AtkinsRéalis

Volume 2, Chapter 10 – Effects on Climate

Manchester City Council

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FORMER CENTRAL RETAIL PARK – THE PARK

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10. Effects on Climate

10.1 Executive summary

Climate change and climate variability can impact successful construction and operation of the Proposed Development. This Environmental Statement (ES) assesses these factors in two separate chapters:

- Chapter 9, Vulnerability of the Proposed Development to climate change; and
- Chapter 10, Effects of the Proposed Development on climate (this chapter)

The Climate Effects chapter provides an assessment of the effects of the Proposed Development on climate, including:

- An examination of the current emissions baseline for national, regional and Site-specific scenarios;
- An assessment of Greenhouse Gas (GHG) Emissions profile of the Proposed Development's assets, for construction and operation phase of the Proposed Development, as well as their potential impact to a singular receptor, the atmosphere.
- Identification of specific mitigation to adapt the construction and operational processes to reduce the Proposed Development's overall carbon impact.

The baseline examination confirms the Site-specific and future baseline emissions to be zero as a worst-case approach.

The assessment of potential impacts finds that the Proposed Development generates a total of 1,459 tonnes CO_2e for both construction and operational phase, with majority emissions contributed by raw material acquisition, manufacture and production stage (PAS2080:2023 Lifecycle: A1 – A3) during construction phase, followed by emissions from plant and machinery use during construction processes. The effects of these impacts were found to have a minor, non-significant impact on the climate. Mitigation measures recommended to minimise or reduce the impacts further involve preparation of a Carbon Management Plan which will be reviewed and updated throughout construction and operation of the Proposed Development.

10.2 Introduction

The Proposed Development, outlined extensively in Chapter 2 of this Environmental Statement (ES), involves transforming a currently vacant (although the adjacent Phase 1 GPA development will have undertaken earthworks for the majority of the Site before the Proposed Development proceeds) plot of land from the Former Central Retail Park (FCRP) site into a green public space. This revitalized area will feature a mix of soft and hardstanding surfaces. Although no demolition is planned, the construction will include limited earthworks (for parts of the Site not covered by the Phase 1 GPA earthworks), hardstanding installation, and landscaping.

This chapter addresses the climate change requirements outlined in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, which state that the assessment should consider the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions).

The Proposed Development has the potential to affect the Earth's climate by increasing the emissions of greenhouse gases (GHGs) into the atmosphere. The Earth absorbs energy from the sun and re-emits it as thermal infrared radiation. GHGs in the atmosphere absorb this radiation, preventing it from escaping into space. The higher the concentration of GHGs, the more heat energy is retained, and the higher global temperatures become. Due to human activities, the concentration of GHGs in the atmosphere has increased dramatically, with carbon dioxide (CO_2) concentrations now exceeding 400 parts per million, leading to global warming. This leads to myriad indirect impacts as the climate responds to the increased atmospheric temperature.

The scope of analysis used to identify the climate effects of the Proposed Development comprises an assessment of the construction and operational phase. It identifies the study area, describes the methodology, presents baseline conditions, identifies potential impacts on climate, and presents suggested mitigation measures during construction and operation.

10.3 Competent expert evidence

This chapter has been prepared by the following individuals who have used their knowledge and professional judgement to undertake this assessment:

- A Chartered Environmentalist Full Member of Institute of Environment Management and Assessment (IEMA) with five years of experience in environmental impact assessment.
- An Environmental engineer and Carbon and Sustainability consultant with three years of experience in environmental impact assessment

10.4 Relevant legislation and guidance

10.4.1 International agreements

Paris Agreement (2015)

Strengthened negotiations at COP21 led to the 2015 Paris Agreement, the aim of which is to maintain the increase in global average temperature at 'well below' 2°C and 'pursue efforts' to limit the temperature increase even further to 1.5°C.

In 2018, the IPCC published a special report (IPCC, 2018) in response to the Paris Agreement, to present the impacts of the targeted 1.5°C temperature rise. The report highlighted that to achieve this, global emissions must decrease by 45% by 2030 (against a 1990 baseline), and that net zero global emissions (where emissions and removals from the atmosphere are balanced) must be achieved by 2050. This is noted to require rapid and far-reaching transitions of every sector on an unprecedented scale.

