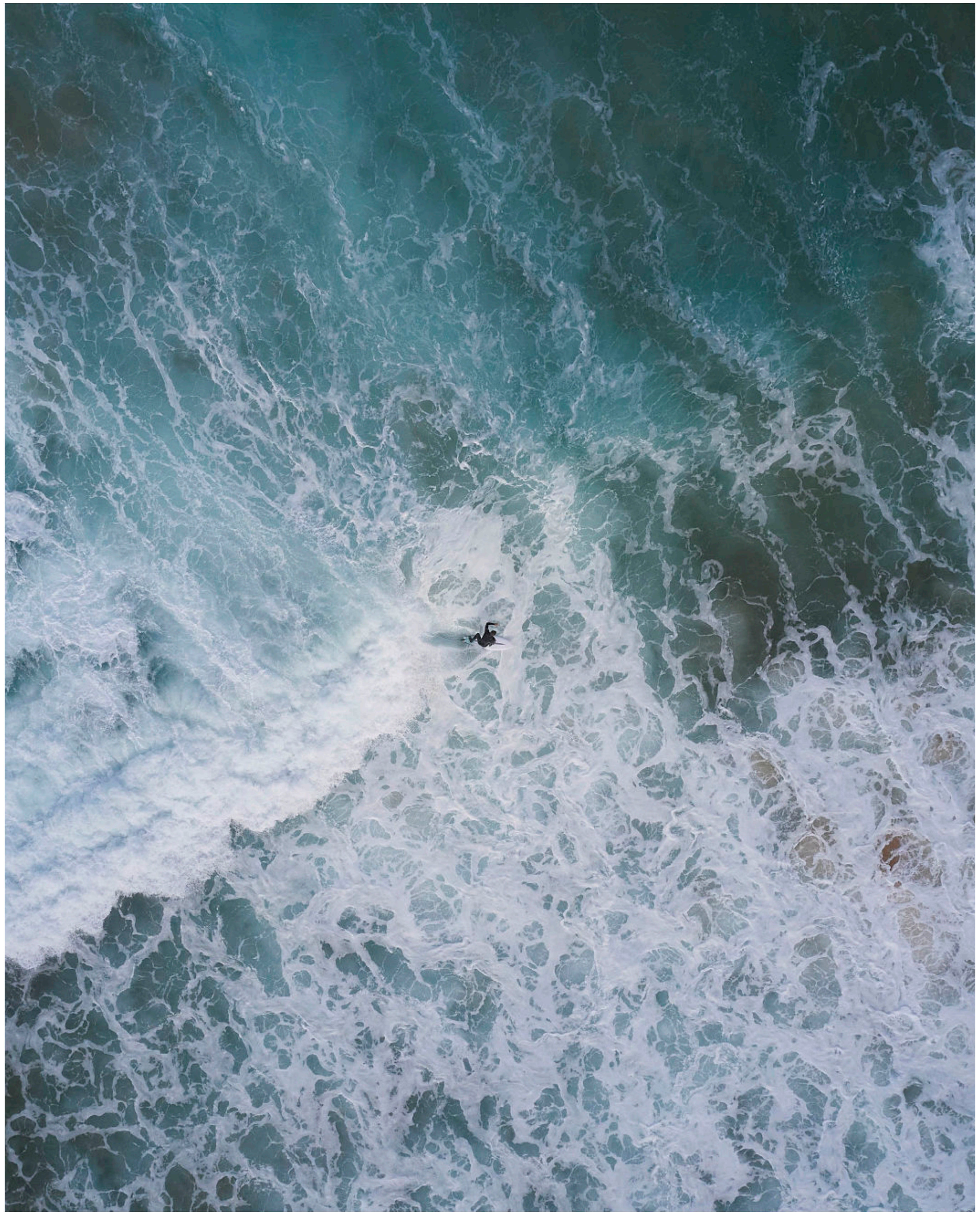
WARREN AND MAHONEY®

Go Zero

WAM's guide to a lower carbon future.

Published By
Warren and Mahoney



TOITŪ CARBON ZERO ISO 14064-1 ORGANISATION

Warren and Mahoney acknowledge the importance of all First Nations peoples across the Pacific where our studios and projects are located. In New Zealand, we acknowledge the importance of Te Tiriti in empowering Indigenous communities.

In Australia, we acknowledge the Gadigal people of the Eora Nation, and the Wurundjeri Woi Wurrung people of the Eastern Kulin Nation, as the Traditional Custodians of the Land on which our studios are located. We recognise their continuing connection to land, water and culture and pay our respect to their Elders, past, present and emerging.

Introduction

With the impacts of climate change increasing in frequency and severity, it's clear that we now need urgent solutions to the growing carbon emissions associated with the built environment.

Warren and Mahoney has produced this guide with the objective to elevate our collective carbon literacy. Importantly, the content included in this guide goes beyond the idea of awareness, to provide an actionable resource of design strategies that can be used by anyone to reduce the carbon impact of their projects.

This intellectual property is provided openly, for the time to act is now. This guide is broken into three key chapters:

01. Why invest in sustainable design?

02. Sustainable design strategies in practice

03. Measuring the results and impact

Achieving low carbon outcomes does not need to be complex. The goal of this document is to demystify the language, concepts and processes.

The fight against climate change hinges on mitigating carbon emissions. Lets work together to build a low carbon future.

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01 Why invest in low carbon design?

In the construction industry, sustainable development is one of the greatest challenges and opportunities of our time as highlighted on the following page.

In recent years there has been a quantum leap forward in our ability to measure the carbon and financial impacts of a building. We are now able to confidently calculate the potential for carbon reduction and payback periods clients can expect.

This document seeks to enable anyone in the industry to strengthen the business case for investing in environmental sustainability.

7,145t

The upfront embodied carbon impact of a 7-storey steel and concrete building.

Outsized impact

As participants in the construction sector, the decisions we make in our professional lives really matter - see the green circles for scale. That's why, as an industry, we need to raise the bar... because the results are worth it!

2t

Annual recommended carbon footprint per person to keep global warming under 1.5°C.

662t

Warren and Mahoney 2023 annual carbon footprint as an organisation.

t= tons of carbon equivalent

Why invest in low carbon design?

According to the Green Building Council of Australia, Green Star rated office buildings see a 16.4% higher market value/sqm, longer leases and 13.5% higher annual returns.

Five years ago, low carbon design was a nice-to-have. Today it's a market advantage. Tomorrow it will be too late.

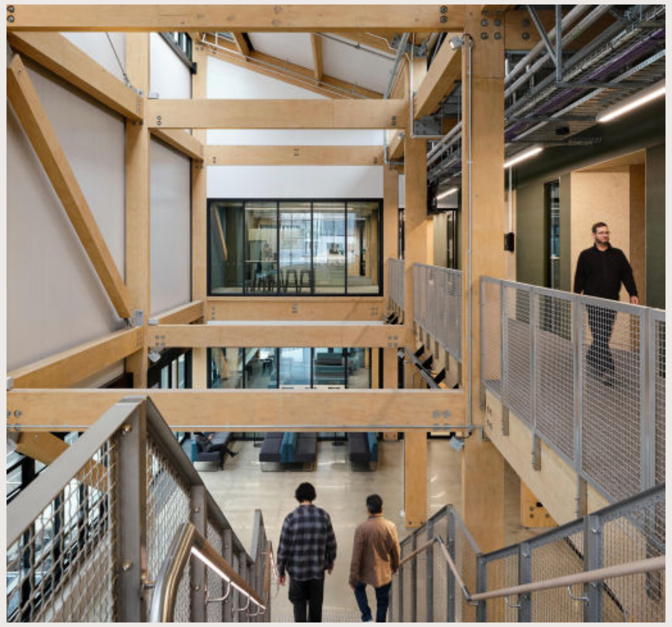
Internationally, the demand for low carbon buildings is growing with a momentum that is undeniable. Change is being driven at every level of the value chain, from regulators and funders, to building owners and tenants.

Beyond the environmental imperative, low carbon design is an investment opportunity.

Low carbon design reduces our impact on the environment and future-proofs our investments from both a changing climate and a changing market. Although there can be a capital cost to building more sustainably, the investment can reap substantial benefits.

He Toki Kai Te Rika
Otago Polytechnic
Trades Training Centre

Using the Living Building Challenge as a sustainable design framework, the Polytechnic Campus Development project is the 11th in the world to register as a Living Community Challenge Project.



Mason Bros.
Wynyard Quarter, Auckland

It has the distinction of the first building in Auckland to achieve both 6-Star Green Star rated and NABERSNZ 5.5 Star-rated.

