, the role of local governments is often overlooked when policy is being developed. This can lead to a lack of ownership and increases the risk that policies are not properly implemented or enforced, meaning that national and EU governments cannot meet their goals and targets.

Local governments are also the entities who are closest to the citizen and therefore have a key role in ensuring that new policies have the buy-in of local citizens. Therefore, it is crucially important that there is deep and meaningful engagement with local governments to ensure alignment and successful delivery. This requires concerted and coordinated action across all levels of governance, from the EU to the national to the subnational level.

### Importance of Subnational and Local Governments

- National and local governments have many roles to play in European ambition into action. They can support the decarbonisation and greater resilience of the built environment, acting as:
  - **Policy maker:** integrated strategy development; cross-sectoral strategic action planning; embedding sectoral targets and measures within climate action, recovery and resilience objectives and plans, ensuring policy alignment across levels and in a vertically integrated manner (multi-level governance).
  - **Planner, architect & engineer:** zoning and land-use (embodied carbon targets for zoning processes, zoning requirements for bio-based materials, carbon-scored land sales competitions, parking...
requirement optimisation, etc.; integrated energy systems design (e.g. district heating & cooling, renewable energy self-consumption, etc.).

- **Procurer & standard-bearer**: sustainable procurement practices (see dedicated roadmap); influencing the market via sustainable practices as well as adopted and enforced standards.

- **Implementer / facilitator**: financial backing (guarantor / private finance de-risking, subsidy and grant administration); renovation program design and operation; construction sector re-/ upskilling; integration of local RES and nature-based solutions.

- **Awareness raiser**: target group-specific community outreach and engagement (e.g. via One-Stop-Shops / citizen advice hubs, social programs, institutions, etc.).

- **Observer, regulator and enforcer**: monitoring and reporting frameworks; GHG inventory compilation; control of quality / adherence to standards.

### Recommendations to all Levels of Governance

<table>
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<tr>
<th><strong>Governance Level</strong></th>
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<tbody>
<tr>
<td><strong>Subnational and Local</strong></td>
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<tr>
<td>- Increase awareness and demand for highly energy efficient and low-carbon buildings. Develop and roll-out target group-specific community outreach and engagement (e.g. via One-Stop-Shops / citizen advice hubs, social programs, institutions, etc.).</td>
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<tr>
<td>- Support the decarbonisation and greater resilience of the built environment by integrating WLC in cross-sectoral action planning, and embedding sectoral targets and measures within local climate action plans.</td>
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<tr>
<td>- Development of comprehensive local roadmaps on whole life carbon - aligned with national and EU policies - outlining the role of subnational authorities in delivering on EU goals. Develop local roadmaps to highlight where governments have regulatory authority to address WLC (i.e integrated energy systems design, etc.).</td>
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embodied carbon targets for zoning process and prioritization of modular construction, designs that promote reversibility and adaptability).

- Support the use of Level(s) in procurement and local regulations as the basis to compile local GHG inventories/databases. Work with the National Government to understand how to align local inventories with national databases required under the EPBD.

- Explore direct access to funding and make use of relevant opportunities at the regional and national level (e.g. grants, loans, etc.); explore Public-Private Partnerships (PPPs), either in the form of equity or as blended financial opportunities; explore lighter forms of financial involvement, by acting as a guarantee for private investments with public relevance, where those are of strategic importance.

- Pilot (then standardise) circular construction approaches in public renovation and new construction (for administrative, social services, public housing, infra and urban planning), to lead by example and prove viability.

- Use own procurement to stimulate and support a market for local secondary materials and demonstrate excellence and viability of net zero WLC buildings. Facilitate sharing and optimised reallocation and intensity of use of existing buildings.

- Implement financial policies covering taxation, fees, incentives and commercial (dis)advantages to reduce embodied carbon and limit unnecessary construction: cities often have the jurisdiction to offer performance-based or other rebates on property taxes.

- Support construction sector re-/upskilling and foster the creation of new local employment; align renovation strategy and targets with existing policies and measures to tackle energy poverty.

**National Governments**

- All governments commit to the implementation of national whole life carbon Roadmaps. These roadmaps must consider EU policies and directives, National Energy and Climate Action plans and National Planning Policies, to ensure a holistic and integrated approach that brings national building codes into line with EU environmental objectives.

- Embed Level(s) in national procurement policy and use the indicators within Level(s) as the basis to build or strengthen national building databases and prepare for whole life carbon reporting requirements under the EPBD.

