

IMPLEMENTATION PATHWAYS

NEW DEVELOPMENTS

CONTENTS

3	The purpose of this guide and the meaning of Net Zero for new development projects
4	Understanding the Towns Fund project type
5	Carlisle – Start with the Park: St Cuthbert’s Garden Village
6	Clay Cross – Low Carbon Housing
7	Blackpool – Multiversity
8	The benefits and opportunities of Net Zero new developments: building a business case
9	The project life cycle and key interventions
12	Design and planning
17	Construction and Operation
18	Monitoring and Evaluation
19	Further resources



THE PURPOSE OF THIS GUIDE AND THE MEANING OF NET ZERO FOR NEW DEVELOPMENT PROJECTS

Globally, approximately 38% of energy related greenhouse gas (GHG) emissions are attributed to the building industry, with 28% deriving from building operation and 10% from the materials used in their construction and maintenance¹.

To achieve net zero emissions by 2050 globally and in the UK, this decade must be spent at least halving emissions by 2030 from business as usual. These reductions must be applied across the entire building systems value chain, to stay on track with the goals of the Paris Agreement to limit the global temperature rise above pre-industrial levels to 1.5°C.

This means taking a whole carbon lifecycle approach. Our goal must drive down whole lifecycle emissions of buildings to net zero, not just [operational emissions](#). In pursuing this we need to view key decisions through the lens of whole life carbon impact.

When teams mobilise for urban development activity, they should look at ways of addressing community and public realm regeneration. New developments for the community should be prioritised, such as building clean, affordable and healthy housing with low carbon materials and near a green communal space.

The inadequacy of Britain's housing has been painfully revealed by the COVID-19 lockdown. Housing is society's infrastructure, yet we are still living in, and building, cramped, dark, unhealthy, isolating homes in neighbourhoods with little or no community infrastructure or green space. In 2019, approximately 13.4% of England households lived in fuel poverty², creating multiple chronic crises in health and care, as well as amplifying inequality and harming our wellbeing.

COVID-19 has dramatically impacted our economy. There's an urgent need to stimulate an inclusive, sustainable and low carbon economic recovery.

New development activity through neighbourhood regeneration is a very effective way to stimulate economic recovery while offering training and trading in new, green, lead markets. However, it is blocked by a huge shortage of traditional construction skills and increasingly centralised employment models, destroying opportunities for SMEs and local networks to take root and connect. Prioritising the building of new, connected education centres, skills & enterprise hubs and office space focused on sustainability, the environment and low-carbon technology will provide skills and employment opportunities and will boost the local green business sector. This will promote equity, prosperity and help towns to meet the UK's Clean Growth objectives.

Activity to achieve net zero is ramping up globally in the face of the climate crisis, and the built environment has a significant role to play in tackling this and many other critical areas mentioned above.

This document sets out some guidance to ensure that towns in the UK are building and maintaining new developments in an environmentally and socially just way, not only to reduce emissions and build resilience to the worsening effects of climate change, but to boost local economies and create thriving, healthy communities.



¹4 IPCC (2018), [Special Report on Global Warming of 1.5°C](#)

²[Annual Fuel Poverty Statistics in England, 2021 \(2019 data\)](#), Department for Business, Energy & Industrial Strategy



UNDERSTANDING THE TOWNS FUND PROJECT TYPE

The following pages are factsheets for how four different types of new development project (mixed use, residential, commercial and educational), from four towns (Carlisle, Clay Cross, Blackpool and Cheadle) that have published their Town Investment Plans, have embedded net zero in their projects. *If you would like to learn more about the projects, please contact your Town Coordinator.*





CARLISLE

START WITH THE PARK: ST CUTHBERT'S GARDEN VILLAGE MIXED USE

Carlisle have requested £2m for the St Cuthbert's Garden Village (SCGV) [project, as described in their Town Investment Plan](#). 'Start with the Park' will prioritise green space and public realm development in addition to the delivery of 10,000 new homes, new employment opportunities and a new neighbourhood centre, attracting working-age families. It is a transformative development supporting population and green economic growth. The project provides a connective, multi-modal green travel route connecting the key settlements of SCGV with Carlisle City Centre and high-quality leisure and recreation facilities.



