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ADVANCING NET ZERO

Net Zero Carbon Buildings:

A Framework Definition

APRIL 2019

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Foreword

Climate change is undoubtedly the greatest challenge of our times. The 2016 Paris Climate Agreement sparked renewed optimism that the global community can, and will, work together to reduce emissions and limit warming to safe levels. However, the science is now showing with alarming clarity how quickly we are running out of time to avoid catastrophic and irreversible changes to the world around us. We need to take urgent action to almost halve global emissions by 2030 and eliminate them completely by the middle of the century.

It is in this context that the term 'net zero carbon' has started to enter the mainstream. Businesses, government and civil society are all grappling with what net zero carbon will mean for them and how it can be achieved in practice. This report aims to make sense of this for the construction and property industry, and build consensus about the actions needed to achieve a net zero carbon built environment.

The framework set out in this report is intended as a first step towards delivering buildings that are in line with the aims of the Paris Agreement – namely net zero carbon across the whole life of a building. In practice, however, such an ambition would be challenging to deliver today without more accurate measurement and data of emissions. So, the framework presented here refers to two definitions for net zero carbon buildings – one for in-use operational energy and one for emissions from the construction process – which should be adopted by any organisation involved in the built environment that is serious about climate change mitigation.

The framework is initially intended to act as guidance, with tighter standards and targets developed over time in order to drive further action and accelerate change. This is a complex and emerging discipline for built environment professionals, so I encourage everyone associated with the design, construction and operation of buildings to engage with the framework, and to work with us in evolving the details over the years to come.

Together, let us demonstrate that our industry can lead on achieving net zero carbon.

Julie Hirigoyen
Chief Executive, UKGBC

Executive Summary

In late 2018, the IPCC issued a stark warning. It clearly established that achieving the ambitions of the Paris Climate Agreement, limiting warming to 1.5°C to avoid the most catastrophic impacts of climate change, will require action at an unprecedented pace and scale.[1]

Deep cuts in greenhouse gas emissions from the global economy are required by 2030, with net zero emissions by 2050. This enormous challenge can only be tackled by governments, businesses and civil society working together to take ambitious action to radically reduce emissions.

The World Green Building Council is catalysing the construction and property industry to lead the transition to a net zero carbon built environment, through its Advancing Net Zero campaign, which the UK Green Building Council (UKGBC) has embraced and adopted for a UK context. In the UK, the operation of buildings accounts for around 30 per cent of emissions, mainly from heating, cooling and electricity use.[2] While for new buildings, the embodied emissions from construction can account for up to half of the carbon impacts associated with the building over its lifecycle.[3]

The term 'zero carbon' has a particular connotation in recent years of UK Government climate policy. However, this report is intended to represent a distinctly new chapter. Whereas historical 'zero carbon' policies focused only on operational energy and modelled performance in new buildings, this report very clearly expands the scope to in-use performance and to encompass the whole life carbon impacts of both new and, crucially, existing homes and buildings. Moreover, this is not exclusively or even primarily, a report about government policy. This report outlines an overarching framework of consistent principles and metrics that can be integrated into policy, but primarily can be used as a tool for businesses to drive the transition to a net zero carbon built environment.

The framework has been developed by an industry task group of businesses, trade associations and non-profit organisations, undertaken in a spirit of collaboration and consensus-building. It provides guidance on the definition of net zero carbon buildings – both homes and non-domestic – and a way to demonstrate how a building has achieved net zero carbon status. It focuses on carbon impacts that can be readily measured and mitigated today – operational energy and embodied impacts of construction.

However, the framework cannot be static, and this iteration is only the first step. The scope and minimum requirements of the framework will need periodic improvements and updates over the next decade, in order to increase robustness and provide sufficient stretch for industry to lead the transition to net zero whole life carbon buildings.

THE FRAMEWORK

The net zero carbon buildings framework sets out definitions and principles around two approaches to net zero carbon, which are of equal importance:

Net zero carbon – construction (1.1):

"When the amount of carbon emissions associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy."

Net zero carbon – operational energy (1.2):

"When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

Developers aiming for net zero carbon in construction should design the building to enable net zero carbon for operational energy, and where possible this should be achieved annually in-use. Net zero carbon for both construction and operational energy represents the greatest level of commitment to the framework. A third approach for **net zero carbon – whole life (1.3)** is also proposed at a high level, but further work will be needed to define the scope and requirements for this approach.

The summary table on the following page outlines which principles should be followed to demonstrate alignment with net zero carbon for construction and for operational energy. The detailed framework in the full report includes the background rationale for the principle, associated technical requirements and, where relevant, any areas for future development of the framework. Public disclosure of data is required throughout the framework to demonstrate the approach taken to achieve net zero carbon and alignment with the principles. Suggested disclosure templates are set out in Appendix A and B of this report.

Steps to Achieving a Net Zero Carbon Building

1. Establish Net Zero Carbon Scope*

- 1.1 Net zero carbon – **construction**
- 1.2 Net zero carbon – **operational energy**

2. Reduce Construction Impacts

- 2.1 A whole life carbon assessment should be undertaken and disclosed for all construction projects to drive carbon reductions
- 2.2 The embodied carbon impacts from the product and construction stages should be measured and offset at practical completion

3. Reduce Operational Energy Use

- D ✔ 3.1 Reductions in energy demand and consumption should be prioritised over all other measures.
- D ✔ 3.2 In-use energy consumption should be calculated and publicly disclosed on an annual basis.

4. Increase Renewable Energy Supply

- D ✔ 4.1 On-site renewable energy source should be prioritised
- D ✔ 4.2 Off-site renewables should demonstrate additionality

5. Offset Any Remaining Carbon

- ✔ ✔ 5.1 Any remaining carbon should be offset using a recognised offsetting framework
- ✔ ✔ 5.2 The amount of offsets used should be publicly disclosed

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.

* Please also note, a further scope for net zero whole life carbon (1.3) will be developed in the future.

Image © Redevco

NEXT STEPS

As a freely available resource, the framework should be used by building developers, designers, owners, occupiers and policy makers to inform the development of building tools, policies and practices. Different stakeholders will utilise the framework for their own specific purpose, but the framework should enable a common understanding of how net zero carbon buildings are defined.

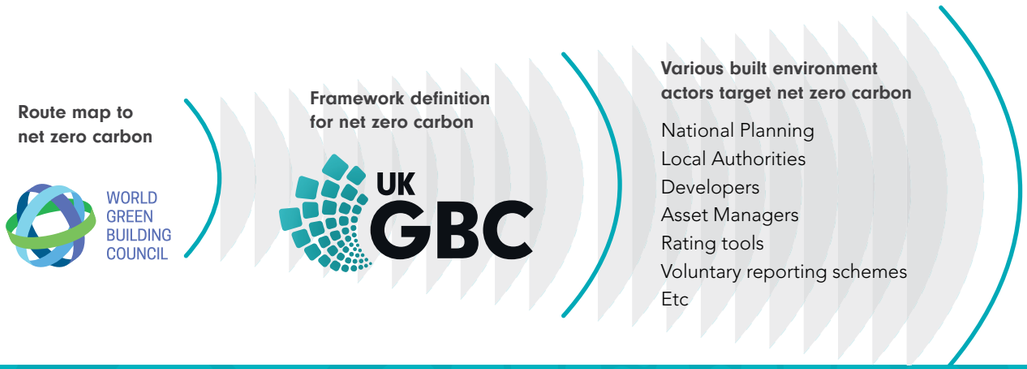
Further development of the framework

The framework sets out a number of areas where further development is needed. This includes the introduction of energy use intensity targets, development of an approach for whole life carbon, requirements for 'net zero ready' new developments, and more tailored consideration for residential buildings – please see the Future Development of the Framework section of this report for detail. UKGBC is committed to leading on updating the framework but cannot do this without active collaboration across the industry. The task group supporters and other relevant organisations will be invited to join a steering committee to oversee the process and ensure a consensus based approach to net zero carbon.

Energy use intensity targets

As an immediate priority, energy use intensity (EUI) targets for existing buildings must be developed over the next six months and integrated into the framework by the end of 2019. This can follow the methodology set out by the Dutch Green Building Council for 'Paris Proof' targets.[4] We call on the commercial real estate industry to work with UKGBC to develop these targets over the coming months, providing data and committing to testing their use.

This framework definition aims to act as a catalyst for all actors in the built environment to drive demand for net zero carbon buildings.



Applying the framework

The framework represents an industry consensus on how a net zero carbon building can be achieved today. Stakeholders are encouraged to apply the framework as a whole, or in its component parts, to help build the industry's capacity to deliver net zero carbon buildings. Actions that can be taken include:

Sign up to the global Net Zero Carbon Buildings Commitment

The WorldGBC Net Zero Carbon Buildings Commitment invites developers, landlords, occupiers and regional authorities to commit to all buildings in their direct control achieving net zero carbon for operational energy by 2030. We call on UK business to sign up to the Commitment and use this framework to achieve net zero carbon for operational energy, and to go even further by reducing embodied impacts from construction.

