CASE REF: APP/U3100/V/23/3326625.

LAND BETWEEN A34 MILTON INTERCHANGE
TO
B4015 NORTH OF CLIFTON HAMPDEN

PROOF OF EVIDENCE

(Carbon Emissions and Financial Viability**)**

Topic 1 – Need for and Benefits of the Scheme

Topic 8 - Climate Change and Carbon Emissions

Topic 14 – Other Policy Matters and Planning Balance

Ng Chien Xen

for

NEIGHBOURING PARISH COUNCIL JOINT COMMITTEE (NPC-JC)

26 January 2024.

Introduction

1 I am a transport economist with experience advising governments and companies on the business cases of large infrastructure projects. I have also worked on infrastructure costs on a number of regulatory price reviews, with a recent focus on estimating the impact of inflation on costs. In addition, my analysis has been submitted to courts and tribunals in the context of antitrust cases. My CV is provided in appendix 1.

2 I have been asked by the NPC-JC to assess the carbon emissions and financial viability of the HIF1 scheme. The views expressed in this report are my own.

Carbon emissions

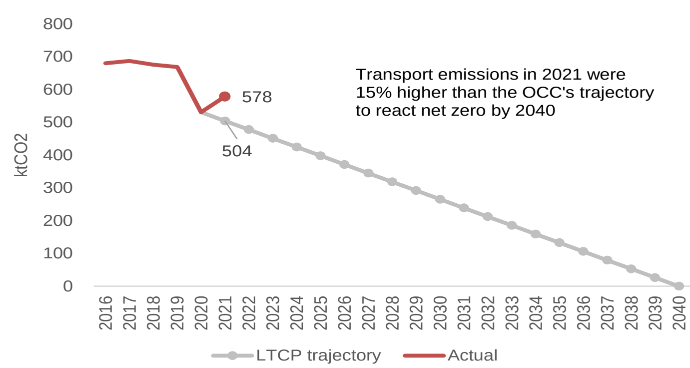
The OCC's climate targets are challenging; current evidence suggests a significant risk of missing these targets.

3 The LTCP targets reducing current Oxfordshire car trips by a quarter in 2030, a third by 2040, and a net-zero transport network by 2040. HIF1 may be consistent with these targets if significant emissions and traffic reductions can be identified elsewhere in Oxfordshire.

4 The latest 'LTCP monitoring report' shows that to reach a net-zero transport network by 2040[1] the emissions reduction achieved in 2020 due to lower travel demand during the pandemic needs to be maintained, with further reductions each year.

5 However, Figure 1, which uses the OCC's methodology and the most recently available data, shows actual emissions increased in 2021 and is around 15% higher than the trajectory set out by the OCC; the methodology is available in appendix 2.1.

Figure 1 Transport carbon emissions in South Oxfordshire and the Vale of White Horse: actual vs. net zero trajectory



[1] Appendix 1 tab1. OCC (2023), 'Local transport and connectivity plan—monitoring report 2022-2023', July, Figure 3 page 11

Source: LTCP monitoring report[2] and DESNZ.[3]

6 Similarly, the number of car trips increased by 4.5% from 2019–2022; however, a 25% reduction by 2030 is required.

7 While there is uncertainty over how emissions and travel demand will evolve post-pandemic, the evidence above suggests that Oxfordshire will not achieve its climate targets. This is consistent with the Climate Change Committee's (CCC) June 2023 report to parliament, which states that without policy action traffic is likely to increase beyond the CCC's decarbonisation pathway.[4]

<u>HIF1's emissions have been underestimated by approximately a factor of 4, and the impact on local carbon budgets have not been assessed.</u>

8 Policy 27 of the LTCP requires that the OCC assesses the impact of HIF1 on Oxfordshire's carbon budgets, taking into account embodied, operational and user emissions. However, the OCC's assessment of HIF1's emissions is not compliant with this policy for two key reasons.

9 First, the OCC's approach to quantifying user emissions is flawed. It finds that road user emissions will fall if HIF1 proceeds compared to if it did not.[5] This is because the OCC has assumed, without justification, that emissions will increase at the same rate regardless of whether HIF1 proceeds.[6] This is unlikely to be correct since increasing road capacity leads to more car trips (known as 'induced demand'),[7] and therefore greater emissions.

10 I estimate that HIF1's user emissions up to 2050 are around 326ktCO2, taking into account the expected uptake of electric vehicles. When added to the OCC's estimates of embodied

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[2] Appendix 3 Tab 1 OCC (2023), 'Local transport and connectivity plan—monitoring report 2022-2023', July, Figure 3,
[3] Appendix 3 Tab 8. DESNZ (2023), 'UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2021', July, 'Local Authority territorial carbon dioxide (CO2) emissions estimates within the scope of influence of Local Authorities 2005-2021' See Core Documents.
[4] Appendix 3 Tab 5. Climate Change Committee (2023), 'Progress in reducing emissions. 2023 report to parliament', p.113,). See Core Documents.
[5] AECOM (2021), Environmental Statement Chapter 15 – climate', para. 15.10.11 (accessed 16 December 2023). See Core Documents.
[6] AECOM (2021), Environmental Statement Chapter 15 – climate', para. 15.5.3, (accessed 16 December 2023). In this paragraph, it is explained that this assumption was used because 'existing plans for urban development in the area present methodological challenges for the traffic model when considering 2034 emissions' without providing further explanation as to what these limitations are. It also states that this assumption was agreed in consultation with the OCC and Wood Group UK Limited. See Core documents
[7] The evidence for this was recently reviewed and confirmed by a recent study commissioned by the DfT. See WSP, RAND and DfT (2018), 'Latest evidence on induced travel demand: an evidence review', Rand Europe for Department for Transport May 2018 (can be accessed at " See Core Documents.

