Department for Transport

Greenhouse Gases Workbook

TAG Reference

TAG Unit A3 - Environmental Impact Appraisal

Notes

This tool helps valuing the impact arising from the change in CO2e emissions, in conjunction with guidance in TAG Unit A3.

To use this tool, the following are required:

1 Year of appraisal
2 Opening year of the analysed scheme/policy
3 Annual CO2e emissions (tonnes), split by traded and non-traded sector, both for the 'without-scheme' and 'with-scheme' forecasts.

Cells requiring user inputs on the 'inputs' sheet are shaded light green. The user inputs required are:

1 Scheme name
2 Scheme opening year
3 Scheme type (road, rail or road/rail)
4 Current year - the year the appraisal is undertaken to ensure the correct profile of discount rates
5 Unit of account - the unit of account for monetised values to be expressed in (factor cost or market prices)
6 Without scheme emissions in the non-traded sector
7 With scheme emissions in the non-traded sector
8 Without scheme emissions in the traded sector
9 With scheme emissions in the traded sector

The other standard inputs are taken from the TAG data book / guidance:

1 Carbon appraisal values - TAG Data Book Table A3.4.1
2 Traded carbon values - TAG Data Book Table A3.4.2
3 Standard 60-year appraisal period
4 Standard DfT base year for present values and prices
5 HMT profile of discount rates
6 GDP deflator series from TAG data book (if results are required for a different base year)

The 'Outputs 1' sheet produces 'Worksheet 1' as described in TAG Unit A3.
The 'Outputs 2' sheet supports the computation of additional carbon cost-effectiveness metrics, as described in TAG Unit A3, Appendix D.

Note: The traded component of the estimate is adjusted to account for the cost of any UK allowances (UKAs) purchased to cover traded sector emissions (i.e. emissions from sectors covered by the UK Emissions Trading System). Additional adjustments may be necessary to avoid double-counting. For further information, please refer to TAG Unit A3, section 4.1.

Version Control

Date	Description
May-24	Updated in line with clarified guidance in TAG Unit A3 on traded carbon valuation and units of account; updated GDP deflator forecasts and GHG values to match TAG Data Book v1.23 (May 2024); added Carbon Budgets 5 and 6.
May-23	Updated GDP deflator forecasts and aligned GHG values to match TAG Data Book v1.21 (May 2023)
Nov-22	Updated GDP deflator forecasts and aligned GHG values to match TAG Data Book v1.20.1 (November 2022)
May-22	Updated GDP deflator forecasts and aligned GHG values to match TAG Data Book v1.18 (May 2022)
Nov-21	Updated GDP deflator forecasts in line with TAG Data Book v1.17 (November 2021)
Sep-21	Updated GHG values in line with TAG Data Book v1.16 (September 2021) - reflecting new BEIS carbon values Link to BEIS values
Jul-21	Updated GDP deflator forecasts in line with TAG Data Book v1.15 (May 2021)
Jul-20	OBR sensitivity version: updated GDP deflator forecasts
Jul-20	Updated GDP deflator forecasts
Nov-19	Updated carbon values and GDP deflator forecasts
May-19	Updated carbon values and GDP deflator forecasts
Nov-18	Updated GDP deflator forecasts
May-18	Updated GDP deflator forecasts
Dec-17	Updated carbon values and GDP deflator forecasts
Aug-17	Updated carbon values and GDP deflator forecasts
Mar-17	Updated carbon values and GDP deflator forecasts
Jul-16	Updated carbon values and GDP deflator forecasts
Dec-15	Updated carbon values and GDP deflator forecasts
Mar-15	Revised workbook structure released as forthcoming change
Nov-14	Updated non-traded carbon values in line with the 2014 DECC / Supp. Green Book guidance on energy and GHGs
Spring 2014	Updated non-traded carbon values in line with IAG 2013 guidance
Jan-14	Definitive release
17/10/2013	Release of restructured guidance

Contact

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Greenhouse Gases Workbook - Inputs

Scheme details

Scheme name	Shrewsbury NWRR - Low Economy	*Scheme_name*
Opening year	2025	*Opening_year_in*
Scheme type (select from list)	Road	*Scheme_type*
Current year	2024	*Current_year_in*
Output unit of account	Market prices	*Unit_of_account*

Emissions (tCO2e per year)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Non-traded sector																																
Road without scheme																																
Road with scheme																15520.99	20694.66	5739.481	580.314	594.8102	609.3058	623.7997	638.2919	629.8938	621.4943	613.0931	637.0147	596.2865	593.2507	590.2134	587.1752	625.1568
Rail without scheme																																
Rail with scheme																																
Traded sector																																
Road without scheme																																
Road with scheme																0	0	48.46966	51.05789	53.64574	56.36264	58.9948	61.60648	60.82148	60.07373	59.42289	58.77698	58.11341	56.98838	55.84902	54.7157	53.58255
Rail without scheme																																
Rail with scheme																																

