Future Homes Hub

New Homes Sector

Net Zero Transition Plan

A shared framework for accelerating transition while building more homes

April 2025

Working with:

CARBON TRUST

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Companies committed to the New Homes Sector Net Zero Transition Plan

Companies commit to reducing emissions to contribute to sectoral decarbonisation in line with the Sector Transition Plan, building on the commitment to respond to the Future Homes Delivery Plan by:

- Collaborating on shared activities and mechanisms to reduce emissions at scale
- Sharing information, expertise and research where appropriate
- Sharing data on emissions by disclosing according to the sector sustainability metrics

Allison Homes · Bargate · Barratt Redrow · Bellway · Berkeley Group · Bewley Homes · CALA

Carbon Neutral Homes · Cavanna Homes · CG Fry & Son Development · Churchill Living · Clarion Housing Group · Crest Nicholson · croudacegroup

dandara · Duchy of Cornwall · Durkan Homes · Fairview New Homes Ltd. · gleeson · Greencore Homes · Hill The Hill Group

Keepmoat · L&Q · Lioncourt Homes · McCarthy Stone · millerhomes · orbit homes · Persimmon Plc

Places for People · platform housing group · strata · Taylor Wimpey · Thakeham · VerdeGO Group · Vistry Group

This commitment recognises that there remains uncertainty in the data and in whether external assumptions (for example decarbonisation of the grid) will be met, which means that the initial plan will need to be updated. Nevertheless, we recognise that this uncertainty should not prevent planning, investing and acting now.

Overview

The purpose of this sector level transition plan is to provide a shared pathway and framework for the whole sector to reach net zero emissions. The plan aims to ensure that transition is smooth and efficient whilst taking the opportunity to improve the quality, performance and affordability of new homes. This is especially important given the Government's commitment to accelerating delivery of new homes. Supporting smaller homebuilders to decarbonise and capture the opportunities of the transition is a key priority.

The Future Homes Standard 2025 will result in homes that are zero carbon in use as the grid decarbonises by, or soon after, 2030. However, there remain significant challenges in decarbonising the production of new homes, including the materials, transport, and construction processes. There will inevitably also be further changes beyond 2025 to maximise the benefits of the transition to all electric new homes in the context of a rapidly changing energy system.

The pathways for these other aspects of net zero are not yet clear. Furthermore, there is a wide range of dependencies over which individual homebuilders have limited, or no, control such as: the development and rollout of new carbon measurement methods; the pace of the decarbonisation of materials; and technology development for alternative energy sources for on-site equipment.

This first version of the plan seeks to identify:

- ✔ The current breakdown of carbon by emissions source
- ✔ The emissions reduction pathway required to align with the Government's Carbon Budgets and overall Net Zero strategy
- ✔ The levers and actions required to meet that pathway
- ✔ The structures for collaborative work across homebuilders, supply chain, Government, and other stakeholders to solve problems and overcome barriers to achieving the pathway

The Future Homes Standard Implementation Board, administered by the Hub, already exists to support the sector to deliver zero carbon ready homes in operation with associated working groups to solve specific issues. This report proposes setting up an Embodied Carbon Implementation Board managed by the Hub to bring together homebuilders, suppliers, Government, and others to collaborate on the reduction in emissions from materials, transport, and construction of developments. The Hub will also work through the Net Zero Council to align this plan with other sectoral transition plans so they mutually reinforce each other.

The plan is grounded in a model developed by the Carbon Trust which allows us to understand the necessary actions to meet the pathway as well as other dependencies, such as grid decarbonisation and decarbonisation of products. In parallel to the transition plan, the Future Homes Hub is also developing metrics on behalf of the sector which will enable us to measure annual progress. We can then adapt the plan in response to the wider, changing landscape to help remain on track for net zero.

This is the first version of the transition plan. We expect a number of relevant developments during 2025 including the publication of the Future Homes Standard and Carbon Budget 7. The Hub will, therefore, provide a revised update in 2025 that will also recognise sector-reported embodied carbon metrics and updated construction product decarbonisation pathways. Please let us know if you have any updated information to inform the plan. Given the limited data available for first version, the plan may well evolve in early revisions. The initial pathway does not reach net zero based on the levers modelled, so further levers may be needed to reach net zero.

The transition plan and its initial pathway provides a guide and benchmark to company level decarbonisation. However, some companies have already committed to Science Based Targets or specific plans, and every company will have their own circumstances that will determine the most appropriate actions. Companies are nevertheless asked to collaborate to meet the overall sector pathway. The Hub will facilitate that collaboration to help deliver the change efficiently.

Forewords

David Thomas

Chair, Future Homes Hub and CEO, Barratt Redrow PLC

For the UK to transition successfully to clean energy, building a generation of high quality, comfortable and affordable homes, government and the homebuilding sector need to unite behind one plan.

The Net Zero Transition Plan is therefore a fundamental component, providing the framework for the new homes community to achieve a smooth transition. The long-term roadmap starts to provide the clarity, consistency and certainty industry has been calling for.

Our next step is the Future Homes Standard 2025, which, as the grid decarbonises, will mean new homes will be zero carbon in use from around 2030. This will eliminate emissions from new homes, as well as enable better living and lower energy bills for customers.

However, that will not be the end of the line, we will need to go further. The embodied carbon challenge is becoming increasingly important, with a greater focus on the materials we use and the emissions generated within the supply chain.

This means regulatory change will continue, and so we need to work with government to set a clear timetable to and beyond 2030 – a timetable that also stretches beyond our industry into the supply chain and other dependencies, such as transport.

Government understands the need for interconnected sector-level transition plans, that work across the economy and are underpinned and supported by good policy. The Net Zero Council, on which I am proud to be a member, is working to fill any gaps and to bring these plans together, to enable industry and government to work in lock-step.

While there are clear benefits for society, the environment and for our customers, achieving the transition will not be easy and there will be obstacles to overcome. We will need to support each other. We must commit to collaborate and share lessons from innovation and trials, as well as larger companies helping to create markets for low carbon products at the scale required to bring down cost. The whole new homes supply chain must work with us to play their part in achieving this transition plan.

As with all plans, we will need to adapt and adjust as we go and as more information becomes available, but this is a positive step. We are making good progress, together, and the Hub will continue to work with you to make zero carbon homes a reality.

Forewords

Ryan McLaughlin

Director of Net Zero Strategy, DESNZ

Accelerating to net zero will unlock a range of benefits for businesses, including new market opportunities, access to green finance and reduced energy bills. Businesses, in turn, have a vital role to play and that is why sector roadmaps are so important - they help to guide the transition plans of individual companies, provide clear signals to investors and focus policymakers on priorities.

Government is committed to working in partnership to support the business community in delivering their plans. The Net Zero Council brings government together with the private sector, civil society, local government and trade unions and is supporting the development of sector roadmaps, including for the new homes and construction sector.

I congratulate the sector and the Future Homes Hub on the publication of this initial plan and look forward to working with the sector to support delivery.

John Palmer

Deputy Director, New Build Standards and Performance

Reducing embodied carbon in the built environment is essential for achieving net zero targets. This is a complex area for the house building industry due to the need for action throughout the supply chain and the potential implications for design and construction practices.

I am encouraged and appreciative of the Future Homes Hub's efforts in bringing this initiative together. The Hub's excellent work over recent years to make sure industry understands and is ready for net zero speak for themselves. An industry-wide approach like this can help developers understand and manage embodied carbon, enabling them to make the necessary changes.

The government plans to seek views from industry on our approach in due course. However, it is encouraging that industry is already taking steps to understand what is needed to reduce embodied carbon and I look forward to seeing its progress.

Executive Summary

- Transition plan context
- Transition plan approach
- Initial transition pathway
- Delivery plan, partnership, and governance

Part 1: Transition plan context

Climate change policy context

The UK Government is legally committed to achieving net zero greenhouse gas emissions by 2050, with progressive reductions in the intervening 'carbon budget' periods. At COP29 in Baku, the Prime Minister announced that the UK will commit to a "nationally determined contribution" of an 81% reduction in emissions by 2035, compared to 1990 levels. Every sector of the economy will be required to reduce emissions to contribute to the national targets and the UK's net zero strategy.

New Homes in the UK

During the same period, the UK will need to build 6m homes to keep pace with housing needs and the Government has committed to build 1.5m in the current parliament. From a climate change perspective this makes it more important to decarbonise but also creates risks from seeking to accelerate both housing delivery and decarbonisation simultaneously. It is, therefore, fundamental that the sector works with the Government and others to create the conditions for building low carbon homes at scale, including:

- A shared plan that gives the sector long term direction and investment certainty
- Delivery mechanisms that bring Government, homebuilders, and the supply chain together around that shared plan
- Consistent carbon and energy standards at a national level
- Recognition of different build types and development contexts, for example, taller buildings and urban regeneration schemes
- Support for smaller developers to make transition as simple and seamless as possible, recognising that smaller developers have fewer technical resources to navigate change

Benefits of a proactive approach

Taking a proactive and planned approach to the energy and net zero transition allows the sector to secure several benefits, such as:

- ✓ Achieving a smoother transition, for example, securing skills and supply chain capacity
- ✓ Working in partnership with Government to secure policies that work for the sector
- ✓ More effectively meeting the expectations of investors, local governments, and customers
- ✓ Capturing the opportunities associated with the move to electrification such as creating homes that are more comfortable and healthy, that have lower running costs, and make the most of smart technologies
- ✓ Being ready for the future, for example, avoiding costly retrofit

Part 2: Transition plan approach

Role of the sector Transition Plan

The transition to Net Zero requires system-level change, with individual companies having limited control over many of the factors required by the transition. A sector transition plan, therefore, provides a shared platform for:

- Aligning company level plans with the Government's plan
- Working in partnership with Government, supply chain, and others on whom we depend
- Developing shared solutions as well as pooling and sharing knowledge where beneficial
- Supporting smaller developers
- Providing a transparent basis for tracking progress and making early adjustments where necessary

Analytical method and scope

The transition plan has been developed by the Future Homes Hub with support of the Carbon Trust through a steering group of homebuilders, including those who have developed company level transition plans. The core method has been to:

- Quantify baseline emissions
- Establish current knowledge about the required emissions reduction pathway
- Identify reduction levers and how they can be deployed
- Set out required delivery plans, structures, and governance

The plan is underpinned by a sectoral model developed by the Carbon Trust who have sought to use the best available information. The scope of the plan is limited to the emissions that Carbon Trust has been able to quantify and model. Therefore, this does not currently include 'zero carbon placemaking' – i.e., actions encouraging sustainable lifestyles through careful planning of sites. The transition plan has not yet assessed costs. This will be covered in later iterations as we expect to learn about reduction options in more detail.

Dependencies and uncertainty

Note that there are multiple dependencies (including on policy, grid decarbonisation, grid connection and infrastructure, supply chain and skills availability, and supply chain decarbonisation) in addition to analytical uncertainty (including methodological and data gaps that are being rectified). This is part of the rationale for putting in place governance arrangements (see part 4) that allow us to track progress, constantly take action to overcome barriers, and adjust the plan.

Part 3: Initial transition pathway

Baseline emissions

The initial estimate of the baseline carbon emissions from new homes, is just under 50 million tonnes per annum in total, or 235 tonnes per completed home placed on the market. This is based on 2022 estimates provided by homebuilders extrapolated to the 205,000 homes completed in the financial year.

This is made up of:

Homes in use emissions	39% (18.8 $MtCO_2e$)
Construction emissions	6% (3.1 $MtCO_2e$)
Construction products emissions	50% (24.2 $MtCO_2e$)
Head office, staff, and other emissions	5% (2.3 $MtCO_2e$)

Emissions reduction context: the required pathway

To provide an initial required pathway, the sector wide Transition Plan seeks to align with the Government's Carbon Budget Delivery Plan in combination with the Climate Change Committee's advice on Carbon Budgets. This is because the Climate Change Act, from which the UK's legal obligation to achieve Net Zero emissions derives, puts the starting obligation on the Government to develop the requisite measures and policies.

- **For homes in use emissions,** the Government's plan, building on the 31% emissions reduction through changes to Part L in 2021 (compared to the 2013 regulations) is to implement the Future Homes Standard (FHS), as soon as possible, to avoid new homes adding to the annual stock of carbon emissions. Based on the FHS consultation, this would mean all new homes would be enabled for net zero carbon in operation as the grid decarbonises. The Future Homes Hub proposes to work with the Government to review any further refinements needed to maximise the benefits of zero carbon homes.
- **For both construction emissions and construction product emissions,** the plan references the CCC's manufacturing and construction emissions pathway, as this is currently the best government-endorsed indication of the required pathway.

For those companies that have committed to Science-Based targets, the SBTi pathway is also an important reference point. Companies agree science-based targets individually, while specific buildings guidance was published in August 2024.

