ماجد الفطيم
MAJID AL FUTTAIM

GREAT MOMENTS
FOR EVERYONE,
EVERYDAY

UNDERSTANDING EMBODIED CARBON

HOW MAJID AL FUTTAIM IS ADDRESSING EMBODIED CARBON

LEADING BY EXAMPLE: SUSTAINABILITY THOUGHT LEADERSHIP SERIES

IN THIS REPORT

Much has changed since we announced our Net Positive commitment in 2017. We are witnessing an increased global awareness on the climate crisis as many businesses make their own net zero pledges. For us at Majid Al Futtaim, a business in expansion to new markets, understanding the full impact of our buildings is a key element of our Net Positive ambition. This thought-leadership paper introduces how we are tackling embodied carbon in our 2040 roadmap, highlights the importance of accounting for embodied carbon, reviews best practice guidance, and outlines the tools we are developing.

With so many of us navigating the unknown road to net zero, it's vital that we learn from each other and work together to achieve our ambitions, ultimately benefiting our world. I'm pleased to share with all our stakeholders our plan of action, how we will overcome challenges and our successes.

As always, I encourage you to join us to *Dare Today, Change Tomorrow.*

Ibrahim Al-Zu'bi
Chief Sustainability Officer
Majid Al Futtaim

RETHINKING RESOURCES

We **DARE TO** rethink our use of resources to make a Net Positive impact

OUR STRATEGY

In 2018, we launched our Company-wide sustainability strategy, *Dare Today, Change Tomorrow*. Our strategy will transform the way we do business and embed sustainability thinking in everything we do, whilst contributing to 10 UN SDGs. The strategy sets out 21 material issues and 11 ambitious Sustainable Business Commitments across three strategic focus areas: Transforming Lives, Rethinking Resources and Empowering Our People.

OUR SUSTAINABLE BUSINESS COMMITMENT....

has seen us commit to become Net Positive in carbon for all operational, tenant and development activities by 2040.

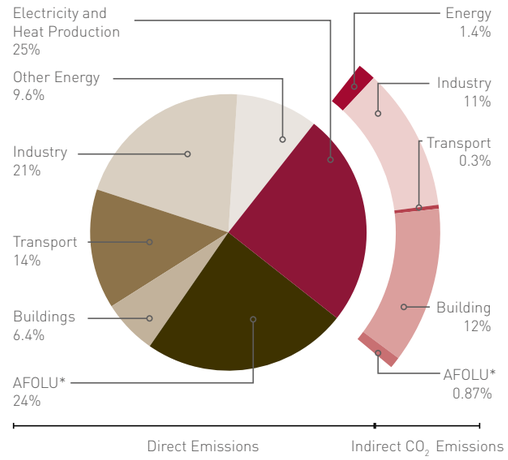
NET POSITIVE CARBON

OUR ALIGNMENT TO THE SDGS...

Our Net Positive Carbon commitment contributes to:

BUILDING THE CASE FOR ADDRESSING EMBODIED CARBON

Climate change is one of the greatest challenges of our time. Human-made carbon emissions have accelerated the normal rate at which the planet is warming, leading to severe environmental, social and financial effects. According to the World Green Building Council (WorldGBC), the building and construction sectors account for 39% of all carbon emissions in the world, with operational emissions responsible for 28%. The remaining 11% comes from carbon emissions associated with the construction of buildings, known as the embodied carbon[1]. These emissions are estimated to account for 50% of the entire carbon footprint of new construction between now and 2050. By 2060, the total global floor area of buildings will double, with more than 50% of this anticipated within the next 20 years.



*Agriculture, Forestry and Other Land Use

Figure 1: Greenhouse gas emissions by economic sectors[2]

GLOBAL TRENDS

The Paris Climate Agreement adopted in December 2015 stimulated research globally on climate change mitigation, leading to the development of various studies and frameworks to assist carbon-emitting industries in their efforts to reduce carbon emissions. Research in the built environment industry has been primarily focused on tackling operational emissions leading to energy performance targets being introduced in building regulation, planning requirements and sustainability assessment rating schemes (BREEAM, LEED, GRESB, etc.)[3]. This meant that other building performance aspects outside operational performance were left unaddressed.

