

On behalf of the Claimant  
P Goodwin  
First Witness Statement  
Date: 23 October 2020; redacted 16 March 2021

**IN THE HIGH COURT OF JUSTICE**  
**CO/2003/2020**  
**QUEEN'S BENCH DIVISION**  
**PLANNING COURT**  
**BETWEEN:**

**R (on the application of)**  
**TRANSPORT ACTION NETWORK LIMITED**

**Claimant**

**-and-**

**THE SECRETARY OF STATE FOR TRANSPORT**

**Defendant**

**-and-**

**HIGHWAYS ENGLAND COMPANY LTD**

**Interested Party**

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**FIRST WITNESS STATEMENT OF PHIL GOODWIN**

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I, Phil Goodwin, BSc (Economics), PhD (Civil Engineering) FCILT, FIHT, [REDACTED]  
[REDACTED] WILL SAY AS FOLLOWS:

**Introduction**

1. Currently I am Emeritus Professor of Transport Policy at University College London and at the University of the West of England, also Senior Fellow (Transport and Climate Change) of the Foundation for Integrated Transport Policy, a charity, also an Associate of Transport for Quality of Life<sup>1</sup>, and a member of DfT's Joint Analysis Development Panel, JADP<sup>1</sup>. Formerly, I was an economist at the Greater London Council (1974-1979), Reader and Director of the Oxford University Transport Studies Unit (1979-1995), head of the ESRC Transport Studies Unit and Professor of Transport Policy at UCL (1996-2004), and Professor at UWE (2005-2011). I was founding editor of the journal *Transport Policy* in 1995, and editor-in-chief of the journal *Transportation Research (A) Policy and Practice* (2005-2010). I have written, as an individual and with colleagues, over 100 significantly cited published works, and other articles, working papers, and unpublished reports, 1969-2020<sup>2</sup>.

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<sup>1</sup>My statement should not be taken as the advice of JADP, which has not discussed this Case.

2. Much of my career has been spent on commissioned research for, and advising, the Department for Transport (“DfT”) and its predecessors, including its Standing Advisory Committee on Transport Appraisal, SACTRA, for which I was co-author of three foundation works on environmental appraisal, induced traffic, and transport and the economy. I have also advised local authorities, voluntary organisations, some foreign governments, international agencies, and other bodies, and was a non-executive director of the Port of Dover 1989-2006.
3. 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.

### Outline

4. The purpose of this statement is to highlight certain areas of factual disagreement, which have arisen from the Defendant’s evidence. The key point I would like to make relates to the Defendant’s claims that appraisals by Highways England and DfT are sufficient to assess the carbon impact of RIS2, and to conclude that the quantity of CO2 emission attributable to the RIS2 road schemes is insignificantly small.
5. In summary, I believe that the evidence and work the Defendant/DfT has reported do not support its conclusions. I have reached this view based on professional, evidential and logical grounds. Citations (including to the Defendant’s evidence), data, references and evidence underpinning my points are collated in an Annex appended to this statement, referred to by number in the text.

### Preliminary consideration: how does road construction affect CO2?

6. Increasing road capacity increases CO2 emissions in five main ways:
  - a) during<sup>3</sup> the construction period itself, notably in land clearance and preparation, embodied carbon used in the production of concrete and other materials, and tailpipe emissions from contractors’ vehicles and other activities;
  - b) during operation from road maintenance, servicing, lighting etc;
  - c) from road users during its lifetime of the scheme particularly the tailpipe emissions of that proportion of its expected traffic which has actually been generated or ‘induced’ by the presence of the road itself, including the effect of changes in traffic speed;
  - d) consequential effects of the roads on settlement and activity patterns, notably when they enable developments of housing, workplaces and retailing, increasing car-dependent lifestyles, increasing car ownership (and increasing the embedded carbon from vehicle manufacturing) and new patterns of warehousing and freight logistics; and