Emission values

Carbon appraisal values (£/tCO2e) - "factor cost" unit of account

Price base year: 2010 *CO2e_value_price_base_in*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Low	83.9	85.2	86.5	87.8	89.1	90.5	91.9	93.3	94.7	96.1	97.6	99.4	101.0	102.5	104.1	105.6	107.2	108.9	110.5	112.2	113.9	115.7	117.4	119.2	121.0	122.9	124.7	126.6	128.6	130.5	132.5	134.5
Central	167.8	170.4	173.0	175.6	178.3	181.0	183.8	186.6	189.4	192.3	195.2	198.9	201.9	205.0	208.1	211.3	214.5	217.8	221.1	224.4	227.9	231.3	234.8	238.4	242.1	245.7	249.5	253.3	257.1	261.1	265.0	269.0
High	251.8	255.6	259.5	263.4	267.4	271.5	275.6	279.8	284.1	288.4	292.8	298.3	302.9	307.5	312.2	316.9	321.7	326.6	331.6	336.7	341.8	347.0	352.3	357.6	363.1	368.6	374.2	379.9	385.7	391.6	397.5	403.5

Source: TAG Data Book v1.23 (May 2024), Table A3.4.1

Traded carbon values (£/tCO2e) - "factor cost" unit of account

Price base year: 2010 *CO2e_value_price_base_in*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Low	12.2	11.4	6.1	3.5	4.4	5.2	4.4	4.4	1.7	0.0	0.0	3.5	7.0	36.9	45.6	51.4	55.7	52.8	49.9	42.0	40.5	43.4	48.5	50.7	52.1	57.9	61.5	68.0	75.3	76.7	74.5	72.4
Central	12.2	11.4	6.1	3.5	4.4	5.2	4.4	4.4	11.4	11.4	12.2	18.4	23.6	50.7	52.1	57.2	65.9	70.2	70.9	64.4	63.0	68.0	73.1	78.2	80.3	87.6	92.6	97.7	104.9	104.9	102.8	100.6
High	12.2	11.4	6.1	3.5	4.4	5.2	4.4	4.4	22.7	22.7	24.5	32.3	40.2	46.3	60.8	72.4	82.5	83.9	89.7	85.4	85.4	92.6	94.8	98.4	100.6	107.8	112.9	117.2	123.0	123.8	122.3	120.1

Source: TAG Data Book v1.23 (May 2024), Table A3.4.2

Appraisal period and discounting

Appraisal period (years)	62	*Appraisal_period_length_in*
PV base year	2010	*PV_base_year_in*
Outputs price year	2010	*Price_base_outputs_in*
Discount period 1	30	*Discount_period_1_in*
Discount period 2	75	*Discount_period_2_in*
Discount period 3	125	*Discount_period_3_in*
Discount rate 1	3.5%	*Discount_rate_1_in*
Discount rate 2	3.0%	*Discount_rate_2_in*
Discount rate 3	2.5%	*Discount_rate_3_in*

Source: TAG Data Book v1.23 (May 2024), Table A1.1.1

Carbon budget 1 start	2008	*Carbon_budget_1_start_in*
Carbon budget 1 end	2012	*Carbon_budget_1_end_in*
Carbon budget 2 start	2013	*Carbon_budget_2_start_in*
Carbon budget 2 end	2017	*Carbon_budget_2_end_in*
Carbon budget 3 start	2018	*Carbon_budget_3_start_in*
Carbon budget 3 end	2022	*Carbon_budget_3_end_in*
Carbon budget 4 start	2023	*Carbon_budget_4_start_in*
Carbon budget 4 end	2027	*Carbon_budget_4_end_in*
Carbon budget 5 start	2028	*Carbon_budget_5_start_in*
Carbon budget 5 end	2032	*Carbon_budget_5_end_in*
Carbon budget 6 start	2033	*Carbon_budget_6_start_in*
Carbon budget 6 end	2037	*Carbon_budget_6_end_in*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
GDP deflator	100.0	102.2	103.8	106.0	107.4	108.1	110.2	112.2	114.4	116.8	123.0	122.6	128.9	138.2	140.3	141.9	144.3	147.0	149.8	153.3	156.8	160.4	164.1	167.9	171.7	175.7	179.7	183.8	188.1	192.4	196.8	201.3

Indirect tax correction factor: 1.19 *Indirect_tax_correction_factor_in*

Source: TAG Data Book v1.23 (May 2024), Annual Parameters

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
581.0964	565.7114	550.3258	534.9397	2043.522	504.1665	492.7432	481.3197	469.896	469.896	469.896	469.896	469.896	469.896	543.2407	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	3541.832	523.1626	523.1626	523.1626	523.1626	564.1831	523.1626	523.1626	523.1626	523.1626	613.3086	523.1626

52.44886	51.348	50.35124	49.35553	48.36911	47.33413	45.87816	44.38376	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
136.5	138.6	140.6	142.8	144.9	147.1	149.3	151.5	153.8	156.1	158.4	160.8	163.2	165.7	168.2	170.7	173.2	175.8	178.5	181.2	183.9	186.6	189.4	192.3	195.2	198.1	201.1	204.1	207.1	210.2	213.4	216.6	219.8	223.1	226.5	229.9
273.0	277.1	281.3	285.5	289.8	294.1	298.6	303.0	307.6	312.2	316.9	321.6	326.5	331.4	336.3	341.4	346.5	351.7	357.0	362.3	367.7	373.3	378.9	384.5	390.3	396.2	402.1	408.1	414.3	420.5	426.8	433.2	439.7	446.3	453.0	459.8
409.6	415.7	421.9	428.3	434.7	441.2	447.8	454.6	461.4	468.3	475.3	482.4	489.7	497.0	504.5	512.0	519.7	527.5	535.4	543.5	551.6	559.9	568.3	576.8	585.5	594.3	603.2	612.2	621.4	630.7	640.2	649.8	659.5	669.4	679.5	689.7

