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Examination Principle Issues	**Climate Change**

DEADLINE D1 SUBMISSION

I am a scientist with a background in computer modelling of complex phenomena, including climate change. Between 1995 and 2006, I ran the high-performance computer service at the University of East Anglia. I also have 17 years' experience working on planning and climate change issues as a councillor both on Norwich City Council and on Norfolk County Council, and as an environmental consultant. My current work at CEPP is to promote the necessary rapid response to the Climate Emergency in mainstream institutions, such as local authorities, planning inquiries and government, through the lenses of science, policy, and litigation. (Further resume in Appendix H).

In so far as the facts in this statement are within my knowledge, they are true. In so far as the facts in this statement are not within my direct knowledge, they are true to the best of my knowledge and belief.

SUMMARY

The key issue of this Written Representation ("WR") is how the significance of the climate change impacts of carbon emissions associated with the scheme are assessed. This is also the question with respect to greenhouse gases ("GHGs") which the Secretary of State (SoS) must grapple with and reach a reasoned conclusion, and that the Examination recommendations from the ExA must deal with.

By background, the UK has now a legal and policy framework on Climate Change which might be labelled as the "net zero" world. This "net zero" world contains several legal requirements, for example: the Net Zero target 2050, the Sixth Carbon Budget, the 2030 68% reduction target, the 2035 78% reduction target; and policy to deliver these legal requirements, for example, the Net Zero Strategy. None of these existed before 2019, and some of them are very recent, for example the Sixth Carbon budget and the Net Zero Strategy.

This requires a new approach to assessing significance, and this recognised by the Government in reviewing the NPSNN which was published in 2014 under a completely different UK climate change regime.

With the emergence of the new UK legal and policy frameworks on climate change, new industry guidance has emerged too, such as the publication by IEMA of a best practice guidance of EIA assessment of GHGs from infrastructure projects. It provides recommendations that naturally, given the very different prevailing climate change regime, extend the traditional NPSNN based evaluation of significance with further contextualisation for GHG significance assessment. Application of this guidance for contextualisation literally provides "add-on" value to GHG assessment and the ES because the resulting significance assessment is considerably more trustworthy and accurate. This is explained at Section 2 of the WR.

Having explained this, I move on in section 3 to report errors in the Applicant's Climate Impacts Assessment Table. These are numerical errors and a failure of the Applicant to follow its own DMRB LA114 guidance. It is of concern that ES Chapter 7 on Climate is so riddled with such errors.

I then make an "A to B" data journey to explain how the climate impacts assessment table is generated in section 4. This serves a number of purposes. First, it demonstrates that there is no cumulative assessment of the climate impacts of the carbon emissions associated with the scheme by providing a deconstruction of how data from the traffic model makes its way to arrive in the assessment table. The process also generates some additional data that is useful to me for the later IEMA contextualisations which I carry out.

Section 5 goes into the detail of the implications of there being no cumulative assessment of carbon emissions in the ES, and also provides further analysis of the causality of the issue (for example, how the baselines and scenarios in the traffic model are configured to exclude cumulative assessment). It also responds to incorrect arguments that the Applicant has made elsewhere about cumulative assessment and provides an update on my legal cases on (the lack of) cumulative assessment of carbon on other DCO schemes to which the Applicant is an Interested Party. Just for

clarity, I once again state that categorically in this summary that there is no assessment of the climate change impact of cumulative carbon emissions in the ES.

Section 6 returns to key issue of how the significance of the climate change impacts of carbon emissions associated with the scheme are assessed. It explains the recommended approach in the IEMA guidance, including the IEMA significance criteria, and explores how the IEMA approach help answers questions like "*to what extent does the project contribute, or undermine, securing the Net Zero Strategy and 6th carbon budget?*", and, thereby, helps to establish whether the scheme meets "NPSNN 5.18 test" or not.

Section 7 puts this into practice. As the Applicant has put forward groundless reasons for not attempting IEMA contextualisation on other schemes, I first show that these do not apply in general and also specifically to the A66 scheme. I then provide three IEMA based contextualisation models for the operation emissions of the A66 scheme, each based on transparent methods (I explain all my assumptions), and freely and readily available data. I also apply two of the contextualisations to the construction emissions (I exclude one contextualisation method as its timeframe is not applicable to the construction emissions). The three contextualisations are based on the Net Zero Strategy transport trajectories, BEIS local authority carbon emissions data, and the Tyndall Centre local authority carbon budgets.

For each contextualisation in section 7, I carry out a significance assessment based on the IEMA significance criteria, and a significance test based on the NPSNN 5.18 test. In each of the three operation emission contextualisations, the IEMA significance is "Major Adverse" and the NPSNN 5.18 test fails because of the additional information provided by the contextualisation that is missing in the Applicant's assessment. Table CEPP.WR.Tab-12 in section 7.15 compares the significance assessments made in the Application and Environmental Statement, and those based on the IEMA contextualisations.

IEMA significance criteria "Major Adverse" is specified as "*the project's GHG impacts are not mitigated or are only compliant with do-minimum standards projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.*" This equates to a failed NPSNN 5.18 test which is that "*the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets".*

I conclude by each of the three methods that the scheme is IEMA "Major Adverse" and fails the NPSNN 5.18 test.

There are a number of problems which result from this. First is that the ES is unlawful as there is no cumulative assessment of carbon emissions. Should this issue not be addressed by the Applicant, then the Examining Authority is respectfully requested to consider whether it is of the view that it is necessary for the ES to contain the necessary further information. The Examining Authority is requested to give consideration to Reg 20 (1) of the 2017 Regulations which provides the Examining authority with the option to 'suspend consideration of the application' if it is necessary for the ES to contain further information.

Second, the ES is effectively missing the data that IEMA contextualisations provide in determining both the IEMA significance criteria and the NPSNN 5.18 test in the "net zero" world of climate legislation and policy.

I should make it clear that IEMA contextualisation is not an "optional extra". The point I am making is that the IEMA contextualisation is a necessary part of assessment, in the "net zero" legal and policy world, to actually reach the correct conclusion. Without it, the incorrect conclusions may be reached, as the Applicant has in their ES. This is because relevant and vital data is being missed. In approach of the Applicant the assessor (or competent expert) goes into the assessment process (including NPSNN 5.18) with their eyes 95% closed; by employing IEMA assessment as an additional tool the assessor goes in with their eyed wide open.

The Examining Authority is also respectfully requested to consider if the ES should be updated with IEMA contextualisations, so that a **trustworthy** significance assessment can be attained. I have already in this WR provided indicative (and also robust) examples of the methods of contextualisation which could be employed.

In conclusion, on the basis of my three IEMA based contextualisations, I conclude that the scheme is "Major Adverse" and fails the NPSNN 5.18 test on the basis of the scale of the climate change impacts from its carbon emissions. The scheme should therefore be recommended for refusal.

A brief summary of the ISH2 Hearing is provided at section 1.2. This Written Representation has been crafted to expand and explain all the points which I made at the ISH2.

Contents

1 INTRODUCTION

1.1 Deadline 1 (D1)

1 This is my Written Representation submission for Deadline D1. I previously submitted a Relevant Representation which is reproduced in clear format at Appendix G.

2 As well as this Written Representation, I have also drafted a Principal Areas of Disagreement Summary Statements (PADDS), submitted at deadline D1.

3 I include in the next section a short write up of the ISH2 hearing on December 1st 2022.

1.2 ISH2 Hearing

4 I am grateful for the discussion with Inspector Roscoe at the ISH2 Hearing. I made the following points, noted by Inspector Roscoe, which I said I would explain in this Written Representation:

(A) CATEGORICALLY, there is no assessment of the impact of cumulative carbon emissions in the ES. Categorically, no such cumulative assessment has been attempted. Importantly, I stated that it is **not** that a cumulative assessment of carbon emissions has been attempted, and I disagree with the way it has been done. It is that a cumulative assessment of carbon emissions has not been done at all in the ES and the Application.

I address this issue in this WR at section 5 entitled "There is no assessment of the impact of cumulative carbon emissions in the ES".

(B) The omission is unlawful with respect to the EIA Regulations 2017 ("the 2017 Regulations").

I address this issue at section 5.5 which explains the relevant statutory requirement. The legal framework for Environmental Impact Assessment, and the 2017 regulations, is given at Appendix A.

(C) I also noted at the ISH2 that the Applicant's consultant had referred to "a spatial approach to a cumulative assessment for GHG emissions" as not being appropriate. I stated that I disagreed that the IEMA guidance[1] said this. I address this issue at section 5.6 "The applicant misinterprets the IEMA guidance".

(D) The applicant refers to IEMA as relevant guidance, and that ES "broadly aligns with IEMA guidance" (see section 6.1). This is false as the applicant has taken the very

[1] Institute of Environmental Management & Assessment (IEMA), "Assessing greenhouse gas emissions and evaluating their significance", version 2, 2022

opposite approach to the best practice guidance from IEMA for making an EIA assessment of carbon emissions and assessing significance in these ways:

(a) IEMA refers to comparison of carbon emissions against national carbon budgets as only a starting place of limited value. The ES only contains such a comparison to national carbon budgets. This is addressed in section 6.2 "Contextualisation of GHG assessment". Therefore the Applicant, in the ES, has not progressed beyond the starting place in the IEMA guidance.

(b) IEMA recommends local, regional, and sectorial contextualisation of carbon emissions. The ES contains no such contextualisation and so does not align with the IEMA guidance. This is addressed in section 6.2 "Contextualisation of GHG assessment".

(E) At ISH2, I then posed the question "Why is this important?" referring to both the omission of a cumulative carbon assessment, and the omissions of any IEMA based approach to local, regional and sectorial contextualisation of carbon emissions. I explain it was important because cumulative assessment and contextualisation were both required to be able to make an assessment of the significance of the climate impacts from the carbon emissions of the project.

This related to the determining significance (and the discussion on significance thresholds at the ISH2). Without cumulative assessment and contextualisation, there was missing information/data, so significance could not be determined robustly. The assessment of significance in the ES is, therefore, not meaningful.

This WR provides indicative examples of the missing information, for example, contextualisation of carbon emissions by three methods in section 7 "IEMA contextualised assessment for the scheme". The methods as laid out show why the assessment in the ES is not meaningful, and crucially why it reaches an incorrect significance assessment.

(F) I said at ISH2 until the emissions from the scheme are quantified and assessed, both solus[2] and cumulatively, and contextualised by comparisons with the local and regional climate policy and budgets, it is not possible to answer key question such as:

(a) is the scheme in line with measures necessary to achieve the UK's trajectory towards net zero, or

(b) does it fall short of fully contributing to the UK's trajectory towards net zero, or

[2] In isolation

(c) does it lock-in emissions and therefore cannot make a meaningful contribution to the UK's trajectory towards net zero.

(G) Without clear answers to these questions, the Secretary of State cannot be satisfied that the material provided by the Applicant in the Environmental Statement is sufficient for him to reach a reasoned conclusion on the significance of the effects of the proposed development on the environment, and that it meets legal, guidance and policy requirements.

5 This Written Representation has been written to expand and explain all the points which I made at the ISH2.

1.3 Information request

6 I request further information within this submission, and list the information required at section 9.

1.4 Definitions and Abbreviations

DMRB	Design Manual for Roads and Bridges
DM	"Do Minimum" traffic modelling scenario
DS	"Do Something" traffic modelling scenario
EIA	Environmental Impact Assessment
EFT	Emissions Factor Toolkit
GHGs	Greenhouse Gas Emissions
ER	Environmental Report
ES	Environmental Statement
TAG	Transport analysis guidance

7 For scientific clarity and precision, I use the following additional definitions:

- **Absolute emissions** – *carbon emissions which are expressed in terms of* ***an absolute quantity*** *of emissions. The value of the absolute emissions, as released into the atmosphere, quantifies the real measure of the impact of greenhouse gases on the environmental factor (or receptor) of the global climate.*

- **Differential emissions** – *carbon emissions, with an associated value which has been* ***derived by differentiation of absolute emissions****. The differentiation is usually performed by the difference between two traffic scenarios, one with a transport intervention and one without.*

1.5 Transparency

8 All the data from the calculations which I make in this WR may be provided in spreadsheet form to the examination, should it be required by the ExA or other parties.

2 APPROACHES TO SIGNIFICANCE ASSESSMENT OF GHGS

9 The key issue of this WR is how the significance of the climate change impacts of carbon emissions associated with the scheme may be optimally assessed to produce a robust and trustworthy significance assessment. This is necessary for the Secretary of State to be able to make a lawful decision under the Planning Act 2008 and other relevant legislation.

10 Evaluating significance of GHGs can be understood at an overarching level as "*is the Scheme consistent with the legal framework of the Climate Change Act 2008, the Net Zero target 2050, the Sixth Carbon Budget, the 2030 68% reduction targets, the 2035 78% reduction target, and the policy framework of the Net Zero Strategy to deliver them?*"

11 And what level of adversity (eg "Minor Adverse" etc) is attached to the climate impacts of the scheme when that question has been answered.

12 These are the questions which the Secretary of State (SoS) must grapple with and reach a reasoned conclusion, and that the Examination recommendations from the ExA must deal with.

13 This vital question of how to evaluate significance has been phrased in a number of ways at the next level, for example:

> "*Does the scheme do enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects"*

and

> *"Is the increase in carbon emissions resulting from the proposed scheme so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets*

The first is from the IEMA Guidance (the significance criteria for "Minor Adverse") and the second from the NPSNN (the "NPSNN 5.18 test").

14 It can be seen that both evaluations have a common objective, that the scheme must align with, or not have a material impact so significant on, meeting national Climate Change targets. However, the approach to demonstrating how, and whether, national Climate Change targets will be met differs between IEMA and the NPSNN. The difference in approach can largely be attributed to the different publication dates of the guidance: NPSNN, 2014 and IEMA guidance, version 2, 2022.

15 NPSNN 5.17 says "*However, for road projects applicants should provide evidence of the carbon impact of the project and an assessment against the Government's carbon budgets.*" ("the NPSNN 5.17 comparison"). This simplistic comparison, and any assessment based on it, has to be understood in the context that it was written before the Net Zero target 2050,

under a different regime of legislated carbon budgets (the 2nd and 3rd budgets) with an 80% carbon reduction target for 2050. The completely different legislative and policy framework for climate change in 2014 is one reason why the government recognised that the NPSNN needed to be reviewed, as is now currently on-going.

16 The IMEA guidance version 2 has been published in the "net zero" world, which now is the legal and policy framework. It identifies a (third) key principle in its introduction to "Significance" (IEMA, v2, Chapter 6):

> *"GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit [footnote 31]; as such any GHG emissions or reductions from a project might be considered to be significant [footnote 32]"*
>
> Where footnote 31 is *"There is a global GHG emission budget that defines a level of dangerous climate change, and any GHG emission that contributes to exceedance of that budget or threatens efforts to stay within it can be considered as significant."*
>
> And footnote 32 is *"The third principle is related to the IPCC carbon budget definition. The IPCC's Sixth Assessment Report (WG1: The Physical Science Basis, Table SPM.2) indicates that the remaining global carbon budget from 2020 that provides a two-thirds likelihood of not exceeding 1.5°C heating is 400 GtCO2; for an 87% likelihood it is 300 GtCO2."*

As well as being in the "net zero" world, the IEMA guidance clearly identifies its scientific sources (the latest IPCC report), and as we will see IEMA advocate science-based carbon budgets (see section 6.2 of this WR) and makes clear that all emissions all emissions contribute to climate change[3].

17 In the perspective of the "net zero" world, IEMA accepts the comparison against national budgets as a starting place for assessing significance. However, it strongly recommends that that such a national comparison is then in addition contextualised with comparisons with local, regional and sectorial carbon budgets and targets.

18 The applicant has, as far as significance assessment, only performed the MPSNN 5/17 comparison, and has decided (despite claiming otherwise, see next sub-section) not to follow IEMA, and therefore, not to do local regional and sectorial contextualisation. It is an error for the Applicant to develop its ES as if the two approaches are options, and that one may be selected over the other, as it has done by solely using the NPSNN 5.17 comparison method for significance.

19 With the emergence of the new UK legal and policy frameworks on climate change, and the publication by IEMA of a best practice guidance reflecting them, the reality is that by using

[3] IEMA Guidance, version 2, Box 3

the IEMA approach, in addition to an assessment that *starts* with a NPSNN 5.17 comparison, results in a significance assessment which is considerably more **trustworthy and accurate**.

20 When IEMA contextualisation is used with the NPSNN national comparison, the resulting ES provides a much more accurate evaluation of the risk of delivery of the legal and policy framework. By this, I mean, that an evaluation of the common objective, that the scheme must align with, or not have a material impact so significant on, meeting national Climate Change targets is the ultimate goal for both IEMA and NPSNN. However, using IEMA contextualisation provides a much greater evidence-base on which to make the significance assessment at NPSNN 5.18.

21 For the A66 project, I have carried out a significance assessment based on the above principle. That is of using additional IEMA contextualisation to provide a greater, and very relevant, evidence base on which to make the NPSNN 5.18 test.

22 I use three different contextualisations which I will explain in this WR at section 7.

23 Table CEPP.WR.Tab-12 in section 7.15 of this WR compares the ES assessment with my contextualisation assessments. In each of my contextualisation, the project is found to be IEMA significance criteria "Major Adverse" and to fail the NPSNN 5.18 test, whereas the ES finds the scheme to pass the NPSNN 5.18 test based solely on the old NPSNN 5.17 comparison.

24 The reason for the difference is that the contextualisations that I carry out massively extend the evidence base being used compared with the ES. This is why I said at the ISH2 that by not using IEMA contextualisation, and also in not doing a cumulative assessment, the Applicant was hampering itself by working with only some of the data (in other words there was "missing data"). The "missing data" in question is key aspects of more recent policy since the NPSNN was published, for example, the Net Zero Strategy projections of carbon reductions, and the Tyndall Centre science-based carbon budgets which align to the science-based budgets required to deliver the Paris Agreement (as explained in section 7.11 and Appendix B).

25 Therefore, by doggedly continuing to follow what is widely accepted as outdated guidance in the NPSNN, even as it is being reviewed by the Government, the Applicant is not just avoiding (on groundless reasons, see section 7.1 of this WR) new methods, but they are excluding a significant evidence base related to more recent legislation and policy which is critical and essential to perform the NPSNN 5.18 test correctly.

26 Therefore the NPSNN 5.18 test performed by the Applicant without any IEMA contextualisation produces a misleading and incorrect result (assessment): it arrives at the incorrect significance assessment in relation to the new policy and legislation. Beyond being technically wrong, it is legally in error, as by deliberately omitting new evidence bases, such as the Net Zero Strategy trajectories which are part of the legally required plan to deliver the Climate Change Act, it cannot be said to rationally assess the latest legal and policy framework.

27 It is only by also carrying out IEMA contextualisation(s), as a complementary evaluation(s), that the technically correct, and lawful, significance assessment can be reached.

28 The detail of this will follow in this WR. First, in the next sub-section, I highlight some of the reference points in ES Chapter 14 related to this.

2.1 Background issues in the ES Chapter 14

29 For background, I identify here important aspects of the Applicant's approach which relate to the issue of evaluating significance as above, and also the issue of cumulative assessment, and define my WR in relation to them.

30 DMRB LA114, section 1.2 identifies two climate topics for which environmental assessments must describe the likely significant effects of a proposed project on the environment under the EIA Regulations[4]. This WR is concerned only with the first "*impact of the project on climate (GHG emissions)*", as also identified by the Applicant at ES, Chapter 7, section 7.1.6. I do not address the second issue "*vulnerability of the project to climate change (adaptation)*".

31 In Table 7-2 on relevant NPSNN policies, the Applicant identifies for "carbon emissions" NPSNN 5.17, 5.18 and 5.19. With 5.17 and 5.18 being related to "assessment of likely significant effects". Table 7-2 fails to include NPSNN 4.4 which is under the NPSNN "General principles of assessment" section:

> "*In this context, environmental, safety, social and economic benefits and adverse impacts, should be considered at national, regional and local levels.*"

which indicates that local and regional assessment of environmental impacts should be part of the assessment of adverse impacts.

32 The Applicant outlines "Assessment methodology" at ES section 7.4, and provides an assessment based on it at ES section 7.11. "Evaluation of significance" is discussed at ES 7.5.19- 7.5.24.

33 At 7.5.22, the Applicant states that operational emissions will only be assessed against the 6th carbon budget period (and Table 7.24 reflects this). This does not follow the applicant's own LA114 guidance as above to report GHG emissions against each carbon budget period (5th and 6th carbon budgets for operational emissions), see also section 3.3 of this WR.

34 The Applicant's claims that the ES "broadly aligns with IEMA guidance" at 7.4.4. This is **false** because the IEMA guidance, firstly, says that a comparison against national budgets is only a starting place and a limited method of assessment, but the Applicant only makes such a comparison against national budgets, see more at section 6.2 of this WR. Secondly, IEMA

[4] DMRB LA114 references an older versions of the EU Directive (2011), but the same applies for the 2017 regulations, transposed from the 2104 EIA Directive (2014/52/EU)

says that contextualisation of such an assessment with local and regional carbon budgets/targets/policy is necessary, and this has not been done.

35 The ES's supposed "broad" alignment with IEMA guidance appears to have been made as a retrofit reaction to a number to Scoping responses[5] in Table 7-3 "Summary of scoping opinion and response".

36 At ES section 7.8.3, the baseline for the purported 'Do-minimum' ("DM") scenario is given in Table 7-10 for the years "2019 baseline scenario (historic)", "2029 modelled opening year" and "2044 modelled future year". The PAS 2080 scope of operational emissions "User utilisation of infrastructure (B9)" defines the DM scenario.

However, the baseline in 2019 is **not** the same as the baseline in 2029 and 2044. In section 5.1 of this WR, I provide a "*Overview of elements in the traffic forecasting*". The 2019 DM baseline contains just one of those elements:

> "(1) The baseline traffic model", as described in section 5.1

Whereas the 2029 and 2044 DM baselines contain these additional elements:

> "(2) Other schemes promoted by National Highways" (null in this case), and
> "(3) Local land based and road developments"

37 The omission of (2) and (3) from the 2029 and 2044 DM baselines is a key causal factor why the ES contains no cumulative assessment of the climate impacts from carbon emissions, as discussed in section 5 of the WR.

38 Having laid out these issues, I now discuss technical and numerical errors in the Applicant's ES and assessment.

[5] For example, Cumbria County Council at page 7-17 "*Assessment approach could be strengthened through to adoption of IEMA guidance for assessing the significance of greenhouse gas emissions.*"; Cumbria County Council / Eden District Council at page 7-23 "*There is no reference to the best practice guidance document, Institute of Environmental Management and Assessment (IEMA) EIA Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance. Although the Environmental Scoping Report states that emissions will be assessed in line with DMRB LA 114, it is requested that the ES should refer to the IEMA guidance, acknowledging that all GHG emissions are considered significant.*"

3 ERRORS IN THE CLIMATE IMPACTS ASSESSMENT TABLE

39 When assessing the climate impacts of both the construction and operational carbon emissions from the scheme, the Applicant makes a single assessment[6] (for each of the 4th, 5th and 6th carbon budgets).

