

Net Zero Whole Life Carbon Roadmap

Summary for Policy-Makers

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UKGBC, 2021

The Summary for Policy-Makers presents the key findings and policy recommendations for the UK Government – and devolved governments and stakeholders – from the Net Zero Whole Life Carbon (WLC) Roadmap for the UK Built Environment, as developed by the project team. The policies are intended to enable the UK to achieve its 2050 net zero target.

The WLC Roadmap aims to build a common vision and agreed actions for achieving net zero carbon in the construction, operation, demolition and reuse of buildings and infrastructure in the UK. It does this through establishing a carbon budget and trajectory for the UK Built Environment sector, as well as setting out the key policies and actions for Central Government, Local Authorities, and relevant stakeholders. While the policy recommendations were developed independently by the project team, many of the recommendations have been aligned with industry initiatives such as Construct Zero from the Construction Leadership Council, the UK's Sixth Carbon Budget, and the Construction Industry Council's Climate Action Plan. In some

areas the recommendations build on existing Government policy initiatives, providing further proposals and timelines.

While the intended audience of this document is the UK Government, the Devolved Governments may also find the recommendations applicable for their net zero journeys. The Devolved Governments – and local authorities – are critical to reducing UK emissions and will also require strong climate policies on the net zero pathway to 2050.

It is acknowledged that in many cases, the Devolved Governments have already implemented ambitious policies targeting the built environment, making tangible progress on some of the recommendations set out below.

Executive Summary – Key Recommendations

1 Buildings: Operational Carbon

1A) EXISTING HOMES

- Improving the energy efficiency of our existing homes is a fundamental element of the UK's Net Zero 2050 pathway, linked to a transition from fossil fuel heating to zero carbon heating technologies, with a significant role for heat-pumps.
- There is increasing consensus that although there is a clear role for hydrogen within sectors such as industry and transport, there is limited rationale and significant uncertainty around the use of hydrogen to heat buildings (other than in areas surrounding industrial clusters).
- There can therefore be no further delay in embarking on a national programme of home retrofit, transforming UK housing to make it efficient, warm and cheaper to heat whilst phasing out fossil fuel heating.
- The government should publish a National Retrofit Strategy by 2022, setting out a clear national homes upgrade programme to 2040, fully coordinated with local government, industry, and relevant stakeholders via a Central Retrofit Agency, deploying digital building renovations plans/passports to accurately describe Net Zero pathway(s).
- Introduce mandatory minimum EPC ratings of C, for owner-occupied homes at the point of sale by 2028.
- Establish a clear trajectory for improving the Minimum Energy Efficiency Standard (MEES) for the domestic rented sector to at least EPC C by 2028.
- Reform EPCs to establish in-use energy performance as the rating metric (as opposed to cost), reducing the performance gap and also disincentivising gas usage.
- Introduce and clearly signpost a cut-off date of 2030 for the sales of gas and oil boilers.
- Introduce variable stamp duty rates adjusted in line with the energy performance of a property.
- Remove VAT on energy efficiency retrofit works (i.e. 0% VAT) where energy performance improvement targets are met (to incentivise energy efficiency improvements whilst retaining VAT revenue from general improvement works).
- Introduce direct government grants for low income households.

1B) EXISTING NON-DOMESTIC BUILDINGS

- Introduce in-use energy performance-based rating schemes for non-domestic buildings in a phased approach between 2022-2029, including mandatory energy disclosure, associated minimum performance standards and fiscal incentives.
- Retain proposals for use of MEES in the non-domestic sector in the short to medium term. Review the need for MEES as a policy lever as energy performance rating schemes become established.
- Introduce and clearly signpost a cut-off date of 2030 for the sales of gas and oil boilers.
- Remove VAT on energy efficiency retrofit works (i.e. 0% VAT) where energy performance improvement targets are met (to incentivise energy efficiency improvements whilst retaining VAT revenue from general works).

1C) NEW BUILDINGS

The Future Homes Standard (FHS) and Future Buildings Standard (FBS), and associated updates to Part L of the buildings regulations for new buildings to include:

2025

- Energy Usage Intensity (EUI) target (kWh/m²/yr) compliance approach in place of notional building methodology for new office buildings >1,000m² and new homes (35-40 kWh/m²/year for new homes).
- Thermal Energy (Space Heating) Demand limits (15 kWh/m²/year for new homes).
- Low carbon heating for all new buildings (no fossil fuel combustion).
- Measures to limit peak demand and enable load shifting (with limits on peak demand from 2030).
- Minimum standards for currently unregulated key appliances with high influence on annual & peak demand, i.e. cooker hobs & showers.