In recent years, the term "whole life carbon emissions" has been introduced with the aim of expanding industry's focus to addressing carbon emissions throughout the lifecycle of buildings. In 2019, the WorldGBC published "Bringing Embodied Carbon Upfront"[4], a report calling for the global built environment to tackle not only the operational carbon but also the embodied carbon in the built environment.

REGIONAL CONTEXT

The Middle East and North Africa (MENA) region's population is rapidly growing and becoming increasingly urbanised[5] and the demand for sustainable buildings is rising.

Increasing climate crisis awareness and the commitment from regional and global businesses have been vital in driving change towards effective design and construction that support sustainability in the region.

Sustainable infrastructure is a growing priority in the region, and in particular in the United Arab Emirates (UAE), a signatory of the Paris Climate Agreement, with strategies including UAE Vision 2021, Dubai Plan 2021 and Abu Dhabi Plan 2030, positioning the UAE as a leading example for the MENA region.

Emirates Green Building Council (EmiratesGBC), a pioneer in the field of green building in the region, plays a critical role in driving the dialogue and action, to support in aligning the UAE's built environment with global environmental and climate targets. Certification for net zero buildings is now a reality in the region thanks to EmiratesGBC and International Living Future Institute (ILFI). This is a major catalyst towards climate action within the built environment in the region.

EMBODIED CARBON: WHY DOES IT MATTER?

From a whole life carbon perspective, embodied carbon refers to the greenhouse gases (GHG) emitted throughout the entire life of a building, from construction, to maintenance and decommissioning.

The different embodied carbon emissions sources in a building include:

- Embodied carbon of construction materials, fixtures and fittings
- Carbon emissions from transporting the building material to the construction site
- Carbon emissions from the building process
- Carbon emissions from maintenance, repair and replacements
- Carbon emissions from deconstructing and disposing the building at the end of its lifetime

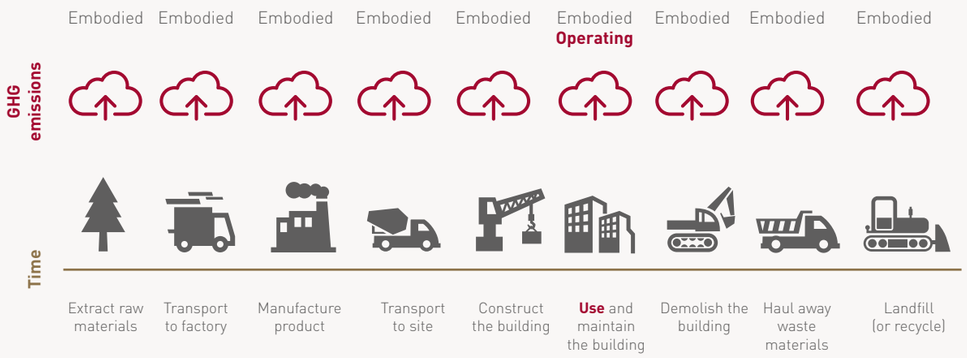


Figure 2: Embodied carbon emissions in the built environment[6]

HOW TO MEASURE EMBODIED CARBON

WHOLE LIFE CARBON ASSESSMENT METHOD

The whole lifecycle of carbon in a building is quantified using Lifecycle Assessment (LCA). It is through these assessments that the industry has come to understand the importance of embodied carbon.

The whole life carbon assessment method was developed by the Royal Institute of Chartered Surveyors (RICS). The method provides a framework for measuring whole life carbon emissions at the different stages of a building's life and sets out guidance for how to conduct whole life carbon assessments.

There is not a strict number of assessments that needs to be carried out to comply with ISO standards, but assessments should be undertaken in a sequential fashion during the design, procurement, construction and post-completion stage, starting as early as at concept design stage. Early stage assessments are recommended to establish a baseline carbon estimate for the project, to integrate whole life carbon into the design process and to identify carbon reduction potential while there is significant capacity to influence decisions. Further assessments at later project stages are advisable for monitoring the carbon budget progress as the project develops and providing the actual carbon footprint at practical completion. Whole life carbon savings for a project can only be quantified and claimed when whole life carbon assessments have been carried out at a minimum of two different points in time.