Levers and the initial pathway

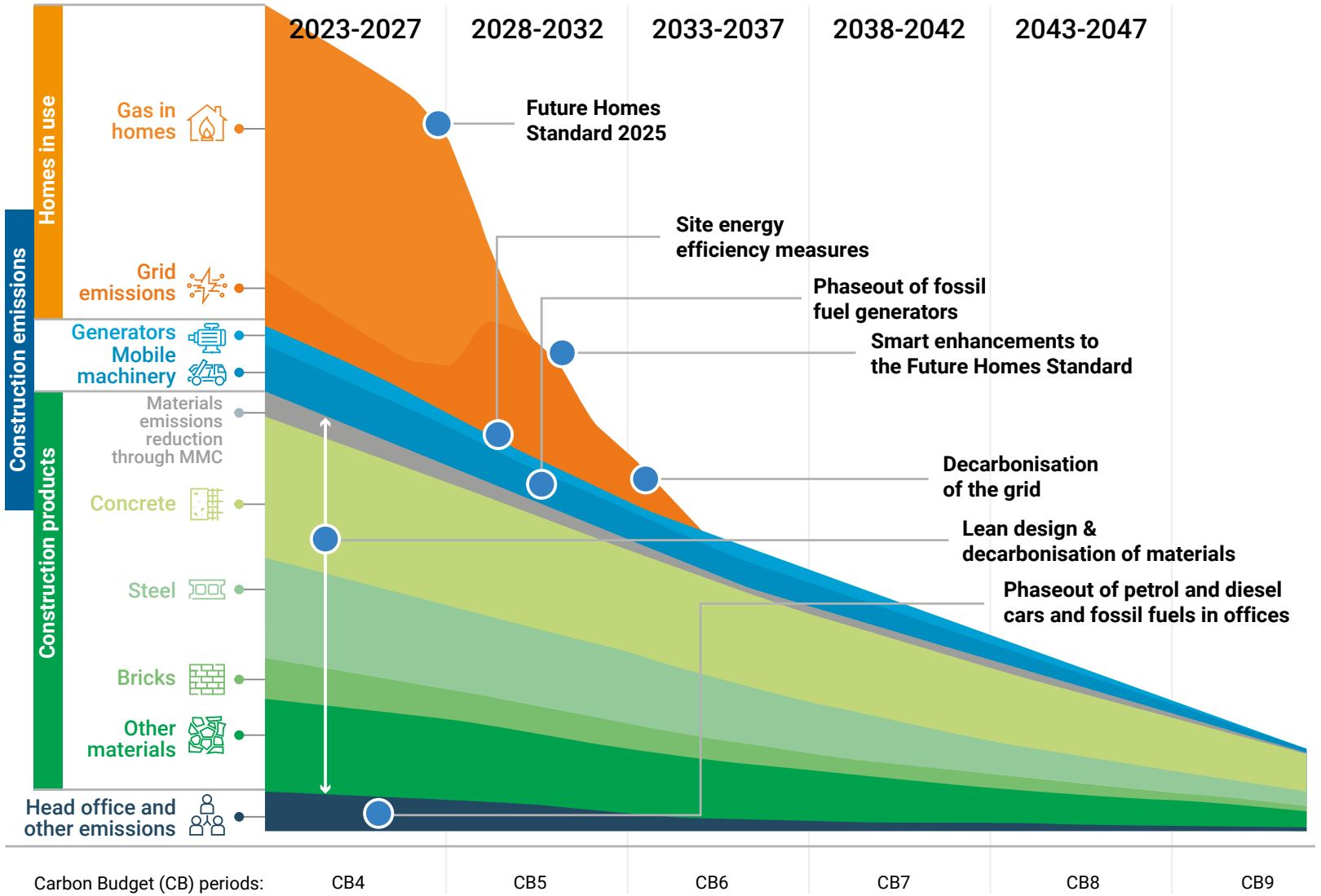
The Hub has reviewed potential levers for reducing emissions and offers an initial view of how these can be pulled to achieve the target emissions reductions. This is based on information from existing company transition plans, while also incorporating available information from other supply sectors. The 9 levers considered are:

1. Operational decarbonisation impacts of the anticipated Future Homes Standard
2. Smart controls and energy storage
3. Fuel switching and plant decarbonisation
4. Generator/compound energy saving
5. Design for low embodied carbon and alternative materials
6. Reduce carbon intensity: concrete
7. Reduce carbon intensity: steel
8. Reduce carbon intensity: brick
9. Reduce carbon intensity: other materials

Figure 1 shows that the combined impact of applying these levers, within the core reduction pathway. Pulling the levers identified achieves significant headway; however, it should be noted that coordinated action is needed to achieve the emissions reductions identified so far. A greater reduction of emissions will also require a combination of design changes (so far greater use of timber is the only design change considered) and reducing the carbon intensity of products. Part 4 sets out the arrangements to do this.

While uncertainty is embedded within any such projection, the core pathway shows the impact of lever scenarios chosen to represent neutral optimism and higher likelihood, based on the data available. When embedding these scenarios, the pathway falls short of reaching net zero, so further reductions will need to be identified in future versions as we get better data and understanding of the impact of different levers.

Figure 1: The New Homes transition plan pathway.



Part 4: Delivery plan, partnership, and governance

Delivery Plan and roles

Part 4 sets out a shared timeline for working in partnership to implement the plan, identifying actions for homebuilders, for sector wide partnership, and for Government. Successful delivery will depend on all parts of the homebuilding community playing their part. In the future, there will also likely be the need to form specific agreements, including procurement standards.

The Delivery Plan proposes activities for Government and individual companies, while also, more importantly, identifying where parties need to collaborate to develop the levers required to deliver the change.

Two Implementation Boards are proposed to oversee the delivery plan, coordinate between parties and to resolve challenges that obstruct its implementation. The Future Homes Standard Implementation Board has already begun to define the focus areas for the sector and is delivering solutions to complex problems. This will continue. In addition, the Embodied Carbon implementation Board will be created to bring the homebuilders, manufacturers, designers, Government departments and others together to reduce embodied carbon.

Governance and revision

Implementation will be overseen by the two implementation boards, with help as needed from the Future Homes Leadership Council to implement agreements through companies and the relaunched Net Zero Council to help secure action and partnership with dependent sectors.

This plan must also be maintained and updated to correct course and stay on track as we gain better understanding of: the sector metrics; how other complementary sectors are performing; and the impact of the sector's interventions, with the next revision expected in the second half of 2025.

Part 1: Transition plan context

- Climate change science, legal and policy context
- New homes in the UK
- The role of new homes in UK decarbonisation

Climate change science, legal, and policy context

Environmental pressures are increasingly recognised as amongst the greatest challenges to humanity in the 21st century. At a global level, climate change is already having significant effects on the earth's weather systems, including extreme events such as hurricanes and heatwaves, and is rapidly intensifying. The Earth has warmed by over 1.1C since the late 19th century, and is set to warm further until net greenhouse gas emissions reduce to zero, with significant further warming already locked in. The pressures on the UK's immediate natural resource base are already a public and government concern; and now they are also intensifying.

The Climate Change Act 2008 legally commits the Government to ensuring that the UK reaches its Greenhouse Gas emissions targets by 2050. It contains a system of five yearly carbon budgets, carbon reduction programmes, and independent advice from the Climate Change Committee, to which the Government has to respond.

The national target was amended in 2019 to be 'net zero' greenhouse gas emissions by 2050, in line with the 2015 Paris Agreement. In December 2020, the Government then committed to 68% reduction (compared to 1990 levels) by 2030 as its Nationally Determined Contribution to meeting the Paris Agreement; and in November 2024 to 81% reduction by 2035.

The Climate Change Committee set out high-level pathways for different sectors of the economy in its 6th Carbon Budget in December 2020, including its advice on implementation of the Future Homes Standard. In 2021, the Government published its Net Zero Strategy, which included a range of policies and measures building on sectoral strategies, such as, the Energy White Paper; Industrial Decarbonisation Strategy; and Heat and Buildings Strategy to set out the Government's overall plan for meeting net zero.

This was updated in 2023, with a particular focus on scaling up and deploying technologies for different key sectors.

The CCC's 2024 Progress Report stated that "action is needed across all sectors of the economy, with low-carbon technologies becoming the norm." In March 2025 the CCC published its 7th Carbon Budget.

New homes in the UK

The social and government objective to build more homes

The last three decades have seen substantial undersupply of new homes. In turn, this has led to problems of affordability across all housing tenures as evidenced by the Affordable Housing Commission's 2020 report. Other related impacts include reduced home ownership for younger people; greater difficulty in moving home across the age spectrum; and consequentially impaired labour mobility and economic performance.

In response, the new Government has set a target of 1.5 million new homes over the next parliament (2024-2029). This averages to 300,000 new homes per year for the next five years. The transition plan, therefore, needs to be designed in a way that doesn't undermine the viability or continued progress towards meeting this target.

The industry structure including the context for smaller developers

Home building is a diverse sector. Developers range in scale from building in single digits to developing in the tens of thousands per year. The strategy, therefore, needs to recognise the circumstances across these different parts of the sector and ensure we do not inadvertently further affect the business climate in ways which could reduce market diversity, disadvantage smaller developers, and create additional barriers to market entry.

Equally, the plan must acknowledge the leading examples set by developers further along the decarbonisation journey, and ensure relevant examples of scalable and applicable progressive activities are held up and shared across the homebuilding community. The plan aims neither to suppress nor prevent firms from going over and above the core pathway.

A further challenge comes from the range of different home and development types. For example, the technical and design context for building urban regeneration schemes and taller buildings may require alternative solutions for meeting climate and environmental goals than those appropriate for lower-rise housing.

The ecosystem of sectors and professions that influence new homes development

While developers are at the 'sharp end' of building homes, in reality, the design and shape of new homes depends on a much wider and more complex 'supply chain' of sectors and professions.

Developers are constrained in their ability to achieve fundamental change without supply chain sectors understanding and mutually supporting a shared plan and direction of travel.

The role of new homes in UK decarbonisation

While this plan sets out the decarbonisation of the new homes sector, it also acts as an important enabler for the UK's transition to net zero. In particular, the activities of the new homes sector will:

1. Pioneer the use of smart controls at scale, addressing infrastructure constraints for all-electric homes.
2. Deploy energy storage and load shifting to reduce peak loads on the grid and minimising the impact from net additional homes, supporting the Government's clean energy mission.
3. Create robust supply chains for low carbon technologies and materials that support the retrofit market and other sectors in construction.
4. Initiate and generate the demand and hence investment in green skills.
5. Act as the pathfinder for zero carbon building design and performance assessment that can be replicated in UK construction and retrofit.
6. Set a positive example for other sectors' net zero transitions, demonstrating the viability of achieving net zero in a complex industry through collaboration and commitment from individual organisations.

In turn, this transition is dependent on many other parts of the economy. The Hub, working with the Government's Net Zero Council, is in dialogue with other relevant sectors to develop a shared understanding of each other's transition plans so that the new homes sector can move in lockstep with other parts of the economy. Key collaborators include:

- Low carbon, low emission fuel providers
- Construction product manufacturers and sector organisations
- Energy systems operators and electricity suppliers
- Plant and machinery suppliers
- Other key low carbon technology industry organisations such as energy storage and heat pumps

Part 2: Transition plan approach

Part 2 sets out the approach to developing the transition plan including:

- The role of the sector transition plan
- The analytical method and scope
- Dependencies and uncertainty

Role of the sector transition plan

Transition to net zero requires sytem-level change and, therefore, a high degree of collaboration and alignment across multiple parts of the market and Government. Whilst several individual companies have signed up to Science Based Targets and/or developed their own transition plans or strategies, they have limited control over many of the levers required to decarbonise cost-effectively at the pace required. More widely, the Transition Finance Market Review published in October 2024 set out the rationale for sector planning from a financing perspective:

"Building from the UK's Nationally Determined Contribution (NDC), the development of clear and robust sectoral decarbonisation pathways will be critical to aligning financing decisions with national targets and establishing credibility in the transition finance market."

There are some advantages of sector-wide collaboration, including:

- Aligning with the Government's statutory plans for decarbonisation and working with Government to overcome barriers
- Pooling and sharing knowledge, R&D, good practice and guidance on solutions, which, across over 2,000 companies, will achieve economies of scale, especially to support smaller developers
- Identifying the areas where coordination and partnership is needed to achieve results
- Creating shared standards and protocols to reduce the risk of new products (e.g. HVO, batteries or green hydrogen) or perception of greenwashing (false net zero claims)
- Providing clear signals at scale to suppliers of products and technologies on which we depend to decarbonise
- Creating a level playing field and helping the process of pathfinding pending regulation
- Providing transparency about progress with consistent measurement and facilitating early adaption if not on course

More broadly, by working together we can help create "one plan", progressively providing confidence in a shared national plan and discouraging divergent standards, while allowing the space for innovation and ensuring that scalable examples of best practice are shared and rewarded.

Method and scope

Plan development process

This initial transition plan has been developed by the Future Homes Hub, with support from the Carbon Trust, through a steering group of homebuilders representing the large majority of new homes output, including a cross-section of smaller homebuilders. The Transition Plan was developed through the following steps:

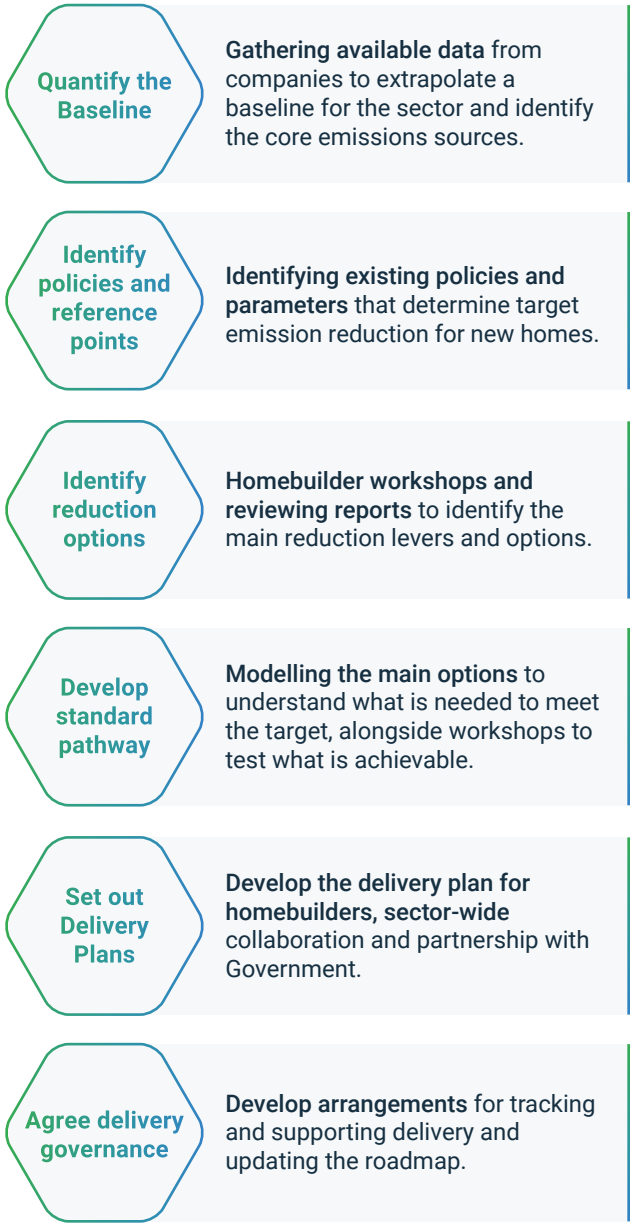


Figure 2

The Carbon Trust model

The Carbon Trust model, which underpins the Plan, considers emissions associated with delivering and operating new homes.

- Emissions from new homes in use
- Emissions from construction activities on site and head office
- Emissions from materials used to construct new homes and developments

Within each category, the model identifies the most material decarbonisation levers and describes the interventions and commitments needed for the sector to decarbonise before 2050. The model factors the expected impact of these levers that the sector and other actors can control. The technical annex sets out detail on all the assumptions made and the limitations of specific levers.

The impact of site layout, location and planning on residents' carbon footprints, along with any potential impact of resident behaviour within the home, are not included within the scope of this version of the Transition Plan.

Benefits from carbon sequestration of materials calculated in the RICS PS module D have also not been included within calculations and so do not impact the end-of-life emissions from these products. Future analysis will be carried out to consider impacts on the end-of-life emissions from modelled levers as these are currently not included in calculations.

Related initiatives

The Hub has sought to align with other related initiatives where appropriate as referenced in the transition pathway section and in the annex. The Hub will continue to engage with relevant initiatives and seek ongoing alignment following publication of the plan and as it evolves over time.

Dependencies and uncertainty

The transition plan depends on a number of factors outside the immediate control of homebuilders and there are several sources of uncertainty in the analysis underpinning the transition plan. The Carbon Trust model makes assumptions to allow projections to be made with reasonable levels of certainty. See the technical annex for more detail.