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
70.2	68.8	68.0	68.0	67.3	66.6	67.3	67.3	68.8	69.8	70.8	71.9	73.0	74.1	75.2	76.3	77.4	78.6	79.8	81.0	82.2	83.4	84.7	86.0	87.2	88.6	89.9	91.2	92.6	94.0	95.4	96.8	98.3	99.8	101.3	102.8
97.7	96.3	96.3	97.0	96.3	96.3	97.7	97.0	99.9	101.4	102.9	104.4	106.0	107.6	109.2	110.8	112.5	114.2	115.9	117.6	119.4	121.2	123.0	124.9	126.7	128.6	130.6	132.5	134.5	136.5	138.6	140.7	142.8	144.9	147.1	149.3
119.4	117.2	118.7	119.4	120.9	120.1	121.6	122.3	124.5	126.3	128.2	130.2	132.1	134.1	136.1	138.1	140.2	142.3	144.5	146.6	148.8	151.1	153.3	155.6	158.0	160.3	162.7	165.2	167.7	170.2	172.7	175.3	177.9	180.6	183.3	186.1

2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
206.0	210.7	215.6	220.5	225.6	230.8	236.1	241.5	247.1	252.8	258.6	264.5	270.6	276.8	283.2	289.7	296.4	303.2	310.2	317.3	324.6	332.1	339.7	347.5	355.5	363.7	372.0	380.6	389.3	398.3	407.5	416.8	426.4	436.2	446.3	456.5

2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	year_in
																							Non_traded_emissions_road_without_scheme_in
523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626	523.1626															Non_traded_emissions_road_with_scheme_in
																							Non_traded_emissions_rail_without_scheme_in
																							Non_traded_emissions_rail_with_scheme_in

																							Traded_emissions_road_without_scheme_in
42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382	42.91382															Traded_emissions_road_with_scheme_in
																							Traded_emissions_rail_without_scheme_in
																							Traded_emissions_rail_with_scheme_in

2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	
233.3	236.8	240.4	244.0	247.7	251.4	255.1	259.0	262.8	266.8	270.8	274.9	279.0	283.2	287.4	291.7	296.1	300.5	305.0	309.6	314.3	319.0	323.8	CO2e_values_factor_low_in
466.7	473.7	480.8	488.0	495.3	502.7	510.3	517.9	525.7	533.6	541.6	549.7	558.0	566.3	574.8	583.4	592.2	601.1	610.1	619.2	628.5	638.0	647.5	CO2e_values_factor_central_in
700.0	710.5	721.2	732.0	743.0	754.1	765.4	776.9	788.5	800.4	812.4	824.6	836.9	849.5	862.2	875.2	888.3	901.6	915.1	928.9	942.8	956.9	971.3	CO2e_values_factor_high_in

2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	
104.3	105.9	107.5	109.1	110.7	112.4	114.1	115.8	117.5	119.3	121.1	122.9	124.7	126.6	128.5	130.4	132.4	134.4	136.4	138.4	140.5	142.6	144.7	Traded_CO2e_values_factor_low_in
151.5	153.8	156.1	158.4	160.8	163.2	165.7	168.2	170.7	173.3	175.9	178.5	181.2	183.9	186.6	189.4	192.3	195.2	198.1	201.1	204.1	207.1	210.2	Traded_CO2e_values_factor_central_in
188.9	191.7	194.6	197.5	200.4	203.5	206.5	209.6	212.7	215.9	219.2	222.5	225.8	229.2	232.6	236.1	239.7	243.3	246.9	250.6	254.4	258.2	262.1	Traded_CO2e_values_factor_high_in

2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	
467.0	477.8	488.8	500.0	511.5	523.3	535.3	547.6	560.2	573.1	586.3	599.8	613.5	627.7	642.1	656.9	672.0	687.4	703.2	719.4	736.0	752.9	770.2	GDP_deflator_in