40 The key data for this assessment of the climate change impacts of the carbon emissions from the scheme is presented in Table 7-24 of the Environmental Statement (ES). This may be referred to as the Climate Impacts Assessment Table, as it is the only table in the ES which presents the comparisons, made against national carbon budgets, which form the assessment.

41 Regrettably, it is necessary, at the outset, for me to point out **three errors** , and **a failure** to follow the Applicant's own DMRB guidance, in the data presented in the Climate Impacts Assessment Table. Given this is the only assessment of the climate impacts of carbon emissions from the scheme in the entire ES and the evaluation of significance is based entirely on the percentage figures with in it, I find it very concerning that it is so riddled with errors. First, I reproduce the original ES table, followed by a version in which the errors are corrected. I then explain the failure to follow guidance, and the errors.

3.1 Original Climate Impacts Assessment Table[7], Table 7-24

Table 7-24: Comparison of emissions against UK Carbon Budgets

Project stage	Estimated total GHG emissions over carbon budget (tCO_2e) ('Do-something' Scenario)[81]	Net CO_2 project GHG emissions (tCO_2e) (Do something minus Do-minimum)[82]	Relevant carbon budget[83]		
			4th (2023-27)	5th (2028-32)	6th (2033-37)
Construction[84]	518,562	518,562	0.027%	0.03%	N/A
Operation[85]	77,162,187	2,190,452	N/A	N/A	0.019%
Total	77,680,749	2,709,014	0.027%	0.03%	0.019%

Table CEPP.WR.Tab-1 – The original Table 7-24 in the ES, highlighting errors

42 Each of the figures highlighted yellow is incorrect, and the cell highlighted orange indicates the failure to follow guidance.

[6] The assessment is singular as the method and the comparison used, and comprises three percentages figures, one for each of the 4th, 5th and 6th carbon budgets

[7] Table 7-24 in the original document is split and spread over two pages, making it difficult to follow. I have joined the two sections together above.

43 Note footnote 85[8] - this is also erroneous as will be explained later.

3.2 Corrected Climate Impacts Assessment Table

44 I have added row and column identifiers, and additional rows of data (A, B and D, highlighted in grey below) to assist with my explanation. Row A provides the 5-year carbon budgets in tonnes of CO2 (tCO2e) for context: these are the same figures as given by the Applicant in Table 7-6 (expressed there as millions (mega) tonnes (MtCO2e)). Row B presents the Construction emissions and splits them across the 4th and 5th carbon budgets in the same proportions as the Applicant does in the original. Row D presents the correct Operation emissions and splits them across the 5th and 6th carbon budget: the method for deriving this split of figures is explained later in the section 4.1 "Extraction of 5th and 6th operational carbon budget data from Table 7-23".

tCO2e	Project stage	Estimated total GHG emissions over carbon budget (tCO2e) ('Do-something' Scenario)	Net CO2 project GHG Emissions (tCO2e) (Do something minus Do-minimum)	Relevant carbon budget		
				4th (2023-27)	5th (2028-32)	6th (2033-37)
A				1,950,000,000	1,725,000,000	965,000,000
B	Construction	518,562	518,562	261,516	257,046	
C =B/A	Construction			0.013%	0.015%	N/A
D	Operation	77,162,187	2,190,452		162,744	195,255
E =D/A	Operation			N/A	0.009%	0.020%
F =C+E	Total			0.013%	0.024%	0.020%
	1	2	3	4	5	6

Table CEPP.WR.Tab-2 – Corrected version of Applicant's Table 7-24

3.3 Failure to follow National Highway's own DMRB guidance

45 DMRB LA114 describes at paragraphs 3.18 and 3.19 how the assessment which the Applicant is doing at Table 7-24 is required to be performed. Table 3.18 of the LA114 guidance is an almost identical proforma version to Table 7-24. Paragraph 3.19 states "*Where a project stage extends over multiple carbon budget periods, the projects GHG emissions shall be reported against **each** carbon budget for each project stage.*"

46 However, ES 7.5.22 on "evaluation of significance" states:

> *"Total estimated GHG emissions from the operational stage of the Project will be considered against the Sixth Carbon Budget (2033-2037) as this is the Carbon Budget set*

[8] Footnote 85 erroneously states "*The operational emissions for the 5-year budget period include the modelled yearly emissions for each year, plus an allowance for average annual maintenance/replacement emissions over the 60-year study period.*" as will be explained later.

furthest into the future able to represent the operational phase, to provide a reasonable worst case assessment using information currently available on carbon budgets."

47 This is wrong in these respects:

i. Table 7-24 does **not** follow the applicant's own LA114 guidance as above to report GHG emissions against each carbon budget period;

ii. The Climate Impacts Assessment Table makes comparisons for each of the 4th, 5th and 6th carbon budgets. It is irrational not to present the full data, as it has been estimated, for each of these budgets.

iii. In this case, the 6th carbon budget is **not** the worst case assessment when LA114 is correctly followed in the corrected version of the Table above. A greater proportion of the carbon budget is actually used by the project in 5th carbon budget (cell F5 above) as this period has both construction and operation emissions.

48 For the A66 project, the opening year is 2029 and operational emissions have been estimated from 2029 - 2088[9] in the 60-year appraisal period. The project, therefore, spans 4 years of the 5th carbon budget (2028-2032), and the full 5 years of the 6th carbon budget (2033-2037). Table 7-24 fails to comply with DMRB, LA144, paragraph 3.19 in only reporting against the 6th carbon budget (and **not** reporting for the 4 years in the 5th carbon budget). This is corrected in my amended version of the table above.

3.4 First error, assessment of construction emissions is overestimated

49 The percentage figures for the impact of the construction emissions in Table 7-24 are overestimates. This is clear by adding the fractions of construction emissions in the 4th and 5th carbon budgets together as follows:

(0.027% * 1,950,000,000) + (0.030% * 1,725,000,000) = 1,044,000 tCO2e

50 This figure is approximately twice the "Construction stage total (tCO2e)" emissions reported in Table 7-21 of 518,562 tCO2e. Therefore, the quantity of construction emissions carried forward to Table 7-24 is approximately twice that which it should be.

51 I have corrected this in my amended Table by proportioning the construction emissions across the 4th and 5th carbon budgets using the same split as the Applicant, based on the total construction emissions as reported as 518,562 tCO2e in Table 7-24. This produces the correct percentage proportions of national budgets for these emissions at corrected cells C4 and C5 (and going forward into cells F4 and F5) in my amended Table.

[9] A further error is that Table 7-23 says, in its headers, that the 60 years period is "Total over modelled 60-year operation (2029 – 2089)". This is actually a 61-year period and is therefore incorrect. The correct end date of the 60-year period is 2088.

3.5 Second error, operation emissions not included or assessed for 5th carbon budget

52 The operational emissions in the 5th carbon budgets, implicit in Table 7-23, have not been carried forward into the assessment at Table 7-24, as already explained as a failure to comply with DMRB LA114. The results in the data in Table 7-24 underestimate the impacts, as the 5th carbon budget has both construction and operational emissions. It is also the budget with largest impact in percentage terms in both the original and corrected versions of Table 7-24. The consequence of not properly following the DMRB guidance and omitting the operational emissions for 4 years of the 5th carbon budget, is that the emissions for this carbon budget period with the greatest climate impact[10] are underestimated (until corrected in my version of the Table).

3.6 Third error, wrong (combination of PAS 2080 modules) operational emissions carried forward from Table 7-23

53 Paragraph 7.11.21 states that "*Operational phase emissions have been assessed against the Sixth Carbon Budget (2033-37) (as the Carbon Budget set furthest into the operational phase) by taking an annual operational emissions figure (i.e. net emissions for the future modelled year of 2044 plus one sixtieth of estimated maintenance emissions) and comparing it to an annual figure for the Sixth Carbon Budget*".

This equates to the sum of the PAS 2080 module B9 ["Vehicles using the highways infrastructure"] and (B2-B5) ["Maintenance and replacement]" emissions are taken forward for the comparison with carbon budgets. However, this not what has been done, as only the module B9 emissions have been taken forward. The percentages in original Table 7-24, therefore, do not include the estimated maintenance emissions[11], resulting in an underestimate of the operation emissions. I have corrected this error in my amended Table, leading to the corrected figures at F5 and F6. The corrected figures at F5 and F6 align with the description in footnote 85 (which original Table 7-24 does not) that "*the operational emissions for the 5-year budget period include the modelled yearly emissions for each year, **plus** an allowance for average annual maintenance/replacement emissions over the 60-year study period.*"

The figures in the original Table 7-24 meet this description: "*the operational emissions for the 5-year budget period include the modelled yearly emissions for each year, **without including** an allowance for average annual maintenance/replacement emissions over the 60-year study period".*

[10] The 5th carbon budget is the most impacted on the basis of this comparison with national budgets only. When other comparisons are used for contextualisation, as later in this report, the 6th carbon budget is found to be the most impacted. This demonstrates the limitation of the single approach of comparing a solus 'difference' value for emissions against national budgets.

[11] Demonstrated in my own spreadsheet, but not reproduced here. I do reproduce the correct extraction of operational emissions from Table 7-23 to Table 7-24 later in Table CEPP.WR.Tab-4

3.7 Conclusions

54 The Applicant's ES only provides one assessment of carbon emissions. This is given at Table 7-24 and is an assessment against national carbon budgets (the NPSNN 5.17 comparison). The IEMA guidance states that such an assessment against national carbon budgets is only a starting place of limited value, see section 6.2. However, the Applicant's ES Table 7-24 captures only such a starting place and is the only assessment. It is unfortunate to say the least that this starting and only assessment, in the Applicant's ES, is so seriously erroneous as demonstrated by every cell in the original table being incorrect (as indicated in the Table 7-24 reproduced above), and in not following the DMRB LA114 guidance.

It does not inspire confidence in the assessment made of the climate impacts of carbon emissions from the scheme.

55 The corrected version of the assessment actually shows that the impacts are less than the Applicant estimated. I acknowledge, then, that the corrected figures do not change the conclusions made by the applicant, based on its limited comparison. However, this is irrelevant to my case as I do not agree that those conclusions are correct. The reasons why I do not agree with the conclusions will be presented in detail in later sections, but just to provide a summary in advance, this is because:

i. Firstly, the applicant's assessment is the **sole** assessment in the ES and is a Scheme-only assessment. This means that the EIA Regulations 2017 requirement for a cumulative assessment in the ES is not discharged by the assessment. The corrected data in Table 7-24 does not give a wrong assessment (although it is a limited one), per se, but taken alone as it has been by the Applicant, it is insufficient to fulfil the legal requirements of the EIA regulations as is explained later. Therefore, the significance of the climate impacts of the carbon emissions from the scheme cannot be fully assessed on the basis of the corrected version of Table 7-24 at Table CEPP.WR.Tab-4 alone.

ii. Secondly, the assessment against national budgets (whether based on estimated of the emissions which are Scheme-only or cumulative with other developments) is extremely limited, just a starting place, according to the best practice guidance from IEMA. No attempt has been made to contextualise the assessment, despite IEMA strongly recommending that this is done. Further, in the "net-zero" world, the correct conclusion can only be reached with further contextualisation. This is demonstrated later by my contextualisations which lead to (three) different conclusions for the NPSNN 5.18 test.

56 To correct these points, I will later provide three different contextualisations of operations emissions which include cumulative assessment, and which each show that applicant's significance assessment is wrong, see section 7.

4 A TO B: HOW THE CLIMATE IMPACTS ASSESSMENT TABLE IS GENERATED

57 Section 5 after this one will explain why a cumulative assessment has not been made and why it should have been.

58 To do this, it is first necessary to deconstruct how the estimated operational emissions data presented in Table 7-23 is transformed to the assessment provided at Table 7-24. That A to B journey is now explained in this section.

59 Table 7-23 is entitled "*'Do-Something' and 'Do-Minimum' operation ('use stage') emissions*" and presents five rows of data for estimated operational emissions. For explanation, I have clipped the data for just opening year 2029 from Table 7-23 below and provided keys to the rows and columns. It is important to note that as well as the DS and DM scenarios (in columns 2 and 3), it also calculates the 'difference' between them in column 4.

	Project stage / PAS 2080 Module	Emissions (tCO_2e)		
		Modelled opening (future) year (2029)		
		'Do-minimum' scenario	'Do-something' scenario	Difference [80]
A	Maintenance and replacement (B2-B5)	N/A	2,027	2,027
B	Vehicles using the highways infrastructure (B9)	1,506,832	1,546,036	39,204
C	Land use and forestry (D)*	0	-2,444	-2,444
D =A+B	Total operational 'use stage' emissions excluding operational land use benefits	1,506,832	1,548,063	41,231
E = A+B+C	Total operational 'use stage' emissions including operational land use benefits	1,506,832	1,545,618	38,786
	1	2	3	4

Table CEPP.WR.Tab-3 – Opening year 2029 segment of Table 7-23

60 The first three rows (A, B and C) provide the elements, or different types, of operational emissions being considered as classified by PAS 2080[12] modules[13]. The bottom two numerical rows add these elements together, excluding and including "land use benefit" emissions respectively.

61 The second row (B) labelled "Vehicles using the highways infrastructure (B9)" is the emissions from vehicles using the road as estimated from the traffic model. The last sentence of 7.11.21 on the next page states that "*Land-use benefits during the operational phase have*

[12] British Standards Institute (2016) PAS 2080:2016 Carbon Management in Infrastructure

[13] And as indicated by the header of Table 7-23, column 1 "*Project stage / PAS 2080 Module*"

been excluded from the evaluation of significance to provide a pessimistic assessment" – this is referring to the third row (C) labelled "Land use and forestry (D)*". This means that it is the fourth row (D) entitled "*Total operational 'use stage' emissions excluding operational land use benefits*" which is intended to be taken forward for assessment and evaluation of significance.

62 However, the Applicant's error, noted above in section 3.6 "Third error, wrong PAS 2080 operation emissions carried forward from Table 7-23" is that it is the data from row B which has been taken forward to Table 7-24, not the data from row D.

63 I will now show how the data that the Applicant intended to take forward (ie row D), but didn't, is taken forward.

64 The table shows the "difference" between "Do Something" and "Do Minimum", and this is 41,231 tonnes of CO2 for the modelled opening year of 2029 (cell D4 above). For the design year of 2044, it is 35,772 tonnes as shown in the original Table.

65 However, the requirement from DMRB, LA114, paragraph 3.19[14] is to report the carbon emissions for each carbon budget period. To obtain the figures for the 5th carbon budget 2028-2032 (note: 2028 is before the opening year 2029 and has no operational emissions) and the 6th carbon budget 2033-2037, the quantity for each intervening year between 2029 to 2044 may be calculated by linear interpolation – that is, by assuming that the data points for the intervening year lie along a straight-line graph between the opening and design years.

[14] "*Where a project stage extends over multiple carbon budget periods, the projects GHG emissions shall be reported against each carbon budget for each project stage.*"

66 I have performed this calculation and illustrate it in Table CEPP.WR.Tab-4 below.

67 In Table CEPP.WR.Tab-4, I have extracted sub-tables for the 5th and 6th carbon budgets which show the linearly interpolated figures derived for each of the years in those budgets. The red arrows show how that data is transferred for the opening year 2029.

68 The figures in the orange highlighted cells show the totalled 'difference' figures across each carbon budget. These (orange) figures are the sums of the "Difference", or DS-DM, figures in the row above them which are in the yellow highlighted cells. It is these orange figures which are transferred to the (corrected) version of Table 7-24 at Table CEPP.WR.Tab-2 above, and lead to the correct assessment percentages in that Table as discussed.

69 The yellow figures and orange figures below align with the description in footnote 85 – "*The operational emissions for the 5-year budget period include the modelled yearly emissions for each year, plus an allowance for average annual maintenance/replacement emissions over the 60-year study period.*" In other words the maintenance emissions have been correctly added in on my tables below in Table CEPP.WR.Tab-4. and to my corrected version of Table 7-24 (Table CEPP.WR.Tab-2) where they are not in the Applicant's original Table 7-24.

70 It should be noted that some rounding effects occur in the Applicant's data and my data, so that the figures may not be exactly same; however, all the figures between my work and the Applicant's are consistent to within 10 tonnes of CO2, and usually much less.

4.1 Extraction of 5th and 6th operational carbon budget data from Table 7-23

Project stage / PAS 2080 Module	Emissions (tCO_2e)		
	Modelled opening (future) year (2029)		
	'Do-minimum' scenario	'Do-something' scenario	Difference [89]
Maintenance and replacement (B2-B5)	N/A	2,027	2,027
Vehicles using the highways infrastructure (B9)	1,506,832	1,546,036	39,204
Land use and forestry (D)*	0	-2,444	-2,444
Total operational 'use stage' emissions excluding operational land use benefits	1,506,832	1,548,063	41,231
Total operational 'use stage' emissions including operational land use benefits	1,506,832	1,545,618	38,786

Tables below extracted by linear interpolation between 2029 (to the left) and 2044 (to the right)

Modelled design (future) year (2044)		
'Do-minimum' scenario	'Do-something' scenario	Difference
N/A	2,027	2,027
1,209,944	1,243,698	33,754
0	-2,444	-2,444
1,209,944	1,245,725	35,772
1,209,944	1,243,280	33,337

5th Carbon Budget (2028-2032) // Emissions (tCO2e)
Total operational 'use stage' emissions excluding operational land use benefits (PAS2080: B9 + (B2-B5))

	2028	2029	2030	2031	2032
Do-minimum scenario		1,506,832	1,487,039	1,467,247	1,447,454
Do-something scenario		1,548,063	1,527,907	1,507,751	1,487,595
Difference		41,231	40,868	40,504	40,141
Difference: Total across Carbon Budget					**162,744**

6th Carbon Budget (2033-2037) // Emissions (tCO2e)
Total operational 'use stage' emissions excluding operational land use benefits (PAS2080: B9 + (B2-B5))

	2033	2034	2035	2036	2037
Do-minimum scenario	1,427,662	1,407,869	1,388,077	1,368,284	1,348,492
Do-something scenario	1,467,440	1,447,284	1,427,128	1,406,972	1,386,816
Difference	39,778	39,414	39,051	38,688	38,324
Difference: Total across Carbon Budget					**195,255**

Table CEPP.WR.Tab-4 – A to B journey of data from Table 7-23 to Table 7-24

71 The above explanation shows the "A to B" process that the outputs of the traffic model scenarios take, leading to the assessment in Table 7-24.

72 I now show why that assessment is not cumulative.

5 THERE IS NO ASSESSMENT OF THE IMPACT OF CUMULATIVE CARBON EMISSIONS IN THE ES

73 First, I explain, briefly and in summary, what elements (or sources of traffic) are in the 'Do Something' ("DS") and 'Do Minimum' ("DM") traffic model scenarios by reference to the Applicant's own information.

5.1 Overview of elements in the traffic forecasting

74 The transport model is known as the A66TM[15] (A66 Traffic Model). At a simple breakdown, the **DS** scenario contains these elements:

(1) **The baseline traffic model**, comprising the adjoining Strategic Road Network and local road network, calibrated against actual traffic counts and other data[16]. Originally, the base (or calibration) year was 2015[17] but the Applicant took the opportunity to update the base year model from 2015 to 2019 in parallel to the development of the second generation of the Regional Traffic Models (RTM2)[18].

The operational carbon emissions for the baseline model at base year 2019 are given in Table 7-10 as 1,577,127 tCO2e.

(2) **Other schemes promoted by National Highways** in the near vicinity of the proposed scheme with high certainty that they are to be progressed i.e. progressed beyond preferred route announcement stage. For the A66TM, there appears to be none in this category;

(3) **Local land based and road developments** in the study area. This is referred to by me as 'other locally committed development' in the study area. The developments included were based on discussions with the relevant planning authorities, of foreseeable developments promoted on a similar timeline to the scheme. An Uncertainty log was developed with input assumptions of these developments and infrastructure schemes, which enabled the selection of schemes for the core scenario[19]. Only those developments that were considered 'near certain' or 'more than likely', within the core area and considered 'big

[15] 3.8 Combined Modelling and Appraisal Report [APP-237], chapter 3.

[16] The history of the development of the A66TM model, and its calibration to reach this base year model is given in [APP-237], chapter 3.

[17] [APP-237], section 4.2.2

[18] [APP-237], section 4.2.3

[19] [APP-237], sections 5.3.6 - 5.3.21 describes the selection process, and Appendix A of the "Combined Modelling and Appraisal Report", and Appendix D - Stage 3 Transport Forecast Package" [APP-240, page D-91] gives the "Development Uncertainty Log"

enough' were included in the modelling[20]. All developments classed as 'reasonably foreseeable' and 'hypothetical', were excluded.

Section 5.3.20 of the Combined Modelling and Appraisal Report [APP-237] gives the sites of "particular interest" to the A66 project, which are all included in the core scenario[21]. These are described below. Note the selection of these sites leads to an underestimate of the traffic and emissions associated with them in the model, as described below.

(4) **Future year travel demand[22],[23]** based on national government regional growth rates which include a representation of likely growth rates excluding known planning developments already included in the traffic model;

(5) **The scheme** itself.

75 As there are no schemes under element (2) above, the DS scenario includes elements (1), (3), (4) and (5) above, and the DM scenario includes elements (1), (3) and (4) above. Only (5), the Scheme itself, in isolation, is omitted between the two.

76 Therefore, DS is the scenario with the scheme and includes the Scheme and 'other locally committed development' ie element (3) above. The DM scenario also includes the 'other locally committed development' with only the Scheme omitted.

[20] [APP-237]/ section 5.3.15. 5.3.18 gives the size criteria threshold for the inclusion of developments in the core scenario as follows. Core area: over 200 jobs for employment sites; over 100 dwellings for residential sites. Wider area: over 500 jobs for employment sites; over 250 dwellings for residential sites.

[21] This is confirmed in [APP-240]/section 5.4.9

[22] [APP-237], sections 5.3.1 - 5.3.5

[23] This is represented by DfT's NTEM/TEMPRO growth factors for car usage, and growth in freight is derived from DfT's National Transport Model.

5.2 Locally committed development in the core scenario

77 The developments listed in Section 5.3.20 of the Combined Modelling and Appraisal Report [APP-237], sites of "particular interest" to the A66 project and included in the core scenario, are summarised below:

	Site	Jobs	Houses
A66 route	C2615	822	
A66 route	C2618	822	
A66 route	C2238		505
North Penrith	C2397		299
North Penrith	C2457	420	
County Durham	C716		726
County Durham	C686		500
Catterick Garrison	C69		155
Catterick Garrison	C2631		160
Darlington	C630	1,536	
Darlington	C39		1,200
Darlington	C175	1,140	
TOTAL		**4740**	**3545**

Table CEPP.WR.Tab-5 – Local land based and road developments included in core scenario

78 Note, that this is an underestimate of traffic (and emissions) from local land based and road developments in the core scenario as the following are omitted[24]:

i. Schemes that are less than 200 jobs for employment sites, and less than 100 dwellings for residential sites.

ii. 'reasonably foreseeable' sites. The likelihood of these increases if the scheme is delivered, and would contribute consequential cumulative traffic and emissions in later years;

79 Whilst, it may be pragmatic for modelling to omit these, their omission does not fit with the Applicant's claim that the carbon emissions are reported as the worst-case. Currently no emissions are assessed for <u>all</u> the local land based and road developments, contrary to the 2017 Regulations as above. However, if this were to be rectified by the production of a cumulative carbon assessment, then it will be an underestimate due to the arbitrary omission of the types of schemes highlighted above.

