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Appendix: Climate Change

Euston Tower, Camden, Volume 3, Appendix: Greenhouse Gases

November 2023

Experts in air quality management & assessment

Document Control

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Annexes

A1 Annex 1: GHG Policy and Legislation

National Planning Policy

National Planning Policy Framework

A1.1 The National Planning Policy Framework (NPPF)[1] sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which is an environmental objective:

> *"to protect and enhancing our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".*

A1.2 Part 14 of the framework is entitled *"Meeting the challenge of climate change, flooding and coastal change"* and sets out the strategy for minimising the climate change effects of new development. Paragraph 154 states that:

> *"New development should be planned for in ways that […] can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."*

A1.3 Paragraph 155 states further that "*to help increase the use and supply of renewable and low carbon energy and heat, plans should:*

> *a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);*
>
> *b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and*
>
> *c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers*".

A1.4 Paragraph 157 states that, when determining planning applications, the NPPF requests that planning authorities should expect new development to:

[1] Department for Leveling Up, Housing & Communities, 2023. National Planning Policy Framework, Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1182995/NPPF_Sept_23.pdf

"*a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and*

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption."

Climate Change Act (2008) [2]

A1.5 The overarching Act in relation to climate is the Climate Change Act 2008. The Act introduces a legally binding target to reduce the UK's greenhouse gas (GHG) emissions to at least 80% below 1990 levels by 2050. It also provides for a Committee on Climate Change (CCC) with power to set out carbon budgets binding on the government for five-year periods.

A1.6 In the 2009 budget, the first three carbon budgets were announced which set out a binding 34% CO_2e[3] reduction by 2020; and the government has since adopted the fourth and fifth carbon budgets to reduce CO_2e by 50% by 2025 and 57% by 2030.

A1.7 The CCC also produces annual reports to monitor the progress in meeting these carbon budgets. Consequent upon the enactment of the Climate Change Act, a raft of policy at national and local level has been developed aimed at reducing carbon emissions.

Climate Change Act 2008 (2050 Target Amendment) Order 2019 [4]

A1.8 In June 2019, the government passed an order to amend the 2050 carbon emissions target in the Climate Change Act 2008 from 80% below 1990 levels to zero net carbon (i.e. 100% below 1990 levels). This new target will essentially end the UK's contribution to climate change by 2050.

Approved Document L[5]

A1.9 The Ministry of Housing, Communities and Local Government has published a series of 'Approved Documents' which provide guidance on ways to meet building regulations. The latest version of the Approved Documents L1A and L2A on the Conservation of Fuel and Power define the energy efficiency requirements for new buildings (domestic and non-domestic). The baseline Part L compliant CO_2 emissions calculated for the Proposed Development and presented within the Energy

2 Her Majesty's Stationery Office, 2008. Climate Change Act 2008

3 Carbon dioxide equivalent (CO_2e) is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.

4 Her Majesty's Stationery Office, 2019. The Climate Change Act 2008 (2050 Target Amendment) Order 2019

5 HM Government, 2023. Approved Document L. Conservation of Fuel and Power. Volume 1: Dwellings, and Volume 2: Buildings other than dwellings.

Statement[6] were determined in accordance with the methodology detailed within these Approved Documents.

Regional Policy

The London Plan[7]

A1.10 The London Plan establishes strategic planning policy for London over the next 20 – 25 years and promotes the fundamental objective of accommodating London's population and economic growth through sustainable development. It sets out the Spatial Development Strategy for Greater London and the Development Plans of all London Boroughs must eventually comply with the general requirements of the London Plan.

A1.11 The London Plan includes planning policies both for reducing energy consumption within buildings and, significantly, promoting the use of decentralised electricity generation and renewable energy. These policies cover the role of boroughs in supporting the Mayor's Energy strategy and the requirements of planning applications.

A1.12 Policy SI 2 in the London Plan relates specifically to GHG emissions; it states:

"Policy SI 2 – Minimising Greenhouse Gas Emissions

A. Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction an operation, and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) Be lean: use less energy and manage demand during operation.

2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.

3) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

4) Be seen: monitor, verify and report on energy performance.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should aim to achieve 10 per cent, and non-residential development should aim to achieve 15 per cent through energy efficiency measures.