The Glasgow Climate Pact, resulting from COP26 held in 2021, strengthened focus on limiting the temperature rise to 1.5°C, recognising the severity of climate impacts above this limit.

10.4.2 National

Climate Change Act (2008) as amended in 2019

To support international efforts, the UK Climate Change Act (2008) set a legal reduction target of 80% for the UK against 1990 levels by 2050. It also introduced a series of carbon 'budgets' for five-year periods, to act as stepping-stones to the overall reduction. There are budgets currently set up to 2037.

In response to the ambitions of the Paris Agreement, in 2019 the Climate Change Act was amended to set the overall reduction target by 2050 to at least 100% in net emissions against 1990 levels.

The UK has so far outperformed its budgets, but progress is slowing, and the country is not on track to meet its future budgets or the overall reduction target, according to the most recent Progress Report to Parliament by the CCC (CCC, 2023).

Table 10-1 UK Carbon Budgets as set in Carbon Budget Orders 2009, 2011, 2016 and 2021

UK carbon budget period	UK carbon budget level
1st carbon budget (2008 to 2012)	3,018 MtCO_2e
2nd carbon budget (2013 to 2017)	2,782 MtCO_2e
3rd carbon budget (2018 to 2022)	2,544 MtCO_2e
4th carbon budget (2023 to 2027)	1,950 MtCO_2e
5th carbon budget (2028 to 2032)	1,725 MtCO_2e
6th carbon budget (2033 to 2037)	965 MtCO_2e

Table source: Advice on reducing the UK's emissions - Climate Change Committee (theccc.org.uk)

Construction 2025 (UK Government, 2013)

Construction 2025 is a UK Government strategy paper that sets out how efficiency improvements will be created in construction covering sustainability and carbon and including a target to reduce whole life emissions by 50% by 2025 in the built environment.

The included emissions reduction target of 50% is not project specific, and the efficiency improvements are broad.

Carbon Budget Delivery Plan (HM Government, 2023)

The plan sets out a package of proposals and policies and associated timescales and delivery risks that enable carbon budgets 4-6 to be met from the different sectors.

England National Planning Policy Framework (NPPF)

The NPPF sets out the government's planning policies for England and how these are expected to be applied, including of relevance, meeting the challenge of climate change (paragraph 154).

10.4.3 Regional/local

Manchester City Council (MCC) Climate Emergency Declaration 2019[1]

In July 2019, MCC declared a climate emergency recognising need for the Council and the city as a whole to do more to reduce its carbon emissions, mitigate the negative impacts of climate change and committing to be at the forefront of the global response to climate change.

Manchester City Council's Climate Change Action Plan (CCAP) 2020 (refreshed 2022)[2]

This document was published by MCC setting out a five-year plan to respond to Climate Emergency and work towards becoming a zero-carbon organisation by 2038.

Places for Everyone Joint Development Plan[3]

The Places for Everyone (PfE) plan provides objectives and guidance policies to help create inclusive and sustainable economic growth across nine boroughs. It reinforces the ambition to bring forward development on brownfield land and provide greater protection of environmental assets whilst also supporting wider strategies around clean air, walking and cycling and underpins the ambition to be a carbon neutral city region by 2038. Specifically, the plan includes a carbon and energy policy (JP-S2) which outlines measures to support Greater Manchester's carbon neutral goals including the use of carbon assessment tools and the consideration of low carbon materials and methods.

10.5 Assessment methodology

The potential impacts of GHG emissions are very specific in terms of receptors and impacts because:

- There is only one receptor, the atmosphere, which is non-site-specific;
- There is only one direct impact, the release of carbon emissions; and
- All units of CO_2e can be considered to have the same impact no matter where they are emitted.

Therefore, assessment of the effects of the Proposed Development is limited to quantification of the magnitude of GHG emissions, from individual sources and in total, and comparisons of these to the baseline. Different GHGs have different global warming potentials, and to account for this they will be reported throughout this assessment as their CO_2e value.