emissions, HIF1's overall emissions are around 481ktCO2. This significantly exceeds the OCC's estimate of around 124ktCO2, an underestimate by a factor of 3.9.[8,9]

11 Second, the OCC has not assessed HIF1's contribution to Oxfordshire's carbon budget. Based on research by the Tyndall Centre at the University of Manchester, I have compared HIF1's emissions (orange area) to local carbon budgets (orange and grey area) in Figure 2 below.[10] It shows that HIF1 will consume a significant proportion of the carbon budget—around 20%.[11] This is equivalent to the annual car emissions of around 350,000 South Oxfordshire and Vale of White Horse residents.[12.]

12 Instead, the OCC has only compared HIF1's emissions to national carbon budgets. It finds that HIF1 uses up only 0.0077% of the carbon budget from 2023–2027, and reduces emissions in the following years; the OCC concludes that the greenhouse gas effects are 'not significant'.[13] However, comparing the emissions of HIF1, a local infrastructure project, to the national carbon budget—all the emissions from all sources in the whole UK economy—is fundamentally flawed. It neglects the impact HIF1 has on Oxfordshire's own carbon reduction targets. The CCC has emphasised that strategic policy and practical action at local levels are critical to achieving the pathway towards net zero.[14]

Figure 2 Impact of HIF1 on South Oxfordshire and the Vale of White Horse's remaining transport carbon budget

[8] I have calculated this by adding embodied emissions (155ktCO2) to operational emissions (OCC's calculation shows a reduction of 5,752tCO2 over 5 years, or 1,150tCO2 per year) up until 2050. AECOM (2021), Environmental Statement Chapter 15 – climate', table 15.15, See Core documents

[9] Further details are provided in appendix 2.3.

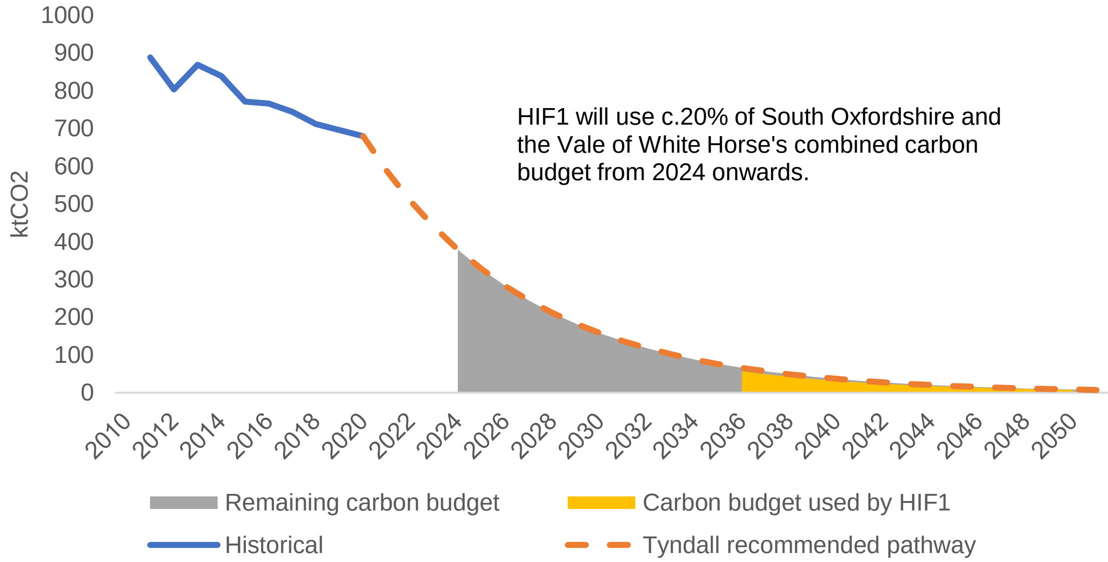
[10] Further details are provided in appendix 2.2.

[11] Or 10% of Oxfordshire's remaining transport carbon budget, which is still significant. However, for reasons set out in appendix 2, it is more appropriate to consider South Oxfordshire and the Vale of White Horse's carbon budget, rather than for Oxfordshire as a whole.

[12] Appendix 3 Tab 9 CREDS, 'Place-based carbon calculator', (. Average of 2019 car emissions for South Oxfordshire and the Vale of White Horse.

[13] AECOM (2023) Environmental Statement Chapter 15 – Climate', September, Table 15.15, (accessed 29 December 2023) See Core documents.

[14] Appendix 3 Tab10. Climate Change Committee (2020), 'Local authorities and the sixth carbon budget', December, p.16, See Core documents



Source: Tyndall Centre[15] and author's calculations.[16]

<u>Proceeding with HIF1 leads to a significant risk that Oxfordshire's climate targets cannot be met</u>

13 It is unlikely that HIF1's emissions could be absorbed by identifying emissions reductions in other areas. To illustrate this, my analysis suggests HIF1's emissions would significantly exceed the potential carbon savings from Oxfordshire achieving its cycling targets.[17] Moreover, as described above, Oxfordshire is not currently on track to achieving its climate and transport targets.

14 The CCC is clear: 'constraining the growth in vehicle mileage is vital to reducing emissions'[18] and that road-building projects should be reviewed to ensure that they 'do not lock in unsustainable levels of traffic growth' and 'permit schemes only if they can meaningfully support cost-effective delivery of Net Zero'.[19] My analysis suggests HIF1 does not meet these criteria.