80 The Applicant should provide estimates of:

[24] See "core scenario" at [APP-237], sections 5.3.14-5.3.18

- the additional number of homes and jobs that would be included in the core scenario if no size limit was applied;

- the additional number of homes and jobs that would be including in the core scenario if 'reasonably foreseeable' sites were also included.

5.3 Traffic model runs of interest for carbon

81 Five traffic model runs, based on the DS and DM scenarios, as described above, are of interest for extracting estimates of carbon emissions, and making assessments, these are as described at 7.5.15:

- 2019 Baseline scenario
- 2029 Do-Minimum (DM) scenario: the traffic scenario at the modelled
- opening year without the Project
- 2029 Do-Something (DS) scenario: the traffic scenario at the modelled opening year with the Project
- 2044 Do-Minimum (DM) scenario: the traffic scenario at the design year (15 years after the opening year) without the Project
- 2044 Do-Something (DS) scenario: the traffic scenario at the design year with the Project.

82 These DS and DM carbon estimates for 2029 and 2044 are the scenarios summarised in Table 7.23. The data is then processed in the A to B journey, as described in Table CEPP.WR.Tab-4 leading to the Corrected Climate Impacts Assessment Table at Table CEPP.WR.Tab-2.

83 I note that the Applicant also ran an additional model year at 2051[25],[26] 22 years after opening year. As this is the year after the UK target for net-zero carbon emissions, it would be very relevant for the carbon emissions estimated from this model run to be provided to the examination.

5.4 Reviewing the carbon emissions assessment done against the elements in the traffic model

84 Table 7-23 provides estimates of carbon emissions from the DS and DM scenarios at opening year 2029 and design year 2044, and also over the 60-year appraisal period (2029-2088[27]). I have shown at Table CEPP.WR.Tab-4 above that the annual figures between 2029 and 2088 are implicit in the data, and the DS and DM emissions figures can be extracted for the 15-year period 2029-2044 based on linear interpolation.

85 I have also shown that a DS-DM 'difference' trajectory of emissions figures between 2029 and 2044, including the 4-year trajectory for the 5th carbon budget (2028 being a null year for

[25] [APP-237], section 5.2.1

[26] [APP-237], section 5.2.2: "2051 was chosen as this is the current horizon year to which DfT currently provide trip end forecasts"

[27] A further error is that Table 7-23 says, in its headers, that the 60 years period is "Total over modelled 60-year operation (2029 – 2089)". This is actually a 61-year period and is therefore incorrect. The correct end date of the 60-year period is 2088.

operational emissions) and 5-year trajectory for the 6th carbon budgets, may be extracted as described in Table CEPP.WR.Tab-4. The data which is transferred into Table 7.24 for assessment of significance is, therefore, the DS-DM 'difference' total for each carbon budget (the orange highlighted figures in Table CEPP.WR.Tab-4.

86 As the only difference between the DS and DM scenarios is the Scheme itself, the estimated figure for the emissions from the scheme for each carbon budget used for assessment (in Table 7-24) is Scheme-only, or 'solus', and not cumulative. Assessment of the significance of the scheme was then made by comparing this difference figure to each national carbon budget (i.e. a Scheme-only assessment was made).

87 This is why I describe the difference between the "DM" and "DS" scenarios as "Scheme-only" estimates, and why I say that no cumulative assessment was made.

88 This comparison of the 'difference' DS-DM estimates against national carbon budgets cannot, in itself, discharge the requirement of the EIA 2017 Regulations for an assessment of the cumulative impacts of the scheme.

5.5 There is no cumulative impacts assessment of the carbon emissions from the scheme

89 It is a statutory requirement that the ES assess the cumulative effects of the scheme with other developments: paragraphs 5 of Schedule 4 to the EIA Regulations 2017, relevantly, requires the ES to include:

> *"A description of the likely significant effects of the development on the environment resulting from, inter alia:*
> *…*
> *(e) the cumulation of effects with other existing and/or approved projects, …;"*

More detail of the legal framework for Environmental Impact Assessment, and the 2017 regulations, is given at Appendix A.

90 The problem with the ES is that by including "*existing and/or approved projects*" in the DM scenario (and then presuming that it is the traffic model baseline), it inaccurately treats all of the committed local land based and road developments in the study area (ie element (3) of the scenarios above), other than the Scheme, as though they give rise to *existing* emissions and not *additional emissions* alongside the Scheme. This means that the Applicant has not actually conducted any assessment of the significance of the cumulative carbon emissions from the Scheme with other existing and/or proposed developments. The Applicant has only conducted an assessment of the impact of the Scheme in isolation, against a baseline that assumes that the other existing and/or proposed developments in the area already exist.

91 It can be noted from above, that local land based and road developments (ie element (3) above) will generate new emissions, alongside the scheme emissions, from over 4700 new jobs and 3500 new homes at a minimum. As described above, this is in fact an underestimate of the additional development which can be expected alongside the scheme. The emissions

from these local land based and road developments are treated as if they are existing emissions (when in fact the developments haven't yet been built) because, as shown above, the DM scenario is (incorrectly) treated as the baseline for the carbon emissions assessment.

92 This then infects the assessment as ES section 7.11, and the evaluation of significance at 7.11.24, and via Table 7-24, about whether there could then be a material impact on the ability of the Government to meet the national carbon budgets. As above, the ES considers only the figure for the difference between the two scenarios (i.e. "Scheme only" figures). It sets these out as percentages of the various 5-year national carbon budgets. It, therefore, looks at the Scheme's impact on climate change in isolation and not cumulatively with any other existing or proposed developments. In particular, it does not assess (such as against the carbon budgets) the cumulative impact of the Scheme with any other projects, in this case the local land based and road developments, or make any judgement about what projects should be considered cumulatively with this one. This makes it impossible to assess lawfully whether the scheme's emissions cumulated with other projects' emissions would materially impact the ability to meet the Government's carbon reduction targets.

93 My position is simply that it is a legal requirement in assessing the significance of the scheme to include the cumulative impact of the Scheme with existing and/or approved projects and that the Applicant has, instead, considered only the impact of the Scheme in isolation in Table 7-24 (the **only** assessment ever made in the ES).

94 I repeat my statements at the ISH2:

- CATEGORICALLY, there is no assessment of the impact of cumulative carbon emissions in the ES. Categorically, no such cumulative assessment has been attempted. Importantly, it is not that a cumulative assessment of carbon emissions has been attempted, and I disagree with the way it has been done. It is that a cumulative assessment of carbon emissions has not been done at all in the ES and the Application.

  The traffic and emissions from the local land based and road developments are added into the traffic model DS scenario, and then subtracted out when the DS is compared to the DM scenario. Table 7-24 is presents the data on which the only assessment made in the ES is based, and the "A to B journey of data" from Table 7-23 to Table 7-24 as shown in Table CEPP.WR.Tab-4 and the related description demonstrate that this results solely in the Scheme-only emissions being assessed.

- The omission is unlawful with respect to the EIA Regulations 2017 ("the 2017 Regulations"). Until this omission is corrected, the ES remains unlawful. By failing to conduct the cumulative assessment, the ES is defective because it fails to meet the requirements in paragraphs 5 of Schedule 4 to the EIA Regulations 2017 read with Schedule 4, para. 5(f) and reg.5(2).

95 However, the lack of any cumulative assessment is just the first of the problems which make the ES fundamentally unsuited to assessing the material impacts of the scheme on the ability

to meet the Government's carbon reduction targets. The second problem is the lack of any contextualisation of the assessment made with local, regional and sectorial budgets as discussed in the next main section.

96 First, I discuss further issues about cumulative carbon assessment which are relevant to the unlawful ES.

5.6 The applicant misinterprets the IEMA guidance

97 The Applicant misinterprets what the IEMA guidance means in saying that a spatial approach to a cumulative assessment for GHG emissions is not appropriate ([APP-050]/section 7.4.4.). The Applicant appears to take this to mean that additional emissions generated alongside the scheme by "local land based and road developments" (element (3) in my list above) do not need to be accounted. These emissions form part of the study area, and the applicant correctly includes them in the DS scenario, as discussed above. Where the Applicant has gone wrong is to also include them in the DM 'baseline' scenario, so that they are never accounted for cumulatively. The IEMA guidance supports the opposite interpretation as follows:

98 On page 17 under "Current baseline", IEMA state:

> *"The current baseline represents existing GHG emissions from the assessment prior to construction and operation of the project under consideration. This may include emissions from existing projects (e.g. energy consumption from a building which is scheduled for refurbishment, demolition or replacement) and infrastructure (e.g. current operational and end-user emissions of a road due to be upgraded)."*

This definition of 'baseline' corresponds to (1) in my list above, and reinforces my point that the additional emissions from (3) in my list [ie "(3) local land based and road developments"] in the study area should not be included in the baseline (ie DM) as the Applicant has incorrectly done.

99 On page 19 under "Step 3: Assessment methodology", and sub-section "Inclusions and Exclusions" IEMA states that "The project boundary should include its spatial extent and life cycle stages relevant to the scope of the assessment". Cumulative emissions are not listed for exclusion at this point.

100 On page 21 under "Cumulative GHG emissions", IEMA states, first, that:

> *"All global cumulative GHG sources are relevant to the effect on climate change, and this should be taken into account in defining the receptor (the atmospheric concentration of GHGs) as being of 'high' sensitivity to further emissions."*

This means that as the global receptor of GHGs is the global atmosphere, and it is a receptor of "'high' sensitivity", all relevant emissions should be considered, and that would include emissions in the traffic model study area which are generated in additional to those from the

scheme itself (ie the emissions from "(3) local land based and road developments" which characterise additional traffic emissions being generated alongside the scheme within the same study area).

101 Later on page 21, IEMA state

> *"The contextualisation of GHG emissions, as discussed in Section 6.4, should incorporate by its nature the cumulative contributions of other GHG sources which make up that context. Where the contextualisation is geographically – or sector-bounded (e.g. involves contextualising emissions within a local authority scale carbon budget, or a sector level net zero carbon roadmap), then the consideration of cumulative contributions to that context will be within that boundary."*

This again implies that all relevant emissions should be considered. The context is provided by the traffic model study area, and *cumulative contributions of other GHG sources* should include emissions in the traffic model study area which are generated in addition to those from the scheme itself.

102 As best practice guidance for the EIA of GHGs, nowhere does IEMA state that the requirement for "*the cumulation of effects with other existing and/or approved projects"* under paragraphs 5 of Schedule 4 to the EIA Regulations 2017 may be dispensed with, which appears to be the Applicant's position at ([APP-050]/section 7.4.4).

5.7 Incorrect arguments used on other schemes

103 On other applications, the Applicant has given two arguments relating to cumulative carbon assessment which attempt to establish that it has done cumulative carbon assessment, when in fact it hasn't done any such thing. This is an attempt to try to maintain that the ES is, after all, lawful when in fact it is not as it breaches the requirements of the 2017 regulations.

104 The ES is unlawful because there is no cumulative assessment as I have demonstrated. However, I consider each of these arguments here for completeness, as I anticipate that they might otherwise appear in the narrative of this examination too.

105 First, it has been said, on other projects, that the Applicant's ES included an 'inherently cumulative' estimate of emissions because it included emissions from the other related schemes within both 'Do Minimum' and 'Do Something' traffic model scenarios. However, as the impact of the A66 scheme is reported as being (and is then assessed by reference to) the 'difference' between these two scenarios, the resulting assessment of the significance of impact is actually based only on the emissions from the Scheme itself. It follows that there is no cumulative evaluation in the ES, and the assessment of the significance of impact made at ES 7.11.18- 7.11.24 (and Table 7-24) is precisely the opposite of conducting the required cumulative assessment.

106 Second, it has been said, on other projects, that the Applicant's ES achieved a cumulative assessment as the emissions from the Scheme were compared against the benchmark of a

national carbon budget. That is wrong because the Scheme-only emissions estimated in the ES (and then carried forward into the assessment of significance) did not include the cumulative emissions and so were only one part of the overall relevant emissions, which should have been assessed. In the A66 ES, comparing the underestimated emissions figure against the national carbon budget did not give an assessment of the cumulative effect of the Scheme along with the effects from local land based and road developments (which is what was required). Instead, it gave a comparison of the significance of only the Scheme-specific emissions. The result is in the ES for this scheme, the Applicant's analysis approaches the assessment of significance on the basis that there was no difference between the Scheme-only emissions figure and a cumulative emissions figure. That cannot represent a true assessment of cumulative impact.

107 Further, this argument from the Applicant is quite illogical. The national carbon budgets are being used as a benchmark in the comparison being made. What is being compared is an estimate of carbon emissions from the scheme as it is the scheme that is being assessed. The nature of the benchmark does not make the assessment of that estimate cumulative or not. It is how that estimate is derived which makes it cumulative or not, and I have shown at section 5.4 and 5.5 above that, given a correct understanding of it derivation, it is not cumulative.

5.8 Update on R(Boswell) v Sec of State for Transport CO/2837/2022, CO/3506/2022 & CO/4162/2022

108 These are three claims before the High Court in which there is a ground (Ground 1 in each case) which relates to the issue of cumulative carbon assessment, as discussed above.

109 On 14 December 2022, the Honourable Mr Justice Holgate granted permission to apply for judicial review for Ground 1 in each of CO/2837/2022, CO/3506/2022 & CO/4162/2022.

6 ASSESSMENT OF SIGNIFICANCE

6.1 Latest IEMA Guidance

110 In February 2022[28], the Institute of Environmental Management & Assessment (IEMA) released version 2 of its "Assessing greenhouse gas emissions and evaluating their significance" guidance. Although the IEMA Guidance is not on a statutory footing, it is the primary guidance on assessing the significance of greenhouse gas emissions within the UK. Worldwide, IEMA is the professional home of over 18,000 environment and sustainability professionals from around the globe.

111 Under ES section 7.3.9, the Applicant states that the IEMA guidance "*provides an approach to undertaking assessment of GHG emissions within the EIA process in the UK*". At 7.4.4, the Applicant states that their assessment "follows"[29] DMRB LA114 guidance and "broadly aligns with IEMA guidance". Points of difference between the Applicant's approach and the IEMA guidance are noted as:

- the treatment of cumulative assessment. I have dealt with this at section 5.6 "The applicant misinterprets the IEMA guidance" above. Note this an academic point on the part of the Applicant as the Applicant has made no cumulative assessment, in any case;

- the assessment of significance which I will come onto. First, it is necessary to understand the IEMA guidance's recommended approach to assessment of GHGs (before the assessment of their significance is addressed), and this now explained.

6.2 Contextualisation of GHG assessment

112 The IEMA guidance sets out that "the crux" of significance of GHG emissions is whether the project under consideration "*contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". Importantly, it goes on to state that the "*context of a project's carbon footprint determines whether it supports or undermines a trajectory towards net zero".*

113 Whether a project supports or undermines a trajectory towards net zero is a key condition in also determining the NPSNN 5.18 carbon test of whether "*the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets*". If a project does not support a trajectory towards net zero, then it has a material impact on the ability of Government to meet its carbon reduction targets, and it fails the NPSNN 5.18 test.

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[28] This appears to be the same guidance as referenced by the Applicant at footnote 28 of Chapter 7 as "2021" – this is believed to be an error in the ES.

[29] Although DMRB LA 114 has **not** been followed correctly by the Applicant as explained above,

114 The IEMA guidance continues:

> "*The starting point for context is therefore the percentage contribution to the national or devolved administration carbon budget as advised by the CCC. However, the contribution of most individual projects to national-level budgets will be small and so this context will have* ***limited value****."*

115 The IEMA Guidance, therefore, goes on to set out that it is good practice to use sectoral, regional and local carbon budgets to contextualise the project's GHG emissions. Local authority scale budgets are recommended including those from local authorities to the science-based local authority scale carbon budgets compiled by researchers at the Tyndall Centre at the University of Manchester.

116 The guidance also states that "***It is good practice to draw on multiple sources of evidence*** *when evaluating the context of GHG emissions associated with a project*"

117 Guidance issued by the European Commission for the EIA Directive, from which the EIA regulation is transposed to the UK statute, also states[30] that the assessment of GHG emissions "*should take relevant greenhouse gas reduction targets at national, regional and local levels into account, where available*", see Appendix F.

118 Further under "General principles of assessment", the NPSNN at 4.4 states:

> *"In this context, environmental, safety, social and economic benefits and adverse impacts, should be considered at national, regional and local levels. These may be identified in this NPS, or elsewhere."*

119 Both the NPSNN and the EIA Guidance support the recommendations of IEMA that contextualisation of carbon emission assessment should be carried out by reference to local, regional and sectorial budgets and targets.

6.3 IEMA Significance assessment

120 The IEMA Guidance addresses significance at Chapter 6. It acknowledges the objective of the Paris Agreement and the UK's net zero 2050 target together with 5 yearly carbon budgets defining a trajectory towards net zero. It then states:

> *"To meet the 2050 target and interim budgets, action is required to reduce GHG emissions from all sectors, including projects in the built and natural environment. EIA for any proposed project must therefore give proportionate consideration to whether and how that project will contribute to or jeopardise the achievement of these targets.*
> …

[30] "Environmental Impact Assessment of Projects", Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, page 39

The crux of significance therefore 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.

Often a project will cause a change in GHG emissions compared to the baseline which should be assessed, as discussed in Sections 5.3. When setting this impact into context to determine significance, it is important to consider the net zero trajectory in line with the Paris Agreement's 1.5°C pathway.

The timing of reductions is critical due to the cumulative effect of GHG emissions in the atmosphere. Achieving net zero or very low emissions by 2025 instead of 2040 would avoid 15 years of cumulative heating.

The specific context for an individual project and the contribution it makes must be established through the professional judgement of an appropriately qualified practitioner, drawing on the available guidance, policy and scientific evidence."

121 The IEMA Guidance then seeks to categorise significance by reference to the UK's net-zero compatible trajectory and provides the chart below together with the following categories:

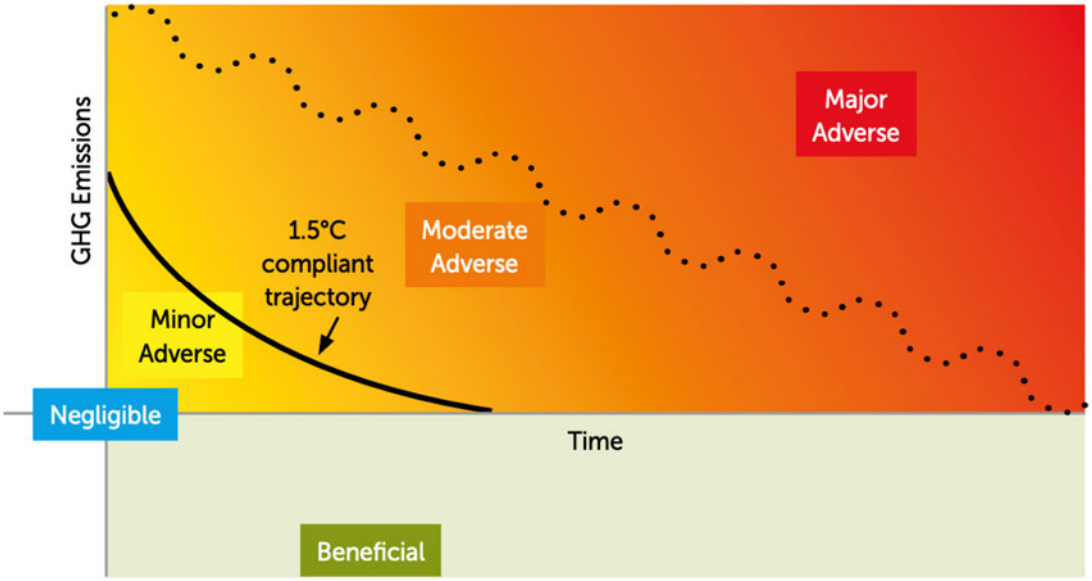


Figure CEPP.WR.Fig-1: IEMA Significance diagram (reproduced)

122 Any project assessed more than "Minor Adverse" (ie 'Moderate' or 'Major' Adverse) has a significant adverse effect.

123 IEMA explain that a "Minor Adverse" (and not significant) project is one:

> *"that is compatible with the budgeted, science-based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects."*

124 Box 3 of the IEMA guidance provides a table on significance criteria, and for "Minor Adverse" states:

> *"the project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero".*

Note that it is the project itself that must be fully in line with measures necessary to achieve the UK's trajectory towards net zero. "Minor Adverse" significance cannot be achieved by relying upon the national policy setting to meet the UK climate targets by actions elsewhere. I now discuss the national policy compliance setting which prevails.

125 The IEMA guidance significance criteria for "Moderate Adverse" is:

> *"the project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero."*

126 The IEMA guidance significance criteria for "Major Adverse" is:

> *"the project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero."*

6.4 The national policy compliance setting and significance assessment (including IEMA) of the scheme

127 The Examining Authority is required to make a recommendation to the Secretary of State, and that must include either agreeing with the Applicant's assessment, disagreeing with the Applicant's assessment and/or recommending to the SoS that s/he consider particular unresolved (by the examination) issues in the assessment in making his/her decision. The following is intended to provide vital context for that recommendation process.

128 The Climate Change Committee's ("**CCC's**") June 2022 Progress Report[31] identified significant delivery risks or policy gaps for 38% of required emissions reductions to meet the Sixth Carbon Budget ie: around 61% of the required emissions reductions for the 6th carbon budget are not even secured "on paper" yet. In the surface transport sector about half of the required emissions reductions for the 6th carbon budget are not even **secured** "on paper" yet.

129 A key message in the report was that tangible progress on delivery is lagging the policy ambition. That is, policy alone will not deliver the deep and rapid emissions reductions needed to meet the Sixth Carbon Budget, and earlier targets like the Nationally Determined Contribution under the Paris Agreement to reduce emissions by 68% by 2030. Substantial, decisive and urgent action, and delivery is needed. More is provided on this CCC report in Appendix D.

130 The Secretary of State is required to reach a reasoned conclusion on the significant effects of the proposed development on the environment under Regulation 21 of the 2017 Regulations (the EIA Regulations). S/he must do so in full consideration of extent to which national policies on climate change, including those of his own department, have been secured or not. As above, he must take into account that the delivery of around half the carbon emission reductions of his own policies under the TDP remain unsecured and in doubt.