Dependencies include:

Grid decarbonisation:

Grid decarbonisation has a substantial impact on the sector's emission profile both directly in terms of the operational emissions of new homes and as a factor on which supply sector decarbonisation depends. The model uses the Future Energy Scenarios 2024 (FES 2024) Electric Engagement scenario for grid decarbonisation but can incorporate different scenarios. This scenario broadly reflects a lower ambition compared to the new Government's clean power mission for 2030, acknowledging that not all the policies to deliver on this ambition have yet been put in place. It is important to note that demand-side response including energy storage is likely to be a key enabler for rapid decarbonisation of the grid as highlighted in the National Energy System Operator's (NESO) Clean Power 2030 report but this has not yet been modelled fully within the plan.

Supply sector pathways:

The plan depends on the pathways set out in external roadmaps, for example covering concrete and steel, which in turn incorporate assumptions on grid decarbonisation and technology deployment, and may not be realised. The implication of this uncertainty is that progress against external pathways must be tracked, and meeting the targets may require greater reliance on design for reduction of waste, reduction of material usage alongside material change to reduce carbon than the plan currently assumes. Future iterations of the plan will develop alternative scenarios to reflect uncertainty around material decarbonisation and the potential role of: materials reduction; recycled materials; and the adoption of bio-based materials in the sector's decarbonisation pathway.

Government policy:

The plan depends on key existing and upcoming policies referenced in Government's Carbon Budget Delivery Plan being implemented. Notably the Future Homes Standard is assumed to be delivered in a form aligned to the options presented during consultation. Further policy development will be needed, for example, on embodied carbon to underpin the required pathway.

Grid capacity and infrastructure:

Capacity assumptions are baked into FES scenarios. While FES 2024 Electrical Engagement accounts for the expansion of low carbon grid infrastructure to evolve to serve electrification, the model does not test the capacity of infrastructure as housing delivery accelerates, nor does it factor the average energy demand placed on the grid by each additional house which is influenced by many factors, for example: location, form, fabric performance, orientation, and heating system. It is acknowledged that these considerations intimately impact the infrastructure and generation capacity needed for the grid to decarbonise; however, the modelling complexity these assessments would require are out of scope of this version of the plan. We intend to add functionality to better test these scenarios and interactions in future versions of the plan (see Part 4 of this document).

Technology, supply chain, and skills:

The plan depends on the availability of supply and skills at the scale required, for example for heat pumps, HVO, batteries, and green hydrogen.

As well as uncertainty arising from external dependencies (see annex 2.7), there are also several data uncertainties including:

Methodological inconsistency:

Historically, there has been no consistent basis for measuring and reporting on carbon emissions between homebuilders. This is being rectified through agreement to report using consistent metrics, means of measurement, and assurance arrangements. There is also more specific and detailed work required to agree a consistent approach to embodied carbon measurement. It will, therefore, take further time for higher quality data to be generated in order to be confident in baseline measurement across the sector. This is not a reason for delayed action; however, the initial baseline provides a basis for defining a delivery plan and the Hub plans to re-baseline in subsequent years to refine the starting position and, therefore, allow measurement of progress with greater confidence.

Limited complexity of the model:

The model is limited in terms of the variables it considers and reduction scenarios are relatively coarse. In reality there will be complex interactions between levers which have not been modelled. Due to likely uncertainties from data sources etc., more sophisticated modelling is not justified at this stage.

Data gaps:

There are specific areas where there remain significant data gaps, for example:

- Environmental Product Declarations of input products
- Comparative modelling of reductions associated with different design and material choices
- In-use energy use intensity verification of homes
- Expected policy and its impacts
- Baseline data granularity and consistency

Size of baseline dataset:

Our baseline represents c. 33% of the output of the sector in 2022. Those developers who have responded skew towards volume, low rise housebuilders. Higher density and small developers are underrepresented.

Data assurance challenge in measuring progress with confidence:

Linked to the problem of uncertainty within the baseline is the uncertainty in measurement of sectoral performance over time. Any statement of progress must ensure that the baseline used to compare progress has been updated, or 'rebaselined' so that a fair assessment can be made.

Making progress in the context of uncertainty

At this stage, the plan does not seek commitment from the community to adhere to a precise decarbonisation pathway, the uncertainties are too high for this to be meaningful. What it does seek, however, is for the sector, supply chain, and policymakers to work in partnership and commit to action in specific challenging areas that are imperative for progress.

A key principle of the transition plan is that it will be iterative, taking on board new information and assessing the impact of interventions, allowing the sector and partners to adjust course over time. The plan acknowledges the layers of uncertainty built into making decarbonisation projections, and aims to refine the sector's understanding of performance as higher quality data becomes available.

Furthermore, early action or inaction by the sector in other areas not included in the plan could determine the impact these levers have. For example, preventing biodiversity loss is a necessary condition for the sector to adopt bio-based materials and timber. Future iterations of the plan intend to draw out these connections.

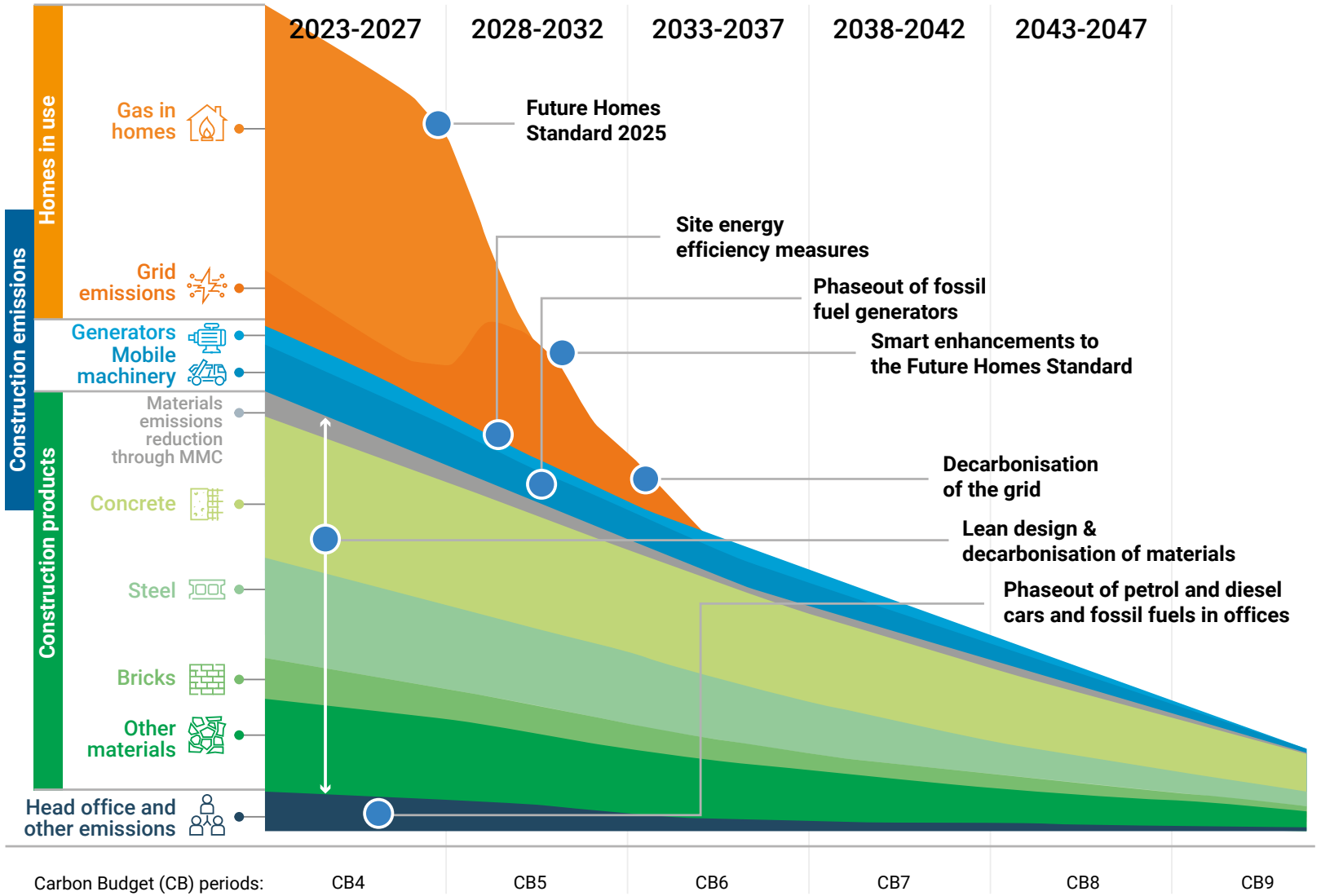
Part 3: Initial Transition Pathway

Part 3 sets out an initial transition pathway based on assessment of:

- The emissions baseline
- The required pathway
- The main levers that will reduce carbon emissions
- Assumptions about how and when these levers will be pulled to meet the required pathway

The initial transition pathway is illustrated in the following diagram (hereafter ITP diagram), with baseline emissions (in 2022) shown on the left of the chart and the reduction pathway achieved through pulling the levers annotated.

Figure 1 (repeated): The New Homes Transition Plan pathway



Baseline emissions

Lifecycle emissions from homes completed in 2022, by emissions category

From the baseline data provided by homebuilders, we estimate the sector was responsible for lifecycle emissions[a] of just under 50 MtCO2e in 2022, having delivered c. 205,000 homes in the financial year. This represents around 235 tCO2e/unit completion.

These emissions can be broken down into the different stages of the lifecycle of a home.

Homes in use emissions – 39% (18.8 $MtCO_2e$)

Emissions associated with the operation of sold products (in this case homes) to heat, power and cool them. This figure includes all lifecycle operational emissions from homes (60 years) front loaded in the year of delivery. The homes in use emissions baseline figure is derived from modelled regulated emissions for heating and unregulated emissions from appliance use. The model assumes homes are each sold with an oven and a hob. More recent modeling has indicated that other components of unregulated emissions may contribute significantly. This will be investigated further and addressed in future iterations of the plan.

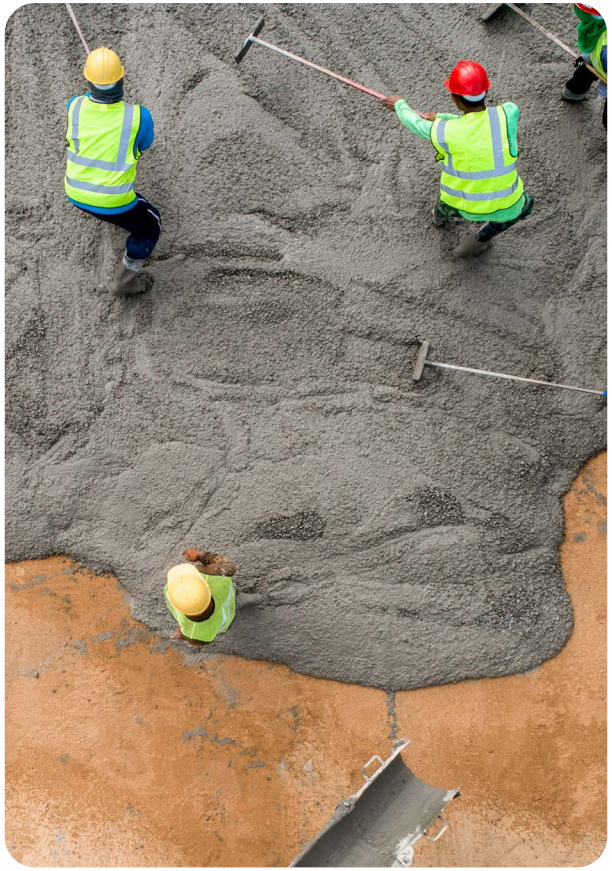
Construction emissions – 6% (3.1 $MtCO_2e$)

Emissions associated with the construction project phase. For example, from the use of construction machinery, transportation, heating and drying of homes, etc.

Construction products emissions – 50% (24.2 $MtCO_2e$)

Emissions associated with energy consumption (embodied energy) and chemical processes during

[a] See exclusions in later sections



the extraction, manufacture and transportation of construction materials or products associated with homes and developments.

Head office, staff and other emissions – 5% (2.3 $MtCO_2e$)

Emissions associated with the corporate side of business activity, such as office sites and employee travel/commuting.

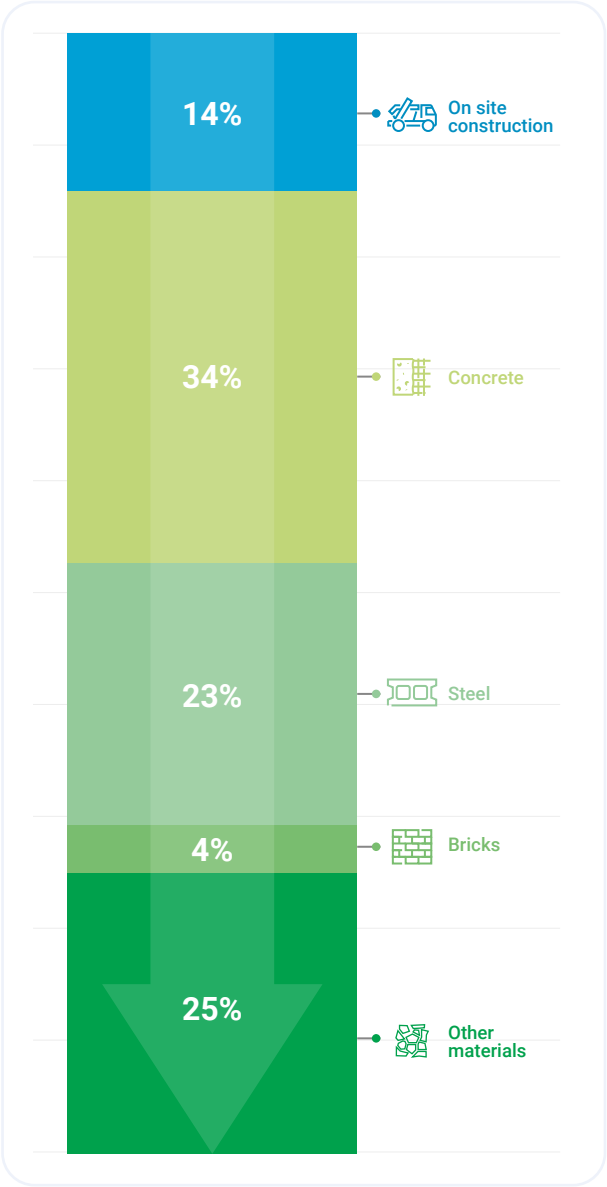


Figure 3: Baseline embodied emissions contributions from on site and construction product sources (excludes head office and other emissions)

Emissions reduction context: the required pathway

To provide an initial required pathway, the sector wide Transition Plan seeks to align with the Government's Carbon Budget Delivery Plan, in combination with the Climate Change Committee's advice on Carbon Budgets. This is because the Climate Change Act, from which the UK's legal obligation to achieve net zero emissions derives, puts the starting obligation on the Government to develop the requisite measures and policies. See box 1 for more detail on the Climate Change Committee's advice relevant to homebuilding.