LIFECYCLE STAGES

The figure below shows the life stages of a building and the modules (A to D) as set out in the whole life carbon assessment methodology developed by RICS.

Life stage	Modules	System boundary		
Product Construction Process	A1 to A3 A4 and A5	Embodied carbon to practical completion (PC-CO_2e)	Embodied carbon over the lifecycle (LC=CO_2e)	Whole life carbon (WL-CO_2e)
Use End of Life	B1 to B7 C1 to C4			
Benefits and loads beyond system boundary	D			

Figure 3: RICS Whole Life Carbon Assessment life stages and system boundaries[3]

- **Product stage** (Modules A1-A3) covers the embodied carbon of building materials
- **Construction Process stage** (Modules A4-A5) covers the GHG emissions associated with construction activities e.g. from energy used and waste generated
- **Use stage** (Modules B1-B7) covers the embodied carbon of maintenance, repair and small refurbishments
- **End of Life stage** (Modules C1-C4) covers the GHG emissions linked to the demolition of infrastructure

CARBON DATA SOURCES

In order to calculate the carbon emissions at the different life stages of a building, RICS whole life carbon assessment methodology proposes the following carbon data sources:

- Environmental Product Declarations (EPDs), which are used to calculate the embodied carbon of building materials in the product stage [A1-A3], some elements of the use stage [B1-B5] and the end of life stage [C1-C4]
- Grid carbon factors, relevant to the country where the assessment is carried out, are used to calculate the carbon emissions from construction operations in the constructions stage [A4-A5] and the expected life time operational carbon [B6-B7]

ENVIRONMENTAL PRODUCT DECLARATIONS (EPDs)

An EPD is a document used to quantifiably demonstrate the environmental performance of a product or a material over its lifetime. In the construction sector, EPDs are used by engineers and architects to compare the environmental performance of different building materials, enabling the most sustainable option to be chosen[7]. EPDs contain accurate information on the amount of GHG emissions per one unit of a specific building material. An EPD is usually valid for five years and is generated according to the relevant standards: construction EPDs are based on the ISO 14044 and EN 15804 standards. Certified EPDs help to achieve EPD and LCA credits in the following certification schemes: LEED, BREEAM, DGNB, HQM, and others.

CONVERSION FACTORS

The most recent and relevant carbon conversion factors must be used to calculate carbon emissions in whole life carbon assessments. The carbon conversion factors sources need to be approved by the relevant government or energy ministries.

HOW TO REDUCE EMBODIED CARBON

The carbon baseline of any given development project should be established at the early stages of the project development while there is significant capacity to influence carbon reduction decisions. Figure 4 shows the carbon reduction potential at the different stages of a development project and the associated carbon reduction measures possible at those stages.

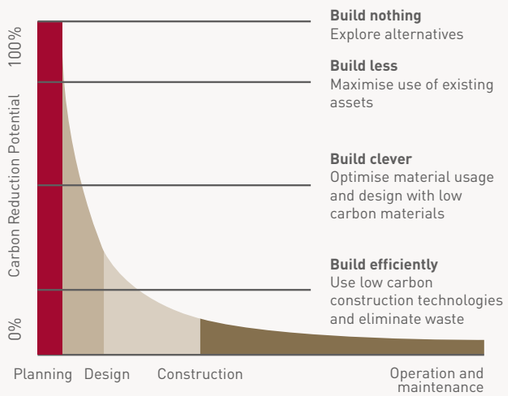


Figure 4: Opportunities to reduce embodied carbon from design stage[8]

EMBODIED CARBON IN DEVELOPMENTS

Embodied carbon in developments refers to all carbon emissions produced before the building becomes operational.

Over a building's lifetime (typically 60 years), the embodied carbon emissions are significantly higher than the operational carbon emissions. An office building's lifetime embodied carbon is believed to be double the amount of its operational carbon. Moreover, the embodied carbon emissions up to practical completion (i.e. embodied carbon in developments), that is before the building becomes operational, are generally higher than the embodied carbon from the use of the building over its lifetime. In office buildings, embodied carbon up to practical completion is around 35% whilst the in-use total embodied carbon is 32%. This evidences how carbon intensive buildings can be before they can even be used.