2027-2029

- Interim amendments in 2027 and 2029 to introduce EUI target compliance approach for other sectors, aligned with mandatory energy disclosure timetable.
- Align the introduction of the EUI compliance approach per sector with the timings of confirmed mandatory energy disclosure (with timetable to be confirmed ahead of 2025).

2 Buildings: Embodied Carbon

- Use planning reforms to prioritise reuse of existing buildings and assets, and disincentivise demolition and new build.
- Introduce the regulation of embodied carbon for new buildings and major refurbishments:
 - Mandatory measurement and reporting of Whole Life Carbon by 2023 for large buildings (>1,000m²) and residential developments (≥10 dwellings).
 - Minimum standards (limits) for Upfront Embodied Carbon by 2025 for more mature sectors (i.e. those with sufficient asset level benchmark data), with associated fiscal incentives and penalties.
 - Minimum standards (limits) for Upfront Embodied Carbon by 2027 in all sectors.
 - Final phase to introduce minimum standards for all size buildings (with a suitable minimum threshold) in all sectors by 2030.
- Allow local planning authorities to set more ambitious limits on upfront carbon for new development than those introduced via Building Regulations.
- Remove VAT on refurbishment works (i.e. 0% VAT) which retain building structural frame and achieve energy performance targets to incentivise re-use over demolition.

3 Infrastructure & Industry

- Introduce the role of a National Infrastructure Integrator to enable holistic decision-making across UK infrastructure planning with full visibility of all carbon impacts.
- Demonstrate leadership within public procurement via Infrastructure and Projects Authority (IPA) commitment to the CSIC Carbon Reduction Code (which includes integrating carbon reduction targets and reporting commitments explicitly in all procurement documents from 2021).
- Work with the cement sector to identify feasible options for CCS deployment and transportation at dispersed sites.
- Support the deployment of hydrogen within industry to aid decarbonisation (i.e. for high temperature processes), and adopt a transparent and robust science-based approach to the options available for hydrogen production.
- Ensure carbon pricing policies such as UK ETS continue to drive deep industrial decarbonisation over the long-term whilst maintaining competitiveness and minimising carbon leakage. Considerations must include links with the EU ETS, the future of free allowances, and an equitable supply adjustment mechanism which keeps pace with the EU Carbon Border Adjustment Mechanism (CBAM) and, once tested, may enable the phase-out of free allowances.
- Set the UK Emissions Trading Scheme (UK ETS) cap based on the pathway to the UK Net Zero target and consider expanding the scheme to include increased coverage of materials and sectors.
- Incorporate carbon accounting into National Planning Policy Frameworks to ensure net-zero is consistently included in all areas of national planning policy.

Key Recommendations for Policy-Makers

1 Buildings: Operational Carbon

1A) EXISTING HOMES

Approximately 50% of emissions from the UK built environment relates to our existing housing stock, predominantly through fossil fuel boilers. Achieving net zero will not be possible without fundamental and urgent improvements to heating demands and heating technologies within our existing homes.

We must transition away from the current dependence on fossil fuel heating to zero carbon heating technologies, with a significant role for heat-pump technologies. There is increasing consensus that although there is a clear role for hydrogen within sectors such as industry and transport, there is limited rationale and significant uncertainty for the use of hydrogen to heat buildings (other than in areas surrounding industrial clusters).

There can therefore be no further delay in embarking on a national programme of home retrofit, transforming UK housing to make it efficient, warm, and cheaper to heat, whilst transitioning away from fossil fuel heating. It is critical that Government therefore introduce and support a large-scale, transformative domestic retrofit strategy and programme that is fully coordinated with local authorities, industry, consumers and other relevant stakeholders, and does not disadvantage lower-income households.

The Construction Leadership Council (CLC) National Retrofit Strategy (NRS) sets out a pathway for how this can be achieved, with initial focus on capacity building, supply chain readiness, skills and training, building toward an accelerated deployment of fabric energy efficiency improvements and heat pump installations from the late 2020s to the mid-2030s. The strategy plans for 97% of UK homes to undergo energy efficiency retrofit by 2040.