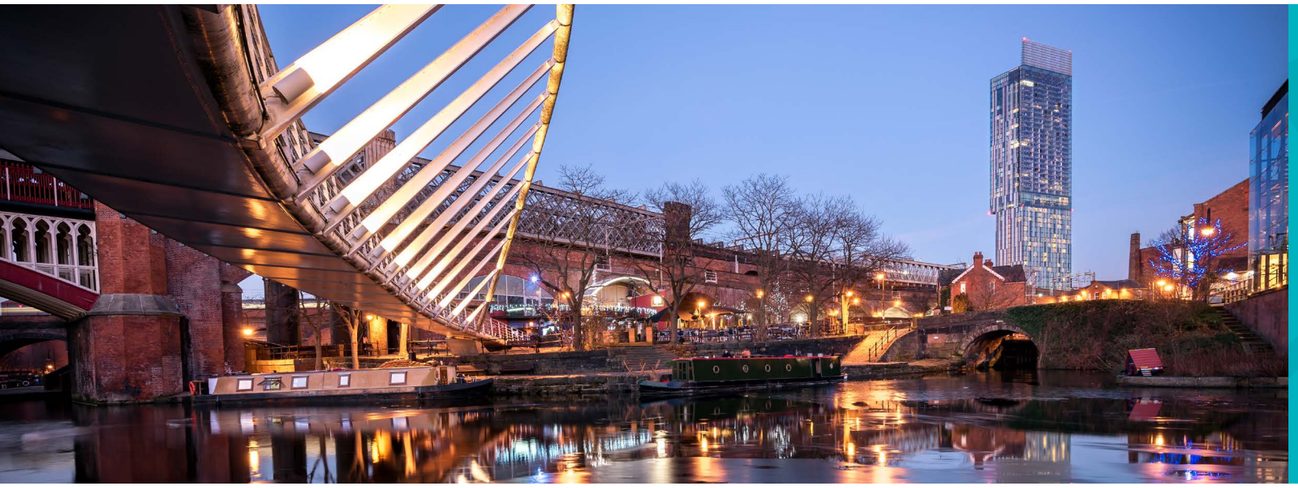
Target net zero carbon and share knowledge

We invite building developers, designers, owners and occupiers to 'take up the challenge' by applying the framework to their own projects and buildings, and then sharing knowledge and any lessons learnt. UKGBC will be compiling a catalogue of net zero carbon case studies profiling projects that either achieve net zero carbon for construction or operational energy, or those that involve approaches which align with the framework. To provide a case study, please get in touch with us at ANZ@ukgbc.org.

Integration into policy

There is a clear role for both national and local policy makers to support the framework and help drive the transition to a net zero carbon built environment. The principles can be used to help inform the direction of policies and public procurement – in particular, the focus on in-use energy performance and addressing embodied carbon – at both national and devolved/local level. We also welcome close collaboration with policy makers on the future development of the framework, to ensure that where possible future requirements for net zero carbon are aligned with the ambitions of policy frameworks relevant to buildings and construction.

Introduction



ADVANCING NET ZERO

The global Advancing Net Zero Campaign was established by the World Green Building Council (WorldGBC) in 2016 to catalyse the built environment towards meeting the requirements of the Paris Climate Agreement. The campaign has developed high-level principles for net zero carbon buildings in operation and has set targets for new buildings to meet this standard by 2030 and for all buildings to achieve this level by 2050.[5] This definition states that buildings should be highly energy efficient and all energy used should be from renewable sources, although offsets are permitted during the transition. Targets for net zero embodied carbon are also being developed and will be launched during World Green Building Week in September 2019.

WorldGBC has also led the development of the Net Zero Carbon Buildings Commitment[6], launched at the Global Climate Action Summit in September 2018. The Commitment challenges signatory companies, cities, states and regions to reach net zero carbon for operational energy in their portfolios by 2030, and to advocate for all buildings to be net zero in operation by 2050. It is intended to drive demand for net zero carbon buildings for operational energy use and allow the construction and property industry to demonstrate leadership in the transition to a low carbon economy.

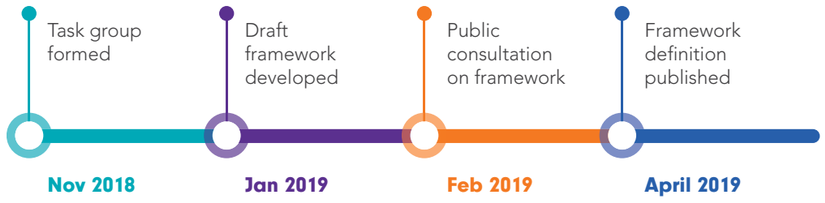
UKGBC has launched its own Advancing Net Zero programme to help drive this transition to a net zero carbon built environment in the UK. The programme is developing consistent approaches for the measurement, reporting and mitigation of in-use energy performance and whole life carbon emissions. This involves facilitating consensus across the industry on what are appropriate methods for rapidly advancing towards genuinely net zero emissions and then advocating their use to the wider industry and government bodies.

NET ZERO CARBON BUILDINGS TASK GROUP

As part of the Advancing Net Zero Programme, UKGBC convened an industry task group in October 2018 to develop a definition for net zero carbon buildings in the UK. The task group consisted of representatives from 37 businesses from across the building value chain and from 13 trade associations, professional institutions and non-profit organisations. Please see the Acknowledgements section of this report for a full listing of these participants.

The aim of the project was to build consensus in the construction and property sectors on a high-level definition, which will allow the building value chain to work towards a consistent outcome in tackling climate change. The intention was to build on the WorldGBC definition for net zero for operational energy but also start to account for embodied and whole life carbon to increase industry familiarity and fluency in calculating and addressing these emissions.

The task group developed initial draft proposals for a framework definition that were issued for consultation in February 2019. Feedback responses were received from across the building value chain, including over 50 written responses and over 100 in-person responses at two workshops, held in London and Manchester. For full transparency, a summary of the initial proposals, feedback responses and list of respondents is available alongside this report.[7] The task group and UKGBC then reviewed and updated the framework, in response to the feedback received.



Framework Definition for Net Zero Carbon Buildings

The framework outlined in this report aims to provide clarity on the definition of net zero carbon buildings in the UK. It offers an overarching framework of consistent principles and metrics that can be used to guide the transition to a net zero carbon built environment. As a freely available resource, it should be used by building developers, designers, owners, occupiers and policy makers. The principles should be used to inform the development of building rating tools, policies and practices.

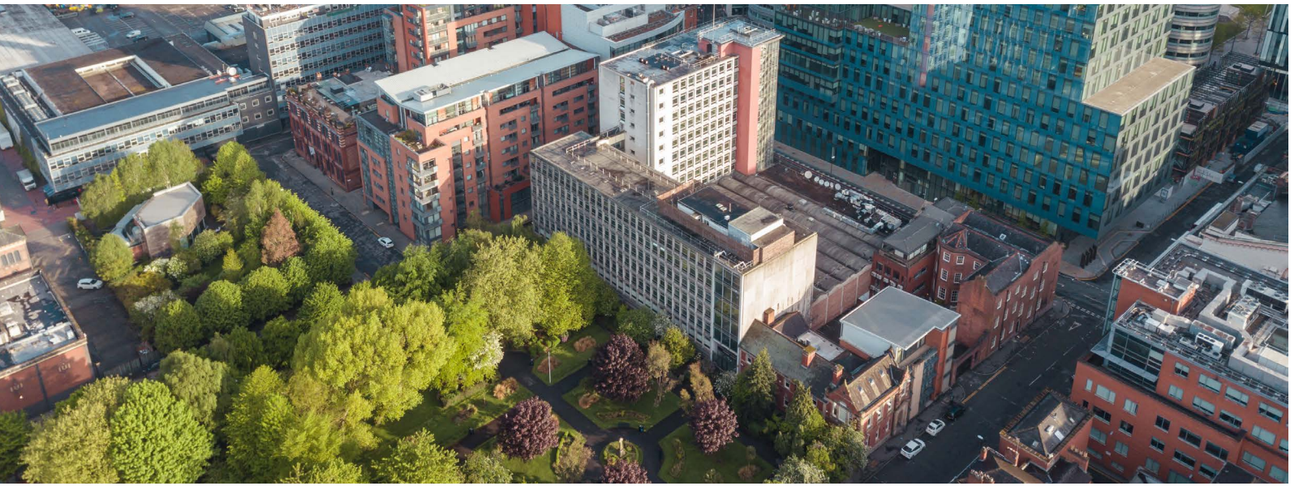
Different stakeholders may utilise the framework for their own purposes, but central to the framework will be industry consensus, enabling a common understanding of how net zero carbon buildings should be defined. The framework will initially act as guidance and a way to demonstrate how net zero carbon can be achieved for a building. Over the next five years, the scope and requirements of the framework will be developed to challenge the industry and ensure that net zero carbon can become a badge to demonstrate industry leadership.

1. Polluter pays
The cost of addressing emissions should be borne by the actors who are responsible for creating them. As far as possible, any emissions should be measured and offset at the time they occur, to encourage reduction and mitigation as first steps before considering any form of offsetting. Where appropriate, operational energy use should be delineated between the actors who have responsibility and/or the ability to influence energy use.