6 Arup (2023) Energy Statement

7 GLA, 2021. The London Plan: The Spatial Development Strategy for London, Available: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the relevant borough's carbon offset fund, or

2) off-site provided that an alternative proposal is identified and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver greenhouse gas reductions. The operation of offset funds should be monitored and reported on annually.

E. Major development proposals should calculate and minimize carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F. Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognized Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions."

GLA Guidance on Energy Assessments [8]

A1.13 The GLA guidance on energy assessments provides guidance to assist with the preparation of energy assessments for new developments, and the role these assessments and strategies play in compliance with Policy SI 2 of the London Plan. The GLA guidance states that:

"Each application is considered on its merits, taking into account the individual characteristics of the development. Case-specific energy comments for each development are provided at Stage 1 and 2 of the GLA planning process by GLA energy officers to ensure applications comply with London Plan policy. However, for the avoidance of doubt, energy assessments should:

- *be submitted at the planning application stage, not submitted post planning in response to a condition;*
- *report estimated site-wide regulated CO_2 emissions and reductions (broken down for the residential and non-residential elements of the development), expressed in tonnes per annum, after each stage of the energy hierarchy, using the GLA's carbon emissions reporting spreadsheet;*
- *demonstrate how the net zero carbon target for major residential and non-residential development will be met, with at least a 35% on-site carbon reduction beyond Part L 2021 and provide the value of the offset payment which will be paid in the relevant borough's carbon offset fund to make up any shortfall to achieve net-zero carbon, where required;*
- *commit that energy efficiency measures alone will reduce regulated CO2 emissions for residential uses by 10 per cent below those of a development compliant with Part L 2021 of the Building Regulations, and by 15 per cent for non-residential uses;*
- *align with related documents and assessments that are submitted as part of the planning application, e.g. Whole Life-Cycle Carbon Assessments, Air Quality Assessments, Sustainability Statements."*

A1.14 Therefore, the target reduction on CO_2 emissions for the Proposed Development according to the GLA's requirements is:

- Residential development: 35% reduction below the Part L 2021 Baseline, with 10% reduction from energy efficiency measures alone, and proposals for making up the shortfall (e.g., offsetting) to net zero carbon; and
- Non-residential development: 35% reduction below the Part L 2021 Baseline, with 15% reduction from energy efficiency measures alone, and proposals for making up the shortfall (e.g., offsetting) to net zero carbon.

Whole Life-Cycle Carbon Assessments Guidance[9]

A1.15 This guidance document explains how to prepare a Whole Life-Cycle Carbon (WLC) assessment in line with Policy SI 2 of the London Plan.

A1.16 It defines WLC emissions as the carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal. As such they capture a building's operational carbon emissions from both regulated and unregulated energy use, as well as its embodied carbon emissions, i.e., those associated with raw material extraction, manufacture and transport of building materials, construction and the emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal.

A1.17 The draft guidance confirms that the Mayor's net zero-carbon target continues to apply to the operational emissions of a building. The WLC requirement is therefore not subject to this target but, as set out in London Plan Policy SI 2, planning applicants are required to calculate the embodied emissions of the development, as well as the operational emissions, and demonstrate how these can be reduced as part of the WLC assessment.

[8] GLA, 2022. Energy Assessment Guidance: Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)

[9] GLA, 2022. London Plan Guidance. Whole Life-Cycle Carbon Assessments. Available: https://www.london.gov.uk/sites/default/files/lpg_-_wlca_guidance.pdf

A1.18 The guidance confirms that planning applicants should continue to follow the GLA's Energy Assessment Guidance to assess and reduce operational emissions and insert the relevant information into the WLC assessment.

London Environment Strategy [10]

A1.19 The London Environment Strategy, published in May 2018, sets out an action plan for environmental improvement in London up to 2050 and covers a range of core environmental aspects including energy and climate change, air quality, green infrastructure, waste and noise.