KPMG

KPMG has committed to a target of achieving net zero carbon emissions by 2030. In 2021 they verified their targets under the science-based target initiative. Simple design choices and careful selection of materials reduced the embodied carbon impact of their recent Wellington fitout by 26% when compared to industry benchmarks.

The four drivers for low carbon design:

01

Government commitments and regulations

Governments worldwide are intensifying their focus on environmental sustainability. The Australian and New Zealand governments have committed to reducing their GHG emissions to 43% and 50% (respectively) of their 2005 levels by 2030. As a result, governments are introducing:

- Planning regulations requiring new developments to model and report on their operational, embodied and transport carbon impacts.
- Programmed changes to the Building Code to improve thermal and energy performance, reduce the use of fossil fuels and introduce embodied carbon limits.
- Incentives to increase the uptake of renewable energy generation.
- Incentives to increase the adoption of environmental ratings, such as Green Star, Nathers, NABERS, BASIX and Homestar.
- Mandatory performance requirements for government buildings and tenancies and minimum environmental ratings such as Green Star and NABERS.

02

Climate related reporting requirements and the growth of green finance

Countries and regions representing 56% of the global GDP have committed to introducing mandatory climate related disclosures by 2025.

For large companies and financial institutions, mandatory climate-related disclosures began in New Zealand in 2023 and will begin in Australia in 2025. These laws require businesses to make climate-related disclosures, covering GHG emissions, climate governance, and climate risk management across their value chains.

As a result, there is a growing focus on carbon impacts of developments, and funders are steering capital toward sustainable investments. There has been a significant rise in the availability of green and sustainable financing products and incentives such as green bonds and loans. These offer market advantage to developers and owners investing in sustainable buildings through:

- Lower borrowing costs.
- Better access to capital.

03

Corporate carbon commitment and science-based targets

The transition to a more sustainable future is also being driven by corporations who have set their own climate commitments. A new report from Microsoft and the University of London reveals that 75% of Australian companies have net zero 2050 targets.

An increased scrutiny of sustainability claims is driving a growing number of companies to align their commitments with independent international bodies such as the Science-Based Targets initiative (SBTi). Over recent years, the growth of the SBTi has been exponential - by the end of 2023, over 25% of the Forbes 2000 companies had SBTi validated targets.

Commitment to these targets has significant implications on a company's upstream and downstream property-related decisions, requiring them to measure and reduce the operational and embodied carbon impacts of:

- The buildings they tenant.
- The buildings they own and operate.
- The buildings that are developed for them by others.
- The buildings they invest in.

04

Customer expectation and tenant demand

There is growing consumer demand for sustainable buildings as new generations prefer to live and work in spaces that mirror their values. Companies adopting sustainable business practices are gaining a competitive advantage, particularly among younger workers.

Transparency about the environmental impact of products and services is increasingly expected by consumers, and they are willing to pay a premium for sustainably produced goods and services according to the PwC 2024 Voice of the Consumer Survey. This trend is poised to extend into the real estate industry.

In the workforce, the preference for environmentally conscious workplaces is becoming more pronounced. According to a 2021 IBM study, 71% of job seekers and employees are more attracted to companies that demonstrate a commitment to environmental sustainability. This reflects a broader shift towards more ethically and environmentally-focused business practices across industries.

Getting started with carbon and emissions

Decarbonisation of the built environment involves both the reduction of the way we use our buildings (operational carbon) and the reduction of the way we construct and maintain buildings (embodied carbon).

Low carbon design requires a reduction in both embodied and operational carbon.

Recognising the practical challenges of achieving net zero carbon emissions, the World Green Building Council has proposed different timelines for achieving net zero embodied and operational carbon.

- *By 2030 all new buildings must be net zero operational carbon and all new buildings will have at least 40% less embodied carbon.*
- *By 2050 all new buildings must be net zero operational carbon and net zero in embodied carbon.*

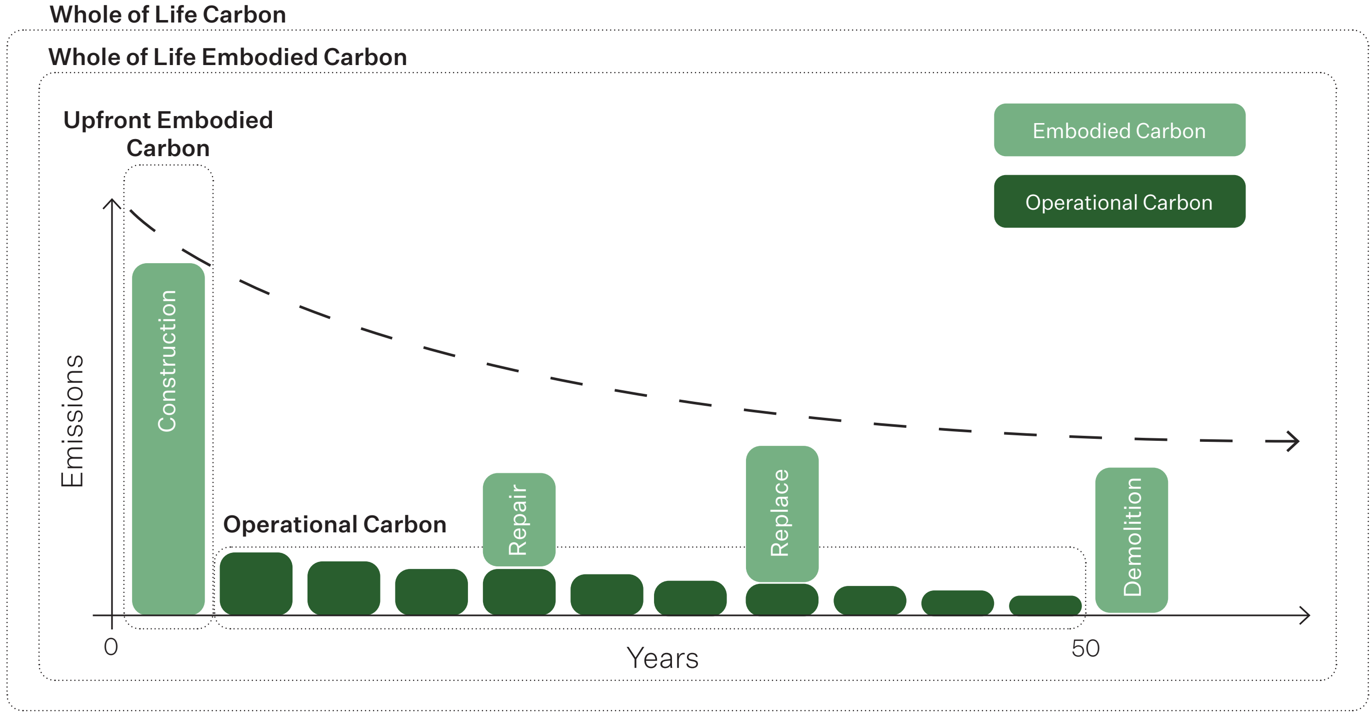
Much of the focus to date has been on reducing operational carbon through improving the energy efficiency of our designs.

While operational carbon efficiency can be improved over time, we will only get one chance to significantly reduce the embodied carbon of a building and that is at the outset of the project.

If we are to limit global warming to 1.5 degrees, there is a strong argument that we will need to achieve the early wins that only a reduction in embodied carbon can offer.

Carbon emissions over a typical building's life cycle follows a predicable pattern

Emissions over a buildings life cycle



At the start of the building's life there is a large spike in embodied carbon emissions from materials used in construction. These emissions are called upfront embodied carbon.

During the life of the building there will also be periodic embodied carbon emissions from repair, maintenance, or replacement of materials as they age.

At the end of the building's life, there will be another spike in embodied carbon emissions caused from deconstruction/demolition, transport, and waste processing.

While the building is in use, there will be annual operational carbon emissions from the energy and water.

Importantly, over the life of the building we can expect that the annual operational carbon emissions will reduce, as equipment becomes more energy efficient and as the national electricity grids shift to higher ratios of renewable energy generation.

However, emissions from upfront embodied carbon are locked in after construction and can't be reduced. This is why we need to work hard during the design phase to reduce the carbon intensity of the scheme.

"The approach to reducing carbon emissions from energy and materials will vary from one project to another. By recognising a well-rounded strategy early, you set the foundation for your project to make a lasting difference, from construction through to long-term operation."

Emily Newmarch
Sustainability Lead
Warren and Mahoney

Waimarie Lincoln University

The project is the first to be completed since Lincoln University adopted its campus-wide decarbonisation strategy. Innovative engineering and material selection reduced the embodied carbon by 36%.