2. Improve measurement and transparency
As far as possible, building emissions should be based on measurement rather than estimates and using the most accurate data available. Public disclosure of emissions should also provide transparency about how this information has been collected and the approach taken by a building to achieve net zero carbon. Operational energy performance should be based on measured in-use energy consumption and generation, while whole life carbon assessments of construction impacts should be verified and updated at the point of completion.

The Framework; overarching principles

3. Encourage action today and tighten requirements over time
A net zero carbon built environment will require a whole life carbon approach to net zero carbon buildings, but the framework outlined here is limited in scope to areas where measurement and mitigation are feasible today – operational energy use and embodied carbon from construction. High level principles and metrics have been set out for these areas to guide actions and encourage public disclosure of data. Future development of the framework will introduce more robust requirements and targets, for example minimum energy efficiency targets, and expand the scope to take a net zero whole life carbon approach.



FRAMEWORK OVERVIEW

The framework sets out the two definitions for net zero carbon buildings and the approach that should be taken to demonstrate achievement of this status. The two definitions are:

1.1 Net zero carbon – construction (for new buildings and major renovations)

1.2 Net zero carbon – operational energy (for all buildings in operation)

The graphic on the following page sets out which sections of the report are relevant to each definition and the order in which each relevant section should be read. A building targeting net zero carbon for construction should be designed to achieve net zero carbon for operational energy.

Within each section are a set of principles that have been ordered in terms of priority and, again, should be reviewed in that order. Each **principle** sets out the approach that should be followed, including a **rationale** for the principle, associated **technical requirements** and, where relevant, any areas for **future development**.

Public disclosure is required throughout the framework to demonstrate the achievement of a net zero carbon building. The minimum reporting requirements for this are summarised in two templates, included as Appendix A and B.

A third definition, net zero carbon – whole life (1.3), is also proposed at a high level, but further work will be needed to develop the detail of this approach.

Steps to Achieving a Net Zero Carbon Building

1. Establish Net Zero Carbon Scope*

1.1 Net zero carbon – **construction**

1.2 Net zero carbon – **operational energy**

2. Reduce Construction Impacts

2.1 A whole life carbon assessment should be undertaken and disclosed for all construction projects to drive carbon reductions

2.2 The embodied carbon impacts from the product and construction stages should be measured and offset at practical completion

3. Reduce Operational Energy Use

3.1 Reductions in energy demand and consumption should be prioritised over all other measures.

3.2 In-use energy consumption should be calculated and publicly disclosed on an annual basis.

4. Increase Renewable Energy Supply

4.1 On-site renewable energy source should be prioritised

4.2 Off-site renewables should demonstrate additionality

5. Offset Any Remaining Carbon

5.1 Any remaining carbon should be offset using a recognised offsetting framework

5.2 The amount of offsets used should be publicly disclosed

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.

* Please also note, a further scope for net zero whole life carbon (1.3) will be developed in the future.

APPLICABILITY OF THE FRAMEWORK

This framework provides a set of overarching principles relevant to all building types and sizes. This enables the framework to be applied universally to achieve large-scale uptake of net zero carbon buildings. Ultimately, the framework is aiming for the maximum amount of floor area in the built environment to be verified as net zero carbon.

Boundaries for net zero carbon

In all instances, the building developer, owner or occupier seeking to achieve net zero carbon should do so over the greatest amount of building area they have influence or direct control over. In all examples, the boundary and related floor area should be clearly disclosed to allow the market to appreciate the extent to which the building developer, owner or occupier has achieved net zero carbon.

For **net zero carbon – construction**, the boundary is defined as all areas included in the whole life carbon assessment that have been reported and offset at practical completion. Where multiple buildings are being delivered, the aim should be to achieve net zero carbon for the whole development.

For **net zero carbon – operational energy**, the boundary (or energy scope) is defined as all areas under operational control or influence where a net zero carbon balance has been achieved on an annual basis. The energy scope should be disclosed to allow comparability between buildings.

Please note, the framework addresses scope 1 and 2 emissions only for operational energy use. For scope 3 emissions, UKGBC is developing industry guidance to assist commercial real estate companies in the measurement, reporting and reduction of these impacts. This guidance is due to be released mid-2019.[8]

	Boundary options
Net zero carbon – construction	• Tenancy (fitout or refurbishment) • Single building (new or refurbishment) • Multi-building development (new)
Net zero carbon – operational energy	• Individual dwelling/tenant area in multi-unit building • Base building • Whole building • Multi-building development • Portfolio (base building or whole building)

Applicability for homes

The framework places a strong emphasis on public disclosure to demonstrate how net zero carbon has been achieved and the extent to which the principles have been followed. For operational energy, it is recognised that the annual public disclosure of energy use, generation and offsets is currently more suited to commercial buildings than for individual homes. This is due to the limited extent of sophisticated energy monitoring systems in domestic properties and privacy issues with the use of energy data.

Initiatives such as Passivhaus and Energiesprong offer approaches to energy monitoring in homes while the Government's SMETERS programme is also looking to improve understanding of in-use energy performance.[9] The future development of a market for Green Mortgages is also likely to result in an increased emphasis on measuring in-use performance of properties.[10] Until these approaches become mainstream, it is expected net zero carbon for operational energy is mainly suited to homes where in-use energy performance is reported on an aggregated basis. This includes at a development-level where the energy of individual homes is totalled for that development, or at a building-level in the private or social rented sectors where energy is required to be reported.

The development of a 'net zero ready' route for new buildings will also provide an alternative route for new housing for sale. Please see the Future Development of the Framework section of this report for additional detail.

1. Establish Net Zero Carbon Scope

1.1 Net zero carbon – construction is defined as:

"When the amount of carbon emissions associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy."

Rationale

The carbon impacts related to the product and construction stages of a building are significant, in some cases accounting for half of a new building's whole life carbon impacts,[11] see examples on following page. By tackling these carbon impacts initially, a staged approach may be set for tackling whole life carbon impacts in future.

The suggested offsetting of these embodied carbon impacts up to practical completion rather than the whole life of the building reflects the fact that the UK building industry currently rarely measures or reports on embodied carbon impacts for the maintenance, repair, refurbishment and end-of-life stages of a building's lifecycle. This is due to a lack of reliable data being available for such stages, which would result in them being based on modelled estimates alone, and would reduce the robustness of the offset process.

Developers aiming for net zero carbon in construction should also design the building to enable net zero carbon for operational energy. Where the ownership of a building does not change after construction, the developer should proceed to achieving net zero carbon in operation when in-use. Net zero carbon for both construction and operational energy represents the greatest level of commitment to the framework. The preferred scenarios are detailed below:

Scenario	Preferred approach
Developer constructs building and maintains ownership	Achieve net zero carbon for construction and target net zero carbon for operational energy when in-use.
Developer constructs building and transfers ownership	Achieve net zero carbon for construction and design the building to enable net zero carbon for operational energy when in-use.

Technical requirements

A whole life carbon assessment should be undertaken to determine the building's carbon impact, in line with the RICS Professional Statement 'Whole life carbon assessment for the built environment'. Please see Principle 2.1 for additional detail.

A building's product and construction stages are defined as modules A1 to A5 of EN15978 ('embodied carbon to practical completion' as per Section 1 of the RICS Professional Statement).

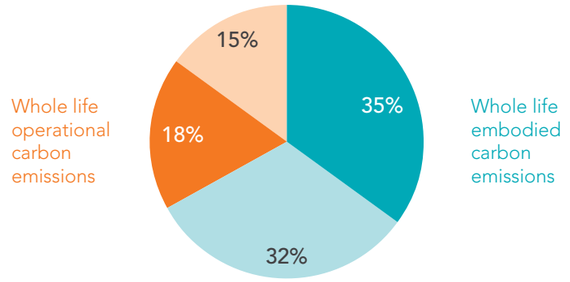
The whole life carbon assessment and the related offsetting of carbon (either through net export of on-site renewable energy or the purchase of offsets) should be audited by a third-party.

Please see Appendix A for the minimum reporting requirements.

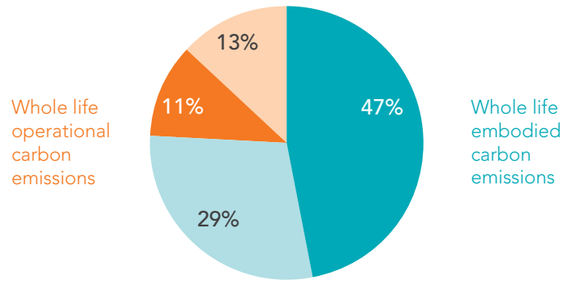
Please also see the following sections in this report for additional detail: 2. Reduce Construction Impacts and 5. Offset Any Remaining Carbon.