Key Policy Recommendations for Government

Adopt a National Retrofit Strategy by 2022, setting out a clear national homes upgrade programme, fully coordinated with local government, industry, and relevant stakeholders:

Strategy & Engagement

- Establish a Central Retrofit Agency – to coordinate policy-makers, local authorities, housing associations, community groups, local advocates, green finance and funding experts, industry bodies and regulators, private sector partners, and existing and future retrofit customers – to fund projects, track progress, share learnings, promote innovation, and broker partnerships.
- Develop a comprehensive engagement plan to ensure all households are aware of the funding and the benefits of taking action early.

Policy

- A clear trajectory and regulatory framework to introduce mandatory minimum EPC rating of C (or equivalent under updated EPC methodology), for owner-occupied homes at the point of sale (with suitable caveats e.g. historic building considerations) by 2028.
- A clear trajectory for improving the Minimum Energy Efficiency Standard (MEES) for the domestic rented sector to at least EPC C (or equivalent under updated EPC methodology) by 2028.
- Introduce and clearly signpost a cut-off date of 2030 for sales of gas and oil boilers.

Fiscal incentives

- Variable stamp duty rates adjusted in line with the energy performance of a property. House buyers would receive a reduced rate if a property is above a certain energy efficiency rating, and an increased rate for less efficient properties, designed to be fiscally neutral.
- Remove VAT on refurbishment work (i.e. 0% VAT) where energy performance improvement targets are met (to incentivise energy efficiency improvements whilst retaining VAT revenue from general improvement works).
- Council tax reform considering variable rates / rebates dependant on energy performance.

- Direct government grants for low-income households to support both energy efficiency improvements and the installation of low carbon heating.
- Incentivise banks and lenders to offer low interest mortgage extensions and loans for retrofit for landlords and homeowners, where energy performance improvement targets are met.
- Adjust the gas and electricity tax regime (which currently strongly favours gas) for domestic customers, to incentivise the shift to heat-pump technology, whilst mitigating risks to those in fuel poverty.

Enablers

- Reform EPCs to establish in-use energy performance as the rating metric (as opposed to cost), reducing the performance gap and also disincentivising gas usage, and enabling EPC ratings to be used as a meaningful regulatory driver in reducing emissions, by 2023.
- Accelerate SMETERS project working towards incorporation of actual measured energy data into the EPC methodology.
- Support the development of digital building renovation plans or ‘passports’ (in conjunction with industry) that inform evidence-based, retrofit pathways for existing building stock varieties and are held within a central property database.
- Support the development of the right market framework to enable financial incentives for individual consumers to trade energy flexibly and improve the route to market for pricing solutions such as flexible tariffs (e.g. Time of Use (ToU)).

Skills & Business

- Create a national retrofit training and skills strategy, scaling up rapidly to meet emerging demand, working with trade associations within the home repair, maintenance and improvements (RMI) market, local skills partnerships, and informed by the Government’s Green Jobs Taskforce and the CITB work on Building Skills for Net Zero.
- High profile promotion throughout the country with communications programme to inspire and recruit, targeting school leavers, those reskilling for career change in declining sectors and existing construction workers in need of upskilling.
- Leverage public procurement to build demand for skills and supply chains by providing a guaranteed pipeline to enable the transition away from traditional approaches and rapid expansion of market delivery capability. Incentivise and support firms to take on new apprentices.
- Update apprenticeship and training standards to align with the required retrofit delivery programme, optimising digital skills.

1B) EXISTING NON-DOMESTIC BUILDINGS

Non-domestic building stock currently represents approximately 20% of Built Environment carbon emissions. Significant improvements in the pace of energy efficiency deployment are required as progress in recent years has been slow, and a shift in approach towards mandatory energy disclosure and performance-based metrics is required to galvanise markets. A significant proportion of emissions are from heating, predominantly via fossil fuel heating systems, and therefore enabling a shift to low carbon heating systems is also critical.