The decommissioning of the coal boiler and the adoption of geothermal and PV renewable energy is estimated to have reduced the potential whole-of-life operational carbon by 92%

02

Low carbon design strategies in practice

There are no silver bullets in low carbon design. Data shows that the highest performing projects implement small but intentional initiatives. Like compounding interest, these add up over the long-term.

Our aim in this section, is to demystify the process. We will provide guidance on how to set your project up for success and describe simple ways to help you become an informed participant in the sustainable design process.

Deloitte Centre and Intercontinental Hotel

The choice to retain the existing concrete structure has resulted in an outcome with less than half the embodied carbon emissions of building new. The redevelopment is targeting a 6 Green Star rating and a 4 Star NABERS rating.

01

Set the aspiration

The first step is the creation of a carbon brief and budget. Going into a project, it's critical to understand what you want to achieve. Is it simply a more sustainable outcome, is it to meet your new reporting standards, do you want to push towards net zero or beyond?

It's important to engage with your architect at the earliest stages of a project to help define the opportunity and develop a carbon brief that sits alongside the spatial brief and project budget. The carbon brief can be included in consultant agreements to provide the design team with a clear target for the embodied and operational carbon of the project, while at the same time defining the scope and method of measurement.

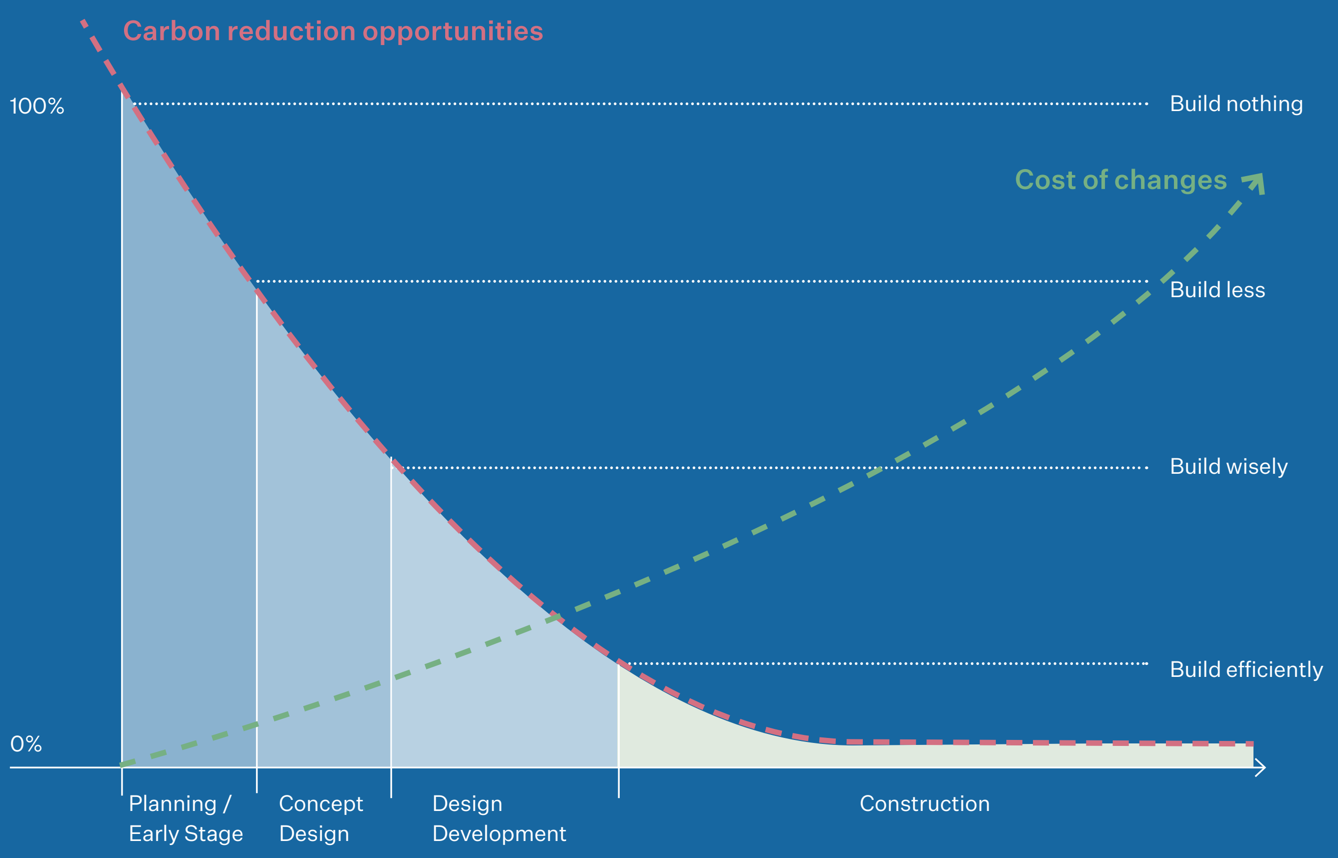
02

Act early for the biggest impact

The ability to reduce the carbon impact of a project diminishes with every design phase and every design decision, as illustrated below.

The cost of making changes increases with every design phase and every design decision.

Simple moves like building form and orientation can have a huge impact on its carbon intensity - so it's critical these decisions are considered holistically from the outset.



03

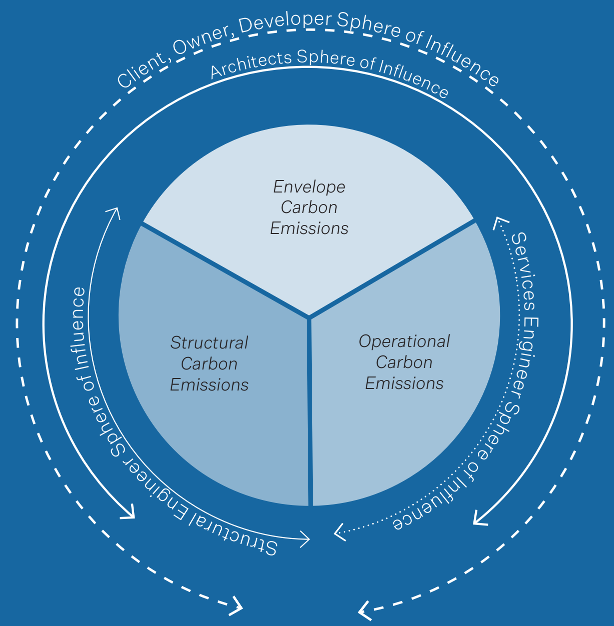
A successful team structure

If we want to deliver building forms that are inherently more efficient to construct and operate, tomorrow's low carbon design will require the engagement of all members of the design team.

The diagram below illustrates how an integrated approach is needed. Your architect, as lead design consultant, will be pivotal to the process of achieving a holistic low carbon solution. It is our experience that innovative low cost and low carbon outcomes result from strong design leadership and a united and motivated team.

Ultimately however, it's the ambition of the investors, developers and tenants that will determine the outcome of the project.

Sphere of influences



04

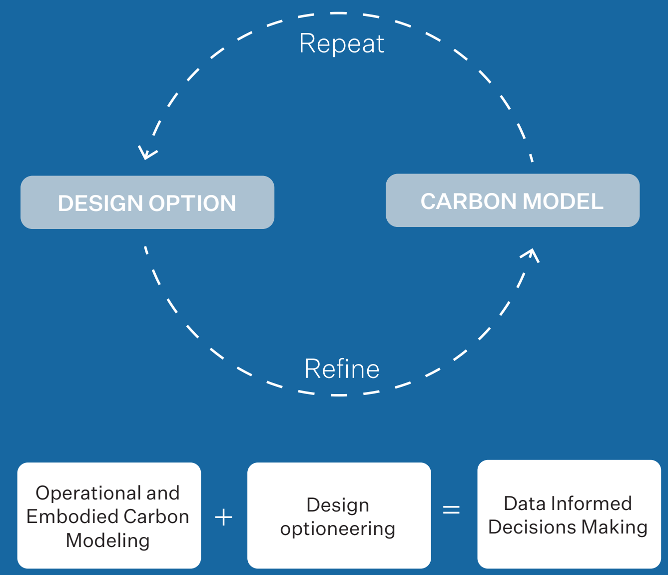
A data driven design process

Data-driven, real time decision-making can now inform the design to achieve the optimal response.

In a traditional design process, sustainability and carbon modeling occurs after the concept design is substantially complete and the potential for changes are minimal. Here, carbon assessments are auditing the design, rather than influencing it.