The majority of embodied carbon emissions in developments are emitted throughout the creation and installation of the building elements (Figure 5). They are made of large volumes of carbon intensive structural materials, such as steel, concrete and masonry.

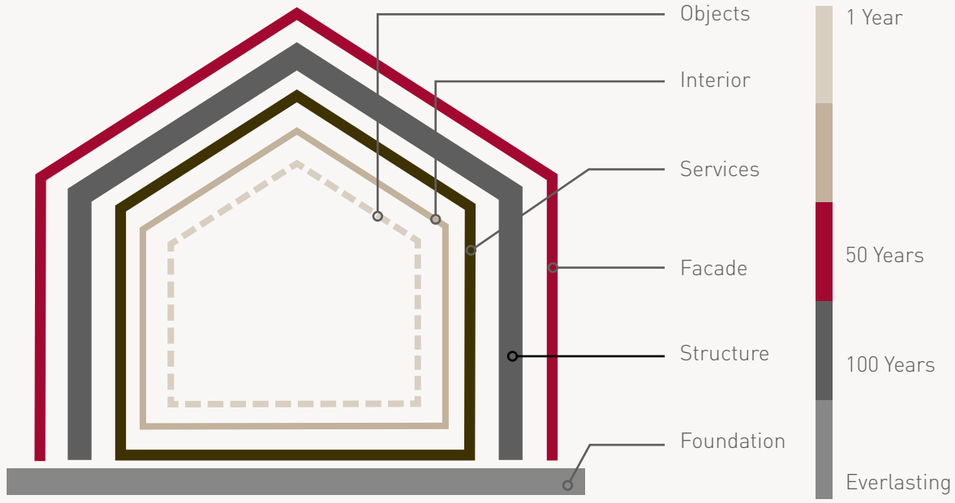


Figure 5: Elements of a building and their typical lifetime[4]

ADDRESSING EMBODIED CARBON

In 2017, Majid Al Futtaim made the bold commitment to become Net Positive by 2040, making us the first organisation in the MENA region with such an ambition. In line with this, we also aim to develop an understanding of the embodied carbon in our developments and take measures to reduce emissions where possible.

OUR PATH TO NET POSITIVE

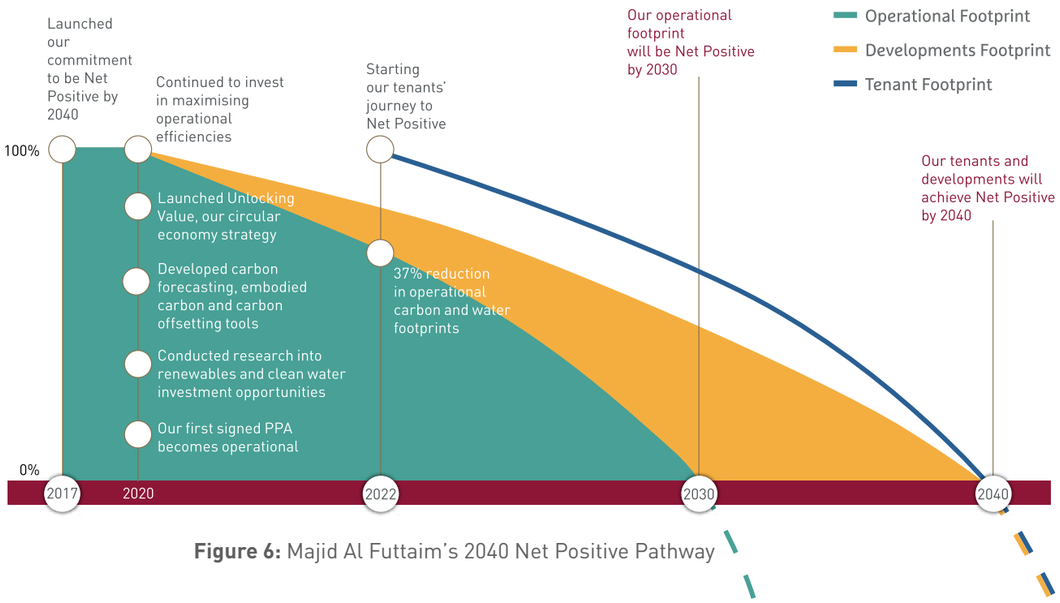


Figure 6: Majid Al Futtaim's 2040 Net Positive Pathway

We have come a long way in our journey to tackle operational carbon and have made notable progress towards our Net Positive goals.