Key Policy Recommendations for Government

Energy Performance Disclosure

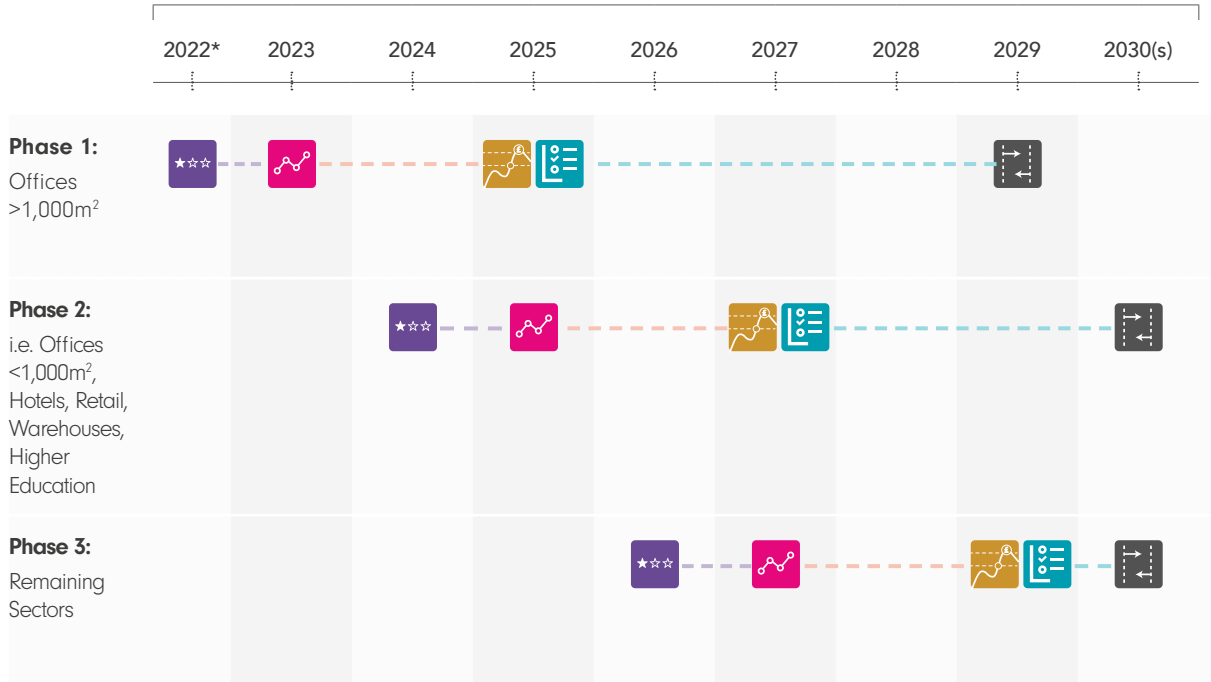
Introduce performance-based rating schemes for existing non-domestic buildings via a phased approach:

- Introduce the planned **performance-based rating system for large office buildings (>1,000m²)** by May 2022, including **mandatory energy performance disclosure**.
- Introduce **minimum standards** and **fiscal incentives for large office buildings** by **2025**, including **separate minimum standards for new buildings** (with suitable transitional arrangements).
- Fiscal incentives could take the form of penalties or discounts linked to existing or new taxation mechanisms.
- Introduce performance-based rating systems in **other non-domestic sectors (and small office buildings)** by **2025**, followed by minimum standards and fiscal incentives for both new and existing buildings.
- By 2028 establish performance-based rating systems in remaining non-domestic sectors.

Policy and Fiscal incentives

- Retain proposals for use of MEES in the non-domestic sector in the short to medium term. Review the need for MEES as policy lever as performance rating schemes become established.
- Review Landlord & Tenant Act 1954 to require by law that all new business leases include green lease clauses, the standards of which should be developed with industry.
- Remove VAT on refurbishment work (i.e. 0% VAT) where energy performance targets are met (to incentivise energy efficiency works whilst retaining VAT revenue from general improvement works)
- Introduce and clearly signpost a **cut-off date of 2030** for the sale of **gas and oil boilers**.

TIMELINE:



Reading this timeline



Performance Rating Scheme Launch



Minimum Standards & Fiscal Incentives introduced



Progressive tightening of Minimum Standards & Fiscal Incentives



Mandatory Energy Disclosure



Part L compliance for New Buildings based on EUI



(2021: Part L 2021 introduces mandatory EUI Forecast for all buildings >1,000m²)

1C) NEW BUILDINGS

Current building regulations (Part L) and energy rating mechanisms (EPCs) do not adequately predict or represent the actual performance of buildings in practice. In addition to the use of compliance tools and methodologies to predict performance at the design stage, a significant “performance gap” exists between design intent and building performance outcomes, due to multiple factors, including insufficient attention towards building handover.

