MAJID AL FUTTAIM EMBODIED CARBON PORTFOLIO

Distribution Centre

INTENDED FOR

ماجد الفطيم
MAJID AL FUTTAIM

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DISTRIBUTION CENTRE

PROJECT NAME	**MAJID AL FUTTAIM EMBODIED CARBON PORTFOLIO DISTRIBUTION CENTRE**
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TABLE OF CONTENT

EXECUTIVE SUMMARY

Majid Al Futtaim has daring and ambitious sustainability goals and commitments, wherein it aims to achieve Net Positive Carbon and Water for all operating companies by 2040. In 2018 Majid Al Futtaim signed the World Green Building Council (WGBC) Net Zero Carbon Buildings Commitment that would lead towards the decarbonization of buildings while also aligning their ambitions with the United Nations Sustainable Development Goals (SDGs).

While Majid Al Futtaim's primary focus so far has been a reduction in operational carbon footprint, as it traditionally accounted for most of their carbon footprint, it is also recognized that embodied carbon is becoming increasingly important towards achievement of their Net Positive aspirations.

Majid Al Futtaim is one of the most progressive clients in the region who are pioneers of the sustainability agenda in various markets including the built environment. Their initiatives and attention towards embodied carbon at the client level, not only serves their own sustainability agenda, but also influences the market and supply chain to respond towards their progressive requirements by moving towards supply of low carbon materials and technologies.

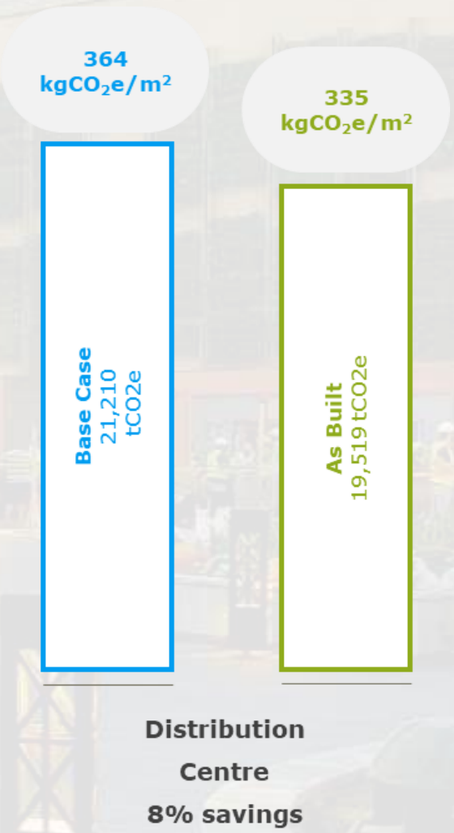
An embodied carbon study was done on the Distribution Centre of Majid Al Futtaim. The results of the exercise indicate that the asset results in a cumulative embodied carbon (A1-A4) of 20K tCO_2e. Additionally, the asset design saved 6k tCO_2e against no carbon savings scenario. The amount of carbon savings is equal to the carbon sequestration resulting from planting 6K trees.

1,692 tCO_2e

Carbon Savings

6,107 Trees

Carbon Sequestration



INTRODUCTION

As it currently stands, every year 3,729 million tons CO_2 of embodied carbon is contributed by built environment[1] - this translates to 11% of annual global greenhouse gas (GHG) emissions. If the trend continues, embodied carbon will be responsible for almost 50% of the emissions linked to new constructions, with the other chunk coming from operational carbon.