Examples of total whole life carbon emissions breakdown for new buildings
© RICS; Sturgis Carbon Profiling

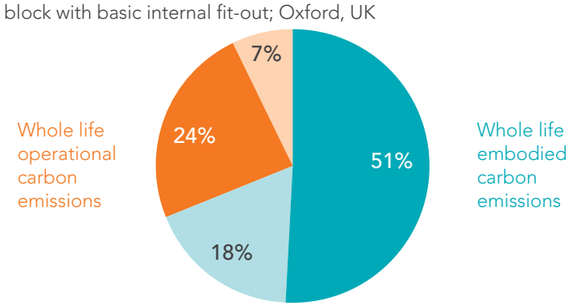
Office
Speculative office building with Cat A fit out; central London

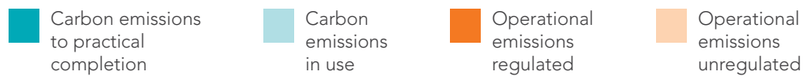


Warehouse
Typical warehouse shed with office space (15% by area); London perimeter, UK



Residential
Residential block with basic internal fit-out; Oxford, UK





1.2 Net zero carbon – operational energy is defined as:

"When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

Rationale

The energy used in the operation of existing buildings represents the most significant carbon impact from the built environment contributing 30% of the UK's total emissions in 2017.[12] This covers energy used for heating and cooling, cooking, lighting and plug-loads, but excludes commercial process loads and transport (electric vehicle charging).

The reporting of a building's carbon relates energy consumption to carbon impacts, allowing comparability in terms of actual impact of greenhouse gas emissions across buildings. For example, equivalent buildings in terms of type, use and energy consumption will have different carbon impacts dependent on the mix of energy sources used and any offsets applied.

The scope of net zero carbon for operational energy should be defined as all areas under operational control that have been used to demonstrate a net zero carbon balance. The energy scope should be disclosed to allow comparability between buildings. This does not limit the extent to which net zero carbon can be achieved, enabling the decarbonisation of buildings at scale.

As an example:

- A portfolio owner may demonstrate net zero carbon across the entire energy scope under their control (typically landlord areas); or
- The owner of a multiple-building development may demonstrate net zero carbon across the entire precinct (potentially whole buildings); or
- The building owner in a multi-let commercial building may demonstrate net zero carbon for all landlord areas under their operational control, and an individual tenant may demonstrate the same for all leased areas under their control.

In all examples, the energy scope and related floor area should be disclosed to allow the market to appreciate the extent to which the building owner or occupier has demonstrated an annual net zero carbon balance.

The use of on-site fossil-fuel generation is currently permitted under the framework for net zero carbon – operational energy. This is in recognition of the current prevalence of gas heating for the existing building stock and uncertainty about the use of the gas grid for future low-carbon heating. These impacts should be clearly disclosed and offset to achieve a net zero carbon balance.

Technical requirements

The building should report annual carbon impacts as a total (tCO_2e) and in terms of intensity ($kgCO_2e/m^2$). The emissions factors used in calculations should be market-based or location-based.[13]

Where the building's 'total annual net CO_2e emissions' equal zero, and these calculations have been audited through a third-party, the building can be considered net zero carbon for operational energy. The indicators reported against will quantify the extent to which off-site renewables and offsets are being used to achieve this outcome.

Please see Appendix A for the specific indicators that should be reported against.

Please also see the following sections of this report for additional detail: 3. Reduce Operational Energy Use, 4. Increase Renewable Energy Supply and 5. Offset Any Remaining Carbon.

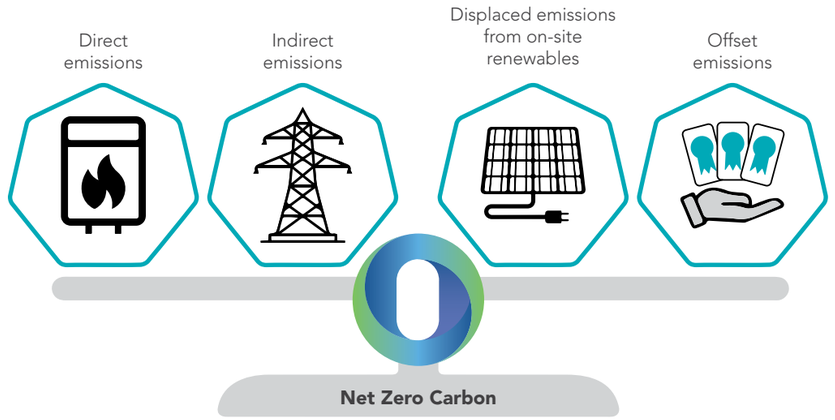
Future development

Dynamic 'time of use' emissions factors should be adopted for all carbon calculations as these provide a greater level of accuracy. These emission factors are based on the carbon intensity of the electricity grid when energy is imported (or exported). A consistent and commonly understood methodology is needed for this approach to be utilised in the framework.

A trajectory should be set for the phasing out of on-site fossil fuel use. This is likely to be introduced with requirements for new buildings to move to renewable energy sourced heating, followed by existing buildings.

A set of strict requirements should be developed for 'net zero ready' new buildings to enable developers to design for net zero carbon for operational energy. This would help to demonstrate alignment with the framework in situations where in-use verification is not possible, for example new homes built for sale.

Net zero carbon for operational energy is achieved when a building's total annual net CO_2e emissions equal zero, that is, all carbon impacts are balanced by all carbon credits



1.3 Net zero carbon – whole life is defined as:

"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."

Rationale

In order to achieve a net zero carbon economy, the UK must account for and offset *all* carbon impacts from the built environment. This will require moving towards a net zero whole life carbon approach for all buildings which will need to be developed in detail over the next five years.

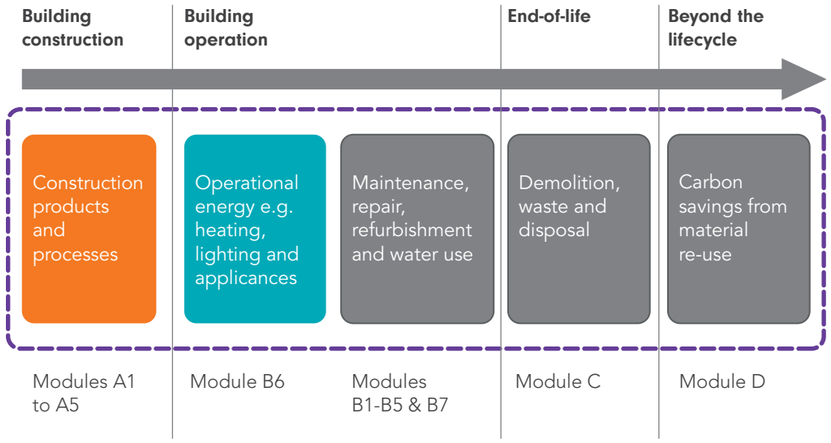
A future net zero whole life carbon definition should ensure that a lifecycle approach is taken to make informed decisions about building design and operation. It should also encourage design for flexibility, adaptability and deconstruction to minimise end-of-life impacts and enable a 'circular economy' within the built environment.

Net zero whole life carbon is not proposed as an approach at present due to current limitations in the reporting of carbon from the maintenance, repair, refurbishment and end-of-life stages of a building's lifecycle. Instead, buildings are encouraged to aim for net zero carbon in construction (new buildings and major refurbishments) and for operational energy (existing buildings), until greater familiarity with whole life carbon impacts has been achieved.

Future development

Reporting and offsetting processes for whole life carbon will be developed and introduced into the framework within the next five years to take account of all building lifecycle stages. This will build on the current framework principles addressing construction impacts at practical completion and operational energy impacts in-use, but will also likely require annual reporting and offsetting of embodied carbon impacts from maintenance, repair and refurbishment on an annual basis.

Breakdown of three net zero carbon scopes



All Modules referred to are from EN15978 Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method

Net Zero Carbon – Construction (1.1)

Net Zero Carbon – Operational Energy (1.2)

Net Zero Carbon – Whole Life (future development) (1.3)

2. Reduce Construction Impacts

2.1 A whole life carbon assessment should be undertaken and disclosed for all construction projects to drive carbon reductions.

Rationale

A whole life carbon assessment addresses a building's entire carbon impacts throughout its lifecycle. Moving towards a net zero carbon built environment will require measurement and mitigation of carbon impacts across all stages of a building's lifecycle.[14]

The reporting of in-use embodied carbon impacts in a building's lifecycle is currently challenging, however a modelled assessment of impacts should still be carried out. This assessment is valuable to inform early design decisions which aim to minimise the building's whole life carbon impacts.

Technical requirements

The whole life carbon assessment should be undertaken in line with the RICS Professional Statement 'Whole life carbon assessment for the built environment'.[15] This includes alignment with the minimum scope and reporting requirements, as per Section 3 of the RICS Professional Statement. A whole life carbon assessment should also be accompanied by reporting in line with ICMS 2.[16]

The whole life carbon assessment should be carried out in two phases:

1. The first assessment should take place as early as concept design (RIBA Stage 2 or equivalent) and as a minimum before the commencement of technical design (RIBA Stage 4 or equivalent). This ensures the assessment has the greatest potential to drive carbon reductions in all future stages of the project's delivery.