- e) synergetic effects such that the impact of each single road improvement on its own may be small but the combined effects of many, in the context of prevailing transport policies, pricing and management, give a greater total than the sum of their parts.
7. A similar categorisation is provided by the Publicly Available Specification (PAS) 2080:2016 Carbon Management in Infrastructure, commissioned by the Green Construction Board and drawn up by a steering group including HM Treasury and major companies. This specifies requirements for the management of whole life carbon in infrastructure, and states “Achieving carbon reductions in infrastructure depends on robust leadership and governance and the integration of the key carbon management process components (i.e. baseline and target setting, monitoring, quantification, reporting and continuous improvement) into existing infrastructure delivery processes”. A key concept here is that of the system boundary, defined as the ‘set of criteria specifying the life cycle, spatial and temporal extent of a GHG quantification or management system’ PAS 2080 defines the various sources of carbon from infrastructure as follows:
- Capital carbon, “GHG emissions associated with the creation, refurbishment and end of life treatment of an asset”
  - Operational carbon “associated with the operation of infrastructure required to enable it to operate and deliver its service”
  - User carbon - “GHG emissions associated with Users’ utilisation of infrastructure and the service it provides during operation”
8. For the purposes of reporting the UK allocates GHG emissions into a number of different sectors other than ‘transport’ based on definitions set out by the IPCC as shown in the Annex<sup>4</sup>. However, while these impacts all arise from the road building programme, they extend well beyond that, as they have wider road network effects as well as impacts on other sectors.
9. The technical ability to carry out assessment of this kind exists within the DfT, and elsewhere. Elements (a), (b) and (c) in para 6 are capable of estimation using standard practice on modelling, though the calculation of the size of induced traffic under (c) is a subject of professional debate and there is indicative evidence, based on results from HE’s analysis of earlier schemes, that HE’s consultants’ modelling underestimates the scale of induced traffic<sup>5</sup> especially in the longer term. This overlaps with effect (d) and can partly take account of it.
10. Effect (e) cannot be taken into account by adding up scheme appraisals, because the DfT’s appraisal rules<sup>6</sup>, following Treasury guidance, require that each scheme is appraised on the assumption that all the other schemes do not go ahead (and, similarly, that no new policies are assumed other than those which are already officially ‘likely’ and have proceeded to a stage of detail where their costs and effects can be included). To take account of synergetic effects, a different sort of nationwide higher level

appraisal is necessary. Such exercises are technically feasible and have been carried out successfully in the past<sup>7</sup> when considering traffic growth and congestion effects, which can be easily extended to carbon effects.

11. Thus, the carbon effects of road building are very diverse, through different mechanisms. The extent to which the figures reported by the Defendant take these into account is crucial, and I discuss this below.

Is the amount of CO2 attributable to the RIS2 road plans too small to be important?

12. Both the DfT and HE describe the CO2 outputs that they have included with words like 'small', 'not significant', and 'not material' (see examples<sup>8</sup> in the Annex). In the DfT Witness Statements (though as far as I know not previously), the words 'de minimis' are used, presumably with the usual meaning that the issue is too trivial to be a concern of the Court. The descriptions depend on two elements: the quantum of CO2 which I consider to be substantially less than the full amount; and the standard used to define 'small' which I consider to be illogical and inconsistent.