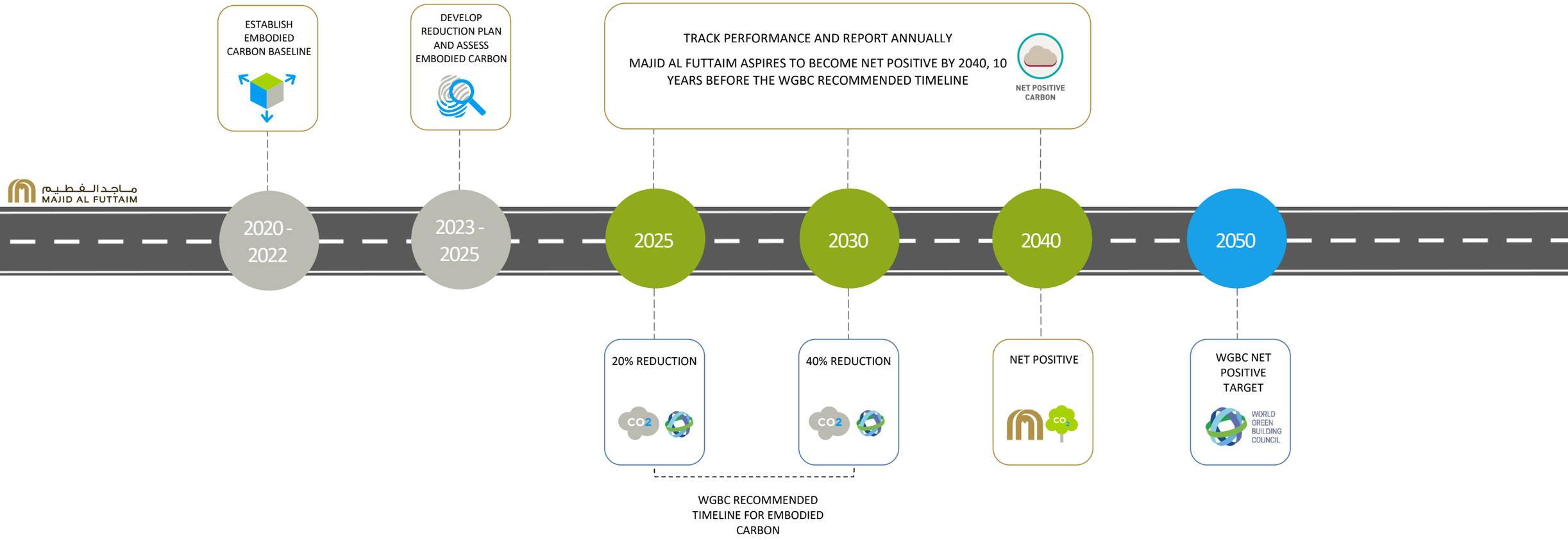
Majid Al Futtaim has made the commitment to achieve Net Positive targets by the year 2040. To do so, they have aligned themselves with the World Green Building Council (WGBC) stakeholder goals to achieve this target in terms of both operational and embodied carbon.

To achieve this target, Majid Al Futtaim has taken the steps to develop an embodied carbon benchmark for their built assets as a first step towards understanding the embodied carbon impact of their existing constructions and develop a carbon accounting plan for future constructions.

This report focuses on Majid Al Futtaim's Distribution Centre embodied carbon. The exercise results were taken forward to estimate the total embodied carbon estimation for the other hotels of Majid Al Futtaim

It is clear from this that Majid Al Futtaim as a company is aware of their sustainable accountability and is taking active measures towards being more responsible in their procurement methods.

As an additional benefit, achieving Net Zero Carbon will also aid in meeting United Nations Sustainable Development Goals (SDGs).



DELIVERY PLAN

To develop the carbon portfolio for the existing assets, it is important to do so in a systematic manner.

The assessment reporting methodology was aligned and cross-referenced to terms and lifecycle stages defined in the widely adopted European Standard - EN 15978.

This allows Majid Al Futtaim management to make informed decisions and help maximize the embodied carbon reductions for future projects

The main objective of the reporting is to develop a simplified embodied carbon account (Stages A1-A4 & D for timber) for the major materials and components.

Depending on availability of data, a benchmark can be generated based on typologies, gross floor areas etc.

1 WORKSHOP

Conduct a kick-off workshop between the projectteam and the client team. The project team willexplain the process of carbon accounting tothe client team and provide a list of required documentation that needs to be acquired to start the accounting process.

During the process, various workshops will be conducted to inform andupdate the client team on progress and if required, examine the missing information, and find alternative solutions to report accurately.

2 FEASIBILITY

Check feasibility of targets - how easily attainable they are, what information is required to calculate the final value, if the available information is sufficient to allow for the exercise to be completed.

Additionally, highlight challenges, if any, that would lead to an inaccurate account, but also call attention to opportunities to improve on design through refurbishment to improve where possible.

3 EVALUATION

Evaluate the carbon reduction strategies highlighted in step 2 and how they can be implemented within the design. Consider its impact on the whole life carbon, the cost implications, constructability, end of life use etc. to ensure that the targets are easily achievable with lowest impact.

4 REPORTING

Develop a carbon account of the assets from all the information gathered and provide a base case (typical construction) versus constructed comparison to report on savings achieved.

Include the assumptions made as part of the exercise to help the client team get a holistic picture and be more informed about which materials or requirements need to be regarded more closely in the future.

5 METHODOLOGY

Outline the findings and methodology used during the exercise to find the carbon savings. Present the information in a report, start developing a benchmark for carbon intensity of various typologies and advise Majid Al Futtaim on the way forward.