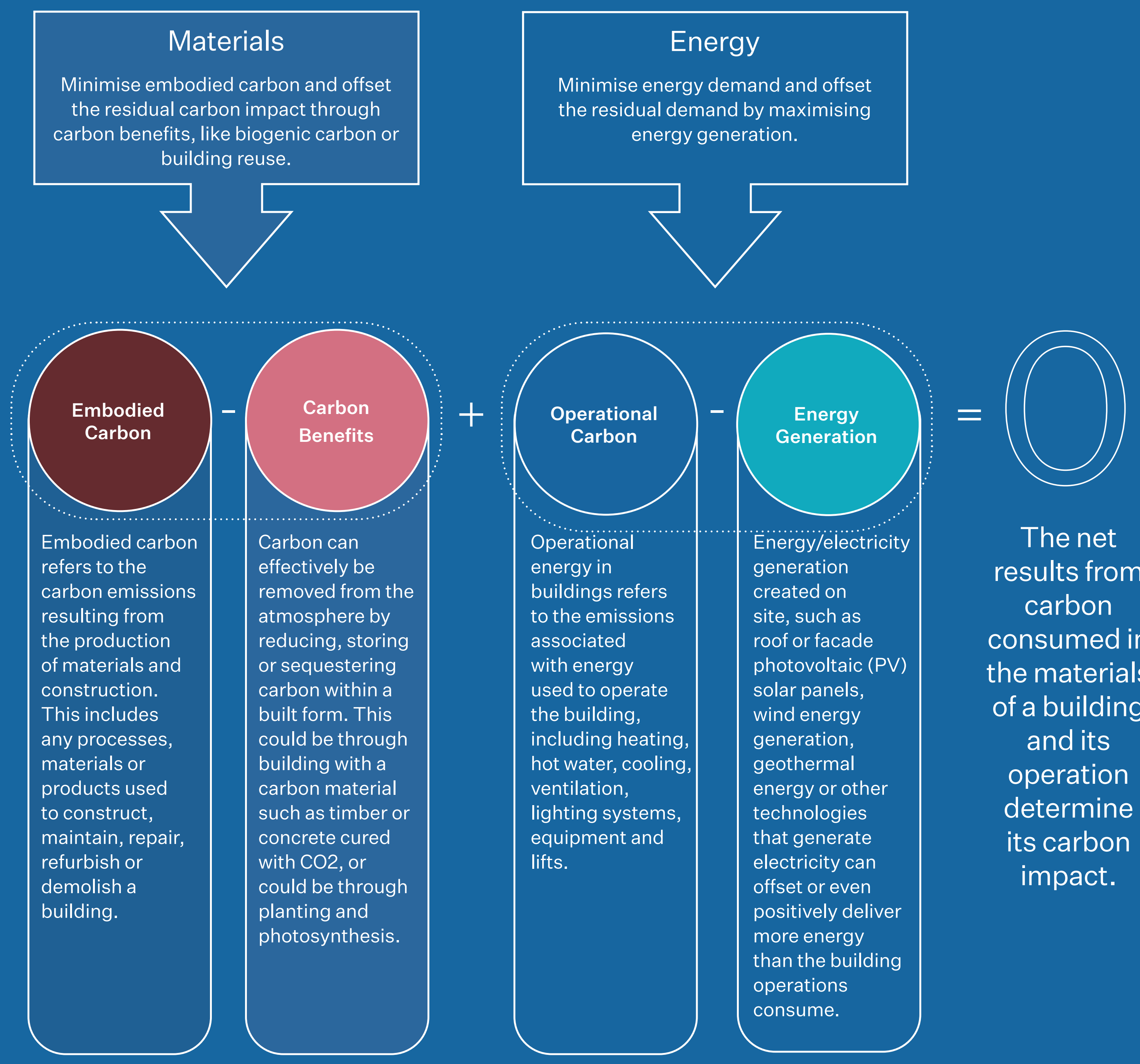
In an integrated design process, empowered by the latest technology and digital models, the designer and carbon modeler work hand-in-hand, particularly in the earliest, most intense concept phases of the project, to derive the right solutions - balancing form, function and sustainability to deliver on the brief.

An integrated process



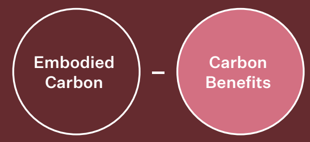
In conversation with investors, developers and tenants, we heard a growing frustration with frameworks and accreditations that were overly complicated. The WAM Carbon Equation responds to a desire for a simple pathway to 100% Net Zero.

The WAM Carbon Equation



The climate impact of your building is the sum of these design strategies. The key to reducing carbon emissions in buildings is to focus on high impact and low cost.

Embodied carbon reduction



Reducing the embodied carbon in our built environment is one of the biggest opportunities for the sector. With the ability to accurately model carbon, we can now see the design potential of adaptive re-use, mass timber and other low carbon design opportunities.

Embodied carbon strategies should be approached sequentially. The pyramid below provides a structure for decision making to achieve the greatest impact in the most cost effective way.

The embodied carbon equation is colour coded in the pyramid below - illustrating those strategies that reduce embodied carbon emissions and those that balance and/or offset these emissions. Collectively, this is the embodied carbon side of the WAM Carbon Equation.

Building less by optimising the brief.

Refurbish and retrofit existing building stock.

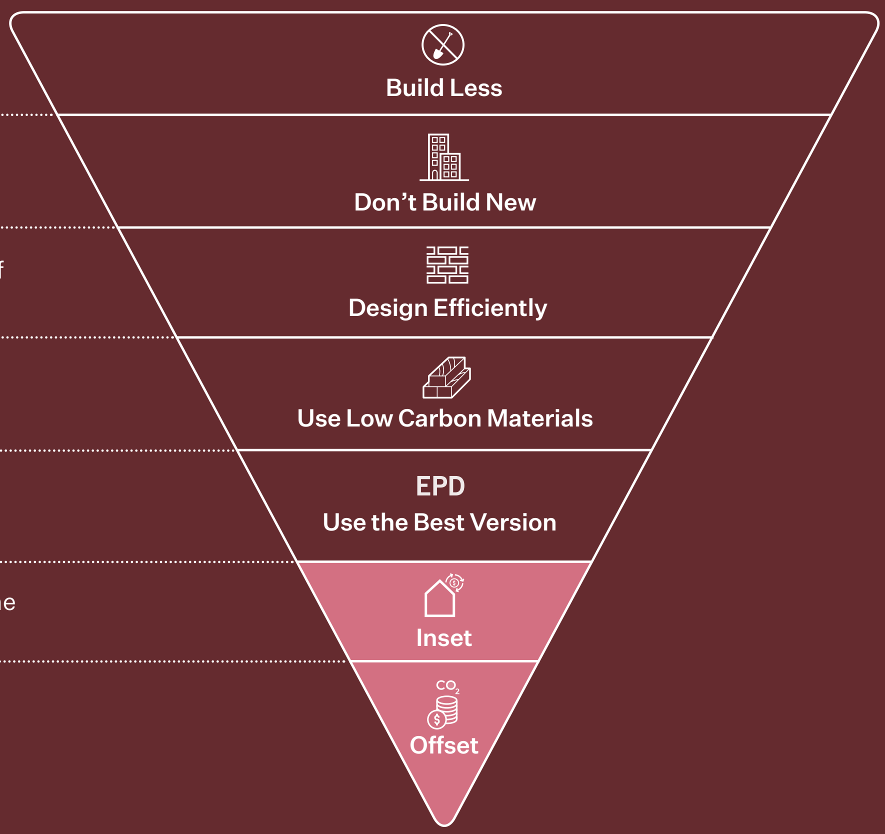
Maximise the efficiency and functionality of each component of the design.

Prioritise the selection of low carbon and natural materials.

Opt for products manufactured with lower embodied carbon.

Before resorting to offsets, consider how the elements can act as a carbon sink.

Purchase high-quality carbon credits to offset unavoidable emissions.



Return on investment

When considering embodied carbon reduction, return on investment is a critical project consideration. It's essential to work with the project cost consultant to achieve the greatest possible carbon reductions and efficiencies at the lowest possible cost. Considering return on sustainability investment will ensure the largest possible carbon reductions are achieved within budget.

Key design strategies to minimise embodied carbon

1. Building less

Building less is good for the planet and our budgets.

The first challenge on every project should be to interrogate the brief to refine the project into the smallest amount of spaces required to achieve the intended outcome.

2. Don't build new

"The greenest building is the one that already exists". Refurbishment and adaptive re-use means that the CO2 that is already captured in existing buildings stays there. When retrofitting there are considerations such as floor-to-floor heights, structural integrity, fire escape, core location, facade performance and more that needs to be taken into consideration - our experienced team can take you through the adaptive reuse process.

A building's structure typically accounts for over 50% of its overall embodied carbon. By building the structure in mass timber, such as CLT and Glulam, the structure can become a carbon asset rather than a carbon liability.