*Quantum*

13. There is a glaring problem, on which DfT's witnesses make no comment, that the total emissions of carbon from RIS2 schemes reported by Highways England in its separate scheme appraisals give a number which is roundly 100 times greater than that suggested by DfT witnesses. I outline the reasons for this discrepancy, and its implications, as follows.
14. The DfT has not published any assessment of the full impact of RIS2 including all schemes, for the full appraisal period, and the full range of carbon impacts as specified by PAS 2080. Their suggested amount of CO2 produced by RIS2 is 0.28Mt (Andrews w/s para 63). This actually relates to the fifth carbon budget period (a narrow 5-year window), of 5 'new' schemes only, and do not include the total capital/construction emissions as specified above. It is therefore a partial analysis and substantially underestimates the full impacts of RIS2.
15. By contrast, Highways England has calculated very much higher quantities. The Claimant obtained Highways England's Appraisal Summary Tables (ASTs) through Freedom of Information requests, for 40 of the 50 listed RIS2 schemes, which provide the full appraisal period of 60 years, lifetime (60 year) carbon user emissions for individual schemes, (though these also do not include construction emissions). These ASTs are a required part of the appraisal process, summarising the extensive modelling and assumptions. The lifetime user carbon emissions of these 40 RIS2 schemes added up (without any adjustments) comes to 26 Mt. Of these, the emissions for 'new' schemes most recently added to RIS2 came to roundly 10 Mt.
16. Construction emissions can be significant, and would mostly take place during the period of the fourth and fifth carbon budgets. For example, the construction emissions for the A303 Stonehenge alone are around 0.5MtCO2e<sup>9</sup>. Sloman et al (2020) estimated,

based on scaling up the construction emissions from published environmental assessments for RIS schemes, that the whole RIS2 programme will generate around 6MtCO<sub>2</sub>e from construction alone<sup>10</sup>.

17. Thus, when we add up HE's separate calculations we see a figure which is over a hundred times larger than the figure suggested as relevant to their appraisal by the Defendant. The most important reasons for the discrepancy seem to be that the HE's AST figures relate to 40 of the 50 listed RIS2 schemes, for the whole 60-year appraisal period. The DfT's suggested 0.28 Mt:

- only includes 5 schemes (the 'new' ones) out of the 50 listed schemes and many unlisted interventions contained in RIS2;
- only calculates carbon for a 5-year period rather than the full appraisal period of 60 years;
- the 5 years concerned are 2028 to 2032 during which not all of these five schemes would have been fully in operation;
- the carbon emissions do not include carbon from construction, being mainly short-term additional traffic, i.e. (c) in the list of sources.

18. This curtailed calculation seems likely to be the main explanation why the figure is so much less than the sum of the separate appraisals.

19. Neither HE nor DfT figures include all five of the sources of carbon from the schemes listed in para 6 above. There is no process of certification that the calculations are complete, and it would be reasonable to query exactly which effects listed in para 6 above have been taken into account in each of the figures the Defendant relies on. To the best of my knowledge, they do not include any additional allowance in (c) to allow for the longer term effects of (d), and they do not seem to include the synergy effect in (e) because if it had been done, one would have a strong expectation that the resulting figure would be greater than the sum of the schemes appraised separately, not smaller, since that would be the point of a programme<sup>11</sup>.

20. Taking account of an underestimate of induced traffic, overlapping with (d), and the synergetic effects in (e), might increase all the Highways England estimates by 50% to 100% in the long run: this is tentative, but could readily be made more confident by technical work well within the DfT's current capability.

21. My judgement is that for a full appraisal of the carbon effects of RIS2, it is important that this should have included all schemes (not just the five 'new' ones), and all carbon effects of all processes (a) to (e) in para 6, since they all constitute works still to be completed and operational, whatever their previous history. It should also include any increased carbon costs, consequential on the RIS2 schemes, of maintaining the existing SRN and local road network as per the guidance in PAS 2080.

22. The full appraisal period should be included, because CO<sub>2</sub>, once emitted, remains present in the atmosphere for very long periods, and any carbon target, for any year, implicitly assumes that once achieved the emissions must subsequently be held down permanently. Therefore, only by calculating the full emissions would the Defendant have been able to accurately measure what other compensating reductions would have to be made in other sectors of the economy or other parts of the transport sector, to reach those carbon reduction targets. Therefore the framework of figures listed by HE seems the right place to start a reappraisal, adding the omitted factors, albeit one might want to reconsider changes in the vehicle market and personal travel trends which have changed significantly since the time the original appraisals were carried out, which is not considered further here.
23. Therefore, I conclude that the quantum of carbon considered by the Defendant to be relevant to its defence, is very substantially smaller than is truly the case

