West Midlands Zero Carbon Homes Routemap

Introduction

In July 2020, the West Midlands Combined Authority (WMCA) declared a climate emergency and set a challenging 80-year carbon budget. Our goal is to achieve net zero carbon emissions by 2041 and deliver zero-carbon homes in the region by 2025.

Our Zero Carbon Homes Routemap sits alongside our Zero Carbon Homes Charter. It sets out programmes of action over the short, medium and long-term which will allow us, and our partners to meet our ambitious target and deliver the Charter's principles.

We will seek to be as collaborative and innovative as possible in our approach. Partnerships across the region and throughout the supply chain are required to ensure new housing helps deliver clean and inclusive growth.

WMCA's role in delivering this ambition is three-fold:

- We need to deploy our funding in ways that secure positive outcomes on the ground.
- We need to broker new relationships across industry, creating a culture of collaboration and innovation in the West Midlands, and growing our zero-carbon housing sector.
- We must bring our partners along with us, working closely with our local and national public, private and third sector stakeholders to develop a single voice on the approach and commitment to delivering zero-carbon homes at scale in the region.

Integral to our approach will be ensuring new residential development, no matter its use, tenancy or construction type, supports healthy, resilient communities.

Cover image credit: +Home 2030 by igloo, Mawson Kerr and Useful Projects

Eco-Vicarage by Associated Architects: First homes to have been awarded Zero Carbon Level 6 under the UK Code for Sustainable Homes and Passivhaus accreditation in Worcester.

Wooton Wawen by Waterloo Housing Group: A passivhaus affordable housing development in Warwickshire with superior levels of insulation and built with high-quality materials.

Purpose This Routemap is an action plan rather than a strategy. It sets out how we will achieve the principles of our Zero Carbon Homes Charter. It provides programmes of action along five key enablers, proposing specific timescales and identifying best practice to guide us on our journey to zero-carbon homes.

The Routemap has been designed this way to allow us to remain agile, adapt and change focus based on the progress being made, as well as other factors such as availability of funding and/or technological advancements.

Process The Routemap has been co-developed with West Midlands local authorities, including an Officer Working Group and the Low-Carbon Officer Group, as well as with a task force of industry leaders. It is informed by a baseline gap analysis produced by Useful Projects in October 2020 as well as by our Zero Carbon Homes Charter.

Audience This Routemap is aimed at all those involved in delivering zero carbon housing products and services in the region, including policy-makers, developers, educational and Research and Development (R&D) institutions and the regional supply chain.

In particular, this Routemap sets out clear actions for stakeholders involved in delivering residential development on land that WMCA owns, aquires or invests in.

Implementation This is a live document which will be reviewed on an annual basis in order to evaluate our progress and determine our next steps. The Routemap will evolve through time and is aligned with other policy priorities including delivering high-quality, affordable homes and accelerating the uptake of advanced manufacturing in construction..

Structure This Routemap is structured around five key enablers. They set out how we and our partners can accelerate the delivery of zero carbon homes by:

- Creating an enabling policy landscape which builds certainty and consistency around the approach to delivering zero-carbon homes in the region - Policy and Guidance Enabler.
- Adopting collaborative governance models and delivery processes to maximise resources and enhance knowledge-sharing- Governance and Delivery Processes Enabler.
- Aligning investments to support the delivery of zero-carbon homes and demonstrating the cost effectiveness of doing so- Financial Capital Enabler.
- Building our capacity, regional skills and expertise in zero-carbon homes- Human Capital Enabler.
- Facilitating the deployment of zero-carbon technologies to build an innovation-led green economy- Technology, Innovation and Infrastructure Enabler.

How to Navigate this Routemap

This Routemap focuses on five key enablers. For each enabler, we have provided a summary of actions being undertaken, WMCA's commitment, a programme of action, and best practice case studies. Additionally, further notes, guidance and resources for each enabler are presented at the back of the report. Key themes also underpin the enablers, providing anchoring values for our work in delivering zero-carbon homes.

Key Themes Underpinning the Five Enablers

Policy and Guidance

Governance and Delivery Processes

Financial Capital

Human Capital

Technology, Innovation and Infrastructure

Knowledge-Sharing / Collaboration / Community-Engagement / Capacity-Building / Innovation

Using the Programme of Action Tables

Programme of Action	2021 Actions	2022-2025 Actions	2025+ Actions

The programme of action describes the core workstreams that we will undertake with the help of our partners. These workstreams will be further developed into specific projects.

The actions we have described in 2021 allow WMCA and its partners to plan and prepare for the delivery of zero-carbon homes. It lays the foundation for our future work.

From 2022 to 2025, actions are focused on how WMCA and its partners will bring forward new projects and programmes. This period of time is when we will build our capacity and expertise in delivering zero-carbon homes.

As of 2025, we will be delivering zero-carbon homes in the region at scale. Our earlier interventions will enable us to do so in a cost effective way, and we will continue to build on our learning from previous projects to improve future delivery.

Zero Carbon Homes Charter

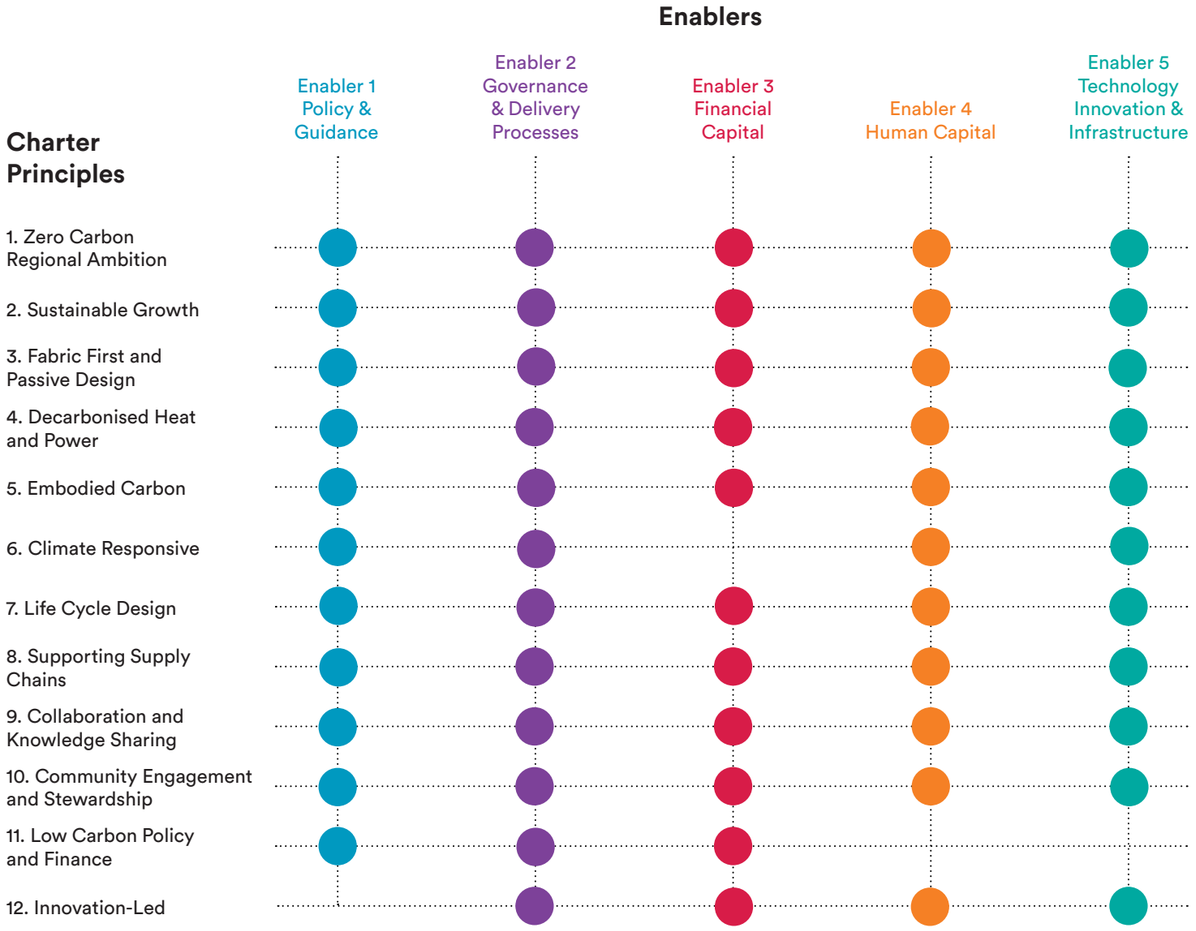
This Routemap will support us to meet the aspirations set out in our Zero Carbon Homes Charter. The Charter frames our commitment and long-term objective to deliver zero carbon homes in the region.

The Charter helps us in building a region that drives zero carbon development and innovation, in future proofing our economy and in enabling our communities to prosper for years to come.

It consists of twelve principles which we encourage all those involved in delivering homes in the West Midlands to embrace.

The Zero Carbon Homes Charter principles are:

- Principle 1: Zero Carbon Regional Ambition
- Principle 2: Sustainable Growth
- Principle 3: Fabric-First and Passive Design
- Principle 4: Decarbonised Heat and Power
- Principle 5: Embodied Carbon
- Principle 6: Climate Responsive
- Principle 7 Life Cycle Design
- Principle 8: Supporting Supply Chains
- Principle 9: Collaboration and Knowledge Sharing
- Principle 10: Community Engagement and Stewardship
- Principle 11: Low Carbon Policy and Finance
- Principle 12: Innovation-Led



The matrix above shows how the Routemap's enablers support the delivery of the Zero Carbon Homes Charter.

This Routemap does not assign specific actions directly against the Charter's principles because the programmes of work identified in this document involve cross-cutting actions which will enable multiple principles to be delivered.

The Zero Carbon Homes Charter sets our ambition for the region across six themes and 12 principles. You can find ithe full document on our website.

Sustainable Co-Benefits

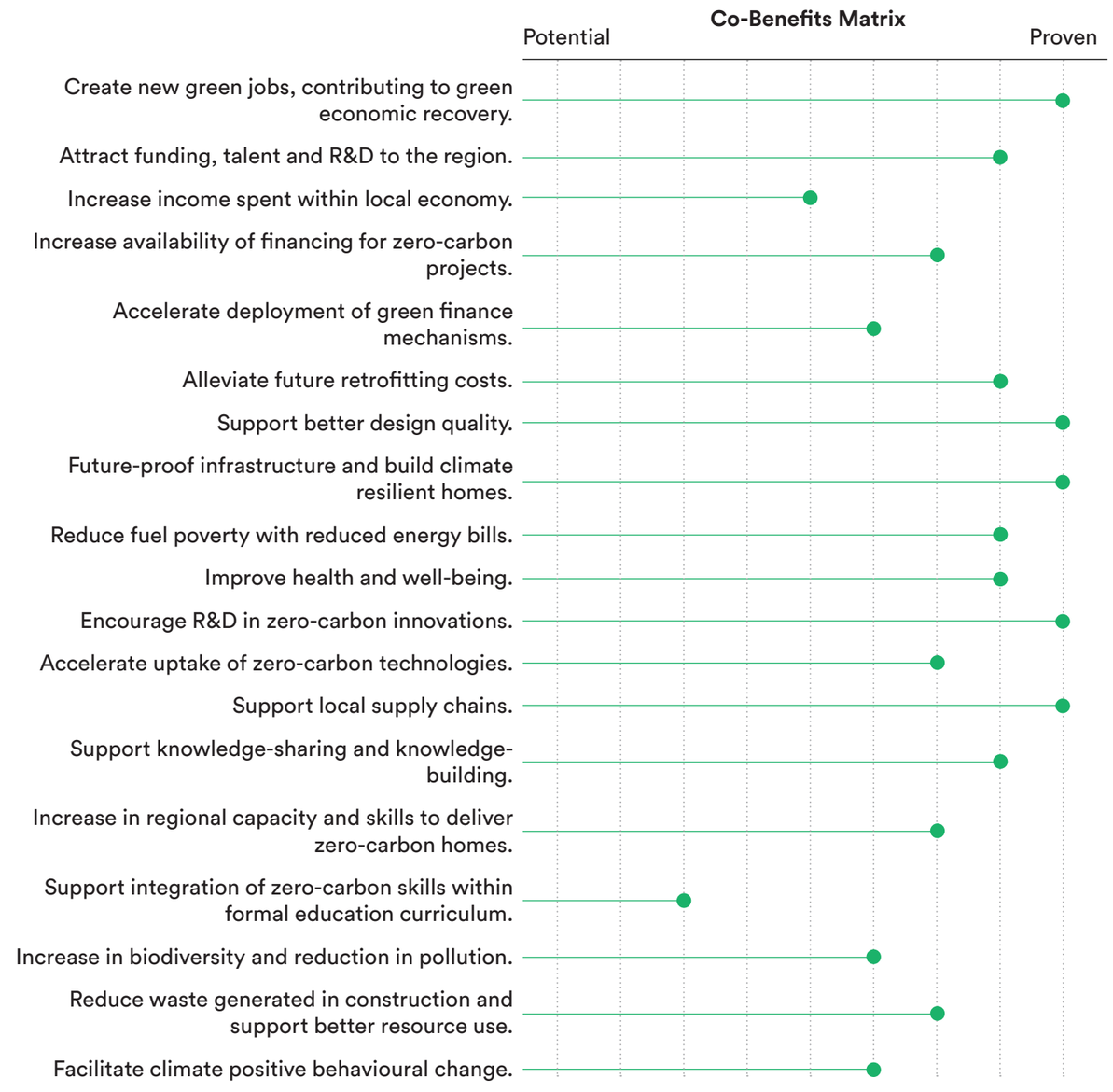
Delivering zero-carbon homes will provide numerous tangible socio-economic benefits that will help build more resilient, healthier communities as well as support a transition to a low-carbon economy.

Quantifying these co-benefits is a key step in building compelling whole-value business cases that demonstrate the potential for long-term cost effectiveness in building zero-carbon homes.

Articulating these added benefits will help us balance the initial added cost of delivery with the positive impacts on inclusive growth, environmental protection and economic prosperity for the region.

Air tightness testing is a crucial performance test when building passive design homes.