A1.20 The Strategy sets a series of targets, including the aim to make London a zero-carbon city by 2050; reiterating the same commitment as is included in the London Plan. It sets out a series of measures designed to achieve this aim, which are focussed upon delivering zero-carbon energy, zero-carbon transport and zero-carbon development. The Strategy also sets out plans for retro-fitting existing buildings to enable them to be considered to be zero-carbon.

Local Policies

A1.21 The London Borough of Camden (LBC) Local Plan[11] was adopted in 2017, and within this there are two policies that are relevant to climate change.

A1.22 Policy CC1: Climate change mitigation, which states that:

"The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

[10] GLA, 2018. London Environment Strategy
[11] London Borough of Camden (2017) Camden Local Plan

f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. protecting existing decentralised energy networks (e.g., at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment."

A1.23 Policy CC2: Adapting to climate change, which states that:

"The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

e. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;

f. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;

g. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings o achieve "excellent" in BREEAM domestic refurbishment; and

h. expecting non-domestic developments of 500 sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new development from 2019."

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A2 Annex 2: Extract from Whole Life Carbon Assessment

		[A1] to [A3]	[A4]	[A5]	[B1]	[B2]	[B3]	[B4]	[B5]
ent									
	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,163,115 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	3,558,534 kg CO2e	608,302 kg CO2e	171,196 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	5,566,266 kg CO2e	1,631,544 kg CO2e	285,135 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	4,518,791 kg CO2e	2,572,441 kg CO2e	93,074 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	369,100 kg CO2e	119,441 kg CO2e	15,393 kg CO2e	0 kg CO2e	12,839 kg CO2e	3,210 kg CO2e	224,352 kg CO2e	0 kg CO2e
	-7,427 kg CO2e	751,472 kg CO2e	43,312 kg CO2e	74,897 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	76,233 kg CO2e	0 kg CO2e
	0 kg CO2e	12,634,728 kg CO2e	682,018 kg CO2e	25,532 kg CO2e	0 kg CO2e	389,843 kg CO2e	97,461 kg CO2e	3,992,746 kg CO2e	0 kg CO2e
	0 kg CO2e	136,776 kg CO2e	2,702 kg CO2e	0 kg CO2e	0 kg CO2e	3,554 kg CO2e	888 kg CO2e	257,059 kg CO2e	0 kg CO2e
	0 kg CO2e	1,288,124 kg CO2e	125,687 kg CO2e	130,128 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,275,865 kg CO2e	0 kg CO2e
	-177,424 kg CO2e	113,030 kg CO2e	3,953 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	118,758 kg CO2e	0 kg CO2e
	-631,866 kg CO2e	1,955,565 kg CO2e	108,723 kg CO2e	180,616 kg CO2e	0 kg CO2e	57,196 kg CO2e	14,299 kg CO2e	4,248,305 kg CO2e	0 kg CO2e
	-11,986 kg CO2e	371,636 kg CO2e	11,504 kg CO2e	18,113 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	524,750 kg CO2e	0 kg CO2e
	-3 kg CO2e	11,784,959 kg CO2e	340,776 kg CO2e	119,289 kg CO2e	4,213,825 kg CO2e	311,979 kg CO2e	77,995 kg CO2e	22,421,361 kg CO2e	0 kg CO2e
	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
	-3,768 kg CO2e	1,136,790 kg CO2e	379,493 kg CO2e	37,844 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	731,944 kg CO2e	0 kg CO2e
sions not specific to an ilding element category				2,016,066 kg CO2e					
TOTAL kg CO_2e	**-832,473 kg CO2e**	**44,185,768 kg CO2e**	**6,629,896 kg CO2e**	**4,330,398 kg CO2e**	**4,213,825 kg CO2e**	**775,410 kg CO2e**	**193,853 kg CO2e**	**33,871,374 kg CO2e**	**0 kg CO2e**