Our focus so far has been on addressing operational carbon emissions, in line with international best practice. As the green building movement broadens its focus to other areas of the built environment that generate carbon, we welcome the change and are actively taking steps to tackle the embodied carbon in our developments, alongside operational carbon.

We believe that embodied carbon is just as important to address as other sources of carbon, particularly for companies operating in the development and construction sectors, and therefore it is a carbon source that should be addressed within our Net Positive journey. We hope that our decision to understand embodied carbon at this early stage will inspire a much-needed new trend within the industry and within our region.

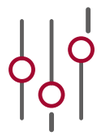
TACKLING EMBODIED CARBON AT MAJID AL FUTTAIM

WorldGBC outlined the principles for reporting embodied carbon emissions in the "Bringing embodied carbon upfront" report. In alignment with this, we will develop a roadmap for our planned actions up to 2040. The principles are:

PREVENT

Where possible, consider if the materials need to be used in the first place. Reducing the number of materials used will reduce the embodied carbon footprint. Additionally, consider alternative strategies for delivering the desired function, such as increasing utilisation of existing assets through renovation or reuse.

REDUCE AND OPTIMISE



Where possible, reduce material use by thinking about how to reuse or renovate with existing materials or assets. Evaluate each design choice in terms of the embodied carbon reduction potential and as part of a whole lifecycle approach.

- Apply design approaches that minimise the quantity of new material required to deliver the desired function.
- Prioritise materials which are low or zero embodied carbon, responsibly sourced, and which have a low lifecycle impact in other areas, including the health of the occupant, as determined through a product specific environmental product declaration, where available.
- Choose low or zero carbon construction techniques that have maximum efficiency and minimum waste on site.

PLAN FOR THE FUTURE

Take steps to avoid future embodied carbon during and at end of life, by maximising the potential for maintenance, repair and renovation, and ensuring flexibility for future adaptation. We will aim to design our buildings for disassembly and deconstruction to facilitate future reuse, selecting materials which can be recycled, and which can be extracted and separated easily for processing.

OFFSET

Include residual embodied carbon emissions within the project or organisational boundary where possible or if necessary, and only as a last resort, through verified offset schemes.

OUR EMBODIED CARBON

In order to tackle our embodied carbon emissions, we need to be able to measure them. For this, we created an embodied carbon assessment tool that enables us to calculate the embodied carbon in our developments at different stages of any project.

Our Net Positive strategy focuses on embodied carbon in developments with objectives set to be achieved in 2040. Therefore, the tool proposed offers Majid Al Futtaim a means to measure the embodied carbon of developments up to practical completion, that is the emissions occurring during the product and construction stages of a building cycle, also known as the up-front carbon. We believe that the embodied carbon in our developments is among the most significant source of carbon emissions in the lifecycle of our buildings, and therefore needs to be tackled first. However, the tool is based on the principles set out in the RICS whole life carbon assessment methodology, and as such lays the foundations for future expansion in scope and boundary, e.g. addressing whole life carbon emissions. It is within our ambition to start addressing whole life carbon emissions in the near future.

Currently, the scope and boundaries for the embodied carbon assessment tool for Majid Al Futtaim are:

Scope: Establish a methodology for calculating the embodied carbon of developments to practical completion (module A). Its purpose is to help us better understand the carbon emissions linked to our development activities and inform future carbon reduction plans necessary to achieve our ambitious goals for Net Positive.