6.5 The key criteria of significance assessment is how secure is the delivery of the Net Zero Strategy

131 The applicant National Highways has, on other recent schemes, attempted to rely upon an assumed inevitable success of the NZS (and TDP) policies to retrofit meeting the NPSNN 5.18 test. The logic goes that whatever the emissions from the scheme, and their trajectory, national policy will deliver UK climate budgets and targets because these budgets, targets, and policy documents purporting to deliver them, merely exist. On this (false) logic, a scheme can increase emissions, and even if the reported emission increases have never been demonstrated by the Applicant to be compatible with the relevant budgets and targets, the carbon emissions are considered to be compatible with those budgets and targets, because they will be "inevitably" delivered.

[31] Climate Change Committee, "2022 Progress Report to Parliament - The CCC's annual assessment of UK progress in reducing emissions",

132 However, the real question is the other way round.

That is, not how the mere existence of a national legal and policy framework on climate change assists the scheme in attaining some notional, but undemonstrated, compliance to it, but rather how the scheme itself assists the delivery of that national legal and policy framework.

I am reminded of John F. Kennedy's immortal words[32] "*Ask not what your country can do for you – ask what you can do for your country*".

What is of the most interest, then, is the question "<u>to what extent does the project contribute, or undermine, securing the Net Zero Strategy and 6th carbon budget?</u>", and how does this establish whether the NPSNN 5.18 test is met or not.

133 It is far too premature for weight to be given to any claims based on the notion that the NZS, or the TDP, will <u>inevitably succeed</u> in securing the Government's carbon emissions reduction targets – this applies both to Environmental Statements, and to DCO decisions. <u>Such a proposition is clearly not true or evidenced.</u>

134 Following the CCC Progress Report, the SoS cannot assume that this proposition holds with any credibility. The CCC Progress Report has indeed shown that the success of the NZS and the TDP are by no means secured, and that no weight can be given to the proposition that they are. In fact, the evidence from the CCC Progress Report is that much more progress is required in securing the NZS trajectories for both surface transport and other parts of the economy for the Sixth carbon budget and net-zero.

135 The same delivery risk or policy gap was highlighted by the High Court in R (Friends of the Earth) v Secretary of State for Business Energy and Industrial Strategy [2022] EWHC 1841 (Admin) ("the Net-Zero case")[33]. Holgate J. recorded the NZS's acknowledgement that the delivery pathways to achieve the 6th Carbon Budget are "highly ambitious" and face considerable "delivery challenges" and recorded that achievement was subject to "a wide uncertainty range". The judge noted at [204] and [211] that in approving the Net Zero Strategy, "*one obviously material consideration which the Secretary of State must take into account is risk to the delivery of individual proposals and policies and to the achievement of the carbon budgets and the 2050 net zero target.*" In finding the NZS unlawful, the judge described this as "the critical issue" when concluding that the information provided to the Minister when reporting on the NZS was insufficient to enable him to discharge his reporting obligations under section 14 of the Climate Change Act 2008.

[32] John F Kennedy, inaugural address, January 20, 1961

[33] R (Friends of the Earth) v Secretary of State for Business Energy and Industrial Strategy [2022] EWHC 1841 (Admin)

136 Likewise, this delivery risk or policy gap should be at the front of the Secretary of State's mind in considering the A66 scheme, and the assessment of significance, and, with respect, the ExA's recommendations must facilitate proper consideration of the issue. And the key question is "*does the project increases the delivery risk (to the Net Zero Strategy and 6th carbon budget), or does it reduces it?*"

7 IEMA CONTEXTUALISED ASSESSMENT FOR THE SCHEME

137 I now provide three assessments of the schemes which follow the IEMA principles of contextualising the scheme's carbon emissions against local, regional and sectorial carbon budgets and targets. These are provided as indicative assessments, but which could be refined during the examination process and agreed by parties as being additional information for the Environmental Statement. They provide both the missing contextualisation described above, and the missing cumulative assessment required by the 2017 regulations.

138 The Applicant has previously resisted making such contextualisation on other schemes. The reasons are groundless as I now discuss, first.

7.1 IEMA contextualisation of the A66 scheme carbon emissions is perfectly feasible

139 The Applicant has claimed that the IEMA discourages use of local carbon budgets because of 'limitations' are listed in the Table at page 29 of the IEMA guidance. However, this suggestion conflicts with the Figure 6 immediately before the table which highlights "Local e.g. borough council carbon budget" as one of the measures encouraged for contextualisation by IEMA, and the fact that "advantages" are also listed for "Local or regional carbon budgets developed by local authorities and researchers (e.g. the Tyndall Centre at the University of Manchester".

These limitations are not "disadvantages" given to direct the EIA practitioner away from the contextualisation which the IEMA Guidance unequivocally promotes. The guidance is merely cautioning, as would be expected, about the limits of the approaches suggested – not contradicting its own advice.

140 One of the limitations is "It's unclear whether emerging local authority or regional budgets will add up coherently to the UK budget". In the contextualisation examples, which I give below, the local budgets provided in each method demonstrably add up coherently to national budgets, because they each are derived from, or linkable to, national budgets in the first place.

141 A further claim made previously by the Applicant is that they are, in effect, stymied from following the IEMA guidance for contextualisation because to paraphrase the Applicant's position "we have looked but can't find any relevant budgets to use".

This claim is also groundless, and I provide three different methods and budgets/trajectories below, simply derived from widely available information.

For the process of contextualisation, one is not looking or technical perfection (ie the perfect "oven-ready" local budget). One is looking for a method which provides additional signifiers as to climate impacts – that is highlights the impacts of the carbon emissions in a way which may not be obvious from the initial assessment against national budgets.

7.2 Threshold criteria for significance in contextualisation

142 For the purposes of this indicative contextualisation, I will use two "tests" or thresholds. The **first** is based on the five significance criteria in the IEMA guidance. It is worth noting that the question of whether the contextualisation shows the scheme to be "Minor Adverse", or more than "Minor Adverse" (ie "Moderate Adverse" or "Major Adverse") is important on the IEMA thresholds. This is because this is the threshold point for significance in the IEMA guidance. A "Minor Adverse" scheme is not significant whereas a more than "Minor Adverse" scheme has significant adverse effects.

143 Further, IEMA "Minor Adverse" is also a test of whether a scheme *"may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects."*

144 This provides a link to the **second** threshold which is the NPSNN 5.18 test of whether "*the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets*".

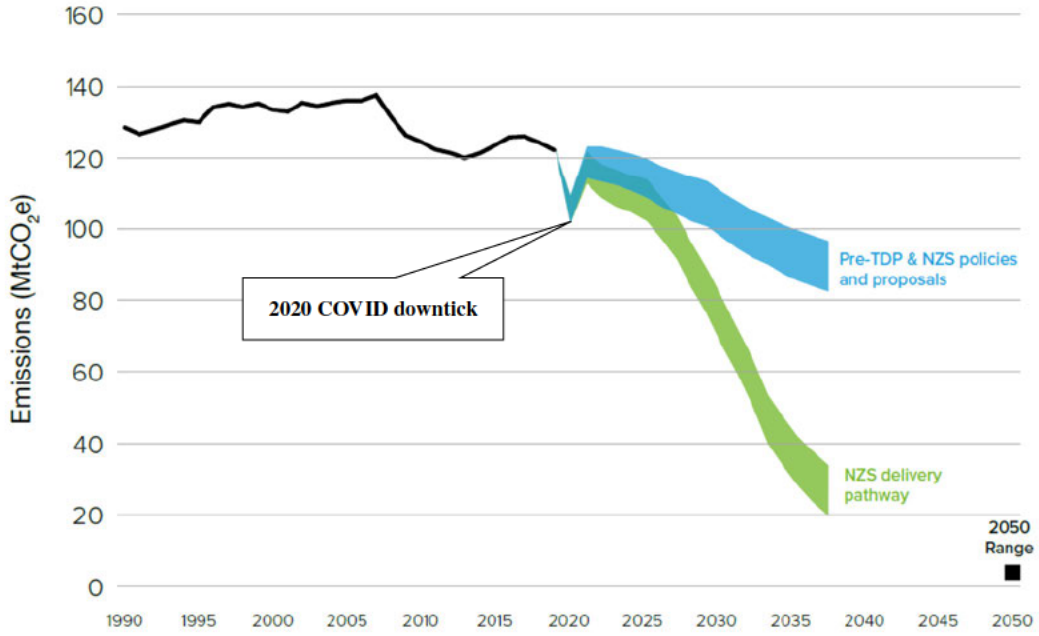
145 I will provide an evaluation for each of these two thresholds for each of the contextualisation studies which now follow.

7.3 Contextualisation 1: The transport system in the study area against the Net Zero Strategy transport trajectory

146 The NZS delivery pathway, related to road transport, shown below corresponds to a fall in residual emissions from domestic transport emissions (excluding aviation and shipping) by around 34-45% by 2030 and 65-76% by 2035, **relative to 2019 levels.** See Figure 21 from the NZS reproduced below.

147 Figure 21 of the NZS, is a refined version of the Figure 2 of the TDP reproduced in Appendix E and comparison of the two demonstrates the policy linkage between the TDP and the NZS, and that the policy trajectory including carbon reductions is the same (the main difference is that TDP graph is more 'fuzzy'). Essentially the same indicative delivery pathway for domestic transport has been carried forward from the TDP to the NZS.

Figure 21: Indicative domestic transport emissions pathway to 2037



Source: BEIS analysis

Figure CEPP.WR.Fig-2: NZS Figure 21 reproduced

148 The data behind this graph can be found in the spreadsheet[34] given on the NZS webpage, from which the annual targets (reductions from 2019) for each year from 2020 to 2037 may be derived for the domestic transport sector. I have made this calculation in Table 2 below, which shows the reductions in the NZS Figure 21 ("Figure 21: Indicative domestic transport emissions pathway to 2037") and present it below for the upper bound and lower bound figures[35] (the upper and lower bounds of the green "NZS Delivery Pathway" on the graph). The figures are presented as percentage reductions from 2019 (which is 100%).

Reductions from 2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
NZS (Upper)	-10.79%	-0.41%	-3.52%	-4.74%	-5.89%	-7.36%	-11.37%	-15.37%	-21.67%
NZS (Lower)	-17.09%	-7.93%	-11.45%	-13.16%	-14.72%	-16.52%	-20.85%	-25.18%	-31.73%

[34] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066450/nzs-charts-tables-v1.1.xlsx

[35] The data is derived from "Net Zero Strategy: charts and tables (updated 5 April 2022)", tab "3v.Transport", data on rows 43 and 44 compared to cell AG40 (2019 emissions – central estimate).

(Continued)	2029	2030	2031	2032	2033	2034	2035	2036	2037
NZS (Upper)	-27.64%	-34.51%	-40.80%	-47.42%	-56.26%	-61.00%	-65.58%	-69.09%	-72.20%
NZS (Lower)	-37.94%	-44.97%	-51.43%	-58.22%	-67.21%	-72.12%	-76.86%	-80.54%	-83.89%

Table CEPP.WR.Tab-6: Percentage reductions from 2019 of the NZS Delivery pathway, domestic transport

149 I then take the transport model study area and assess it against the NZS trajectory using these assumptions:

- The base year of the transport model is 2019, and the baseline DM emissions are given in Table 7-10 as 1,577,127 tCO2e.
- The scheme opening year is 2029 and the DS emissions are given in Table 7-23. Although the scheme does not exist between 2019 and 2029, the hypothetical trajectory between those dates does provide a measure of the Applicant's estimated projection of the expected emissions reductions within the transport system represented by the study area between those dates.
- Between 2029 and 2041, the DS emissions may be calculated by linear interpolation and as already described in Table CEPP.WR.Tab-4.

- The DS emission trajectory for the scheme is then normalised to 100% at 2019 (the base year for the NZS trajectory). This generates these figures for annual carbon reductions against a 2019 base:

tCO2	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
DS (Do Something) PAS 2080 units B9 + (B2-B5)	100.00%	99.82%	99.63%	99.45%	99.26%	99.08%	98.89%	98.71%	98.53%	98.34%
NZS Upper bound	100.00%	89.21%	99.59%	96.48%	95.26%	94.11%	92.64%	88.63%	84.63%	78.33%
NZS Central trajectory	100.00%	86.06%	95.83%	92.52%	91.05%	89.70%	88.06%	83.89%	79.72%	73.30%
NZS Lower bound	100.00%	82.91%	92.07%	88.55%	86.84%	85.28%	83.48%	79.15%	74.82%	68.27%

continued	2029	2030	2031	2032	2033	2034	2035	2036	2037
DS (Do Something)	98.16%	96.88%	95.60%	94.32%	93.05%	91.77%	90.49%	89.21%	87.93%
NZS Upper bound	72.36%	65.49%	59.20%	52.58%	43.74%	39.00%	34.42%	30.91%	27.80%
NZS Central trajectory	67.21%	60.26%	53.88%	47.18%	38.27%	33.44%	28.78%	25.18%	21.95%
NZS Lower bound	62.06%	55.03%	48.57%	41.78%	32.79%	27.88%	23.14%	19.46%	16.11%
Relative reduction from 2019 (NZS Central/DS)	17.79								6.47

continued	2038	2039	2040	2041	2042	2043	2044
DS (Do Something)	86.66%	85.38%	84.10%	82.82%	81.54%	80.26%	78.99%
NZS Upper bound							
NZS Central trajectory							
NZS Lower bound							

Table CEPP.WR.Tab-7: Percentage reductions from 2019 of the study area DS and the NZS Delivery pathway

150 The data above is drawn graphically below.

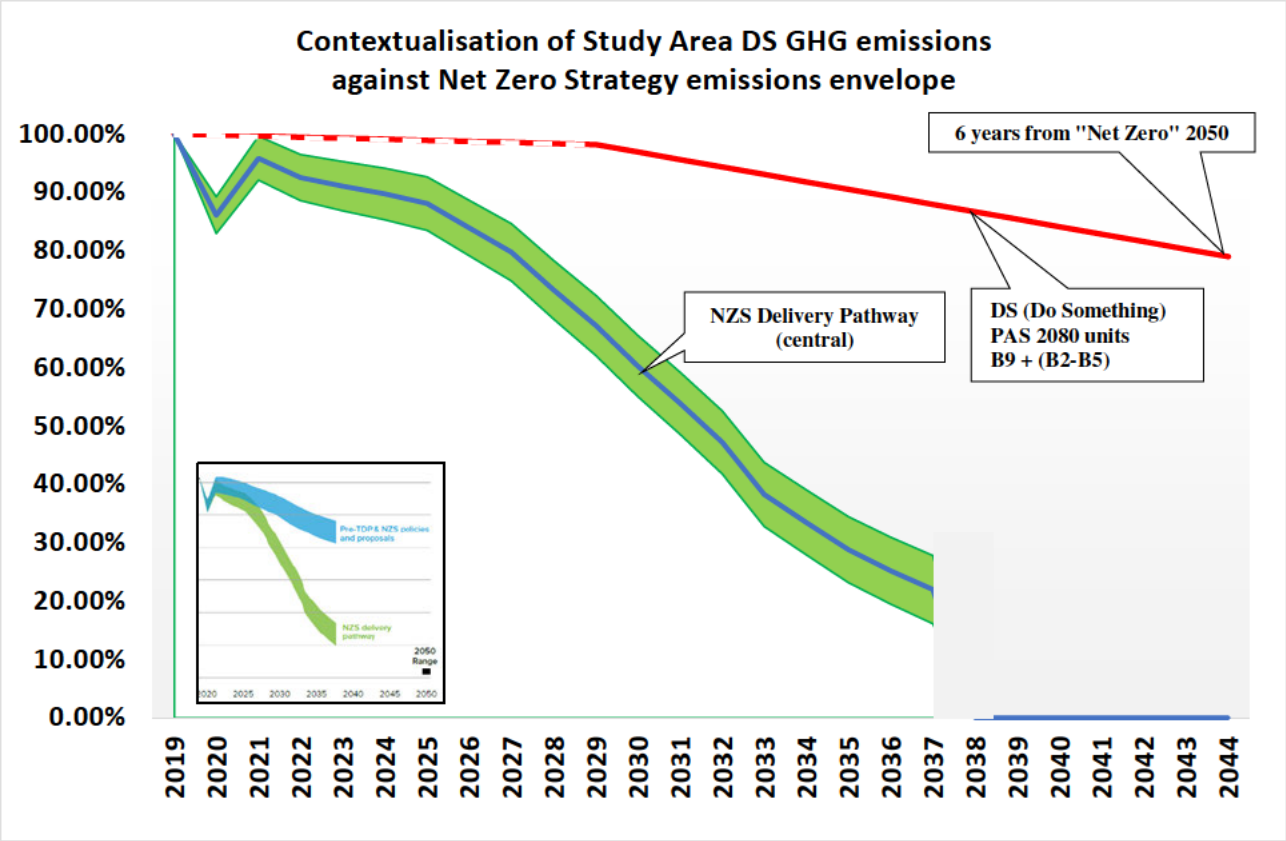


Figure CEPP.WR.Fig-3: Contextualisation of Study Area DS GHG emissions against Net Zero Strategy emissions envelope (part of original NZS Figure 21 in inset)

7.4 Contextualisation 1: Discussion

151 The comparison in this contextualisation is based upon analysing the emissions reductions in the traffic system represented by the traffic model[36] study area from the base year 2019. This is the base year for both the traffic modelling and for the NZS trajectory.

152 The 2019 starting place in the NZS trajectory is about 120,230,000 tCO2e of annual domestic transport emissions. The base year, DM, figure is 1,577,127 tCO2e. So the slice of the national emissions represented by the traffic model study area is 1.31% (or 1/76th) of the national total (at base year 2019). The analysis is, in effect, watching what happens to that 1/76th slice annually over time compared to what is projected to happen over the total to meet the 6th carbon budget and other targets (like the 78% by 2035 and 68% by 2030 targets). Therefore, there is no limitation that the figures being used here may not coherently add up to national totals - they represent 1/76th of the national total, and when they are added to the other 75/76th, the national total is generated. They do represent an abstract slice of the

[36] The scenario represented in the graph is DS, and that includes the elements (1), (3), (4), and (5) as listed at Section 5.1.

national total – the abstraction is purely a direct function of the construction of the Applicant's traffic model.

153 It is clear from the graph that the traffic projections, and resulting carbon emissions, do not align to the NZS trajectory. I have calculated the relative rates of carbon reduction (as these are shown on Table CEPP.WR.Tab-7 above) from 2019 for the traffic model and the NZS, given the normalisation of the two data sets. For the period 2019-2029, essentially this decade, the NZS trajectory reduces emissions approximately 18 times faster than the traffic model study area. For the period 2019-2037 to the end of 6th carbon budget, the NZS trajectory reduces emissions approximately 6.5 times faster than the traffic model study area.

154 It is also of serious concern that at 2044, just 6 years from the national "net zero " 2050 target, the carbon emissions for the traffic system associated with the scheme are estimated by the Applicant's traffic model to be still at 79% of the 2019 levels.

155 It can be seen that the period between 2019 and 2029 is "lost time" – this is the time when serious transport decarbonisation should be happening (now) to build up for the next decade, yet virtually no decarbonisation occurs in the study area. The result of this is that the red line actually falls behind the NZS Figure blue envelope which represents "Pre-TDP & NZS policies and proposals" (as shown in the inset). The clear conclusion of this is:

- The scheme's traffic model projections do not even meet the pre-TDP & NZS policies and proposals. It is, therefore, not even clear if the project meets "do-minimum standards". By not even following the blue NZS Figure 21 envelope, I conclude that the project is worse than meeting "Do Minimum standards" (as in the the IEMA significance thresholds).

156 If the road is opened in 2029, then it generates additional emissions, as evident in Table 7-23. Electric vehicle penetration is correctly modelled for this period as the traffic modelling is based on the latest Emission Factors Toolkit v11[37] which takes account of electric vehicles in the period beyond 2030 for carbon emissions estimation[38]. From the red line, it can be seen that some emission reductions do occur to 2037 – however, the red line is much less steep than the NZS envelope on the graph. By 2037, the NZS trajectory reduces emissions approximately 6.5 times faster from the 2019 base year than the traffic model study area.

7.5 Contextualisation 1: Assessment under the IEMA significance thresholds

157 Under the IEMA significance thresholds, to avoid being more than "Minor Adverse", a scheme *"may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects."*

[37] [REP-050]/para 7.5.15

[38] Department for Environment, Food & Rural Affairs (2021) Emissions Factors Toolkit v11.0 User Guide

158 The NZS trajectory given in the graph is the trajectory which the Government has decided for domestic transport is consistent with at least a 78% reduction (in emissions) by 2035, and other budgets and targets under the Climate Change Act. It is clear that the scheme, as represented by its traffic model, does not align with it. Far from contributing to meeting the 78% reduction, which would mean staying within the NZS trajectory envelope, the scheme requires that even deeper emissions reductions, beyond the NZS trajectories, are made in transport systems elsewhere in UK, or in other sectors of the economy.

159 For IEMA, the significance of the "Major Adverse" project is specified as "*the project's GHG impacts are not mitigated or are only compliant with do-minimum standards projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.*"

160 I conclude therefore that the scheme is more adverse than "Minor Adverse", and that this is significant. As the scheme, and its transport model, is at least 6 times slower to reduce emissions than the NZS transport trajectory for the study area, and as above do not even meet the "Do Minimum standards" that existed before the TDP and NZS, I conclude that the scheme is "Major Adverse".

7.6 Contextualisation 1: NPSNN 5.18 test

161 The NPSNN 5.18 test is "*the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets*"

162 It is clear that the scheme increases emissions from Table 7-23. These increases are non-negligible because their overall effect is that scheme makes insufficient reduction in emissions, even with the introduction of electric vehicles (as included in the modelling) across the whole study area. This is clear from the fact that, by 2037, aligning with the NZS trajectory requires the emissions to be 21.95% of what they were in 2019 (Table CEPP.WR.Tab-7 , NZS Central trajectory) whereas they are projected to be 87.93%[39] of what they were at 2019 (as validated by traffic model calibration).

163 Such a non-negligible increase in emissions is material, and I therefore conclude that the increase in carbon emissions resulting from the A66 scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, and the scheme fails the NPSNN 5.18 test.

7.7 Contextualisation 2: Transport system against BEIS local authority area transport emissions (NZS adjusted)

164 Contextualisation 1 used the study area itself to define a slice of the national transport system to assess against the NZS. Contextualisation 2 makes a similar comparison but bases

[39] The NZS trajectory reduces emissions approximately 6.5 times faster than the traffic model study area between 2019 and 2037.

it upon a geographical area, that of the three local planning authority administrative areas (Eden District, Durham County and Richmondshire District) for the scheme.