[B6]	[B7]	[C1]	[C2]	[C3]	[C4]		Module D
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
		1,705,902 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,705,902 kg CO2e	0 kg CO2e
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,163,115 kg CO2e	0 kg CO2e
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
		21,232 kg CO2e	82,707 kg CO2e	47,199 kg CO2e	0 kg CO2e	4,489,169 kg CO2e	-422,615 kg CO2e
		33,212 kg CO2e	386,238 kg CO2e	21,921 kg CO2e	356 kg CO2e	7,924,672 kg CO2e	-2,130,046 kg CO2e
		26,962 kg CO2e	66,137 kg CO2e	3,887 kg CO2e	0 kg CO2e	7,281,292 kg CO2e	-63,828 kg CO2e
		2,202 kg CO2e	4,267 kg CO2e	74,621 kg CO2e	0 kg CO2e	825,424 kg CO2e	-117,632 kg CO2e
		4,484 kg CO2e	9,885 kg CO2e	9,171 kg CO2e	0 kg CO2e	962,026 kg CO2e	-652,978 kg CO2e
		75,387 kg CO2e	128,212 kg CO2e	3,326 kg CO2e	9 kg CO2e	18,029,261 kg CO2e	-207,706 kg CO2e
		816 kg CO2e	648 kg CO2e	4 kg CO2e	9 kg CO2e	402,455 kg CO2e	-485 kg CO2e
		7,686 kg CO2e	54,150 kg CO2e	2,318 kg CO2e	445 kg CO2e	2,884,402 kg CO2e	-1,106,151 kg CO2e
		674 kg CO2e	494 kg CO2e	205,256 kg CO2e	62 kg CO2e	264,803 kg CO2e	-20 kg CO2e
		11,668 kg CO2e	29,730 kg CO2e	828,078 kg CO2e	34 kg CO2e	6,802,347 kg CO2e	-2,669,690 kg CO2e
		2,217 kg CO2e	2,478 kg CO2e	14,036 kg CO2e	5 kg CO2e	932,752 kg CO2e	-358,049 kg CO2e
58,259,707 kg CO2e	67,841,914 kg CO2e	70,316 kg CO2e	70,556 kg CO2e	120,740 kg CO2e	1,013 kg CO2e	166,060,096 kg CO2e	-9,983,310 kg CO2e
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
		0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
		6,783 kg CO2e	238,491 kg CO2e	93,614 kg CO2e	292 kg CO2e	2,621,483 kg CO2e	-318,361 kg CO2e
						2,016,066 kg CO2e	
126,101,621 kg CO2e	**425,669 kg CO2e**	**1,969,541 kg CO2e**	**1,073,991 kg CO2e**	**1,424,171 kg CO2e**	**2,224 kg CO2e**	**224,365,267 kg CO2e**	**-18,030,870 kg CO2e**

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A3 Annex 3: Extract from Energy Strategy

	Total regulated emissions (Tonnes CO2 / year)	CO2 savings (Tonnes CO2 / year)	Percentage savings (%)
Baseline: Part L 2021	325.7		
Be lean: Savings from energy demand reduction	292.2	33.5	10%
Be clean: Savings from heat network	292.2	0.0	0%
Be green: Savings from renewable energy	279.2	13.0	4%
Cumulative on-site savings	-	**46.5**	**14%**
Annual savings from off-set payment	-	298.5	-
Cumulative savings for off-set payment (t CO2)		8,375	
Cash in-lieu contribution (£)		£795,581	

Table 2: Total Proposed Development regulated carbon emissions results, savings, off-set calculation and cash in-lieu contribution.

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A4 Annex 4: Professional Experience

Guido Pellizzaro, BSc (Hons) MIAQM MIEnvSc PIEMA

Mr Pellizzaro is a Technical Director with AQC, with more than 15 years' experience in environmental consultancy and is a Technical Director at AQC. He has managed and delivered Greenhouse Gas assessments for major urban regeneration planning applications and EIA developments throughout the UK. He is a Member of the Institution of Environmental Sciences and of the Institute of Air Quality Management, and a Practitioner of the Institute of Environmental Management and Assessment.

Julia Burnell, MEnvSci (Hons) MIEnvSc MIAQM

Miss Burnell is a Senior Consultant with AQC with over seven years' experience in the field of air quality. She has experience of undertaking a range of air quality assessments for power, transportation, and mixed-use development projects both in the UK and internationally. She is also experienced at preparing environmental permit applications for medium combustion plant/specified generator sites and has commissioned and maintained numerous ambient air quality monitoring surveys. Prior to her work with AQC, Julia completed an MEnvSci (Hons) in Environmental Science (four-year integrated master's). She is a Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences.