Financial viability

[15] Tyndall Centre, 'The Tyndall Carbon Budget Tool', (can be accessed - "https://carbonbudget.manchester.ac.uk/reports/combined/") (accessed 16 December 2023). The figure can be recreated by selecting both the Vale of White Horse and South Oxfordshire in the 'create a new combined authority' tool.
[16] See appendix 2.4 for further details and sensitivities.
[17] See appendix 2.5 for further details.
[18] Appendix 3 Tab 11 CCC (2020), 'Local authorities and the sixth carbon budget', 2023).
[19] Appendix 3 Tab12. CCC (2023), 'Progress in reducing emissions. 2023 report to parliament', June, p.420, recommendation R2023-148,

15 HIF1 is unlikely to be financially viable within the current funding envelope.[20] This is for three key reasons.

16 First, the budget for HIF1, set in early 2022, failed to anticipate rising inflation, and allocated only £27m for inflation.[21] My analysis, based on the BCIS All-in Tender Price Index,[22] suggests an inflation allowance of £62m is required, more than double what is available.[23]

17 Second, there is insufficient allowance for risk. While a £52m risk and contingency fund is included, my analysis indicates this equates to only a P62 degree of certainty using the DfT's TAG framework,[24] meaning that there is only a 62% probability that HIF1 can be completed in the given budget. Typically, a P80 risk allowance is used instead[25]—around £80m in the case of HIF1.

18 Taking these two factors together, I estimate the overall cost of HIF1 to be £366m, which significantly exceeds the current available funding of £296m.[26]

19 Third, HIF1 is unlikely to be deliverable within the current funding availability period. Around 74% of HIF1's funding is from Homes England, which is available only up to 31st March 2026.[27] However, around half of HIF1's expenditure is 2026 and 2027, as shown Figure 3 below. The OCC has acknowledged that HIF1 is a significant financial risk because the scheme now cannot be completed before March 2026, and either will need to be stopped, or an extension to the funds and timeline will be needed.[28]

Figure 3 HIF1 expenditure profile over time

[20] Financial viability is a relevant planning consideration. See for example a recent CPO decision which explains that because it cannot be concluded that a scheme is financially viable, it cannot be shown conclusively that the CPO is justified in the public interest. See the Compulsory Purchase Order decision of case APP/PCU/CPOP/Z5060/3278231, dated 4 October 2022, Paras. 372–374. Furthermore, The CPO Guidance states: "The greater the uncertainty about the financial viability of the scheme, the more compelling the other grounds for undertaking the compulsory purchase will need to be." Department for Levelling Up, Housing & Communities (2018), 'Guidance on compulsory purchase process and The Crichel Down Rules', para. 106

[21] Oxfordshire County Council (2023), 'Didcot Garden Town Housing Infrastructure Fund (HIF1). Amendments to the grant determination agreement', para. 26, 15 March, See Core Documents.

[22] Appendix 3 Tab 13 This BCIS Tender Price Index measures the trend of contractors' pricing levels in accepted tenders at commit to construct, i.e. cost to client. BCIS (2022), 'BCIS tender price index panel', 15 March,

[23] See appendix 2.6 for further details.

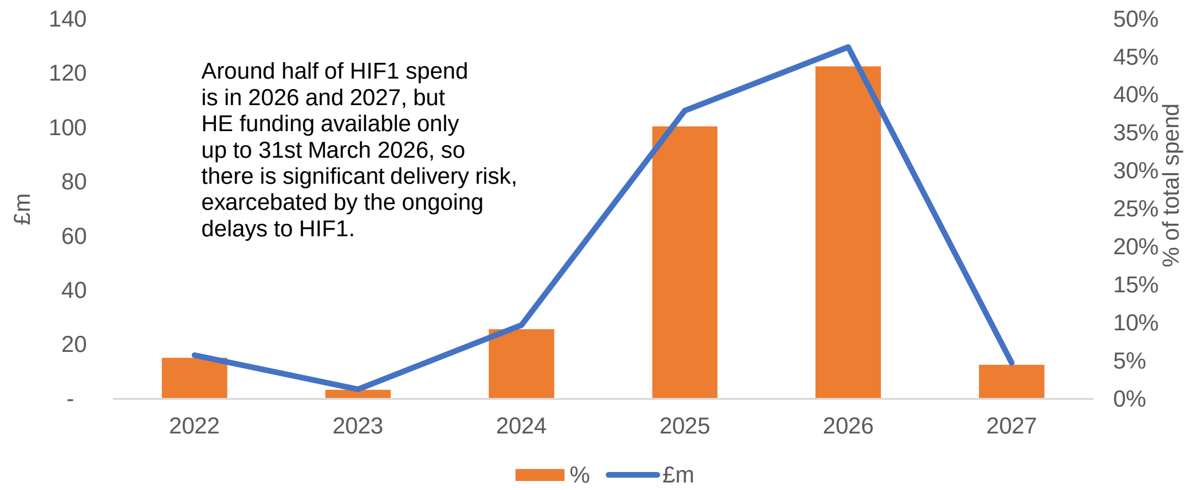
[24] Appendix 3 Tab 14 DfT (2023), 'TAG: optimism bias workbook', 30 November, I used the 'Road cost and schedule' and assumed that the scheme was at the Full Business Case (FBC) stage.