165 The normalisation of the comparison is again based upon the base year 2019. In this contextualisation, the starting place is the UK local authority carbon dioxide emissions statistics from BEIS[40]. This gives emissions for every local authority area in the UK, broken down into sectors, and sub-sectors, including for road transport. The road transport emissions for Eden District, Durham County and Richmondshire District in 2019 were reported as 1,605,644 tCO2e. The breakdown by sub-sector and local authority from the BEIS data is as below:

tCO2e / 2019	Eden	Richmondshire	Durham
Road Transport (A roads)	135,690	48,727	391,400
Road Transport (Motorways)	264,131	111,682	194,608
Road Transport (Minor roads)	60,464	62,088	336,855
	460,285	222,497	922,863
			1,605,644

Table CEPP.WR.Tab-8: Road transport emissions in 2019 across Eden District, Durham County and Richmondshire District (BEIS data)

166 These emissions quite clearly may be added up, with other UK areas and sectors, to the national emissions reported by the Government for 2019, both for the transport sector and for the whole economy. The is self-evident from the BEIS reporting spreadsheet. Therefore, there is no limitation that the figures here may not coherently add up to national totals.

167 The next step is to calculate the NZS Central trajectory for the local authority road transport emissions for each year to 2037 (from the 2019 base year), and then to calculate the emissions budget for the 5th and 6th carbon budgets[41] - this trajectory is referred to as "BEIS Local Authorities (NZS Central trajectory)".

168 This trajectory represents the total road transport emissions for the three local authorities at 2019, and projects out to 2037 how the emissions should reduce if they were to follow the NZS central trajectory for each subsequent year. It, therefore, simply applies the NZS national policy to the transport sector emissions for the three local authority areas. Alignment with this trajectory is the same as the IEMA "Minor Adverse" threshold of "*to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects.*" Alignment with the trajectory therefore gives a measure of the IEMA "Minor Adverse" threshold.

[40] Government website: UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019, https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019

[41] This has been done using the NZS trajectory annual percentage reductions at Table CEPP.WR.Tab-7, the calculation is not reproduced here for brevity.

169 From the "BEIS Local Authorities (NZS Central trajectory)", the allocated carbon emissions for the 5th and 6th carbons are calculated[42].

170 These "carbon budgets" for the local authority-based data, which are based on the authorities transport emission performance at 2019 being projected out to 2037 along the NZS trajectory, is then compared to the 5th and 6th carbon totals for the scheme. This is given in the assessment table below, with an annual comparison at 2019 for reference.

tCO2e	Base Year 2019	2028-2032 (5CB)	2033-2037 (6CB)
Study Area	(DM) 1,577,127	(DS) 6,071,317**	(DS) 7,135,639
BEIS Local Authorities (NZS Central trajectory)	1,605,644	4,846,473	2,370,393
Study Area/BEIS	98%	125%	301%

** Only 4 years of data 2029-2032

Table CEPP.WR.Tab-9: Assessment table against BEIS (NZS Central trajectory)

7.8 Contextualisation 2: Discussion

171 The base year comparison shows that the 2019 calibrated traffic model study area is has 98% of the carbon footprint of the BEIS reference local authority data. It is convenient, though coincidental, that the two base year figures are nearly equal[43].

172 However, in the four years after opening year of 2029, the scheme is modelled to consume 125% of the NZS allocation to the 5-year 5th carbon budget period. (Note, if the scheme were operational for the full 5 years of the budget period, then the percentage would be higher). This already shows that when the scheme, and its traffic model, are contextualised against the three local authorities that by the end of the decade it is using considerably more than its fair share.

173 However, the comparison is drastically worse, for the 6th carbon budget comparison. The scheme, and its transport model, use 3 times (301%) as much as the NZS allocation to the three local authorities.

7.9 Contextualisation 2: Assessment under the IEMA significance thresholds

174 In this case, the non-alignment and non-contribution to the UK net-zero target and climate targets (as represented by the Net Zero Strategy trajectory) has been demonstrated by consideration of the carbon budgets which would be available to the three local authority

[42] These may be calculated from the data derived at the sub-tables at Table CEPP.WR.Tab-4 for the 5th and 6th carbon budgets, the calculation is not reproduced here for brevity.

[43] The approximate 1:1 alignment is coincidental. The ES explains that study area extends out beyond the local authority area [APP-237]/Figure 4-1 along major roads into a wider area, whilst not all links in the transport network within the local authorities are in the traffic model, and the two appear to approximately cancel each other out.

areas if they followed the NZS trajectory for road transport from the 2019 emission levels in the area.

175 In using, 3 times the NZS allocated emissions budget by the 6th carbon budget, the scheme clearly does not do enough *"to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035"* and does not avoid *"significant adverse effects"*. I conclude therefore that the scheme is at least more adverse than "Minor Adverse", and that this is significant. As the scheme, and its transport model, use 3 times (301%) as much as the NZS allocation to transport for the three local authorities, I conclude that the scheme is "Major Adverse.

7.10 Contextualisation 2: NPSNN 5.18 test

176 The conclusions here are similar to those for Contextualisation 1. The area of the three local authorities is not small, and the additional emissions from the scheme, and the lack of serious emission reduction across the area from the traffic modelling for the scheme, generates a non-negligible impact. The impact is such that starting from close to equivalence at 2019 where the scheme's traffic model emissions essentially used the annual allocation (and actual reported emissions) for 2019, that by the 6th carbon budget, the scheme is using 3 times its allocated share.

177 Again the issue is, with such a non-negligible impact in emissions, for the UK to achieve delivery of the Net Zero Strategy, which other area will reduce its transport emissions beyond the NZS trajectory (virtually impossible), or which other sector will reduce its emissions beyond its NZS trajectory (also virtually impossible) to meet the 6th carbon budget.

178 Such a non-negligible impact in emissions is material, and I therefore conclude that the increase in carbon emissions resulting from the A66 scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, and the scheme fails the NPSNN 5.18 test.

7.11 Contextualisation 3: Transport system against science-based local authority area budgets from the Tyndall Centre

179 The 3rd contextualisation method augments the Net Zero Strategy based approaches, underlying Contextualisations 1 and 2 above, by deploying science-based local authority carbon budgets from the Tyndall Centre at the University of Manchester. IEMA identify these budgets as providing reference budgets which align with the required pace of reductions for "a credible 1.5°C transition scenario"[44]. IEMA further identify such reference budgets as vital tools in ensuring that a project's GHG emissions are in line with the "net zero

[44] IEMA (2022), footnote 9, "*The pace of reduction should align with a credible 1.5°C transition scenario (for example Science Based Targets Initiative Net Zero or Tyndall Centre aligned carbon budget)*".

ambition"[45] and that they are compatible with the UK's commitments under the Paris Agreement[46]. IEMA also recommend Tyndall Centre budgets in Table 1[47] of their guidance.

180 The aggregated Tyndall Centre carbon budget report and explanatory document for Eden, Richmondshire, County Durham is provided at Appendix C: this report is in a standard format which can be generated from Tyndall's website for individual local authorities, or any aggregation of them.

181 It should be noted that the supposed "issues" with local budgets which the Applicant has alleged elsewhere do not apply to the Tyndall Centre budgets, as follows:

A. Tyndall Centre budgets are accessible and can be easily found. They have been available in their current form for four years.

B. The local budgets from Tyndall, by definition, "*add up coherently to the UK budget*" as the Tyndall budgets are derived directly from a UK budget which the Tyndall scientists derive from the global carbon budget. They may also be aggregated across a number of local authority areas as I do in this contextualisation for the three planning authorities through which the scheme would pass. It should be noted, however, that the Tyndall Centre national budget is derived scientifically by '*translating the "well below 2°C and pursuing 1.5°C" global temperature target and equity principles in the United Nations Paris Agreement to a national UK carbon budget*'. This gives different national budgets to the Climate Change Committee budgets; this is explained in more detail at Appendix B.

182 Critical to the contextualisation being done here for the A66 scheme, IEMA state that use of such budgets is key to establishing if a project is "Minor Adverse effect and not significant" for significance assessment. That is use of such a budget is a critical tool in determining compliance with the "Minor Adverse" significance threshold. At page 25, on the IEMA significance thresholds, it is stated:

> *"A project that is compatible with the budgeted, science-based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a <u>minor adverse</u> effect that is <u>not significant</u>. It may have residual emissions but is doing enough to align with and*

[45] IEMA (2022) page 6, "*<u>With climate change taking centre stage, projects are increasingly scrutinised and challenged for not mitigating GHG emissions in line with the net zero ambition and the associated required pace of reductions[footnote 9]. This critical change is known as the transition imperative.</u> EIA Climate chapters are receiving a lot more attention with clients, project developers and stakeholders often asking: 'what do we need to do and how can we be net zero?'. Addressing significance and contextualising projects' emissions is an increasingly challenging exercise, especially under a tapestry of national and sectoral carbon targets and budgets, regional and local plans and sectors all on different pathways. This guide aims to provide practitioners with the best advice on how to tackle these questions.*"

[46] IEMA (2022) page 28, "*Researchers at the Tyndall Centre at the University of Manchester have proposed local authority scale carbon budgets that are compatible with the UK's commitments under the Paris Agreement*".

[47] IEMA (2022) Table 1, "*Local or regional carbon budgets developed by local authorities and researchers (e.g.the Tyndall Centre at the University of Manchester)*"

contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 [footnote 37] and thereby potentially avoiding significant adverse effects."

Where footnote 37 is:

"or other science-based 1.5°C compatible trajectory as may be defined for a specific sector or local area, as applicable"

183 Data for the contextualisation has been prepared by:

i. Generating (on the Tyndall Centre website) the Tyndall Centre budgets for the individual[48] authorities and extracting each annual budget[49] from 2019 to 2037;

ii. Adding the three authority budgets together, and checking the values against the annual budgets in the aggregated budget (and confirming they are the same);

iii. Calculating the road transport (emissions) share of the total in the UK local authority carbon dioxide emissions statistics from BEIS at 2019. The shares are: Eden, 47.35%; Richmondshire, 55.27%; County Durham, 38.69%;

iv. Using these figures to calculate the proportioned road transport share for each year in the aggregated budgets. That is this formula is used for a typical year *20nn*:

*= (Eden_2019_Trans_Share * Eden_20nn) +*
*(Rshire_2019_Trans_Share * Rshire_20nn) +*
*(Durham_2019_Trans_Share * Durham_20nn)*

This assumes for setting a benchmark Tyndall Centre transport budget across the aggregated local authorises that the 2019 share of traffic emissions is allocated to each individual authority until 2037. That is, it is assumed that the transport emissions proportion in each local authority remains constant through the period 2019-2037.

v. Carbon budget period totals are calculated (for the 4th, 5th and 6th carbon budgets although I only use 5th and 6th carbon budgets) for the total and the transport share across the aggregated local authorities.

184 This provides the Tyndall Centre budgets in the Table CEPP.WR.Tab-10 on the next page.

[48] Whilst not strictly necessary, this data on a per authority level was collected as it might be useful later

[49] This can be read off the graph for each year on the website version

tCO2	2019	2020	2021	2022	2023	2024	2025	2026	2027
Eden	1,000,000	860,000	740,000	640,000	550,000	470,000	410,000	350,000	300,000
Richmondshire	410,000	350,000	300,000	260,000	230,000	200,000	170,000	150,000	130,000
Durham	2,410,000	2,100,000	1,840,000	1,600,000	1,400,000	1,220,000	1,070,000	930,000	810,000
All-3	3,820,000	3,310,000	2,880,000	2,500,000	2,180,000	1,890,000	1,650,000	1,430,000	1,240,000
All-3 by CB									**8,390,000**
All-3 Transport Share Proportioned	1,632,514	1,413,126	1,228,080	1,065,768	929,194	805,093	702,068	608,439	527,284
All-3 Transport Share by CB									**3,572,078**

Continued / tCO2	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Eden	260,000	220,000	190,000	170,000	140,000	120,000	110,000	90,000	80,000	70,000
Richmondshire	110,000	90,000	80,000	70,000	60,000	50,000	40,000	40,000	30,000	30,000
Durham	710,000	620,000	540,000	470,000	410,000	360,000	320,000	280,000	240,000	210,000
All-3	1,080,000	930,000	810,000	710,000	610,000	530,000	470,000	410,000	350,000	310,000
All-3 by CB					**4,140,000**					**2,070,000**
All-3 Transport Share Proportioned	458,601	393,787	343,103	301,023	258,078	223,737	197,999	173,053	147,316	130,974
All-3 Transport Share by CB					**1,754,592**					**873,078**

Table CEPP.WR.Tab-10: Tyndall Centre budgets for Eden, Richmondshire, County Durham

185 The carbon budget period totals are now taken forward into an assessment table which compares the differential, solus estimates of emissions from the scheme (these are the same values as in the corrected version of Table 7-24 at Table CEPP.WR.Tab-2), and the absolute, cumulative, DS estimates[50].

	tCO2	5CB (2028-2032)	6CB (2033-2037)
A	A66 (Solus, Differential) 5CB and 6CB	162,744	195,255
B	A66 (Absolute, Cumulative, DS) 5CB and 6CB	6,071,317	7,135,639
C	Tyndall All-3 by CB	4,140,000	2,070,000
D	Tyndall All-3 Transport Share by CB	1,754,592	873,078
E=A/C	All-3 A66 (Solus, Differential) / Tyndall CB	3.93%	9.43%
F=A/D	All-3 A66 (Solus, Differential) / Tyndall CB - Transport Share	9.28%	22.36%
G=B/C	All-3 A66 (Absolute, Cumulative, DS) / Tyndall CB	146.65%	344.72%
H=B/D	All-3 A66 (Absolute, Cumulative, DS) / Tyndall CB - Transport Share	346.02%	817.30%
		1	2

Table CEPP.WR.Tab-11: Assessment table against Tyndall Centre science-based carbon budgets

7.12 Contextualisation 3: Discussion

186 Again, note that carbon emission estimates for the scheme only cover four of the five years for the 5th carbon budget, so the percentage figures will be less than it would be the full five years.

187 The solus, differential carbon emissions from the scheme (ie the DS-DM, or 'difference', estimates from Table 7.23, as corrected in Table CEPP.WR.Tab-2) are calculated to consume over 9% (cell E2) of the Tyndall 6th carbon budget of the entire 3 local authority area budget. With the corresponding figure for the proportioned transport budget being over 22% (cell F2).

188 Again for the 6th carbon budget, when cumulative, absolute, DS emissions are considered, then the traffic system with the scheme as modelled by the Applicant consumes over 340% (cell G2) of the entire 3 local authority area budget and over 810% (cell H2) of the proportioned transport budget.

7.13 Contextualisation 3: Assessment under the IEMA significance thresholds

189 Under the IEMA significance thresholds, to avoid being more than "Minor Adverse", a scheme "*may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects.*"

[50] As calculated separately

190 Even the percentage for solus carbon emissions shows that the incremental change from adding the scheme to the road network consumes over 9% of the 6th carbon budget of the whole area. This is on top of all other activities, including the existing transport system and industry, domestic, commercial and other sector emissions, which must fit in the remaining 90% of the Tyndall budget to be consistent with the UK obligations under the Paris agreement. Emissions on this scale are clearly not consistent with keeping these three local authorities aligned with the necessary UK trajectory *towards net zero by 2050 with at least a 78% reduction by 2035.*

191 When the entire road network for the A66 scheme modelling is considered, via the Applicant's modelling of the DS scenario, then the transport network can be seen to consume over 300% of the 6th carbon budget. This means that there is no emissions available for any other sectors (industry, domestic, commercial, public sector). The realistic interpretation of this is that for the three authorities to align with the UK, their economies would need to grind to halt in order for just a one third of their road system to continue functioning as the Applicant envisages, in order for the UK to be consistent with the UK's obligations under the Paris agreement.

192 For IEMA, the description of the "Major Adverse" project is specified as "*the project's GHG impacts are not mitigated or are only compliant with do-minimum standards projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.*"

193 For each of the previous contextualisations, I have first concluded that the scheme is more adverse than "Minor Adverse", and then that it is "Major Adverse" On the basis on this Tyndall Centre budget contextualisation, I conclude the same and that the scheme is "Major Adverse". The scheme locks in emissions to the area's transport system, and it clearly does "*not make a meaningful contribution to the UK's trajectory towards net zero".* It actually does the very opposite and renders the area's proportionate 6th carbon budget impossible to meet when assessed against science-based budgets aligned with the Paris Agreement.

7.14 Contextualisation 3: NPSNN 5.18 test

194 The conclusion is the same as the for contextualisation 1 and 2. The impacts of the scheme, as discussed on the basis of Table CEPP.WR.Tab-11, are non-negligible. Such impacts which, just in the next decade, consume the entire carbon budget of the area and severely undermine the UK's obligations under the Paris agreement are material. I therefore conclude that the increase in carbon emissions resulting from the A66 scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, and the scheme fails the NPSNN 5.18 test.

7.15 Operational emissions: summary of contextualisation against Applicant's assessment

195 The Table below summarises the IEMA guidance based contextualisations against the Applicant's assessment. In each case, the contextualisation characterises schemes emissions in a way that is not apparent in the limited national budget only assessment from the applicant. Each IEMA based contextualisation is assigned "Major Adverse" and significant on basis of the IEMA guidance significance threshold schemas (Box 3, in the IEMA guidance). Each contextualisation assessment demonstrates that the scheme emissions are so significant to have a material impact on the ability of Government to meet its carbon reduction targets, and therefore fails the NPSNN 5.18 significance test.

	Benchmark	Sector	Scale	Summary	IEMA Significance	NPSNN 5.8 test
Application and Environmental Statement	National Carbon budget	All sectors	Whole UK	Small contribution to national budgets	Not assessed	Small contribution of impacts (test "success" assumed on basis of 'limited'[51] comparison)
Contextualisation 1	Net Zero Strategy transport trajectory	Transport	Traffic model Study Area	Badly non-aligned with NZS transport trajectory – reduces emissions from 2019 over six times slower	"Major Adverse" and significant	Non-negligible emission increases - so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets. **Test failed.**
Contextualisation 2	Net Zero Strategy transport trajectory normalised by BEIS local authority area transport emissions (2019)	Transport	The three planning authority areas	Consumes over 300% of the NZS trajectory aligned transport budget	"Major Adverse" and significant	Non-negligible emission increases - so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets. **Test failed.**
Contextualisation 3	Science-based local authority area budgets from the Tyndall Centre	All sectors and Transport	The three planning authority areas	Consumes over 340% (cell G2) of the entire 3 local authority area 6th carbon budget (whole economy)	"Major Adverse" and significant	Non-negligible emission increases - so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets. **Test failed.**

Table CEPP.WR.Tab-12: Operational emissions: Summary of significance assessments made in the Application and those based on the IEMA contextualisations

[51] IEMA describe the comparison against national targets as limited and requiring contextualisations by other assessments as given in the Table

7.16 Construction emissions (Contextualisation 2)

196 The alignment of the scheme to the NZS Figure 21 transport envelope between 2019 and 2037, as in Contextualisation 1, is not directly applicable to construction emissions, so I start with Contextualisation 2.

197 In this assessment of construction emissions, I use the same benchmark, as described above under "Contextualisation 2: Transport system against BEIS local authority area transport emissions (NZS adjusted)" and the correct value for the construction emissions as shown in Table CEPP.WR.Tab-2. The table below shows the results.

tCO2	4CB (2023-2027)	5CB (2028-2032)
Scheme Construction	261,516	257,046
BEIS 2019 Road Transport Sector at NZS Central Band	6,943,132	4,846,473
	3.77%	5.30%

Table CEPP.WR.Tab-13: Assessment table against BEIS (NZS Central trajectory) : construction emissions

198 The table shows that the construction emissions consume over 3.7% of the 4th carbon budget, and at least 5.3% of the 5th carbon budgets, allocations for NZS trajectory for transport normalised at 2019 against the BEIS reported carbon emissions normalised at 2019. This is on top of the operational emissions for the 5th budget already assigned an IEMA significance of "Major Adverse" and failing to meet the NPSNN 5.18 test.

7.17 Construction emissions (Contextualisation 3)

199 In this assessment of construction emissions, I use the same benchmark, as described above under "Contextualisation 3: science-based local authority area budgets from the Tyndall Centre" and the correct value for the construction emissions as shown in Table CEPP.WR.Tab-2. The table below shows the results.

tCO2	4CB (2023-2027)	5CB (2028-2032)
Scheme Construction	261,516	257,046
Tyndall All-3 by CB	8,390,000	4,140,000
Tyndall All-3 Transport Share by CB	3,572,078	1,754,592
Scheme Construction/Tyndall CB	3.12%	6.21%
Scheme Construction/Tyndall CB - Transport Share	7.32%	14.65%

Table CEPP.WR.Tab-14: Assessment table against Tyndall Centre science-based carbon budgets: construction emissions

200 The table shows that the construction emissions consume over 7.3% of the 4th carbon budget, and at least 14.6% of the 5th carbon budgets, allocations for transport in the Tyndall Centre budgets.

201 This is on top of the operational emissions for the 5th budget already assigned an IEMA significance of "Major Adverse" and failing to meet the NPSNN 5.18 test.

8 BCR CALCULATIONS

202 At ISH2, National Highways agreed to submit a post-hearing note setting out how the carbon costs were factored into the APP-237 tables. I await to see this note before making any detailed comments on the BCR calculations. However, I note the following.

203 The applicant must show how the full 60-year operational carbon costs are calculated. To do this they should provide the full TAG 60-year Greenhouse Gases workbook.

204 The applicant must show how the construction emissions costs are calculated. The figure of £35.53m for "Construction & Maintenance" in [APP-237]/Table 6-9 appears too low, as I noted in my Relevant Representation.

205 Once the correct construction carbon cost has been calculated, it should be added to the costs side of the BCR calculation, as it is a cost in the construction, and not a (negative) benefit of the scheme's operation. (This will result in a small relative increase to the BCR, as the BCR is less than 1).

206 The BCR should be calculated when the benefits of the scheme for carbon emissions have been considered in cumulation with other existing and/or approved projects.

9 INFORMATION REQUESTED

207 I request that the Applicant discloses the following information:

1 The full 60-year carbon appraisal for operational emissions, including the DS and DM trajectories, and the full TAG 60-year Greenhouse Gases workbook

2 The economic and carbon outputs from TUBA

3 The estimated "Do Something" and "Do Minimum" carbon emissions from the additional run of the model year at 2051[52].

4 For locally committed development in the core scenario, estimates of:

- the additional number of homes and jobs that would be included in the core scenario if no size limit was applied;
- the additional number of homes and jobs that would be including in the core scenario if 'reasonably foreseeable' sites were also included.

[52] [APP-237], section 5.2.1

10 CONCLUSIONS

208 The ES is unlawful as there is no cumulative assessment of carbon emissions. Should this issue not be addressed by the Applicant, then the Examining Authority is respectfully requested to consider whether it is of the view that it is necessary for the ES to contain the necessary further information. The Examining Authority is requested to give consideration to Reg 20 (1) of the 2017 Regulations which provides the Examining authority with the option to 'suspend consideration of the application' if it is necessary for the ES to contain further information.

209 The ES is effectively missing the data that IEMA contextualisations provide to determine both the IEMA significance criteria and the NPSNN 5.18 test in the "net zero" world of climate legislation and policy.