CLEAN GROWTH

The **urban regeneration** project will grow Carlisle's population and create **new jobs**. Providing green infrastructure, such as 5 hectares of green space and public realm will improve health and wellbeing, and encourage the community to make full use of landscape quality.

CONNECTED PLACES

Enhancing transport links will **connect key residential and employment locations** with one another and the city centre, as well as promoting **sustainable, active travel**. Outcomes include 7km new walking and cycling routes lined with greenery, an increase in cycling and walking trips; and permanent changes in travel behaviour, resulting in **lower carbon emissions, reduced congestion and improved health and wellbeing**.

Fig. 1 St. Cuthbert's Garden Village – Carlisle TIP, from Carlisle Town Investment Plan



CLAY CROSS LOW CARBON HOUSING RESIDENTIAL

Clay Cross' low carbon housing project has been shortlisted in their [Town Investment Plan](#). The delivery of this project will include new and highly sustainable housing to meet the needs of local communities while bringing derelict and underused land back into use. One of the developments will form part of a low carbon energy demonstrator project.



INCLUSIVE COVID-19 RECOVERY

Improved residential provision in Clay Cross will enhance the townscape environment and improve perceptions of the place by residents, business, and visitors, with the potential to encourage investment in the area. Delivering **healthy, adaptable housing**, with a range of types and venues, will meet the needs of local communities.

CLEAN GROWTH

This project promotes **sustainable methods of construction** which are consistent with the wider Energy Network Strategy project, and is in keeping with aims to move towards low carbon growth in the UK. The scheme will be incorporated into the **energy network**, including potentially being **hydrogen ready**, as well as **linking the scheme to a decentralised, heat network**. The site can enhance **Town Centre Conservation Area**.

Fig. 2 Clay Cross Spatial Strategy - bird's eye view illustration, from Clay Cross Town Investment Plan





BLACKPOOL MULTIVERSITY EDUCATION FACILITY

Blackpool Council, Blackpool & The Fylde College and Lancaster University have sought Town Deal funding valued at £9m, to create a new world class learning facility in the form of a new 'Multiversity' which will be carbon neutral in operation. Read more in [Blackpool's Town Investment Plan](#).



INCLUSIVE COVID-19 RECOVERY

Whilst at an aspirational stage, the proposal for a Multiversity in the town centre will not only **impact on the skills agenda** but provide **substantial footfall into the town centre, providing a sustainable economic boost** to the town centre by regenerating over the long term. The aim is to create a new university experience that facilitates higher level **upskilling, reskilling and lifelong learning** within the Town Centre, improving social mobility and raising aspirations among young people, and freeing up an existing College site for residential development.

CLEAN GROWTH

The existing site has buildings that range between 10 years old to over 100 years old and the **new building will aim for carbon reduction targets** against the current 600 tonnes CO₂e per annum. The project will also support the wider Fylde Coast and the wider Lancashire area bringing with it associated **socio-economic, health and environmental benefits**.

Fig. 3 Depiction of the 'Multiversity' learning facility to be built in Blackpool

THE BENEFITS AND OPPORTUNITIES OF NET ZERO NEW DEVELOPMENTS: BUILDING A BUSINESS CASE

Net zero new development schemes can provide multiple benefits. Drawing on the social, economic and environmental value, that will be derived from embedding net zero into the new development project, will help to build the business case. In fact, investors are increasingly looking to build portfolios that take into account ESG (environmental, social and governance) factors. Benefits of embedding net zero include:



Think about how value can be generated through both financial and social return on investment, and through natural capital.

- Stimulation of the **local green economy** due to construction, skills and material requirements
 - **Green infrastructure** (proximity to parks, green roofs etc.) is well documented to increase the value of property
 - Mixed use developments with both commercial and educational facilities that embody net zero principles, such as commercial facilities for green businesses and education facilities providing courses on climate and sustainability, can strengthen business/education collaboration to **improve productivity and green employment prospects**
 - Commercial and education developments can improve productivity, **social mobility** and, in particular for the latter, **raise aspirations** among young people about a climate safe future
 - **Improved physical health** for users and nearby residents through:
 - better local air quality from clean construction and operation
 - facilitation of low-emissions, active mobility
 - a green space for fitness activities
 - **Improved mental health** for users through:
 - connection with nature (e.g. internal and external green and blue infrastructure, such as green walls and external features will attract wildlife)
 - social connection (e.g. green spaces for social interaction)
 - **Clean energy** can be generated locally with decent payback, for example by installing solar panels
 - All of the above benefits, for all types of new development, attract users and footfall, and can **boost the local economy through regeneration**.
-
- In addition to the above benefits, the following steps should be taken to build a business case for a net zero project:
- Ensure the project is aligned with relevant local, regional and national policy ([see page 17](#))
 - Ensure the project is properly managed and resourced.