EXERCISE PILLARS

CARBON ACCOUNTING

FEASIBILITY

Ensuring that the carbon quantification is delivered with the highest accuracy possible and comparing it with the relevant databases in the market

CONSISTENCY

Ensuring that consistent methodologies are used to allow for a meaningful comparison of emissions over time

TRANSPERANCY

Complete transparency must be provided on all assumptions, references and calculations done along any referenced EPDs & databases

CARBON ACCOUNT

Carbon Accounting is quantifiable way to measure direct and indirect GHG emissions. It helps businesses understandthe climate impact that procurement and design choices can make. It also helps businesses set goals and targets to improve or limit their emissions.

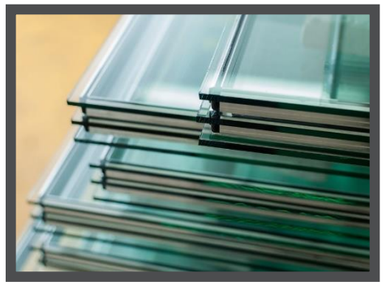
The values generated can be used to define base case, end goals and track process to reduce and limit carbon emissions. As a developer, the focus lies on the careful material selection as shown in Figure 01.

Special attention should be given to major materials and components such as concrete, steel, glazing, timber etc. The next section provides details on sources that can be used to gather carbon data for materials.

steel

timber

concrete



glass

tiles & carpets

paints & coatings

bricks & screed

insulation

other materials

Figure 1: Building materials that contribute to GHG emissions

SYSTEM BOUNDARY

Life Cycle Assessment (LCA) is a systematic set of procedures for compiling and examining the inputs and outputs of materials and energy, and the associated environmental impacts directly attributable to a building, infrastructure, product or material throughout its lifecycle (ISO 14040:2006).

The following paragraphs will refer to the lifecycle stages or modules. These modules present kgCO2e (and other parameters such as Ozone Depletion Potential) information under one of the following boundaries:

- Cradle-to-Gate: Raw material extraction till the manufacturing process (A1-A3)
- Cradle-to-Grave: Raw material extraction till disposal post-use(A1-A5, B1-B5, C1-C4, D)
- Cradle-to-Gate with Options: Cradle to Gate with additional modules as applicable.

The availability of following verified documentation and databases allows for a way to quantify GHG emissions.

1 INVENTORY OF CARBON AND ENERGY DATABASE

The Inventory of Carbon and Energy (ICE) Database is an embodied carbon and energydatabase for building materials.

It collects data from various sources (whether theybe EPDs or historical information) and collates itinto one large database. As each material whoseinformation is attained uses their own preferred methodology to present the information, ICE Database V3 now provides with a data quality indicator (DQI) which applies a statistical averagebased on how many data points have been collected for a particular material.

2 ENVIRONMENTAL PRODUCT DECLARATION

An Environmental Product Declaration (EPD) is a verified and registered document that communicates the life-cycle information about a product – hence informing us of a products' environmental

International Organisation for Standardization (ISO) 14025 is the governing standard against which a product is measured. As per ISO 14025,an EPD falls under a Type III declaration which "quantifies environmental information on the lifecycle of a product to enable comparisons between products fulfilling the same function".

Stages A1 - A3 considers the manufacturing of a material. Thisis also coined as "Cradle-to-Gate"

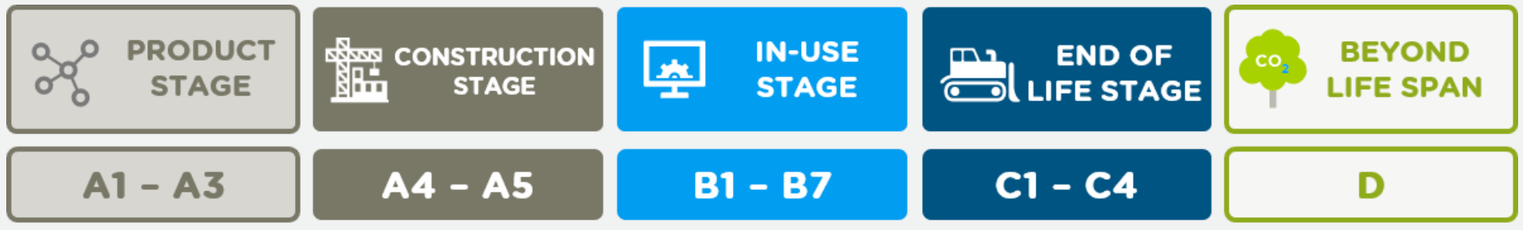
Stages A4 - A5 considers the carbon footprint left during theconstruction and transport of materials to the site

Stages B1 - B7 considers the operational and embodied carbon associated with the use stage of the buildings (refurbishments, maintenance, energy consumption etc.)