George Chousos, BSc MSc AMIEnvSc AMIAQM

Mr Chousos is a Consultant with AQC, having joined in May 2019. Prior to joining AQC, he completed an MSc in Air Pollution Management and Control at the University of Birmingham, specialising in air pollution control technologies and management, and data processing using R. He also holds a degree in Environmental Geoscience from the University of Cardiff, where he undertook a year in industry working in the field of photo-catalytic technology. Since joining AQC, George has been gaining experience in undertaking air quality assessments, both qualitatively and using atmospheric dispersion modelling, to accompany planning and permitting applications. Projects have ranged in scale, from small scale residential development to Environmental Impact Assessments (EIAs). The assessments have considered the effects on both human health and ecological habitats. George also has experience completing construction dust risk assessments, Air Quality Neutral assessments, Local Authority Annual Status Reports (ASRs), as well as odour assessments.

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TRIUM

Climate Change

Technical Note

London

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INTRODUCTION

1 This technical note describes a future climate scenario for the London region which has been developed by Trium using the future climate projections data published by the Met Office (UKCP18). UKCP18 projections consider the climate effects arising from a series of 'Representative Concentration Pathways' (RCP) emissions scenarios (described further below).

2 The purpose of this technical note is to present projection data for the future climate and to provide guidance to the EIA technical team on how to consider whether the effects of the Proposed Development (defined under the current climate conditions) may alter under the future climate scenario. In the context of the future climate condition, consideration needs to be given to:

- The change in the magnitude of impact of the Proposed Development;
- Receptor vulnerability to changes in climate;
- Vulnerability of the Proposed Development to climate change; and
- Resilience of the Proposed Development to climate change.

Climate Projections

3 UKCP18 gives probabilistic projections[1] for a number of atmospheric variables, with different temporal and spatial averaging, for several future time periods, under four different future RCP emissions scenarios.

4 In general, the longer the lifetime of a development, the greater the uncertainty about the impact of climate change over time. Uncertainty is dealt with by presenting projections which are probabilistic in nature, and which give the probability of different climate outcomes.

5 To make use of the probabilistic projections, an emissions scenario and percentile outcome (i.e. the likelihood of the change in climate occurring) needs to be identified.

6 The emissions scenario and probabilistic projection are detailed within this document and have been used by all technical disciplines contributing to the Environmental Impact Assessment (EIA), to ensure consistency in approach.

Emission Scenarios

7 The RCP emission scenarios represent four distinct Representative Concentration Pathways (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) available in the UKCP18 climate projections. These are named according to the concentration of greenhouse gas modelled to occur in the atmosphere in 2100. The RCPs have been developed for long-term and near-term climate modelling and provide time-dependant projections of atmospheric greenhouse gas concentrations. These pathways were developed based on a literature review of current climate modelling research and have been chosen to represent the full range of climate outcomes presented within the literature.

8 The emission scenarios represent assumptions in terms of climate policy, land use and technological development, with RCP2.6 representing the 'optimum' emission scenario (i.e. measures aimed at achieving the maximum reduction in GHG emissions).

9 RCP 8.5 is the most conservative, highest emission, and highest-impact scenario. It assumes that technological development will slow and that there will be little to no decarbonisation of world power from new technology. It also assumes that no further climate mitigation or regulations to reduce climate change or air pollution will be implemented.

[1] Probabilistic projections give a range of possible climate change outcomes and their relative likelihoods i.e. unlikely, likely or very likely ranging across 10th to 90th percentiles.

TRIUM

10 More information on the RCPs can be found in the UKCP18 Guidance: Representative Concentration Pathways[2].

Adopted Emissions Scenario: RCP8.5

11 RCP8.5 has been used in the climate projections presented in this technical note as it represents a suitably conservative emissions scenario with regards to climate policy, land use, and technological development. This is in accordance with the Institute of Environmental Management and Assessment's (IEMA's) Climate Change Resilience and Adaptation guidance[3], which states that *"Recommended best practice is to use the higher emissions scenario (RCP 8.5 in the latest UKCP18 projections) at the 50th percentile, for the 2080s timelines, unless a substantiated case can be made for not doing this (e.g. anticipated lifespan of the project is shorter than 2080s)"*.