THE PROJECT LIFE CYCLE AND KEY INTERVENTIONS

From the design right through to implementation and monitoring, there are many opportunities to make emissions reductions at each stage of a new development project. **New development projects should aim to achieve net zero operational and embodied emissions, while taking ambitious action on consumption-based emissions.**

Achieving net zero emissions will take time. **The project should adopt near-term targets, driving rapid emissions reduction now, aligned with the leading global commitments on emissions reduction³.** Achieving net zero emissions will also require holistic thinking. The Ten Priorities for London's Resilience⁴ are helpful to guide comprehensive integration of both net zero and resilience principles into urban development.



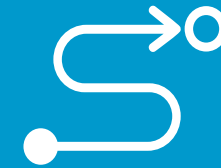
Plans for achieving a net-zero development should be sketched from the outset, as a large proportion of a building's emissions are situated at the beginning of the lifecycle.



³C40 Cities & Arup guidebook "[Green and Thriving Neighbourhoods](#)"

⁴NLA report "[Resilient London: confronting climate change](#)"

THE PROJECT LIFE CYCLE AND KEY INTERVENTIONS



Key considerations around the following themes include:

EMISSIONS

Emissions come from three sources:



1. Operational emissions are emitted during a building's lifetime. Annual operational emissions should be calculated using the Global Protocol for Community-Scale GHG Emissions (GPC) standard using the BASIC reporting level to capture Scope 1 and 2 emissions from stationary energy and transportation, as well as Scope 1 and 3 emissions from waste. The standardised GPC methods can be used to fill data gaps where necessary⁵.



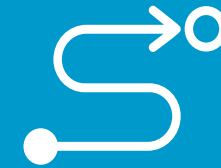
2. Embodied carbon emissions refer to a quantity of CO₂e associated with the construction processes and materials used to construct and maintain the building throughout its lifespan. All embodied emissions should be assessed, including those due to material extraction, manufacturing, assembly, maintenance, repairs, replacements, deconstruction, demolition and any associated transport, waste and end of life impacts. Embodied emissions only occur at specific points through the development cycle.



3. Consumption based emissions encompass full supply chain emissions from the construction of new buildings. It excludes operational emissions during a building's lifetime. Consumption-based GHG accounting is an alternative to the production-based approach to measuring GHG emissions. It focuses on the consumption of goods and services, and GHG emissions are reported by consumption category rather than GHG emission source category. Since this considers a far broader set of emissions sources, consumption-based emissions assessments inevitably involve more complex data and more detailed calculations.

⁵Sources for the above three definitions are The "Future of Urban Consumption in a 1.5 C World", Arup, C40 Cities & University of Leeds, the C40 Cities & Arup guidebook "[Green and Thriving Neighbourhoods](#)", the 2021 report by WBCSD & Arup "[Net zero buildings: where do we stand?](#)".

THE PROJECT LIFE CYCLE AND KEY INTERVENTIONS



CIRCULAR ECONOMY PRINCIPLES

These should be adhered to for all new projects and major retrofit in the design phase by:

- Using fewer materials or materials with lower embodied carbon, and use recycled steel and concrete where possible.
- Rewarding resource efficient and circular design.
- Considering the question: can we engineer and design the project from the outset in such a way that materials can be repurposed through their lifetime without emitting further carbon?



USING LOW CARBON TECHNOLOGIES

- Exemplar innovative carbon reduction technologies include roof mounted solar PV and associated battery storage and heat pumps.
- For these technologies, add the necessary systems at base level, such as, double thickness insulated walls, reinforced structures to allow for green roofs and new sustainable technologies including renewable energy sources.