Greenhouse Gases Workbook - Calculations

			Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
Appraisal period																																																
Opening year	2025	*Opening_year*																																													
Opening year	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Appraisal period length (years)	62	*Appraisal_period_length*																																													
Appraisal period			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Check	TRUE																																														
Emissions (tCO2e)																																															
Non-traded sector																																															
Road without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Road with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764
Road - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764
Rail without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total change in non-traded emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764
Change over 60 years (tCO2e)	78456.39	*Non_traded_emissions_change_60years*																																													
Traded sector																																															
Road without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Road with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Road - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Rail without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total change in traded emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Change over 60 years (tCO2e)	2825.762	*Traded_emissions_change_60years*																																													
Total change in CO2e emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15520.9924**	**20694.6565**	**5787.95116**	**631.371851**	**648.455956**	**665.668397**	**682.794526**	**699.898399**	**690.715327**	**681.567992**	**672.51599**	**695.791652**	**654.399907**	**650.239058**	**646.062434**	**641.89089**	**678.73931**	**633.545235**	**617.059427**	**600.67706**	**584.295273**	**2091.89063**	**551.50061**	**538.621334**	**525.703431**	**512.809799**	**512.809799**	**512.809799**	**512.809799**	**512.809799**
Change over 60 years (tCO2e)	81282.15	*TOTAL_emissions_change_60years*																																													
Change in opening year (tCO2e)	15520.99	*TOTAL_emissions_change_opening_year*																																													
Carbon budget periods																																															
Carbon budget 1 start	2008	*Carbon_budget_1_start*																																													
Carbon budget 1 end	2012	*Carbon_budget_1_end*																																													
Carbon budget 2 start	2013	*Carbon_budget_2_start*																																													
Carbon budget 2 end	2017	*Carbon_budget_2_end*																																													
Carbon budget 3 start	2018	*Carbon_budget_3_start*																																													
Carbon budget 3 end	2022	*Carbon_budget_3_end*																																													
Carbon budget 4 start	2023	*Carbon_budget_4_start*																																													
Carbon budget 4 end	2027	*Carbon_budget_4_end*																																													
Carbon budget 5 start	2028	*Carbon_budget_5_start*																																													
Carbon budget 5 end	2032	*Carbon_budget_5_end*																																													
Carbon budget 6 start	2033	*Carbon_budget_6_start*																																													
Carbon budget 6 end	2037	*Carbon_budget_6_end*																																													
Masks																																															
Carbon Budget 1			1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 2			0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 3			0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 4			0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 5			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 6			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in traded emissions (tCO2e)																																															
Carbon Budget 1	0	*Traded_emissions_change_Budget_1*																																													
Carbon Budget 2	0	*Traded_emissions_change_Budget_2*																																													
Carbon Budget 3	0	*Traded_emissions_change_Budget_3*																																													
Carbon Budget 4	48.46966	*Traded_emissions_change_Budget_4*																																													
Carbon Budget 5	281.6676	*Traded_emissions_change_Budget_5*																																													
Carbon Budget 6	297.2085	*Traded_emissions_change_Budget_6*																																													
Change in non-traded emissions (tCO2e)																																															
Carbon Budget 1	0	*Non_traded_emissions_change_Budget_1*																																													
Carbon Budget 2	0	*Non_traded_emissions_change_Budget_2*																																													
Carbon Budget 3	0	*Non_traded_emissions_change_Budget_3*																																													
Carbon Budget 4	41955.13	*Non_traded_emissions_change_Budget_4*																																													
Carbon Budget 5	3046.522	*Non_traded_emissions_change_Budget_5*																																													
Carbon Budget 6	3097.782	*Non_traded_emissions_change_Budget_6*																																													
Emission valuations																																															
Price adjustment																																															
			Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