210 The NPSNN 5.18 test performed by the Applicant without any IEMA contextualisation produces a misleading and incorrect result (assessment): it arrives at the incorrect significance assessment in relation to the new policy and legislation. Beyond being technically wrong, it is legally in error as, by deliberately omitting new evidence bases, such as the Net Zero Strategy trajectories which are part of the legally required plan to deliver the Climate Change Act, it cannot be said to rationally assess the latest legal and policy framework.

211 The Examining Authority is also respectfully requested to consider if the ES should be updated with this information, so that a trustworthy and correct significance assessment can be made. I have provided indicative methods of contextualisation which could be used.

212 On the basis of my three IEMA based contextualisations, I conclude that the scheme is "Major Adverse" and fails the NPSNN 5.18 test on the basis of the scale of the climate change impacts from its carbon emissions. **The scheme should therefore be recommended for refusal.**

Dr Andrew Boswell,
Climate Emergency Policy and Planning, December 18th, 2022

11 APPENDIX A: LEGAL FRAMEWORK: ENVIRONMENTAL IMPACT ASSESSMENT

213 The Scheme is a Nationally Significant Infrastructure Project ("NSIP") within the meaning of s.14 and s.22 Planning Act 2008 ("PA 2008") and is EIA development. EIA of NSIPs is governed by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ("the 2017 Regulations").

214 The EIA process, including the preparation of an ES, must identify, describe and assess (those being separate statutory steps) in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on various prescribed factors, including climate (for example the nature and magnitude of greenhouse gas emissions): see reg. 5(1), 5(2)(c) and Schedule 4, para. 5(f) of the 2017 Regulations.

215 By reg. 14(2) [CB/344-45], the ES must include, at least, the information set out in reg. 14(2)(a) to (f). This includes:

> *"(b) a description of the likely significant effects of the proposed development on the environment [… and]*
>
> *(f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected."*

216 By reg. 14(3)(b). an ES must:

> *"include the information reasonably required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment;"*

217 In turn, paragraph 5 of Schedule 4 to the 2017 Regulations requires the environmental statement to include:

> *"A description of the likely significant effects of the development on the environment resulting from, inter alia:*
>
> *[…]*
>
> *(e) the cumulation of effects with other existing and/or approved projects […]*
>
> *(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.*
>
> *[…]*
> *The description of the likely significant effects on the factors specified in regulation 5(2) should cover the direct effects and any indirect, secondary, cumulative,*

transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development …".

218 When deciding whether to make an order granting development consent for relevant development the Secretary of State must, by reg. 21(1) [CB/346]:

"(a) examine the environmental information;

(b) reach a reasoned conclusion on the significant effects of the proposed development on the environment, taking into account the examination referred to in sub-paragraph (a) and, where appropriate, any supplementary examination considered necessary;

(c) integrate that conclusion into the decision as to whether an order is to be granted […]"

219 'Environmental information' is defined by reg.3(1) as:

"the environmental statement […], including any further information and any other information, any representations made by any body required by these Regulations to be invited to make representations and any representations duly made by any other person about the environmental effects of the development and of any associated development…"

220 It follows that the conclusion on whether development consent is granted must be based on an assessment of the significant effects of the proposed development on the environment which must in turn take into account (among other things) *a description of the likely significant effects of the development on the environment resulting from the cumulation of effects with other existing and/or approved projects*. That involves three distinct stages: (1) identification and description of those cumulative effects, (2) assessment of their significance, and (3) integration of that into the decision on whether development consent should be granted.

11.1 Accepted application—effect of environmental statement being inadequate

221 Reg 20 (1) provides the Examining authority with the option to 'suspend consideration of the application' if it is necessary for the ES to contain further information. This situation would arise if the ES was found to be inadequate because it failed to make an adequate assessment of the significant effects of the proposed development on the environment, for example, because the ES did not include *a description of the likely significant effects of the development on the environment resulting from the cumulation of effects with other existing and/or approved projects*.

222 The necessary steps are provided at Reg 20 as follows:

"(1) Where an Examining authority is examining an application for an order granting development consent and paragraph (2) applies, the Examining authority must—

(a)issue a written statement giving clearly and precisely the reasons for its conclusion;

(b)send a copy of that written statement to the applicant; and

(c)suspend consideration of the application until the requirements of paragraph (3) and, where appropriate, paragraph (4) are satisfied.

(2) This paragraph applies if—

(a)the applicant has submitted a statement that the applicant refers to as an environmental statement; and

(b)the Examining authority is of the view that it is necessary for the statement to contain further information.

(3) The requirements mentioned in paragraph (1) are that the applicant must—

(a)provide the Examining authority with the further information;

[…]"

12 APPENDIX B: SCIENCE-BASED CARBON BUDGETS AND COMPLIANCE WITH THE PARIS AGREEMENT

223This appendix is provided to give some overall context to carbon budgets, and the difference between policy-based carbon budgets, such as those in the UK carbon budgets, and science-based carbon budgets, such as the Tyndall Centre budgets.

12.1 What is a carbon budget and how is it produced?

224A financial budget is defined as 'a plan to show how much money a person or organisation will earn and how much they will need or be able to spend'[53]. A carbon budget is similar, but instead of money, it sets out "the cumulative amount of carbon dioxide (CO2) emissions permitted over a period of time to keep within a certain temperature threshold[54]." **Unlike money, for carbon budgets, there are no overdraft facilities, nor national deficits, not quantitative easing mechanisms from central banks.** Once a CO2 budget is spent, it cannot be recovered, and the laws of physics determine the consequences for the planet and for humanity[55]. Carbon budgets are a tool to help reveal the truth of this situation.

225The "laws of physics" can now provide increasingly accurate modelling of the global and local carbon budgets. In the last five years the reports of the Intergovernmental Panel on Climate Change (IPCC) have highlighted that our political institutions, businesses, and society have not started to respond to the climate emergency with the urgency required. Simply put humanity is living outside of our budget.

226Collectively, we now know that this decade is the most crucial decade for reversing 200 years of carbon polluting activities, reversing the rash, profligate spending of our collective carbon budget, and building a new future based on a non-polluting global society. It is crucial that we address this emergency using every tool possible, and this includes carbon budgets and their capacity to point to where we are not doing enough, as captured by IEMA as "*doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 [footnote 37]and thereby potentially avoiding significant adverse effects.*"

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[53] [redacted]

[54] [redacted]

[55] Greenhouse gas removals (GGR) and negative emissions technologies may provide extremely costly, speculative, and unproven at scale methods which proxy for an "overdraft facility". Even if these work, they would be like paying back a loan at a huge interest rate. See, in core documents, Kevin Anderson , John F. Broderick & Isak Stoddard (2020): A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy, DOI: 10.1080/14693062.2020.1728209, Appendix A "*However, there is wide recognition that the efficacy and global rollout of such technologies are highly speculative, with a non-trivial risk of failing to deliver at, or even approaching, the scales typically assumed in the models. … Whilst the authors of this paper are supportive of funding further research, development and, potentially, deployment of NETs, the assumption that they will significantly extend the carbon budgets is a serious moral hazard (Anderson & Peters, 2016).*"

12.2 Relationship of a carbon budget and the 2015 Paris Agreement

227 The Paris Agreement 2015 is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016[56]. The UK is a signatory to the agreement. Its goal is to limit global heating to well below 2ºC degrees, preferably to 1.5 ºC, compared to pre-industrial levels.

228 Scientists have established models that calculate how much more carbon dioxide[57], at various statistical probabilities, may be emitted globally into the atmosphere before breaching various temperatures of global overheating – eg: how many billions of tonnes (or Gigatonnes, GtCO2) before breaching 1.5 degrees (at 66% chance), how many billions of tonnes before breaching 2.0 degrees etc (at 50% chance). These are referred to as carbon budgets, and I have previously explained them above as a bank account analogy but with no overdraft, deficit, or quantitative easing facilities available.

12.3 The difference between policy-based and science-based carbon budgets

229 It is important to understand the difference between science-based carbon budgets and political targets like the UK net-zero target. Net-zero by 2050 can be achieved by many different paths or trajectories of annual carbon emissions, and the carbon emitted is basically the area under the curve. Annual emissions cuts may be applied late (known as "backloaded") or early (known as "frontloaded") depending on policy decisions. Policy that delivers backloaded, or less steeply front-loaded, cuts will have a much greater quantum of carbon emissions emitted under the curve on the way to get to net-zero, and therefore also require larger carbon budgets (from the fixed global budget).

230 **Science-based carbon budgets by contrast** aim to define a curve or trajectory which meet the criterion of fitting within the global carbon budget. That is science-based carbon budgets follow the path necessary to meet a temperature target aligned to the Paris agreement.

231 The UK Committee on Climate Change publish paths and budgets, and Parliament has placed them in statute, but their ability to meet the criterion of the Paris temperature target has not been demonstrated scientifically – although CCC may genuinely endeavour to meet that criterion. In fact, the CCC budgets, and assumptions, and hence UK carbon budgets, are increasingly challenged by scientists, see below.

232 It is further worth noting that a recent report[58] from Climate Crisis Advisory Group (CCAG) has recently said that there is no remaining carbon budget for the 1.5°C Paris

[56] [redacted]

[57] In fact, the models assess a variety of Greenhouse Gases, but for simplicity I restrict this document to CO2 (carbon dioxide) carbon budgets

[58] CCAG report, August 2021, "The final warning bell",

[redacted]

temperature target and policy should be directed towards net-negative carbon emissions as soon as possible. The report says:

> *"**The CCAG is clear that the current shift in global emissions is not sufficient to avoid global disaster, and there is no 'remaining Carbon Budget'**. If proper account is taken of all greenhouse gases, and their CO2 equivalence, the 450ppm threshold has already passed, contradicting the widespread notion of a 'carbon budget' that could still be spent whilst remaining below 1.5°C temperature rise."*

The CCAG was founded, and is chaired, by the eminent scientist Professor Sir David King, Fellow the Royal Society (FRS), and former UK Government's Chief Scientific Advisor from 2000 to 2007. CCAG comprises prominent climate scientists. It was created in response to the Climate Emergency in 2021, as a new advisory group to help inform the public, governments and financial institutions providing them with the most comprehensive science, and more crucially, guiding them towards action for climate repair. CCAG's important scientific commentary on the climate crisis can be made by their small group on a faster cycle than the IPCC.

12.4 Science-based carbon budget assessment of compliance against UK obligations under the Paris agreement

233 To understand what emission reductions should be made in UK local authority areas to make a 'fair' contribution[59] towards the Paris Climate Change Agreement, scientists at Manchester Tyndall Centre have taken IPCC global carbon budgets and produced the so-called SCATTER budgets for UK local authorities. SCATTER stands for Setting City Area Targets and Trajectories for Emissions Reduction project and was funded by the Department for Business Energy and Industrial Strategy (BEIS). It developed a methodology for Local Authorities to set carbon emissions targets that are consistent with United Nations Paris Climate Agreement[60]. The Tyndall budget for the Eden, Richmondshire, County Durham (aggregated) is given in Appendix C and used by me in for my "Contextualisation 3" assessment.

234 These science-based budgets translate the "well below 2°C and pursuing 1.5°C" global temperature target, and the equity principles enshrined in the United Nations Paris Agreement, to a national UK carbon budget which is then split between sub-national areas using different allocation regimes.

235 The assumptions for this transformation from global to local budgets in given in two sources:

[59] 'fair' meaning equitable under the Paris Agreement equity principles between developing and developed nations, known as Common but Differentiated Responsibilities and Respective Capabilities (CBDR–RC) [redacted]

[60] [redacted]

a) a 2020 Climate Policy paper[61], widely referred to as the "Factor of Two" paper

b) the "full" report from the Tyndall Carbon Budget Tool for UK Local Authorities[62], widely referred to SCATTER budgets

These two sources are authored by the same research group and are internally consistent. The "Factor of Two" paper is a landmark in 2020 in appraising national carbon budgets.

Table 1: *Periodic Carbon Budgets for 2018 for EDEN+RSHIRE+DURH.*

Carbon Budget Period	Recommended Carbon Budget (Mt CO_2)
2018 - 2022	16.4
2023 - 2027	8.4
2028 - 2032	4.2
2033 - 2037	2.1
2038 - 2042	1.0
2043 - 2047	0.5
2048 - 2100	0.5

Table CEPP.WR.Tab-15: Tyndall Centre carbon budgets for Eden, Richmondshire, County Durham (aggregated)

236The Tyndall Centre carbon budgets for Eden, Richmondshire, County Durham (aggregated) are shown above. As extracted from "Setting Climate Commitments for City of Eden, Richmondshire, County Durham", as provided at Appendix C which states "*The recommended budget is the maximum cumulative CO2 amount we consider consistent with EDEN+RSHIRE+DURHAM's fair contribution to the Paris Agreement. A smaller carbon budget, with accelerated reduction rates and an earlier zero carbon year, is compatible with this approach. It is however important that for an alternative zero carbon year the proposed 5 year budget periods are the same or lower that those specified in Figure 2. Furthermore meeting the budget must not rely on carbon offsets.*"

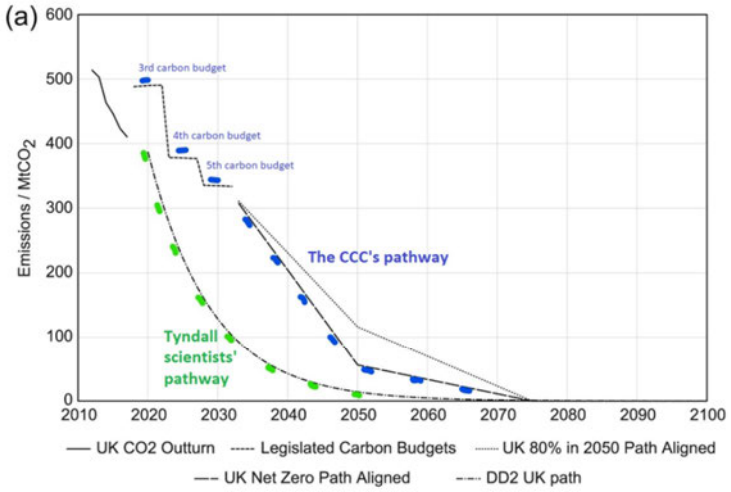
12.5 Comparison to carbon budgets/targets derivable from the Climate Change Committee

237Following, the Climate Change Committee (CCC) sixth Carbon Budget (6CB) report, the UK has enshrined in law and policy its headline recommendation is for the UK to deliver a reduction in net annual emissions of 78%, against a 1990 baseline, by 2035. The previous UK ambition was targeting an 80% reduction against 1990 figures by 2050 under the original Climate Change Act, so this represents a halving of the time to get to around 80% emission cuts (against 1990 baseline) from 2020.

[61] Kevin Anderson, John F. Broderick & Isak Stoddard (2020): A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy, DOI: 10.1080/14693062.2020.1728209

[62] The report for the City of Edinburgh is provided in the core documents

238However, the CCC do not show anywhere how the 6th Carbon Budget (6CB) can be derived directly by a stepwise downscaling from a scientifically established global carbon budget (in contrast to the Manchester Tyndall research and references above which do demonstrate this). The derivation of the 6CB is focussed more on meeting the national, politically set, net zero-target of 2050 via an array of policy interventions rather than fitting to a specific carbon budget (relating to the back-loading and front-loading point above). The point here is that are many possible pathways to reach net-zero, and each will have different accumulated carbon emissions under the curve – so one can reach net-zero having added more or less emissions to the global atmosphere, some pathways may blow our carbon budgets. The science-based carbon budget approach is designed to specify a pathway which keeps within the carbon budgets.



This graph is from the Factor of Two paper by climate scientists at the Tyndall centre. People & Nature added the highlights. The pathway for UK carbon emissions highlighted in green is one that, the scientists argue, is compatible with the Paris agreement. The pathway highlighted in blue is one they have plotted to reflect the CCC's emissions reductions proposals: it implies cutting emissions at about half the pace that the scientists' pathway implies

Figure CEPP.WR.Fig-4: Comparison of science-based Tyndall Centre et and policy-based CCC carbon budgets, and Paris Agreement alignment (reproduced)

239Generally, the difference between the Tyndall and CCC carbon budgets is that the Tyndall ones are 2 – 3 times smaller (and tighter). As shown above, the Tyndall budgets have rapid decarbonisation from 2020 in order to meet the overall budget (area under the curve). The Tyndall trajectory is derived from the IPCC budget for 1.7°C[63], supporting

[63] at 50% chance in the IPCC SR1.5 report

the point from CCAG that there is no remaining budget for 1.5ºC (it is simply not possible to calculate the Tyndall budgets for 1.5 ºC[64]). So the Tyndall budgets are consistent with IPCC global carbon budgets of 1.7ºC degrees of global heating. This is not 1.5ºC because, essentially, there are not enough degrees of freedom in the system to produce budgets consistent with 1.5ºC, the lowest end of the Paris target[65].

240 The graph above is taken from[66] and illustrates the difference between CCC and Tyndall carbon budgets. In simple terms, the carbon budget is the area under the annual emissions trajectory curve. Issues such the shape of the curve, front-loading or back-loading emissions reductions can produce vastly different curves and corresponding *areas under the curve*.

241 So it is possible for the UK to meet net-zero at 2050 via vastly different overall carbon budgets – the green line in the graph meets the global budget for 1.7 ºC, the blue CCC pathway overshoots this temperature target. Therefore "net-zero", in itself, is not a good measure of compliance with the Paris agreement temperature target whereas a science-based carbon budget is.

242 Note, the details of the carbon accounting differ, so it is not easy to get a like-for-like comparison between the science-based carbon budget from Manchester Tyndall and the Climate Change Committee budgets. For further information, see footnotes[67].

243 Simply put the UK carbon budgets are based on the policy-driven target of net-zero by 2050. However, such a policy-driven target does not consider the overall emissions generated in how the UK gets to net-zero[68].

244 A key issue is the "area under the curve" in the emissions trajectories. Science-based carbon budgets such as those from the Tyndall Centre, research that the UK Department of Business, Energy and Industrial Strategy supported, demonstrate that the area under their curve of their emissions trajectories is consistent with the global carbon budgets from the Intergovernmental Panel on Climate Change (IPCC).

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[64] at a greater than a 17% chance

[65] see Tyndall's "Factor of Two" research paper, Kevin Anderson, John F. Broderick & Isak Stoddard (2020) A factor of two: how the mitigation plans of 'climate progressive' nations fall far short of Paris-compliant pathways, Climate Policy, 20:10, 1290-1304, DOI: 10.1080/14693062.2020.1728209

[66] [redacted]

[67] "How the UK Climate Change Committee steals from the carbon budget", blog post by Professor Peter Somerville, 8th July 2021, [redacted] and "Calculating a fair carbon budget for the UK". blog post by Professor Peter Somerville, 8th July 2021 [redacted]

[68] This is clearly evidenced by the overarching UK Net Zero Strategy being found unlawful (London High Court judgment, July 18th 2022) and the UK Government accepting this by not appealing (October 13th 2022).

12.6 The risk in delivering Climate Change Committee budgets

245 Even on their own terms, these policy-based targets are far from guaranteed to be delivered with the state of current climate policy. This is evidenced by the recent legal case[69] on the UK Net Zero Strategy (NZS) where it was found that the policies had not been properly quantified, and that the UK Government had not considered several things, especially **the risk to delivery of the policies** in their strategy for meeting the sixth carbon budget. The UK Government have accepted the NZS is unlawful[70] and are not appealing.

246 Further on 29th June 2022, the Climate Change Committee (CCC) submitted its "Progress in reducing Emissions[71] - 2022 Report to Parliament" and found that "credible plans" existed for only 39% of the required emissions reduction to meet the UK Sixth Carbon Budget. This indicating a clear policy shortfall in policy on Climate Change across the UK, see Appendix D.

247 Over the period to 2050 in the UK, the Tyndall Centre found that at least two times as much carbon would be produced comparing the UK carbon budgets with their own science-based targets[72]. If the science-based budgets from Tyndall Centre can only deliver a UK contribution towards 1.7°C at best, then the CCC budgets for both the UK and Scotland are only consistent with a much-greater global heating temperature target with more than twice as many emissions being produced by 2050. Note the UK's obligation under the Paris Agreement is to "*keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius*".

248 In short, science-based targets give a far more accurate picture for assessment and risk analysis than nationally legislated carbon budgets. This especially applies to assessing whether infrastructure is consistent with the UK's commitments under the Paris Agreement. The best practice IEMA guidance also strongly encourages the use of science-based carbon budgets for local and regional contextualisation, as I use in Contextualisation 3.

249 The key takeaway at this point is that to assess whether the scheme complies with the UK net-zero target, then comparisons are made with the national budgets and the Net Zero Strategy, as in Contextualisations 1 and 2. However, to assess whether the scheme complies with the UK's international obligations under the Paris agreement, then comparisons need to be made with science-based carbon budgets and local/sector scaled versions of them, as in Contextualisation 3.

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[69] See the judgment at [redacted]

[70] "Government accepts its flagship climate strategy is unlawful", [redacted]

[71] [redacted]

[72] "Factor of two" paper as above

13 APPENDIX C: TYNDALL CENTRE LOCAL BUDGETS FOR EDEN, RICHMONDSHIRE, COUNTY DURHAM (AGGREGATED)

250 This was generated from the Tyndall Centre website at:

[redacted]

Setting Climate Committments for EDEN+RSHIRE+DURHAM

Quantifying the implications of the United Nations Paris Agreement for EDEN+RSHIRE+DURHAM

EDEN+RSHIRE+DURHAM CONSISTS OF THE FOLLOWING LOCAL AUTHORITIES: COUNTY DURHAM, EDEN, RICHMONDSHIRE

Key Messages

This report presents climate change targets for EDEN+RSHIRE+DURHAM[i] that are derived from the commitments enshrined in the Paris Agreement [1], informed by the latest science on climate change [2] and defined in terms of science based carbon setting [3]. The report provides EDEN+RSHIRE+DURHAM with budgets for carbon dioxide (CO_2) emissions and from the energy system for 2020 to 2100.

The carbon budgets in this report are based on translating the "well below 2°C and pursuing 1.5°C" global temperature target and equity principles in the United Nations Paris Agreement to a national UK carbon budget [1][ii]. The UK budget is then split between sub-national areas using different allocation regimes [4]. Aviation and shipping emissions remain within the national UK carbon budget and are not scaled down to sub-national budgets. Land Use, Land Use Change and Forestry (LULUCF) and non-CO_2 emissions are considered separately to the energy CO_2 budget in this report.