- Align Long Term National Renovation Strategies with national and EU targets for new buildings and use the indicators within the BUILD UPON² Framework to continuously monitor progress against these targets.
Create enabling frameworks to support the implementation of the Waste Framework Directive at national level, in particular the EU Construction and Demolition Protocol and Member State sorting systems.

Work with subnational authorities to ensure that public procurement policy is supporting functioning markets for recirculation and valorisation of building components and materials.

Validate national guarantee certificates for reused and recycled materials.

Encourage the use of building information modelling (BIM) and building logbooks to improve the traceability of materials.

European Commission

The EU Strategy for a Sustainable Built Environment should be delivered as proposed and outline the role of national and local government in delivering on EU policy.

Specify standards on interactions between levels of governance and require stipulations of citizen engagement/consultation for implementation of key EU directives.

EU dedicates funding for demonstration projects, to increase the market readiness of solutions, strengthen business models and promote the integration of technologies.

DG Reform funds effectively channelled to strengthen multi-level governance processes to ensure the vertical integration of strategies and policies.

Promote Level(s) as the tool to report on WLC at all levels of governance and provide national and subnational actors with guidance on how the information collected via digital building logbooks and Level(s) can inform national databases.

Articulate how data collected at the building level can inform local and national databases and how this is aligned with a common database for all buildings in the EU.

Setup of a technical assistance facility, financial support mechanism to enable national and subnational databases.

Setup of a dedicated technical assistance and financing mechanism that is directly accessible by subnational governments, including for project development and replication.
Crosscutting Tools and Frameworks

The implementation and delivery of the policy recommendations outlined above are key to the delivery of a fully decarbonised, circular, resilient and integrated built environment in Europe. However, the current EU policy framework does not address the impact of the built environment in a cohesive manner, a reflection of the fragmented nature of the built environment supply chain.

The myriad of EU policies and directives that impact the built environment sector are often targeted to different points in the building lifecycle that overlook the interdependencies and synergies across these points in a building’s lifecycle.

Although the recommendations in this report are divided into ‘routes’ the reality is that they are highly interconnected and recommendations in one area have relevance in another. In fact, there are a number of tools and frameworks mentioned throughout the recommendations in each of the policy routes that cut across all four topics.

The common denominator needed to enable the delivery of the recommendations across each of the policy routes is data. Access to reliable data can enable more effective and targeted policy making, better designs, more efficient construction and management of buildings, and can accelerate the creation of innovative business models.

Specifically in relation to the delivery of the recommendations in this report, it is necessary to:

- Compile information on material inventory required for Digital Building Logbooks and Building Renovation Passports.
- Compile information on the environmental impact at the building level.
- Feed into national and EU databases needed to inform WLC benchmarks and set targets against 2050 objectives.

There are a number of tools and frameworks available to ensure the correct data is being collected, outlined below.

Level(s)

Level(s) contains 16 indicators related to whole life carbon, circularity and sustainability. Reporting according to Level(s) provides key information and data about the performance of the individual building which can be linked to key EU policy objectives. This is a key enabler of many of the recommendations across each of the Policy Routes.

Requiring reporting of the key Level(s) indicators via Procurement prepares the market for integration of these reporting requirements into wider regulation. Further,
the disclosure of this information revealed by these indicators will help inform the databases that are needed to inform benchmarks and targets recommended under the Building Regulation and Sustainable Finance routes. Lastly, reporting on the key waste and circularity indicators within Level(s) will enable many of the recommendations regarding disclosure of Waste and Circularity.

Key Recommendations

- European Commission WLC Roadmap to outline the role of Level(s) - and a timeline - for reporting, and setting carbon limit values for both operational and embodied carbon.
- European Commission outlines guidance on how data from Level(s) feeds into City Databases > National Databases > EU Databases

Product Level Data - Environmental Performance Declarations/ Product Environmental Footprint

The Building Regulation and Procurement routes calls for the introduction of carbon intensity limits based upon robust benchmarks. The first step in developing these benchmarks is to report on whole life carbon according to Level(s). However, in order to ensure that the data at the building level is accurate, the product level data must provide accurate information about the environmental impact of the product across the life cycle, such as that provided by Environmental Product Declarations (EPDs) and Product Environmental Footprints (PEFs). An EPD/PEF provides the relevant data about the product that can sometimes be compared with other products. However, it does not guarantee that a product has a low environmental impact.

Key Recommendations

- Mandatory product level data (PEF or EPD) via Procurement and eventually Building Regulations to inform national databases and enable setting of WLC limit values.