#### *Percentage*

24. There is no a priori standard of how many tonnes of carbon are to be judged 'small' or 'negligible'. Therefore, a separate question is the basis on which this has been done. The (under)estimated total carbon emitted has been expressed as a percentage of an inherently much bigger figure, initially *all* CO<sub>2</sub> from *all* sources in the whole economy. This practice started with the HE reports of each scheme separately, and was also used by DfT in the public statements and pre-hearing discussions<sup>12</sup>.
25. As far as I know, the use of a denominator of the 'whole economy' type is unique to CO<sub>2</sub> in road appraisal. It is never applied to any other effect of a road scheme, for example: the total number of jobs generated by a specific scheme, as a proportion of the total jobs in the economy; or the number of minutes travel time saved by a particular scheme, as a proportion of all the time spent on everything in the whole country. The total economic cost of congestion, on all roads, in the economy is substantially less than 1% of GDP, so the time savings due to reduced congestion on a few roads, for as long as it lasts, will be, by this definition, a much smaller percentage of GDP than RIS2 emissions are claimed to be of total carbon budget. *Any* such calculation would always result in a very small number and be open to words like 'immaterial' or 'insignificant'. But this does not in the slightest prove that the effect is unimportant by comparison with other methods of increasing employment, or saving time. Nor therefore can it justify claims of *de minimis*.
26. The Defendant then offers an alternative denominator, namely the selected CO<sub>2</sub> emissions from the RIS2 schemes as a percentage of all emissions in the transport sector, with less attention to the whole economy comparison<sup>13</sup>. This would be appropriate if there were a specific target for emissions from the transport sector, i.e. if any increase due to road construction were going to be offset entirely by other emissions within the transport sector. But it is less relevant if there is no such target, as is claimed by the Defendant (Moran w/s para. 59), where it is said that: "the UK's approach to meeting carbon budgets does not require setting individual emissions

targets sector-by-sector.” In any case, this ratio also is not applied to appraisal of other carbon-reducing measures, all of which are assessed on the assumption that small improvements are worth having, and can add up to large quantities. Government encouragement to individuals and companies to use electric vehicles is also based on the presumption that small effects by many individuals add up to a material total. Time savings of a few seconds per journey are often too small even to be noticed, but they are routinely added up to give economic benefits of millions of pounds.

Are the main uncertainties about future transport and CO2 trajectories adequately taken into account by considering other scenarios for traffic growth and vehicle electrification?

27. The Defendant relies on its own traffic forecasts to calculate carbon from road transport, and the time savings from relief of traffic congestion, that the RIS2 schemes are assessed to provide. Seven different scenarios for traffic growth were produced in the 2018 forecasts<sup>14</sup> in order to address the problem that there are very substantial uncertainties in the forecasts themselves. All of these forecasts include implemented and adopted policies only and do not include future policies or Government ambitions that have not been legislated.
28. DfT Witnesses make specific reference to tackling this uncertainty by considering Scenario 7, this being the only one in which the trajectory of take up of electric vehicles was assumed to be consistent with the then carbon targets, as they stood in 2017-18. This scenario assumes 100% of sales of cars and LGVs are zero emission by 2040, consistent with the policy in the Clean Growth Strategy to end the sale of all new conventional petrol and diesel cars and vans by 2040. However, the accuracy of the calculation is called into question for the following reasons:
- i. First, neither scenario 7 nor any of the other scenarios in RTF18 are net zero compliant. Indeed even its chief analyst acknowledged the net zero legislation was an “unexpected event [with] significant impacts”<sup>15</sup>. Carbon emissions from all road transport in England under scenario 7 will be 18 MtCO<sub>2</sub>e in 2050, when required to be effectively zero.
  - ii. Second, the scenario also produced higher traffic congestion levels over the whole network, which would be beyond the limited extra capacity of the RIS2 schemes, so the offered relief from congestion is overwhelmed by the increase in traffic.
  - iii. Third, it also did not take into account the additional road renewal and maintenance carbon footprint from significantly higher traffic flows across the entire road network. For these reasons, Scenario 7 in some ways increases the *uncertainty* of the deliverability of RIS2 within current carbon budgets, rather than giving greater confidence.