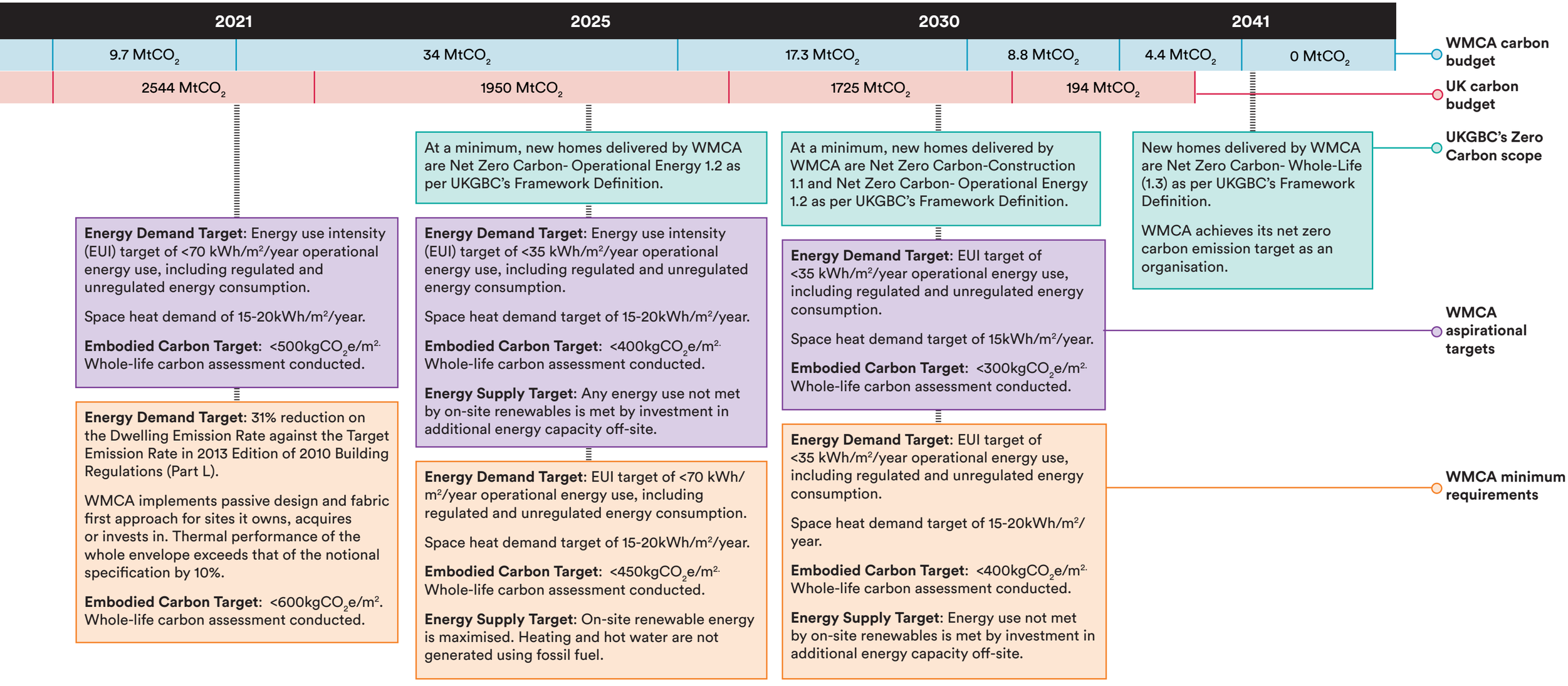
Zero-carbon homes deliver several tangible co-benefits and help build healthier, inclusive and more resilient communities.



Zero Carbon Definition and Targets

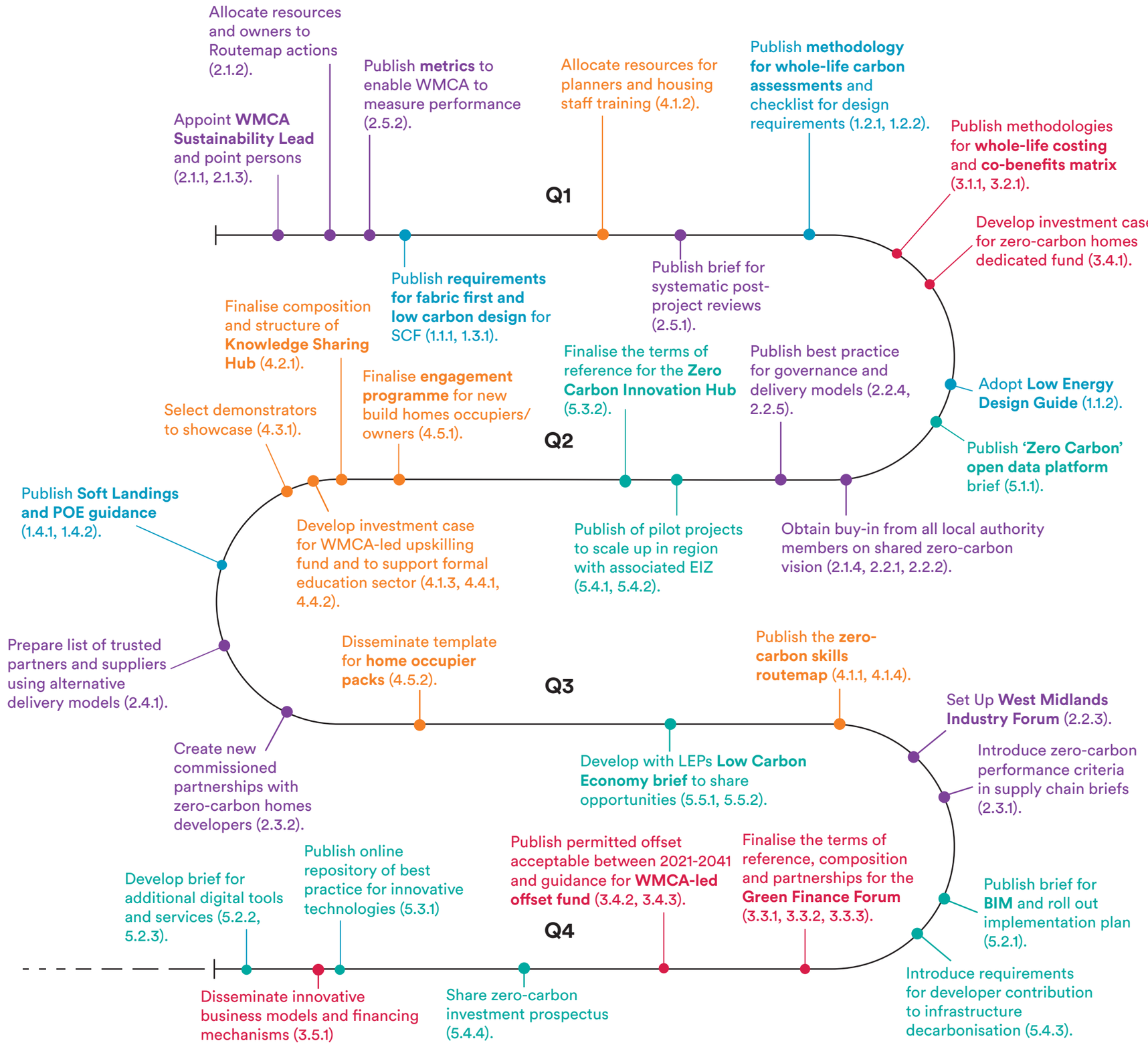
WMCA has adopted UK Green Building Council's (UKGBC) framework definition for a net zero carbon building:

When the amount of carbon emissions associated with a building's embodied and operational impacts over the life of the building, including its disposal, are zero or negative.



2021 Routemap

This Routemap provides a detailed sequence of priority actions identified within the Routemap for 2021. This page shows how time-specific actions from different programmes across the five enablers complement and dovetail with one another.

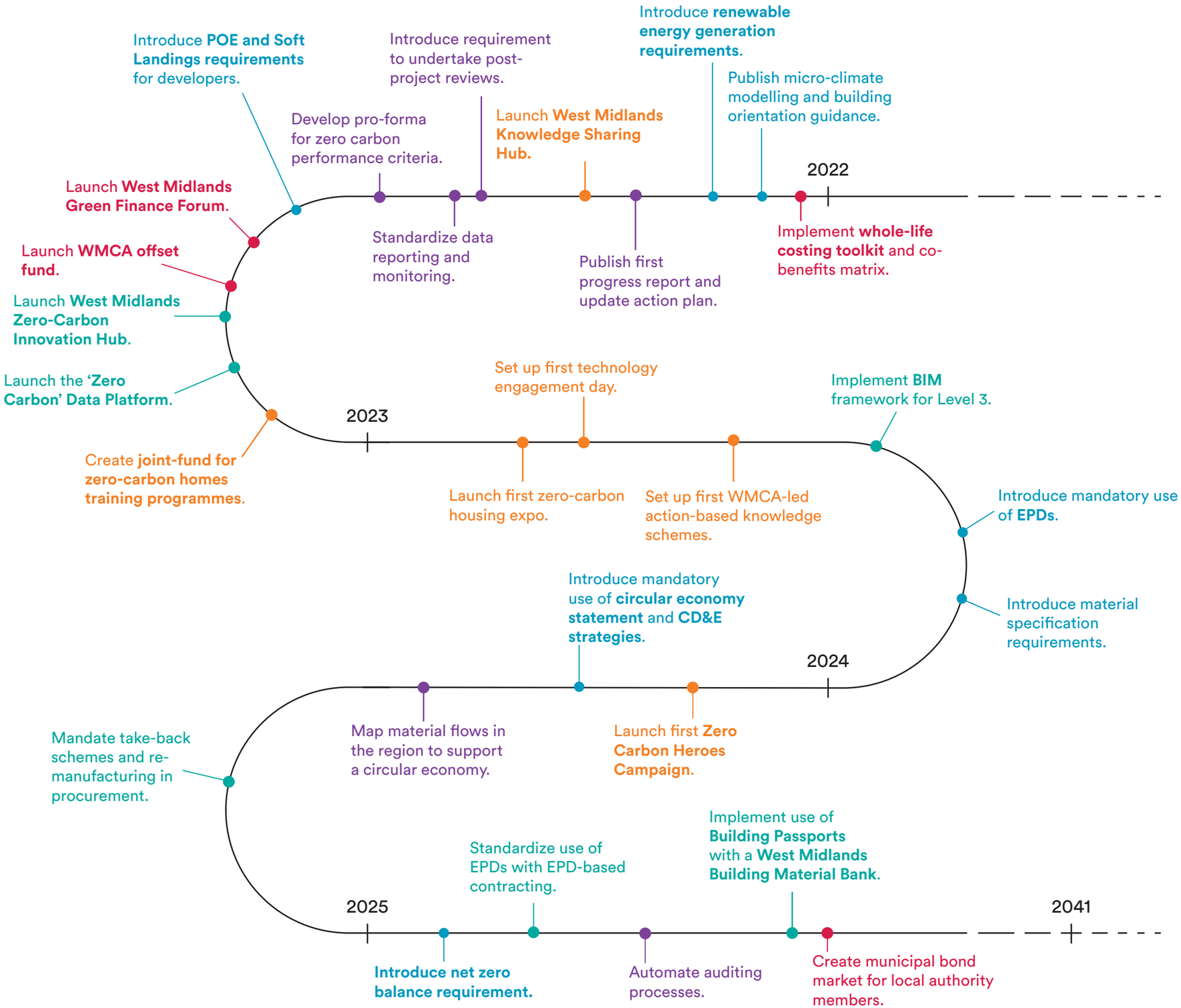


Routemap Enabler Key:

- Policy and Guidance
- Governance and Delivery Processes
- Financial Capital
- Human Capital
- Technology Innovation and Infrastructure

2022 – 2025 Routemap

This Routemap provides a selection of key actions from 2022 to 2025. This page shows how selected actions, set across the five enablers, complement one another to help us reach our 2025 zero-carbon homes target.



Routemap Enabler Key:

- Policy and Guidance
- Governance and Delivery Processes
- Financial Capital
- Human Capital
- Technology Innovation and Infrastructure

Enabler 1:

Policy & Guidance

Summary:

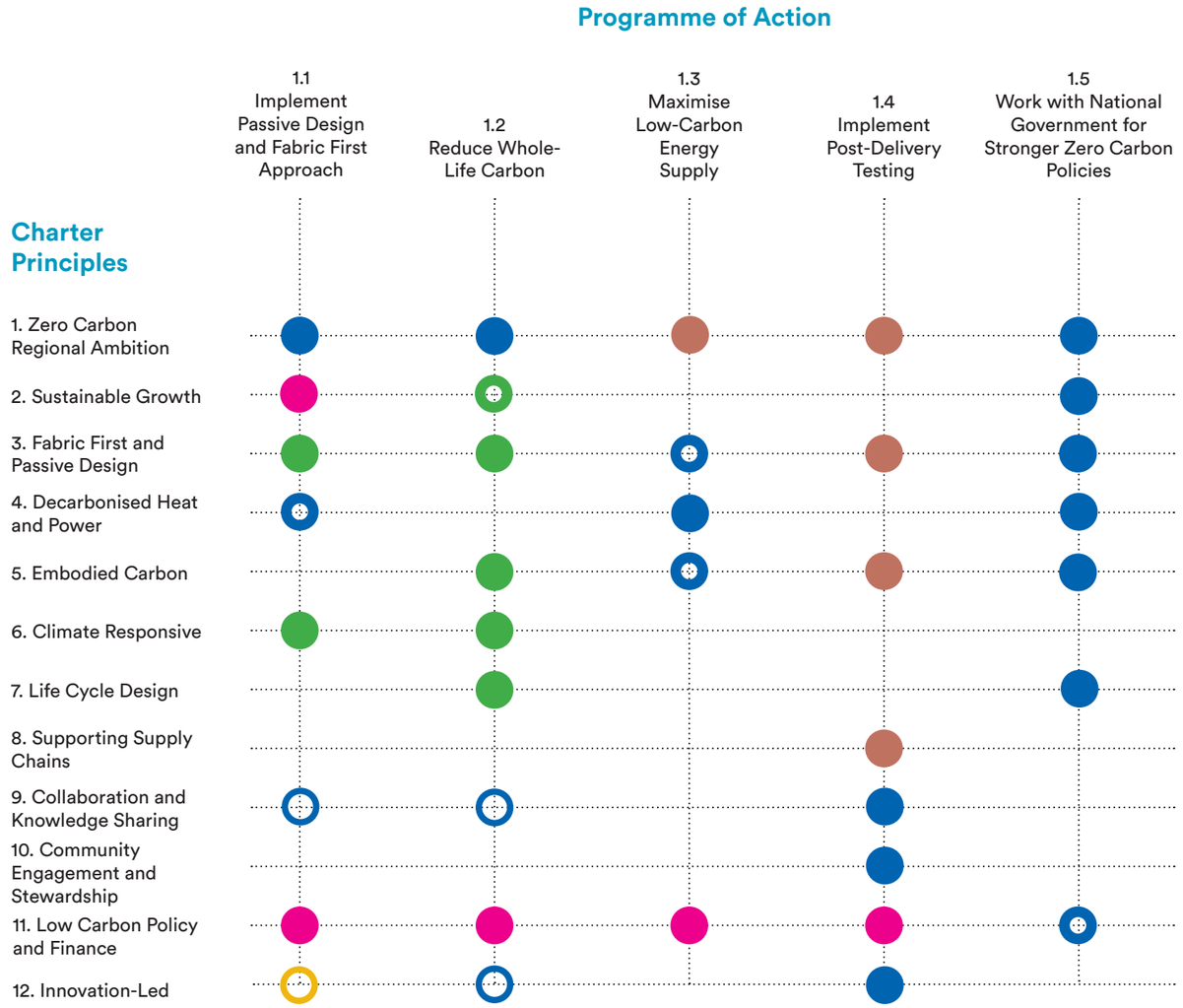
WMCA will set clear policies supporting the delivery of zero-carbon homes within the region. We will go beyond national standards and become a leader in supplying zero-carbon homes.