Building Renovation Passports (with integrated Digital Building Logbooks)

Under the Building Regulation policy route, it is recommended that Building Renovation Passports (BRP) are integrated with Digital Building Logbooks (DBL) to serve as a common repository for all relevant building data including information about the origin and location of materials and products, providing insight into the material, circular and financial (residual) value of a building.
There is a further recommendation to outline how the data contained in BRPs and DBLs will be used to populate databases at national level and inform benchmarks on WLC also recommended under *Procurement* (in addition to *Building Regulations*).

At a minimum BRPs & DBLs should provide information on the building’s energy performance, material use over the lifecycle, sustainability performance, potential energy and cost savings etc. The provision of this information will also help deliver on the requirements about circularity referenced across all the policy routes.

**Key Recommendations**

- European Commission to provide guidance on how Building Renovation Passports will be integrated with Digital Building Logbooks.
- European Commission to mandate information to be collected via Building Renovation Passports (Level(s), energy performance, circularity, material inventory)
- European Commission supports Building Renovation Passports as a tool to support implementation of MEPS.
- European Commission outlines guidance on the data flow from BRPs to city databases, national databases and also EU databases

**Energy Performance Certificates**

Under the EPBD, Energy Performance Certificates (EPCs) must be issued when buildings are constructed, sold or rented. However, these are often unreliable and they are not currently harmonised.

To support delivery of recommendations on progressive tightening of MEPS and WLC under *Building Regulations* and to provide accurate information for recommendation under *Sustainable Finance* tools, the EC must consider how to make the current EPC framework more robust, reliable and trustworthy.

EPCs can complement BRPs and facilitate their improvement over time based on actual performance data. Access to actual performance data will empower building owners to model and project the impact of building improvements on the EPC rating, which could help unlock private finance for renovation.

The European Commission must outline parameters to facilitate harmonisation and increase the accuracy of EPCs such as standardisation of calculation, setting of primary energy factors, frequency of calculation etc. Further, as building policy moves to address WLC, EPCs must also include reporting on WLC.

**Recommendations**
• EPCs evolve to require reporting on both final energy demand, primary energy demand (calculated asset ratings as well as measured operational ratings) and whole life carbon (based on Level(s) indicators).

Bauhaus

The New European Bauhaus (NEB) forms a cultural and creative counterpart of the Commission's Renovation Wave. The Bauhaus provides an opportunity to showcase the integrated nature of the built environment and how a comprehensive approach can deliver on climate and circularity objectives whilst also maintaining and ensuring quality, sustainable, aesthetically pleasing and inclusive built environment.

The five pilot projects currently being pursued as part of the NEB must pioneer zero carbon buildings driven by circular principles where quality buildings are well integrated into their districts and the wider built environment.

The dissemination phase must reach all corners of the EU and demonstrate to national and subnational authorities the benefits of adopting the NEB approach.

Recommendations

• The Bauhaus pilot projects uses Level(s) as a framework for analysing their sustainability and results used to educate all stakeholder about the benefits and viability of a decarbonised and quality built environment.
Implementing the Policy Routes

In order to ensure the successful delivery of the recommendations, all stakeholders across the value chain have a role to play in the successful delivery of these policy recommendations.

- **Investors** have a major influence. They own portfolios of buildings, as well as shares in companies who have their own building portfolios, on whom they can exert pressure. They also provide loans and funding for building projects for which they can set certain criteria for construction, which can include sustainability targets.

- **Designers** incorporate a range of professionals including architects and specialist engineers who prepare a design, with the opportunity to reduce environmental impacts of how a building is constructed, which incorporates building materials, land use and construction techniques.

- **Educators** are responsible for the training of the construction workforce, setting the curriculum that prospective trainees must be taught to become qualified in different disciplines in the buildings sector. They also adjudicate whether employees receive official accreditation and certification.

- **Manufacturers** transform raw materials or components into the building materials and products used by construction companies on sites and as such, have a major influence on the embodied carbon of buildings.

- **Construction companies** are hired by public and private clients to construct buildings to specifications predetermined at the design stage. However, in many cases, they have a significant influence over the final selection of suppliers. They must therefore work closely with architects, product manufacturers and a range of subcontractors to ensure compliance and successful delivery of projects.

- **Real estate users and owners** are the individuals responsible for a building during its operational life. They have the power to make decisions on aspects that will improve the energy usage of buildings such as renovation and renewable energy integration as well as the use of smart building features. They often also procure fit-out items which are some of the most frequently replaced elements of buildings where there may be greatest need and opportunity for circular solutions.