## Conclusions

29. Carbon emissions from RIS2 are substantially larger than is claimed, due to omitting some of the sources of carbon, only counting some of the years and only 5 of the schemes, and not counting any of the synergetic effects of the programme as a whole. In summary the appraisal is flawed for the following reasons:

- DfT had no net zero compliant traffic forecasts on which to base its modelling of RIS2.
- DfT excluded the carbon impacts of all but 5 of the RIS2 schemes from its modelling

30. Claims of 'insignificance' and 'de minimis' are exaggerated, by expressing the emissions as a percentage of inherently larger, but inappropriate, comparators.

## Statement of Truth

31. I believe that the facts stated in this witness statement are true. I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

Signed

Phil Goodwin

Dated: 23 October 2020; redacted 16 March 2021

## ANNEX TO FIRST WITNESS STATEMENT OF PHIL GOODWIN

I acknowledge the very helpful assistance I have had in preparing this Witness Statement from Lynn Sloman and Lisa Hopkinson of TQL, as well as from the Claimant’s staff particularly Chris Todd, Becca Lush and Ralph Smyth.

I exhibit the documents referenced to in the footnotes of this statement in **Exhibit ‘PG1’** at the corresponding document number.

<sup>1</sup> I was contributor to their 2020 report on the carbon impacts of the national roads programme, Sloman L, et al (2020) *‘The carbon impact of the national roads programme’* [PG1/1]

<sup>2</sup> listed (with other more ephemeral works) at:

<https://scholar.google.co.uk/citations?user=3hF5I4oAAAAJ&hl=en>

<sup>3</sup> The witness statement by Professor Anable also points out that there are carbon implications before construction, in the loss of trees and other plants that absorb and lock in CO2.

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Sector	Emissions description	Relevance to RIS2
Surface transport	Fuel used in vehicles	Fuel used by road users and also operations such as highway patrols
Industry	Production of materials, vehicles etc. and construction.	Construction of roads and their renewal, such as resurfacing.
Power	Electricity generation from fuel combustion and electrical equipment manufacture	Power used for road lighting and increasingly charging of EVs, also for upgrading National Grid.

<sup>5</sup> SACTRA (an advisory body appointed by Government) reported that the amount of additional or ‘induced’ traffic brought about by additional road capacity tended to be about double after longer term effects (not usually modelled) were taken into account than the first year effects.

<https://webarchive.nationalarchives.gov.uk/20121007051102/http://www.dft.gov.uk/publications/t-runk-roads-and-the-generation-of-traffic/>. A recent study by Highways England suggested that while

their (short term) forecasts of traffic on improved roads did not show a consistent over or underestimate, there forecasts on traffic in the ‘without case’ (as judged by basic traffic trends on unimproved roads, did show a systematic tendency to overestimate. Since induced traffic is defined as the difference between the ‘with’ and ‘without’ case, that suggested an underestimate of the induced traffic in the short term also [PG1/5].

<sup>6</sup> [PG1/6] para 2.1.1 “the impacts of a scheme should be based on the difference between forecasts of the without-scheme and with-scheme cases’. Note that 2.2.3 ‘In most cases there should also be no difference in the transport network, other than the scheme being assessed, between the without- and with-scheme cases’. There are some circumstances where ‘further improvements are likely’, and these may be taken into account in the following way . ‘However, there may be circumstances where it is clear that transport conditions without the scheme are such that further

improvements are likely. Where that is the case, these improvements, *and their associated costs*, should be included in the without-scheme case but not in the with-scheme case'. (my italics added). That does not apply in this case.

<sup>7</sup> See, for example, work carried out by DfT for the Eddington Review [PG1/7]. This looked at the different scale of road building that would be economically justified with or without a road user charging system aimed at congestion relief. This would be readily extended to investigate the effects on the warranted road programme with or without a charging system based on carbon emissions, hence enabling a reappraisal of the implications of carbon targets of different intensity, taking both congestion and carbon into account.