An enabling policy environment is required to build certainty amongst our partners, the industry and the supply chain. Clear region-wide policies and guidance will allow for improved delivery processes and will provide clarity and certainty.

We will first implement requirements that encourage a fabric-first approach and passive design, in line with recommendations from industry experts such as London Energy Transformation Initiative (LETI) and Royal Institute of British Architects (RIBA).

We will also work to reduce embodied carbon and to maximise renewable energy. As we grow our expertise, we will implement stronger zero-carbon requirements for new homes on our sites.

We are also committed to leverage our role and scale as a regional authority to influence national policy and to advocate for stronger standards and additional funding for the region.



Audience:

- Developers and Designers
- Policy-Makers
- R&D and HEFE Institutions
- Construction Supply Chain
- WMCA
- All

Key:

Programme of action: Strength of correlation with Charter

Adopting passive design standards reduces operational energy and delivers socio-economic benefits to home occupiers.

Enabler 1:

Policy & Guidance

WMCA Commitment

We will work with local and national partners to set new, aspirational policies that delivers our zero carbon targets. In doing so, we will seek to build a consistent, transparent and supportive policy framework that enables all those delivering housing in the region to join us on our zero-carbon transition.

Programme of Action	2021 Actions	2022-2025 Actions	2025+ Actions
1.1. Implement Passive Design and Fabric First Approach	**1.1.1** Introduce passive design and fabric first requirements within WMCA Single Commissioning Framework (SCF). **1.1.2** Develop and adopt a WMCA Low-Energy Design Guide to achieve passive design and fabric first requirements on sites WMCA owns, acquires or invests in.	- Produce and publish micro-climate modelling and building orientation guidance. - Facilitate co-development of passive design and fabric first guidance amongst WMCA local authority members (See Enabler 2.1). - Share data on zero-carbon homes to make the case for zero-carbon home targets above building regulations.	
1.2. Reduce Whole-Life Carbon	**1.2.1** Introduce mandatory whole-life carbon assessments based on RICS guidance to measure whole-life carbon on sites WMCA owns, acquires or invests in. **1.2.2** Develop checklist of measures and design requirements to be applied on sites WMCA owns, acquires or invests in, in order to reduce whole-life carbon.	- Introduce mandatory use of Environmental Product Declarations for sites WMCA owns, acquires or invests in. - Introduce mandatory use of circular economy statements and Construction Demolition & Excavation (CD&E) strategies for sites WMCA owns, acquires or invests in. - Introduce specification requirements for low embodied carbon, reused, recycled materials and responsible sourcing for sites WMCA owns, acquires or invests in.	- Require appointment of a principal contractor to monitor and report on 'as constructed' embodied carbon on sites WMCA owns, acquires or invests in.
1.3. Maximise Low-Carbon Energy Supply	**1.3.1** Introduce requirement for electric-led solutions and smart systems on sites WMCA owns, acquires or invests in. **1.3.2** Support the recommendations of the upcoming 'Energy Infrastructure for Zero Emission Vehicles Strategy' where it applies to residential development for sites WMCA owns, acquires or invests in.	- Review and update the regional energy strategy to ensure appropriate infrastructure is in place to service new demand from electrically-heated homes. - Introduce renewable energy generation requirement on-site and/or on buildings as a condition of WMCA housing investment. - Support investments in low-carbon energy infrastructure and technologies on sites WMCA owns, acquires or invests in.	- Introduce requirement for a net zero balance on sites WMCA owns, acquires or invests in. Any energy not met by on-site renewable is met by investments in additional renewable capacity off-site.
1.4. Implement Post-Delivery Testing	**1.4.1** Develop and publish region-wide guidance for Soft Landings. **1.4.2** Develop and publish region-wide guidance for Post Occupancy Evaluation (POE) (See Enabler 4.5.2 for home information pack) .	- Implement region-wide reporting framework for POE and Soft Landings (See Enabler 5.1). - Implement system with partners for continual review of POE and Soft Landing data to inform future delivery. - Introduce requirement for developers to conduct POE and Soft Landings for sites WMCA owns, acquires or invests in (See Enabler 4.5.2).	- Digitise and automate Soft Landing and POE processes.
1.5. Work with National Government for Stronger Zero Carbon Policies	**1.5.1** Work with national government to support a move towards stronger building regulations standards. **1.5.2** Advocate for additional funding to plug the zero-carbon homes skills gap. **1.5.3** Advocate for more control over energy infrastructure in the West Midlands (See Enabler 5.4).	- Support West Midlands local authorities in adopting zero-carbon requirements where they aspire to do so. - Engage with the planning inspectorate to assist member local authorities in negotiating in favour of zero-carbon homes. - Work with MHCLG to ensure zero-carbon standards remain a priority within planning reforms. - Collaborate with other regions to effect change in zero-carbon policies. - Encourage private developers to adopt WMCA zero-carbon targets and requirements.	

Policy & Guidance

Best Practice

	QUALITY CHECKLIST	Minimum Requirement	Net Zero-Carbon by 2050	Net Zero-Carbon by 2030
En.1	Operational Energy (KWh/m2/y)	146	< 70	< 0 - 35
En.2	Embodied Carbon (kgCO2e/m2)	1000	< 450	< 300
En.3	Space Heating Energy Demand (KWh/m2/y) of net living space	54.26	25	15
En.4	Airtightness (air changes/ hr @ n50)	5	3	≤ 0.6
En.5	Ventilation Strategy (m3/hr/person)	Natural - extract fans	Mechanical - with extract fans	Mechanical Heat Recovery (30)
En.7	What is the on-site reduction in CO2 emissions against Building Regulations Part	0-34%	35%-50%	≥ 50%

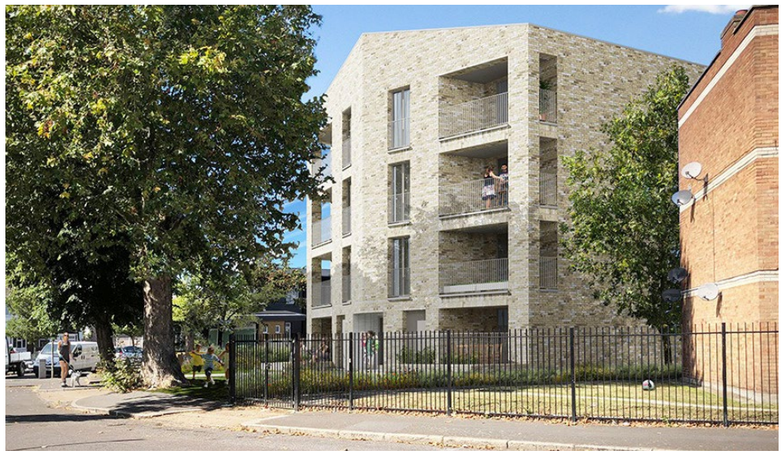
HGGT, Sustainability Checklist

How to use policy-making to drive sustainable place-making:

The Harlow and Gilston Garden Town (HGGT) is a large-scale development between East Hertfordshire, Epping Forest and Harlow District Council together with Hertfordshire and Essex County Councils. The five partner authorities have all declared a climate emergency and have developed Sustainability Guidance, and an associated checklist, to support sustainability across the development.

The guidance is aimed at developers, design teams, consultants and contractors to help them guide their development and design proposals. It is also aimed at local authority officers and decision-makers guiding them in the assessments of planning applications, through the use of the checklist provided. The guidance and its checklist can be used during masterplanning, pre-application, planning application and post-planning since the guidance includes tools for POE and ongoing monitoring requirements.

The Checklist indicates the quality of development in line with the Garden Town's standards using a red/amber/green (RAG) approach. Red represents the minimum requirements compliant with policy and building regulations but not with climate declaration targets. Amber requirements are compliant with being net zero by 2050. Green requirements meet HGGT's goal, and climate declarations' targets of net zero by 2030. The checklist is applied to various environmental sustainability themes including energy efficiency, carbon reduction and renewable energy.



LBN, Low-Energy Design Strategy

How to embed passivhaus standards in a local authority's housing delivery and reduce the cost uplift:

In response to its climate emergency declaration, London Borough of Newham (LBN) Council employed an in-house Sustainability Lead to lead on the development of a Low-Energy Design Strategy. The strategy targets full passivhaus certification for all new housing development sites directly delivered by the council.

To overcome nervousness around additional costs, the Sustainability Lead first proposed a 'passive principles' solutions, looking to achieve as close as possible to the passivhaus standard. This opened the door to pursuing the strategy further leading to more in-depth research on costs and feedback from experience contractors which proved the case for targeting the full standard.

It was discovered that by learning from their experience, councils can deliver passivhaus homes at no extra capital cost when compared to minimum standard homes, as is the case with Exeter City Council.

Since Newham Council had no expertise delivering passivhaus homes, the Sustainability Lead presented a conservative estimate of a 10% cost uplift. Costed options for mitigating the initial cost uplift were presented including: income from capitalised fuel bill savings, reduced carbon offset payments, subsidy from the carbon offset fund, operational and maintenance savings demonstrated through a whole-life cost analysis.

UKGBC, New Build Playbook

How to set region-wide carbon and energy demand targets:

In January 2021, UKGBC will be publishing its updated 'New Build Playbook'. The policy handbook is a resource for local authorities looking to set zero-carbon requirements for new homes. The handbook focuses on several key areas to reduce carbon dioxide emissions within new homes including:

- Reducing energy demand;
- Reducing embodied carbon;
- Measuring in-use performance;
- Low-carbon energy supply; and
- Zero-carbon balance which addresses residual emissions.

This playbook sets pragmatic minimum targets local authorities should aim for as well as aspirational requirements for those wishing to accelerate the delivery of zero-carbon homes. The playbook provides a communal approach for local authorities in the West Midlands to use in setting their zero-carbon targets and planning guidance. Setting communal targets across the region will help push the zero-carbon agenda, will ensure there is a consistency of messages across members, and will encourage private developers.

Enabler 2:

Governance & Delivery Processes

Summary:

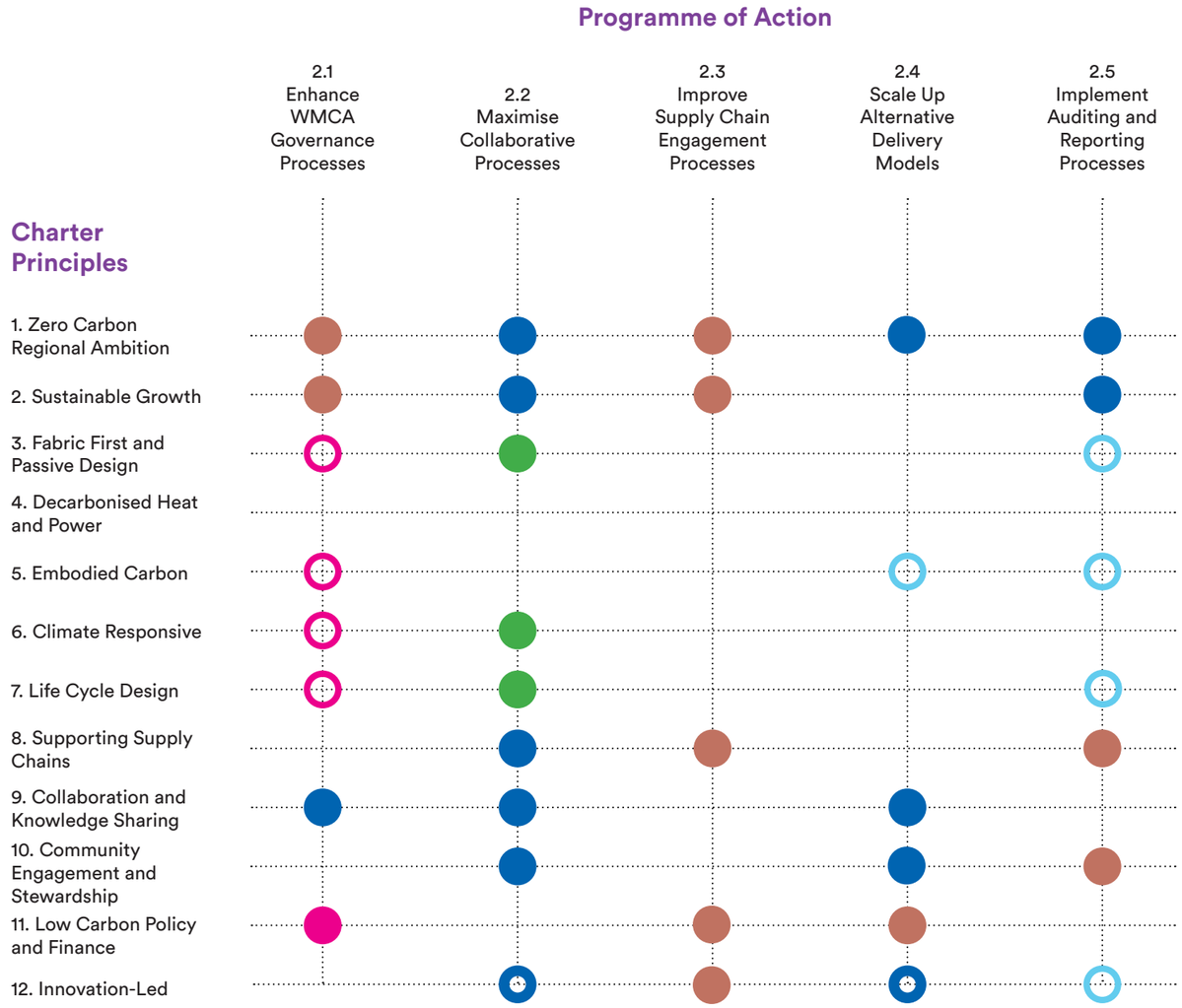
WMCA will develop and implement governance and delivery processes that support and accelerate the completion of zero-carbon homes in the region. This will in part be done by promoting collaborative and at-scale approaches that support a cost-effective volume of zero-carbon homes being delivered.