For homes in use emissions, the Government's plan, building on the approximate 31% emissions reduction on 2013 realised by 2021 changes to Approved Document L, is to implement the Future Homes Standard as soon as possible to avoid new homes adding to the annual stock of carbon emissions. Based on the consultation, this would mean all new homes would be zero carbon as the grid decarbonises. The Future Homes Hub proposes to work with the Government to review any further refinements needed to maximise the benefits of zero carbon homes.

For both construction emissions and construction product emissions, we use the CCC's Carbon Budget 6 manufacturing and construction emissions pathway as the best currently available indication of the likely required pathway.

For those companies that have committed to Science-Based targets, the SBTi pathway is also a useful reference point, noting that companies agree science-based targets individually and that specific buildings guidance was published in August 2024. This indexed SBTi cross-sector pathway line is, therefore, shown alongside an indexed pathway for CB6 manufacturing and construction in Figure 4. See box 2 for more detail on SBTi in the context of the transition plan.

Figure 4: Embodied Absolute emissions incl. Construction Emissions

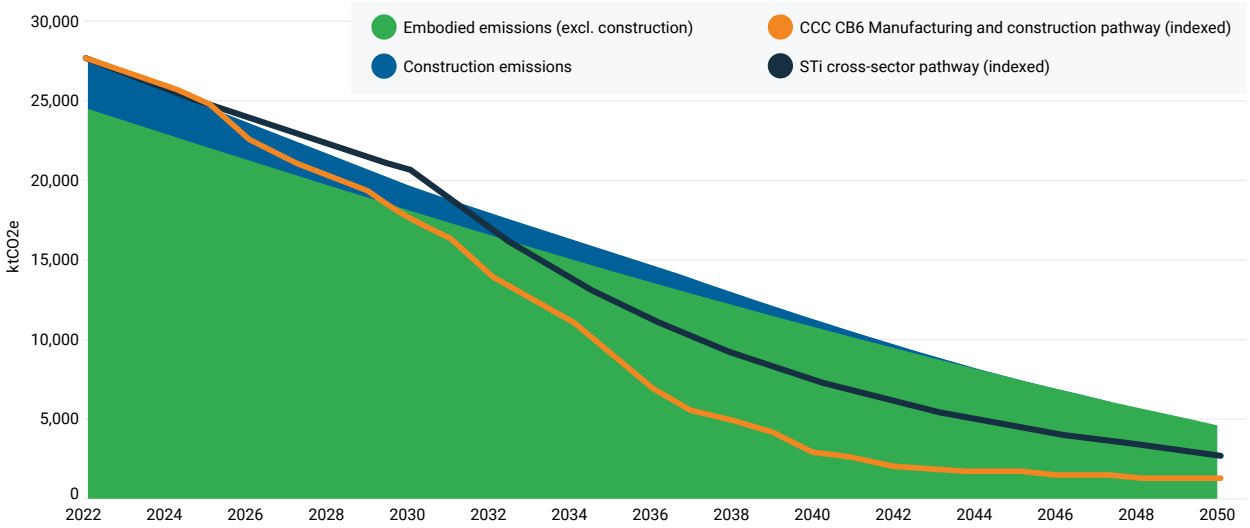


Figure 4: Embodied absolute emissions incl. Construction Emissions

Box 1: The CCC's Carbon Budget 6 Balanced Pathway

The CCC develops Carbon Budgets for the UK economy which set science-derived emission limits necessary to achieve the UK's legally binding commitment to hit net zero by 2050 and 81% reduction on 1990 levels by 2035. They are also designed to align to 1.5 °C warming limits. Carbon budgets are published to cover 5-year periods and are laid down 12 years before the start of the periods they cover.

Carbon Budget 6 (CB6) covers emissions from the entire UK economy. Emissions from homes are accounted for under three main 'sectors'. **Residential buildings** looks at direct emissions from using fossil fuels in homes. **Electricity supply** accounts for indirect emissions from electric heating, lighting and other uses. **Manufacturing and construction** considers emissions from materials and the construction process.

It is difficult to disaggregate the impact of new homes from existing homes and other asset types within the Carbon Budget so we have taken the economy-wide balanced pathway as a reference for overall lifecycle emissions from homes.

Future iterations of the transition plan will look to align with Carbon Budget 7, once published in 2025, including policies proposed on buildings and embodied carbon. This will allow new home-specific assumptions to be broken out of the wider projection.

Box 2: **The SBTi cross-sector pathway**

The Science Based Targets Initiative encourages individual businesses to commit to decarbonisation targets specific to the nature of their operations, size, and operating geography.

The model applies a target carbon reduction trajectory to the 2022 baseline figures, based on a cross-sector SBT-aligned pathway. An SBT-aligned reduction trajectory can be considered valid as it scales up organisational best practice targets to the sector level.

Achieving alignment with 1.5 °C warming limits does not only require the sector to reach Net Zero by 2050, but also to reduce cumulative emissions up to that point. This means that maintaining current emission levels and then aggressively reducing emissions a few years before 2050 would be inadequate. In order to align with these decarbonisation targets, the sector will need to meet or stay below the annual emissions limits set out in each pathway.

In August 2024, SBTi released their buildings sector guidance. This guidance is more ambitious than the cross-sector guidance due to "significant projected growth in global floor area and various technologically and commercially mature options to decarbonise heating and cooling that are already available."

It should be noted that the roadmap baseline data was generated prior to publication of buildings sector SBTi guidance, and as such reporting methodologies are diverse and not necessarily aligned. Our aim is to update the baseline information reporting methodology to align with the SBTi building sector guidance pathway.

Housing delivery growth

Housing growth in line with the Government commitment to increase housing delivery will have one of the largest impacts on the total emissions for the sector. National carbon budgets consider growth across the economy and how to allocate "headroom" to different economic activities. The Future Homes Standard means that once new homes are zero carbon they will not add 'homes in use' emissions. However, housing growth will have an impact on total energy demand and on embodied carbon, reinforcing the need to focus on these two issues. While our model currently considers a flat delivery rate from the baseline year, future versions of the transition plan will test the impact of aligning growth assumptions to different sources, including those baked into Carbon Budget 7.

Levers to meet the required pathway

The plan identifies nine decarbonisation levers that have a notable impact in reducing homebuilding emissions. These levers focus on emissions at different stages of the lifecycle of the home: **Construction products** used to build the home, the emissions from **on site construction,** and the emissions from the operation of the **homes in use.**

The levers can be used by homebuilders, the supply chain and other new homes stakeholders to drive forward decarbonisation, whereas other factors may be beyond the direct control of the sector, for example grid decarbonisation.

The levers are intended to show a notional way of contributing to the required pathway, but it is important to note that beyond regulatory requirements, homebuilders should choose the most appropriate ways to decarbonise, reflecting their specific circumstances.

Summary: Projected impact of the levers on baseline emissions by 2050

Lifecycle stage	No.	Lever	Impact ($MtCO_2e$)
Homes in use	1	Future Homes Standard (assumed impact)	15.5
	2	Smart controls and energy storage	N/A
On site construction	3	Fuel switching and plant decarbonisation	1.98
	4	On site generation and storage	0.91
Construction products	5	Design for low embodied carbon and alternative materials	0.61
	6	Reduce carbon intensity: concrete	7.44
	7	Reduce carbon intensity: steel	5.06
	8	Reduce carbon intensity: brick	0.80
	9	Reduce carbon intensity: other materials	5.71

The following sections set out what impact the levers have on reducing emissions by 2050 compared to the 2022 baseline, and what assumptions have been made about when and how these levers will create the initial pathway.

Homes in use (1/2)

Figure 5: Homes in use emissions by reduction source

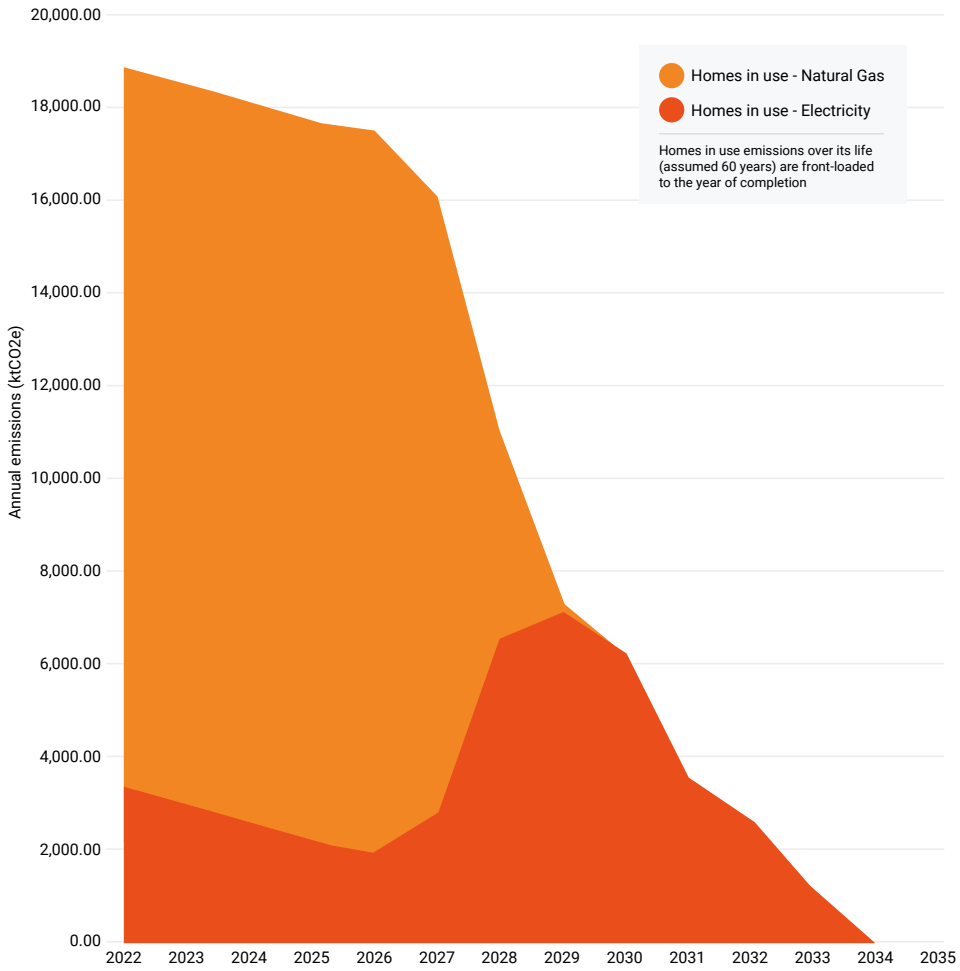


Figure 6

Lever 1: Future Homes Standard 2025

Impact: 15.5 $MtCO_2e$

Description

Future Homes Standard 2025 will require all new homes to switch from the gas grid onto electricity. This 'zero carbon ready' standard will achieve zero carbon as the grid decarbonises.

Low rise homes are likely to:

- be all electric and include PV
- see a high proportion of heat pumps
- see some changes in ventilation design and installation

4 storey and over (see also above): all electric but with a wider range of heating and hot water solutions including district heating.

Means of delivery

- 2025: Government to publish updates to Part L of the Building Regulations
- 2024-2029: Future Homes Standard implementation Board, co-chaired by Government and industry to identify and resolve challenges around implementation

Main assumptions

- FHS introduced in 2025 with a two-year lead-in and transition period
- Most homes not expected to be built to FHS 2025 until 2028-29. (In August 2024, only 20% of homes were completed to 2021 regs)
- Electricity grid is fully decarbonised by 2034

Homes in use (2/2)

Lever 2: Smart controls and energy storage

Impact: **Impact: N/A** (reduction of energy use and grid balance to enable/support grid decarbonisation)

Description

A further change to new build standards to respond to issues not addressed in 2025. Note that none of these changes have currently been proposed or confirmed by the Government. Elements could include:

- Reducing peak loads on the grid will be increasingly important as more sectors move to be powered by electricity. Reflecting the capacity and capability for demand flexibility, such as storage and smart controls, will be needed in future regulation
- Adding an energy consumption metric. The UK commitment to decarbonise the electricity grid by 2030 requires a significant increase in net zero energy generation, storage and transmission together with ensuring maximum efficiency
- Demonstrating actual building performance supported by methods that are cost-effective at scale, if excluded from 2025

Means of delivery

- 2026-2029: Government explores potential future regulatory change to reduce energy consumption of homes

Main assumptions

It is assumed that smart home technology enables a 19.6% energy efficiency improvement by 2050, and that the share of homes equipped with smart home technology goes from 0% in 2022 to 100% in 2050. Note that, despite the high cumulative uptake of this technology over time, the carbon savings impact of this lever diminishes quickly as the grid is assumed to rapidly decarbonise. Future versions of the transition plan will more comprehensively model the impact of demand-side response and energy storage.

On site construction emissions (1/2)

Figure 6: On site and other emissions by reduction source

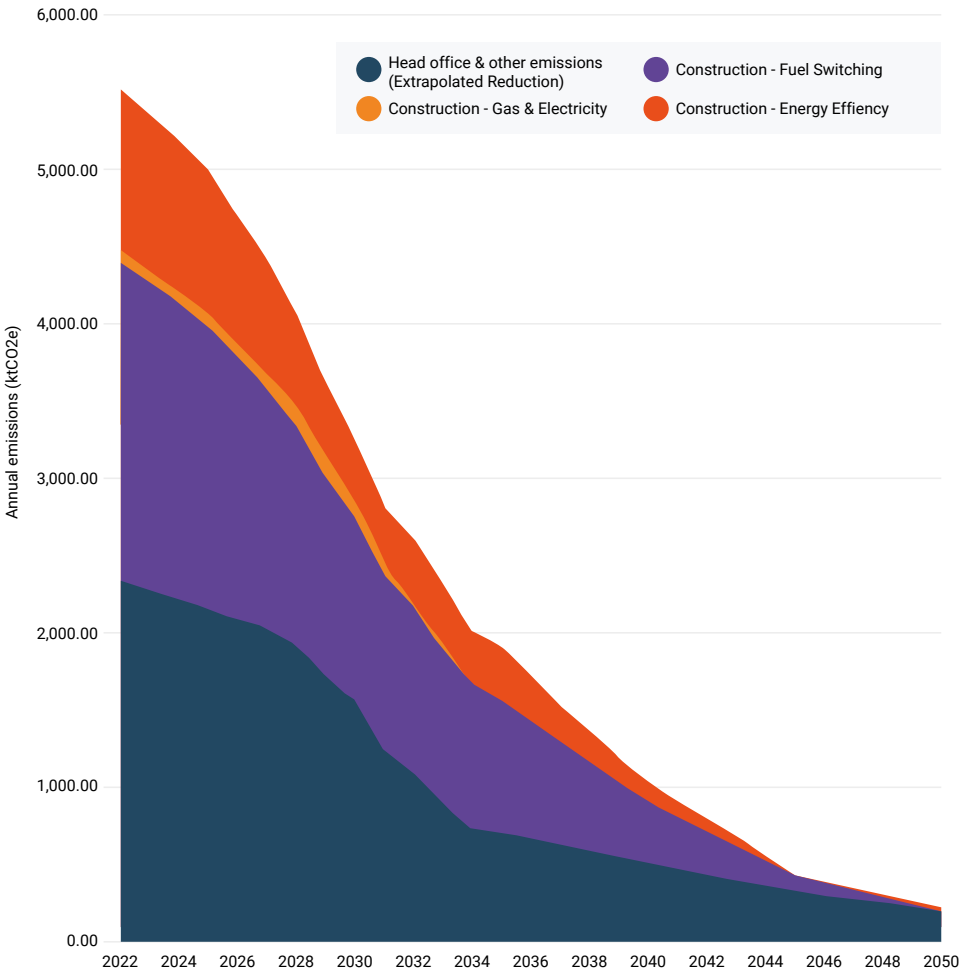


Figure 7

Lever 3: Fuel switching and plant decarbonisation

Impact: 1.98 $MtCO_2e$

Description

Increase use of low carbon fuel (e.g. HVO) in construction machinery and, from 2030 onwards, to use zero-carbon-aligned fuel (e.g. electricity or green hydrogen).