Boundaries: The boundaries for the proposed embodied carbon assessment tool are set out as below:

- Suitable for new developments and major retrofit projects
- Spatial boundary of construction site
- Used to calculate carbon emissions to practical completion (Module A) as shown in Figure 7:
  1. Product stage [A1-A3] deals with the carbon emissions associated with the cradle to gate processes
     - **a.** Raw materials & supply
     - **b.** Transport to manufacturing plant
     - **c.** Manufacturing & fabrication
  2. Construction process stage [A4-A5] covers the emissions from construction activities
     - **a.** Transport to project site
     - **b.** Construction & installation process (energy used, and waste produced)
- At a minimum, the substructure and superstructure of a development or retrofit project should be included in the assessment, described in more detail in Figure 8 to the right.

ASSESSMENT TOOL

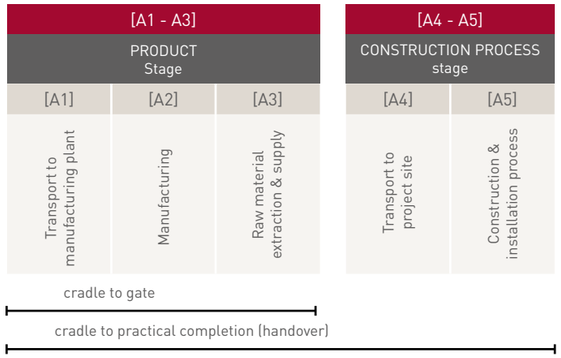


Figure 7: Embodied carbon emissions to practical completion (Model A)[3]

1	Substructure	1.1 Substructure
2	Superstructure	2.1 Frame 2.2 Upper floor inc balcony 2.3 Roof 2.4 Stairs and ramps
3	Superstructure	2.5 External walls 2.6 Windows and external doors

Figure 8: Building elements to be included in the embodied carbon assessment, at a minimum[3]

The main uses for our embodied carbon assessment tool can be seen in Figure 9.

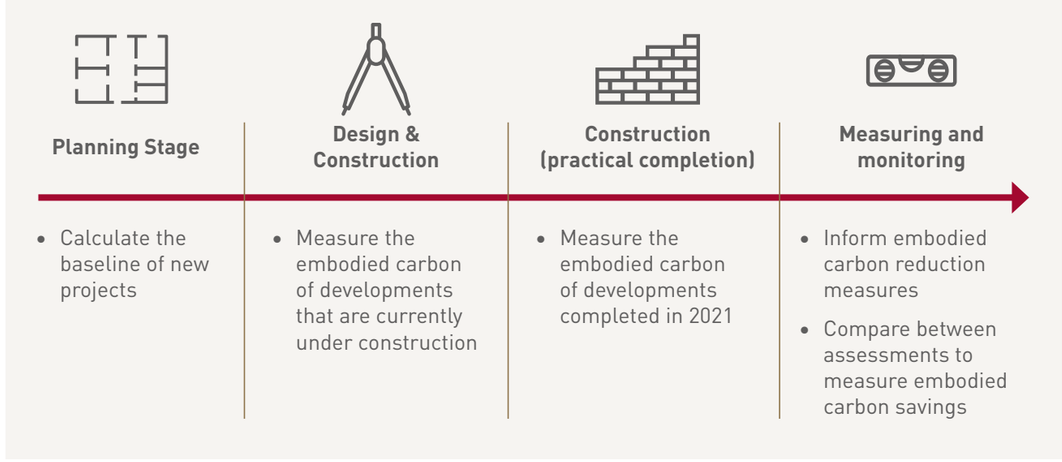


Figure 9: The role of Majid Al Futtaim's embodied carbon assessment tool

CONSIDERATIONS AND ASSUMPTIONS

- For retrofit projects, only new building materials should be accounted for in the assessment; all remaining building elements and materials are the equivalent of a "clear site" for new developments
- Data estimations should be replaced by actual data when it becomes available
- Actual EPDs should be sourced from suppliers, otherwise the EC3 database should be used to source similar EPDs
- Embodied carbon reductions cannot be claimed following a reduction in floor area of the project. Floor area information used in the whole life carbon assessments needs to remain unchanged

OUR APPROACH

The WorldGBC developed detailed stakeholder specific pathways for tackling embodied carbon, including embodied carbon reduction milestones to become net zero embodied carbon by 2040. The WorldGBC process can be used as a guide to international best practice.