Based on our analysis, for EDEN+RSHIRE+DURHAM to make its 'fair' contribution towards the Paris Climate Change Agreement, the following recommendations should be adopted:

1. Stay within a maximum cumulative carbon dioxide emissions budget of 25.3 million tonnes ($MtCO_2$) for the period of 2020 to 2100. At 2017 CO_2 emission levels[iii], EDEN+RSHIRE+DURHAM would use this entire budget within 7 years from 2020.
2. Initiate an immediate programme of CO_2 mitigation to deliver cuts in emissions averaging a minimum of -13.1% per year to deliver a Paris aligned carbon budget. These annual reductions in emissions require national and local action, and could be part of a wider collaboration with other local authorities.
3. Reach zero or near zero carbon no later than 2042. This report provides an indicative CO_2 reduction pathway that stays within the recommended maximum carbon budget of 25.3 $MtCO_2$. At 2042 5% of the budget remains. This represents very low levels of residual CO_2 emissions by this time, or the Authority may opt to forgo these residual emissions and cut emissions to zero at this point. Earlier years for reaching zero CO_2 emissions are also within the recommended budget, provided that interim budgets with lower cumulative CO_2 emissions are also adopted.

1. Introduction

This report presents advisory climate change targets for EDEN+RSHIRE+DURHAM to make its fair contribution to meeting the objectives of the United Nations Paris Agreement on Climate Change. The latest scientific consensus on climate change in the Intergovernmental Panel on Climate Change (IPCC) Special Report on 1.5°C [2] is used as the starting point for setting sub-national carbon budgets [3, 4] that quantify the maximum carbon dioxide (CO_2) associated with energy use in EDEN+RSHIRE+DURHAM that can be emitted to meet this commitment. This report translates this commitment into;

1. a long-term carbon budget for EDEN+RSHIRE+DURHAM;
2. a sequence of recommended five-year carbon budgets;
3. a date of 'near zero'/zero carbon for the area.

The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement commits the global community to take action to "hold the increase in global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C" [1]. Cumulative emissions of CO_2 from human activity are the principle driver of long-term global warming[iv]. It is the relationship between CO_2 and global temperatures which means that staying within a given temperature threshold requires that only a certain total quantity of CO_2 is released to the atmosphere. This is the global carbon budget.

In addition to setting global average temperature targets, the UNFCCC process also includes foundational principles of common but differentiated responsibility [1]. This informs the fair (equitable) distribution of global emissions between nations at different stages of economic development. Industrialised nations are expected to show leadership towards a low carbon future, while it is acknowledged that a greater total share of future emissions will be associated with other countries as they develop (though their emissions per capita will remain low). Any sub-division of the global carbon budget must therefore account for the development needs of what the Paris Agreement refers to as "developing country Parties" in setting a fair/equitable national or sub-national carbon budget.

The carbon budgets presented here apply to CO_2 emissions from the energy system only. Although all greenhouse gas (GHG) emissions, such as methane and other forcing agents, such as aircraft contrails, affect the rate of climate change, long term warming is mainly driven by CO_2 emissions [5]. Furthermore the physical or chemical properties of each GHG vary, with different life-times causing warming in different ways, and with subsequent, and often large, uncertainties in their accounting [6]. As such the global carbon budgets in the Intergovernmental Panel on Climate Change (IPCC) Special Report on 1.5°C (SR1.5) [2], relate to CO_2-only emissions. In this report we have discussed non-CO_2 emissions and CO_2 emissions associated with land use, land use change and forestry separately.

Ultimately staying within a global temperature threshold (e.g. "well below 2°C") requires limiting cumulative CO_2 emissions over the coming decades. Carbon budgets can be an effective way to understand the amount of CO_2 emissions that can be released into the atmosphere in order to do this. End point targets such as 'net zero' by 2050, with very clear assumptions, can be useful indicators of ambition, but it is ultimately the cumulative CO_2 released on the way to that target that is of primary significance to achieving climate change goals. Whereas end point focused targets can be met with varying levels of CO_2 emissions (and therefore varying global temperature with consequent climate impacts) depending on their reduction pathways, carbon budgets specify the limits to CO_2 emissions within the period of the commitment. This is a reason why the UK Climate Change Act has legislated 5-year carbon budget periods, as well as a long term target, to keep CO_2 emissions consistent with the framing goal of the climate change commitment. It is also the reason why we recommend a carbon budget based approach.

1.2 Wider UK Policy Context

The UK Climate Change Act now legislates for a commitment to net zero greenhouse gas emissions by 2050[v], with five yearly carbon budgets to set actions and review progress [7]. The carbon budgets for this target were not available at the time of our analysis for direct comparison, however the

recommended budget in this report will most likely be more stringent. This is primarily due to two key differences between our approach and the current recommendations of the UK Government's advisory body the Committee on Climate Change (CCC) that inform the revised UK net zero target:

1. The equity principles of the Paris Agreement and wider UNFCCC process are explicitly and quantitatively applied. Our approach allocates a smaller share of the global carbon budget to the 'developed country Parties', such as the UK, relative to 'developing country Parties'. Moreover the approach is also distinct in including global 'overheads' for land use, land use change and forests (LULUCF) and cement process emissions related to development.
2. Carbon dioxide removals via negative emissions technologies (NETs) and carbon offsets[vi] are not included. The UK Climate Change Act's 'net zero' framing means that the commitment is met when greenhouse gas emissions (debits) and removals (credits) from the UK's carbon 'account' balance at zero. Hence the 2050 target can be met using carbon dioxide removal technologies, including land use sequestrations, and potentially carbon offsetting. The CCC include a significant role for NETs such as bioenergy carbon capture and storage and direct air capture in their analysis supporting the net zero target. Doing so theoretically increases the size of a carbon budget, but increases the risk of failing to deliver on the Paris global temperature target. The UK Government has also rejected the CCC's advice to explicitly exclude international carbon offsetting as an approach to meeting the net zero target. Allowing for future carbon dioxide removal technologies and international carbon offsetting ostensibly increase the size of the UK's carbon budget. However carbon removal technologies are at a very early stage of development and whether they can be successfully deployed at sufficient scale is highly uncertain. While they are an important technology to develop, it is a major risk to prematurely adopt a carbon budget that allows for additional CO_2 on the basis that future generations will be in a position to deploy planetary-scale NETs. Similarly, as the CCC note in their advice, the efficacy of carbon offsetting as a contribution to meeting global climate change commitments is not robust enough to incorporate into recommended carbon budgets.

We regard our UK carbon budget to be at the upper end of the range that is aligned with the Paris Agreement's objectives. Early results from the latest Earth system models suggest that the climate may be more sensitive to greenhouse gases than previously thought implying a smaller global carbon budget is required [8]. In addition, assuming that developing countries will, on aggregate, implement rapid emissions reduction measures in line with a 2025 peak year is far from certain. Therefore, we recommend that these budgets are taken as reflective of the minimum commitment required to deliver on the Paris Agreement.

2. Method

The Setting City Area Targets and Trajectories for Emissions Reduction (SCATTER) project [4] funded by the Department for Business Energy and Industrial Strategy (BEIS) developed a methodology for Local Authorities to set carbon emissions targets that are consistent with United Nations Paris Climate Agreement. This report uses the SCATTER methodology with revised global carbon budgets, based on the latest IPCC Special Report on 1.5°C and updated CO_2 emissions datasets, to downscale global carbon budgets to EDEN+RSHIRE+DURHAM. This methodology has been successfully piloted with Greater Manchester Combined Authority and is being made available nationally to support all local authorities and groupings of local authorities.

Step 1: A global carbon budget of 900 $GtCO_2$ is taken from the Intergovernmental Panel on Climate Change (IPCC) Special Report on 1.5°C [2]. This global carbon budget represents the latest IPCC estimate of the quantity of CO_2 that can be emitted and still be consistent with keeping global temperatures well below 2°C with an outside chance of stabilising at 1.5 °C. This budget assumes no reliance on carbon removal technologies.

Step 2: A 'global overhead' deduction is made for process emissions arising from cement production (60 $GtCO_2$) [9][vii]. Cement is assumed to be a necessity for development [5]. We also assume that there is no net deforestation at a global level (2020 to 2100) so none of the global carbon budget is allocated to this sector. This will require a significant global effort to rapidly reduce deforestation and significantly improve forestry management as well as increase rates of reforestation and potentially afforestation.

Step 3: A share of the global carbon budget is allocated to "developing country parties" assuming a trajectory for those countries from current emissions to a peak in 2025 then increasing mitigation towards zero emissions by around 2050. The remaining budget is allocated to "developed country parties" which includes the UK [10]. This approach of considering developing countries first, is guided by the stipulation of equity within the Paris Agreement (and its earlier forebears, from Kyoto onwards) [10].

Step 4: The UK is apportioned a share of the 'developed country Parties' budget after Step 3 to provide a UK national carbon budget. The apportionment is made according to "grandfathering"[viii] of emissions for the most recent period up to the Paris Agreement (2011 to 2016).

Step 5: Aviation and shipping emissions are deducted. Assumptions and estimates are made about the level of future emissions from aviation, shipping and military transport for the UK. These emissions are then deducted from the national budgets as a 'national overhead" to derive final UK energy only carbon budgets. Emissions from aviation including military aircraft are assumed to be static out to 2030, followed by a linear reduction to complete decarbonisation by 2075. The total CO_2 emissions of this path are >25% lower than Department for Transport central forecast followed by reduction to zero by 2075. Shipping emissions are based on Walsh et al [11] 'big world' scenario out to 2050 followed by full decarbonisation from this sector by 2075. These aviation and shipping emissions (1,518 $MtCO_2$) are then deducted as a 'national overhead' from the UK budget to derive the final carbon budgets for the UK, from which local authority budgets are subsequently derived [4]. The budgets provided are therefore aligned with "well below 2°C and pursuing 1.5°C" provided that aviation and shipping emissions do not exceed the pathway assumed in our analysis [4]. Failure to hold aviation and shipping emissions within the outlined allocation will reduce the carbon budget for UK regions, including for EDEN+RSHIRE+DURHAM.

Step 6: EDEN+RSHIRE+DURHAM is apportioned a part of the remaining UK carbon budget. Our recommended budget is based on sub-national allocation through 'grandfathering'. A grandfathering approach allocates carbon budgets on the basis of recent emissions data. The most recent annual CO_2 emissions for EDEN+RSHIRE+DURHAM up to the Paris Agreement [12] (2011-2016) is averaged and compared to averaged data for the whole UK [13] over the same period. The carbon budget (2020-2100) for EDEN+RSHIRE+DURHAM is then apportioned based on EDEN+RSHIRE+DURHAM's average proportion of UK CO_2 emissions for the 2011-2016 period. CO_2 emissions in the carbon budget include emissions from fossil combustion within the region and a share of the emissions from national electricity generation (relative to the EDEN+RSHIRE+DURHAM area's end-use electricity demand).

Step 7: Carbon emission pathways. The carbon budgets for EDEN+RSHIRE+DURHAM are related to a set of illustrative emission pathways. These pathways show projected annual CO_2 emissions from energy use in EDEN+RSHIRE+DURHAM and how these emissions reduce over time to stay within the budget. The energy-only CO_2 emissions for 5-yearly interim carbon budget periods are calculated in line with the framework set out in the UK Climate Change Act. It is the cumulative carbon budget and the 5 year interim budgets that are of primary importance as opposed to a long term target date. The combination of a Paris-compliant carbon budget and the projected emissions pathways can however be used to derive an indicative near zero carbon target year for EDEN+RSHIRE+DURHAM. The near zero carbon year of 2042 is defined here as the point at which, on the consistent reduction rate curve, less than 5% of EDEN+RSHIRE+DURHAM's recommended budget remains. Annual CO_2 emissions at this point fall below 0.15 $MtCO_2$ (CO_2 levels >96% lower than in 2015 – a Paris Agreement reference year).

3. Results

3.1 Energy Only Budgets for EDEN+RSHIRE+DURHAM

Following the Method the recommended energy only CO_2 carbon budget for the EDEN+RSHIRE+DURHAM area for the period of 2020 to 2100 is 25.3 $MtCO_2$. To translate this into near to long term commitments a CO_2 reduction pathway within the 25.3 $MtCO_2$ is proposed here. A consistent emissions reduction rate of -13.1% out to the end of the century is applied. In 2042 95% of the recommended carbon budget is emitted and low level CO2 emissions continue at a diminishing level to 2100.

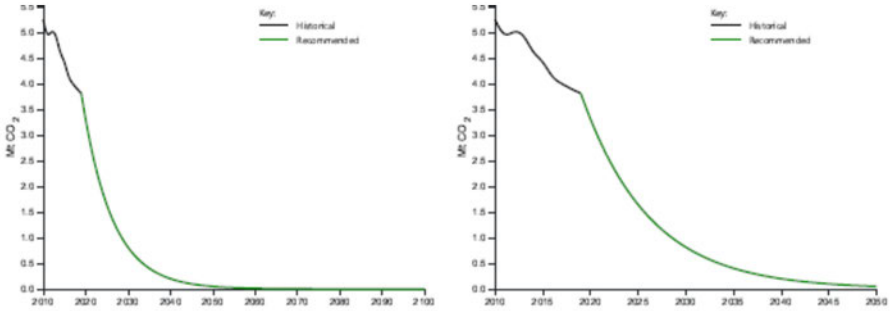

Figure 1a (left): *Energy related CO_2 only emissions pathways (2010-2100) for EDEN+RSHIRE+DURHAM premised on the recommended carbon budget.* ***Figure 1b (right):*** *Energy CO_2 only emissions pathways (2010-2050) for EDEN+RSHIRE+DURHAM premised on the recommended carbon budget.* ***y-axis shows emissions in $MtCO_2$***

Table 1 presents the EDEN+RSHIRE+DURHAM energy CO_2 only budget in the format of the 5-year carbon budget periods in the UK Climate Change Act. To align the 2020 to 2100 carbon budget with the budget periods in the Climate Change Act we have included estimated CO_2 emissions for EDEN+RSHIRE+DURHAM for 2018 and 2019, based on BEIS provisional national emissions data for 2018 [14] and assuming the same year on year reduction rate applied to 2019. The combined carbon budget for 2018 to 2100 is therefore 33.1 $MtCO_2$.

Table 1: *Periodic Carbon Budgets for 2018 for EDEN+RSHIRE+DURHAM.*

Carbon Budget Period	Recommended Carbon Budget (Mt CO_2)
2018 - 2022	16.4
2023 - 2027	8.4
2028 - 2032	4.2
2033 - 2037	2.1
2038 - 2042	1.0
2043 - 2047	0.5
2048 - 2100	0.5

The recommended budget is the maximum cumulative CO_2 amount we consider consistent with EDEN+RSHIRE+DURHAM's fair contribution to the Paris Agreement. A smaller carbon budget, with accelerated reduction rates and an earlier zero carbon year, is compatible with this approach. It is however important that for an alternative zero carbon year the proposed 5 year budget periods are the same or lower that those specified in Figure 2. Furthermore meeting the budget must not rely on carbon offsets.

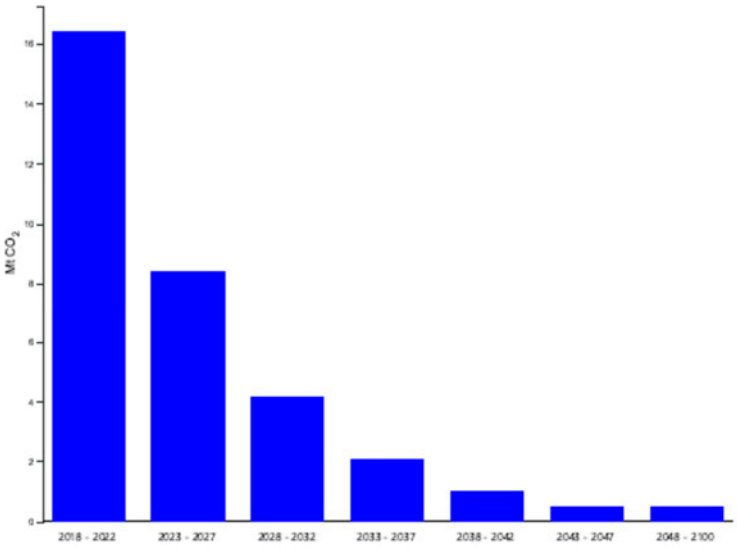

Figure 2: *Cumulative CO_2 emissions for budget period (based on Table 1) from 2018 to 2100 for EDEN+RSHIRE+DURHAM*

3.2 Recommended Allocation Regime for Carbon Budget

The recommended carbon budget is based on a grandfathering allocation regime for sub-dividing the UK sub-national energy only carbon budget. There are three distinct allocation regimes that can be applied to determine sub-national budgets. We have opted to recommend one common approach for allocating carbon budgets that can be applied to all Local Authority areas. This enables straightforward compatibility between carbon budgets set at different administrative scales. For example this makes it easier for individual Local Authorities to calculate their own carbon budgets that are compatible with a budget set at Combined Authority scale. It also means that under the recommended carbon budgets, all Authorities are contributing to a common total UK carbon budget. If for example all Authorities selected the allocation regime that offered them largest carbon budget the combined UK budget would not comply with the objectives of the Paris Agreement. The common approach to allocation we recommend therefore further assures that the carbon budget adopted is Paris Agreement compatible.

We have chosen a grandfathering as our common allocation approach because, based on our analysis, it is the most appropriate and widely applicable regime within the UK.

Population and Gross Value Added[ix] (GVA) are alternative allocation regimes. Population shares the carbon budget equally across the UK on a per capita basis. In this allocation regime the UK population [15] is compared to that of EDEN+RSHIRE+DURHAM [16] from 2011 to 2016. The carbon budget (2020-2100) for EDEN+RSHIRE+DURHAM is then apportioned based on its average proportion of the UK population for the period 2011-2016. For regions where per capita energy demand deviates significantly from the average (e.g. a large energy intensive industry is currently located there) the budget allocated may not be equitable for all regions, therefore it is not recommended as the preferred allocation. GVA is used as an economic metric to apportion carbon budgets. For example, the UK total GVA [17] is compared to that of EDEN+RSHIRE+DURHAM [17] from 2011 to 2016. The carbon budget (2020-2100) for EDEN+RSHIRE+DURHAM is then apportioned based on EDEN+RSHIRE+DURHAM's average proportion of UK GVA for the period 2011-2016. GVA can be useful as a proxy for allocation on economic value, however without an adjustment for the type of economic activity undertaken, areas with high economic 'value' relative to energy use can get a relatively large budget, while the inverse is true for areas with energy intensive industries, and/or lower relative economic productivity. We would therefore not recommend GVA as an appropriate allocation regime for all regions.

Table 2 presents the result outcomes for alterative allocation regimes – population and gross value added (GVA).

Table 2: *Energy only CO_2 budgets and annual mitigation rates for EDEN+RSHIRE+DURHAM (2020-2100) by allocation regime*

Allocation regime (% of UK Budget allocated to EDEN+RSHIRE+DURHAM	UK Budget[x] ($MtCO_2$)	EDEN+RSHIRE+DURHAM Budget ($MtCO_2$)	Average Annual Mitigation Rate (%)
Grandfathering to EDEN+RSHIRE+DURHAM from UK (1.1%)	2,239	25.3	-13.1%
Population split to EDEN+RSHIRE+DURHAM from UK (1.0%)	2,239	21.7	-15.0%
GVA split to EDEN+RSHIRE+DURHAM from UK (0.6%)	2,239	14.0	-21.5%

Pathway projections for the change in annual energy-only CO_2 emissions pathways for EDEN+RSHIRE+DURHAM based on the carbon budgets in Table 2 are illustrated in Figure 3a & 3b.

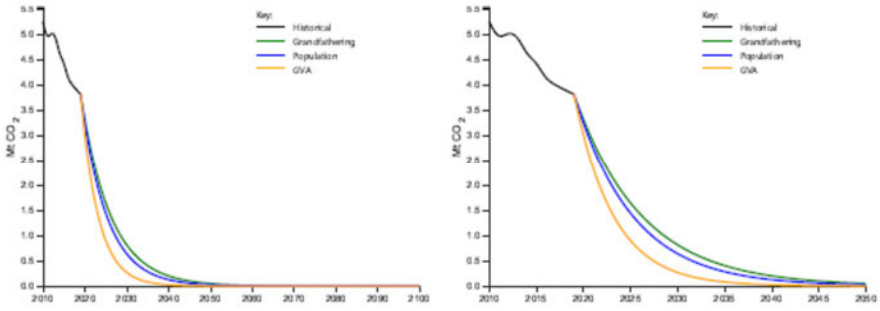

Figure 3a (left): *Energy related CO_2 only emissions pathways (**2010-2100**) for EDEN+RSHIRE+DURHAM premised on carbon budgets shown in Table 2.* ***Figure 3b (right):*** *Energy related CO_2 only emissions pathways (**2010-2050**) for EDEN+RSHIRE+DURHAM premised on carbon budgets shown in Table 2.* ***y-axis shows emissions in $MtCO_2$***

3.3 Land Use, Land Use Change and Forestry emissions for EDEN+RSHIRE+DURHAM

Land Use, Land Use Change and Forestry (LULUCF) consist of both emissions and removals of CO_2 from land and forests. We recommend that CO_2 emissions and sequestration from LULUCF are monitored separately from the energy-only carbon budgets provided in this report. EDEN+RSHIRE+DURHAM should increase sequestration of CO_2 through LULUCF in the future, aligned with Committee on Climate Change's high level ambition of tree planting, forestry yield improvements and forestry management [18]. Where LULUCF is considered, we recommend it compensate for the effects of non-CO_2 greenhouse gas emissions (within the geographical area) that cannot be reduced to zero, such as non-CO_2 emissions from agriculture.

3.4 Non-CO_2 Emissions

The IPCC SR1.5 report identifies the importance of non-CO_2 climate forcers (for instance methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), sulphur dioxide (SO_2) and black carbon) in influencing the rate of climate change. However, a cumulative emission budget approach is not appropriate for all non-CO_2 greenhouse gases, as the physical and chemical properties of each leads to differing atmospheric lifetimes and warming effects [19]. There are also substantial relative uncertainties in the scale, timing and location of their effects.

We do not provide further analysis or a non-CO_2 emissions reduction pathway in this report. However the global carbon budget in the IPCC Special Report on 1.5°C, that our analysis is based on, assumes a significant reduction in rate of methane and other non-CO_2 emissions over time. Therefore to be consistent with carbon budgets EDEN+RSHIRE+DURHAM should continue to take action to reduce these emissions.

The Department of Business Energy and Industrial Strategy's Local Authority emissions statistics do not at this time provide non-CO_2 emissions data at the regional level. Given the absence of robust non-CO_2 emissions data, any non-CO_2 emissions inventory by other organisations at scope 1 and 2 for EDEN+RSHIRE+DURHAM may form the basis of monitoring and planning for these emissions. We recommend considering the adoption of a LULUCF pathway that includes CO_2 sequestration sufficient to help compensate for non-CO_2 emissions within EDEN+RSHIRE+DURHAM's administrative area.

4. Conclusions

The results in this report show that for EDEN+RSHIRE+DURHAM to make its fair contribution to delivering the Paris Agreement's commitment to staying "well below 2°C and pursuing 1.5°C" global temperature rise, then an immediate and rapid programme of decarbonisation is needed. At 2017 CO_2 emission levels[xi], EDEN+RSHIRE+DURHAM will exceed the recommended budget available within 7 years from 2020. **To stay within the recommended carbon budget EDEN+RSHIRE+DURHAM will, from 2020 onwards, need to achieve average mitigation rates of CO_2 from energy of around -13.1% per year**. This will require that EDEN+RSHIRE+DURHAM rapidly transitions away from unabated fossil fuel use. For context the relative change in CO_2 emissions from energy compared to a 2015 Paris Agreement reference year are shown in Table 3.