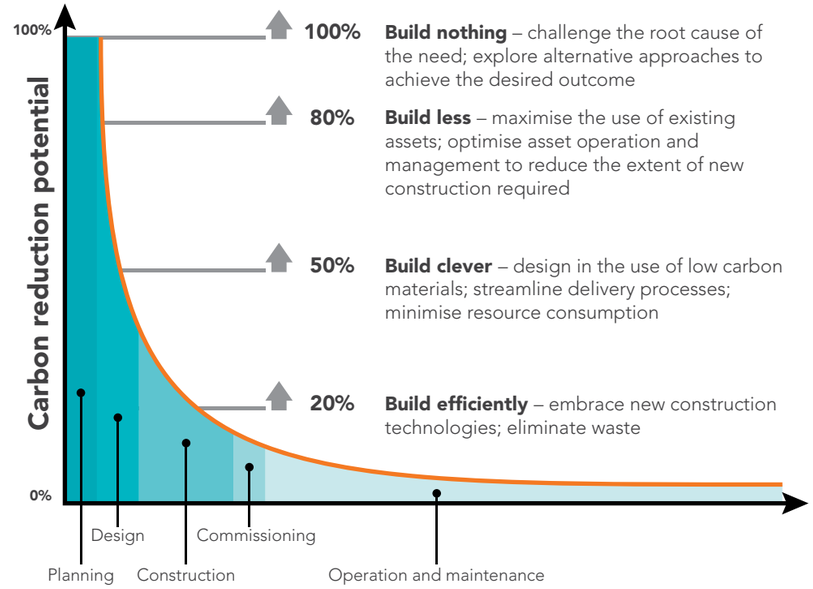
2. A further assessment should be undertaken at practical completion (end of RIBA stage 5) which should measure the as-built outcome, in place of modelled assumptions. This final as-built assessment should be used to determine the extent of carbon impacts needing to be offset to achieve net zero carbon for construction.

In parallel with the assessment, the project team should also review the UKGBC's Circular economy guidance for construction clients guidance document[17] to ensure that the building is designed to maximise circular outcomes for a net zero carbon built environment. However, this assessment is not part of the scope of this framework.

Future development

As data and reporting processes improve, buildings will be required to disclose and offset whole life carbon impacts throughout the building's lifecycle to achieve net zero whole life carbon. Please see Principle 1.3 for additional detail.

Embodied carbon reduction potential at different stages of a building project
© HM Treasury; Green Construction Board



2.2 The embodied carbon impacts from the product and construction stages should be measured and offset at practical completion.

Rationale

Buildings aiming to achieve net zero carbon for construction should address all embodied impacts from the building's product and construction stages up to practical completion. The carbon to be offset should be determined through the whole life carbon assessment undertaken at the point of completion.

The carbon can be offset using two routes:

A. One-off payment made at the point of completion; and/or

B. Net export of on-site renewable energy on an annual basis.

These two offset routes can be used together, and the intended approach should be disclosed.

Technical requirements

Where on-site renewable energy generation is used as an offset, the achievement of net zero carbon for operational energy should take precedence. Once net zero carbon for operational energy has been achieved, any surplus carbon credits from exporting on-site renewable energy can be used to offset embodied impacts.

Please see Appendix A for the minimum reporting requirements.

Please see section 5. Offset Any Remaining Carbon for further details on the procurement and reporting of offsets.

3. Reduce Operational Energy Use

3.1 Reductions in energy demand and consumption should be prioritised over all other measures.

Rationale

In order to achieve a net zero carbon economy by 2050, the UK must reduce its total energy consumption and source the remaining energy demand primarily from renewable sources.[18] In addition to this, increased demand will be placed on the electricity grid as fuel sources are switched to electricity (e.g. through the electrification of heat in buildings and electric vehicle charging).[19]

Investing in energy efficiency and demand reduction is the most cost-effective way to minimise the new infrastructure that will be required to achieve a zero carbon energy system.[20] The building should target reductions in energy demand and consumption to reduce the amount of total electricity supplied, both from the electricity grid and from renewable energy sources.

By quantifying the extent to which renewable energy and offsets are being used to achieve a net zero carbon building, the market will be empowered to appreciate the building's energy intensity and autonomy in achieving net zero carbon.

Technical requirements

The approach used to reduce energy demand and consumption will vary between buildings dependent on its characteristics. Below is a list of suggested considerations:

Building fabric and passive design – Reducing the overall energy demand required to operate the building. Improvements include efficient fabric and shading design to reduce heating and cooling demand, natural daylighting to reduce artificial lighting demand, natural ventilation to reduce HVAC demand, appropriate sizing of building systems to limit over-engineering.[21]

Systems efficiency – Increasing the energy efficiency of the building systems. Improvements include highly energy efficient building systems – HVAC, lighting, vertical transport etc.

Energy management – Implementing smart energy/building management systems. Improvements include conducting an energy audit, managing occupant behaviour, managing 'peak loads', adjusting HVAC temperature set points, achieving ISO 50001 accreditation.[22]

Further considerations – The physical wellbeing of building occupants should be considered alongside energy reductions. These include considerations around indoor air quality, daylight and overheating. The building should be designed and operated in line with best practice guidance on overheating,[23] however this assessment is not part of the scope of this framework.

Future development

A building claiming to be net zero carbon for operational energy should demonstrate high level of energy efficiency in order to minimise demand on energy systems and support the transition to a net zero carbon economy. An immediate priority for the framework will be the development of energy use intensity (EUI) and thermal energy demand intensity (TEDI) targets for net zero carbon buildings – operational energy.

Please see the Future Development of the Framework section of this report for further details.

3.2 In-use energy consumption should be calculated and publicly disclosed on an annual basis.

Rationale

The UK building stock currently suffers from a 'performance gap' where modelled building energy performance does not equate to actual in-use performance.[24] This has created a gap in the market where building owners are simply unaware of the gap between modelled and measured results.

The building's in-use energy should be measured and reported on an annual basis to accurately address its carbon impacts. Reporting on an annual basis considers seasonal variations and provides a standard comparative measure between buildings.

The boundary of the energy scope should also be reported for transparency (e.g. base building, individual tenancy, whole building etc.). It is recognised that different reporting scopes will reduce comparability between buildings, however this should not limit a building owner or occupier from achieving net zero carbon for the complete energy scope under their control.

Technical requirements

The building's annual energy use should be reported as a total (kWh) and in terms of intensity (kWh/m^2).

Please see Appendix B for the specific indicators that should be reported against.

4. Increase Renewable Energy Supply

4.1 On-site renewable energy sources should be prioritised.

Rationale

The UK must increase its total supply of renewable electricity whilst simultaneously reducing demand on the electricity grid.[25] A building powered from on-site renewable energy sources achieves both these aims.

Additionally, this approach helps to support a decentralised energy system, resulting in reduced transmission and distribution losses for the electricity grid, and improved land uses with the reduction of renewable energy generation on greenfield sites.

The building developer, owner or occupier should, where feasible, aim to install or upgrade the supply of renewable energy on-site. Benefits of this approach include implicit additionality of renewables for the UK, reduced demand on the electricity grid and increased building value. Renewable energy sources include photovoltaics, heat pumps and biomass.

Technical requirements

The amount of renewable energy generated on-site, minus any storage losses, should be measured and reported annually, in line with principle 3.2.

Please see Appendix B for the specific indicators that should be reported against.

4.2 Off-site renewable energy should demonstrate additionality.

Rationale

The purchase of renewable energy generated off-site should demonstrate additionality, that is, supply directly attributed to the building developer, owner or occupier which would not otherwise have taken place. This reduces the likelihood of double-counting any off-site renewable energy.

Power Purchase Agreements (PPAs) for electricity, certified low-carbon district heating/cooling and certified green gas (e.g. biogas from sustainable sources) will all achieve this aim and provide the most credible additionality.

Technical requirements

Any renewable electricity purchased should demonstrate additionality in line with the following RE100 guidance documents:

- 'Making credible renewable electricity usage claims';[26] and
- 'Technical note on renewable electricity options'.[27]

Future development

The criteria for demonstrating additionality from off-site renewable energy sources may be updated in the future with the development of specific guidance for the framework.

5. Offset Any Remaining Carbon

5.1 Any remaining carbon should be offset using a recognised offsetting framework.

Rationale

Where all feasible measures for reducing carbon impacts have been reasonably exhausted, offsets can be utilised to cover any residual carbon. The offsets purchased should be commensurate with any outstanding carbon to achieve a net zero carbon balance.

Technical requirements

Offsets should either be procured directly or via recognised existing offsetting frameworks. Both of these routes should seek to demonstrate additionality, avoid double-counting and provide a clear process for verification of carbon savings.

Offsetting frameworks that should be considered include the Clean Development Mechanism[28] and Gold Standard.[29]

The frequency for the procurement of offsets should be as follows:

- For **net zero carbon – construction**, offsets should be commensurate with the carbon impacts determined at practical completion. Exported on-site renewable energy can also be used as an offsetting route on an annual basis – please see Principle 2.2 for additional detail.
- For **net zero carbon – operational energy**, offsets should be commensurate with the carbon impacts determined annually.