INCLUSIVE GROWTH

In the context of infrastructure development, an inclusive growth-led view is how investment can create the kinds of places that people want to live and work in. Coupled with a net-zero approach, below are some steps to facilitate inclusive growth and people-centred design in new developments:

- Establish connection to local transport networks, with a focus on active and low carbon mobility
- Establish digital connectivity, for example reducing people's need to travel to meet up
- Set up amenity hubs, for example a café serving food and drink that is low-carbon and locally sourced

DESIGN AND PLANNING

CLEAN AIR ZONE

When designing a vision for a new urban development with net zero principles, it is important to inspire creativity and keep community at the heart of the project.

This diagram illustrates what a net zero mixed use development might look like, where residents, workers and students can enjoy access to all amenities required for day-to-day living, whilst breathing clean air, connecting with nature, and enjoying social interaction and physical activity. Described within the eco-business park building are some key features that should be adopted across all buildings in the new development.

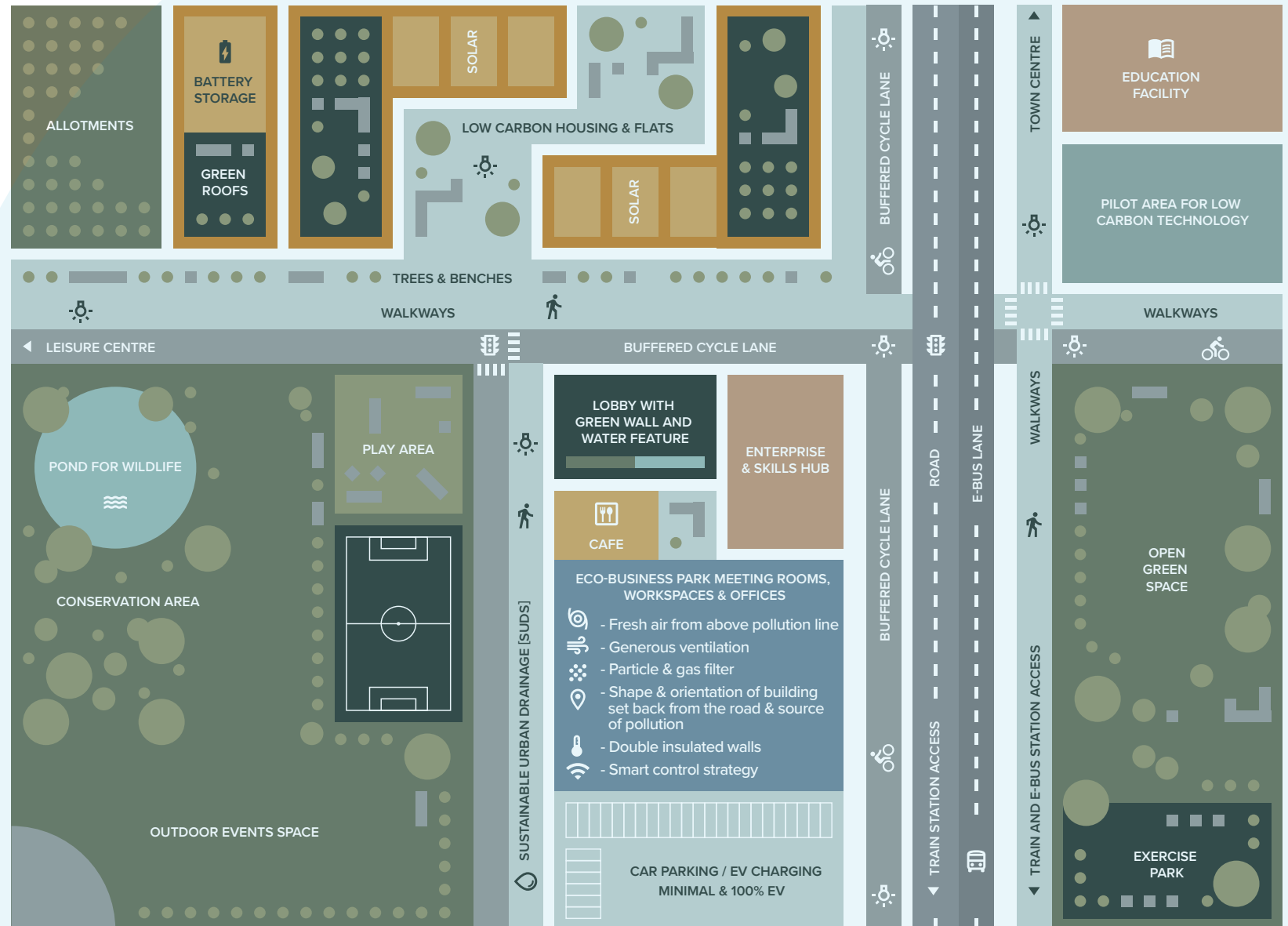
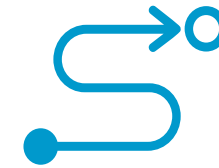


