Appendix E – Climate Change

Introduction

Transport Scotland is committed to achieving enhanced road safety across Scotland, aiming for zero fatalities and serious injuries by 2050. This initiative aligns with Scotland's National Transport Strategy and climate change goals, promoting safe, active, and sustainable travel choices.

End-user vehicle emissions were calculated in accordance with DMRB LA 114 Climate (2021). Emissions were quantified using STAG from the Transport Scotland. This took into account different vehicle and fuel types, appropriate forecast fuel consumption parameters and applied appropriate emissions factors according. From this, emissions were quantified for each year over the lifetime of the proposed scheme (up to 2045) to inform the appraisal options.

Outputs from Transport Model for Scotland (TMfS) have been used in comparative assessment between the Do-minimum (without policy) and Do-something (with policy) Options 1 and 2 and various futures. Each Option was modelled with and without policy futures; the policies within the model are understood to be:

- 20% reduction in car kilometres by 2030;
- Phase out the need for new petrol and diesel cars and vans by 2030; and
- Net zero carbon emissions by 2045.

The modelling was conducted in two further futures: first, a 100% compliance future run; followed by realistic compliance future. The latter will be based on WSP's research findings and a review of the compliance model outputs.

Transport modelling and greenhouse gases

The GHG assessment is based on best practice methodologies available at the time of undertaking the assessment, which are using the Department for Transport (DfT) Transport Analysis Guidance Databook and calculating emissions over the lifespan of the scheme.

The calculations are based on the traffic forecasts for the Do Minimum (without policy) and Do Something (with policy). Information for the GHG assessment comes from the transport models including Annual Average Daily Traffic (AADT), distance, speeds, and percentages of Heavy Goods Vehicles by transport model road link.

The baseline scenario is considered over the 60-year lifespan of the proposed scheme. Non-traded CO_2e emissions (petrol and diesel vehicles) and CO_2e traded emissions (electric vehicles) have been calculated in accordance with the latest guidance available at the time of each of the assessments. The baseline scenario involves no construction activities and therefore the construction baseline has been assumed to have zero emissions. The GHG emissions for the construction phase will be calculated separately.

To inform the business case and planning application for the transport scheme, a series of Transport Analysis Guidance assessments have been undertaken for:

- Option 1 without policy (100% compliance and realistic compliance);
- Option 1 with policy (100% compliance and realistic compliance);
- Option 2 without policy (100% compliance and realistic compliance); and
- Option 2 with policy (100% compliance and realistic compliance).

All the above options were assessed using transport modelling with outputs from Transport Model for Scotland (TMfS) for a Do minimum year (2025, 2030, and 2045) and Do Something Year (2025, 2030,2045) being used within the GHG assessment.

Table E-1 highlight the difference between carbon emissions from the Do-minimum and Do-something scenario over a 60-year period for the transport scheme. From the 100% compliance model, it can be observed that the most change in emissions occurs in Option 2 without policy and Option 2 with policy. This is because of the increase in HGV speed on single carriageway to 50mph and dual carriageway to 60mph. As observed in the literature review, HGV release less GHG under higher speeds compared to LGV. This is being reflected in the table above. The 100% compliance scenarios also play a key role in the emission change.

Table E-1 – 100% Compliance Model

Overall Assessment Score	Option 1 (Without Policy)	Option 1 (With Policy)	Option 2 (Without Policy)	Option 2 (With Policy)
Change in CO_2e emissions (tonnes) over 60-year appraisal period following opening (With Scheme)	279,448,590.76	231,761,262,33	275,543,531.07	227,928,176.74
Change in CO_2e emissions (tonnes) over 60-year appraisal period following opening (Without Scheme)	279,875,749.00	231,951,850.91	280,723,550.76	231,951,850.91
Total Changes CO_2e emissions (tonnes) over 60-year appraisal period following opening (Difference)	-427,158.23	-190,588.58	-5,180,019.69	-4,023,674.17
Percentage change (% Change)	-0.28%	-0.08%	-4.24%	-1.73%

Table E-2 – Realistic Model

Overall Assessment Score	Option 1 (Without Policy)	Option 1 (With policy)	Option 2 (Without Policy)	Option 2 (With Policy)
Change in CO_2e emissions (tonnes) over 60-year appraisal period following opening (With Scheme)	280,466,270.10	231,167,684.55	278,343,665.06	230,226,841.25
Change in CO_2e emissions (tonnes) over 60-year appraisal period following opening (Without Scheme)	280,723,550.76	231,305,494.33	280,723,550.76	231,951,850.91
Total Changes CO_2e emissions (tonnes) over 60-year appraisal period following opening (Difference)	-257,280.66	-137,809.78	-2,379,885.70	-1,725,009.66
Percentage Change (% Change)	-0.09%	-0.06%	-0.82%	-0.74%

Table E-2 shows the changes in emissions when a realistic compliance is applied to the traffic models. Options 2 without policy and Option 2 with policy still shows the biggest changes compared to the other scenarios due to the efficiency of HGV when they operate at higher speeds compared to lower speeds.

Summary

In summary, this traffic assessment Options demonstrate a significant difference in emission reduction between the 100% compliance model and the realistic model. For the 100% compliance model, the majority of emission reduction was observed in option 2 both with and without policy implementation. This model assumes that all traffic users strictly adhere to traffic regulations, resulting in notable decrease in emissions. A key factor contributing to this reduction was the increased speed of HGVs, as their efficiency improves at higher speeds.

Conversely, the realistic model, which reflects the typical scenario, still showed a decrease in Option 2 with and without policy, but less pronounced compared to 100% compliance model. This suggests that actual behaviour patterns can significantly impact the effectiveness of emissions reduction strategies.

When applying the DMRB LA111 scale to the 100% compliance scenario, the benefits ranged from minor for Option 2 with policy to moderate without policy. In contrast, the realistic scenario only showed negligible benefits in the traffic assessment.

These findings highlight the importance of compliance and behavioural in achieving substantial emission reductions and the varying impacts of policy measures under different compliance assumptions.