Building Regulations must therefore shift from the “notional building” comparison approach to in-use energy performance metrics (Energy Usage Intensity EUI – kWh/m²/year), to drive an industry shift towards an outcomes-led “design for performance” approach.

To enable the transition to Net Zero, additional metrics will require focus, including measures to limit peak demand. Buildings designed in the coming years must also be equipped to deliver the energy performance levels required for Net Zero by 2050, to avoid the need for future retrofitting, and the risk of unnecessary future occupant disruption, cost and embodied carbon.

Key Policy Recommendations for Government

Update the regulatory and policy framework for new homes:

- Update the National Calculation Methodology (NCM, as underpinned by SAP) and the EPC methodology to create a fit-for-purpose predictive methodology for energy performance of dwellings, that better reflects in-use energy performance.
- 2025 Future Homes Standard and associated Building Regulations Part L 2025 update to introduce:
 - Energy Usage Intensity (EUI) targets inc. regulated and unregulated loads (kWh/m²/yr).
 - Thermal energy demand limits (kWh/m²/yr).
 - Low carbon heating for all new buildings (no fossil fuel combustion).
 - Measures to limit peak demand and enable load shifting (with limits on peak demand from 2030).
 - Minimum standards for currently unregulated key appliances with high influence on annual & peak demand, i.e. cooker hobs & showers.
- Stamp duty rates should be adjusted in line with the energy performance of a property (as part of wider policy across the market – see Existing Homes).
- Increased availability of green mortgages with reduced interest rates for the most efficient homes to stimulate market demand for future building efficiency standards (as part of wider policy across housing market – see Existing Homes).

- Enable accelerated planning approval for early adopters of future energy efficiency levels (with disclosure of performance on completion).
- Local planning authorities’ ability to set more ambitious targets for new development should be retained until suitable EUI targets consistent with Net Zero are established within building regulations (i.e. 2025).

Update Building Regulations for new non-domestic buildings to include:

- Part L 2021 final statutory guidance to include mandatory provision of Energy Usage Intensity (EUI) forecasts (regulated and unregulated loads) for all buildings >1,000m².
- 2025 Future Buildings Standard and associated Building Regulations Part L 2025 update to introduce:
 - For office buildings >1,000m²: EUI target (kWh/m²/year) compliance approach in place of notional building methodology.
 - Thermal Energy Demand limits (kWh/m²/year) for different building typologies.
 - Low carbon heating for all new buildings (no fossil fuel combustion).
 - Peak Load assessment (and ability for load shifting).
- Interim amendments to 2025 Building Regulations Part L to introduce EUI target compliance approach for additional sectors, aligned with mandatory energy performance disclosure dates (see section 1b):
 - 2027 amendments: Phase 2: Potential sectors: Offices <1,000m², Hotels, Retail, Warehouses, Higher Education.
 - 2029 amendments: Phase 3: Remaining sectors.
- Align the introduction of the EUI compliance approach per sector with the timings of a confirmed mandatory energy disclosure timetable (with timetable to be confirmed ahead of 2025).
- 2030 Building Regulations to include:
 - Peak load limits demand limits (W/m²) for different building typologies.
- Local planning authorities’ ability to set more ambitious targets for new development should be retained until suitable EUI targets consistent with Net Zero are established within building regulations per sector (i.e. 2025 onwards).

2 Buildings: Embodied Carbon

Embodied carbon from new construction and refurbishment of buildings makes up approximately 19% of built environment emissions, but as operational emission levels from buildings are ratcheted down, the embodied component will become an increasing proportion of the total, with no simple mitigation option. By 2035, the trajectory results indicate that embodied carbon will form over half of all built environment emissions, with the domestic retrofit programme putting pressure on cumulative carbon budgets in the early 2030s.

Since 1990, the industry has only achieved a meaningful reduction in total embodied carbon emissions in the period following the financial crisis of 2008. Given the emissions reductions required in the coming years, the early 2020s is the period when regulation of embodied carbon of buildings will need to be introduced, to embed consistent measurement and then introduce emission limits. This will act as a demand reduction policy mechanism, in tandem with industrial decarbonisation measures on the materials supply side.