12 The use of RCP8.5 is also in accordance with "*the National Policy Statement on National Networks, which states that developments should use the UKCP09 high emissions scenario at the 50% probability level*"[3]. RCP8.5 is the UKCP18 high emissions scenario and therefore has been identified as the most reasonable conservative emissions scenario for identifying future climate change projections in EIA.

13 The IEMA guidance recommends the use of RCP8.5 against a baseline period of 1980-2000 unless strong justification can be provided otherwise.

14 In line with the IEMA guidance, the climate projection data provided in this technical note are produced using RCP8.5 against the 1980-2000 baseline at the 50% probability level (or percentile).

[2] UKCP18 Guidance: Representative Concentration Pathways https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-guidance---representative-concentration-pathways.pdf [accessed 16/02/22]
[3] Institute of Environmental Management and Assessment, (2020); Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.

APPROACH TO ASSESSMENT

15 The future climate scenario is presented in this note in '*The Future Climate Condition in London for EIA*'. In line with the IEMA guidance and based on the approach, methodology and significance criteria relevant to the technical assessment, each technical specialist should consider this future climate scenario in respect of potential alterations to the following, within their ES chapter:

- The sensitivity of identified receptors;
- The magnitude of impacts;
- The resultant effects; and
- Any additional mitigation that might be required to address the future climate scenario.

Mitigation Measures

16 Mitigation measures should identify appropriate resilience and adaptive management measures.

17 Resilience measures include design features (e.g. habitable rooms within residential units located above the flood level which accounts for climate change) and construction materials (e.g. materials resistant to increases in temperature), to provide an appropriate resilience to changes in the existing climatic conditions, as well as occurrences of extreme weather.

18 Adaptive management measures account for the anticipated changes in the future climate. Consideration should be given as to whether there are opportunities to introduce mitigation measures later into the project when they are required, instead of including them from the outset when they're not required. These measures could be secured through a commitment to prepare a management plan/strategy (or equivalent) which would periodically review the need for such measures and their integration into the scheme when required.

19 Where mitigation is proposed, narrative should be provided on the anticipated effectiveness of the measures against the predicted future climate conditions.

20 A statement should be provided to clarify whether or not the projected future climate change is anticipated to alter the findings of the assessment as already presented for the Proposed Development under the current climate conditions.

THE FUTURE CLIMATE CONDITION IN LONDON FOR EIA

21 The 2022 UKCP Headline Findings[4] highlights the key climate projections for the UK as follows:

- By the end of the 21st century, all areas of the UK are projected to be warmer, more so in summer than in winter;
- Hot summers are expected to become more common. The temperature of hot summer days, by the 2070s, show increases of 3.8°C to 6.8°C, under a high emissions scenario, along with an increase in the frequency of hot spells;
- Rainfall patterns across the UK are not uniform and vary on seasonal and regional scales and will continue to vary in the future;
- Significant increases in hourly precipitation extremes in the future;
- Despite overall summer drying trends in the future, future increases in the intensity of heavy summer rainfall events are likely;
- Future climate change is projected to bring about a change in the seasonality of extremes; and
- Sea levels rising.

[4] *UKCP (August 2022), UK Climate Projections: Headline Findings.*

22 The future climate projections for London, based on RCP8.5, are presented and described below for the climatic variables:

- Temperature
- Precipitation; and
- Wind speed.

23 When assessing the effects of climate change in a technical ES chapter, the data presented in the proceeding tables should be used by the technical specialist as the basis for their assessment.

Temperature

24 Table 1 presents the projected air temperature data for London up until 2099, in 20 year timeslices, from 2020. In line with the Met Office predictions[5], the data present future summers to be hotter and winters to be warmer, with the annual temperature steadily increasing.

25 Depending on the lifetime of the Proposed Development, different timeslices will need to be considered. When developing adaptive mitigation measures, consideration should be given to the appropriate time to implement these measures based on the temperature increase at each timeslice.

