

TAG Unit 3.3.5 – Greenhouse Gases

Baseline Conditions

- 1.1. In terms of greenhouse gas emissions, Carbon Dioxide (CO₂) is considered to be the most important and is used in WebTAG as the key indicator of the impacts of transport on climate change.
- 1.2. According to the Leeds Climate Change Strategy: Vision for Action (Leeds Initiative, July 2009), in 2006, Leeds produced almost 6.1 million tonnes of CO₂. The three biggest contributors are the commercial and industrial sector (37%) domestic (30%) and transport (26%).
- 1.3. At present there is no data regarding greenhouse gas baseline conditions; however, information can be provided once the results of the analysis using the DMRB methodology are available. Further data may be acquired from the NAEI, who provides background data for CO₂/km square grids, and from the LTP2 Annual Monitoring report which contains CO₂ emission maps for the Primary Road Network across West Yorkshire.

Impact of Do Minimum

- 1.4. Over the past 4 years, total emissions have declined by 1% with falls in domestic and transport emissions offset by rising commercial and industrial emissions. The impact of the Do Minimum scenario is likely to maintain this decline in transport emissions; however, this is likely to be offset by rising commercial and industrial carbon dioxide emissions.

Impact of Preferred Scheme

- 1.5. Assessment of the Preferred Scheme has been carried out quantitatively based on changes in traffic flows on the road network. The assessment has been carried out by comparing the differences in total emissions across the modelled area. No traffic data for the design year (opening year plus 15 years) was available; therefore it has been assumed that there will be no change in emissions of CO₂ from the opening year. The overall effects for the Preferred Scheme are assessed as **slight adverse**.
- 1.6. Changes in emission of carbon are attached. The initial results derived from modelled traffic data and under review indicate that there will be an increase in carbon emissions in the Preferred Scheme compared to the Do Minimum scenario.

Impact of Next Best Alternative

- 1.7. A qualitative assessment of the Next Best Alternative's effect on greenhouse gasses has been carried as traffic data for this scenario

are unavailable. No traffic data for the design year (opening year plus 15 years) was available, therefore it has been assumed that there will be no change in emissions of carbon from the opening year. It would be expected that the Next Best Alternative would create changes in traffic flows around the city of Leeds similar to those presented within the transport model produced for the Preferred Scheme. The overall effects for the Next Best Alternative are assessed as **slight adverse**.

- 1.8. Overall, carbon emissions are expected to be higher in the Next Best Alternative compared to the Preferred Scheme. When the bus is utilising its diesel generator, carbon emissions would occur. It would be expected that these emissions would provide a greater contribution to regional emissions of carbon than those associated with electricity production required to power the trolleybus for the Preferred Scheme.

Impact of Lower Cost Alternative

- 1.9. A qualitative assessment of the Lower Cost Alternative's effect on greenhouse gasses has been carried as traffic data for this scenario are unavailable. No traffic data for the design year (opening year plus 15 years) was available; therefore it has been assumed that there will be no change in carbon emissions of from the opening year. It would be expected that the Lower Cost Alternative would create changes in traffic flows around the city of Leeds similar to those presented within the transport model produced for the Preferred Scheme. The overall effects for the Low Cost Alternative are assessed as **slight adverse**.
- 1.10. Overall, greenhouse gas emissions are expected to be higher in the Lower Cost Alternative compared to the Preferred Scheme. As the option comprises diesel powered buses, total carbon emissions would be greater than those emitted from the Preferred Scheme and Next Best Alternative. It would be expected that these emissions would provide a greater contribution to regional emissions than those associated with electricity production required to power the trolleybus for the Preferred Scheme.

TAG Unit 3.3.5 - Greenhouse Gases: Worksheet



APPRAISAL- Greenhouse Gases

Proposal Name: Preferred Option

Current Year of Appraisal: 2008

Proposal Opening year: 2016

Project (Road/Rail or Road and Rail): Road

Methodology – Greenhouse Gases Assessment

The greenhouse gases objective assessment for the three options, 'preferred', 'next best' and 'lower cost' have been undertaken following a quantitative and qualitative approach.