[25] Appendix 3 Tab 15 RICS (2015), 'RICS professional guidance, UK. Management of risk', section 4.1.3.1,)

[26] Appendix 3 tab 7. OCC (2022), 'Didcot Garden Town Housing Infrastructure Fund (HIF) Revised Grant Determination Agreement', 21 June, para. 20, referred to above at note 21 (accessed 18 December 2023).

[27] Although there appears to be assurance that 'risks to the delivery time frame caused by exceptional circumstances outside the Council's direct control will be mitigated'. OCC (2022), 'Didcot Garden Town Housing Infrastructure Fund (HIF) Revised Grant Determination Agreement', 21 June, paras. 2 and 20). See Core Documents

[28] Appendix 3 Tab 3 OCC (2023), 'Capital programme update and monitoring report', 17 October, para. 78,



Source: OCC.[29]

Conclusion

20 In conclusion, the HIF1 scheme contravenes the LTCP. The OCC has not assessed its impact on local carbon budgets, and proceeding will likely mean that South Oxfordshire and the Vale of White Horse cannot stay within its carbon budget under the Paris agreement, as required by the LTCP. It also increases car trips at a time when the OCC is seeking to reduce them. Moreover, it is not deliverable within the current funding envelope, and presents a significant financial risk to the OCC, unless the funding settlement is re-negotiated. For these reasons, the HIF1 scheme must be rejected.

[29] Appendix 3 Tab 2 .OCC, 'Capital programme 2022/23 to 2032/33', p.7, [Can be accessed on OCC site at https://mycouncil.oxfordshire.gov.uk/documents/s64282/CA_JAN2423R08%20Section%205.4%20Capital%20Programme%20Cabinet%20Jan%2023.pdf] (accessed 28 December 2023).

Appendix 1: CV

I work as an economist at Oxera, a European economics, finance and data science consultancy. I have significant experience preparing business cases, including on HS2 and Northern Powerhouse Rail and in helping companies on their approach to investment appraisals. I am also experienced in quantifying the emissions of infrastructure projects and environmental policies. In addition, I have worked on a number of regulatory price controls in the UK and across Europe, as well as their subsequent appeals before courts and the Competition and Markets Authority. I graduated with a first-class degree in economics from the University of Cambridge.

I have set out my selected project experience below.

- Advice to a large European rail infrastructure manager on the impact of input price inflation on their cost base (2023).
- Advice to a large UK water company on their approach to investment appraisals, including the valuation of carbon and other benefits and the estimation of whole-life asset costs (2021-22).
- Advice to ACI Europe on the fare, demand and carbon impacts of the European Commission's Fit for 55 proposals (2022).
- Advice to the Sunday Times on the economic case for HS2, including how its economic case has changed over time and how its value for money has been affected (2023).
- Advice to the General Aviation All Party Parliamentary Group the economic case for EGNOS, a satellite-based augmentation system that enables precision aircraft landings (2022–23).
- Advice to the Oakervee Review on the economic and strategic case for HS2 (2019).
- Advice to the DfT and for a Dispatches documentary on the value for money of Northern Powerhouse Rail (2019).
- Advice to a range of regulated utilities, including electricity, gas and water companies, in the UK and Europe in the context of regulatory price reviews (2018-22).
- Advice to a range of stakeholders within the aviation industry on antitrust and state-aid matters (2018-23).

My publications include:

- Ng. C.X., Davidson. J and Granatstein. M. (2022), ‘The ‘Fit for 55’ proposals: effects on aviation and the role of rail’, Papers and Proceedings of the European Transport Conference, Milan.
- Horncastle, A., Duffy, J., Ng, C.X., Krupa, P. (2021), ‘Benchmarking in the European Water Sector’, In: Ray, S.C., Chambers, R.G., Kumbhakar, S.C. (eds) Handbook of Production Economics. Springer, Singapore[30].
- Ng, C.X. (2019), ‘What is the impact of new rail stations on deprivation?’ Papers and Proceedings of the European Transport Conference, Dublin.
- Elvery, S., Ng, C.X. and Shepherd, S (2019), ‘What is the economic and financial case for new or local regional rail lines?’ Papers and Proceedings of the European Transport Conference, Dublin.

[30] Hyperlink disabled~https://doi.org/10.1007/978-981-10-3450-3_42-1

Appendix 2: Methodological note

2.1 This annex sets out the methodology and detail behind the results presented in this report. The files to reproduce the analysis can be found at[31]. Figure 1

21 The actual emissions shown in Figure 1 were sourced from DESNZ's dataset on historical emissions by local authority, which is available until 2021.[32] This is more up-to-date than the data used in the LTCP monitoring report, where historical data is only available until 2020. As a result, the recommended emissions in 2021 as set out in the LTCP monitoring report can be compared against actual emissions in 2021.

22 In the monitoring report, the OCC appears to have calculated the trajectory of carbon emissions using a linear extrapolation from the last available year of historical data to zero emissions by 2040. I have used the same approach to calculate the LTCP trajectory in Figure 1.

2.2 Calculation of carbon budgets

23 While policy 27 of the LTCP specifies that the emissions of infrastructure projects should be compared to Oxfordshire's carbon budget, which the OCC defines as the emissions that can still be emitted while staying within the Paris agreement, it does not specify precisely which carbon budgets should be used. To the best of my knowledge, the CCC does not publish a carbon budget by local authority. Therefore, I have used the carbon budgets calculated by the Tyndall Centre at the University of Manchester.