3. Design efficiently

Whether you are designing from new, or not, doing more with less should always be a core design consideration and here at WAM we call this quality over complexity. Key strategies include:

- Reducing the size of the building through efficient planning.
- Optimise structure to minimise the amount of concrete or steel.
- Design more efficiently to reduce materials and costs.
- Minimise construction waste through modular design and offsite fabrication.
- Dematerialise by removing materials required for decorative purposes only.
- Design for life-cycle, circularity and re-use with whole of life costing considered.

4. Use low carbon materials

Select materials with lower carbon intensity ($kgCO_2e$-/kg) per unit of material. Key strategies include:

- Considering structural efficiency and timber if appropriate.
- Minimise the use of carbon-intensive materials such as concrete, steel and aluminium.
- Use One Click LCA or other carbon comparison tools to compare material options during the design.
- Select durable materials with a low "whole of life" carbon impact.
- Avoid materials which require applied surface finishes.

5. Use the best version

Opt for products manufactured with lower embodied carbon by utilising Environmental Product Declarations (EPD) to inform purchasing decisions.

- Use products such as "green concrete" rather than industry standard products.
- Prioritise products with high recycled content.
- Consider where the product is manufactured and its shipping and transport impact.

6. Inset

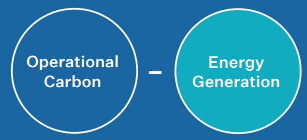
By selecting materials such as timber, which takes carbon out of the atmosphere while it's growing, building materials can effectively act as a carbon sink trapping carbon for the life of the building. This is typically termed "biogenic carbon" or "carbon sequestration."

7. Offset

Avoiding and reducing emissions should always be the top priority. However, to bring a building's embodied carbon down to zero, there is often no choice but to resort to purchasing offsets.

Carbon offsets should only be used as a last resort. When purchasing offsets, seek high-quality carbon credits that have a real impact.

Operational carbon reduction



Reducing the operational carbon intensity of a building provides dual benefit. From an operators perspective, improved efficiency will reduce energy demand and operational running costs. For society, a reduction in energy demand relates to a direct reduction in carbon emissions.

Investments in operational carbon reductions should be evaluated, not only on their carbon benefit, but also in relation to the return on investment (or payback period).

As illustrated below, we believe that the design of low carbon solutions should be approached sequentially. The first step in the process is always to reduce the energy demand through passive low energy design.

Once the form and envelope has been optimised, consideration is given to efficient servicing systems, eliminating fossil fuels, renewable power generation and finally offsetting to reach net zero carbon in operation.

The operational carbon equation is colour coded in the pyramid below - illustrating those strategies that reduce operational carbon emissions and also those that can generate energy to balance usage. Collectively, this is the operational carbon side of the WAM Carbon Equation.

Use less energy through passive low energy design principles.

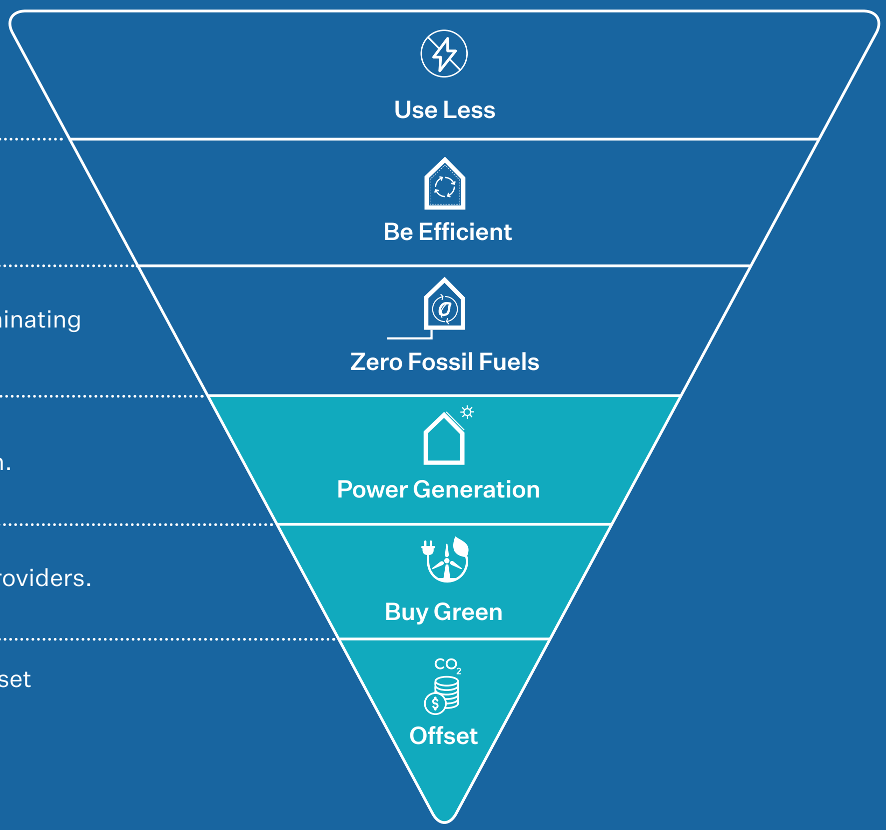
Employ efficient mechanical and electrical systems and equipment.

Transition to 100% electric operations, eliminating the use of gas and fossil fuels.

Install on-site renewable energy generation.

Purchase renewable energy from off-site providers.

Purchase high-quality carbon credits to offset unavoidable emissions.



Return on investment

When considering operational carbon reduction, return on investment is a critical project consideration. It's essential to work with the project cost consultant to achieve the greatest possible carbon reductions at the lowest possible cost. Considering return on sustainability investment will ensure the largest possible carbon reductions are achieved within budget.

Key design strategies to minimise operational carbon

1. Use less

Passive low energy design principles can be used to create a building form which is inherently more energy efficient and is less reliant on servicing systems to maintain comfortable conditions. Passive design principles should always be the first consideration. Typically:

- Orientation and form of the building in response to sun and wind.
- Optimise the orientation of glazing and the window-to-wall ratio to provide thermal comfort year-round.
- External shading to block unwanted summer sun but admit beneficial winter sun.
- Placement of openable windows and natural ventilation strategies.
- Placement of thermal mass to regulate temperature.
- A high performance, well insulated and airtight envelope.

2. Be efficient

Energy-efficient mechanical, electrical and hydraulic systems which might include:

- Energy-efficient heating and cooling systems such as heat pumps and/or ground sourced heating/cooling.
- Heat recovery and reclaim systems.
- Daylight harvesting and energy efficient lighting (LEDs).
- Energy efficient equipment.
- Low water plumbing fittings
- Improved zoning and controls.
- BMS and smart building solutions.
- District energy systems.

3. Zero fossil fuels

Building electrification is one of the most important factors in decarbonising our buildings. One of the first steps to a decarbonised future is removing fossil fuels from buildings by:

- 100% electric operations.
- Replacing fossil-fuel systems such as diesel and coal fire boilers with renewable alternatives.
- Replacing gas cook-tops with induction cook-tops.
- Move away from gas boilers to electric heat pumps or electric boilers.
- Using energy when the grid is greener and there is less reliance on non-renewable energy sources.

4. Power generation

As a result of technological advances and cost reductions, the generation of renewable energy on site is becoming an increasingly attractive option for many projects. Excess power can be sold back to the grid or stored for later use in on-site battery storage to improve the net performance. Opportunities include:

- Solar water heating.
- Photovoltaic (PV) panels.
- Ground source heating and cooling.
- Micro hydro systems.
- Small vertical wind turbines.

5. Buy green

The purchase of certified renewable energy from energy suppliers is an attractive option for many building owners to eliminate the residual carbon from the electrical energy used in the building. Energy providers may offer certified renewable electricity directly from the grid, or for large users may offer to provide the renewable energy infrastructure on-site - usually in the form of a photovoltaics. Such on-site installations are becoming more common but are also more complex and will involve a long-term supply agreement with the provider.

6. Offset

Avoiding and reducing emissions should always be the top priority. However, to bring a building's operational carbon down to zero, there is often no choice but to resort to offsets. Carbon offsets should only be used as a last resort.

When purchasing offsets, ensure the purchase of high-quality carbon credits that have a real impact.

03

Measuring impact to get the right results

As the saying goes, what you can measure you can manage.

There is currently a lack of transparency and consistency in the market with respect to carbon measurement and reporting, resulting in confusion on what to trust. The aim of the next few pages is to shine some light on the language being used and provide guidance on sustainability certifications you may wish to pursue to validate your investment.

Understanding how emissions are measured and reported will help inform your approach to carbon reduction.

90 Devonport Road, Tauranga

90 Devonport Road, which is currently under construction, is set to be the largest mass timber office building in New Zealand.