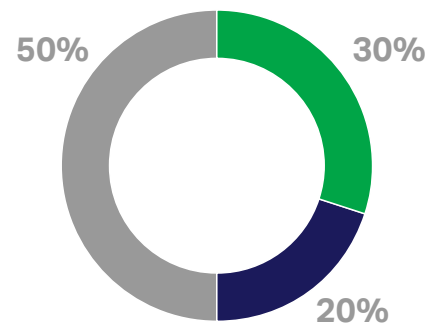
Fig. 5 Best practice - mixed use development illustration

DESIGN AND PLANNING



A whole life carbon approach must be adhered to from the outset of an urban development project. Below is a graph depicting how emissions are emitted over a building's entire lifecycle.

Figure 4: Estimated distribution of carbon emissions per life cycle stage



- Embodied A1-A5
- Embodied B-C
- Operational B6-B7

Figure 5: Whole life carbon emissions, Arup (2020)⁷

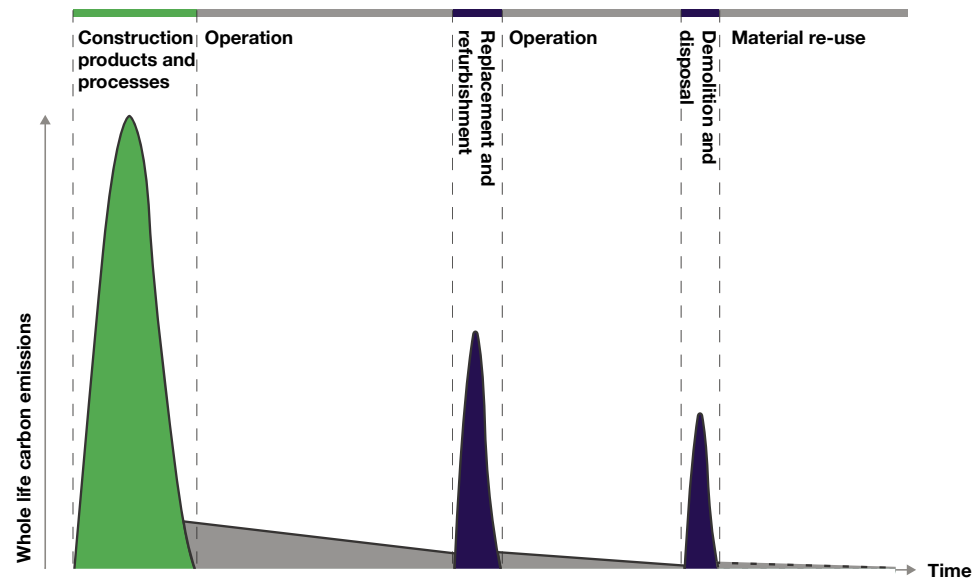
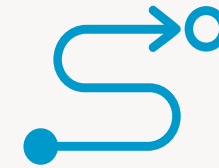


Fig. 6 Estimated distribution of carbon emissions per life cycle stage and Whole life carbon emissions, from the 2021 report by WBCSD & Arup “[Net zero buildings: where do we stand?](#)”

DESIGN AND PLANNING



In the 2021 report by WBCSD & Arup “Net zero buildings: where do we stand?” report, the below graphic depicts the sources of carbon at each stage:

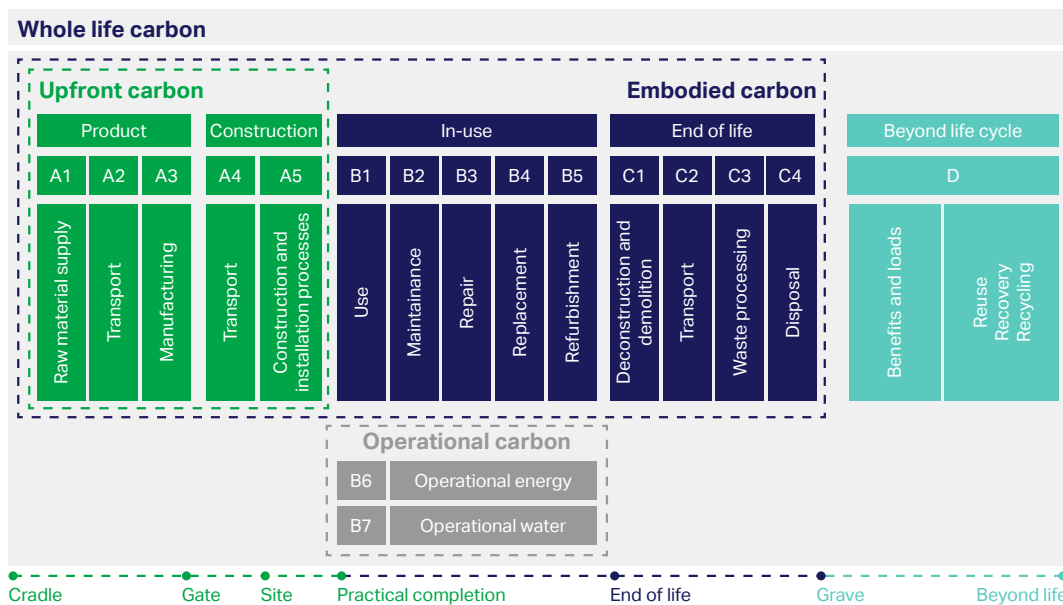


Fig. 7 Whole life cycle stages, from the 2021 report by WBCSD & Arup

These diagrams illustrate the importance of applying net-zero levers throughout a new development’s lifecycle, such as:

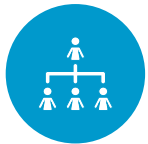
DEMAND SIDE:

Change the building brief e.g., require lifecycle assessment in planning permissions, position the new development back from the road and sources of pollution, consider building occupants’ demands (for example, green infrastructure), work with designers to use less resource, etc.

SUPPLY SIDE:

Decarbonise materials and energy, employ technology such as carbon capture and solar PVs, design to encourage sustainable transport such as EV and bike parking and EV charging, ventilate fresh air above the pollution line, etc.

DESIGN AND PLANNING



FRAMEWORKS

A selection of the following frameworks should be considered at the planning stage:

- [BREEAM](#) – Building Research Establishment Environmental Assessment Method, first launched in the UK in 1990. It sets best practice standards for the environmental performance of buildings through design, specification, construction and operation
- [LEED](#) – Leadership in Energy and Environmental Design is a voluntary environmental certification system developed by the U.S. Green Building Council in 2000 and is a competitor to BREEAM. It covers design, construction, operation and maintenance
- [WELL](#) – the leading tool for advancing health and well-being in buildings globally
- [FitWELL](#) – a certification and competitor to WELL
- [RIBA 2030 Climate Challenge resources. Royal Institute of British Architects](#)
- Aligning with the global ambition of the World Green Building Council (WGBC), the [UKGBC](#) published its first framework definition for net zero carbon buildings and a target for achieving net zero carbon for all new buildings by 2030 (and all existing buildings by 2050).



These frameworks are optional, but will significantly increase the market value of your urban development project, by mitigating risk, lowering running costs and attracting both investors and occupants.





DESIGN AND PLANNING

POLICY ALIGNMENT (ALL TYPES OF NEW DEVELOPMENT)

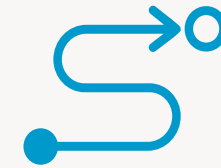
National level

- The UK Industrial Strategy aims to boost UK productivity and transform the economy, by strengthening the ‘five foundations’
- The UK’s Clean Growth Strategy provides an ambitious blueprint to decarbonise all sectors of the UK economy, and, more recently, the UK became the first major economy to make a legal commitment to net zero emissions by 2050. The Strategy also supports entrepreneurship and innovation in low carbon products and services.