10.5.1 Guidance

The assessment has been undertaken in accordance with the following guidance:

- IEMA (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance[4]; and
- PAS 2080:2023 - Carbon Management in buildings and infrastructure[5].
- Royal Institution of Chartered Surveyors (RICS) Whole life carbon assessment for the built environment (2023)[6]

[1] Council Climate Emergency Resolution (manchester.gov.uk)
[2] Climate Change Action Plan (manchester.gov.uk)
[3] https://www.greatermanchester-ca.gov.uk/media/9578/places-for-everyone-joint-development-plan-document.pdf
[4] https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance
[5] https://www.bsigroup.com/en-GB/insights-and-media/insights/brochures/pas-2080-carbon-management-in-infrastructure-and-built-environment/
[6] https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment.html#:~:text=This%20guidance%20mandates%20a%20whole%20life%20approach%20to,the%20interpretation%20and%20implementation%20of%20EN%2015978%20methodology.

10.5.2 Impacts to be assessed

Table 10-2 presents the elements that were scoped in or out of the assessment.

Table 10-2 - Elements scoped in or out of the assessment for the Proposed Development

Lifecycle Phase	PAS 2080:2023 lifecycle stage	GHG Emission Sources (not exhaustive)	Scoped in or scoped out
Site preparation and construction	A1 – 3 Embodied carbon from material supply	Embodied emissions from the extraction and processing of raw materials	Scoped in
	A4 Transportation	Emissions from transportation of materials and staff to site	Scoped in - material transportation. Scoped out - Staff travel. Limited information is known about the number of staff required on site during construction
	A5 Construction Processes	Emissions from the use of machinery on site	Scoped in
	Land use Change	Emissions from the loss of vegetation, habitats and soil	Scoped in
Operation	B1 Use	Emissions from the use of equipment at the site	Scoped out - No significant emission-generating activities are anticipated to take place on site
	B2-5 Maintenance, repair, replacement, refurbishment	Emissions from the replacement of worn and damaged materials	Scoped in
	B6 Operational energy use	Emissions from lighting across the site	Scoped in
	B7 Operational water use	Emissions from the watering of plants and grass areas	Scoped in
	Land use change and forestry	Ongoing land use emissions, sequestration from new or improved habitats	Scoped in
Decommissioning	C1-4 Deconstruction, transportation, waste processing and disposal	Emissions from the use of machinery use to demolish the site	Scoped out - Due to the nature of the site, no decommissioning date is set

The elements scoped out are not anticipated to materially affect the outcomes resulting from this assessment. It is considered that the elements not included in the assessment would not contribute to more than 5% of the Proposed Development's total GHG emissions. This is in line with a proportionate approach which considers that where expected GHG emissions are less than 1% of total GHG emissions they can be excluded from assessment, provided that the combined exclusions are not more than a maximum of 5% of total GHG emissions, in accordance with IEMA guidance.

10.5.3 Study Area

The study area includes all carbon emitting activities within the Proposed Development boundary, relevant carbon emitting activities beyond the Proposed Development boundary that contribute to the total carbon footprint of the Proposed Development during construction and operation. The study area is not limited to the geographic extent of the Proposed Development itself, as many emissions will result from upstream, downstream and off-site activities such as material production and transportation of materials during construction.

10.5.4 Calculating Construction Emissions

Design and construction data for the Proposed Development was provided by the design team and is based off the RIBA Stage 2 design.

A quantification of construction phase GHG emissions was calculated using the AtkinsRéalis Limited's Carbon Knowledgebase tool, which contains a detailed library of calculation formulae and over 1,000 emissions factors from authoritative sources such as the Inventory of Carbon and Energy (ICE, versions 2.0 and 3.0), Defra Greenhouse Gas Reporting Conversion Factors, and the EMEP/CORINAIR Emission Inventory Guidebook. The tool calculates the construction phase emissions in accordance with PAS 2080: Carbon Management in Buildings and Infrastructure, the international standard for assessing carbon emissions throughout a project's lifecycle.

Information relating to where materials will be sourced is not yet available, as this will be determined at a later date by the Principal Contractor. Therefore, the RICS (2023) guidance was used to calculate the likely distances that each individual material will be transported to site based on whether that material is generally available to source on a local, regional, national or international level. It is assumed that these distances are covered by HGV.