Targeting a reduction in embodied carbon and a 6 Star Green Star rating, the project sets a new globally relevant benchmark for sustainability and a new standard for design quality.

Understanding the language

There are two key questions when measuring the carbon of a building. The first is what parts of the building are to be included. The second is what parts of the lifecycle are to be considered.

01. What parts of the building are included?

It is important at the outset to clearly understand what parts of the building will be measured, and what parts will be excluded. A tenant may be interested in the fitout only. Developers may be only interested in the base building shell. To add to the confusion, there are many different definitions developed by certifications, governments, and other guidance documentation of what to include and exclude. Ensuring there is a consistent definition of what is measured will mean the results from one building will be comparable to another.

02. What part of the lifecycle is being considered?

When measuring the carbon impact of a building, it's important to understand what parts of the lifecycle are being measured.

As illustrated to the right, European Standard EN 15978 breaks the lifecycle of a building into 17 stages. Two of these relate to operational carbon and 15 relate to embodied carbon.

Our team of carbon specialists can help you navigate this territory and help you set a clear carbon brief for your project, or interpret the carbon measurements of others.

Carbon is typically measured in four ways depending on the purpose. These are:

01. Whole of Life Carbon (Cradle to Grave)

Embodied and operational carbon emissions from all life cycle phases of the building.

02. Operational Carbon

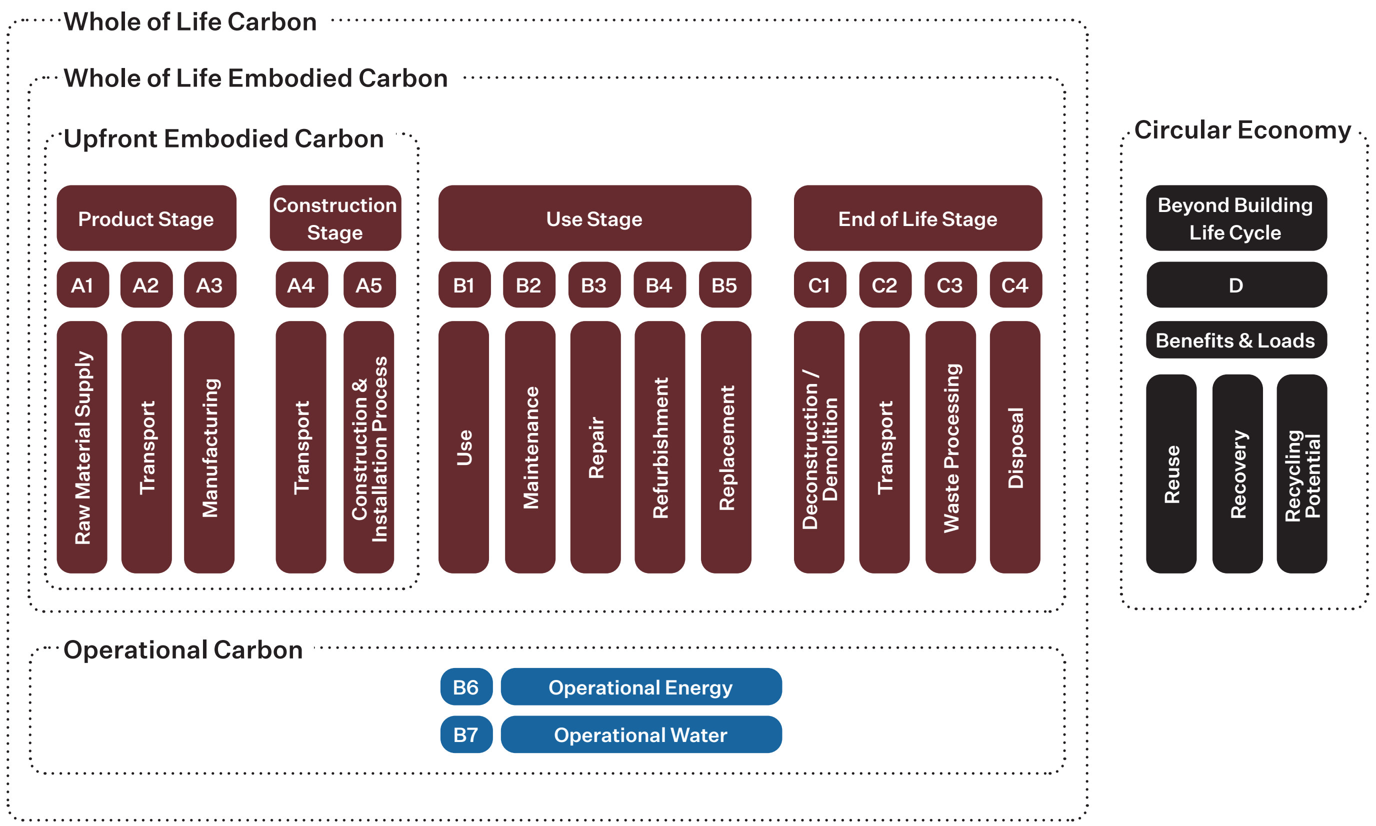
Whole of life operational carbon emissions associated with energy and water usage throughout the life of the building.

03. Whole of Life Embodied Carbon

Embodied carbon emissions from all life cycle phases of the building from construction to demolition.

04. Upfront Embodied Carbon (Cradle to Practical Completion)

Embodied carbon refers to the emissions caused in the materials production and construction phases only.



The above Life Cycle Assessment Scope Diagram is aligned with EN 15978.

Owing to the various ways to account for carbon, developing clarity on what's important for you, and/or any sustainability reporting requirements or certifications you may be pursuing, is critical when considering lower carbon outcomes.

The same project - very different results

Starting a project with a project brief will enable consistent and transparent results.

This page shows how big of an impact, different assessment methodologies can have on project reporting. All results are from the same project. Your consultant team can guide you through the right assessment and reporting frameworks. But ensuring you are comparing apples with apples is critical to set the right ambition and strategy from the start.

Green Star Design & As Built

Scope Categories

- Facilitating Works
- Substructure
- Superstructure
- Internal Finishes
- Services
- Work to Existing Building

440 $kgCO_2e/m^2$

Green Star Net Zero Carbon

Scope Categories

- Facilitating Works
- Substructure
- Superstructure
- Internal Finishes
- Services
- Prefabricated Buildings and Building Units
- Work to Existing Building
- External Works