Future development

Further guidance will be developed on the type of offsets and relevant frameworks that should be used. This guidance should set stricter requirements for permissible offsets to ensure robustness, consistency and additionality, based on an evidence review and lessons learnt from projects.

A future timetable will be developed for the phasing out of the use of offsets for operational energy. The endpoint of the timetable will be a requirement for all operational energy demand to be met using renewable energy. Please see the Future Development of the Framework section of this report for further details.

5.2 The amount of offsets used should be publicly disclosed.

Rationale

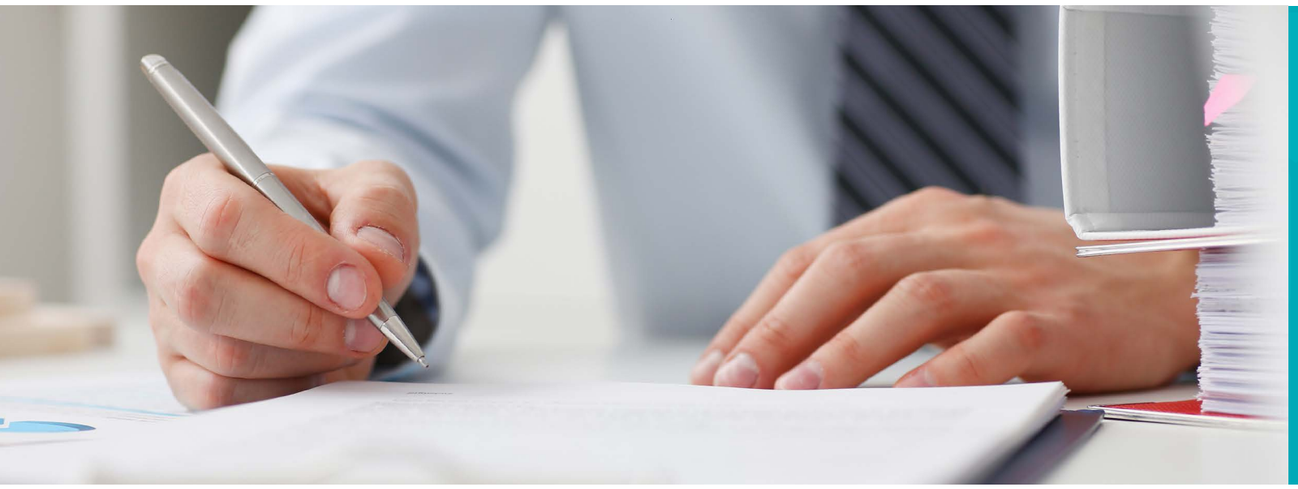
Carbon offsets represent the final step to achieving a net zero carbon building, as industry feedback has raised concerns regarding the reliability of carbon abatement through offsets.[30] By quantifying the extent to which offsets are being used, the market will be empowered to appreciate the building's level of autonomy in achieving net zero carbon.

Technical requirements

The reporting and disclosure of offsets should be as follows:

- For **net zero carbon – construction**, offsets should be procured and disclosed at practical completion, in line with the reporting requirements. Where on-site renewable energy is used as an offsetting route, this should be reported annually as a cumulative figure alongside a statement of the outstanding carbon balance.
- For **net zero carbon – operational energy**, offsets should be procured and disclosed annually, in line with the reporting for energy consumption.

Please see Appendix A and B for the specific information that should be reported.



VERIFICATION

In order to demonstrate that a building is net zero carbon, a minimum level of reporting is required to be publicly disclosed, as outlined in Appendix A and B. Disclosure should be made through any publicly accessible information, such as an organisation's annual sustainability report or clearly presented on a website. This form of public disclosure is intended for building developer, owner or occupier to 'show their working' on how they have achieved net zero carbon.

This information should be the subject of third-party auditing to avoid self-made claims. The auditing should provide transparency on the sources and processes used to determine the net zero carbon balance, however would not be required to verify specific figures (e.g. checking of energy meters). This represents a basic initial approach to auditing claims for net zero carbon, with more robust verification processes needing to be developed in future.

Over time, the intention is to provide alternative routes using existing rating tools and verification schemes. UKGBC will seek to actively begin engagement with scheme providers following publication of this framework, with the aim of developing guidance on how they can be used to demonstrate compliance. The intention is to also encourage the use of this framework to inform the future direction of relevant rating tools and verification schemes.

ADOPTION

Net Zero Carbon Buildings Commitment

This framework is aligned with the WorldGBC Net Zero Carbon Buildings Commitment[31] which was launched at the Global Climate Action Summit in September 2018. Businesses, organisations and regional authorities who sign up are making a commitment that all buildings in their direct control will achieve net zero carbon for operational energy by 2030. The Commitment is intended to help build a market for net zero carbon buildings and will be a key route for driving adoption and uptake of this new framework.

This framework provides additional guidance for UK signatories about the approaches they should take to achieve net zero carbon for operational energy. In addition to this, signatories are encouraged to go above and beyond the Commitment's requirements to also address whole life carbon impacts, as outlined in this framework. By combining the Commitment and this framework, UK signatories will be able to go further and at a faster pace to demonstrate global leadership on net zero carbon.

Voluntary Adoption

Building on the Commitment as a catalyst for demand, the framework can also be used to inform industry working practices to deliver net zero carbon buildings. In this way, the framework is aimed at providing new business opportunities for leading companies and, as the requirements are tightened over time, help to guide the industry in the transition to a net zero carbon built environment.

Some examples on how the principles of the framework can be adopted by different actors within the built environment are provided below:

For developers:

- Drive demand for new and existing buildings net zero carbon buildings
- Explore the business case for net zero carbon buildings, building on existing research[32]
- Integrate principles into design briefs

For consultants:

- Offer innovative approaches to reduce carbon impacts (construction and in-use energy)
- Increase the measurement and reporting of whole life carbon assessments

For contractors:

- Offer solutions to reduce embodied impacts from construction
- Verify in-use performance

For building occupiers:

- Sign up to the Net Zero Carbon Buildings Commitment

For investors:

- Drive investment in net zero carbon buildings

Policy Opportunities

The net zero carbon buildings framework is primarily a tool for industry, but there is also a clear role for national and local policy-makers in using the framework to increase demand for net zero carbon buildings. The table on the following page sets out some of the existing and potential policy levers at a national and local level that could align with the framework.

The policy mechanisms have been set out against the four areas of the framework to indicate their relevance to encouraging the specific outcomes of the framework. They do not represent specific recommendations from the task group but are intended to provide some initial guidance as to how the framework could be reflected in different policy areas, and further work will be needed to develop the individual policy options in more detail. These mainly focus on increasing transparency in building energy use, shifting towards in-use performance outcomes, and improving the measurement and mitigation of embodied carbon.

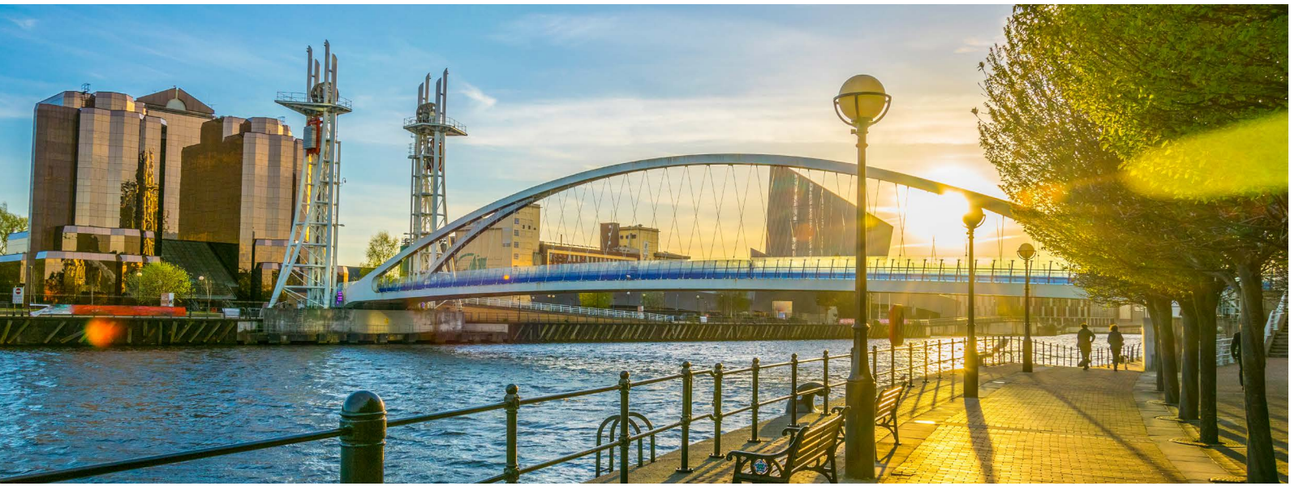
Further policies, regulations and incentives beyond these will be needed to drive energy efficiency and renewable energy in the transition to a net zero carbon built environment.