<sup>8</sup> **Typical findings from Environmental Statements about the carbon impact of road schemes**

Road scheme	Region	Comment in Environmental Statement
<b>A585 Windy Harbour to Skipool</b>	NW	"This increase in emissions as a result of the Scheme would be negligible, and therefore, effects would be Not Significant."
<b>A1 Birtley to Coalhouse</b>	NE	"Based on professional judgement, the magnitude of change in GHG emissions is considered to be negligible. The Scheme with the Allerdene embankment option is therefore expected to have a slight adverse effect (not significant) on climate."
<b>M42 Junction 6</b>	WM	"The assessment has identified that the emissions arising as a result of the Scheme represent less than 0.006% of the total emissions in any five year UK carbon budget during which they would arise. Accordingly, the assessment has concluded that the GHG emissions impact of the Scheme would not have a material impact on the UK Government meeting its carbon reduction targets."
<b>M54 to M6 Link Rd</b>	WM	"Indeed, emissions arising as a result of the Scheme represent less than 0.01% of total emissions in any five-year carbon budget during which they arise. In this context, it is concluded that the GHG impact of the Scheme would not have a material impact on carbon reduction targets as set by the UK government."
<b>A38 Derby</b>	EM	"Indeed emissions arising as a result of the Scheme represent less than 0.01% of total emissions in any five year carbon budget during which they arise. In this context, it is concluded that the GHG impact of the Scheme would not have a material impact on carbon reduction targets as set by the UK government."
<b>A14 Cambridge to Huntingdon</b>	E	"The additional operational emissions of the scheme represent only 0.0043% and 0.012% of the third and fourth national carbon budgets respectively. Those percentages are considered to be negligible and have no bearing on the likely achievement of the relevant policy objectives."
<b>A303 Stonehenge</b>	SW	"Indeed emissions arising as a result of the Scheme represent less than 0.03% of total emissions in any five year carbon budget during which they arise. In this context it is concluded that the GHG impact

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			of the Scheme would <b>not have a material impact</b> on the Government meeting its carbon reduction targets.”
<b>A27 Arundel Bypass</b>	SE		“..all Scheme options represent less than 0.004% of any of the current UK carbon budgets. All Scheme options represent between 0.07 and 0.14% of emissions from West Sussex in 2016, and less than 0.5% of emissions from West Sussex A roads in 2016.” [Tables 14-29 and 14-30 assesses significance as ranging from <b>negligible adverse to moderate adverse</b> ]
<b>Lower Thames Crossing</b>	SE	Thames	“In the context of the total UK emissions from transport modes presented in Table 16.4, and the UK carbon budget, it is considered <b>unlikely that the Project alone would have a significant adverse effect</b> on climate change. However further calculations to determine carbon emissions during the operational phase of the Project, including cumulative effects, will be undertaken and reported within the ES.”

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Examples taken from: *Sloman and Hopkinson (2020)* see **[PG1/1]**

<sup>9</sup> HE Carbon Tool Summary for AECOM A303 Stonehenge **[PG1/9]**

<sup>10</sup> Sloman et al (2020) see **[PG1/1]**

<sup>11</sup> One scheme on its own might simply shift a traffic jam further down the road. All together, in principle, might be able to solve the jam entirely, though induced traffic often stops that happening in practice.

<sup>12</sup> Response from Rachel McClean to Parliamentary Question from Caroline Lucas on 20 July 2020 **[PG1/12]** Note this is also the approach used in the Environmental Assessments for individual RIS2 schemes produced for HE, where carbon emissions are compared to the emissions for a total carbon budget for a supposedly comparable time period.

<sup>14</sup> DfT (2018) Road Traffic Forecasts **[PG1/15]**

<sup>15</sup> DfT (2020) Appraisal and Modelling Strategy. A route map for updating TAG during uncertain times **[PG1/17]**