GDP deflator				100.0	102.2	103.8	106.0	107.4	108.1	110.2	112.2	114.4	116.8	123.0	122.6	128.9	138.2	140.3	141.9	144.3	147.0	149.8	153.3	156.8	160.4	164.1	167.9	171.7	175.7	179.7	183.8	188.1	192.4	196.8	201.3	206.0	210.7	215.6	220.5	225.6	230.8	236.1	241.5	247.1	252.8	258.6	264.5	270.6
CO2e values price base	2010	*CO2e_value_price_base*																																													
GDP deflator index - base	100	*GDP_deflator_base*																																													
Price base for outputs	2010	*Price_base_outputs*																																													
GDP deflator index - for outputs	100	*GDP_deflator_outputs*																																												
Price base adjustment	1.00	*Price_adjustment*																																													
Carbon values in 2010 prices																																														
low (£/tCO2e)				99.9	101.4	102.9	104.5	106.1	107.7	109.3	111.0	112.7	114.4	116.2	118.3	120.1	122.0	123.8	125.7	127.6	129.6	131.5	133.5	135.6	137.6	139.7	141.9	144.0	146.2	148.4	150.7	153.0	155.3	157.7	160.1	162.5	164.9	167.4	169.9	172.4	175.0	177.6	180.3	183.0	185.8	188.5	191.4	194.2
central (£/tCO2e)				199.7	202.8	205.9	209.0	212.2	215.4	218.7	222.0	225.4	228.8	232.3	236.7	240.3	243.9	247.6	251.4	255.2	259.1	263.1	267.1	271.1	275.3	279.5	283.7	288.0	292.4	296.9	301.4	306.0	310.7	315.4	320.1	324.9	329.8	334.7	339.8	344.9	350.0	355.3	360.6	366.0	371.5	377.1	382.7	388.5
high (£/tCO2e)				299.6	304.1	308.8	313.5	318.3	323.1	328.0	333.0	338.1	343.2	348.5	355.0	360.4	365.9	371.5	377.1	382.9	388.7	394.6	400.6	406.7	412.9	419.2	425.6	432.1	438.6	445.3	452.1	459.0	466.0	473.1	480.2	487.4	494.7	502.1	509.6	517.3	525.0	532.9	540.9	549.0	557.3	565.6	574.1	582.7
Valuing changes in emissions (non-traded) (£)																																															
positive values represent a benefit - a reduction in GHG emissions																																															
Low (£)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1951092.9	-2641073.3	-743633.0	-76333.1	-79431.4	-82606.2	-85859.1	-89191.6	-89358.5	-89509.6	-89644.3	-94560.4	-89862.5	-90766.5	-91677.0	-92594.0	-100062.2	-94405.1	-93284.2	-92108.4	-90876.2	-352363.1	-88237.1	-87531.4	-86784.7	-85995.8	-87285.7	-88595.0	-89923.9	-91272.8
Central (£)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3907185.8	-5282146.6	-1487266.0	-152666.2	-158862.7	-165212.4	-171718.2	-178383.3	-178717.0	-179019.2	-179288.6	-189120.8	-179725.1	-181533.1	-183354.0	-185187.9	-200124.4	-188810.1	-186568.4	-184216.7	-181752.4	-704726.3	-176474.2	-175062.8	-173569.3	-171991.6	-174571.4	-177190.0	-179847.9	-182545.6
High (£)				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5853278.7	-7923220.0	-2230899.1	-228999.2	-238294.1	-247818.6	-257577.3	-267574.9	-268075.6	-268528.7	-268932.8	-283681.2	-269587.6	-272299.6	-275030.9	-277781.9	-300186.6	-283215.2	-279852.6	-276325.1	-272628.6	-1057089.4	-264711.3	-262594.3	-260354.0	-257987.3	-261857.2	-265785.0	-269771.8	-273818.4
Discounting and present values																																															
Discount period																																															
Current year	2024	*Current_year*																																													
PV base year	2010	*PV_base_year*																																													
discount period 1	30	*Discount_period_1*																																													
discount period 2	75	*Discount_period_2*																																													
discount period 3	125	*Discount_period_3*																																													
Masks																																															
Discount period 1				0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Discount period 2				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discount period 3				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discount rates and factors																																															
discount rate 1	3.5%	*Discount_rate_1*																																														
discount rate 2	3.0%	*Discount_rate_2*																																														
discount rate 3	2.5%	*Discount_rate_3*																																														
Discount rate profile				0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1			1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79	1.86	1.92	1.99	2.06	2.13	2.21	2.28	2.36	2.45	2.53	2.62	2.71	2.81	2.91	3.01	3.11	3.22	3.33	3.45	3.57	3.70	3.83	3.96	4.10	4.24	4.39	4.54
Discounted GHG benefits																																															
Low (£)				0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1164589.1	-1523122.6	-414355.1	-41094.8	-41316.7	-41515.1	-41690.7	-41844.3	-40504.9	-39201.4	-37932.7	-38659.9	-35496.8	-34641.4	-33805.7	-32989.2	-34444.4	-31398.2	-29976.2	-28597.4	-27260.8	-102126.4	-24709.2	-23682.7	-22686.6	-21720.2	-21300.5	-20888.9	-20485.2	-20089.4
Central (£)				0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2329178.1	-3046245.2	-828710.3	-82189.5	-82633.3	-83030.1	-83381.3	-83688.6	-81009.9	-78402.7	-75865.4	-77319.7	-70993.6	-69282.9	-67611.4	-65978.5	-68888.9	-62796.3	-59952.4	-57194.9	-54521.5	-204252.7	-49418.4	-47365.3	-45373.2	-43440.3	-42600.9	-41777.7	-40970.4	-40178.7
High (£)				0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3493767.2	-4569367.8	-1243065.4	-123284.3	-123950.0	-124545.2	-125072.0	-125533.0	-121514.8	-117604.1	-113798.1	-115979.6	-106490.4	-103924.3	-101417.2	-98967.7	-103333.3	-94194.5	-89928.6	-85792.3	-81782.3	-306379.1	-74127.5	-71048.0	-68059.8	-65160.5	-63901.4	-62666.6	-61455.6	-60268.1
Present values																																															
Low (£)	-4,710,124	*NPV_low_NT*																																														
Central (£)	-9,420,248	*NPV_central_NT*																																														
High (£)	########	*NPV_high_NT*																																														