10.5.5 Calculating Operational Emissions

Data on the energy consumption, water consumption and repair and maintenance for the Proposed Development was provided from the design team using the RIBA Stage 2 design.

During the operation of the Proposed Development, electricity will be required to power lighting throughout the Site. The total annual energy requirement for the Proposed Development has been identified from the design and multiplied by the predicted yearly electricity emissions factors for 60 years[7] from the Opening Year of the Proposed Development (0.041kgCO2e/kWh for 2031) to calculate emissions from operational energy.

During operation, water will be required to maintain the green spaces throughout the site. A square metre of grass needs approximately 81.5 Litres of water a year to be maintained. This represents a small amount of hand watering that will be required during the operation of the Proposed Development. The total area of grass landscape at the site has been multiplied by the water requirement per m^2 to calculate the yearly operational water

[7] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

consumption for the Proposed Development. The carbon factor for water was taken from the Government Greenhouse Gas Reporting: Conversion Factors 2023[8].

The Proposed Development will require maintenance due to standard wear and tear from operational use. Information from the design has been used to identify the anticipated replacement and maintenance of the design components over a 60-year period to calculate the anticipated emissions from maintenance of the Proposed Development. Emissions from design elements that will require partial or full replacement have been calculated via the same method used to calculate those elements during the construction phase, however as embodied emissions are expected to decarbonise in line with Net Zero policy and legislation, a decarbonisation factor has been applied to the emissions from maintenance to account for this.

10.5.6 Calculating Land use, Land use change and forestry

Land use, land-use change and forestry (LULUCF) plays an important role in the balance and transfer of carbon through global carbon cycles. Carbon is stored in and exchanged between the atmosphere and biosphere, which includes plants and soils. When humans alter land-use, they impact the carbon stocks held within the biosphere and the exchange of carbon with the atmosphere. These changes can have adverse climate change impacts, but also provide key mitigation opportunities by removing carbon from the atmosphere and storing it in terrestrial biospheres.

The baseline of the Site being assessed is a vacant plot of land with partial earthworks carried out and remaining hardstanding and vegetation in the dog leg parallel to Great Ancoats Street, and within Cotton Field Park. The site has limited vegetation other than areas of overgrown shrubs and scattered trees. Due to the lack of cohesive habitat of a significant size, as a worst-case scenario, it is assumed that the emissions from LULUCF at the site are 0 tCO_2e/yr. It is also considered, as a worst-case scenario, that the carbon stock within the existing vegetation at the site is also 0 tCO_2e.

Upon completion the Proposed Development will contain a mixture of hardscaping, grass areas and trees. Trees have the capability to sequester carbon over their lifespan, however given the number (97) of trees to be planted at the Proposed Development and the lack of information of the species, it is considered that the amount of carbon sequestered will be negligible. Amenity grassland has limited sequestration capacity. The cutting and removal of grass trimmings releases carbon back into the atmosphere that was sequestered by the grass. Therefore, amenity grassland has a carbon sequestration rate of 0 tCO_2e/year.

Overall, it is considered that the Proposed Development will emit / sequester 0 tCO_2e/year[9].

10.5.7 Significance Assessment

The method of assessment of whether the calculated GHG emissions from the Proposed Development will have a significant effect on climate has been determined in accordance with IEMA's 2022 guidance. There is no legal limit for GHG emissions for any one development. The guidance suggests that the level of significance should be related to how a project contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050, as stated in section 6.2 of the guidance: "The crux of significance…is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050 (or other date as defined in targets for devolved administrations)."

The IEMA 2022 guidance document notes that practitioners need to consider whether project GHG emissions are aligned to achieving net zero by 2050, using the science based 1.5°C trajectory. Where this is not the case, then the effects are judged to be moderate adverse or major adverse, and thus can be classed as a significant effect. Projects that are compatible with the trajectory can have their effects classed as minor adverse, or where the project achieves GHG emission mitigation that goes beyond the trajectory, negligible. In both cases, the effects are not considered to be significant. Projects that result in GHG emissions being avoided or removed from the atmosphere can be considered to have a significant beneficial effect. The IEMA 2022 guidance notes that the UK 2050 target for net zero and interim carbon budgets are considered by the UK Climate Change Committee to be compatible with the required trajectory.