Alongside policies and regulations, it is also important to note that there will be clear roles for both central and local governments to use public procurement to encourage net zero carbon buildings. This approach would mirror that of voluntary adoption by industry, integrating the principles into tenders and briefs for public buildings or developments on publicly owned land.

Policy options to support the framework

	National policy	Local policy
Reduce embodied carbon	• Requirement through Building Regulations for whole life carbon assessments of new buildings and major renovations • Requirement through NPPF for whole life carbon assessments of new buildings and major renovations	• Local Plan requirements for modelling of whole life carbon impacts for new developments • Extension of Local Plan 'zero carbon' requirements to cover whole life carbon, including offsetting of these impacts
Reduce energy demand	• Requirement through Building Regulations for Thermal Energy Demand Intensity (or similar indicator) requirements to be predicted for compliance and verified on completion • Clean Growth Grand Challenge Mission to halve energy use from all new buildings by 2030 (from a 2018 baseline) • Future Homes Standard ambition for 'world leading energy efficiency standards' for new homes from 2025 • Mandatory disclosure of operational energy performance ratings for all commercial buildings (with delineation between landlords and tenants where applicable) • Transition to using operational energy ratings as the basis of minimum base building energy efficiency standards for commercial rented properties	• Local Plan requirements for carbon and energy performance beyond Building Regulations[33] • Local Plan requirements for monitoring and reporting energy performance of new developments for first years of operation[34]
Increase renewable energy supply	• National Planning Policy Framework (NPPF) 2018 Planning Practice Guidance (PPG) on Climate Change to require 'net zero' for all new developments • Recognition of off-site renewable energy procurement as carbon abatement measure within Building Regulations	• Local Plan requirements for carbon and energy performance above Building Regulations (examples as above) • Local Plan requirements for a minimum percentage of renewable energy on-site (Merton Rule) • Local Plan requirements for off-site renewable energy solutions as a route to achieving zero carbon where on-site generation is not feasible
Offsetting	• Infrastructure Act 2015 provision on allowable solutions mechanism • National offset framework or fund in line with Infrastructure Act provisions	• Consistent national framework for local offset funds to improve consistency and transparency • Local Plan requirement for new developments to be 'zero carbon' or 'net zero' and offset funds[35]

Future Development of the Framework



The framework presented here is a first step in setting the industry on a consistent pathway towards the ultimate aim of a net zero carbon built environment. UKGBC will take a lead in updating the framework to increase robustness and tighten minimum requirements but cannot do this work without active collaboration with other industry organisations. This ongoing development must continue to be an open and inclusive process, so the task group supporters and other relevant organisations will be invited to join a steering committee to oversee periodic updates to the framework.

The following issues were highlighted through the task group and consultation as key priorities for future work and updates:

Time of use emissions factors (also see principle 1.2)

Accounting for the carbon intensity of the electricity grid at the time of electricity import (or export) can provide a more accurate method of measuring scope 2 carbon emissions (indirect emissions from the consumption of purchased electricity, steam, heat and cooling) over a year. Using 'time of use' emissions factors would help to take account of grid variations in carbon intensity and provide an incentive to shift a building's energy consumption away from times of peak demand on the grid. This would represent a significant change in the calculation methodology for net zero carbon for operational energy, so 'time of use' emissions factors should be introduced into the framework once the industry has a consistent and accepted methodology.

Whole life carbon (also see principle 1.3)

Achieving a net zero carbon built environment will require a shift towards buildings that are net zero whole life carbon, addressing all carbon impacts associated with the construction, operation and end-of-life stages. The framework currently sets out a high level definition for net zero carbon – whole life, but further work will be needed to develop this approach in detail. This should incorporate both current approaches to net zero carbon for construction and operational energy as well as requiring the annual reporting and offsetting of embodied carbon associated with operation, maintenance, repair and refurbishment of buildings. Additional processes will also need to be developed for end-of-life scenarios which align with the overarching 'polluter pays' principle.

Energy efficiency targets (also see principle 3.1)

The framework encourages energy demand and consumption reduction but does not currently specify minimum energy efficiency targets for net zero carbon buildings. There was however strong support through the consultation for the development of energy efficiency requirements for different building types, particularly in the form of energy use intensity (EUI) targets and thermal energy demand intensity (TEDI) targets.

Energy use intensity targets

For existing buildings, UKGBC intends to explore use of the 'Paris Proof' targets approach pioneered by the Dutch Green Building Council. This approach has set targets in the Netherlands for energy use intensity for different building types based on estimates of national renewable energy capacity in 2050. There is the opportunity to build on existing good practice such as the Design for Performance initiative and Real Estate environmental Benchmark (REEB) to develop similar targets for the UK. UKGBC invites the industry to help develop these targets for the UK immediately after publication, for integration into the framework.

For new buildings, there may be opportunities to align the framework with existing policy options already under discussion, for example the Government's Building Mission to halve energy use from new buildings by 2030[36], the recent recommendations from the Committee on Climate Change on energy efficiency standards for new homes[37], or the proposed Future Homes Standard for 2025.

'Net zero ready' (also see principle 3.1)

The framework is based on the annual reporting of in-use energy to demonstrate a balance of net zero carbon, but this approach is not always possible, for example, if a building is being built or renovated for sale. For these circumstances, the task group recommended the development of 'net zero ready' requirements that would enable and encourage a net zero carbon balance being achieved in operation. These requirements could potentially include: strict energy efficiency targets, the provision of renewable energy options, and as-built testing or monitoring along with energy performance guarantees.

This would not water down the requirements of the framework, as it would only be possible to claim that a building is net zero carbon once a year of in-use energy data is available to demonstrate this. But it would provide a rigorous path for developers to show that their buildings are provisionally aligned with the framework and can achieve net zero carbon for operational energy with appropriate usage.

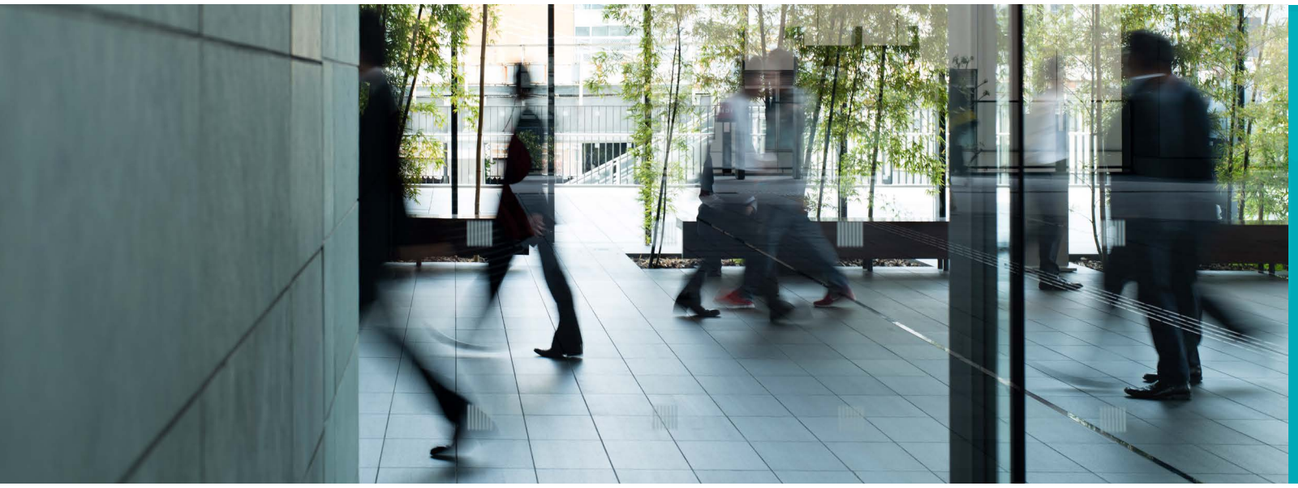
Offsets (also see principle 5.1)

Under the framework, buildings should always seek to reduce carbon before resorting to offsets, and realising a net zero carbon built environment in the future will require the phasing out of offsets as far as possible. Potential options to help achieve this include: setting a maximum threshold for offsets, preventing the use of offsets for new buildings, or preventing the use of offsets for any operational energy. Although these principles have not been included in the initial framework, it will be important to set out a transition plan for how and when offsets should be phased out of the framework over time.

Indicative timeline for framework development

2019	2020	2021
Publication of net zero carbon buildings framework	'Net zero ready' concept	Net zero carbon – whole life approach
Develop energy use intensity (EUI) targets	Guidance on off-site renewable energy	'Time of use' emissions factors
Develop thermal energy demand intensity (TEDI) targets	Guidance on use of offsets	Timetable for phasing out use of offsets
Develop case studies catalogue		

Implications for the Industry



The framework presented here sets out a challenge for the construction and property industry to reimagine the way buildings are designed, constructed and operated. These include the move towards in-use performance as the verifiable metric for energy and the future objective to accurately assess and effectively reduce the whole life carbon impacts of buildings.