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2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643	523.162643
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643	523.162643
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643	523.162643
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
512.809799	**586.154484**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**3584.74547**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**607.096966**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**656.222421**	**566.076466**	**566.076466**

2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
566.076466	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078
276.8	283.2	289.7	296.4	303.2	310.2	317.3	324.6	332.1	339.7	347.5	355.5	363.7	372.0	380.6	389.3	398.3	407.5	416.8	426.4	436.2	446.3	456.5	467.0
197.2	200.1	203.1	206.2	209.3	212.4	215.6	218.8	222.1	225.4	228.8	232.2	235.7	239.3	242.8	246.5	250.2	253.9	257.7	261.6	265.5	269.5	273.6	277.7
394.3	400.2	406.2	412.3	418.5	424.8	431.2	437.6	444.2	450.8	457.6	464.5	471.4	478.5	485.7	493.0	500.4	507.9	515.5	523.2	531.1	539.0	547.1	555.3
591.5	600.3	609.3	618.5	627.8	637.2	646.7	656.4	666.3	676.3	686.4	696.7	707.2	717.8	728.5	739.5	750.6	761.8	773.2	784.8	796.6	808.6	820.7	833.0
-92641.9	-108708.6	-106261.1	-107855.1	-109472.9	-111115.0	-112781.7	-114473.4	-116190.5	-117933.4	-119702.4	-822545.7	-123320.4	-125170.2	-127047.7	-128953.5	-141150.5	-132851.1	-134843.8	-136866.5	-138919.5	-165299.5	-143118.3	-145265.1
-185283.8	-217417.2	-212522.3	-215710.1	-218945.8	-222229.9	-225563.4	-228946.8	-232381.0	-235866.8	-239404.8	-1645091.3	-246640.8	-250340.4	-254095.5	-257906.9	-282301.0	-265702.2	-269687.7	-273733.0	-277839.0	-330599.0	-286236.7	-290530.2
-277925.6	-326125.8	-318783.4	-323565.2	-328418.6	-333344.9	-338345.1	-343420.3	-348571.6	-353800.1	-359107.1	-2467637.0	-369961.2	-375510.6	-381143.2	-386860.4	-423451.5	-398553.2	-404531.5	-410599.5	-416758.5	-495898.5	-429355.0	-435795.4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
4.68	4.82	4.96	5.11	5.27	5.42	5.59	5.76	5.93	6.11	6.29	6.48	6.67	6.87	7.08	7.29	7.51	7.73	7.97	8.21	8.45	8.71	8.97	9.24
-19796.8	-22553.5	-21403.6	-21091.9	-20784.8	-20482.1	-20183.8	-19889.8	-19600.2	-19314.8	-19033.5	-126980.8	-18483.1	-18214.0	-17948.7	-17687.3	-18796.4	-17175.9	-16925.8	-16679.3	-16436.4	-18987.9	-15961.1	-15728.7
-39593.6	-45107.0	-42807.3	-42183.8	-41569.5	-40964.1	-40367.6	-39779.7	-39200.4	-38629.5	-38066.9	-253961.5	-36966.3	-36427.9	-35897.4	-35374.6	-37592.8	-34351.8	-33851.5	-33358.6	-32872.8	-37975.8	-31922.3	-31457.4
-59390.4	-67660.5	-64210.9	-63275.8	-62354.3	-61446.2	-60551.4	-59669.5	-58800.6	-57944.3	-57100.4	-380942.3	-55449.4	-54641.9	-53846.1	-53062.0	-56389.1	-51527.7	-50777.3	-50037.8	-49309.1	-56963.7	-47883.4	-47186.1

2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
477.8	488.8	500.0	511.5	523.3	535.3	547.6	560.2	573.1	586.3	599.8	613.5	627.7	642.1	656.9	672.0	687.4	703.2	719.4	736.0	752.9	770.2
281.8	286.1	290.4	294.7	299.1	303.6	308.2	312.8	317.5	322.2	327.1	332.0	337.0	342.0	347.1	352.4	357.6	363.0	368.5	374.0	379.6	385.3
563.7	572.1	580.7	589.4	598.3	607.2	616.3	625.6	635.0	644.5	654.2	664.0	673.9	684.0	694.3	704.7	715.3	726.0	736.9	748.0	759.2	770.6
845.5	858.2	871.1	884.1	897.4	910.8	924.5	938.4	952.4	966.7	981.2	996.0	1010.9	1026.1	1041.4	1057.1	1072.9	1089.0	1105.4	1121.9	1138.8	1155.8
-147444.1	-149655.8	-151900.6	-154179.1	-156491.8	-158839.2	-161221.8	-163640.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-294888.2	-299311.5	-303801.2	-308358.2	-312983.6	-317678.3	-322443.5	-327280.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-442332.3	-448967.3	-455701.8	-462537.3	-469475.4	-476517.5	-483665.3	-490920.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.5%
9.51	9.80	10.09	10.39	10.71	11.03	11.36	11.70	12.05	12.41	12.78	13.17	13.56	13.97	14.39	14.82	15.27	15.72	16.19	16.68	17.18	17.61
-15499.6	-15273.9	-15051.5	-14832.3	-14616.3	-14403.4	-14193.7	-13987.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-30999.3	-30547.8	-30102.9	-29664.6	-29232.5	-28806.8	-28387.3	-27973.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-46498.9	-45821.7	-45154.4	-44496.8	-43848.8	-43210.2	-42581.0	-41960.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

year

Opening_year_mask

Appraisal_period

Non_traded_emissions_road_without_scheme
Non_traded_emissions_road_with_scheme
Non_traded_emissions_road_change

Non_traded_emissions_rail_without_scheme
Non_traded_emissions_rail_with_scheme
Non_traded_emissions_rail_change

Non_traded_emissions_TOTAL_change

Traded_emissions_road_without_scheme
Traded_emissions_road_with_scheme
Traded_emissions_road_change

Traded_emissions_rail_without_scheme
Traded_emissions_rail_with_scheme
Traded_emissions_rail_change

Traded_emissions_TOTAL_change

CO2e_emissions_TOTAL_change

Carbon_budget_1_mask
Carbon_budget_2_mask
Carbon_budget_3_mask
Carbon_budget_4_mask
Carbon_budget_5_mask
Carbon_budget_6_mask

CO2e_values_low
CO2e_values_central
CO2e_values_high

CO2e_benefits_undiscounted_low
CO2e_benefits_undiscounted_central
CO2e_benefits_undiscounted_high

Discount_period_1_mask
Discount_period_2_mask
Discount_period_3_mask

Discount_rate_profile
Discount_factor

CO2e_benefits_discounted_low
CO2e_benefits_discounted_central
CO2e_benefits_discounted_high