The percentage contribution of the Proposed Development to the national carbon budgets has been determined in accordance with IEMA 2022 guidance on significance. Although the IEMA guidance suggests that, for context, it would be good practice to consider a project's GHG emissions in relation to sector-based targets, there are currently no sector budgets for the public sector, or any other sector provided by the UK Government. Sector-based targets have therefore not been considered in accordance with current UK legislation.

10.5.8 Limitations and Assumptions

The data for the assessment has been provided by the design team and is as up to date for this stage of the design as can be reasonably expected. Where assumptions have been made, they have been selected to present the worst-case scenario for that item/factor.

The key limitation of the assessment is the availability and accuracy of design and construction information to enable calculations. This may require assumptions to be made, and some industry standard data to be used as a proxy. The data and associated assumptions considered for the carbon emissions assessment are detailed below.

The following assumptions have been made during the carbon assessment:

- The Proposed Development will begin construction in 2030 and last 12 months;
- The Proposed Development will begin operation in 2031;
- The Proposed Development will operate for a minimum of 60-years but has no set decommissioning date;
- Users of the Proposed Development will not generate any significant level of emissions.;
- Transportation of materials have been determined using the RICS 2023 guidance and will be transported using HGVs;
- The total area of the Proposed Development that requires watering is 3,063 m^2;
- Each square metre of grass requires 81.5 L/year;
- Decarbonisation of materials, waste and water will occur at a steady rate between 2025 and 2050 when emissions will reach NetZero; and
- Operational energy emissions will decarbonise in line with predicted grid decarbonisation rates.

[8] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023
[9] Natural England (2021) carbon emissions, removals and habitat storage data

10.6 Baseline conditions

The baseline conditions area defined by national, regional and site-specific emissions.

10.6.1 National emissions baseline

The UK's provisional GHG emissions from 2023 were 384.2 million tonnes (Mt) carbon dioxide equivalent (CO_2e), 5.4% lower than in 2022[10]. Buildings and product uses sector was the second largest emitting sector in 2023, contributing 20% of all emissions. The 2023 data is still provisional so may be revised. The total UK emissions for 2022 were 406.2 MtCO_2e, 3.5% less than 2021, with buildings and product uses contributing 20% of emissions[11].

10.6.2 Regional emissions baseline

The total GHG emissions for Manchester for 2021 (the last reported year) were 2,095.6 ktCO_2e[12]. This represents a 48% decrease since 2005, when emissions for Manchester were estimated to be 3,993.6 ktCO_2e. The public sector contributed 7% of emissions to Manchester in 2021, the third largest emitting sector after domestic and transportation sectors.

10.6.3 Site specific emissions

The future anticipated baseline of the Site being assessed is a vacant plot of land with partial earthworks carried out and remaining hardstanding and vegetation in the dog leg parallel to Great Ancoats Street, and within Cotton Field Park, along with the constructed Phase 1 development adjacent on the west. As a result, the existing site has no associated GHG emissions. Therefore, it is assumed that as a worst-case scenario, site-specific baseline emissions are zero.

10.6.4 Future baseline scenario

If the Proposed Development is not constructed, it is likely that the current conditions at the site will remain. Therefore, the site would continue to have zero emissions associated with it and would only be materially impacted by a similar level of development occurring compared to the Proposed Development. As such, future baseline emissions are considered to be zero as a worst-case approach.

10.7 Potential impacts

The only impact to be assessed is the potential of the Proposed Development to generate carbon emissions in both the construction and operation phase. These GHG emissions are identified to impact only one direct receptor i.e., the atmosphere in the form of climate change. The effects of the Proposed Development have been discussed in the further sections. A list of potential sources of carbon emissions are provided below.

The following were identified as greenhouse gas sources during construction:

- The emissions associated with the manufacturing of materials then used within the design,
- The transportation of materials to the Site,
- The construction processes used to undertake the construction of the Proposed Development e.g. emissions from all plant / machinery.

The following were identified as sources during operation:

- Operational energy use such as that for the lighting electricity demand; and
- Emissions from replacement of assets – where applicable.