Collaborative governance models also aim to break the siloes which currently exist across the supply chain and within WMCA. Collaborative approaches and processes will be used to pool resources and effect change on a larger scale.

We will ensure we have the right governance and appropriate resources and skills allocated to implement this Routemap and support local authorities in the region.

We will improve monitoring processes to ensure better compliance with zero-carbon homes targets and set requirements.

Community-led approaches will also be encouraged ensuring local communities reap the socio-economic benefits generated through building zero-carbon homes.



Audience:

- Developers and Designers
- Policy-Makers
- R&D and HEFE Institutions
- Construction Supply Chain
- WMCA
- All

Key:

Programme of action: Strength of correlation with Charter

Alternative delivery models and new methods of construction such as Modern Methods of Construction can accelerate the delivery of zero-carbon homes.

Enabler 2:

Governance & Delivery Processes

WMCA Commitment

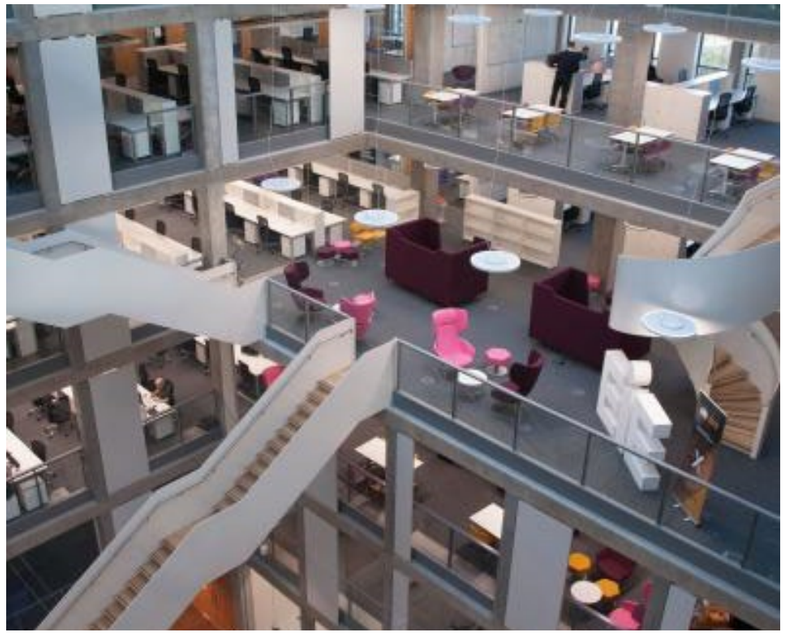
We will embed the actions in this Routemap and associated Charter into our decision-making processes. We will grow both our own and our partner's capacity to consider carbon-related implications within our funding, auditing and reporting processes, and support region-wide collaboration to deliver zero-carbon homes.

Programme of Action	2021 Actions	2022-2025 Actions	2025+ Actions
2.1. Enhance WMCA Governance Processes	**2.1.1** Appoint a central Sustainability Lead within WMCA. **2.1.2** Allocate resources and owners for actions in the Routemap. **2.1.3** Work with local authority members to nominate a sustainability point person. **2.1.4** Embed Zero Carbon Homes Charter ambitions in WMCA decision-making processes.	- Produce annual progress report to monitor progress against actions in the Routemap and update programmes of action. - Include zero-carbon targets and requirements within WMCA procurement briefs, tender evaluation processes and investment decisions.	
2.2. Maximise Collaborative Processes	**2.2.1** Engage with all local authority members and partners to obtain buy-in for Zero Carbon Homes Charter and actions in the Routemap. **2.2.2** Identify collaborators and partnersto deliver the zero-carbon homes vision. **2.2.3** Set up the West Midlands Industry Forum to share best practice, lessons learned and data. **2.2.4** Identify best practice in collaborative governance and delivery models through stakeholder engagement sessions. **2.2.5** Identify best practice in community-led governance and delivery models through community engagement sessions.	- Use convening powers to connect potential consumers and buyers with developers and supply chains through the Industry Forum. - Facilitate creation of cross-sector partnerships through the Industry Forum. - Work with local authorities and developers to facilitate community-led processes through the use of novel engagement tools.	
2.3. Improve Supply Chain Engagement Processes	**2.3.1** Introduce zero-carbon performance criteria within briefs to supply chains and communicate early on with supply chains during development process. **2.3.2** Form partnerships with developers committed to delivering high-quality zero-carbon homes.	- Use the Industry Forum to encourage a two-way dialogue with supply chain. - Develop a pro-forma for development partners to ensure supply chains are embedding and reporting on zero-carbon performance criteria.	
2.4. Scale Up Alternative Delivery Models	**2.4.1** Prepare a list of trusted partners and suppliers experienced in using alternative delivery models and research scope of opportunity for the region in using these models. **2.4.2** Leverage public procurement to encourage alternative delivery models such as joint ventures, community-build models, land trusts and innovative partnership models.	- Update procurement guidance regularly to continue to encourage alternative delivery models including joint ventures and community-led models. - Support set up of Advanced Manufacturing in Construction (AMC) and Modern Methods of Construction (MMC) factories. - Identify opportunities for using Circular Economy principles and cradle to grave approach within delivery processes. - Map material flows in the region to encourage circular economy approach.	- Broker relationships between symbiotic businesses in the region.
2.5. Implement Auditing and Reporting Processes	**2.5.1** Develop brief to include systematic post-project reviews as part of delivery processes. **2.5.2** Select clear metrics against which WMCA will benchmark its performance.	- Standardize data reporting and monitoring across the combined authority. - Introduce requirement to undertake systematic post-project reviews to ensure continual feedback, learning and improvement. - Define specific roles and responsibilities across the supply chain to increase accountability on zero-carbon performance.	- Automate auditing mechanisms to improve compliance and verification.

Enabler 2:

Governance & Delivery Processes

Best Practice



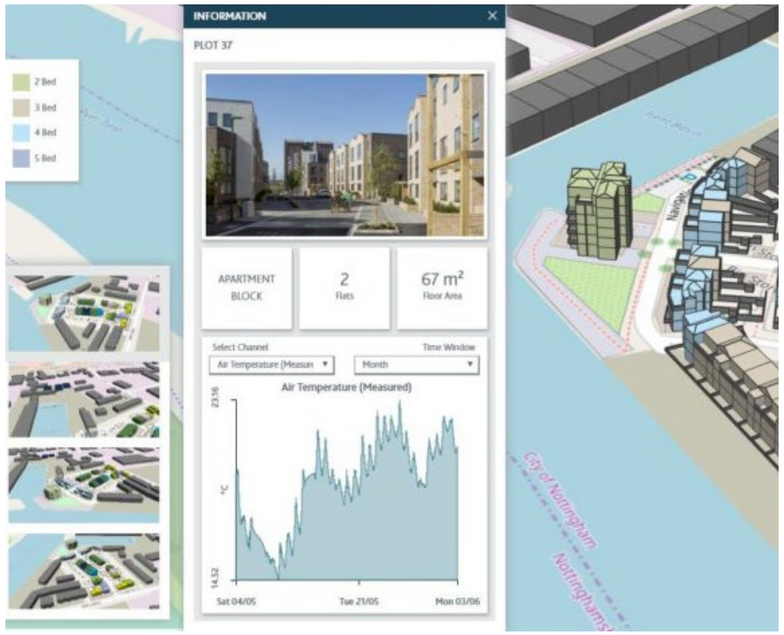
Test Bed, University of Edinburgh

How sustained cross-sector partnerships can drive innovation:

The University of Edinburgh began a cross-sector collaboration project aiming to create a step-change in emissions reductions from the built environment, as well as to improve how building projects are designed, managed and implemented through early-stage decisions and better on-going management of building performance.

The university is working with innovative technology companies, leading industry and public sector organizations. The project seeks to demonstrate the benefits of establishing sustained and effective partnerships between businesses, academics and the public sector in accelerating a transition to a low-carbon economy.

The University will also act as a living laboratory, testing digital tools such as Integrated Environmental Solutions' new Digital Twin technology, as well as advancing data analysis, modelling and simulation. They will maximise opportunities for wider take up of innovative solutions developed during the project through stakeholder engagement and communications.



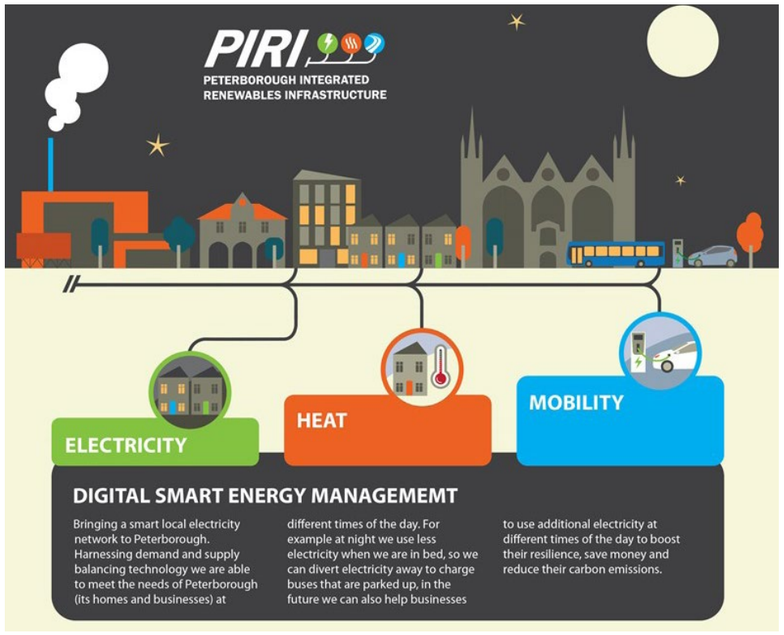
Project Scene, Nottingham

How to innovate with community-led energy schemes:

Project SCENe (Sustainable Community Energy Networks) looks to accelerate the adoption of Community Energy Systems within a housing development in the Nottingham Trent Basin.

The project hosts the largest community energy battery, and includes solar photo-voltaic (PV) panels, local thermal energy production as well as distribution and storage. The project will also advance development in home-smart technology, add communal electric vehicle facilities, a car sharing scheme and a ground source heating.

The project was successful in part by bringing together all the companies involved in the energy supply chain with the potential buyers of the 120 homes on site. This level of engagement and collaboration was supported by the development of novel consumer engagement tools. In addition to testing new models for community energy schemes, the project is also exploring new business models and preparing templates that can be tested on larger-scale housing development schemes.



PIRI Project, Peterborough

How to use cross-sector collaboration to reap the benefits of a whole-system approach:

The Peterborough Integrated Renewables Infrastructure (PIRI) project combines a next generation heat network, electricity network and electric vehicle (EV) infrastructure. This council-led scheme is the largest smart city regeneration project in the UK.

Led by Peterborough City Council, the two-year project is a partnership between SSE Enterprise, Element Energy, Cranfield University, Smarter Grid Solutions and Sweco UK.

By combining technical expertise from various sectors and industries, this project successfully brings together energy generation, demand and storage, thereby unlocking efficiencies not deliverable under our existing, traditional energy systems. The project advocated a 'whole-system' approach to energy by integrating all socio-technical elements into one solution. Taking a holistic perspective means that greater benefits can be achieved, including finding a balance between environmental gains and commercial viability.

Enabler 3:

Financial Capital

Summary:

There is an unprecedented availability of financing options with public and private investors increasingly seeking out opportunities to invest in sustainable projects.

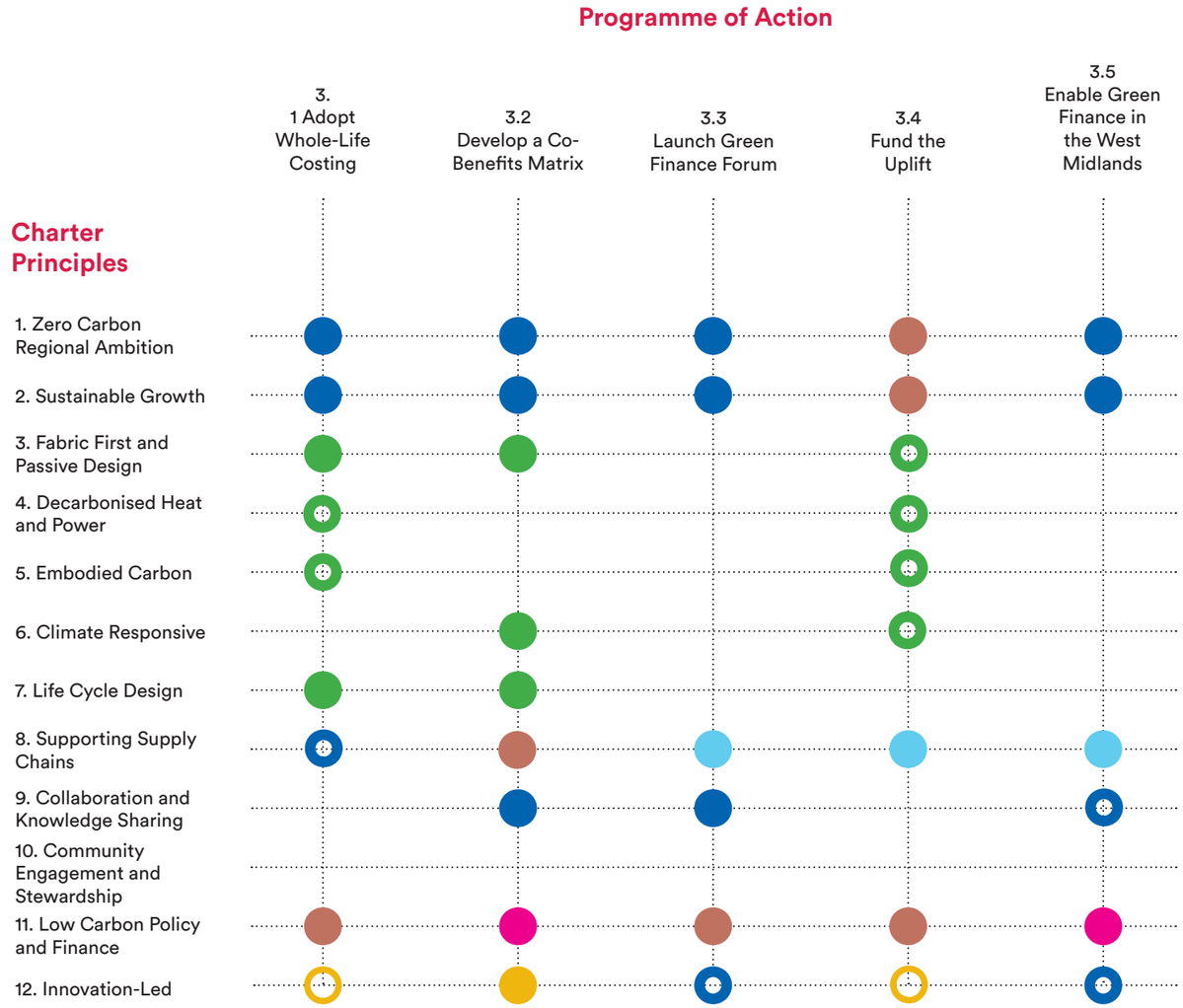
However the routes connecting financial capital with sustainable projects are not clear, in part due to a lack of data on the performance of zero-carbon technology and projects.