Stages C1 - C4 considers end of life stage of either the building or materials within (waste processing, disposal, deconstruction)

Stage D is for construction materials that can be recycled beyond their life span (such as timber), which can then be usedto offset the cumulative footprint

Figure 2: System Boundary: EN 15978:2011
Building Life Cycle Assessment Stages
For this report, Stages A1-A4 & D (for timber) were considered



CARBON REPORT

DISTRIBUTION CENTRE

Data Collection

The Majid Al Futtaim team provided Ramboll's sustainability team, as-built data associated with the distribution centre. The material quantities were indicated with weight, volume, area, or length. The material quantities were extracted for the defined materials scope for the carbon accounting exercise as listed below:

Concrete & Masonry

Steel

Building Services

Finishes

Insulation

Doors & Windows

Boundary Condition

The LCA stages A1-A4 & D (for timber) were considered which provides information about the raw material extraction, its transport to factor, manufacturing, transport to site and beyond life span stage (only for timber).

Base Scenario

A base case scenario of standard construction practices without sustainability principles was developed as a comparison against the as-built designs. The following set of assumptions were considered for the base case scenario:

» Concrete: No cement replacements (0% GGBS) present
» Timber: Not FSC (Forest Stewardship Council) or PEFC (Programme for Endorsement of Forest Certification) certified

The rest of the materials were equivalent in terms of conventional practices and what was procured for the project.

As Built Scenario

An As Built scenario was created based on the materials section or specification provided in the BOQs. The specifications were used to provide realistic carbon estimation of the project were the following was used:

» Concrete: With cement replacements (30% GGBS) present
» Timber: FSC (Forest Stewardship Council) Certified timber
» Steel: Recycled content up to 2% of recycled content

Carbon Estimation

A carbon accounting calculator was developed by Ramboll to track how much embodied carbon is associated with each development. The calculator details the following information using LCA documents mentioned in the previous section:

» Carbon emission value (kgCO2e/kg)
» Quantity of material (kilograms)

RESULTS

Distribution Centre

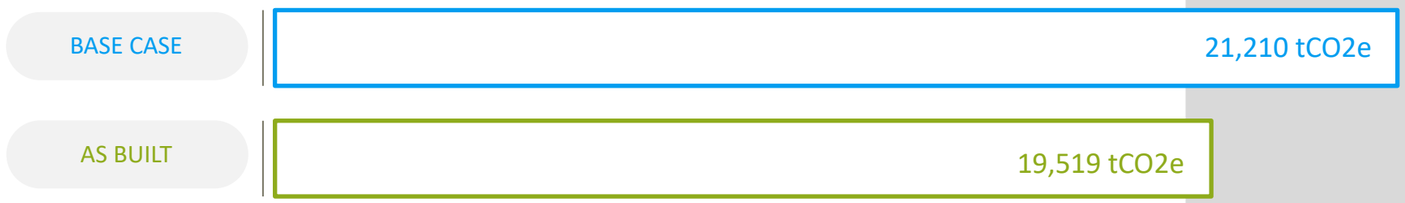
A total of 6 main material groups were considered for this exercise. These will represent the embodied carbon of the construction.

An additional material group - other materials - was considered that would account for 20% of the overall buildings embodied carbon that comes from elements not considered as part of the structure.

The buildings skeleton - which is made of concrete, steel (structural and rebar) - was analysed for the purposes of the study as it is the larger denomination on an average.

The base case considers a conventional concrete with no GGBS and structural steel with no recycled content whereas the as-built case optimizes the structure through the use of concrete with GGBS content and structural steel with recycled content.

Appendix A presents the calculations and carbon factors used for each category for the Distribution Centre.