In-use energy performance

A net zero carbon building for operational energy is required to annually disclose in-use energy performance. A verified net zero carbon building is one that is based on in-use, rather than modelled, energy performance. In this way, net zero carbon should not simply represent a label, but a process which demonstrates that a building's performance is being maintained at net zero carbon.

This will require a realignment of objectives for construction and management. The emphasis will increasingly be placed on a building that works as it is supposed to, with the whole construction value chain taking greater ownership and responsibility for ensuring outcomes. This reflects the recommendations of the Building a Safer Future report[38] that the industry should focus on performance rather than compliance. Achieving these outcomes during operation will also enable collaboration between building owners, managers and occupiers to ensure ongoing levels of performance in achieving a common goal.

Various industry initiatives are already beginning to address the issue of the 'performance gap' such as the BSRIA Soft Landings Framework and the Better Buildings Partnership Design for Performance initiative. The framework should provide an incentive for the use of these types of approaches which will need to become standard practice for the industry in the future. Ultimately, the move towards in-use performance will see a wholesale move in the industry towards 'performance contracts' that are based on achieving specified outcomes.

Whole life carbon

The framework also begins to show the direction for addressing whole life carbon for a building. Understanding the whole life impacts of a building is still a relatively nascent area with challenges of data collection and as-built verification of impacts. Lifecycle assessments (LCAs) are becoming more commonly undertaken and the RICS guidance on whole life carbon assessment[39] has provided greater consistency in how these are carried out. Significant gaps still remain however in the availability of data on embodied carbon of specific products, although these are beginning to be addressed through databases such the Inventory of Carbon & Energy[40] and the RICS Building Carbon Database.[41]

Beyond the issue of measurement, questions will also need to be addressed about accountability in achieving reductions in embodied and whole life carbon. Achieving net zero whole life carbon will require close collaboration within the supply chain to minimise embodied carbon and related liabilities for offsets. Similar to performance contracting for operational energy, this could involve a move towards carbon performance contracting with suppliers. Accounting for whole life carbon will also increase the emphasis on reusing structures and moving towards a circular economy that seeks to maintain value and utility from assets, materials and resources.

Appendix A:
NZC – Construction Minimum Reporting Template

These minimum reporting requirements align with the RICS Professional Statement 'Whole life carbon assessment for the built environment'[42] – please see section 3.6 'Reporting Requirements' for full details. Tables 12 and 13 are included below for reference.

Date of assessment	Date of assessment completion
Verified by	Verifier name and organisation
Project type	New build or refurbishment of existing structure
Assessment objective	Brief assessment purpose statement
Project location	Full address
Date of project completion	Anticipated date of practical completion
Property type	Residential, public/civic, retail, office, infrastructure, etc. State planning use class
Building description	No. of storeys, structural frame, façade type, basement?, brief description of associated external areas and any ancillary structures
Size	NIA, GIA, volume, etc.
Project design life	In years
Assessment scope	Building parts and life stages/modules included
Assessment stage	Design stage at which the assessment has been conducted at
Data sources	List all data sources used in the assessment including building information and carbon data sources

Building elements coverage	**#**	**Building parts/element groups**	**Building elements**	**Coverage (%)**
	0	Facilitating works	0.1 Temporary/Enabling works/Preliminaries 0.2 Specialist groundworks	
	1	Substructure	1.1 Substructure	
	2	Substructure	2.1 Frame 2.2 Upper floors incl. balconies 2.3 Roof 2.4 Stairs and ramps	
		Superstructure	2.5 External Walls 2.6 Windows and External Doors	
		Superstructure	2.7 Internal Walls and Partitions 2.8 Internal Doors	
	3	Finishes	3.1 Wall finishes 3.2 Floor finishes 3.3 Ceiling finishes	
	4	Fittings, furnishings and equipment (FF&E)	Building-related Non-building-related	
	5	Building services / MEP	5.1–5.14 Building-related services Non-building-related	
	6	Prefabricated Buildings and Building Units	6.1 Prefabricated Buildings and Building Units	
	7	Work to Existing Building	7.1 Minor Demolition and Alteration Works	
	8	External works	8.1 Site preparation works 8.2 Roads, Paths, Pavings and Surfacings 8.3 Soft landscaping, Planting and Irrigation Systems 8.4 Fencing, Railings and Walls 8.5 External fixtures 8.6 External drainage 8.7 External Services 8.8 Minor Building Works and Ancillary Buildings	
Assumptions and scenarios	List all assumptions and scenarios used in the assessment including brief justifications			

Offsets

Indicator	Amount
Total embodied carbon (tCO_2 & $kgCO_2e/m^2$) from construction (modules A1 to A5 of EN15978) at practical completion	
Total embodied carbon offset (tCO_2e) at practical completion	
Total embodied carbon cumulatively offset (tCO_2e) in previous years through net export of renewable energy	
Total embodied carbon offset (tCO_2e) this year through net export of renewable energy	
Total outstanding embodied carbon (tCO_2e) balance	

Amount and type of offsets procured this year, including relevant framework used:	
Expected verification processes:	
Cost per tonne of CO_2e:	

| The minimum results required for submission are highlighted in blue.

* Decarbonisation applicable - Report decarbonised values alongside non-decarbonised ones. | Global Warming Potential GWP (TCO_2e) | | |

Appendix B: NZC – Operational Energy Minimum Reporting Template

Dates of achievement	12 month period over which a net zero carbon balance has been achieved e.g. 1 April 2019 to 31 March 2020
Verified by	Third-party verifier name and organisation
Building location	Full address
Building type	Provide planning use class Provide GRESB asset class
Building description	No. of storeys, structural frame, façade type, basement(?), brief description of associated external areas and any ancillary structures.
Energy scope	E.g. individual dwelling, tenant area in multi-unit building, base building, whole building, multi-building development, portfolio (base building or whole building etc.
Assessed area	NLA, GLA
Percentage of total building area	I.e. assessed area / total building area
Emission factors	I.e. location-based or market-based
Data sources	List all data sources used in the assessment

Energy

Indicator	kWh	kWh/m^2
Total annual energy consumption		
Total annual electricity consumption		
Total annual fuel consumption (all other sources e.g. gas, heat network) per fuel type		
Total annual electricity generated by renewable energy sources minus storage losses (e.g. photovoltaic)		

Carbon

Indicator	t CO_2	Kg CO_2/m^2
Total annual indirect CO_2e emissions from imported electricity		
Total annual direct CO_2e emissions from combustion of fuel (e.g. on-site gas) per fuel type		
Total annual indirect CO_2e emissions from combustion of fuel (all other sources e.g. heat network) per fuel type		
Total annual displaced CO_2e emissions from electricity generated by on-site renewable energy sources minus storage losses		
Total annual displaced CO_2e emissions from offsets		
Total annual net CO_2e emissions	0 (only when verified)	

Offsets

Amount and type of offsets procured, including relevant framework used:	
Expected verification processes:	
Cost per tonne of CO_2e:	

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Acknowledgements

The development of the net zero carbon buildings framework was led by an industry task group and informed by a stakeholder consultation on the proposals. UKGBC would like to sincerely thank all task group participants, alongside all involved stakeholders and consultation respondents for their feedback, assistance and contributions over the course of the project.

The task group was supported by the following trade associations, professional institutions and non-profit organisations:

Better Buildings Partnership (BBP)
British Property Federation (BPF)
Building Services Research and Information Association (BSRIA)
Chartered Institute for Building Services Engineers (CIBSE)
Good Homes Alliance
London Energy Transformation Initiative (LETI)
Passivhaus Trust
Renewable Energy Association (REA)
Revo
Royal Institute of British Architects (RIBA)
Royal Institution of Chartered Surveyors (RICS)
Sustainable Energy Association (SEA)
Solar Trade Association (STA)

The task group participants included representatives from the following organisations:

Acclaro Advisory
AECOM
Allies and Morrison
Arup
Atelier Ten
BAM Construct UK
Berkeley Group
Bioregional
BRE
BuroHappold Engineering
Carbon Credentials Energy Services
Cundall
Currie & Brown
Derwent London
EcoEnergy Insights, UTC
Elementa
Greengage Environmental
Grosvenor Britain & Ireland
Haringey Council
Hawkins Brown Architects
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JLL Ltd
Kingspan Insulation Ltd
Landsec
Lendlease
Max Fordham LLP
Redevco
Skanska
Skidmore, Owings & Merrill LLP
Targeting Zero LLP
The Carbon Trust
Turley
Twinn Sustainability Innovation
Verco
Willmott Dixon

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With special thanks to the UKGBC Advancing Net Zero Programme Partners

Lead Partners: The Redevco Foundation

Programme Partners: BAM Construct UK, Berkeley Group, Grosvenor Britain & Ireland, Hoare Lea and JLL.

Questions & Feedback

Central to this net zero carbon buildings framework is industry consensus and the need to set in place a consistent set of principles. We welcome input from any interested stakeholders from across the building value chain on this, or future versions, of the framework to help collectively work towards a net zero carbon built environment.

If you have any questions on the framework or would like to provide feedback, please email ANZ@ukgbc.org

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