To help address this disconnect, we will convene green finance expertise and provide a brokering role between financial stakeholders and zero-carbon homes developers and supply chains.

This approach needs to be underpinned by better performance data as well as using whole-life value appraisal to inform our investment decisions, and those of our partners.

We will engage investors and build stronger partnerships with the financial sector, supporting the deployment of innovative financial mechanisms which can support the delivery of zero-carbon homes.

We will ensure our investments match our commitment to deliver zero-carbon homes and that we spend our money in ways that support decarbonisation and the delivery of wider social value and benefits.



Audience:

- Developers and Designers
- Policy-Makers
- R&D and HEFE Institutions
- Construction Supply Chain
- WMCA
- All

Key:

Programme of action: Strength of correlation with Charter

Innovative financing mechanisms and new business models can help fund the delivery of zero-carbon homes.

Enabler 3:

Financial Capital

WMCA Commitment

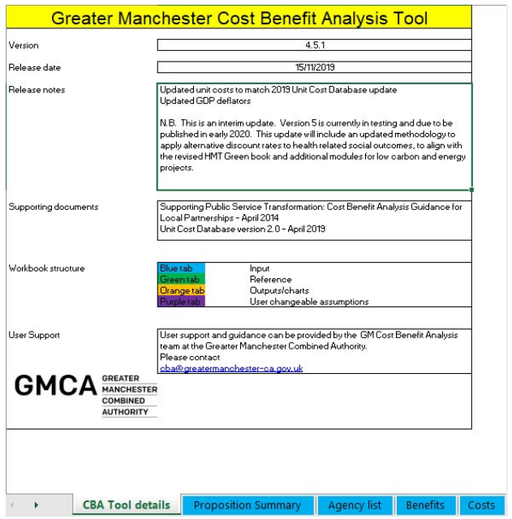
We will identify and implement new approaches to more accurately reflect the benefits of delivering zero-carbon homes, and the implications of failing to do so. We will leverage new and existing funding to accelerate building zero-carbon homes and achieve the economies of scale required to delivery them in the long term.

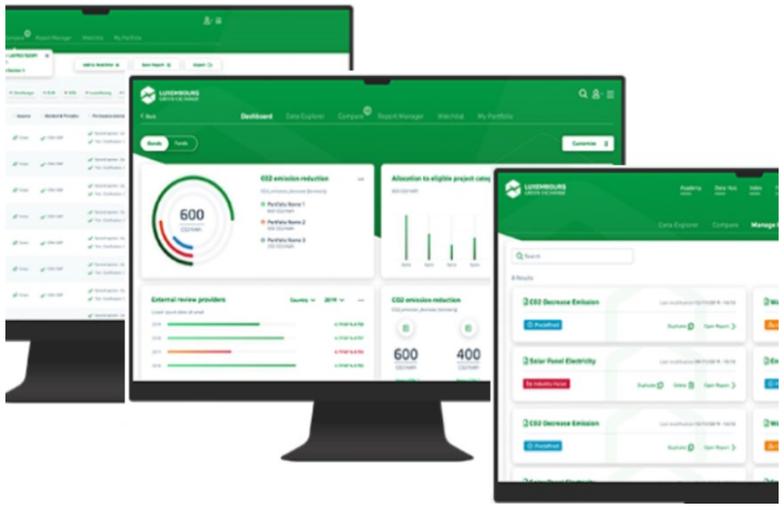
Programme of Action	2021 Actions	2022-2025 Actions	2025+ Actions
3.1. Adopt Whole-Life Costing	**3.1.1** Develop a common methodology to demonstrate whole of life cost-effectiveness of zero-carbon homes.	- Implement whole-life costing across WMCA with the help of a toolkit and guidance, and support members to do the same where they choose to. - Launch training for local authority members to better embed whole-life costing in their organisations' decision-making processes. - Collect real-time data to refine and update whole-life costing methodology.	
3.2. Develop a Co-Benefits Matrix	**3.2.1** Develop a co-benefit matrix to quantify the additional socio-economic benefits provided through the delivery of zero-carbon homes.	- Implement the co-benefit matrix. - Embed co-benefits matrix in business case development, tendering and procurement processes. - Quantify cost of inaction to inform decision-making processes. - Collect real-time data to refine and update co-benefits matrix.	
3.3. Launch Green Finance Forum	**3.3.1** Create terms of reference for a Green Finance Forum to broker relationships between investors and project developers and share financing insights. **3.3.2** Determine composition of the Green Finance Forum through stakeholder engagement sessions. **3.3.3** Identify partners in setting up Green Finance Forum through stakeholder engagement sessions.	- Launch the West Midlands Green Finance Forum. - Share financial data through the open data platform (See Enabler 5.1) to support further investment in zero-carbon projects and technologies. - Assist regional businesses in developing projects that match investors' funding requirements and support the delivery of zero carbon homes.	- Encourage regional businesses to develop financial structures that allocate funds for zero-carbon R&D innovations and pilot scaling up.
3.4. Fund the Uplift	**3.4.1** Develop an investment case for a zero-carbon homes dedicated fund and include zero-carbon criteria in the Single Commissioning Framework. **3.4.2** Determine how much carbon offset is permitted between 2021 and 2041. **3.4.3** Assess feasibility of setting up a West Midlands carbon offset fund managed by WMCA to pool resources across all local authorities and invest in larger zero-carbon schemes.	- Test the capacity of smaller regional businesses and house builders in delivering zero carbon homes and support them accordingly. - Explore alternative development finance options for zero-carbon homes through a series of cross-sector stakeholder workshops. - Launch a WMCA performance-based offset fund.	
3.5. Enable Green Finance in the West Midlands	**3.5.1** Identify opportunities to use innovative business models and financing mechanisms through engagement sessions with investors.	- Partner with financial stakeholders to accelerate the use of green finance mechanisms. - Support mechanisms for leasing equipment within the construction industry. - Create financial incentives to attract low-carbon businesses to the region. - Work with mortgage brokers and insurance companies to increase demand for zero-carbon homes. - Support the inclusion of a premium, as well as a discount, on green loans.	- Explore potential of creating a municipal bond market open to all WMCA local authority members.

Enabler 3:

Financial Capital

Best Practice





Cost Benefit Analysis, GMCA

How to a cost benefit analysis tool can support new investment and partnership models:

The Greater Manchester Combined Authority (GMCA) Research Team has pioneered the development of a cost benefit analysis (CBA) methodology to articulate the fiscal, economic and social value of sustainable interventions.

The CBA model can be used to understand the value for money provided by an intervention and the extent to which new deliver models might generate savings and improved outcomes compared to business as usual. The model measures the economic benefits for individuals and businesses as well as the social benefits in terms of improved health and well-being.

The tool provides a way to compare interventions that may otherwise not be easily comparable. It also introduces the concept of equitability of funding by showing the money flows between organizations that invest in an intervention and those that derive the benefits. It can inform the development of new investment models that can support zero-carbon projects, as well as support new partnership approach with better risk and benefits sharing. The model includes an Excel workbook, a guidance and a unit cost database of more than 800 cost estimates.

LGX Data Hub

How to use open data to accelerate investments in zero-carbon projects

The Luxembourg Stock Exchange (LuxSE) launched LGX DataHub, a unique centralised database of structured data on a vast range of green, social and sustainable securities. The platform is aimed at helping asset managers and investors in building sustainable investment strategies and reporting on their investments.

Issuers of sustainable securities disclose an extensive amount of sustainability data points. These data points are made available in different and often incompatible formats and the data is spread over multiple sources. Identifying, extracting and structuring this data is a time-consuming and resource-intensive exercise.

By providing a centralised repository where relevant data has been aggregated in a consistent manner, the LGX Data Hub facilitates analysis and reporting, as well as comparisons of the impact of different sustainable investments. Such an initiative improves and increases trust and confidence amongst investors, which in turns accelerates sustainable finance.

These types of platforms can be used to share data on the performance of sustainable projects and zero-carbon technologies, increasing the appetite of private investors in investing in these type of ventures.

Service Cost Model, Netherlands

How to accelerate the deployment of service cost models:

Homeowners of a private apartment building in Assen secured finance to achieve their net zero energy target The homeowner association is the first in the Netherlands to have achieved a financing that is building-linked. Securing such finance has been easier for social housing association in the Netherlands, thanks to a regulatory tool that allows landlords to charge extra service costs to tenants of a zero-carbon building, usually through an energy plan.

The private tenants explored various building-linked financial solutions. The best one involved linked the mortgage to an object rather than an individual. The homeowner association would take the loan to retrofit the entire apartment complex and then collect the loan repayments through service costs that residents pay to the association. The only issue is that no banks had experience offering long-term loans to homeowner associations.

Eventually Triodos Bank offered a 30-year loan to the homeowner association bringing the loan repayment costs down to the residents' current energy bills. Since this success, more homeowner associations are seeking similar financial services with their local councils facilitating conversations with financial stakeholders and pushing for a broader rolling out of the service cost model for retrofit and new build.

Enabler 4:

Human Capital

Summary:

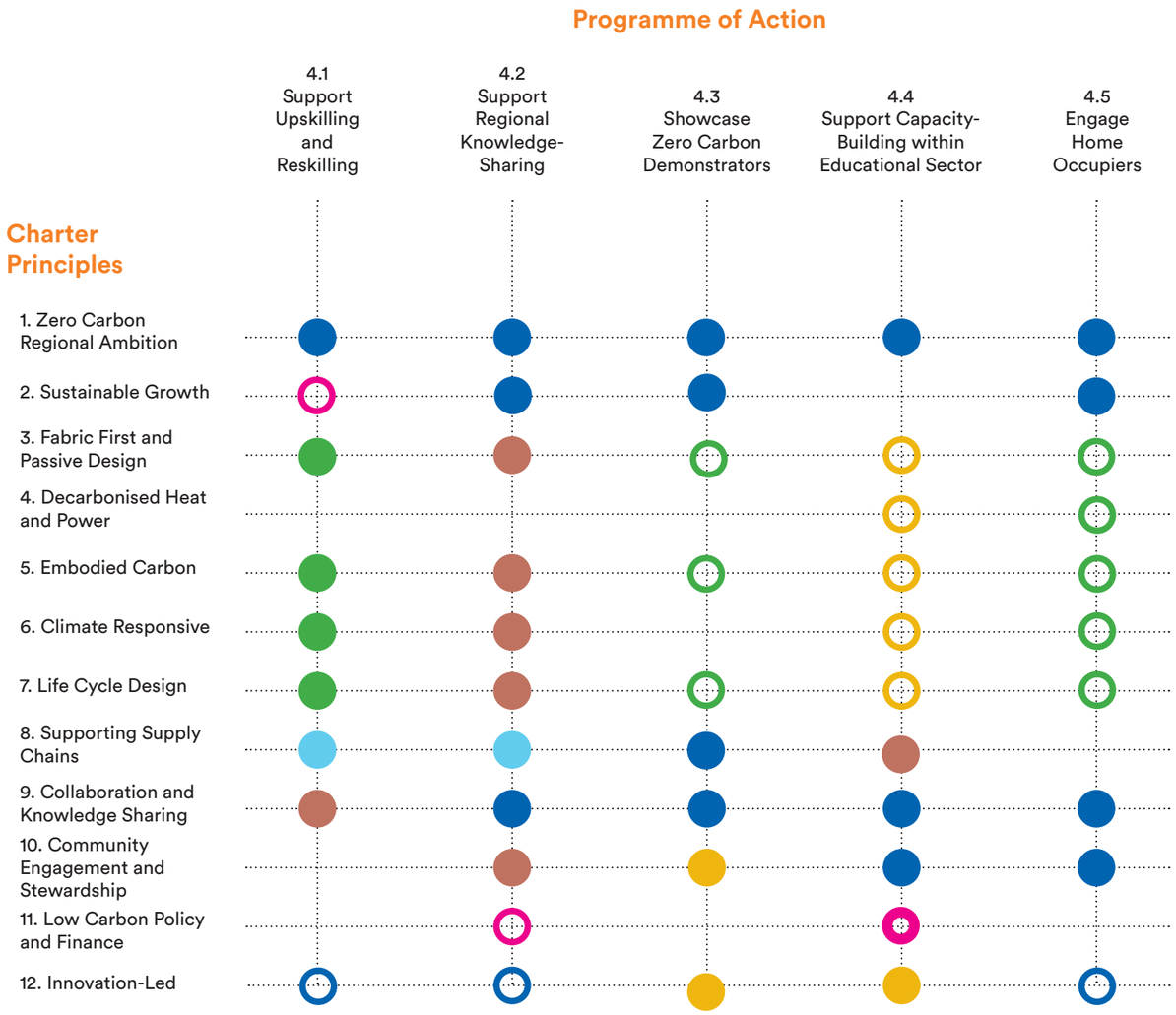
Building the skills and capacity of the supply chain and other supporting sectors and industries is at the heart of accelerating the delivery of zero-carbon homes and reducing the existing cost uplift.