24 The Tyndall Centre calculates carbon budgets based on the remaining carbon that can be emitted whilst being consistent with the Paris agreement.[33] At least 27 local authorities, including Manchester, Sheffield and Leeds, have used the tool to set climate goals.[34] This work was funded by the Department for Business Energy and Industrial Strategy (BEIS, now DESNZ).[35]

The appropriate carbon budget to be used

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[31] Hyperlink disabled~ https://github.com/chienxen/hif1_carbon_cost

[32] DESNZ (2023), 'UK local authority and regional greenhouse gas emissions national statistics, 2005 to 2021', July, 'Local Authority territorial carbon dioxide (CO2) emissions estimates within the scope of influence of Local Authorities 2005-2021' See Core Documents.

[33] Appendix 3 Tab 4 For further details on the Tyndall Centre's methodology, see Tyndall Centre (2019), 'Setting climate commitments for South Oxfordshire. Quantifying the implications of the United Nations Paris Agreement for South Oxfordshire' Appendix), December, [.

[34] Appendix 3 Tab 4. Tyndall Centre (2019), 'Tyndall Carbon Targeter helps local authorities respond to their Climate Emergency'(accessed 15 December 2023).

[35] Appendix 3 Tab 16. Tyndall Centre (2019), 'About the project',

25 One consideration is whether carbon budgets specifically for the transport sector specifically or across all sectors (e.g. including heating, electricity and gas) should be used. I note that the LTCP targets a net zero transport network by 2040,[36] and that the LTCP monitoring report sets out the trajectory of carbon emissions for the transport sector specifically.[37] I also note that the CCC sets a carbon budget for surface transport specifically in its Sixth Carbon Budget, in addition to a national-level budget.[38] Furthermore, if a carbon budget considering all sectors is used, it assumes that HIF1's emissions can be offset by emissions reductions in other sectors, e.g. in domestic heating. However, other sectors are also facing highly challenging decarbonisation pathways,[39] and so it seems unlikely that this assumption is valid. For these reasons, I consider that using a transport sector-specific carbon budget is most appropriate.

26 Another consideration is whether to use carbon budgets for Oxfordshire as a whole, or for the South Oxfordshire and the Vale of White Horse districts specifically where HIF1 is most relevant. I note that the LTCP monitoring report considers transport emissions for each district individually. As such, it would be consistent to use combined carbon budget for the South Oxfordshire and the Vale of White Horse districts. Furthermore, if other districts are included, this means that South Oxfordshire and the Vale of White Horse would implicitly use up the carbon budget of other districts, when these other districts also face challenging decarbonisation pathways. For these reasons, I consider the carbon budgets for the combined South Oxfordshire and Vale of White Horse districts.

Calculating the relevant carbon budget based on the Tyndall Centre's research

27 The Tyndall Centre calculates carbon budgets for each local authority. It provides a recommended emissions pathway from 2020 onwards. However, these emissions are for all sectors combined, and the budget for the transport sector specifically is not provided.

28 I have calculated the remaining carbon budget by using the Tyndall Centre trajectory from 2024 onwards, which comes to 6.03MtCO2 for the South Oxfordshire and Vale of White Horse districts for all sectors. I note this is likely to overstate the remaining carbon budget as it assumes that the districts have managed to stay within their carbon budget from 2020–

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[36] Appendix 3 Tab 17. OCC (2022), 'Local transport and connectivity plan 2022 – 2050', July, p.7,
[37] Appendix 3 Tab 18. OCC (2023), 'Local transport and connectivity plan—monitoring report 2022-2023', July, Figure 3,
[38] CCC (2020), 'The sixth carbon budget. The UK's path to Net Zero', December, chapter 1, Link disable~https://shorturl.at/fvD24.(accessed 15 December 2023). See Core Documents.
[39] For example, the CCC notes that the buildings sector has not decarbonised at the pace of the rest of the economy. CCC (2020), 'Local authorities and the sixth carbon budget', December, section 2, See Core Documents. ..

2023, although evidence suggests that they have likely exceeded the carbon budget in these years.[40]

29 To calculate the transport share of the carbon budget, I multiply transport's share of emissions with the overall carbon emissions. According to the Environmental Change Institute at the University of Oxford, this is 31% and 50% for South Oxfordshire and the Vale of White Horse respectively.[41] This leads to a transport carbon budget of 2.41MtCO2 for the two districts combined.

2.3 Estimating HIF1 road user emissions

30 Calculating the user emissions from a road scheme is a complex exercise. It requires estimating of the additional car miles travelled as a result of the scheme, known as 'induced demand'. This in turn depends on a range of factors, such as the improvement in travel times as a result of the scheme and whether there is a high level of congestion and suppressed demand.[42] In the case of HIF1, according to research by the Department for Transport,[43] the current high levels of congestion[44] suggests that increasing road capacity would lead to high levels of induced demand, and therefore larger road user emissions.

31 Carrying out a detailed exercise requires modelling inputs that I do not have access to and is beyond the scope of this report. Therefore, I have used a high-level approach to estimate HIF1's road user emissions. I have assumed that HIF1 will have the same road user emissions per £m spent as the average of historically delivered road schemes and adjusted these estimates for expected improvements in vehicle fuel efficiency and battery electric vehicle uptake. While this will not yield a precise estimate of HIF1's road user emissions, it does provide an estimate of the likely order of magnitude, which can then be compared to Oxfordshire's carbon budget. Furthermore, my estimate is likely to understate the true level of user emissions if the level of congestion and suppressed demand in the HIF1 scheme area is higher than those of historically delivered road schemes.