950 $kgCO_2e/m^2$

MBIE

Scope Categories

- Substructure
- Superstructure
- Internal Finishes
- Services

395 $kgCO_2e/m^2$

ILFI Zero Carbon

Scope Categories

- Substructure
- Superstructure
- Internal Finishes

350 $kgCO_2e/m^2$

RICS

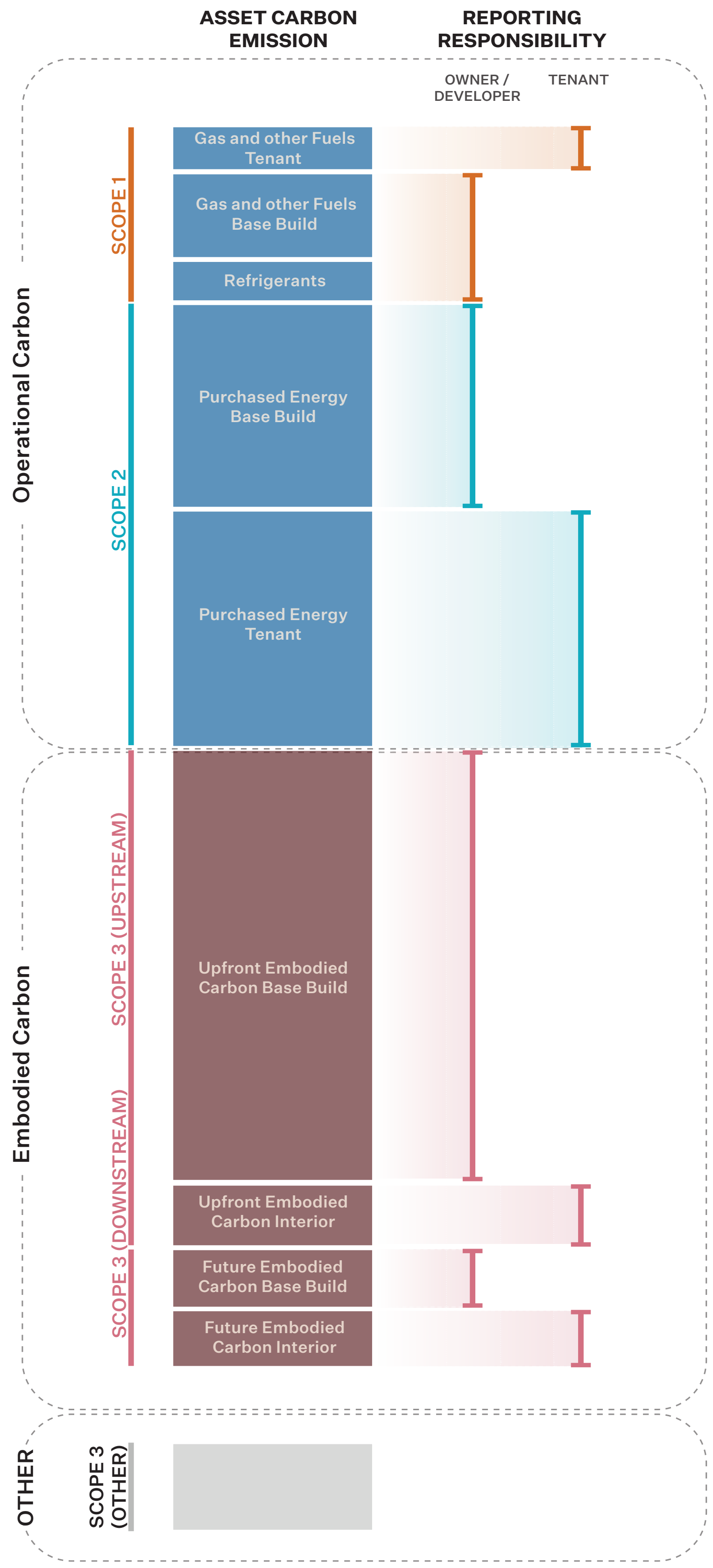
Scope Categories

- Substructure
- Superstructure
- Internal Finishes
- External Works

790 $kgCO_2e/m^2$

Understanding the links between organisational reporting and carbon emissions from buildings

When organisations report on their emissions, they are categorised under three buckets, scope 1, 2 and 3. Which can add confusion if the emissions from buildings are not translated. Operational carbon is typically reported under Scope 1 and 2. Embodied carbon is reported under scope 3. As can be seen in the diagram to the right, what an organisation includes in its reporting will depend on whether it is an owner, developer or a tenant. Your consultant team can help inform areas of impact.



SCOPE 1 EMISSIONS - DIRECT

Scope 1 emissions are direct greenhouse gas (GHG) emissions that occur from sources that are owned or controlled by an organisation. These emissions include those from combustion in owned or controlled boilers, furnaces, vehicles, and other sources.

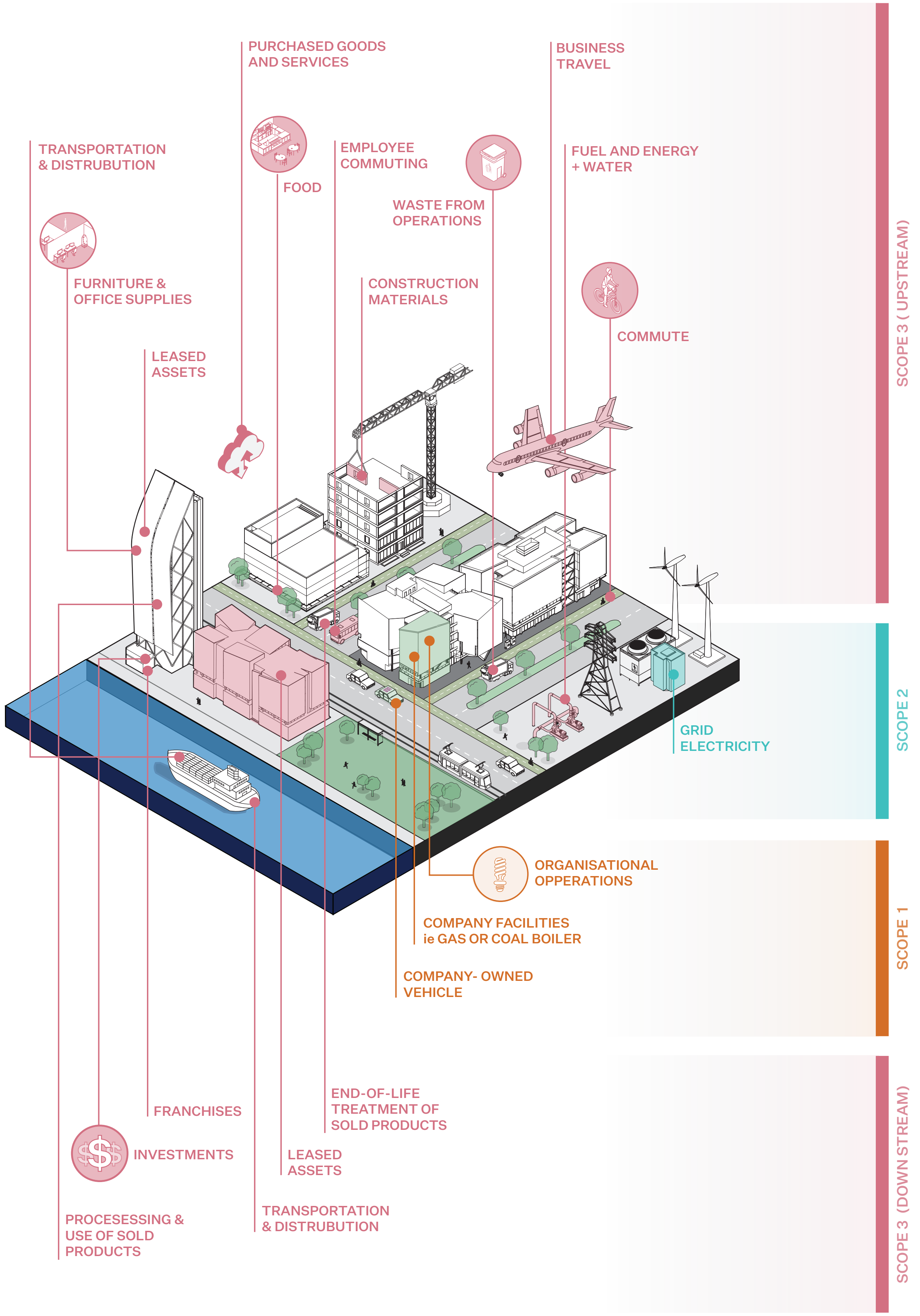
SCOPE 2 EMISSIONS - INDIRECT

Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. These emissions result from the generation of the purchased energy and occur at the facility where the energy is produced, not at the facility using the energy.

SCOPE 3 EMISSIONS - INDIRECT

Scope 3 emissions are all other indirect GHG emissions that occur in a company's value chain. These emissions are not directly controlled by the company but are a consequence of its activities. Emissions-wise, Scope 3 is nearly always the big one, covering upstream and downstream activities.

The infographic below illustrates how emissions are categorised into Scope 1, 2 and 3. Understanding this categorisation is useful to consider where decisions will have the largest impact.



"Carbon accounting is an emerging field. Like financial accounting, we're heading towards generally accepted standards which will make comparing apples with apples much easier. Now is a great time to make sure your organisation is aligned to these standards."

Graeme Finlay
Principal
Warren and Mahoney

Te Huhi Raupō, Taranaki

Te Huhi Raupō is on track to be one of the first healthcare facilities in the world to target Zero Energy and Zero Carbon certification via the International Living Future Institute.

Sustainability certifications developed for our global market

Independent environmental building certifications can be used to guide design teams in their decision making and validate carbon reductions achieved in practice.

The selection of certification tools identified below are either international or specifically designed for use in the NZ/Australian market. Your experienced design team can help you determine which certification to target in order to future proof your asset.