With an estimated 300,000 new roles needed for retrofit alone, WMCA will support upskilling, reskilling and job creation within the zero-carbon built environment sector. We wish to accelerate the provision and uptake of zero-carbon skills and to support knowledge-sharing and capacity-building across the zero-carbon homes supply chain.

We will advocate for making zero-carbon an essential part of the formal educational curriculum in order to bring on board the next generation of built environment professionals on our journey to zero-carbon homes.

Engaging communities and homeowners is also fundamental to the success of delivering zero-carbon homes. Doing so will create demand for high quality new homes and ensure home owners and occupiers understand the technologies in their homes.

Crucially, engagement and knowledge-building will ensure that communities reap the socio-economic benefits of zero-carbon homes.



Audience:

- Developers and Designers
- Policy-Makers
- R&D and HEFE Institutions
- Construction Supply Chain
- WMCA
- All

Key:

Programme of action: Strength of correlation with Charter

Upskilling and reskilling are necessary to reduce the costs and accelerate the delivery of zero-carbon homes whilst future-proofing our educational sector.

Enabler 4:

Human Capital

WMCA Commitment

We will upskill planners and housing staff, local businesses, home occupiers and the supply chain to ensure the region has the capacity and expertise to build high-quality zero-carbon housing products. We will adress the known skills gap, and attract new talent to the zero-carbon construction sector.

Programme of Action	2021 Actions	2022-2025 Actions	2025+ Actions
4.1. Support Upskilling and Reskilling	**4.1.1** Develop and publish a skills routemap to identify skills gaps related to delivering zero-carbon homes. **4.1.2** Allocate resources for WMCA and local authority members' planners and housing staff to improve knowledge of zero-carbon terms. **4.1.3** Develop an investment case for a WMCA-led fund to invest in zero-carbon expertise required for specific projects. **4.1.4** Identify opportunities in using subsidized training programmes.	- Create a joint-fund for zero-carbon homes training programmes, in according with the zero-carbon skills routemap and in collaboration with educational providers. - Facilitate the creation of new roles, and required training, to support the delivery of zero-carbon homes. - Develop the evidence base on the true cost of delivering zero carbon homes to enable local authority members better negotiate with developers on viability issues.	- Identify further opportunities for targeted upskilling and reskilling programmes.
4.2. Support Regional Knowledge-Sharing	**4.2.1** Determine the composition and structure of a West Midlands Knowledge Sharing Hub, working with regional educational providers and other partners.	- Launch the West Midlands Knowledge-Sharing Hub to share data, provide training and encourage knowledge-sharing on zero-carbon homes. - Set up WMCA-led action-based knowledge schemes on delivering zero-carbon homes. - Encourage developers to set up training facilities on large-scale developments. - Support knowledge-transfer partnerships between different businesses and sectors, brokering relationships between stakeholders.	
4.3. Showcase Zero-Carbon Demonstrators	**4.3.1** Identify partners to showcase zero-carbon technologies, tools and innovations in regional university and colleges.	- Advertise demonstrators being showcased in regional universities and colleges. - Share knowledge from demonstrators with partners and across the supply chain to improve future delivery.	
4.4. Support Capacity-Building within Educational Sector	**4.4.1** Identify formal education courses where zero-carbon training could be embedded or strengthened thanks to WMCA's support. **4.4.2** Call for formal education system to include necessary zero-carbon skills and climate sciences.	- Support upskilling of trainers in pivotal built environment courses to build capacity. - Create new zero-carbon development opportunities to accelerate demand to accelerate the demand for existing zero-carbon courses and trainings. - With partners, engage with primary and secondary schools to communicate zero-carbon aspirations with younger generations.	
4.5. Engage with Home Occupiers	**4.5.1** Develop engagement programmes for new built residential homes occupiers and owners. **4.5.2** Create and disseminate a template for home occupier information packs (See Enabler 1.4). Engage with communities to ensure packs are designed with end-users in mind.	- Set up a zero-carbon housing expo to increase understanding and create demand for zero-carbon homes. - Set up technology engagement days and/or open-hous events to increase home occupiers' understanding of technology interface in zero-carbon homes. - Launch Carbon Heroes Campaign to celebrate community-based success stories and best practice.	

Enabler 4:

Human Capital

Best Practice

West London Construction Academy

How to address the built environment skills shortage:

Berkeley Skills Academy is one of the country's first pop-up construction academies which aims to tackle the UK's building skills crisis and stop the exodus of talent from the construction industry.

The state-of-the-art West London Construction Academy is situated on Berkeley's 88-acre regeneration site in Southall and was delivered in partnership with West London College. Southall Waterside is a large-scale development that is scheduled to deliver thousands of homes alongside new retail and community facilities over the next 30 years.

By locating the new training facility in the heart of the site, students can directly progress from the classroom to construction of the site, providing the skills necessary to meet the demands of delivery. The training facilities include a site cabin for classroom-based learning and a warehouse structure for practical training.

This model of skills learning can be replicated on other sites and helps showcase opportunities within the construction industry.

Design for the Future Living, BCU

How educational institutions can create new courses to provide necessary zero-carbon skills:

Birmingham City University (BCU) has launched a new BA(Hons) course called Design for Future Living. This course is a collaboration with MOBIE and aims to explore innovative ideas, new design methods, advanced technologies and entrepreneurial skills in order to critique, challenge and disrupt traditional thinking around the idea of 'home' and to develop radical alternatives.

BCU's long-term ambition is to continue to build the postgraduate offer in the area of future living, supporting better design and innovation around zero-carbon homes and homes fit for the future. Within the School of Architecture & Design and the School of Engineering and the Built Environment, the BCU already have ongoing research and consultancy projects, working in partnership with housing providers and local government organisations. These projects have explored low-carbon self-build homes, design for manufacture and assembly, building life cycle analysis, overheating and indoor air quality, as well as retrofit.

These type of courses and research initiatives play a key role in ensuring the next generation of built environment professionals have the necessary skills to drive the delivery of zero-carbon homes.

Housing Fair, Finland

How to engage home owners and occupiers with zero-carbon homes and their technologies:

Every year, for four weeks in July and August, the annual Housing Fair of Finland takes places. The event is one of the largest housing and living exposition in the world and showcases the ongoing and future trends in building and interior design.

The Housing Fair is set up in actual newly built residential areas, where homes with fully completed interior designs and new technologies are on display for communities to view and interact with. The houses are built for families who move in and live there after the Fair.

The needs of different demographical groups are taken into consideration at the planning stage and a wide range of building, renovation, interior design and landscaping solutions are presented every time. In 2020, the Fair focused on the future of housing showcasing 41 houses.

This event is a great example of how communities can be engaged in the development of zero-carbon homes. It also helps future home owners and occupiers to experience zero-carbon homes as well as to interact and get a better understanding of the technologies used in them.

Enabler 5:

Technology, Innovation & Infrastructure

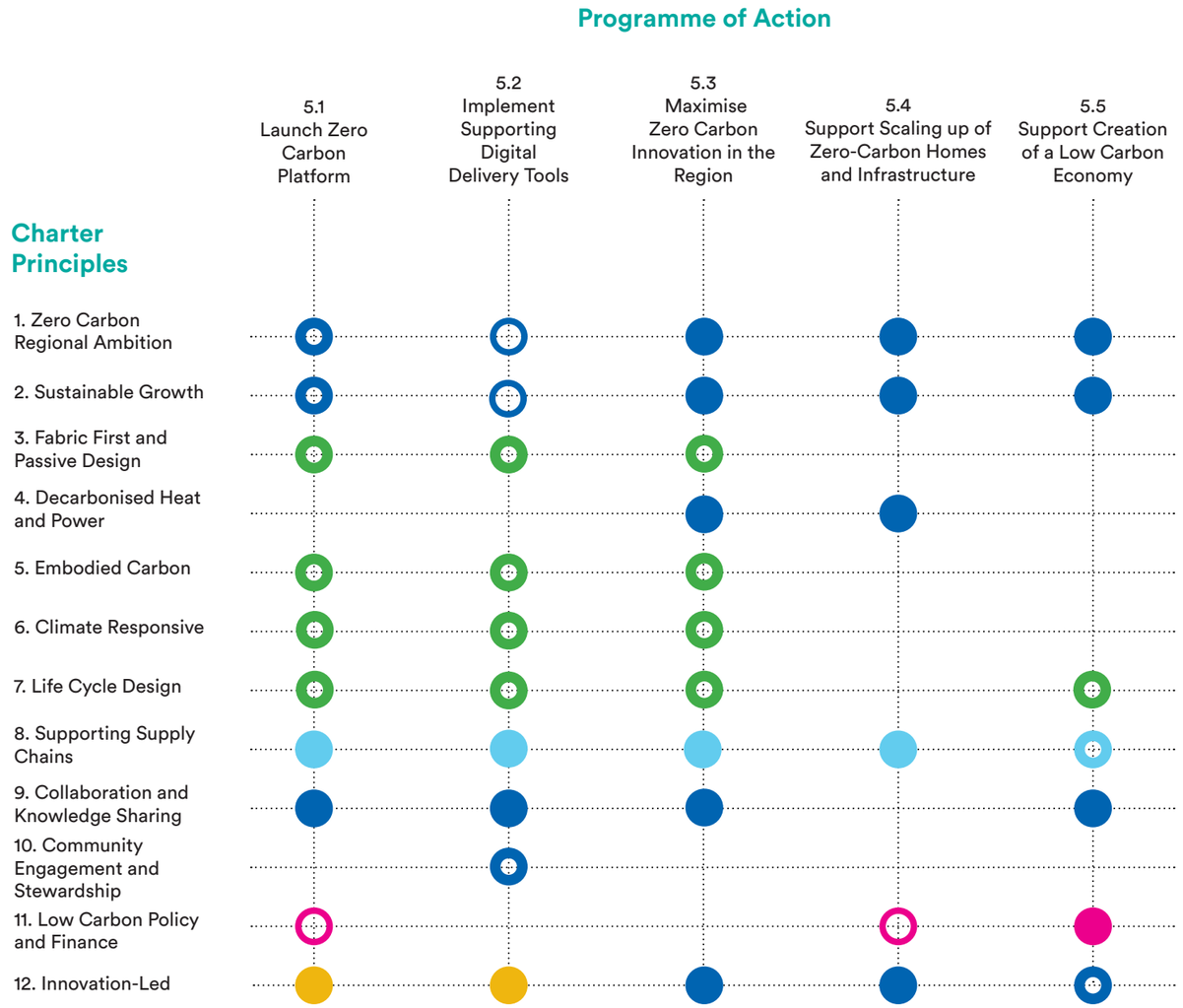
Summary:

Delivering zero-carbon homes at scale will require investment in innovative technologies and digital tools as well as wider infrastructure that support zero-carbon growth.

Regional supply chains and businesses will need to bring forward a wider range of zero-carbon products and services, from digital platforms to servicing of new technologies, which contribute to the provision of zero-carbon homes.

WMCA will ensure infrastructure is continually decarbonised, innovation is maximised, and zero-carbon technologies work to accelerate the transition to zero-carbon homes.

WMCA will also explore ways to stimulate the continual growth of a zero-carbon economy that can underpin and further support the delivery of zero-carbon homes in the West Midlands.



Audience:

- Developers and Designers
- Policy-Makers
- R&D and HEFE Institutions
- Construction Supply Chain
- WMCA
- All

Key:

Programme of action: Strength of correlation with Charter

Building zero-carbon homes will require investment in large-scale low carbon infrastructure particularly for energy and transport.

Enabler 5:

Technology, Innovation & Infrastructure

WMCA Commitment

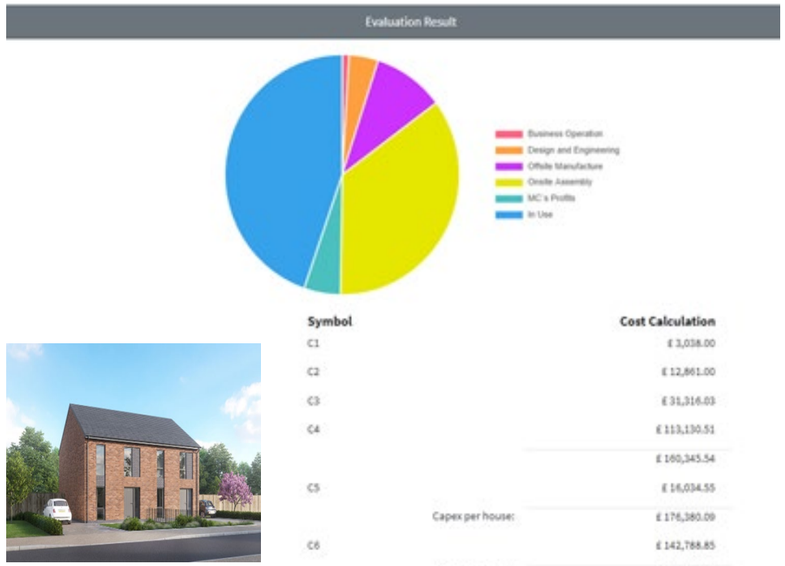
We will prioritise zero-carbon growth and boost the international competitiveness of the region in zero-carbon development. We will use our funding and land to support and showcase innovation and accelerate the drive towards digital skills and tools which will put this region at the forefront of the global net zero carbon transition.