2025

-20%

2030

-40%

2050

Net zero embodied carbon

Figure 10: WorldGBC's net zero embodied carbon recommended targets

2020-2021

- Use tool to measure embodied carbon
- Establish embodied carbon baseline in terms of carbon intensity (tCO_2e/sqm)

2022-2025

- Create embodied carbon reduction plan
- Train development teams on how to reduce embodied carbon and conduct assessments

2025-2040

- Track performance and report annually

Figure 11: Our roadmap to address embodied carbon

TO EMBODIED CARBON

We aim to align our work on embodied carbon as much as possible with the principles outlined by the WorldGBC.

Firstly, we will be looking to establish portfolio baseline intensities ($kgCO_2e$/sqm) for each different asset type in our development's portfolio. We will do this by engaging with our suppliers to provide the relevant carbon data and work with our development and sustainability teams to develop these baselines, with the help of the embodied carbon assessment tool.

From 2022 to 2025, once portfolio baselines have been established, we will explore and aim to optimise our Net Positive embodied carbon intensities for each different asset type in our portfolio.

With a better understanding of our embodied carbon and the potential for reducing it, we will train our development teams on how they can conduct assessments to more accurately assess site-specific embodied carbon. We will then determine the most appropriate method for tracking and reporting progress.

IN PRACTICE: MY CITY CENTRE MASDAR

The vision for the Masdar city development is to 'create a commercially viable sustainable city, providing the highest quality of life with the smallest environmental footprint'. To achieve this vision, Masdar has established measurable goals in the areas of carbon footprint, energy usage, water usage, waste generation, social impact and economic viability.

In 2020, we conducted a study to investigate the embodied carbon of My City Centre Masdar, Majid Al Futtaim's first shopping mall in Abu Dhabi and its 25th in the region – is a flagship mixed-used development with sustainability at its core. This allowed us to understand the actual impact of the embodied carbon, as well as the carbon savings associated with the sustainable building standards we use in our developments. At My City Centre Masdar, we have achieved a 21% reduction in embodied carbon for major construction materials, against a baseline of typical construction materials. This means a 114kg CO_2e/m^2 saving, equivalent to CO_2 emissions of 1,220 flights from Dubai to New York on an A380.

21% reduction in embodied carbon for major construction materials

Which is equivalent to the CO_2 emissions of **1,220 flights** from Dubai to New York on an A380

CO_2

This represents a saving of **114kg CO_2e/m^2**

THE FUTURE IS NET POSITIVE

Understanding the whole lifecycle impact of our buildings is becoming increasingly important to Majid Al Futtaim and is a significant step towards our 2040 Net Positive Commitment.

As our business continues to grow and expand across the region, decoupling our carbon emissions is a key priority. We acknowledge the impact of embodied carbon in our developments and over the past year we have started laying the foundations of our embodied carbon approach through the development of a carbon assessment tool and piloting embodied carbon studies in our assets.

The lifecycle approach to our developments is also a key element of *Unlocking Value*, Majid Al Futtaim's circular economy strategy. From the impact of construction materials and construction waste to procurement, *Unlocking Value* sets out our 2030 roadmap to embed circular principles in all new developments and major refurbishments.

We have taken the time to develop the appropriate tools and roadmap and we have started taking practical steps towards accounting for the embodied carbon of our assets.

In order to understand the impact of our existing portfolio, we will be carrying out carbon accounting studies on existing developments, allowing us to understand the actual impact of the embodied carbon, as well as the carbon savings associated with the sustainable building standards we use in our developments. Our Sustainable Building Policy and Fit-out Policy will be revised to include requirements for carbon accounting. Lastly, our carbon assessment tool will allow us to estimate the embodied carbon of new assets and minimise their carbon impact as much as possible from the outset.

Our Net Positive pathway is ambitious and challenging but, at Majid Al Futtaim, we are committed to play our role towards a sustainable future: a Net Positive future. More than ever we need our stakeholders, in particular our supply chain, to support us and join us in our journey. It takes collective action to drive systematic change. Will you join us in reaching a Net Positive future?

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