Key Policy Recommendations for Government

Embodied Carbon Regulation

Implement a regulatory policy framework for upfront embodied carbon in new buildings, with clear signposting of a phased pathway:

- **Mandatory measurement and reporting** of Whole Life Carbon by **2023** for large buildings (>1,000m²) and residential developments (≥10 dwellings).
- **Minimum standards** (limits) for Upfront Embodied Carbon by **2025** for more mature sectors (i.e. those with sufficient asset level benchmark data), with associated **fiscal incentives and penalties**.
- **Minimum standards** (limits) for Upfront Embodied Carbon by **2027** in all sectors.
- Final phase to introduce minimum standards for all size buildings (with a suitable minimum threshold) in all sectors by **2030**.

Regulation must be supported with suitable data management and collection systems, tools, and incentives for industry to reduce embodied carbon. Building on progress already made within industry, Government will need to provide adequate support to areas such as embodied carbon data management, Environmental Product Declarations (EPDs), and circularity. Supporting recommendations include:

Data Management

- Develop a freely available national embodied carbon assessment tool.
- Utilise existing industry resources to establish a national asset and product embodied carbon database, such as the Built Environment Carbon Database (www.becd.co.uk).
- Recognise and support the development of existing embodied carbon standards and benchmarks.
- Publish embodied carbon benchmarks (using industry standard methodology & carbon factors) and voluntary best practice standards by 2023.
- Support the industry in developing competency standards and QA processes for the assessment of embodied carbon.

EPDs

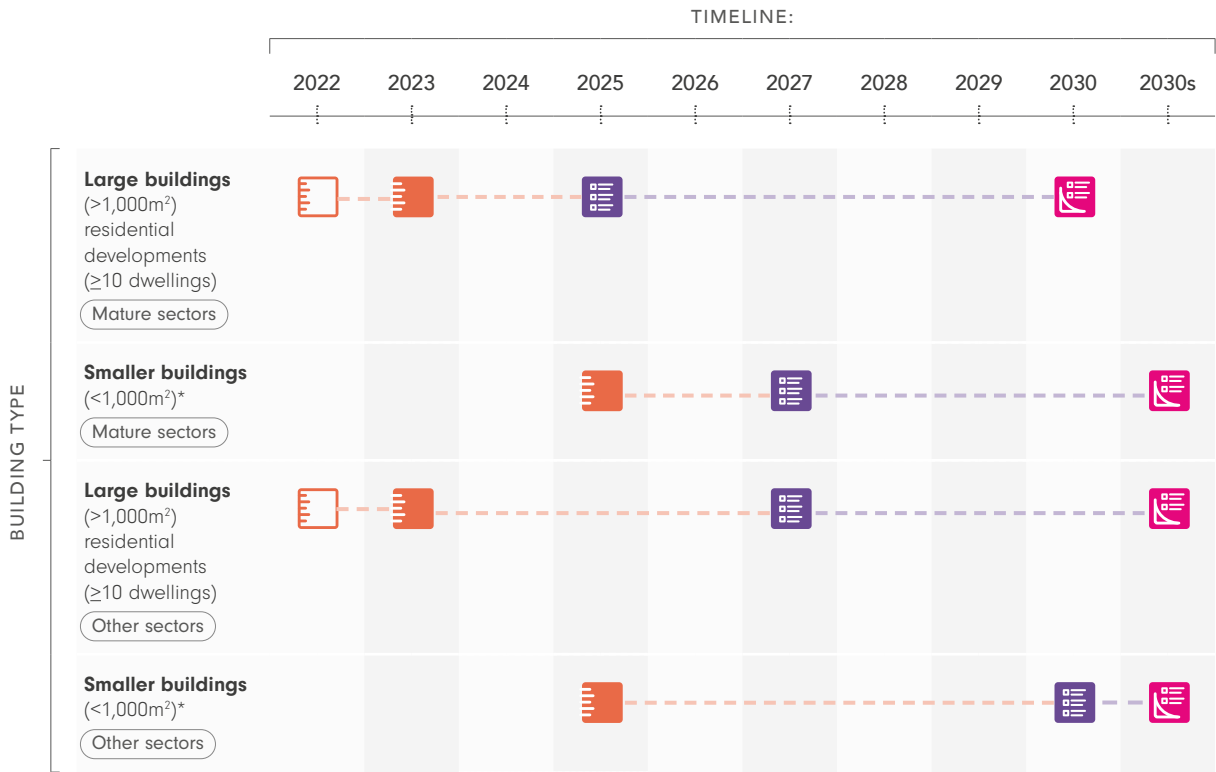
- Support the industry to develop EPDs (to EN15804 & 3rd party verified) at the scale and quality required.
- Incentivise and eventually require manufacturers to declare the impacts of their products.
- Provide financial support to SMEs for EPD development.