32 According to research by Transport for Quality of Life (TfQL), a transport policy consultancy, each £m of expenditure (in 2020 prices) was associated with 613tCO2 in a scheme's

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[40] See Figure 1.
[41] Appendix 3 Tab 6 Environment Change Institute (2021), 'Pathways to a zero carbon Oxfordshire', p.67, link disable~https://shorturl.at/DMVZ1 (accessed 19 December 2023).
[42] Appendix 3 Tab 19, DfT (2018), 'Latest evidence on induced travel demand: an evidence review', May,
[43] *Ibid.*
[44] OCC (2023), 'LPA Statement of case annex 1', 17th July, para. 89, See Core documents. Link disabled~https://shorturl.at/dejqJ (accessed 19 December 2023).

opening year.[45] This is based on an analysis of 63 post-opening project evaluation (POPE) reports, which includes total carbon emissions in the scheme opening year.[46]

33 I apply these figures to HIF1's cost. I first remove the inflation allowance from HIF1's costs to ensure that they are in real rather than nominal terms,[47] before converting it to the same price base (2020 prices) as the TfQL figure above. This gives an estimated 145ktCO2 of emissions in the opening year, assumed to be 2026.[48]

34 I follow TfQL's approach of assuming induced traffic increases at around a rate of 2% of opening traffic per year, starting the year after the scheme is completed, rising to 24% 12 years after scheme completion.[49] This is based on research comparing the changes in long-term traffic flows from road schemes compared to regional and county-level traffic trends, as well as research by the DfT.[50]

35 The carbon emissions per car mile travelled is expected to decline over time due to improving vehicle efficiency and uptake of electric vehicles. I adjust my figures for these trends using the core scenario in the DfT's National Road Traffic Projections (NRTP) for the South East region, which is based on the latest government projections of road traffic demand and includes 'firm and funded' government policy.[51]

36 On this basis, I estimate road user emissions arising from HIF1 to be 326ktCO2 in total by 2050. As explained above, this assumes that HIF1's user emissions intensity will be similar to those of historical schemes (before adjustments for vehicle efficiency and EV uptake), which may be an underestimate given the high levels of congestion and suppressed demand in the area.

37 I add my estimated road user emissions to embodied emissions estimated by the OCC (155ktCO2).[52] This leads to an overall estimate of 481ktCO2.

38 To put these figures into perspective, I have compared these figures to the annual average car emissions of South Oxfordshire and Vale of White Horse residents. Research by the

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45 Appendix 3 Tab 20. Transport for Quality of Life (2020), 'The carbon impact of the national roads programme', July, p.21,
46 *Ibid.*, p.18.
47 The £296m scheme cost includes an inflation allowance of £26.653m. Removing the allowance, the cost of HIF1 in real terms is £269m. I have assumed that this is in 2022 prices based on the fact that the grant determination agreement was revised in 2022, although the price base for HIF1 has not been explicitly stated to my knowledge. OCC (2023), 'Didcot Garden Town Housing Infrastructure Fund (HIF1). Amendments to the grant determination agreement', para. 26, 15 March, See Core Documents
48 In line with the end of the current funding availability period.
49 Appendix 3 Tab 20 Transport for Quality of Life (2020), 'The carbon impact of the national roads programme', July, pp.21–22,
50 *Ibid.,* p.21.
51 Appendix 3 tab 21 DfT (2022), 'National Road Traffic Projections 2022', para. 3.1,
52 Appendix 3 Tab 2. AECOM (2021), 'Didcot Garden Town HIF1 Scheme. Chapter 15 – climate',).

Centre for Research into Energy Demand Solutions (CREDS) and ONS statistics show that this is around 1,378kgCO2 per person annually.[53] Therefore, HIF1's emissions of 481ktCO2 are equivalent to the annual car emissions of around 350,000 local residents.

2.4 Comparing HIF1 emissions to local carbon budgets

39 Given the emissions estimate of 481ktCO2 and a carbon budget of 2.41MtCO2, I estimate HIF1 will consume 20% of South Oxfordshire and the Vale of White Horse's remaining transport carbon budget.

40 I have conducted two sensitivity analyses to check the robustness of my results. First, I calculate road user emissions under a scenario with a high and fast uptake of electric vehicles (the 'vehicle-led decarbonisation scenario' in the DfT's NRTP).[54] Second, I compare HIF1's emissions against Oxfordshire's transport carbon budget (rather than only the South Oxfordshire and Vale of White Horse districts). The results are shown in Table 1 below.

41 The results show that a significant proportion of carbon budgets will still be consumed, ranging from 5–11%, suggesting that HIF1 is not compatible with decarbonisation ambitions even under different definitions of the carbon budget and more ambitious electric vehicle uptake scenarios.

Table 1 Sensitivity analysis

	Scenario	
	Core	**Rapid EVs uptake**
Embodied carbon emissions	155	
Emissions from induced demand	326	121
Total emissions	481	275
South Oxfordshire and Vale of White Horse transport carbon budget	2,413	
% of South Oxfordshire and Vale of White Horse's carbon budget consumed by HIF1	20%	11%
Oxfordshire's transport carbon budget	5,021	
% of Oxfordshire's carbon budget consumed by HIF1	10%	5%

[53] Appendix 3 tab 22. The CREDS place-based carbon calculator shows that average annual car emissions for South Oxfordshire and the Vale of White Horse are 1,470kgCO2 and 1,280kgCO2 respectively (based on 2018 data, the most recently available year). I weight these by the population of the respective districts as of the 2021 census. See CREDS, 'Place-based carbon calculator',; Appendix 3 Tab 23. ONS (2022), 'How the population changed in South Oxfordshire: Census 2021',) and Appendix 3 Tab 24. ONS (2022), 'How the population changed in the Vale of White Horse: Census 2021', link disabled~https://shorturl.at/lxzKL (accessed 28 December 2023).