Table 3: *Percentage reduction of annual emissions for the recommended CO_2-only pathway out to 2050 in relation to 2015*

Year	Reduction in Annual Emissions (based on recommended pathway)
2020	25.7%
2025	63.1%
2030	81.7%
2035	90.9%
2040	95.5%
2045	97.8%
2050	98.9%

The carbon budgets recommended should be reviewed on a five yearly basis to reflect the most up-to-date science, any changes in global agreements on climate mitigation and progress on the successful deployment at scale of negative emissions technologies.

These budgets do not downscale aviation and shipping emissions from the UK national level. However if these emissions continue to increase as currently envisaged by Government, aviation and shipping will take an increasing share of the UK carbon budget, reducing the available budgets for combined and local authorities. **We recommend therefore that EDEN+RSHIRE+DURHAM seriously consider strategies for significantly limiting emissions growth from aviation and shipping.** This could include interactions with the UK Government or other local authority and local enterprise partnership discussions on aviation that reflect the need of the carbon budget to limit aviation and shipping emissions growth.

CO_2 emissions in the carbon budget related to electricity use from the National Grid in EDEN+RSHIRE+DURHAM are largely dependent upon national government policy and changes to power generation across the country. **It is recommended however that EDEN+RSHIRE+DURHAM promote the deployment of low carbon electricity generation within the region and where possible influence national policy on this issue**.

We also recommend that the LULUCF sector should be managed to ensure CO_2 sequestration where possible. The management of LULUCF could also include action to increase wider social and environmental benefits..

Endnotes

[i] Defined in terms of the administrative boundary of the EDEN+RSHIRE+DURHAM area.

[ii] We base our global carbon budget on the latest IPCC Special Report on 1.5°C (IPCC SR1.5) findings on how carbon emissions relate to global temperatures. The budget value we have selected provides a 'likely' chance of staying below 2°C and offers an outside chance at holding temperatures to 1.5°C. As IPCC SR1.5, notes there are no emissions pathways for limiting warming to 1.5°C that do not rely upon significant carbon dioxide removal technology deployment [2]

[iii] Based on BEIS LA statistics 2017 CO_2 emissions EDEN+RSHIRE+DURHAM (excluding aviation, shipping, process CO2 emissions from cement production and those from LULUCF).

[iv] This is due to the near-linear relationship between cumulative CO2 emissions and temperature is the result of various feedback processes and logarithmic relationship between atmospheric CO2 concentrations and radiative forcing, as well as the changes in the airborne fraction of CO2 emissions [19].

[v] The 2019 amended UK Climate Change Act commits the UK to at least a 100% reduction in greenhouse gas emissions by 2050 from 1990 levels on the basis that the UK's 'carbon account' is 'net zero' by this point. This is not the same as zero greenhouse gas emissions by 2050. In this framing residual greenhouse gas emissions are net zero on the provision that they are balanced by greenhouse gas removals in the UK's carbon account.

[vi] Carbon offsetting refers to the purchase of a tradeable unit, representing emissions rights or emissions reductions, to balance the climate impact of an organisation, activity or individual.

[vii] Based on IEA's ambitious 2 degree scenario on process CO_2 for the period 2020-2050, subsequently extrapolating to zero by 2075

[viii] Grandfathering is based on the average proportion of CO_2 emissions from each Party in recent years.

[ix] Balanced approach at current basic prices

[x] After deducting an emissions budget for aviation, shipping and military transport of 1,518 $MtCO_2$

[xi] Based on EDEN+RSHIRE+DURHAM's 2016 CO2 emissions (excluding aviation, shipping, process CO_2 emissions from cement production and those from LULUCF).

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APPENDIX D: CLIMATE CHANGE COMMITTEE (CCC) 2022 PROGRESS REPORT

251 On 29th June 2022, the Climate Change Committee (CCC) submitted its "Progress in reducing Emissions - 2022 Report to Parliament" (referred to as CCC _2022_PROG[73]).

252 The report finds that overall "credible plans" exist for only 39% of the required emissions reduction to meet the Sixth Carbon Budget (CCC _2022_PROG/page 22). This means that **61% of the required emissions reductions for the 6th carbon budget are not even secured "on paper" yet**.

253 CCC _2022_PROG/Figure 3.13 reproduced below shows the relevant data for "credible plans" and other categories for the surface transport sector.

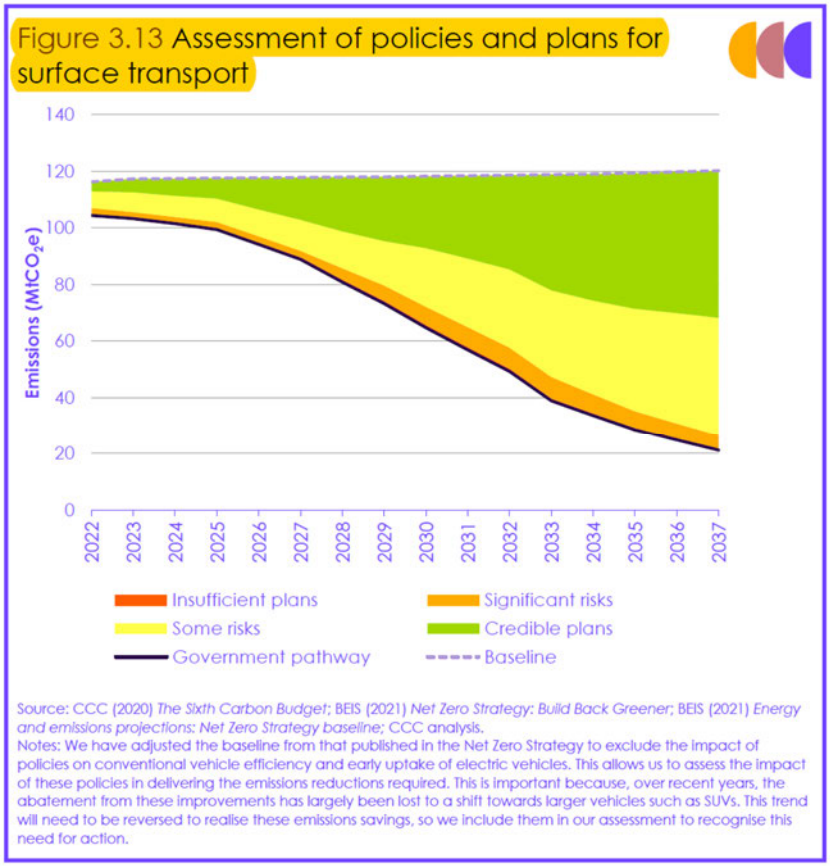

Figure CEPP.WR.Fig-5: CCC assessment of UK transport policies (2022 Progress Report, reproduced)

[73] Climate Change Committee, "2022 Progress Report to Parliament - The CCC's annual assessment of UK progress in reducing emissions",

13.1 Half the emission reductions for surface transport to meet the 6th carbon budget are not secured

254 The spreadsheet "Progress in reducing emissions – 2022 Report to Parliament – Charts and data" (referred to as CCC_2022_DATA[74]) provides the breakdown of the data behind Figure 3.13 above from the report. Delivery of the "Government pathway" requires a reduction of 99.03 MtCO2e against the "Baseline" of 120.23 MtCO2e by 2037. CCC identify credible plans for 51.97 MtCO2e of this (ie **only 52.5%** of the total). So in the surface transport sector **about half of the required emissions reductions for the 6th carbon budget are not even secured "on paper" yet**, revealing the true extent of the "delivery gap" in transport decarbonisation policy from the Government's own advisors on climate change delivery.

255 In identifying barriers to closing the delivery gap, the report is clear in identifying that there is currently no vision from the Government for traffic reduction, as it states at page 130 "*However, the Government has not yet set out a clear vision of the extent of traffic reduction that is desirable, nor a coherent set of policies to deliver this.*" __

256 On page 139, the report identifies that "*the Scottish Government has committed to reducing overall car mileage by 20% by 2030*" and that "*the Welsh Government has also recently committed to reducing the car miles driven per person by 10% by 2030*". By contrast in England, £24 billion is still allocated for Roads Investment Scheme 2 (RIS2) and "*this still provides considerable funding for new roads **which will induce increased demand***".

257 In the section "Recommendations to the DfT" (CCC _2022_PROG/page 571), these recommendations are included:

> *"Set out, through Active Travel England, guidance for **what actions local authorities should take to realise the Transport Decarbonisation Plan's commitment to half of all journeys in towns and cities being walked or cycled by 2030**. This should be accompanied by the required funding."*
>
> *"**Set out measurable targets for the contribution that reducing car travel** will play in delivering transport's Net Zero pathway."*
>
> *"**Reform the Transport Appraisal Guidance to ensure that it enables practitioners to make decisions that are consistent with the Net Zero pathway**. **DfT should consider whether a "vision and validate" approach to the future transport system might be more appropriate than a "predict and provide" one in this context**."*

258 These are just some of the recommendations which require solid and quantified plans to start to address the identified delivery gap in the surface transport policies in the NZS and the TDP. **The recommendations from the Government's advisors also make clear that policies to**

[74] Climate Change Committee, "Progress in reducing emissions – 2022 Report to Parliament – Charts and data", https://[redacted]

reduce traffic and set measurable targets for it do not exist, and that a new approach to road scheme appraisal is urgently needed.

14 APPENDIX E: Transport Decarbonisation Plan, Figure 2

259 On the 14th July, 2021, the Government released its Transport Decarbonisation Plan[75] (TDP).

260 A graph of projections for decarbonising domestic transport in given in the TDP at Figure 2 and reproduced here:

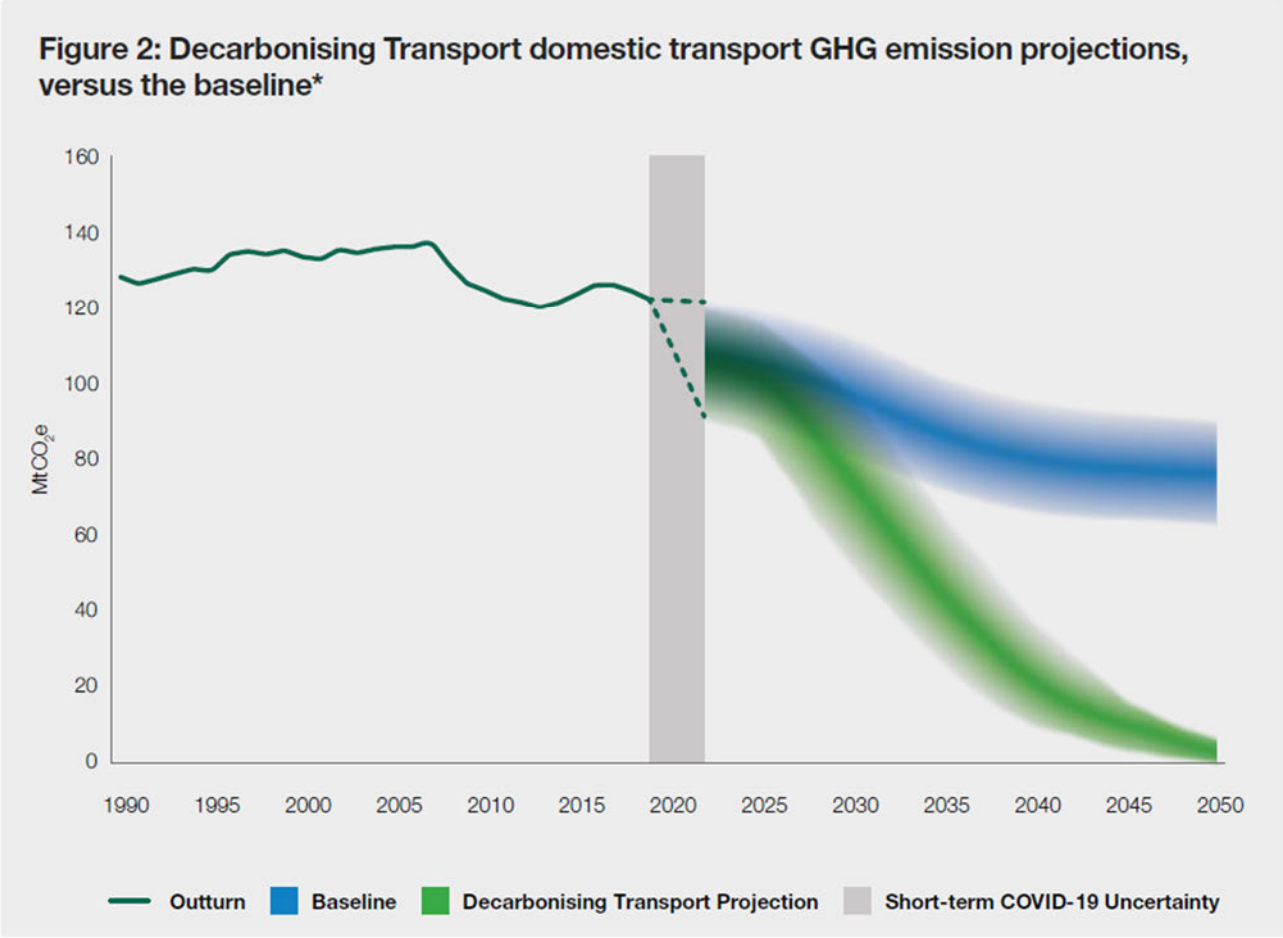

Figure CEPP.WR.Fig-6: Transport Decarbonisation Plan Figure 2 (reproduced)

261 The graph is the same (but less refined than) NZS Figure 21.

[75] https://www.gov.uk/government/speeches/transport-decarbonisation-plan

15 APPENDIX F: EIA GUIDANCE DOCUMENTS

262 This section lays out guidance relating to the EIA Regulations.

263 Following the enactment of the reviewed EU EIA Directive "DIRECTIVE 2014/52/EU" in 2014, three guidance documents were published in 2017 on the screening[76], scoping[77] and EIA report writing[78] stages.

264 Each of these 2017 guidance documents state that they "*aim[s] to help Developers and consultants alike prepare good quality Environmental Impact Assessment Reports and to guide competent authorities and other interested parties as they review the Reports. It focuses on ensuring that the best possible information is made available during decision-making*".

265 Under "Climate change mitigation: Project impacts on climate change" [79] on page 39 of the EIA report writing guidance, it states:

> *"The assessment should take relevant greenhouse gas reduction targets at the* ***national, regional, and local levels*** *into account, where available. The EIA may also assess the extent to which Projects contribute to these targets through reductions, as well as identify opportunities to reduce emissions through alternative measures."*

266 Whilst for cumulative effects[80] at page 50:

> *"[They] can arise from … the interaction between all of the different Projects in the same area;"*
>
> *"… can occur at different temporal and spatial scales. The spatial scale can* ***be local, regional or global****, while the frequency or temporal scale includes past, present and future impacts on a specific environment or region.*" (our emphasis)

267 The guidance is promoted by the EU and identifies that Competent Authorities reviewing the EIA Report and using the information for decision-making, as one of its target audiences.[81]

From the same official webpage for the EIA Directive, further 2013 guidance is provided on "*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*". This guidance predates the 2014 Directive and was produced during the time

[redacted]

[79] PDF page 39

[80] PDF page 52

[81] See "HOW TO USE THIS GUIDANCE DOCUMENT" section

of the 2011 EIA Directive "DIRECTIVE 2011/92/EU". The guidance was implemented for the European Commission under Study Contract No 07.0307/2010/580136/ETU/A3 with Members of the Commission Group of EIA/SEA National Experts and staff from three Directorate-General of the Commission[82]. It reflects the view of the Commission services of the best EIA practice, including those with transposed national regulations like the UK.

268 Section 4.4.2 of this guidance states:

> *"Judging an impact's magnitude and significance must be context-specific. For an individual project — e.g. a road project —* ***the contribution to GHGs may be insignificant on the global scale, but may well be significant on the local/regional scale, in terms of its contribution to set GHG-reduction targets.****"* (my emphasis)

I am concerned that the Applicant claims that the results of its appraisal of differential emissions against national budgets reveals an insignificant effect against national carbon budgets. The guidance rightly suggests that carbon emissions assessed at a local/regional scale may well be significant, as shown in my Contextualisations in the main text.

269 I have not been able to find any UK specific guidance relating to the EIA Regs that would provide different advice to the existing guidance on the official EU Commission webpage for the EIA Regs. It is therefore rational to apply guidance which was written to "*focus[es] on ensuring that the best possible information is made available during decision-making*" under the EIA Directive within the UK. Failure to not even consider such guidance, as is the case in the Environmental Statement, would be irrational.

[82] [redacted] The front-page states "This document benefited from Study Contract No 07.0307/2010/580136/ETU/A3, implemented for the European Commission by

> Milieu Ltd, Collingwood Environmental Planning Ltd and Integra Consulting Ltd. The main authors were Jennifer McGuinn and Guillermo Hernandez from Milieu Ltd; Ric Eales, William Sheate and Jonathan Baker from Collingwood Environmental Planning; and Jiri Dusik from Integra Consulting. Maria Partidario of the Technical University of Lisbon and Helen Byron of the Royal Society for the Protection of Birds/Birdlife UK provided advice. Additional contributions about climate change were collected during the JASPERS workshops (March-April 2012). The text was also revised by Jiri Dusik. Members of the Commission Group of EIA/SEA National Experts (in particular, Paolo Boccardi, Susanna Eberhartinger-Tafill, Paul Fortuin, Aurora Hernando Garcinuno, Anna Kieniewicz, Gabrielle McKeown, Koen Maertens, Tadhg O'Mahony, Martine Moris, Kees Van Muiswinkel, Rainer Persidski, Claire Piens, Matthias Sauer, Roel Teeuwen, Adrian Vecino Varela) and staff of the European Commission's Directorate-General for Climate Action (Vaidotas Kuodys, Sami Zeidan), Directorate-General for Humanitarian Aid and Civil Protection (Yordanka Mincheva, Thomas de Lannoy) and Directorate-General for Environment (Stephanos Ampatzis, Szilvia Bosze, Marco Fritz, Milena Novakova and Przemyslaw Oginski) also Contributed"

16 APPENDIX G: Relevant Representation, Dr Andrew Boswell (as submitted 24 August 2022)

Dr Andrew Boswell, Climate Emergency Planning and Policy

I am an independent environmental consultant specialising in climate science, policy, and law, and I object to the A66 Northern Trans-Pennine Project:

(1) The Environmental Statement (ES) does not comply with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ("**the 2017 Regulations**").

(2) Chapter 7 of the ES presents estimates of the greenhouse gas (GHG) emissions for assessment of significance of the scheme against the fourth, fifth and sixth carbon budgets. Only "scheme-only" estimates are given and assessed (eg the bottom line of Table 7-23, and the "net CO2" data in Table 7-24).

(3) One of the requirements of the 2017 Regulations is that the applicant must provide an environmental statement ("**ES**") including the cumulative impacts of the project and other existing and/or approved projects on climate change. The requirement can only be discharged by providing a separate cumulative assessment in the ES.

(4) The Institute of Environmental Management & Assessment (IEMA) "Assessing greenhouse gas emissions and evaluating their significance" guidance (February 2022) states that best EIA practice for GHGs uses multiple sources of evidence, and contextualises GHG assessment against local and regional carbon budgets. The IEMA guidance says comparison against national budgets is only of "limited value". The ES does not follow this guidance, and instead makes a sole assessment of significance against the entire UK economy carbon budget.

(5) The very large construction stage emissions of 518,562 tCO2e [Table 7-21] have been omitted from the cost side of the BCR calculations (3.8 Combined Modelling and Appraisal Report, page 148). These would amount to over £130,000,000 at the 2025 government carbon valuation increasing the cost side to at least £880m. The value of cumulative carbon emissions from the scheme has not been used in the benefit side of the BCR calculations, because no cumulative assessment has been done.

(6) The existing adjusted BCR of 0.92 is an investment hard to justify. It should be recalculated for the issues above, which would reduce it further.

(7) We are in a climate emergency, and recent record-breaking global heating and drought in the UK, Europe and around the world demonstrate that it is a crisis of ever-increasing dimensions. The scheme increases carbon emissions, and cannot be justified even within the scope of UK climate legislation, especially when properly contextualised by EIA best practice. No scheme increasing carbon emissions on this scale, and at such a poor BCR, can be justified within the planning balance.

(8) However, as a scientist in the good company of many others including Professor Sir David King , former UK Government's Chief Scientific Advisor (see his commentary on the Intergovernmental Panel on Climate Change 6th Assessment report "The final warning bell" at www.ccag.earth), I go further and call out the Government targets, policies including the out-of-date NPSNN as being wholly insufficient to the scale of the crisis. The scheme cannot be justified given the very clear moral grounds of its impacts on future beings.

17 APPENDIX H: RESUME, Dr Andrew Boswell

I am a retired scientist and environmental consultant, working at the intersection of science, policy, and law, particularly relating to ecology and climate change.

- Undergraduate degree, BSc 1977, 1st class honours, Chemistry, Imperial College London
- Postgraduate, DPhil 1981, Oxford University, supervisor Professor R J P Williams, FRS, in Structural Biology, protein binding sites and dynamics
- 1984-1993, software engineering, testing, simulation systems for high-level design and logic synthesis of Very Large Scale Integrated (VLSI) circuits
- MSc, 1994, Parallel Computing Systems, University of the West of England
- 1995-2006, Manager high-performance and computing service across science departments at the University of East Anglia (UEA). System management and scientific modelling including climate modelling.
- 2005-2017, Green Party Councillor and sometimes group leader, Norfolk County Council and Norwich City Council
- 2017-2022, Climate Emergency Policy and Planning. CEPP is my own consultancy to promote the necessary rapid response to the Climate Emergency in mainstream institutions, such as local authorities and government, through the lenses of science, policy, and litigation. Expert contributor to the proposed UK Climate and Ecology Bill[83]. Foundation for Integrated Transport[84]fellowship on "*Exposing the flaws in carbon assessment and transport modelling for road schemes*." Interested party and expert witness on many current UK infrastructure planning examinations[85]. Climate and science-based litigation on three schemes[86]: three judicial reviews launched in the London High Court in summer and autumn 2022.

[redacted]

[84] [redacted]

[85] including A38 Derby Junctions; A417 Missing Link; A57 Link Road; A303 Stonehenge; A47 Blofield to North Burlingham; A47 North Tuddenham to Easton; A47 -A11 Thickthorn Junction; A47 Wansford to Sutton; A66 Northern Trans-Pennine Project; A720 Sheriffhall Roundabout, Edinburgh; Net Zero Teesside; Drax Bioenergy with Carbon Capture and Storage Project

[86] A47 Blofield to North Burlingham; A47 North Tuddenham to Easton; A47 -A11 Thickthorn Junction