Means of delivery

- 2025-2035: Home builders phase out all directly procured fossil fuels on site
- 2030-2045: Sites continue the transition to lower carbon fuels and ultimately to 100% net zero-aligned fuels

Main assumptions

Emissions are reduced by switching gas oil/diesel with lower-carbon (HVO or other) or Net Zero (electrification or green hydrogen) alternatives. Lower-carbon fuels are a transitional solution toward Net Zero alternatives. This lever assumes that all vehicles use Net Zero fuels or alternatives by 2050. In the run-up to 2050, the assumed proportion of vehicles using lower-carbon fuels peaks at 29% in the moderate reductions scenario, based on the DESNZ report (source: Industrial Non-Road Mobile Machinery Decarbonisation Options: Techno-Economic Feasibility Study, written for the Department for Energy Security and Net Zero (DESNZ).

On site construction emissions (2/2)

Lever 4: On site energy generation and storage

Impact: 0.91 $MtCO_2e$

Description

Emission reductions are driven by energy savings achieved by appropriately sizing generators, using battery packs and battery storage facilities, as well as through improvements in the energy intensity of telehandlers and other machinery.

Means of delivery

- 2025-2045: Home builders commit to increasing use of hybrid generators

Main assumptions

- The deployment of hybrid generators increases by 50% in the moderate reductions scenario. Each hybrid generator achieves 50% energy savings (source: Hybrid Power Generation for Improved Fuel Efficiency and Performance by Sandia National Laboratories)
- Telehandlers and other machinery become 50% more energy efficient by 2050 in the moderate reductions scenario (source: Industrial Non-Road Mobile Machinery Decarbonisation Options: Techno-Economic Feasibility Study, written for the Department for Energy Security and Net Zero (DESNZ)

Construction product emissions (1/3)

Figure 7: Construction product emissions by reduction source

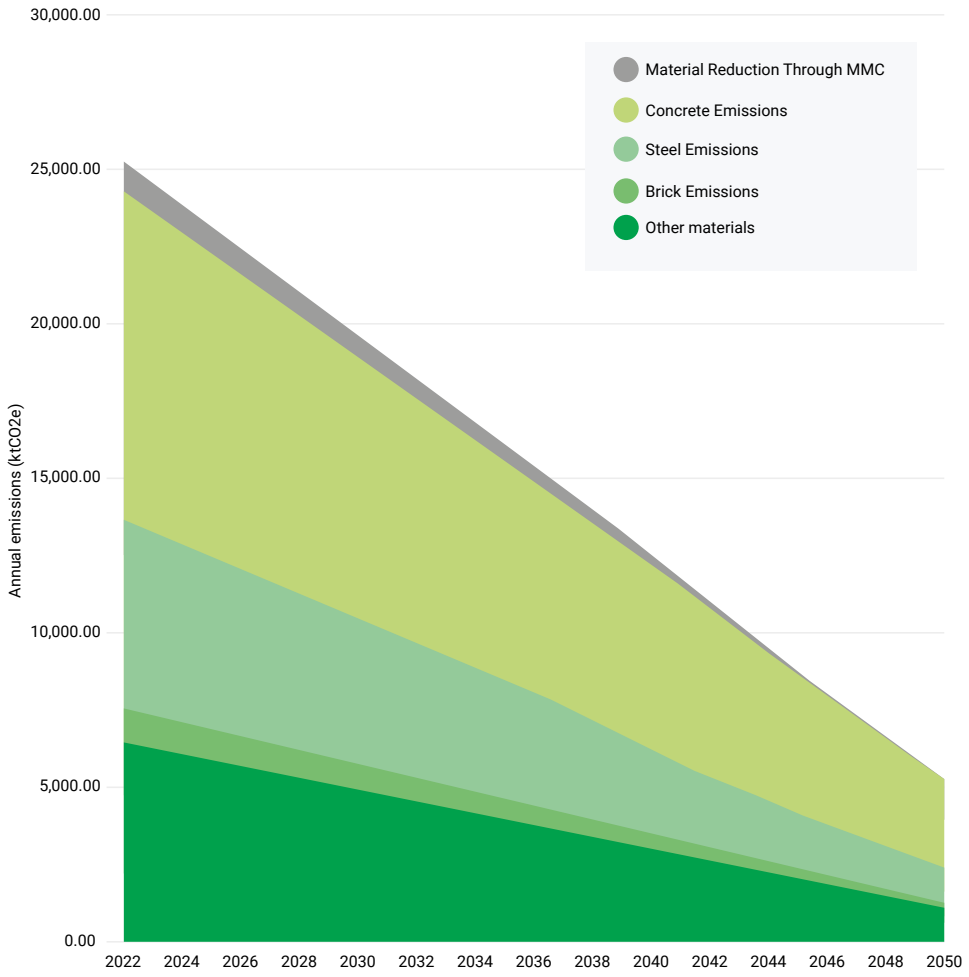


Figure 8

Lever 5: Design for low embodied carbon and alternative materials

Impact: 0.61 $MtCO_2e$

Description

A focus on design rationalisation to reduce material consumption as well as switching to greater use of prefabrication of building components or offsite-assembled systems, including an increasing proportion of structural timber frame to replace masonry and concrete where suitable and where this is proven to contribute towards net decarbonisation.

For modelling purposes, timber build has been used as a proxy for all forms of MMC. Timber studs are used in place of brick and block, engineered timber used in place of concrete.

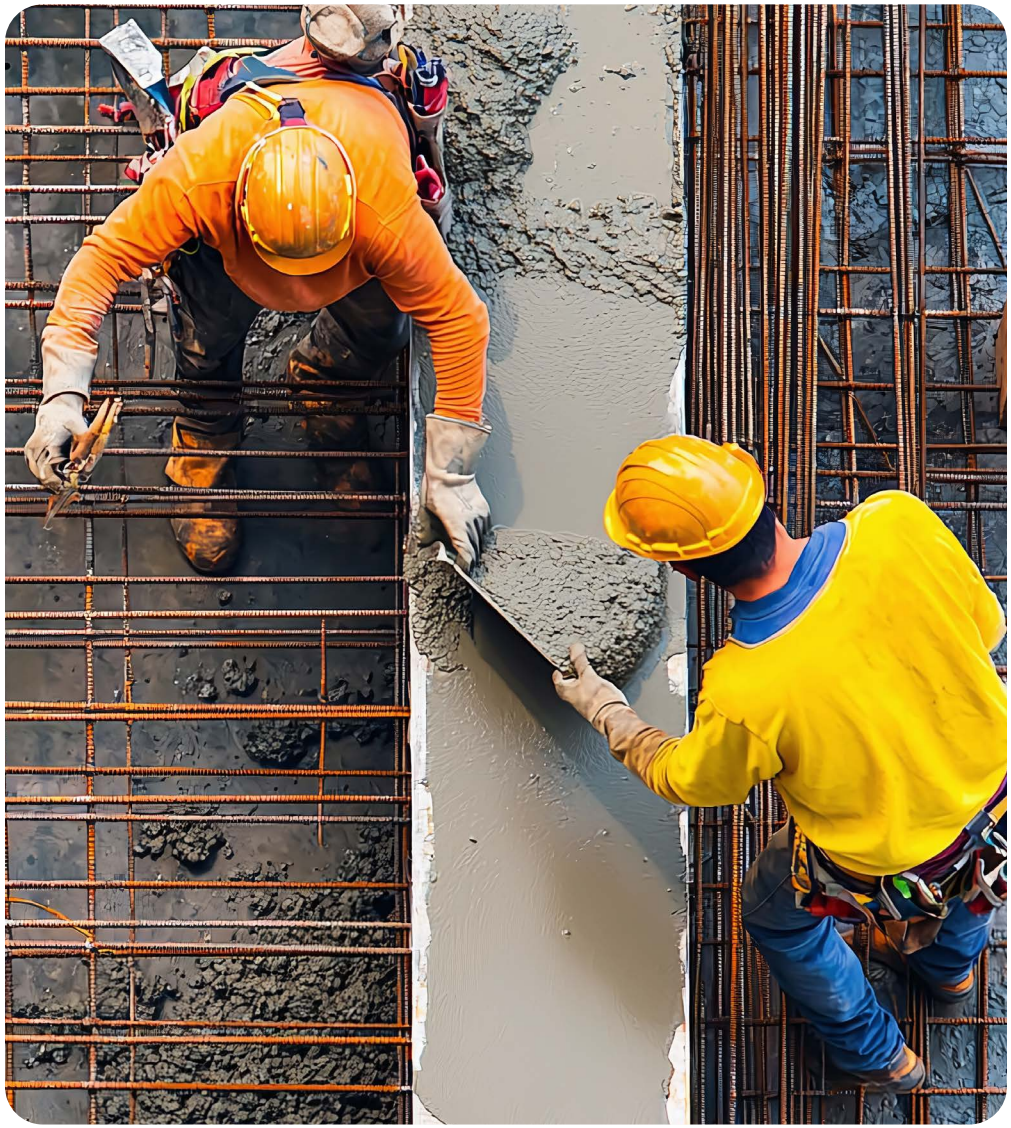
Means of delivery

- 2024-2028: Adoption of widespread and accurate measurement of embodied carbon to demonstrate where design change is effective
- 2025-2035: increasing proportion of timber frame to replace carbon-intensive materials where suitable

Main assumptions

- In the modelled reductions scenario the increase in the share of new build houses built using MMC (modelled as timber build) rather than traditional masonry is 17% from a 2022 baseline.
- The share of new flats using engineered timber rather than concrete is assumed to increase by 4% by 2050. The lower percentage for flats factors in the understanding that a lower proportion of flats would be able to move to timber build.
- These assumptions are based on the study "Wood in Construction in the UK: An Analysis of Carbon Abatement Potential" by the Climate Change Committee

Construction product emissions (2/3)



Lever 6-8: Low carbon concrete, steel, bricks

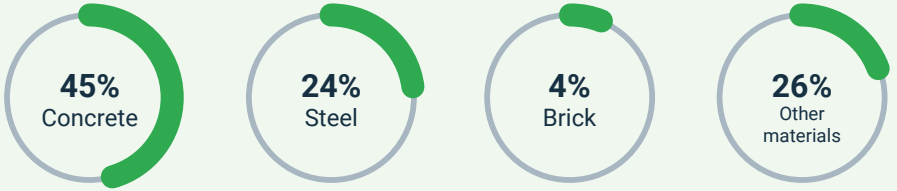
Impact: Concrete 7.44 $MtCO_2e$

Impact: Steel 5.06 $MtCO_2e$

Impact: Clay bricks 0.80 $MtCO_2e$

Description

Reducing the carbon content of carbon-intensive materials. Decarbonisation materials were selected for these specific materials because prior work by Carbon Trust has suggested that these materials represent the largest proportion of the sector's emissions from materials. The average breakdown across the sector is:



Means of delivery

- 2024-2028: Adoption of widespread and accurate measurement of embodied carbon to demonstrate where design change is effective
- 2025-2045: Define material decarbonisation pathway, specification for low-carbon products and agree programme for sector-wider procurement of increasingly lower carbon materials

Construction product emissions (3/3)

Main assumptions

Concrete

Embodied emissions from concrete are reduced following the Low Carbon Concrete Routemap from the Green Construction Board's (GCB) Low Carbon Concrete Group (LCCG) in which carbon reductions are achieved through R&D of concrete technologies. The GCB LCCG Low Carbon Concrete Routemap identifies three reduction pathways, however, the transition plan factors the middle, or 'moderate' pathway:

The moderate reductions pathway is based on developments underlying the low-reduction pathway, and successful development and adoption of AACMs based on calcined clays or volcanic ash. This drives a 75% reduction of concrete emissions by 2050 from a 2022 baseline.

The MPA UK Cement and Concrete Decarbonisation roadmap has also been scenario tested however not modelled in the core pathway. It should be noted that the concrete lever modelled here does not reflect the levers identified in the MPA's Cement and Concrete sector Decarbonisation roadmap. Future versions of the plan will establish a blended lever pathway to best represent the trajectory of the concrete sector as more data becomes available including with respect to the development and deployment of CCS technology.

Steel

Embodied emissions from steel are reduced following the International Energy Agency (IEA)'s roadmap for steel decarbonisation. This assumes an 87% reduction in steel emission intensity by 2050.

Brick

Embodied emissions from bricks are reduced. Emissions are assumed to reduce at the same rate as Ibstock's commitment to Net Zero by 2050.

Lever 9: Reducing carbon in other construction materials

Impact: 5.71 $MtCO_2e$

Description

Measuring the carbon content of all construction materials and setting industry-defined targets for their use to encourage substitution for lower carbon products.