Greenhouse Gases Workbook - Calculations

		Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
Appraisal period																																																
Opening year	2025	*Opening_year*																																													
Opening year	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Appraisal period length (years)	62	*Appraisal_period_length*																																													
Appraisal period			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Check	TRUE																																														
Emissions (tCO2e)																																															
Non-traded sector																																															
Road without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Road with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764	469.8959764	469.8959764
Road - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764	469.8959764
Rail without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total change in non-traded emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15520.99239	20694.65653	5739.481496	580.3139587	594.8102121	609.3057525	623.7997304	638.2919172	629.893845	621.494264	613.0930973	637.0146726	596.2864938	593.2506755	590.2134134	587.1751863	625.1567646	581.0963706	565.7114315	550.3258174	534.9397471	2043.521521	504.1664761	492.7431724	481.3196709	469.8959764	469.8959764	469.8959764	469.8959764	469.8959764
Change over 60 years (tCO2e)	78456.39	*Non_traded_emissions_change_60years*																																													
Traded sector																																															
Road without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Road with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Road - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Rail without scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail with scheme			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail - change in emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total change in traded emissions			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48.46966299	51.05789257	53.64574411	56.36264459	58.99479604	61.60648152	60.82148241	60.0737283	59.42289318	58.77697951	58.11341333	56.98838289	55.84902096	54.71570356	53.58254554	52.44886472	51.3479955	50.3512422	49.35552623	48.36911349	47.33413379	45.87816185	44.38375995	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
Change over 60 years (tCO2e)	2825.762	*Traded_emissions_change_60years*																																													
Total change in CO2e emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15520.9924**	**20694.6565**	**5787.95116**	**631.371851**	**648.455956**	**665.668397**	**682.794526**	**699.898399**	**690.715327**	**681.567992**	**672.51599**	**695.791652**	**654.399907**	**650.239058**	**646.062434**	**641.89089**	**678.73931**	**633.545235**	**617.059427**	**600.67706**	**584.295273**	**2091.89063**	**551.50061**	**538.621334**	**525.703431**	**512.809799**	**512.809799**	**512.809799**	**512.809799**	**512.809799**
Change over 60 years (tCO2e)	81282.15	*TOTAL_emissions_change_60years*																																												
Change in opening year (tCO2e)	15520.99	*TOTAL_emissions_change_opening_year*																																												
Carbon budget periods																																															
Carbon budget 1 start	2008	*Carbon_budget_1_start*																																												
Carbon budget 1 end	2012	*Carbon_budget_1_end*																																												
Carbon budget 2 start	2013	*Carbon_budget_2_start*																																												
Carbon budget 2 end	2017	*Carbon_budget_2_end*																																												
Carbon budget 3 start	2018	*Carbon_budget_3_start*																																												
Carbon budget 3 end	2022	*Carbon_budget_3_end*																																												
Carbon budget 4 start	2023	*Carbon_budget_4_start*																																												
Carbon budget 4 end	2027	*Carbon_budget_4_end*																																												
Carbon budget 5 start	2028	*Carbon_budget_5_start*																																												
Carbon budget 5 end	2032	*Carbon_budget_5_end*																																												
Carbon budget 6 start	2033	*Carbon_budget_6_start*																																												
Carbon budget 6 end	2037	*Carbon_budget_6_end*																																												
Masks																																															
Carbon Budget 1			1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 2			0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 3			0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 4			0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 5			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Budget 6			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in traded emissions (tCO2e)																																															
Carbon Budget 1	0	*Traded_emissions_change_Budget_1*																																													
Carbon Budget 2	0	*Traded_emissions_change_Budget_2*																																													
Carbon Budget 3	0	*Traded_emissions_change_Budget_3*																																													
Carbon Budget 4	48.46966	*Traded_emissions_change_Budget_4*																																													
Carbon Budget 5	281.6676	*Traded_emissions_change_Budget_5*																																													
Carbon Budget 6	297.2085	*Traded_emissions_change_Budget_6*																																													
Change in non-traded emissions (tCO2e)																																															
Carbon Budget 1	0	*Non_traded_emissions_change_Budget_1*																																													
Carbon Budget 2	0	*Non_traded_emissions_change_Budget_2*																																													
Carbon Budget 3	0	*Non_traded_emissions_change_Budget_3*																																													
Carbon Budget 4	41955.13	*Non_traded_emissions_change_Budget_4*																																													
Carbon Budget 5	3046.522	*Non_traded_emissions_change_Budget_5*																																													