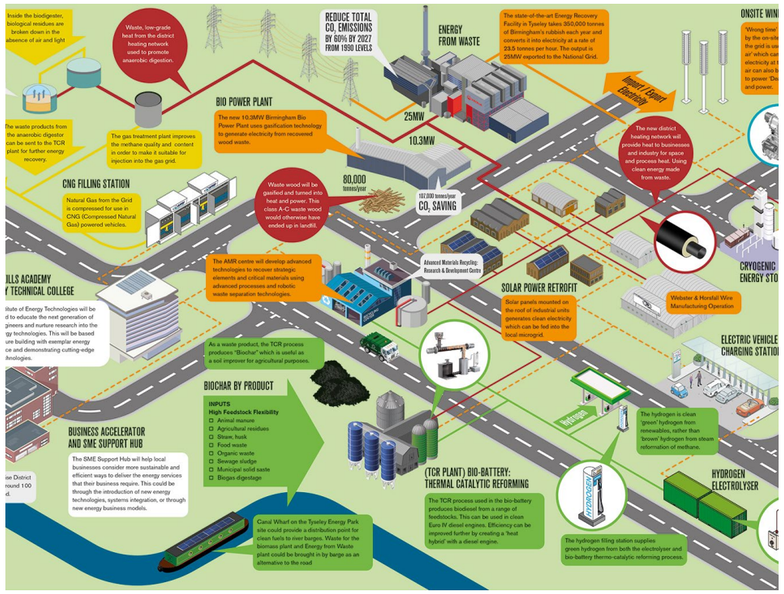
Programme of Actions	2021 Actions	2022-2025 Actions	2025+ Actions
5.1. Launch Zero Carbon Platform	**5.1.1** Develop a brief to create the 'Zero Carbon' open data platform which will integrate all data relevant to the delivery of zero-carbon homes (See Enablers 1.1, 1.2, 1.4, 2.2, 2.5, 3.1, 3.2, 3.3, 4.2 and 5.4).	- Launch the West Midlands 'Zero Carbon' data platform.	
5.2. Implement Supporting Digital Delivery Tools	**5.2.1** Develop a brief for Building Information Management (BIM) aiming to move from BIM Level 2 to BIM Level 3. **5.2.2** Develop a brief for digital delivery tools that support life cycle tracking of materials. **5.2.3** Engage with built environment industry stakeholders to identify the scope of other digital delivery services and innovations that can support delivering zero-carbon homes.	- Implement BIM from design to operation moving to Level 3. - Signpost existing database of EPDs for materials and components that support zero-carbon homes in the region. - Provide a list of preferred materials and products, with their associated EPDs, to be used in the region.	- Standardize the use of EPDs through EPD-based contracting. - Use Building Passports and set up a West Midlands Building Material Bank.
5.3. Maximise Zero-Carbon Innovation in the Region	**5.3.1** Work with Local Enterprise Partnerships (LEPs) and local authorities to build an online repository of best practice with insights on innovative technologies and processes successfully used. **5.3.2** Develop and adopt terms of reference to establish a Zero-Carbon Innovation Hub, including how it will be delivered.	- Set up the West Midlands Zero-Carbon Innovation Hub. - Encourage the use of innovative zero-carbon technologies and processes on sites WMCA owns, acquires and invests in. - Support R&D and innovation in low-embodied materials and circular economic processes.	
5.4. Support Scaling up of Zero-Carbon Homes and Infrastructure	**5.4.1** Identify existing pilot projects with potential for scaling up. **5.4.2** Identify potential of scaling up zero-carbon homes in Energy Innovation Zones (EIZ) or new dedicated housing and energy innovation zones. **5.4.3** Introduce requirements for developers to contribute to decarbonisation of large-scale infrastructure on WMCA sites in order to support the delivery of zero-carbon homes. **5.4.4** Develop and share a zero-carbon investment prospectus to match investors' interests with zero-carbon homes projects.	- Scale up existing pilot projects. - Invest in pilot projects across the region to give all local authority members experience in delivering zero carbon homes. - Use pilot projects to strengthen zero-carbon homes assembly and manufacturing skills in the region. - Support the development of further expertise within existing regional governance structures to ensure large-scale energy infrastructure is appropriate and future-proofed.	
5.5. Support the Creation of a Low-Carbon Economy	**5.5.1** Develop and deliver with LEPs a Low Carbon Economy brief to communicate the scale and types of opportunities for businesses in the region. **5.5.2** Work with the LEPs and the West Midlands Growth Company to broker relationships between supply chains and developers.	- Support a West Midlands circular economy with reuse networks and robust disassembly processes. - Mandate take-back schemes and re-manufacturing in procurement.	- Create regional material loops to retain waste at its highest value in the zero-carbon homes supply chain.

Enabler 5:

Technology, Innovation & Infrastructure

Best Practice





DfMA, Knowledge-Based Tools

How to use digital tools to scale up zero-carbon homes delivery:

The Design for Manufacture and Assembly (DfMA) house team from the West Midlands has developed a proof-of-concept knowledge-based engineering (KBE) tool to evaluate the life cycle cost and CO_2 emissions of offsite products. The tool measures the performance of various house design choices and offsite production systems, which in turn enables designers to choose which option will achieve the largest reduction in CO_2 emissions for the lowest life cycle costs.

The KBE tool links data extracted from BIM models and performance data sheets including operational energy performance data, repair, replacement, service and maintenance cost plans. It can provide general outputs, such as overall costs and carbon performance, as well as detailed outputs of a home's performance broken down by elements, activities and resources.

This tool showcases how digital solutions can improve decision-making early on during the development process, helping demonstrate the cost-effectiveness of zero-carbon homes whilst also driving innovation in delivery processes.

EIZ, Tyseley Energy Park, Birmingham

How to use EIZ to accelerate innovations in zero-carbon technologies:

The concept of the Energy Innovation Zone (EIZ) was born in the West Midlands, with its annual energy bill of £10 billion providing a platform to accelerate innovations in low-carbon energy. Energy Capital is working with the Department of Business, Energy and Industrial Strategy to scale up the implementation of EIZs and is trialling several energy innovation zones in the region. This includes Tyseley and Birmingham's EIZ.

Birmingham City Centre will undergo massive redevelopment over the next 15 years. It aims to transition to low-carbon mobility options but lacks space to build substantial clean energy transport refuelling infrastructure, including hydrogen and electric vehicle charging points.

Part of the solution is to use some of the industrial land available at Tyseley Energy Park to produce clean energy for the city centre and local communities and power a new clean transport refuelling infrastructure. The EIZ will become a hub for clean technology and will help entrepreneurs and low-carbon businesses develop innovative products whilst remaining competitive and attracting funding to the region.

LEO, Low Carbon Hub

How to accelerate community-led energy innovations:

Low Carbon Hub is a social enterprise which aims to encourage community-led energy systems and is driving innovations in community energy.

One example of an innovation project supported by the Low Carbon Hub is LEO (Local Energy Oxfordshire). LEO is one of the most ambitious, wide-ranging innovative and holistic smart grid trial being conducted in the UK.

The project seeks to improve current understanding of how opportunities can be maximised and unlocked to transition to a smarter, flexible electricity system and how homes and communities can realise this benefit. The project creates conditions which could replicate the electricity system of the future.

It provides insights into how Distribution System Operators will need to function in the future, how markets can be unlocked and supported, how to create new investment models for community engagement and how to support the development of a skilled community that can reap the benefit from new energy systems.

Conclusion

This Routemap includes numerous actions that will support WMCA and our partners ito realise our ambition of delivering zero carbon homes by 2025. By leveraging our funding and land in ways which support zero carbon development and the enabling policy framework required to underpin, we hope to make zero carbon homes the norm in this region.

Initially, implementation of the Routemap will focus on the actions for 2021, which aim to set the right conditions to deliver zero carbon homes. This includes building and enhancing our technical capacity, growing our expertise and improving and demonstrating the cost-effectiveness of zero carbon housing products.

The Routemap has been deliberately designed to ensure that there is ongoing scope to modify and adapt our approach. This means we can celebrate any new opportunities, respond to external changes, and continue to innovate and lead in achieving inclusive, clean growth.

Completed passivhaus residential scheme in Callaughtons Ash by Architype in Shropshire as part of a social housing development.

Passivhaus scheme plan for Bournville in Birmingham by Greenbox Associates.

Governance Process The Zero Carbon Homes Routemap is a WMCA- wide document, developed under the governance of the Housing and Land Delivery Board. Its successful implementation is reliant on all WMCA staff embracing it and embedding zero-carbon homes principles within their work. The delivery of this Routemap also requires partnership and collaboration between and within member local authorities and other key partners.

Monitoring Process We will develop an editable programme tracker, which will take the format of an Excel workbook. This workbook will include a framework to monitor progress against a set of Key Performance Indicators (KPIs). The latter will go beyond CO_2 emissions, ensuring we capture the whole-life value brought through zero-carbon homes.

Due Diligence Delivering zero-carbon homes will need us to review some of our priorities. As part of our due diligence processes, including those already embedded in the Single Commissioning Framework, we will ensure that delivering zero-carbon homes has no unintended consequences, and balance its benefits and impacts with those of other socio-economic drivers such as affordability, design quality, job creation and retention and more. WMCA will continue to seek to align and integrate these priorities to maximise co-benefits wherever possible.

Review Process This Routemap is a live document which will require updating over its lifetime. We will review this document on annual basis, or more regularly where appropriate e.g. in response to national guidance or new funding opportunities. This review will:

- Report on progress made in achieving planned actions and determine what is ‘on’ and ‘off’ track.
- Review internal or external changes that could affect the Routemap and its programmes of actions.
- Determine new actions to be undertaken, including highlighting any new opportunities that may arise. Any proposed actions will have to be properly evaluated and costed based on clear criteria which takes into account the whole-life value of an action.
- Provide a series of recommendations on how to accomplish next set of actions.
- Update the trackers and prepare a timeline of next year’s actions.

Additional Resources

Policy & Guidance

Programme of Action	Notes and Guidance	Additional Resources
1.1. Implement Passive Design and Fabric First Approach	- Low-Energy Design Guide can help set passive design and fabric first engineering requirements, minimum energy benchmarks for different typologies. Elements in the design guide should reflect the energy hierarchy, and include regulated and unregulated emissions. - Micro-climate modelling and orientation guidance should support adopting fabric first passive design approaches. - Sharing data on zero-carbon homes can help with viability negotiations. - The Sustainability Lead will collate relevant planning documents to assist with the creation of shared fabric first and passive design guidance. Guidance will sit alongside a suite of planning documents at the local level.	- Information on massing and orientation for passive design (as well as other information on building a passivhaus home) can be found here. - For more information on passivhaus, please visit the Passivhaus Trust's website. - Find out more about building low-energy and passivhaus buildings Making 'Net Zero' Happen. - The CCC Housing Fit for the Future report may also be of interest. - You can find more information about Eco-Vicarages by Associated Architects here and about Wooton Wawen here. Find information about Architype's passivhaus scheme here and about Bournville here.
1.2. Reduce Whole-Life Carbon	- Lifecycle design principles include lean design, building in layers, design for disassembly and support smart resource management. - The checklist will be user-friendly to assist officers in their decision-making processes. - Whole-life carbon assessments should inform decision-making throughout project lifecycle. Assessments will follow the RICS methodology. - To address whole-life carbon, low-carbon transport also needs to be prioritised including: investments in public transport, prioritising active travel solutions within the transport hierarchy, encourage transit-oriented and car free development and include requirements for EV charging infrastructure as a condition of WMCA's housing investment.	- UKGBC's Net Zero Carbon Buildings: A Framework Definition is available here. - LETI's climate emergency design guide can be accessed here and its embodied primer here. - RIBA Climate 2030 Challenge can be accessed here. - RICS Methodology for Whole Life Cycle Assessment can be found here. - More information about the circular economy can be found on the Ellen McArthur Foundation's website. - ICE database providing embodied carbon of various materials can be found on this website (link to a Google Drive). - Information on the Healthy Streets approach can be found here. - Transit-oriented development can also offer some insights for New Vista Homes. More information can be found here.
1.3. Maximise Low-Carbon Energy Supply	- The management and maintenance of energy infrastructure needs to be taken into account. - Electric led solutions such as Air Source Heat Pumps and Ground Source Heat Pumps should complement passive design solutions. - Smart systems will consider co-location of decarbonised transport solutions to encourage a whole-system approach to decarbonisation. - Energy systems solution should complement zero-carbon transport solutions and be coordinated at a regional level.	- Examples of low-carbon energy supply can be found on the UK 100 website. This is a great resource to learn about other projects and best practice.
1.4. Implement Post-Delivery Testing	- POE and Soft Landings should test for occupiers' thermal comfort and ensure new homes perform as they were designed to. - POE and Soft Landings will allow for continual learning and improvements. Data should be collected through shared open data platform and reviewed with partners, members and supply chains to capture and share lessons learnt. This can be done through the West Midlands Industry Forum (See Enabler 2.2). - Digitising POE and Soft Landing will make the processes more open and transparent. This is subject to GDPR.	- Information on Soft landing can be found in Government Soft Landings. - Information about how Soft Landings can help bridge the gap can be found here. - Information on POE can be found on the BRE website and the RIBA website which includes useful guidance.
1.5. Work with National Government for Stronger Zero Carbon Policies	- The outcome of the Future Homes Standards and other planning reforms is of particular interest to this Routemap. - Funding to plug the skills gap could also help increase the capacity of the formal education system in regards to built environment skills.	- Information on the Future Homes Standard can be found here. - More information on the Future Homes Task Force can also be found here. - You can read the 2020 Energy White Paper here.

Enabler 2:

Governance & Delivery Processes

Programme of Action	Notes and Guidance	Additional Resources
2.1. Enhance WMCA Governance Processes	- Sustainability Lead will work with local authority's point persons to develop guidance, set targets, and gather data. The Sustainability Lead will work collaboratively with the Environment Team, Energy Capital and Transport for the West Midlands to ensure joined-up thinking. - A key aim is to ensure a joined-up approach across the combined authority. - Coordination amongst services within the combined authority and across local authorities will also be required.	- Green Alliance has produced a report The Local Climate Challenge: A New Partnership Approach. One of its key recommendation is that a single point of contact within central government is appointed to assist local authority on their carbon neutral journey.
2.2. Maximise Collaborative Processes	- The Charter acts as a shared vision for the region. We will seek buy-in and support from all those involved in building houses including housing associations. - The Industry forum will ideally take a 'hub and spoke' avoiding duplications with other forums in the region and linking up with wider initiatives to maximise impact. It should be used to determine what the supply chains can deliver and what support they require. - The Industry Forum will share data on cost uplifts, carbon savings, co-benefits delivered and cost-effective delivery models. Aggregating this data will provide insights on the supply and delivery cost of zero carbon homes as well as the impact of scale on cost. It will help us challenge false conceptions around the cost uplift of zero carbon homes. - Collaborative models such as joint ventures will support risk-sharing and knowledge-building. - Community-led models such as Community-Interest Companies (CIC) co-design and land trust delivery will be encouraged. We will also encourage local communities to take a financial stake in zero-carbon projects in the region. Novel engagement tools and methods should include using 3D models, virtual reality.	- Kate Raworth's Doughnut Economics model is one of the frameworks used by local authorities to frame their sustainable aspirations and the delivery of their climate actions. This is useful to create shared vision that also take into account social value. - An overview of alternative delivery models can be found here.
2.3. Improve Supply Chain Engagement Processes	- Early engagement with supply chains is essential to improve delivery and should be done as early as possible in the development process. - Creating new commissioned partnerships with developers focused on delivering zero carbon homes will provide a pipeline for new units and opportunities for local supply chains to grow.	- Examples of industry forums include: Zero Carbon Forum, the Delivery Hub and C40 Cities Low-Carbon Districts Forum. - Edinburgh Procurement Pathfinder is exploring how to bring sustainability and carbon impact focus to the University of Edinburgh's procurement and construction activity, driving increased sustainability throughout the supply chain.
2.4. Scale Up Alternative Delivery Models	- Alternative delivery models include AMC, MMC, off-site construction, using cradle-to-grave approach, embedding circular economy principles to name a few. - Alternative delivery models also include land trust, community-led models, community build, Community Interest Company, community-led energy projects, joint ventures and other innovative partnership models.	- Information on adopting circular economy principles and the building in layers approach can be found in UKGBC's Circular Economy Guidance for Construction Clients. - A circular economy actor and resource map was produced by UKGBC and can be found here. - A Designing for Circularity Primer was produced by the Greater London Authority (GLA) and a Circular Economy Statement Guidance is currently under consultation. You can find more information here.
2.5. Implement Auditing and Reporting Processes	- Post-project review is critical to ensure continual learning and improvement. This ties in with implementing POE and Soft Landing processes. Data from post-project review will be shared at the forum.	- Examples of common methodology, reporting framework and tools include Carbon Disclosure Project, Tyndall Carbon Budget Tool and SCATTER Cities, resources which are free to public sector organisations.