[54] Appendix 3 Tab 25 DfT (2022), 'National Road Traffic Projections 2022', paras. 3.40–3.41,.

Note: all emissions figures in ktCO2,

Source: author's calculations.

2.5 Comparing HIF1 emissions savings to potential carbon reduction to shift to cycling.

42 To evaluate whether HIF1 would affect whether Oxfordshire is able to reach its climate targets, I compare HIF1's emissions against the potential savings from Oxfordshire meeting its cycling targets. Shifting travel away from private vehicles towards cycling is an important part of the OCC's strategy for decarbonising transport, as well as improving public health and wellbeing.[55]

43 The OCC aims to increase the number of cycling trips from 600,000 trips per week to 1 million trips per week by 2030.[56] The potential carbon savings from this depends on how of this is achieved by shifting travellers away from other more polluting modes, such as car travel, with the largest carbon saving achieved if all of the increase comes from people switching away from car travel.

44 Estimating the degree of 'modal shift' from car to cycling is a difficult exercise that is outside the scope of this report. Therefore, to obtain an order of magnitude estimate of the potential carbon savings, I assume that the increase in cycling comes entirely from people switching away from car travel.

45 The OCC intends to achieve its target through policies that prioritise walking and cycling and improving walking and cycling infrastructure.[57] These policies would gradually increase cycling over time, meaning that any carbon emissions savings would be realised over a period of time. For the purposes of quantifying these savings, I assume that they would be achieved linearly between 2023 and 2030.

46 According to the DfT's analysis, the average cycle trip is around 3.6 miles. This means that the shift towards cycling could displace up to around 75m miles of car travel annually by 2030. I then estimate the carbon savings my multiplying the displaced car miles with annual forecasts of the carbon emissions per car mile in the South East according to the Core scenario in the DfT's National Road Traffic Projection, which takes into account the

[55] Apprendix3 Tab26. OCC (2022), 'Local transport and connectivity plan 2022 – 2050', July, p.23,.
[56] Appendix3 Tab27. OCC (2022), 'Local transport and connectivity plan 2022 – 2050', July, p.7,.
[57] OCC (2022), 'Local transport and connectivity plan 2022 – 2050', July, See the walking and cycling chapter, p.35 onwards. See Core Documents.

improvement in vehicle efficiency and the uptake of electric vehicles under the Government's firm and funded policies.[58]

47 On this basis, I estimate that the shift to cycling under the OCC's targets would reduce carbon emissions by 292ktCO2 by 2050. As mentioned above, this assumes that the shift towards cycling comes entirely from displaced car travel, when some of these could come from other modes (e.g. displacing bus travel) or are extra trips made by residents. Therefore, the emissions savings are likely to be smaller. Despite this, the emissions savings from cycling is significantly less than the 481ktCO2 of emissions if HIF1 is built.

48 This suggests that the emissions from HIF1 cannot be sufficiently offset by identifying reductions in emissions elsewhere in the transport sector.

2.6 Financial viability

49 In this section, I set out the methodology underlying my analysis of the cost pressures facing HIF1. In page **Error! Bookmark not defined.**, I state that a funding envelope of £366m may be required. This is for two reasons.

50 First, the budget for HIF1 did not anticipate rising inflation; only £26.653m had been set aside to account for inflation, which is a c. 10% uplift on costs.[59] While the revised grant determination states that the inflation allowance was 'calculated against prevailing market indices', [60] it is not stated, to the best of my knowledge, what these indices are and what inflation rates were assumed.

51 However, the OCC has published the anticipated spending profile in its Capital Programme. Based on this, my analysis suggests that, in effect, an average annual inflation rate of around 2.3% had been assumed from 2022 to 2027. This is significantly less than the high inflation rates we have seen. For example, CPI inflation in 2022 averaged 9.1%.[61]

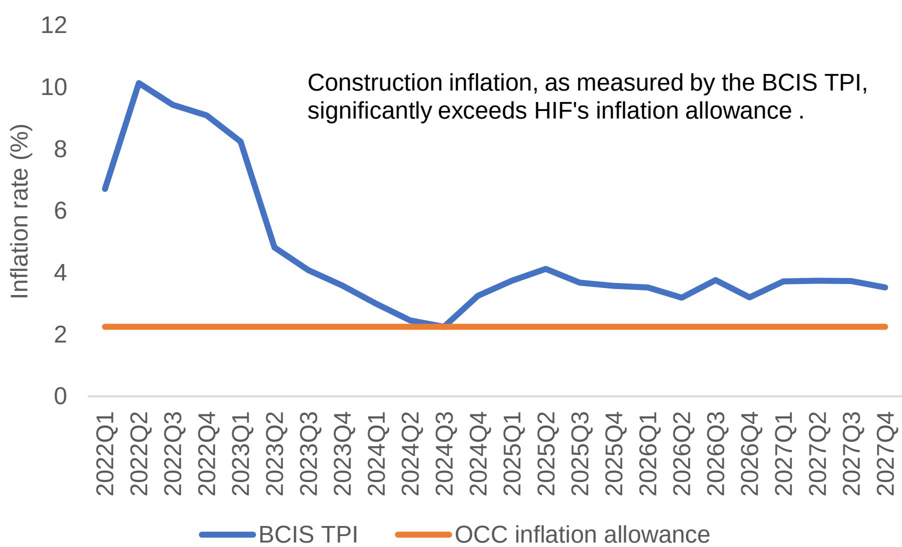
52 Inflation, as measured by the CPI, is not the most appropriate measure of construction inflation as the CPI is based on a basket of consumer goods that may not be relevant to construction, e.g. food. Therefore, I have used the BCIS All-in Tender Price Index (TPI), which measures the trend of contractors' pricing levels in accepted tenders at commit to