Means of delivery

- 2024-2028: Adoption of widespread and accurate measurement of embodied carbon in residual materials
- 2024-2035: Requiring increasing proportion of products with Environmental Product Declaration to be used in homes
- Putting in place measures to drive the reduction of embodied carbon in other construction materials

Main assumptions

- Embodied carbon in other construction materials decreases in line with the average reduction of quantified materials (concrete, steel, brick)
- Measurement and reduction measures are, on average, as effective as those driving reductions in key materials

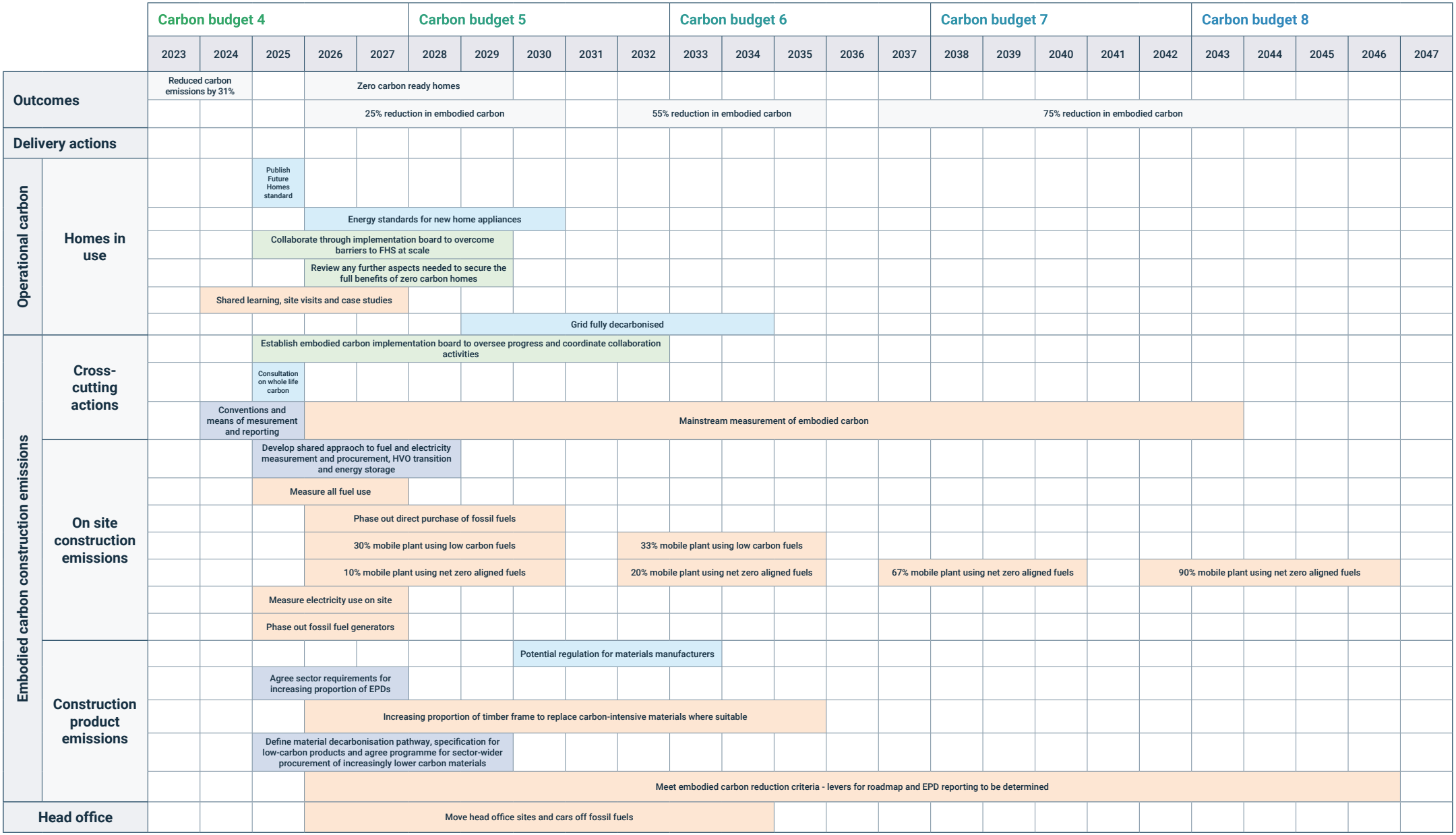
Part 4: Delivery partnership, plan and governance

Part 4 sets out the delivery plan, illustrated in the table overleaf, comprising the enabling measures that are needed to transition to net zero. This plan is reliant on individual home builders, government, and other sectors and collaboration between parties to deliver the plan.

Part 4 also describes the roles of various groups required to enact the delivery plan. It introduces the need for an implementation board for Embodied Carbon alongside maintaining the current Future Homes Standard Implementation Board. It sets out the roles of the Future Homes Leadership Council and Net Zero Council to support others in overseeing and governing the process of delivery and revision.

Key: Individual company proposed actions | Sector collaboration actions | Sector and government collaboration | Government actions

Percentage reductions show are initial estimates, subject to development of the delivery plan



Delivery plan

The delivery plan sets out the enabling measures assumed for individual companies and the Government to achieve the transition to net zero. Although individual companies can develop, and often have already defined, their own transition pathway, the delivery plan sets out where collaboration between the sector, Government, and other connected sectors and organisations is required to effectively deliver change.

Some areas of the plan are well defined and regulated and some can be managed relatively simply on a company level. But much of the detailed mechanism for delivering carbon reduction has yet to be developed, hence the importance of collaboration through:

1. Sector and Government partnership: defining the delivery plan and removing barriers to implementation through implementation boards and exploring the scope of any potential future
2. Collaboration between homebuilders, the wider sector, and other industries to signpost future change and move (where sensible) as a sector to smooth the transition to lower carbon construction

Regulation has been proposed by Government to move to zero-carbon-ready homes through the Future Homes Standard, and has indicated its ambition to deliver a clean energy grid by 2030 as well as consulting on embodied carbon at some point during 2025. Other potential areas for regulation identified in the delivery plan have not currently been proposed or confirmed by Government. However, enacting widespread, effective change will often require government intervention.

These include:

- A potential update to building regulations to reduce energy consumption that may include load shifting, energy performance, as-built or in-use performance, and other measures to reduce load on the grid
- Potential regulation to build homes with low embodied carbon and/or regulation on the production of construction materials to reduce their embodied carbon

For clarity, the inclusion of these potential areas of regulation are placeholders on the roadmap to be explored, and are not indications of Government policy.

Delivery roles

Successful transition to net zero for new homes and more widely for the economy as a whole will require an unprecedented level of partnership and coordinated action. This section specifically sets out the roles in delivering the plan for:

Homebuilders

The delivery plan sets out the actions that homebuilders can take to be on track for the sector's contribution to net zero at national level. These actions, other than those required by regulation, are indicative and individual companies might find different ways of achieving a similar or better outcome.

Implementation partnership

The delivery plan sets out the collaborative action needed to support transition. The Future Homes Hub will coordinate this activity working as needed with, for example, Government organisations, trade associations, and green construction bodies. A key focus will be supporting SME homebuilders with the tools and knowledge needed to track against the plan.

Government

The delivery plan sets out both existing policy and where future regulation could be developed to support the transition to net zero. The Government is required by the Climate Change Act to put in place the measures to achieve net zero overall. Carbon Budget Delivery Plans set out the specific policies for Government. The Future Homes Hub will highlight where there are policy barriers and opportunities for greater effective policy development.

There is, of course, a much wider circle of organisations on which new homes decarbonisation depends such as;

- suppliers and service providers
- financial institutions
- housing associations
- local government
- other sector environmental organisations
- as the transition plan evolves, it may include roles for others

Securing buy-in from these stakeholders to the ambitions of the transition plan, and the mechanisms for change outlined in the delivery plan, is of paramount importance for success. Alongside the delivery roles outlined above, a targeted programme of engagement will continue to take place in 2025 to seek further support and adoption of the plan by these groups.

Small and Medium Enterprises (SMEs)

SMEs are an essential component of a vibrant homebuilding ecosystem and have continued to innovate disproportionately to their output. The delivery plan acknowledges, however, that SMEs face acute resource challenges which limit their ability to track against the plan and actively contribute to the partnership.

Initiatives to help engage and benefit SMEs will be integrated within the delivery plan as it continues to develop. Outputs will include targeted tools and knowledge to enable SMEs to understand and report progress against the plan, and take the actions needed to align. SMEs are also expected to benefit from construction product decarbonisation as larger developers within the delivery partnership help to signal demand across the sector.

Implementation partnership

The Hub envisages two specific vehicles will be needed to coordinate implementation of this plan:

The Future Homes Standard Implementation Board

This body is already up and running. Under a terms of reference agreed with the Government, the FHS Implementation Board brings together the main communities needed to enable implementation of the Future Homes Standard at scale that include representatives for manufacturers and the supply chain, energy networks and distributors, skills bodies, consumer groups, small, national and specialist home builders, energy assessors, housing associations, and government agencies. The board meets quarterly to identify barriers to successful implementation and track progress in overcoming them. It is supported by implementation groups to help find solutions in the following topics:

Heat pumps	▪ To be confident that the supply chain for heat pumps is robust, supporting the demand for all sizes of developer. ▪ That there are skilled designers, installers, maintenance and refurbishment contractors and regulators, to be able to meet demand. And that the required information can be shared effectively between them. ▪ That consumers are confident in the operation and use of heat pumps.
Consumer	▪ That sales teams understand consumer needs and can provide the right information at the right time. ▪ That any consumer misgivings are acknowledged and that the benefits of sustainable homes are clearly understood.
Fabric	▪ That the fabric is designed and is communicated clearly to site operatives to enable the required quality to match the assumptions made by the energy assessor.
Building performance evaluation	▪ That an effective, voluntary scheme is broadly taken up by developers to demonstrate the in-use performance of homes when built.
Grid capacity and energy flexibility	▪ That home construction is not delayed or made more costly by lack of capacity from the electricity grid. ▪ That the peak demand from homes can be reduced through storage, smart controls, micro-grids, and other technologies, that reduce cost to the consumer and the impact of all-electric homes on the grid.
Heat networks	▪ That the practical implications for heat networks from the Home Energy Model are understood and can be effectively implemented.
Home energy model and notional building	▪ That a functioning and correct model is provided in good time to enable assessment of homes designed to the Future Homes Standard.
Ventilation	▪ That a practical and effective competency scheme is established and that ventilation is designed, installed, and maintained to a high quality.

It is proposed that the Future Homes Standard Implementation Board should, at the appropriate time and in agreement with Government, review what further aspects are needed to successfully secure the full benefits of zero carbon homes.

A new Embodied Carbon Implementation Board

It is proposed that a new vehicle – an embodied carbon implementation board - is needed to coordinate implementation of the two elements of embodied carbon contained in this plan: onsite construction and construction products. This will be an effective means to:

- Oversee progress towards reducing embodied carbon
- Identify, prioritise, and sequence the key activities needed to support the sector in reducing embodied carbon at scale and bring together existing activity including the Future Homes Hub's work on embodied carbon measurement, benchmarking, and filling data gaps
- Bring together the main parties that must play a role in reducing embodied carbon, including the relevant Government departments (MHCLG, DBT, and DESNZ), homebuilders, key supplier sectors, and embodied carbon expertise
- Coordinate delivery of activity including where we can work with wider construction bodies to have greater impact or work more efficiently

An initial long list of topic areas developed with homebuilder sustainability directors includes:

- Embodied and whole life carbon measurement and benchmarking including collaborative work to fill data gaps
- Low carbon material streams (including concrete, steel, timber, and bricks)
- Groundworks
- Low-carbon design and alterative materials, including a scope for bio-based materials
- Onsite plant and transport
- Site set up and energy management

The first step would be to map what work is currently underway and what is already known in each of these categories and then develop a plan for tackling priority areas.

The Government is likely to consult during 2025 on the appropriate policy approach to embodied carbon. However, this activity will be needed irrespective of the policy approach, and so it would not make sense to delay.

Delivery, governance, and revision

This plan represents the first version of the transition plan, recognising that further and ongoing revisions are required due to more accurate measurement and reporting, greater clarity of decarbonisation pathways for construction materials, more detailed timescales for collaborative and individual actions, and better understanding of the impact of these actions.

The collation, oversight and governance of these changes as well as the implementation of the actions, is the responsibility of various bodies and will be addressed as set out below.

A new governance of the Transition Plan

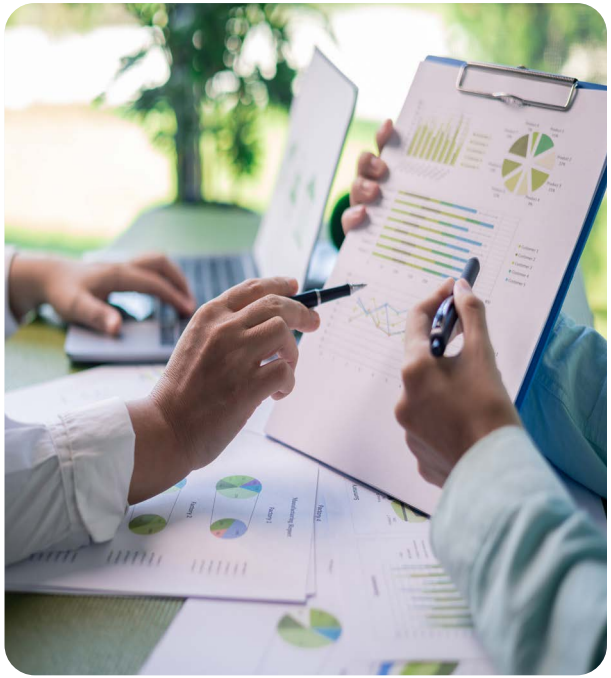
1 **Collection of metrics:** The Future Homes Hub will collate and report a set of sustainability metrics, including for embodied and whole life carbon. Individual homebuilders are expected to commit to report metrics to support this activity, currently reported to the Whole Life Carbon working group that is collating data on designed embodied and whole life carbon to propose benchmarks for the sector.

2 **Updating and revising the transition pathway:** Updating and maintaining the plan is critical to ensure realignment as policy, market, and technology evolve over time. The Future Homes Hub, will re-calculate the baseline for the sector annually, and present to the Sustainability and Performance Steering Group, comprising members of the Hub and invited experts. This steering group will be responsible for agreeing any changes to the baseline. See "Evolution of the transition plan" for more details on updates and revisions proposed.

3 **Developing the delivery plan:** The Future Homes Standard Implementation Board and Embodied Carbon Implementation Board will oversee the sector delivery plan, identify issues and areas for collaboration, and work to remove barriers to implementation. These boards will be informed by the revised baseline to determine the extent and priority of collaboration areas and will help define the activities for individual organisations, the potential for future regulation, and can coordinate between sectors as needed.

4 **Enacting change:** The Future Homes Leadership Council is comprised of Chief Executives from influential home builders representing national and local developers, housing associations, and specialist construction. This Council is instrumental at delivering the change activities proposed by the sector, providing confidence to the supply chain and other actors that the Delivery Plan is being followed and, through collaboration, can reduce the risks associated with the transition.

5 **Coordinating across sectors:** The Future Homes Hub will update key elements of the transition plan at regular intervals as greater granularity is derived. The next iteration is expected in late 2025. This transition plan and its future iterations, are shared with a Net Zero Council, chaired by the Minister for Climate Change that can provide confidence and certainty in the carbon reduction levers delivered by other sectors that are required for the new homes sector to transition to net zero.



Evolution of the transition plan

The transition plan represents the first step for the sector in understanding: the impact of emissions; the key emissions sources; plotting a course to net zero; and planning the activities which will ease the transition.

The Hub is clear, however, that in parallel with the delivery partnership described above, we must commit to evolve the plan as better quality inputs become available. In addition, the transition plan will support the sector to track progress year by year, identifying any deviation from the plan and the reasons for this, proposing course corrections where necessary. Crucially, the plan will evolve to normalise for a changing and improving baseline as measurement methodology continues to standardise.