<table>
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<tr>
<th>Stakeholder</th>
<th>Your role in supporting implementation</th>
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<tr>
<th>Investors</th>
<th>Designers</th>
<th>Educators</th>
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<tr>
<td>● Screen existing assets and portfolios for potential exposure to carbon related risks and add target carbon intensity limits as portfolio criteria.</td>
<td>● Embrace reuse and retrofitting, boosting the reversibility of buildings, e.g. through the use of construction techniques that ensure all materials of the building could be reused and/or recycled at the end of life of buildings.</td>
<td>● Ensure the optimum training, education and continuous professional development of construction and building professionals to ensure readiness for changes in practice.</td>
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<tr>
<td>● Align ESG risk assessment and management with climate neutrality objectives and decarbonisation pathways.</td>
<td>● Use of PEFs/ EPDs, Level(s) &amp; BIM to evaluate whole life environmental impacts.</td>
<td>● Integrate life cycle thinking and environmental and social sustainability in all training curricula across all aspects of the construction value chain.</td>
</tr>
<tr>
<td>● Commit to data collection and tracking social and environmental impacts of financial products.</td>
<td>● Specify locally sourced materials and use materials and construction techniques with lower carbon content.</td>
<td>● Educate and engage clients on the importance and benefits of integration of circularity and WLC principles.</td>
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<tr>
<td>● Integrate multiple benefits of highly efficient and low carbon buildings and portfolios in credit risk assessment and underwriting practices.</td>
<td>● Avoid over-specifications and ensure highly material efficient designs.</td>
<td>● Including recycled and reused materials in the design of new buildings or renovations.</td>
</tr>
<tr>
<td>● Provide customer-friendly financing and lending solutions.</td>
<td>● Design for flexibility in use, resilience, quality and long lifespan.</td>
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| **Manufacturers** | ● Provide harmonized, high quality, open and comparable data on product/construction materials.  
● Support the introduction of digital building logbooks (containing material inventories/passports) and product certification to enable recovery and reuse.  
● Include recycled materials in the production of construction materials.  
● Supply materials and solutions that enable reuse and recycling.  
● Add the management of recycled and reused materials as a service in the long term.  
● Work with public authorities to ensure readiness to accelerate production and accessibility of zero/low-carbon components, products and materials.  
● Ensure readiness to respond to demand of public authorities (signalled by procurement strategies) accelerate production and accessibility of zero-/low-carbon components, products and materials. |
| **Construction Companies** | ● Ensuring a safe and extended use of reused and recycled materials, where possible and when these materials are available.  
● Ensuring selective dismantling at the end of life of buildings. |
| **Real estate users, owners, managers and building professionals** | ● Optimise envelope, system performance and renewable energy integrations from a whole life carbon perspective.  
● Proactive maintenance, servicing and repair strategy.  
● Implement green leases and data sharing.  
● Improve “smart building” features, storage and energy flexibility. |

- Teach to raise acceptance of the aesthetic quality of secondary components and materials.  
- Forge greater understanding and wider application of systems theory and systems thinking; establish cross-disciplinary education, qualification, understanding and practice.  
- Upskill blue and white collar professionals in the construction value chain for digital, low carbon and circular building methods. Use international, verified certifications so that they can be specified in procurements (e.g. building on BuildUp).
Annex A – List of contributing Organizations

WorldGBC would like to thank the following organisations for their time, expertise and enthusiasm to contribute to this endeavour.

Note that at this draft stage, contribution to the roadmap development does not imply that all the listed organisations or their members fully support all the proposals as set out above in the draft text.

Architects Council of Europe
BASF
Boverket - National Board of Housing, Building and Planning of Sweden
Buildings Performance Institute Europe
BBR - Federal Office for Building and Regional Planning of Germany
Carbon Neutral Cities Alliance
CEI-Bois - European Confederation of Woodworking Industries
Croatia Green Building Council
DGNB - German Green Building Council
DI - Dansk Industri - Confederation of Danish Industry
Dutch Green Building Council
Dutch Ministry of the Interior and Kingdom Relations
EBC Construction
ECF - European Climate Foundation
Ecostandard
EEB - The European Environmental Bureau
EFCA - European Federation of Engineering Consultancy Associations
EPRA - European Public Real Estate Association
EURIMA - European Insulation Manufacturers Association
Eurocities
Eurofer - European Steel Association
European Association of Engineering Consultancy Associations