Total savings

8%

1,692 tCO_2e for Stage A1 to A4 & D (for timber)

A

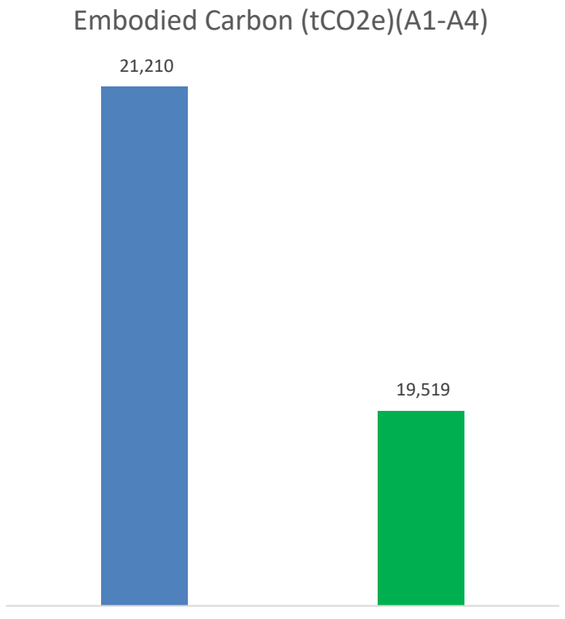
APPENDIX

DISTRIBUTION CENTRE CALCULATIONS, ASSUMPTIONS AND INFORMATION

PROJECT SUMMARY		
Built Up Area - BUA (m^2)	58,185	m^2
Base Case Emissions	21,210	tCO_2e
	364	$kgCO_2e/m^2$
As-Built Emissions	19,519	tCO_2e
	335	$kgCO_2e/m^2$

CARBON SAVINGS SUMMARY		
Overall Savings	1,692	tCO_2e
	29	$kgCO_2e/m^2$
% Savings over base case	8%	

OVERALL SAVINGS	1,691 tCO_2



BASE CASE DISTRIBUTIN CENTRE EMBODIED CARBON

TOTAL EMBODIED CARBON (tCO_2e)	21,210

MATERIALS	CATEGORY	MATERIAL DETAILS			EMBODIED CARBON (tCO_2)	RME NOTES / COMMENTS
		CARBON (kgCO2e/ unit*)	*QUANTITY UNIT	QUANTITY		
CONCRETE		0.103-0.172	kg	36,048,720	5,477	The Carbon Factors are derived from ICE Database v3 The baseline case considers concrete with no GGBS.
MASONRY		333	m3	1,886	628	Obtained from BOQ
STEEL		1.99-2.94	kg	3,558,323	9,306	Obtained from BOQ Carbon factors are derived from ICE Database v3
THERMAL & MOISTURE PROTECTION		2.13-3.68	m2	83,439	1,347	Obtained from BOQ Carbon factors are derived from Environdec & Ecoinvent Database
DOORS & WINDOWS		0.49-1.63 /kg	m2	5,737	552	Obtained from BOQ Values dervied from UK GHG Carbon Factors for glass & timber
FINISHES		Material Variations	m2	Subcateogries vary in Qauntity	190	Obtained from BOQ All EPDs are derived from Environdec & Ecoinvent Database
TRANSPORTATION (+1% of the total)		N/A			210	Percentage of 1% is assumed based on previously received data of previously assessed buildings
OTHER MATERIALS (20% of the total)		N/A			3,500	This category consists of materials not mentioned above and materials that are part of the operational phase including HVAC systems which will have embodied carbon value for stage A1 to A3.

AS-BUILT DISTRIBUTION CENTRE EMBODIED CARBON

TOTAL EMBODIED CARBON (tCO_2e)	19,519

MATERIALS	CATEGORY	MATERIAL DETAILS			EMBODIED CARBON (tCO_2)	RME NOTES / COMMENTS
		CARBON (kgCO2e/ unit*)	*QUANTITY UNIT	QUANTITY		
CONCRETE		0.103-0.142	kg	36,048,720	4,788	The Carbon Factors are derived from ICE Database v3 Up to 30% GGBS is used in the As-Built scenario
MASONRY		333	m3	1,886	628	Obtained from BOQ
STEEL		1.99-2.54	kg	3,558,323	8,314	Obtained from BOQ Carbon factors are derived from ICE Database v3 - Up to 2% recycled content in steel (pre-consumer)
THERMAL & MOISTURE PROTECTION		2.13-3.68	m2	83,439	1,347	Obtained from BOQ Carbon factors are derived from Environdec & Ecoinvent Database
DOORS & WINDOWS		(-1.03) to 1.63	m2	5,737	544	Obtained from BOQ Values dervied from UK GHG Carbon Factors for glass & timber
FINISHES		Material Variations	m2	Subcateogries vary in Qauntity	188	Obtained from BOQ All EPDs are derived from Environdec & Ecoinvent Database
TRANSPORTATION (+1% of the total)		N/A			210	Percentage of 1% is assumed based on previously received data of previously assessed buildings
OTHER MATERIALS (20% of the total)		N/A			3,500	This category consists of materials not mentioned above and materials that are part of the operational phase including HVAC systems which will have embodied carbon value for stage A1 to A3.