- National Levelling Up Agenda

City/regional level

- Declarations of Climate Emergency
- Net Zero Plans
- Environment Plans incl. targets for carbon neutral living
- Local Industrial Strategies
- Digital Strategies
- Clean Air Plans
- COVID-19 Recovery Plans
 - Use combination of democratic processes, engaging communities, particularly the disadvantaged and poor communities worst affected by the pandemic, and business leadership, to determine the priorities and actions to recovery effectively and quickly
- Other plans e.g. innovation zones for low carbon industrial clusters.



POLICY ALIGNMENT (SPECIFIC TYPES OF DEVELOPMENT)

National level:

- The Town and Country Planning Association principles for Garden Settlements include ‘Development that enhances the natural environment, providing a comprehensive green infrastructure network and net biodiversity gains, and that uses zero-carbon and energy-positive technology to ensure climate resilience’
- The DfT policy paper ‘Gear Change: A Bold Vision for Cycling and Walking’, 2020 states that walking and cycling should be put at the heart of transport and place making
- The Housing White Paper ‘Fixing our Broken Housing Market’, 2017 states that well-planned, well-designed, new communities, such as garden villages, have an important part to play in meeting long-term housing needs. It emphasises that to be successful, garden villages must be supported by the necessary infrastructure, including recreational strategic open space.

CONSTRUCTION AND OPERATION

The [UKGBC Net Zero Carbon Buildings framework](#) sets out a pathway to achieving net zero carbon buildings not only in operation, but in construction as well, recognising that the indirect embodied carbon emissions associated with the manufacture and transportation of construction materials can be responsible for as much as 50% of a building's emissions across its entire lifetime. Circular economy principles can also be adhered to by using low to zero waste construction sites.

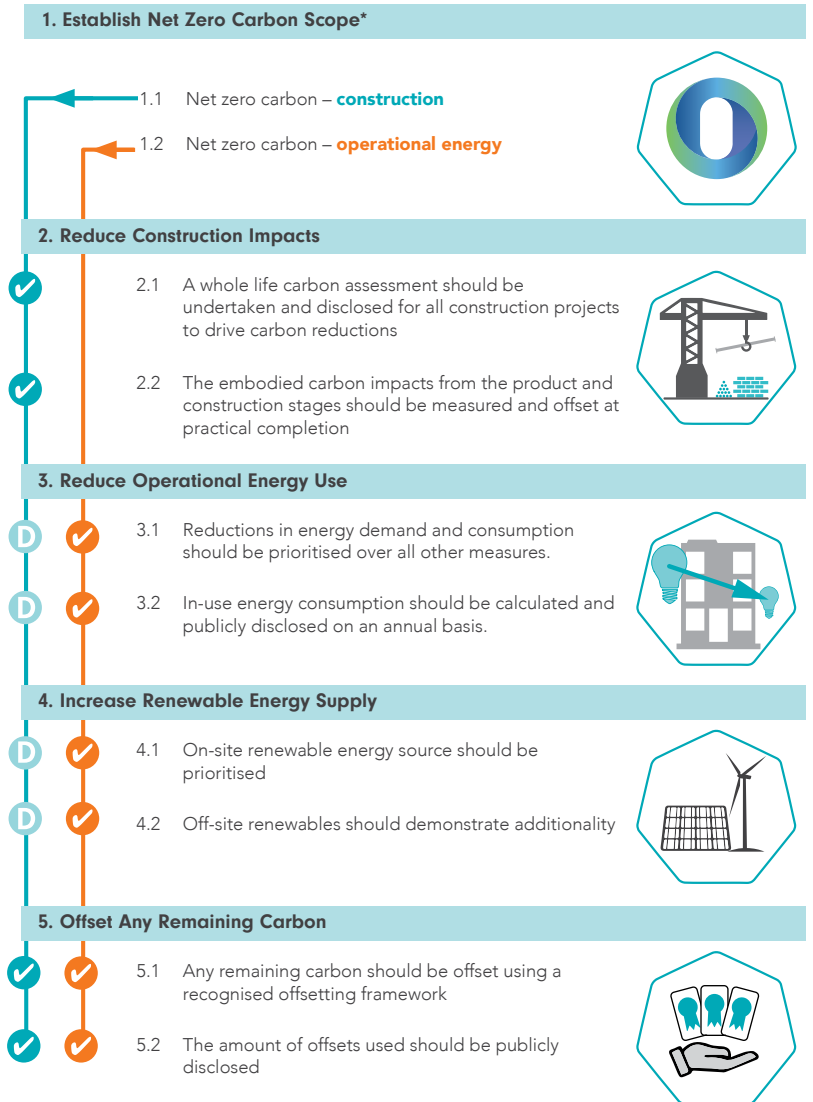
Some steps that can be taken to reduce embodied carbon emissions in construction are:

- Establishing a zero-emission construction site
- Using municipal purchasing power to procure or demand:
 - zero emission construction machinery
 - life cycle assessments (LCAs) and the diversion of construction and demolition waste from disposal for all municipal projects
 - construction materials with a low carbon intensity value, use “eco-branded” concrete and steel, which often have at least 30% reduced CO2 compared to non-eco-branded materials, use thermal efficient materials.



It is important to positively engage the surrounding community during the construction phase. Get them onboard by promoting how you are considering their needs in your project through your inclusive, net zero principles.

Steps to Achieving a Net Zero Carbon Building



D New buildings and major refurbishments targeting net zero carbon for construction should be designed to achieve net zero carbon for operational energy by considering these principles.

Fig. 8 from the UKGBC Net Zero Carbon Buildings Framework

MONITORING AND EVALUATION



Net zero is not a final state but an annual status that needs to be continuously monitored.

A monitoring framework should be adopted by the lead agency and disseminated to all stakeholders. The framework should monitor both emissions and quality of life⁶.

It is important, although challenging, to take account of and report on all emissions across a new development's value chain to ensure the project is delivering the benefits it set out to achieve. Taking a performance-based approach to monitoring and evaluation will help the building industry to innovate and achieve targets to halve emissions by 2030 across the buildings value chain. Some steps to deliver this include:



- **Establish M&E systems beyond the structure of the building** (metalwork, pipes) etc., but consider the impacts on the lifecycle of embodied carbon
- Performing a **whole lifecycle carbon assessment** (WLCA), where emissions are the carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal. The 2021 report by WBCSD and Arup "[Net zero buildings: where do we stand?](#)", contains a methodology for a WLCA
- Setting **carbon performance requirements** or other measures can aid comparison of options. While the overall goal is finding solutions with lower impacts, these options mostly perform in a similar fashion to make the comparison valid
- **Key performance indicators** (KPIs) can be used to model the anticipated performance of the new development during planning and design. The same indicators may be measured during construction and operation to test whether the expected performance is being realised. KPIs can be grouped into 'Reporting' metrics that summarise the overall performance (e.g. emissions reduction) and 'Monitoring' metrics that help track broader progress⁷
- **Share the data.** Sharing of data across building projects will facilitate the comparison and collaboration needed to inform decision-making to reach net-zero emissions across all members of the value chain.

⁶C40 Cities & Arup guidebook "[Green and Thriving Neighbourhoods](#)"

⁷C40 Cities & Arup guidebook "[Green and Thriving Neighbourhoods](#)"

FURTHER RESOURCES

GUIDE	AUTHOR	LINK
How to implement transit-oriented development	C40 Cities	Link
15-minute cities: How to create 'complete' neighbourhoods	C40 Cities	Link
How to start deconstructing and stop demolishing your city's buildings	C40 Cities	Link
How to reduce embodied emissions in municipal construction and lead by example	C40 Cities	Link
The C40 Clean Construction Declaration	C40 Cities	Link
Net-zero buildings: Where do we stand?	Arup & WBCSD	Link
Streets for Pandemic Response and Recovery	C40 Cities	Link
Rapid Response: Emerging Practices for Cities	NACTO	Link
Managing Streets during Lockdown: Around the World 24.04.20	Urban Design London	Link
Net Zero Carbon Buildings: A Framework Definition	UKGBC	Link
RIBA — 2030 Climate Challenge resources	Royal Institute of British Architects	Link
Green and Thriving Neighbourhoods: A pathway to net zero, featuring the '15-minute city	Arup & C40 Cities	Link
The Building System Carbon Framework: A common language for the building and construction value chain	WBCSD	Link
Resilient London: confronting climate change	New London Architecture (NLA)	Link
Net Zero Carbon Buildings: Three Steps to Take Now	Arup	Link

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