Circular Economy


- Remove VAT on refurbishment works (i.e. 0% VAT) which retain building structural frame and achieve energy performance targets (to incentivise re-use over demolition) – while proportionally increasing the VAT on new builds to make this change fiscally neutral.
- Establish a nationwide second-hand materials database, building on city-level networks.
- Update National Planning Policy Frameworks to require evaluation of embodied carbon impacts of new build before permitting demolition.


Local Planning Requirements

- Enable local planning authorities to set more ambitious limits on upfront carbon for new development than those introduced via Building Regulations.




Reading this timeline

 **Mandatory measurement & disclosure** of whole life carbon introduced into Building Regulations at the earliest opportunity

 **Mandatory measurement and disclosure** of Whole Life Carbon comes into force

* With suitable minimum size threshold. Area thresholds and sector maturity criteria to be refined.

 **Progressive tightening of standards** for Upfront Embodied Carbon in line with carbon budget trajectories

 **Minimum standards (limits)**, fiscal incentives, and penalties for Upfront Embodied Carbon

3 Infrastructure & Industry

Operational and embodied emissions from infrastructure make up approximately 5% of UK built environment emissions. Infrastructure spans economic, environmental, and social systems to form the country-wide foundations that enable society to function. While the WLC Roadmap programme constraints required that the scope of the modelled trajectory exclude emissions from surface transport, the difficulty of decoupling the different emissions sources related to infrastructure (embodied carbon, surface transport, etc) is evident when conceptualising infrastructure as an integrated system.

If surface transport is included within the scope of the built environment, the total share of UK emissions increases from approximately 27% to 40%. The decarbonisation of the infrastructure sector therefore requires a systems-thinking approach, balancing embodied carbon impacts of infrastructure investment with emission reductions delivered in other sectors such as transport, through the use of those infrastructure assets.

Strategic infrastructure investments are also required in the industrial sector to enable the decarbonisation of construction material supply chains.

Key Policy Recommendations for Government

Integrated Decarbonisation of Infrastructure Systems

- Introduce the role of a National Infrastructure Integrator to enable holistic decision-making across UK infrastructure investment with full visibility of all carbon impacts.
- Demonstrate leadership within public procurement via Infrastructure and Projects Authority (IPA) commitment to the CSIC Carbon Reduction Code (which includes integrating carbon reduction targets and reporting commitments explicitly in all procurement documents from 2021).
- Set a requirement for all regulators to develop an explicit first-order objective to support the transition to Net Zero by 2050.
- Mandate for PAS 2080 to be fully implemented across all Infrastructure projects by 2025.

Industrial Decarbonisation

- Drive and support 'low regrets' energy efficiency and fuel switching measures within industry to enable the decarbonisation of construction supply chains.
- Support the development of Carbon Capture and Storage (CCS) for use in industry, to deal with hard-to-abate emissions for which there are no alternative mitigation options, e.g. process emissions from cement production. Deliver on plans for initial CCS deployment in two industrial clusters by 2025 with two more by 2030.
- Work with concrete and cement sector to identify feasible options for CCS deployment and transportation in dispersed sites.
- Support the deployment of hydrogen within industry (i.e. for high temperature processes) to aid decarbonisation, and adopt a transparent and robust science-based approach to the options available for hydrogen production.

Carbon Pricing

- Ensure carbon pricing policies such as the UK ETS continue to drive deep industrial decarbonisation whilst maintaining competitiveness and minimising carbon leakage.
- Considerations must include increased carbon prices, links with the EU ETS, the phase-out future of free allowances, and an equitable supply adjustment mechanism which keeps pace with the EU Carbon Border Adjustment Mechanism (CBAM) and, once tested, may enable the phase-out of free allowances.
- Set the UK Emissions Trading Scheme (UK ETS) cap based on the pathway to the UK Net Zero target and consider expanding the scheme to include increased coverage of materials and sectors.

National Planning Policy Framework

- Incorporate carbon accounting into National Planning Policy Frameworks to ensure net-zero is consistently included in all areas of planning policy.