[58] Appendix 2 Tab 28. DfT (2022), 'National Road Traffic Projections 2022', para. 3.1, link disabled~https://shorturl.at/nyEL8 (accessed 19 December 2023).
[59] £26.653m/ (£296m – £26.653m) = 9.9%.
[60] Oxfordshire County Council (2023), 'Didcot Garden Town Housing Infrastructure Fund (HIF1). Amendments to the grant determination agreement', para. 26, 15 March, See Core documents
[61] ONS, 'CPI annual rate 00: all items 2015=100', [Can be accessed at Office for National Statistics – data & analysis for Census 2021] (accessed 28 December 2023).

construct (i.e. the point at which the client authorises the project team to start construction of the project).[62] This index is produced by BCIS, the Building Cost Information Service of the Royal Institution of Chartered Surveyors (RICS); I understand these indices are widely used to measure trends in construction prices. I note that other measures of construction inflation are also available (e.g. building cost indices). However, given that HIF1 would be delivered by competitive tender, using a TPI is more appropriate.

53 The BCIS publishes historical and forecast values of the TPI in its regular publications.[63] This is shown in Figure 4 below and compared against HIF1's assumed inflation rate. It shows that historical and forecast construction inflation significantly exceeds those assumed in HIF1.

Figure 4 BCIS TPI construction inflation rates vs. HIF1's inflation allowance



Source: BCIS[64] and author's analysis.

54 To calculate the impact of using more realistic inflation assumptions on HIF1's costs, I first strip out the inflation allowance in the £296m HIF1 funding envelope. Ideally, this would be carried out using the annual inflation profile that the OCC has used. However, this is not available to me. Therefore, I have stripped out impact of inflation assuming a 2.3% constant annual inflation rate from 2022 to 2027. I then overlay the BCIS TPI inflation profile. Based

[62] Appendix 3 Tab29. This BCIS Tender Price Index measures the trend of contractors' pricing levels in accepted tenders at commit to construct, i.e. cost to client. BCIS (2022), 'BCIS tender price index panel', 15 March,
[63] Appendix 3 Tab 29. This report has used BCIS (2023), 'Outlook for construction', slide 10,
[64] Appendix 3 Tab 29. BCIS (2023), 'Outlook for construction', slide 10,

on this, I calculate that an overall inflation allowance of around £62m[65] is required, a c.23% uplift on costs, compared to the £26.653m (c.10%) that is available.

55 Second, the contingency fund of £52.251m[66] is not sufficient according to industry standards. HIF1's base costs, i.e. excluding the inflation allowance[67] and contingency funds, are £217m. This means that the contingency funds represent an uplift of 24% on base costs. This corresponds to around a P62 level of confidence according to the DfT's optimism bias workbook for roads at the full business case stage.[68]

56 However, a higher level of certainty is typically used. For example, RICS recommends a P80 level of certainty, which corresponds to a 37% uplift on costs.[69] Similarly, the business cases for other large public infrastructure projects also use higher confidence levels; the funding envelope for HS2 Phase 1 is based on a P75 level of certainty,[70] although costs have now exceeded even this level of certainty.[71]

57 For HIF1 to be funded to a P80 level of certainty, I calculate that around £80m in contingency is required, as compared to the £52m that is available. This brings the overall cost of HIF1 to £366m[72] when combined with the impact of inflation. If HIF1 were to be funded to an even higher level of certainty, such as the P90 level, an overall funding envelope of £403m would be required. These figures are summarised in Table 2.

Table 2 HIF1 funding with updated inflation forecasts and increased contingency funding

Degree of certainty	Available funding (pre-inflation)	P62 + inflation	P80 + inflation	P90 + inflation
£m	296	331	366	403

Source: author's analysis.

[65] This assumes the level of risk funding that is available within the £296m funding envelope. However, as will be argued in the following paragraphs, the available risk funding.
[66] Oxfordshire County Council (2023), 'Didcot Garden Town Housing Infrastructure Fund (HIF1). Amendments to the grant determination agreement', para. 25, 15 March, See Core Documents
[67] Contingency is calculated on real costs, so I have stripped out the inflation allowance to calculate the contingency provided in percentage terms. DfT (2021), 'Updating the evidence behind the optimism bias uplifts for transport appraisals', 19 May, appendix D, See Core Documents.
[68] Appendix 3 Tab 30. DfT (2023), 'TAG: optimism bias workbook', 30 November,. I used the 'Road cost and schedule' and assumed that the scheme was at the Full Business Case (FBC) stage. The workbook provides the appropriate contingency at five percentage point intervals, e.g. P60 and P65. I have calculated the contingency uplift for the values in between using linear interpolation.
[69] Appendix 3 Tab 15. RICS (2015), 'RICS professional guidance, UK. Management of risk', section 4.1.3.1,)
[70] Appendix Tab 31.DfT (2020), 'Full business case. High Speed 2 Phase One', para. 2.17,
[71] Appendix 3 Tab 32. For example, see Civil Service World (2023), 'DfT perm sec admits HS2 now represents 'poor value for money', link disabled~https://shorturl.at/iCKNR (accessed 29 December 2023).
[72] £217m * 1.37 (P80 contingency) * 1.23 (inflation) = £366m.