The activities necessary to establish and retain the value and relevance of the plan are as follows;

Short term:

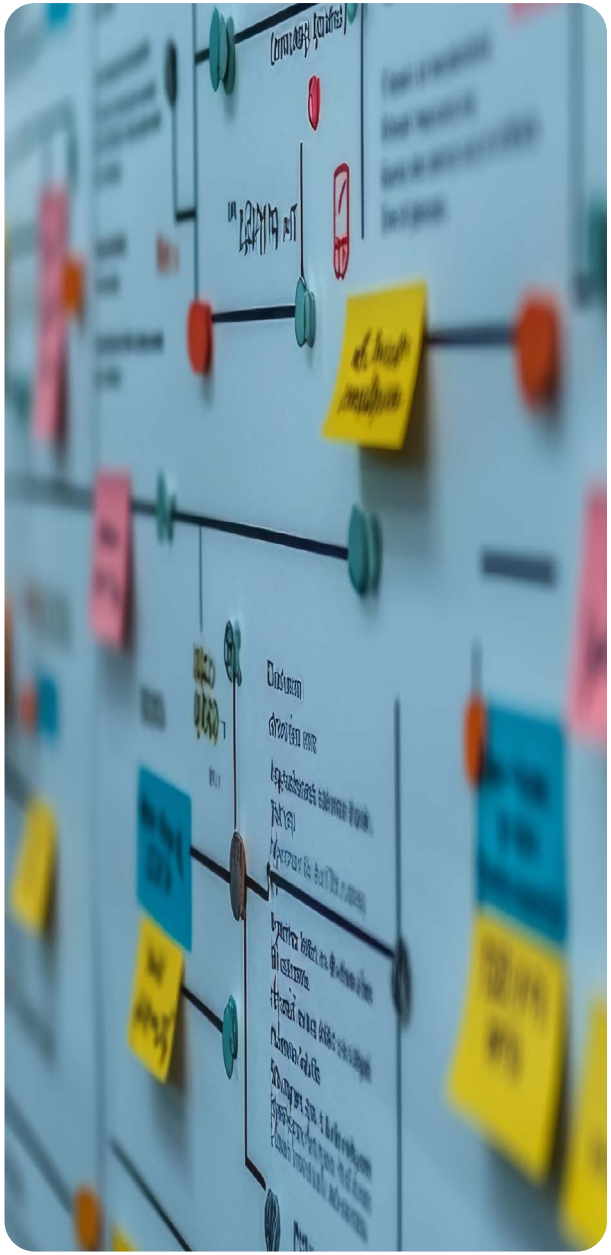
1. The Hub and its advocates must seek commitment from the sector to the framework, and to support its adoption
2. Continue programme of engagement with key extra-sector stakeholders, including local government, financial institutions, housing associations, and suppliers, to seek adoption and involvement in relevant delivery plan activities

Annually:

3. Re-baseline the plan as updated, higher quality sector data becomes available
4. Track the progress of the sector against the pathway, highlighting critical divergence and the need to change course if progress is slower than needed
5. Take on board feedback, improve functionality and add dimensions to the plan responding to need. Commit to revising the model and issuing an updated plan and progress report

Proposed updates for future versions of the plan include:

1. Take stock of assumptions within Carbon Budget 7 (CB7) and review the plan to align
2. Include functionality to allow the impact of different housing delivery scenarios to be tested as clarity on growth mechanisms improves and assumptions in CB7 are published. Understand and model the carbon impact of housing regeneration with replacement lower operational carbon stock
3. Provide guidance for developers to understand how alignment to the plan relates to performance under Science Based Targets. Continue to engage with stakeholders to establish and communicate a clear relationship between growth, Carbon Budgets, and Science Based Targets
4. Include functionality to assess the cost impact to developers associated with different interventions, including assessing emissions reduction value (£/kgCO2)
5. Disaggregate the baseline, model and impacts by typology, i.e. low rise and taller buildings to ensure interventions are most relevant. Better represent unregulated in use emissions within the model
6. Explore modelling interaction between energy intensity of new housing stock, demand side response, energy storage, and grid and generation capacity impacts. Explore including sectoral energy usage as a sectoral target pathway
7. Assess feedback from the initial version of the transition plan "suggested additional use cases" to guide the development of future versions of the plan



Annex

- Methodology
- Limitations
- Alignment with other initiatives

1. Methodology

1.1 Baseline

2022 was chosen as the sectoral baseline year for the following reasons:

- Data quality and availability: recent enough to include more granular reporting data practices from a larger set of developers.
- 'Normal' year: Housebuilding activity largely resumed post-Covid.
- Alignment with other datasets: Net Zero Carbon Building Standard uses 2022 data, allowing augmentation of the baseline dataset.

A business-as-usual scenario is created using the base year emissions value and extrapolated with predicted growth rates to 2050. This scenario shows how emissions would be impacted if no changes were made to the emissions intensity of housebuilding.

Data availability, completeness and accuracy is somewhat limited due to reporting variability and response rate. This will result in uncertainties, however best efforts have been used to establish an evidence based, and consented baseline for the sector, which references other well supported datasets.

To understand the emissions in 2022 the Future Homes Hub requested annual reporting data from members that could be allocated into emissions categories under the following allocation approach:

Emissions	GHGP Scope/Category	Consumption type
Construction emissions	Scope 1	Fuel consumption by housebuilder during construction
	Scope 2	Electricity consumption by housebuilder during construction
	Scope 3 category 1	Fuel consumption by subcontractors during construction
	Scope 3 category 1	Electricity consumption by subcontractors during construction
Construction product emissions	Scope 3 category 1	Materials purchased by housebuilder
	Scope 3 category 1	Materials purchased by subcontractors
Operational emissions	Scope 3 category 11	Lifetime electricity usage by homes sold in the reporting year (includes regulated emissions from heating and unregulated emissions from appliance use)
	Scope 3 category 11	Lifetime natural gas usage by homes sold in the reporting year (includes regulated emissions from heating and unregulated emissions from appliance use)

Seven housebuilders with more advanced data collection were able to provide annual reporting data to feed into calculations. The combined completions of these seven housebuilders covered 68,661 completions. Total completions in the UK in the financial year of 2022 was 204,530 (House building data, UK: financial year ending March 2022, Office for National Statistics), meaning that the sample of housebuilders providing detailed data covered roughly 34% of completions in 2022. The data gathered was scaled up to cover the remaining 66% of completions. Detailed data providers tend to be larger housebuilders, creating an implicit limitation in scaling as SMEs are not contributors to the data pool. It is recommended that the group spends time helping improve data collection processes so that SMEs can contribute to the baseline data.

Scope 3 category 1 annual reporting data fed into construction and construction product emissions calculations. The approach taken by housebuilders to calculate emissions from fuels and materials purchased is divergent in nature. Developers typically use one of two methods to account for emissions in their reporting year: Both methods are valid for the setting of science-based targets and additional detail on these methods can be seen in *Buildings Sector Science-Based Target-Setting Guidance, 2023.*

- Method 1: Accounting for the amount of construction completed that year
- Method 2: Accounting for finished buildings, at practical completion

These methodological approaches can also be overlaid with different approaches to finding total quantities.

An LCA (life cycle assessment) approach – understanding the emissions breakup of a typical house

and scaling to account for the number of completions associated with this house type. Under this approach, an uplift is included to account for waste materials rather than solely materials required to make up a completion.

A purchase ledger approach – understanding the total purchases of over a reporting year period and calculating emissions from this. This can then be divided by the number of completions to understand emissions on a per-completion basis.

There is a further subdivision of approaches into spend-based calculations, quantity-based calculations or hybrid (a combination of the two). Spend-based calculations estimate quantities of materials and fuels based on the amount spent on these items and estimate emissions using emission factors of the unit kgCO2e/currency.

Quantity data is the highest quality data option but the challenges in harvesting quantity data mean that the majority of data gathered is hybrid or spend based.

Within the transition plan baseline figure for "in scope embodied carbon emissions" were calculated as follows.

Developers reported their scope 3 cat 1 emissions. This was then scaled up for all homes completed in 2022, to reach 25.92 MtCO2e. This was then split into subcontractor and non-subcontractor emissions. Based on the data this was split at around a 0.65:0.35 (subcontractor : non-subcontractor) ratio split.

This 65% of scope 3 cat 1 emissions that we assume to be subcontractor emissions is split into diesel emissions and material emissions purchased by subcontractors at 15% diesel and 85% material emissions.

The non-subcontractor emissions and 85% of subcontractor emissions are then broken down by material. Based on prior CT work and data received from a subset of developers these emissions were split according to an estimate of the percentage emissions contributions from each material across the sector;

- 40% - concrete
- 25% - steel
- 4% - brick
- 26% - other materials (not included in "in scope embodied carbon emissions")

It should be noted that not all scope 3 cat 1 emissions are directly related to materials in homes. Other emissions included are infrastructure around the development and commercial plots.

The methodologies used by developers may also lead to inconsistencies in scope 3 cat 1 emissions between developers. For example, developers using a LCA may only include materials within the plot boundary, in contrast to a spend-based methodology which may also include materials outside of the plot boundary.

The data available did not allow for the specificity of house/flat, typology, or urban/rural locations or include background calculation methodologies. This mixture of approaches, estimations and assumptions creates a high level of uncertainty. The level of inaccuracy does not preclude the ability to draw analysis. As such uncertainty has been understood and considered within analysis.

1.2 Development approach

Development of the plan and modelling was carried out in the following steps:

1. Requesting baseline data from Hub members – A data request was sent to all members and the Hub worked with members to gather data at the beginning of the project.
2. Defining decarbonisation levers and pathways – commonly agreed upon decarbonisation levers were selected from a longlist of possible levers. Associated decarbonisation trajectories were plotted against each lever.

3. Workshop 1 – a roundtable discussion with Hub members to provide input into decarbonisation lever selection and understand key challenges associated with each lever.
4. Modelling – baseline data and decarbonisation trajectories were paired alongside assumptions to understand reductions to 2050.
5. Policy and regulation review – existing and missing policy and regulatory dependencies were highlighted and reviewed.
6. Workshop 2 – a roundtable discussion with Hub members to understand the policy trajectories associated with each lever and the future policies required to achieve the levers identified.
7. Results visualisations – graphical outputs were created to understand the impact per lever and the gap to target.
8. Workshop 3 – a roundtable discussion with Hub members to understand organisational commitments and intentions for achieving decarbonisation associated with each lever.
9. Review period – the Hub group reviewed modelling and held sessions with members to refine the transition plan.
10. The transition plan creation – the different sections of work were combined to add qualitative review to quantitative analysis.

1.3 Lever scenario assumptions, definition and approach

1.3.1 Summary table

	Lever	Lever description	Lever specifics
On site construction	On site generation and storage	Generator energy savings: Appropriately sizing generators to stop overloading. Use of hybrid generators. Utilising battery storage facilities means that surplus energy produced can be captured and used when needed. Telehandlers: Energy efficiency through three sets of measures, operational efficiency, machine efficiency and process efficiency.	Variable lever - hybrid generator energy savings are fixed following a source from **Sandia National Laboratories**. Increased deployment of hybrid generators is variable. Energy efficiency savings from non-generator sources follows the reductions defined by DESNEZ in their paper. **Industrial Non-Road Mobile Machinery Decarbonisation Options: Techno-Economic Feasibility Study.** The high reductions option has been used in the pathway.
	Fuel Switching & Plant Decarbonisation	Emissions are reduced by switching gas oil/diesel with lower-carbon (HVO or other) or Net Zero (electrification or hydrogen) alternatives.	Variable lever - options follow scenarios set out by DESNZ in their paper Industrial **Non-Road Mobile Machinery Decarbonisation Options: Techno-Economic Feasibility Study.** The **high reductions** option has been used in the pathway.
Construction product	Design for low embodied carbon and alternative materials	Timber build has been used as a proxy for all forms of MMC. Timber stud in place of brick and block, engineered timber in place of concrete. Timber is assumed to be less carbon intensive than these alternatives, so reductions in concrete for an equivalent amount are expected to result in fewer emissions.	Variable lever - options follow scenarios set out by the Climate Change Committee in their paper **Wood in Construction in the UK: An Analysis of Carbon Abatement Potential (BioComposites Centre)** - Climate Change Committee (theccc.org.uk). The **high reductions** option has been used in the pathway.
	Low-Carbon Materials - Concrete	Embodied emissions from concrete are reduced following the low carbon concrete roadmap from the Institution of Civil Engineers (ICE).	Variable lever - 3 options based on 3 decarbonisation routes from **the ICE's Low Carbon Concrete Routemap.** The 3 options forecast reductions of 56%, 74% and 138% by 2050 from a 2023 baseline. The **midline option** has been used in the pathway. The MPA UK Cement and Concrete Decarbonisation roadmap has also been scenario tested however not modelled in the core pathway. Future versions of the plan will establish a blended lever pathway to best represent the trajectory of the concrete sector as more data becomes available.
	Low-Carbon Materials - Steel	Embodied emissions from steel are reduced following the International Energy Agency (IEA)'s roadmap for steel decarbonisation.	Based on the International **Energy Agency's roadmap for steel decarbonisation.** This projects a 92% reduction of steel emissions by 2050, from a 2020 baseline.
	Low-Carbon Materials - Brick	Embodied emissions from bricks are reduced.	Emissions are assumed to reduce at the same rate as the pathway derived from Ibstock's commitments, to a 38% reduction in 2030 and net zero in 2050. See section 1.3.2.7 for details
Homes in use	Smart controls and energy storage	Homes are fitted with smart technology that enables 20% energy savings from greater energy efficiency.	Variable lever - scenarios are aligned to those provided by the IEEE International Symposium on Electronics and the Environment in their paper **Scoping the potential of monitoring and control technologies to reduce energy use in homes.** The high reductions option has been used in the pathway.
	Future Homes Standard (natural gas phaseout)	Natural gas is no longer fitted into new homes as per Future Homes Standard and Scottish New Build Heat Standard requirements.	In England, 90% new homes complete with a low carbon heat source from end of 2028, according to projected FHS build rate. In Scotland, new homes other than those that had been granted a Building Warrant before April 2024 (and some other minor exceptions) would complete with low carbon heat sources after 2024.

1.3.2 Controllable scenarios

1.3.2.1 On site generation and storage

Emission reductions are driven by energy savings achieved by appropriately sizing generators, using battery packs and battery storage facilities, as well as through improvements in the energy intensity of telehandlers and other machinery.

Assumptions:

- The deployment of hybrid generators increases by 60% by 2050 in the high reductions scenario compared to a 2022 baseline, and 50% in the moderate reductions scenario. Each hybrid generator achieves 50% energy savings (source: *Hybrid Power Generation for Improved Fuel Efficiency and Performance* by Sandia National Laboratories).
- Telehandlers and other machinery become 60% more energy efficient by 2050 in the high reductions scenario, and 50% in the moderate reductions scenario (source: *Industrial Non-Road Mobile Machinery Decarbonisation Options: Techno-Economic Feasibility Study*, written for the Department for Energy Security and Net Zero (DESNZ).