[10] https://assets.publishing.service.gov.uk/media/660445fce8c442001a2203d0/uk-greenhouse-gas-emissions-provisional-figures-statistical-summary-2023.pdf
[11] https://assets.publishing.service.gov.uk/media/65c0cf2e70428200137521cd/2022-final-emissions-statistics-one-page-summary.pdf
[12] https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fassets.publishing.service.gov.uk%2Fmedia%2F64a67b3a4dd8b3000f7fa546%2F2005-21-uk-local-authority-ghg-emissions-update-060723.xlsx&wdOrigin=BROWSELINK

10.8 Assessment of effects

Table 10-3 Construction phase impact assessment

Baseline		Impact assessment				
Receptor	**Sensitivity**	**Impact**	**Mitigation**	**Residual impact magnitude**	**Residual effect**	**Effect significance**
The atmosphere	High	Carbon emissions	PAS2080 Carbon Reduction Hierarchy	Minor	The Proposed Development is estimated to generate 1,308 tCO_2e during the construction phase. The greatest proportion of emissions are derived from emissions from materials (73% of total emissions). The emissions from the construction phase of the Proposed Development will contribute <0.0001% to the UK Government's 5th carbon budget. Using professional judgement, it is considered that the carbon emissions from the construction phase of the Proposed Development will at no point impact the UK Government's ability to meet its carbon budgets. The UK carbon budgets align with the emissions reduction trajectory required to limit warming to 1.5°C, in line with the IEMA guidance (2022) for determining significance. Therefore, the construction phase of the Proposed Development can be considered to have a minor, non-significant impact on the climate.	Slight adverse effect Not significant

Table 10-4 Operational phase impact assessment

Baseline		Impact assessment				
Receptor	**Sensitivity**	**Impact**	**Mitigation**	**Residual impact magnitude**	**Residual effect**	**Effect significance**
The atmosphere	High	Carbon emissions	Carbon management plan	Minor	The Proposed Development is estimated to generate 151 tCO_2e during the 60 year operation phase. The greatest proportion of emissions are derived from maintenance and replacements of materials (7% of total emissions). The emissions from the operation phase of the Proposed Development will contribute 0.00001% to the 5th carbon budget and 0.00002% to the 6th carbon budget. Using professional judgement, it is considered that the carbon emissions from the operation phase of the Proposed Development will at no point impact the UK Government's ability to meet its carbon budgets. The UK carbon budgets align with the emissions reduction trajectory required to limit warming to 1.5°C, in line with the IEMA guidance (2022) for determining significance. Therefore, the operation phase of the Proposed Development can be considered to have a minor, non-significant impact on the climate.	Slight adverse effect Not significant

10.9 Additional mitigation and enhancement measures

10.9.1 Carbon management plan

A Carbon Management Plan should be produced as early in the design process as possible, to identify opportunities to reduce carbon emissions through the use of materials with low embedded carbon, and construction practices that will minimise carbon emissions. The carbon management plan should be reviewed and updated throughout the detailed design phase to identify further opportunities for carbon savings throughout the construction and operation of the Proposed Development.

10.9.2 PAS2080 Carbon Reduction Hierarchy

PAS 2080:2023 is the world's pioneering specification for managing whole-life carbon in buildings and infrastructure. It provides guidance on minimizing carbon emissions by following the carbon reduction hierarchy as presented in Figure 10-1 (in the order of priority shown) when identifying potential opportunities to reduce whole life carbon emissions.