Enabler 3:

Financial Capital

Programme of Action	Notes and Guidance	Additional Resources
3.1. Adopt Whole-Life Costing	- Whole-life costing will help balance additional capital expenditures (CAPEX) with long-term operational savings (OPEX). Whole-life costing will help us move away from looking at built cost only. This then needs to be reflected in procurement and tender processes. - Our whole-life costing toolkit should capture evidence and data from existing zero-carbon projects to provide a more informed view on performance and viability of these schemes. It will help in developing holistic business cases.	- Climate Change Committee Report on the cost uplift of delivering zero carbon homes can be found here. - UKGBC's report Building the Case for Net Zero can be found here. - Useful Project's Finance Climate Action report contains tips and advice on using whole-life costing.
3.2. Develop a Co-Benefits Matrix	- A co-benefit matrix will provide a communal way of quantifying the financial value of the benefits delivered by zero-carbon homes. - To develop this matrix we will work with members, partners and regional universities. - The matrix will ensure whole-life value of zero carbon projects is measured and informs decision-making processes. It will align with other WMCA policy priorities such as affordable housing and advanced manufacturing in construction.	- The National TOMS Framework 2020 can be found here. - Ashden's report on climate actions' co-benefits can be found here. - A report on delivering social value in new development can be found here.
3.3. Launch Green Finance Forum	- In identifying the composition of the forum, we will look at the skills and perspectives requires as well as participants willing to collaborate such as finance advisors, investors and suppliers of zero-carbon technologies. We will also evaluate if The Green Finance Forum should be a branch of a wider forum and connect with existing scheme. - The Green Finance Forum will provide advice on how to structure their assets and investments as well as provide networking opportunities between financial stakeholders, developers, and the zero carbon supply chain. - It will also share data with potential investors and funders on zero-carbon technologies and other solutions that are performing well and represent an interesting investment. - The Green Finance Forum will apply to both new build homes and retrofitting work.	- A report on delivering social value in new development can be found here. - Examples of existing Green Finance Forum include: The Green Finance Institute, and the OECD Forum on Green Finance and Investment. - Edinburgh Pathfinder is a good example of bringing investors local government and innovators together.
3.4. Fund the Uplift	- When exploring the potential of setting up a WMCA carbon offset fund, taking into account any administrative requirements. If we decide to set a performance-based offset fund, it will allow us to pool financial resources across the region and re-invest them in regional zero-carbon projects.	- Milton Keynes has set up a pioneering carbon offset fund which can serve as a best practice for WMCA. - A report on setting carbon price can be found here.
3.5. Enable Green Finance in the West Midlands	- Of particular interest to us is to explore Service Cost Models. This would also be beneficial for our retrofitting efforts. - We would like to accelerate the uptake of green and social bonds, green mortgages and green insurances. - We want to create a Green New Deal for the West Midlands which will create new jobs and help attract businesses that are involved in creating components required in zero-carbon homes.	- Find out more about reinventing retrofit in Green Alliance's report. - See the report on sustainability reporting standards. - Tideway is an excellent example of an organisation embracing the opportunities of green bonds with its Green Bond Framework.

Enabler 4:

Human Capital

Programme of Action	Notes and Guidance	Additional Resource
4.1. Support Upskilling and Reskilling	- The skills routemap will align with our retrofitting workstream. It will build on other research conducted on this topic including: CITB research Building Skills for Net Zero as well as the Sustainability West-Midlands Low Carbon Environmental Goods & Services study. The skills routemap will map existing training, courses and programmes in the region. As part of the process we will also engage with the supply chain and industry to determine existing and missing skills. - The short term fund is designed to provide zero-carbon expertise whilst expertise within the region is built and the cost of delivering zero-carbon homes is on par with traditional homes. - The joint-fund will be created between regional industries, local authorities and educational providers to invest in strategic built environment training programmes. Money from the offset fund could also be used in the long-term. - Targeted training will focus on: design skills (circular, passive etc.), predictive environmental modelling, EPDs, as well as passive design, air tightness and insulation techniques. - Support new roles will include: supporting apprenticeships, recognising the importance of operations and facilities managers, and facilitating reskilling for these new roles. Reskilling should also focus on people looking to transition away from carbon-intensive built environment sectors.	- Guidance and a template to conduct a skills survey as well as additional guidance to build local authorities' capacity to respond to the climate crisis can be found in Pathways to Climate Action. - The Big Rig: Low Carb scheme is a good example of reskilling people within the zero-carbon construction industry through action-based learning. - The West Midlands benefits from existing collaboration between education providers and housing providers. An example is the DfMA's factory-assembly social homes. - Another relevant case study is the MOBIE Northumbria Homes for the Future Innovation Centre. - Another interesting case study is The Marches Centre of Manufacturing & Engineering (MCMT) Career Day. They hosted one of the largest Career Day for engineering and manufacturing. This event engaged young people and mature learners to explore the latest apprenticeship opportunities available in the country.
4.2. Support Regional Knowledge-Sharing	- The Knowledge Sharing Hub will be linked to the Zero Carbon Platform (See Enabler 5.1) and will allow us to aggregate data on the true cost-uplift and other tangible benefits of zero-carbon homes. - The Knowledge Sharing Hub will encourage multi-disciplinary knowledge-sharing as well as upskilling across all sectors and all levels of a organisation.	- Examples of other Knowledge Sharing Hubs includes the Commonwealth Secretariat's Education Hub as well as the Knowledge Hub a digital tool for public sector collaboration.
4.3. Showcase Zero-Carbon Demonstrators	- Demonstrators can help future home occupiers get more familiar with zero-carbon technologies that will be in their homes.	- A nature-based solutions Living Lab is being set up at Salford University or the Living labs at the University of Bristol.
4.4. Support Capacity-Building within Educational Sector	- The aim is to build volumetric capacity within the formal education system to support upskilling of younger generations working within the built environment.	- Resource on support formal education in mainstreaming low-carbon skills.
4.5. Engage with Home Occupiers	- The home occupier template will include information on maintenance and replacements. It will help ensure home occupiers understand their homes as well as the technologies in it.	- The Finnish Housing Fair attracts more than 250,000 visitors every year and showcases latest trends and technologies within the housing industry. - Research on views and attitudes of home occupiers towards zero carbon homes.

Enabler 5:

Technology, Innovation & Infrastructure

Programme of Action	Notes and Guidance	Additional Guidance
5.1. Launch Zero Carbon Platform	- The 'Zero Carbon' open data platform will allow us to share all data relevant to the West Midlands' zero-carbon journey. We will share data relevant to the Industry Forum, Green Finance Forum, Knowledge-Sharing Hub and Zero Carbon Innovation Hub. - The use of digital platform will help relieve burden from local authority members and remove layers of unnecessary bureaucracy. It is possible that the platform will integrate with existing platforms. - We will ensure it is a robust, flexible and open access platform. - When sharing data we will take commercial sensitivity into account.	- Carbon Disclosure Project offers an initial database of data and insights and a network of like-minded organisations.
5.2. Implement Supporting Digital Delivery Tools	- Digital delivery tools should facilitate sharing data, monitoring process as well as smart resource use (including energy management). - Promoting the use of smart systems provides us with more opportunities to collect data on zero-carbon homes.	- Insights on the BIM Framework can be found here. - Digital tools can help bring sustainability to scale as explore here.
5.3. Maximise Zero-Carbon Innovation in the Region	- The Zero Carbon Innovation Hub will incubate and accelerate promising new technologies and attract R&D, as well as businesses, to the region. Innovation challenges could be held every year. The Zero Carbon Innovation Hub will link with other hubs and initiatives in the UK. - When developing innovation-led knowledge scheme theme include: passive house standards and delivery, battery storage optimisation, heat pump and network options, smart energy management and AI.	- An example of a project aiming to maximise smart solutions includes Zero Carbon Rugeley. More information can be found here. Another example Regional Energy System Operator. You can learn more about it here. - Also of interest is the Home of 2030 challenge; a design competition created to drive innovation in the provision of affordable, efficient and healthy green homes for all. - Another relevant case study is the EIT Climate-KIC accelerator.
5.4. Support Scaling up of Zero-Carbon Homes and Infrastructure	- Scaling up projects will allow to share knowledge on best delivery models, procurement routes, cost uplift, carbon savings and co-benefits delivered. - Scaling up pilot projects can demonstrate how zero-carbon homes can be the norm and support setting higher benchmarks for the region. - It will be necessary to include infrastructure for zero-carbon transport. This includes charging infrastructure on site and ensuring that there is enough capacity at the local electricity substation to provide sufficient power for charging. - Future-proofing energy infrastructure equires close working with distribution network operators.	- Some tips on scaling up innovation projects can be found here. - EIZ can help with scaling up projects. Energy Capital's EIZ can be explored here.
5.5. Support Creation of a Low-Carbon Economy	- The Low Carbon Economy Brief will highlight opportunities for business growth from professional and construction services to innovation projects and technologies.	- PwC has produced a low carbon economy index in 2019.

Glossary

Workers in the Walsall Local Homes Factory.

Workers in the Walsall Local Homes Factory.

Alternative Delivery Models: An alternative delivery model can be a different way of managing, collaborating and contracting, or it can involve the establishment of a completely new organisation that could be wholly, or partly owned by the parent body or a completely independent enterprise. They range from small community-based initiatives, employee led spin outs (large and small), local authority companies, to substantial multi-stakeholder partnerships involving private and public sector organisations.

Building Information Modelling: Building information modelling is a process supported by various tools, technologies and contracts involving the generation and management of digital representations of physical and functional characteristics of places.

Building Passport: A Building Passport is a securely stored, online & up-to-date record of the physical attributes of a building through its life cycle.

Carbon Budget: An emissions budget, carbon budget, emissions quota, or allowable emissions, is an upper limit of total carbon dioxide emissions associated with remaining below a specific global average temperature.

Circular Economy: A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use and regenerating natural systems.

Cradle to Grave: A boundary condition associated with embodied carbon, carbon footprint and LCA (Life Cycle Assessment) studies. It includes the cradle to site results but also includes the GHG (GreenHouse Gas) emissions associated with the in use of the material or product (maintenance) and the end of life (disposal, reuse, recycling).

Demonstrator: In this Routemap, demonstrator refers to new technologies, innovations and tools relevant to zero-carbon homes. Pilot projects refer specifically to zero-carbon home schemes that have been or are being delivered in the region.

Embodied Carbon: Embodied carbon means all the CO_2 emitted in producing materials. It's estimated from the energy used to extract and transport raw materials as well as emissions from manufacturing processes.

Energy Innovation Zones: Energy Innovation Zones (EIZs) are designed to stimulate clean energy innovation to drive productivity, exports and growth. Unlike existing approaches, they will work not only to demonstrate new technologies, but also to turn them into fully commercial propositions.

Energy Use Intensity: Energy Use Intensity (EUI) can be defined as the measurement of a building's annual energy consumption relative to its gross square-footage.

Environmental Product Declaration: An Environmental Product Declaration (EPD) is a transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle.

Fabric First Approach: A 'fabric first' approach to building design involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems

Life Cycle Design: Life-Cycle Design is the environmentally sound design of products based on the whole life cycle starting from exploitation and processing of raw materials, preproduction, production, distribution, to use and returning materials back into the industrial cycles.

Material Banks: Material(s) banks are repositories or stockpiles of valuable materials that might be recovered. If those materials replace primary resources used during the construction, operation or refurbishment of buildings and their parts, the need for primary resource mining, for example, of rare earth elements, can be eliminated.

Modern Methods of Construction: Wide term embracing a range of offsite manufacturing and on-site techniques that provide alternatives to traditional house building. MMC ranges from whole homes being constructed from factory-built volumetric modules, through the use of innovative techniques for laying concrete blockwork on-site.

Zero Carbon: The Routemap uses UKGBC's definition of zero carbon focusing on operational and embodied carbon dioxide (CO_2) emissions. Net zero carbon means operational and embodied CO_2 emissions are reduced as much as possible, with the remainder offset to achieve a net balance. Low-carbon refers to construction, design and operational strategies to reduce operational or embodied carbon as much as possible.

Passive Design: In passive solar building design, windows, walls, and floors are made to collect, store, reflect, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer.

Photovoltaic (PVs): A photovoltaic (PV) cell, commonly called a solar cell, is a non-mechanical device that converts sunlight directly into electricity.

Post Occupancy Evaluation: Post-Occupancy Evaluation (POE) is the process of obtaining feedback on a building's performance in use. The value of POE is being increasingly recognised, and it is becoming mandatory on many public projects.
Social Value: The additional, wider benefits that can be created by organisations and projects, for individuals, communities and local businesses.

Soft Landings: The term 'soft landings' refers to a strategy adopted to ensure the transition from construction to occupation is enhanced and that operational performance is optimised.

Space Heating Demand: The amount of active heating input required to heat a building usually expressed in kWh/m²/yr. It is often calculated using building energy software applications such as PHPP, Deap or Sap.

Whole-Life Costing (WLC): Whole life costing is an investment appraisal and management tool which assesses the total cost of an asset over its whole life. It takes account of the initial capital cost, as well as operational, maintenance, repair, upgrade and eventual disposal costs.

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Authors
The Zero Carbon Route Map was produced by Useful Projects in December 2020.

- Project Director Judith Sykes
- Project Lead Laetitia Pancrazi

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