1.3.2.2 Fuel switching & plant decarbonisation

Emissions are reduced by switching gas oil/diesel with lower-carbon (HVO or other) or Net Zero (electrification or hydrogen) alternatives. Lower-carbon fuels are a transitional solution toward Net Zero alternatives. This lever assumes that all vehicles use Net Zero fuels or alternatives by 2050. In the run-up to 2050, the assumed proportion of vehicles using lower-carbon fuels peaks at 71% in 2030 in the high reductions scenario and 29% in the moderate reductions scenario, based on the DESNZ report cited above.

1.3.2.3 Design for low embodied carbon and alternative materials

Timber build has been used as a proxy for all forms of MMC. Timber studs are used in place of brick and block, engineered timber used in place of concrete.

Assumptions:

- It is assumed that 17% of new homes are built using timber in the baseline, based on the *Wood in Construction in the UK: An Analysis of Carbon Abatement Potential* report by the Climate Change Committee.
- In the high reductions scenario, the share of new houses built with timber rather than masonry is assumed to increase by 67% by 2050 in the high reductions scenario and by 17% in the moderate reductions scenario, from a 2022 baseline. The share of new flats using engineered timber rather than concrete is assumed to increase by 17% by 2030 then level off in the high reductions scenario, or 4% by 2050 in the moderate reductions scenario. All flats are assumed to be capable of being built in timber instead of concrete.

1.3.2.4 Low-carbon concrete

Embodied emissions from concrete are reduced following the Low Carbon Concrete Routemap from Green Construction Board's Low Carbon Concrete Group, published by Institution of Civil Engineers (ICE), in which carbon reductions are achieved through R&D of concrete technologies. The ICE Routemap identifies 3 reduction pathways:

- The low reductions pathway is based on the successful use of fly ash from stockpiles and adoption at scale of mixes that use limestone powder, calcined clay and/or volcanic ash as SCMs, enabling a 58% reduction of concrete emissions by 2050 compared to 2022.
- The moderate reductions pathway is based on developments underlying the low-reduction pathway, and successful development and adoption of AACMs based on calcined clays or volcanic ash. This drives a 75% reduction of concrete emissions by 2050 from a 2022 baseline.
- The high reductions pathway is based on the developments underlying Route 1 and successful sequestration of captured carbon dioxide within concrete. The captured carbon dioxide is used to manufacture carbon-negative synthetic SCMs, AACMs and aggregates. This drives a 136% reduction of concrete emissions by 2050 compared to 2022, with concrete becoming carbon-negative by 2043. Note, the MPA UK Cement and Concrete Decarbonisation roadmap has also been scenario tested however not modelled in the core pathway. Future versions of the plan will establish a blended lever pathway to best represent the trajectory of the concrete sector as more data becomes available.

1.3.2.5 Low-carbon steel

Embodied emissions from steel are reduced following the International Energy Agency (IEA)'s roadmap for steel decarbonisation. This assumes an 87% reduction in steel emission intensity by 2050.

1.3.2.6 Low-carbon brick

Embodied emissions from bricks reduce through decarbonisation measures. As a leading clay brick manufacturer in the UK, the emissions decarbonisation trajectory has been aligned to Ibstock's commitments. Ibstock stated the following commitment in their 2022 sustainability report.

The commitment states net zero alignment but lacks details on scope 3 pathway. A 1.5D aligned pathway has been used for scope 1 and 2 reduction due to their commitment to a 40% reduction. To be conservative, a WB2D-aligned reduction has been used for scope 3.

Ibstock's emissions in 2022 are estimated as 76% scope 1 & 2 and 23% scope 3. Using this weighting against near-term commitments for 1.5D versus WB2D a 2030 weighted average reduction has been used for emissions reductions from brick decarbonisation. This reduction is calculated as 38% reduction to a near-term target in 2030. A linear trajectory has been drawn from baseline to near-term and from near-term to long-term.

1.3.2.7 Smart Controls and Energy Storage

Homes are fitted with smart technology that enables energy savings from greater energy efficiency. Emission reductions are calculated based on the expected rollout of energy-saving technology in homes, also taking into account grid decarbonisation. It is assumed that smart home technology enables a 19.6% energy efficiency improvement by 2050, and that the share of homes equipped with smart home technology goes from 0% in 2022 to 100% in 2050.

1.3.3 Uncontrollable scenarios

1.3.3.1 Grid decarbonisation

Electricity from the UK grid progressively becomes zero-emissions as more electricity is sourced from renewables. It is assumed the UK grid fully decarbonises by 2050, based on UK government Energy and Emissions Projections and the Future Energy Scenarios from the *National Energy System Operator*.

1.3.3.2 Natural gas phaseout

Natural gas is no longer fitted into new homes as per Future Homes Standard requirements. It is assumed natural gas is phased out of all new Scottish homes by 2025, and by 2028 in the rest of the UK, according to a FHS build out model developed by the Hub and following Scottish government announcements of a delayed New Build Heat Standard timeline. The model coarsely reflects the continued delivery of Scottish homes with gas boilers to end of 2027, accounting for Building Warrants granted prior to April 2024.

The delivery of FHS-standard completed homes reflects work that the Future Homes Hub has carried out to map the projected buildout based on the observed delivery profile of homes completed to Part L 2021.

Electricity consumption that replaces natural gas consumption is assumed to be halved.

2. Limitations

2.1 Disaggregating offshore emissions

The SBTi target framework has been used to track emissions reductions against targets to 2050 for this sector-level transition plan. The SBTi approach has been selected due to its current standing as the best practice guidance for corporates. The SBTi also addresses the aim of creating a transition plan that could be used as a base for housebuilders who may not be as far along in their decarbonisation process. Applying the Future Homes Hub transition plan to individual housebuilders will speed up the journey to decarbonisation, particularly for SMEs that want to meet a science-based target.

Use of the SBTi SDA approach means that emissions are considered under a global emissions budget associated with meeting a temperature goal and that peak emissions occur in line with IPCC through near-term targets and reductions. It is important to note that a global emissions budget approach will look different to a UK Climate Change Committee budget as imported emissions are factored in. This is aligned to the approach that individual housebuilders will need to consider under the SBTi.

New regulations such as the UK carbon border adjustment (CBAM) have been designed to address carbon leakage. CBAM could work alongside 'product standards, and other policy measures to help grow the market for low emission products.. Factsheet: UK Carbon Border Adjustment Mechanism, 2023. Further detail on imported emissions and carbon leakage were not considered as part of this decarbonisation transition plan.

2.2 Disaggregating typology (homes vs apartments)

Data provided by the housebuilding group was not advanced enough to disaggregate build typologies (e.g. houses vs flats). However, it is important to note that decarbonisation levers would impact typologies to different extents. For example, it is unlikely that high-rise flats will be built from brick, meaning the decarbonisation of brick is only relevant to houses.

With additional data to disaggregate typologies, it would also be useful to assess the emissions efficiency of different typologies and consider the impact that this could have on business strategies.

2.3 No link to generation and grid infrastructure capacity

The analysis undertaken assumes that UK electricity generation and UK grid capacity will meet the requirements to allow for grid decarbonisation in line with *FES 2024 from National Energy System Operator*. Since modelling, the UK government committed to clean power by 2030, so, grid decarbonisation may happen earlier than 2050.

2.4 Demand side generation and storage not directly modelled

The smart controls scenario considers efficiency improvements through the use of smart technology to reduce energy consumption in homes. This lever has a comparatively small impact on emissions due to factoring in grid decarbonisation simultaneously. Despite the small emissions reduction for housebuilders, this lever has been included in the modelling due to the importance of smart storage in homes; it has potential to expand the capacity of the grid and introduce battery storage for demand-side generation. Additionally, smart solutions could help to increase demand-side controls, offsetting peak use through smart augmentation. This solution for grid expansion in not essential for housebuilders to meet SBTs but could be integral in helping the government meet UK carbon budgets.

2.5 Approach to CCS

Carbon capture and storage (CCS) is factored into decarbonisation trajectories as described below.

Grid decarbonisation follows the FES 2024 from National Energy System Operator and includes assumptions around the inclusion of carbon capture and storage in each scenario.

The GCB LCCG Low Carbon Concrete Routemap highlights direct separation, post-combustion and oxyfuel carbon capture as the main technologies of carbon capture under consideration for concrete today. The Low Carbon Concrete Routemap also describes how these technologies are not commercially viable for large-scale rollout. The uncertainty surrounding their commercial viability means that they are not factored into the routes described in this study, however the significant decarbonisation benefit CCS stands to bring as the technology matures is acknowledged.

Future work on the decarbonisation roadmap will review industry progress on CCS and factor in updated predictions on commercial viability.

Steel decarbonisation follows the IEA's Net Zero by 2050 Roadmap for Global emissions. This transition plan expects CCUS-equipped production facilities to play a major role in the decarbonisation of steel, making up more than 50% of decarbonisation.

Depending on how CCS or CCUS is embedded into the manufacturing process benefits from carbon capture may or may not be reflected in future EPDs.

2.6 Reflecting grid decarbonisation within embodied emissions

Steel decarbonisation follows global steel decarbonisation and demonstrates expected renewable electricity generation covering greater than 90% by 2040.

Concrete decarbonisation considers fuel switching to achieve zero carbon kiln energy and this is a significant lever for the decarbonisation of cement and concrete which is in part effected through further decarbonisation of the grid. This is accounted for within the GCB LCCG Low Carbon Concrete Routemap and therefore reflected in the modelling.

Brick assumes grid decarbonisation in line with the SBTi trajectory and relies on electrification and grid decarbonising. Without specific material trajectories available, decarbonisation relies on the UK FES projections present for the lever grid decarbonisation.

2.7 External dependencies

Future iterations of the transition plan will consider how other external dependencies affect the decarbonisation trajectory and the impact of the selected levers.

Areas which will be considered in future iterations include:

Areas which will be considered in future iterations include:

- The impact of demographic changes
- How climate change may impact the selected levers (e.g., how biodiversity loss may affect the implementation of MMC)
- Land availability
- The demand for higher density buildings

3 Alignment with other initiatives

The emissions baseline presented within this report has been developed by aggregating the scope 1, 2 & 3 emissions reporting of Hub members. Therefore, multiple footprinting approaches have been combined, including spend based, quantity based and LCA. This means that:

- All emissions associated with homebuilding have been included such as the road, power and waste water networks associated with developments, resulting in a more expansive baseline than may be seen in other initiatives.
- There is a varying range of data quality included within the baseline data, most notably spend which often inflates emissions, leading to greater uncertainty within the baseline data than other initiatives which may use 100% quantity/LCA data.

Whilst each initiative aims to mitigate emissions within the built environment, differences in boundary and data quality mean that they are not directly comparable.

3.1 Carbon Budgets

The CCC develops Carbon Budgets for the UK economy which set science-derived emissions limits necessary to achieve the UK's legally binding commitment to hit net zero by 2050 and 81% reduction on 1990 levels by 2035. They are also designed to align to 1.5 °C warming limits. Carbon budges are published to cover 5 year periods and are laid down 12 years before the start of the periods they cover.

We engaged with the CCC as part of the consultation process for the Transition Plan, prior to the publication of Carbon Budget 7. Assumptions included within the Carbon Budget 6 (CB6) modelling have been checked against the transition plan assumptions and commentary provided behind any non-alignment. Carbon Budget modelling inputs are in some cases less granular and sector-specific than the transition plan modelling inputs, and CB6 was enacted in law in June 2021 so does not benefit from more recent input data.

The latest carbon budget, CB7, was published in late February 2025 and we have commitment from CCC to work alongside us to test assumptions against the transition plan. Future planned iterations to the transition plan will be informed by and more strongly linked to CB7.

3.2 SBTI

The Science Based Targets Initiative encourages individual businesses to commit to decarbonisation targets specific to the nature of their operations, size and operating geography.

Our model originally applied a target carbon reduction trajectory to the 2022 baseline figures, based on a cross-sector SBT-aligned pathway. A SBT-aligned reduction trajectory can be considered valid as it scales up organisational best practice targets to the sector level.

In August 2024, SBTi released their buildings sector guidance. This guidance is more ambitious than the cross-sector guidance due to "significant projected growth in global floor area and various technologically and commercially mature options to decarbonize heating and cooling that are already available.".

It should be noted that the transition plan baseline data was generated prior to publication of the SBTi buildings sector guidance, and as such reporting methodologies are diverse and not necessarily aligned. While we believe this adequately informs the transition plan, our aim is to update the baseline information over time to check progress and to improve accuracy and consistency with SBTi reporting methodology.

3.3 UKGBC Building Roadmap

The UKGBC published its Buildings Sector roadmap in 2021, which charts a path to net zero for new and existing buildings in all major use classes across the UK. The Hub will continue to engage with UKGBC representatives as the sector transition plan develops to ensure that assumptions for new build residential are tested and aligned, where appropriate.

The transition plan equals or exceeds the ambition of UKGBC-advocated commitments where applicable to new build residential. An ambition of the transition plan is to increase modelling granularity and update the UKGBC roadmap assumptions, to 'fill in' the new build residential segment of the UKGBC roadmap, while remaining within the emissions budget for the sector. We continue to work with UKGBC to explore a formal interaction between our transition plans.

3.4 Net Zero Carbon Buildings Standard

The Net Zero Carbon Buildings Standard builds on the work of the UKGBC roadmap with the aim of establishing intensity limits and targets for new and existing buildings of all uses required to ensure national decarbonisation commitments are met. The Future Homes Hub has both fed into the NZCBS baseline for homes, which helped to form the initial limits, and also continues to represent new build housing on NZCBS sector and specialist groups.

The sector transition plan work aims to test the NZCBS operational and embodied carbon intensity limits against the transition plan projections, and compare and align the assumptions made within the NZCBS model. It should be noted that the NZCBS aims to be ambitious in a short timeframe which may contribute to a discrepancy between published limits and sector transition plan projections.

3.5 CLC

The CLC's performance framework aims to track progress against 9 commitments set out in its initial publication in November 2020, using metrics defined by the CLC displayed as a dashboard reported quarterly. The framework covers all construction activities, not just housebuilding.

The Framework's focus is somewhat weighted towards intervention opportunities at the construction stage, but also considers the impact of operation of buildings. The new homes sector transition plan has tested alignment with the CLC commitments and will remain cognisant of the CLC's reporting which acts as a useful reference for the modelling assumptions, especially for the construction stage levers.

As part of our work on sector metrics, the Hub has engaged with CLC to ensure environmental metrics are reported consistently for homebuilding, which in turn will encourage measurement of sector performance at scale, using the transition plan as an evolving reference point.

Future Homes Hub

If you have any queries or would like to give feedback please contact us.

admin@futurehomes.org.uk
www.futurehomes.org.uk