26 The data are presented for the Annual Mean, Summer Maximum, and Winter Minimum temperature for each timeslice. It is the responsibility of the technical specialist to select the most relevant and appropriate data for their technical discipline.

Table 1 Air Temperature Anomaly at 1.5m Above Ground Level (°C) Relative to Baseline

Timeslice	Predicted Change from Baseline (°C)		
	Annual Mean	Summer Max	Winter Min
	50th Percentile	50th Percentile	50th Percentile
2020-2039	1.04	1.46	0.90
2040-2059	1.87	2.75	1.65
2060-2079	2.96	4.26	2.52
2080-2099	4.28	6.39	3.58

Precipitation

27 Table 2 presents the predicted percentage change in precipitation levels relative to the 1980-2000 baseline. In line with the Met Office predictions[6], the data present future Summers to be drier and Winters to be wetter. The data also predict that annual precipitation will reduce marginally up to 2099.

28 Depending on the lifetime of the Proposed Development, different timeslices will need to be considered. When developing adaptive mitigation measures, consideration should be given to the appropriate time to implement these measures based on the precipitation change at each timeslice.

29 The data are presented for the seasonal extremes of Winter and Summer, as well as an Annual projection for each timeslice. It is the responsibility of the technical specialist to select the most relevant and appropriate data for their technical discipline.

[5] *Met Office Hadley Centre, 2018. 'UKCP18 Factsheet: Temperature' https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheet-temperature.pdf [accessed 09/03/22]*
[6] *Met Office Hadley Centre, 2018. 'UKCP18 Factsheet: Precipitation' https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-precipitation.pdf [accessed 09/03/22]*

Table 2 Precipitation Rate Anomaly (%) Relative to Baseline

Timeslice	Predicted Change from Baseline (%)		
	Annual	Summer	Winter
	50th Percentile	50th Percentile	50th Percentile
2020-2039	1.54	-8.66	7.35
2040-2059	-1.36	-19.99	11.42
2060-2079	-1.92	-29.04	17.90
2080-2099	-2.50	-40.10	23.61

Wind Speed

30 UKCP18 probabilistic data for wind is not available, nor any RCP8.5 data for wind through alternative projections. For this reason, UKCP09 wind data has been reviewed for the A1B scenario, as it is comparable to RCP8.5. This data indicates that there is currently no clear trend in the speed and frequency of winds that would make a meaningful difference to wind microclimate assessments. The small changes to the average wind speeds and frequency by 2080 remain substantially less than the typical year-to-year variability. It is considered that applying a 'worst-case' factor would introduce an unhelpful and unrealistic level of conservatism into the results, and hence wind speed is not a factor taken into account when considering the future climate condition.

31 The long term climate change projections will be kept under review to identify any potential clear trends to projected future changes in wind speed and frequency, that can then be considered within the assessments.

Extreme Weather Events

32 Extreme weather events associated with the above climate change projections should also be considered by each technical specialist contributing to the ES, i.e. heat waves and conversely, heavy rainfall events leading to flooding.

SUMMARY

33 This note provides the future climate condition in London for the technical assessment of the Proposed Development, when assessing climate change. It has been developed to ensure consistency across the technical topics covered in the EIA.

34 It is the responsibility of the technical specialist for each topic in the Environmental Statement to follow the steps set out in this note when considering climate change in their technical assessment.

35 The data provided within this technical note is up to date as of 09 March 2022. It is acknowledged that more information will become available on the UKCP18 interface over time, and revisions of this note shall be provided as appropriate.

TRIUM

Appendix A: Policy and Guidance

Policy and Guidance

- EU Guidance on Integrating Climate Change and Biodiversity into the Environmental Impact Assessment (2013)[7]
- IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2020)[8]
- UK Climate Change Risk Assessment Evidence Report (2017)[9]
- 2017 EIA Regulations (as amended)[10]

[7] European Union, 2013. Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessments
[8] Institute of Environmental Management and Assessment, (2020); Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.
[9] HM Government, 2017. UK Climate Change Risk Assessment 2017
[10] His Majesty's Stationery Office (HMSO) 2017. The Town and Country Planning (Environmental Impact Assessment) (England) Regulations 2017 (amended in 2018 and 2020).