Certification	Description	Embodied Carbon Reduction	Operational Carbon Reduction
WGBC Net Zero Carbon Buildings Commitment **The World Green Building Council**	The World Green Building Council has established a vision called 'Advancing Net Zero' - a global programme towards sector decarbonisation by 2050. As part of this, their 'Net Zero Carbon Buildings Commitment' has been developed for businesses, organisations, cities and regional governments to guide, recognise and promote advanced climate leadership action. The commitment requires reductions in both embodied and operational carbon.	✓	✓
Living Building Challenge The International Living Future Institute	The Living Building Challenge is an international sustainable building certification programme, advocacy tool and rating system that can be applied at various scales. This is the world's most rigorous green building certification framework. Projects are awarded points in the energy and materials petals for a reduced carbon reduction.	✓	✓
Zero Carbon (ZC) The International Living Future Institute	The Zero Carbon (ZC) Certification offered by the International Living Future Institute is solely concerned with emission reductions in embodied and operational carbon. This certification requires full decarbonisation, zero matters.	✓	✓
Zero Energy (ZC) The International Living Future Institute	The Zero Energy (ZE) Certification is based upon the energy performance compared to a reference project. ZE Certification is a standard that recognises the highest levels of energy performance that can be achieved by built projects.	✗	✓
Green Star Green Building Council of Australia and New Zealand	Green Star, developed by the Green Building Council of Australia and New Zealand, is the most recognised sustainability rating tool for commercial buildings, houses, communities and fitouts. Green Star is an internationally recognised holistic rating system that aims to create healthy, resilient and positive places for people and the natural environment. Credits are achieved for both operational and embodied carbon reductions.	✓	✓
Net Zero Buildings Green Building Council of New Zealand	Net Zero Buildings is the carbon neutral standard for New Zealand building operations. Buildings must prove a high level of operational efficiency, before offsetting any residual emissions. Net Zero Buildings certification tracks all major sources of carbon emissions in building operations – energy, water, waste and refrigerants.	✗	✓
Embodied Carbon NABERS Australia	NABERS is soon to release an Embodied Carbon rating tool which will enable new buildings and major refurbishments to measure, verify, and compare their upfront embodied carbon with similar buildings. As Australia currently has no consistent method for measuring embodied carbon, the development of this tool is a critical step towards achieving our 2050 net zero emissions target. Utilising the familiar 6-star scale of other NABERS ratings, it will provide a clear and concise evaluation of a building's environmental impact.	✓	✗
Climate Active Carbon Neutral NABERS Australia	NABERS offers a pathway to achieve Climate Active Carbon Neutral certification - a world-leading, government-backed certification that is aligned to national and international greenhouse gas accounting protocols. By offsetting your remaining operational emissions you can achieve the carbon neutral certification.	✗	✓
Passivhaus Certification	Passivhaus (or Passive House) certification is a rigorous standard for energy efficiency in buildings, focusing on reducing the building's ecological footprint. The Passivhaus standard aims to create buildings that require minimal energy for heating or cooling while maintaining high levels of comfort.	✓	✓

Northcote Aquatic and Recreation Centre, Melbourne

Australia's first 6 Star Green Star all electric aquatic facility

Glossary

A glossary to help you navigate industry jargon.

Biogenic carbon	Biogenic carbon is the carbon stored in plants and soil. Plants absorb CO_2 from photosynthesis and store it. Using plant-based materials like wood or bio-plastics can help reduce CO_2 levels through their carbon absorption properties and fight climate change.
Carbon credits/offsets	An offset is where an avoidance, reduction, or removal of a carbon emission is used to compensate for, or neutralise a CO_2 emission that occurs elsewhere (World Green Building Council, 2021). We can still produce some emissions, but we need to offset them - for example, by planting new forests. As a process this should be the last resort to reduce carbon emissions.
Carbon neutral	Making no net release of carbon dioxide to the atmosphere by balancing emissions of carbon dioxide with its removal (offsetting).
Carbon sequestration	The process of storing carbon in natural geological formations underground which traps the gas permanently.
Clean energy/ Green energy / Renewable energy	Energy generated via naturally replenished resources that do not produce CO_2 as a by-product.
Carbon positive and carbon negative	Going beyond achieving net-zero carbon emissions to create an environmental benefit by removing additional carbon dioxide from the atmosphere. Also sometimes known as carbon negative when the net (emissions minus biogenic) result is negative.
CO_2e (Carbon Dioxide Equivalent)	The equivalent of CO_2 measured in kg as a method to calculate potential climate change impact.
Embodied carbon	Total carbon emissions produced in the production and construction process stages of a building life cycle, including emissions from raw material supply, manufacturing, transportation, and construction or installation of a building (World Green Building Council, 2021).
Emissions	Greenhouse gasses released through the combustion of fossil fuels and other human activities.
EPD (Environmental Product Declaration)	An independently verified and registered document that communicates transparent and comparable data and other relevant environmental information about the life cycle of a product.
Global Warming Potential (GWP)	An environmental impact indicator measuring how much a given amount of greenhouse gas is likely to contribute to global warming over a specific timeframe - usually 20, 100, or 500 years (One Click LCA).
Greenhouse gas	Tiny particles released into the earth's atmosphere that absorb energy from the sun, preventing hear from leaving the atmosphere. Gases include carbon dioxide, methane, nitrous oxide, ozone, water vapour and chlorofluorocarbons from leaving the atmosphere.
Grid factor	A factor multiplied by energy use to determine the carbon emitted to produce a given amount of energy by the local electrical grid.
Life Cycle Assessment (LCA)	A methodology for assessing environmental impacts associated with all stages of the life cycle of a commercial product, process or building.

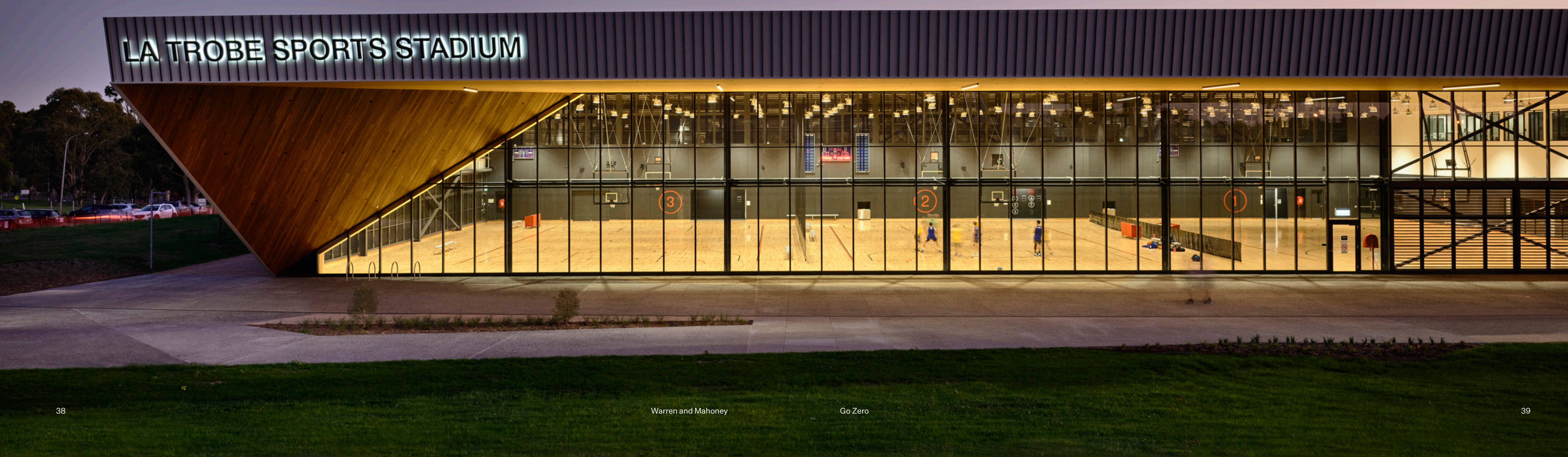
Net Zero (Operational Carbon)	When the amount of carbon dioxide emissions associated with building operations on an annual basis is reduced (highly energy efficient and fully powered from on-site and/or off-site renewable energy sources) to a level that is consistent with reaching net zero at the global or sector level in 1.5oC pathways. Any residual emissions that remain unfeasible to eliminate should be neutralised through carbon removals (World Green Building Council).
Net Zero (Whole of Life)	When, in addition to net zero operational carbon, upfront carbon and other embodied carbon across the building's lifecycle is reduced to a level that is consistent with reaching net zero at the global or sector level in 1.5oC pathways. Any residual emissions that remain unfeasible to eliminate should be neutralised through carbon removals (World Green Building Council)
Operational Carbon	The carbon emissions required to operate a building on an ongoing basis. This includes carbon produced in the burning of fuels for heating, or carbon produced in electricity generation for electric heating, mechanical ventilation, lighting, equipment loads, etc.
Upfront Embodied Carbon	Upfront embodied carbon emissions are the GHG emissions associated with materials and construction processes up to practical completion (Modules A1-A5).
Whole of Life Carbon	Whole Life Carbon emissions are the sum total of all asset-related GHG emissions and removals, both operational and embodied over the life-cycle of an asset, including its disposal.

La Trobe University Sports Park and Stadium

La Trobe University's new indoor sports stadium supports both elite and grassroots sport and took a sustainability first approach. The project earned Australia's first 6 Star Green Star rating for a sports building and was designed with a roof mounted solar array which generates more energy than the stadium's entire electrical demand. The building is net positive operationally.

" We have one planet, one future, and one chance to make a difference. Every project matters. Together lets find the best value, highest impact solutions."

Emily Newmarch
Sustainability Lead
Warren and Mahoney



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