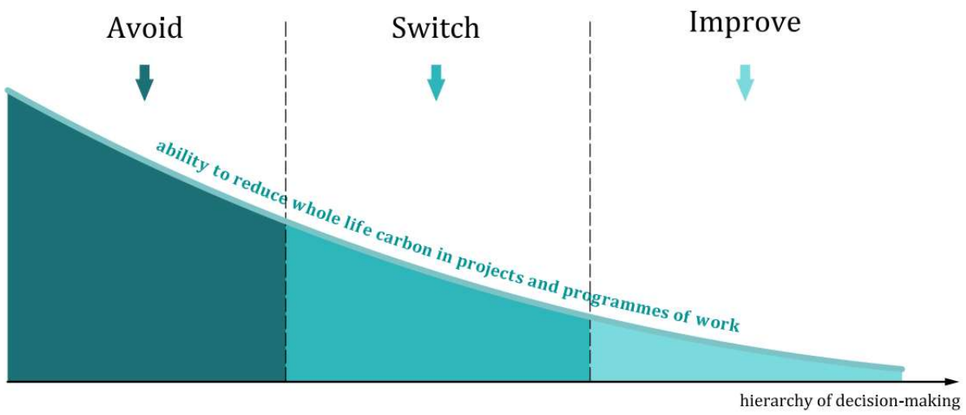


Figure 10-1 PAS 2080:2023 Carbon reduction hierarchy (Figure 5)

In applying the carbon reduction hierarchy for the Proposed Development, the following will be considered:

1. **Avoid**: align the outcomes of the project and/or programme of work with the net zero transition at the system level and evaluate the basic need at the asset and/or network level;
2. **Switch**: assess alternative solutions and then adopt one that reduces whole life emissions through alternative scope, design approach, materials, technologies for operational carbon reduction, among others, while satisfying the whole life performance requirements;
3. **Improve**: identify and adopt solutions and techniques that improve the use of resources and design life of an asset/network, including applying circular economy principles to assess materials/products in terms of their potential for reuse or recycling after end of life.

In the context of mitigation measures for the impacts of the Proposed Development on climate, the carbon reduction hierarchy will initially focus on design changes and smart engineering, and then on offsetting or sequestration, either on-site or off-site. This will also apply to the transportation and construction of the design to ensure low carbon solutions are implemented throughout the 'Before use' stages of the Proposed Development.

10.10 Cumulative effects

This planning application has sight of the prospective Phase 2 development adjacent to the east of the Proposed Development as disclosed within the SRF 2023. It is understood that this will comprise a commercial development with opportunities for ancillary ground floors to provide active frontages. The buildings will be of heights between 6-16 storeys and vehicular access will be available via Old Mill Street. It is assumed the Proposed Development will have been constructed prior to the construction of the Phase 2 development and therefore no cumulative effects are anticipated during the construction phases as these will not overlap. In relation to the operational, all impacts were anticipated to be negligible and not significant in relation to this Effects on Climate assessment when considering the affect the Proposed Development will have on the UK Government's ability to meet its carbon budgets. Therefore, the Proposed Development is not expected to result in adverse cumulative effects in combination with those of the Phase 2 development during its construction nor its operation.

There are no other anticipated future developments to consider within this assessment of inter-cumulative effects as all applications within the planning portal as the time of assessment are expected to already be constructed prior to the Proposed Development. However, it is advised that should concurrent construction projects occur that regular liaison is carried out between the environment manager/engineer or the site manager ensure mitigation measures remain appropriate.

Intra-cumulative effects of the Proposed Development are considered in Volume 2, Chapter 20 of this ES.

10.11 Summary and conclusions

This chapter has presented a review of existing carbon emissions baseline and an assessment of the impacts and potential for significant effects due to the construction and operation of the Proposed Development.

The assessment has been undertaken with reference to relevant legislation, policy and guidance, including PAS2080 carbon reduction hierarchy guidance.

Both the construction and operation phases of the Proposed Development generate carbon emissions which will impact only one receptor, the atmosphere. The total emissions generated by the Proposed Development are 1,459 tCO_2e, out of which the construction emissions account for nearly 89% (1,308 tCO_2e) and the remaining 10% (151 tCO_2e) are contributed by operation phase.

The assessment of the quantity of emissions and their sources were found to have negligible contribution to the UK's carbon budgets (<0.0001%), thereby, aligning with UK Government's ability to meet its carbon budgets.

10.12 Glossary and acronyms

Table 10-5 Glossary of terms

Term	Definition
CCAP	Climate Change Action Plan
CO_2e	Carbon dioxide equivalent
COP	Conference of Parties
ES	Environmental Statement
FCRP	Former Central Retail Park
GHG	Greenhouse Gases

Term	Definition
IEMA	Institute of Environment Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land use, land-use change and forestry
MCC	Manchester City Council
NPPF	National Planning Policy Framework
PAS	Publicly Available Specification
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors

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