Assessment of the 'preferred option' has been carried out quantitatively based on changes in traffic flows on the road network. The assessment has been carried out by comparing the differences in total emissions across the modelled area based on traffic data provided by SDG. No traffic data for the design year (opening year plus 15 years) was available; therefore it has been assumed that there will be no change in emissions of carbon (C) from the opening year.

Assessment of the regional emissions associated with the 'next best option' and 'lower cost option' has been carried out qualitatively as traffic data for these scenarios were unavailable.

Overall Assessment Score for Preferred Option:

Net Present Value of Carbon Emissions of Proposal (£): -3,378,858

(60 Year Period)

*positive value reflects a net benefit (i.e. carbon emissions reduction)

These initial results (which are under review) indicate an increase in Greenhouse Gases based on a predicted increase in modelled road traffic

Quantitative Assessment for Preferred Option:

Change in Carbon Emissions over 60 year appraisal period (tonnes): 79,980

(between 'with scheme' and 'without scheme' scenarios)

Change in Carbon Emissions in Opening year (tonnes): 1,333

(between 'with scheme' and 'without scheme' scenarios)

Qualitative Comments:

No traffic data available for design year
Emissions for years after 2015 assumed to remain constant.

Sensitivity Analysis:

Description:

Upper Estimate Net Present Value of Carbon Emissions of Proposal (£): -4,054,629

Lower Estimate Net Present Value of Carbon Emissions of Proposal (£): -3,040,972

Data Sources:

Traffic data provided by SDG
Emissions calculations carried out using DMRB v1.03c for 2016

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Tonnes of carbon emitted:



Road:

Year	Tonnes of carbon emitted in 'without scheme' scenario	Tonnes of carbon emitted in 'with scheme' scenario
2016	341010	342343
2017	341010	342343
2018	341010	342343
2019	341010	342343
2020	341010	342343
2021	341010	342343
2022	341010	342343
2023	341010	342343
2024	341010	342343
2025	341010	342343
2026	341010	342343
2027	341010	342343
2028	341010	342343
2029	341010	342343
2030	341010	342343
2031	341010	342343
2032	341010	342343
2033	341010	342343
2034	341010	342343
2035	341010	342343
2036	341010	342343
2037	341010	342343
2038	341010	342343
2039	341010	342343
2040	341010	342343
2041	341010	342343
2042	341010	342343
2043	341010	342343
2044	341010	342343
2045	341010	342343
2046	341010	342343
2047	341010	342343
2048	341010	342343
2049	341010	342343
2050	341010	342343
2051	341010	342343
2052	341010	342343
2053	341010	342343
2054	341010	342343
2055	341010	342343

Rail:

Year	Tonnes of carbon emitted in 'without scheme' scenario	Tonnes of carbon emitted in 'with scheme' scenario
2016	0	0
2017	0	0
2018	0	0
2019	0	0
2020	0	0
2021	0	0
2022	0	0
2023	0	0
2024	0	0
2025	0	0
2026	0	0
2027	0	0
2028	0	0
2029	0	0
2030	0	0
2031	0	0
2032	0	0
2033	0	0
2034	0	0
2035	0	0
2036	0	0
2037	0	0
2038	0	0
2039	0	0
2040	0	0
2041	0	0
2042	0	0
2043	0	0
2044	0	0
2045	0	0
2046	0	0
2047	0	0
2048	0	0
2049	0	0
2050	0	0
2051	0	0
2052	0	0
2053	0	0
2054	0	0
2055	0	0

Monetary calculation of total change resulting from scheme:

Change in tonnes of carbon emitted	Shadow Price of carbon per tonne	Shadow Price of carbon for year change	NPV
1333	97.47	129924.56	-80265.03
1333	99.42	132523.05	-79101.76
1333	101.41	135173.51	-77955.36
1333	103.43	137876.98	-76825.57
1333	105.50	140634.52	-75712.16
1333	107.61	143447.21	-74614.88
1333	109.76	146316.15	-73533.51
1333	111.96	149242.48	-72467.80
1333	114.20	152227.33	-71417.55
1333	116.48	155271.87	-70382.51
1333	118.81	158377.31	-69362.47
1333	121.19	161544.86	-68357.22
1333	123.61	164775.75	-67366.54
1333	126.08	168071.27	-66390.21
1333	128.61	171432.69	-65428.03
1333	131.18	174861.35	-64479.80
1333	133.80	178358.58	-63545.31
1333	136.48	181925.75	-62624.36
1333	139.21	185564.26	-61716.76
1333	141.99	189275.55	-60822.32
1333	144.83	193061.06	-59940.84
1333	147.73	196922.28	-59072.13
1333	150.68	200860.72	-58216.01
1333	153.70	204877.94	-57365.81
1333	156.77	208975.50	-56536.81
1333	159.91	213155.01	-55727.91
1333	163.10	217418.11	-54939.11
1333	166.37	221766.47	-54170.43
1333	169.69	226201.80	-53421.87
1333	173.09	230725.84	-52693.43
1333	176.55	235340.35	-51985.11
1333	180.08	240047.16	-51296.81
1333	183.68	244848.10	-50628.53
1333	187.36	249745.06	-49980.27
1333	191.10	254739.97	-49352.03
1333	194.92	259834.77	-48743.81
1333	198.82	265031.46	-48155.61
1333	202.80	270332.09	-47587.43
1333	206.86	275738.73	-47039.27
1333	210.99	281253.51	-46511.13

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Tonnes of carbon emitted:



Road:

Year	Tonnes of carbon emitted in 'without scheme' scenario	Tonnes of carbon emitted in 'with scheme' scenario
2056	341010	342343
2057	341010	342343
2058	341010	342343
2059	341010	342343
2060	341010	342343
2061	341010	342343
2062	341010	342343
2063	341010	342343
2064	341010	342343
2065	341010	342343
2066	341010	342343
2067	341010	342343
2068	341010	342343
2069	341010	342343
2070	341010	342343
2071	341010	342343
2072	341010	342343
2073	341010	342343
2074	341010	342343
2075	341010	342343

Rail:

Year	Tonnes of carbon emitted in 'without scheme' scenario	Tonnes of carbon emitted in 'with scheme' scenario
2056	0	0
2057	0	0
2058	0	0
2059	0	0
2060	0	0
2061	0	0
2062	0	0
2063	0	0
2064	0	0
2065	0	0
2066	0	0
2067	0	0
2068	0	0
2069	0	0
2070	0	0
2071	0	0
2072	0	0
2073	0	0
2074	0	0
2075	0	0

Monetary calculation of total change resulting from scheme:

Change in tonnes of carbon emitted	Shadow Price of carbon per tonne	Shadow Price of carbon for year change	NPV
1333	215.21	286878.58	-48839.98
1333	219.52	292616.15	-48365.81
1333	223.91	298468.47	-47896.23
1333	228.39	304437.84	-47431.22
1333	232.95	310526.60	-46970.73
1333	237.61	316737.13	-46514.70
1333	242.36	323071.87	-46063.10
1333	247.21	329533.31	-45615.89
1333	252.16	336123.98	-45173.01
1333	257.20	342846.45	-44734.44
1333	262.34	349703.38	-44300.12
1333	267.59	356697.45	-43870.03
1333	272.94	363831.40	-43444.10
1333	278.40	371108.03	-43022.32
1333	283.97	378530.19	-42604.62
1333	289.65	386100.79	-42190.99
1333	295.44	393822.81	-41781.37
1333	301.35	401699.26	-41375.72
1333	307.38	409733.25	-40974.02
1333	313.52	417927.91	-40576.21

Net Present Value of Carbon Emissions of Proposal: -3378857.73