Carbon Budget 6	3097.782	*Non_traded_emissions_change_Budget_6*																																													
Emission valuations																																															
Price adjustment																																															
		Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
GDP deflator			100.0	102.2	103.8	106.0	107.4	108.1	110.2	112.2	114.4	116.8	123.0	122.6	128.9	138.2	140.3	141.9	144.3	147.0	149.8	153.3	156.8	160.4	164.1	167.9	171.7	175.7	179.7	183.8	188.1	192.4	196.8	201.3	206.0	210.7	215.6	220.5	225.6	230.8	236.1	241.5	247.1	252.8	258.6	264.5	270.6
CO2e values price base	2010	*CO2e_value_price_base*																																													
GDP deflator index - base	100	*GDP_deflator_base*																																													
Price base for outputs	2010	*Price_base_outputs*																																													
GDP deflator index - for outputs	100	*GDP_deflator_outputs*																																												
Price base adjustment	1.00	*Price_adjustment*																																													
Traded carbon appraisal values in 2010 prices - adjusted for DESNZ traded values and converted to the market-price unit of account																																														
low (£/tCO2e)			85.3	87.9	95.6	100.3	100.9	101.5	104.1	105.8	110.6	114.4	116.2	114.2	111.8	78.0	69.6	64.6	61.3	66.7	72.1	83.6	87.3	86.0	82.0	81.6	82.0	77.3	75.2	69.8	63.4	64.0	69.0	73.9	78.9	83.1	86.4	88.9	92.3	95.8	97.5	100.2	101.2	102.7	104.3	105.8	107.4
central (£/tCO2e)			185.2	189.2	198.6	204.8	207.0	209.2	213.5	216.8	211.9	215.3	217.7	214.8	212.2	183.6	185.6	183.4	176.9	175.6	178.7	190.4	196.2	194.3	192.5	190.7	192.5	188.2	186.7	185.1	181.1	185.8	193.1	200.4	208.7	215.3	220.2	224.4	230.3	235.5	239.0	245.2	247.2	250.9	254.6	258.5	262.3
high (£/tCO2e)			285.0	290.6	301.5	309.3	313.1	316.9	322.8	327.8	311.0	316.2	319.3	316.5	312.5	310.8	299.1	291.0	284.7	288.8	287.8	299.0	305.1	302.7	306.4	308.5	312.4	310.3	311.0	312.6	312.6	318.7	327.5	337.2	345.3	355.2	360.9	367.5	373.5	382.1	388.2	395.4	400.9	406.9	413.0	419.2	425.5
Valuing changes in emissions (traded) (£)																																														
positive values represent a benefit - a reduction in GHG emissions																																														
Low (£)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3232.8	-3682.0	-4484.3	-4923.1	-5071.6	-5053.9	-4961.8	-4927.1	-4594.6	-4422.5	-4053.5	-3615.0	-3576.7	-3774.9	-3961.9	-4139.5	-4266.2	-4351.3	-4389.1	-4466.3	-4533.9	-4475.4	-4447.9	-4342.7	-4407.9	-4474.0	-4541.1	-4609.2
Central (£)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8510.9	-9122.9	-10216.0	-11059.7	-11464.2	-11858.6	-11599.7	-11561.4	-11185.1	-10970.9	-10759.5	-10322.0	-10375.8	-10565.5	-10738.6	-10943.9	-11052.9	-11087.5	-11073.5	-11140.4	-11146.8	-10965.8	-10883.4	-10607.3	-10766.4	-10927.9	-11091.8	-11258.2
High (£)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13997.8	-14695.7	-16040.1	-17196.3	-17856.8	-18875.5	-18761.4	-18764.8	-18440.8	-18278.6	-18166.1	-17814.2	-17800.3	-17921.6	-18069.1	-18109.7	-18237.7	-18170.5	-18140.4	-18064.3	-18085.9	-17811.9	-17548.2	-17204.4	-17462.4	-17724.4	-17990.2	-18260.1
Discounting and present values																																														
Discount period																																														
Current year	2024	*Current_year*																																												
PV base year	2010	*PV_base_year*																																												
discount period 1	30	*Discount_period_1*																																												
discount period 2	75	*Discount_period_2*																																												
discount period 3	125	*Discount_period_3*																																												
Masks																																														
Discount period 1			0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Discount period 2			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discount period 3			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discount rates and factors																																														
discount rate 1	3.5%	*Discount_rate_1*																																													
discount rate 2	3.0%	*Discount_rate_2*																																													
discount rate 3	2.5%	*Discount_rate_3*																																													
Discount rate profile			0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Discount factor	1		1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.32	1.36	1.41	1.46	1.51	1.56	1.62	1.68	1.73	1.79	1.86	1.92	1.99	2.06	2.13	2.21	2.28	2.36	2.45	2.53	2.62	2.71	2.81	2.91	3.01	3.11	3.22	3.33	3.45	3.57	3.70	3.83	3.96	4.10	4.24	4.39	4.54
Discounted GHG benefits																																														
Low (£)			0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1801.3	-1982.3	-2332.5	-2474.2	-2462.6	-2371.0	-2249.1	-2157.8	-1944.2	-1808.1	-1601.2	-1379.7	-1318.9	-1344.9	-1363.8	-1376.8	-1370.9	-1351.0	-1316.6	-1294.5	-1269.6	-1210.9	-1162.7	-1096.9	-1075.7	-1054.9	-1034.5	-1014.5
Central (£)			0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4742.3	-4911.4	-5313.9	-5558.2	-5566.7	-5563.5	-5258.0	-5063.4	-4732.9	-4485.3	-4250.1	-3939.4	-3826.1	-3764.3	-3696.6	-3639.8	-3551.8	-3442.4	-3321.8	-3228.8	-3121.5	-2966.9	-2845.1	-2679.1	-2627.3	-2576.6	-2526.8	-2477.9
High (£)			0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-7799.6	-7911.6	-8343.4	-8642.3	-8670.7	-8855.5	-8504.3	-8218.2	-7803.2	-7473.0	-7175.8	-6798.8	-6563.8	-6385.1	-6219.9	-6023.1	-5860.5	-5641.5	-5441.7	-5235.6	-5064.6	-4819.2	-4587.3	-4345.4	-4261.4	-4179.0	-4098.3	-4019.1
Present values																																														
Low (£)	-69,940	*NPV_low_T*																																													
Central (£)	-172,497	*NPV_central_T*																																													
High (£)	-280,832	*NPV_high_T*																																													

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2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
469.8959764	543.2406616	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	3541.831644	523.162643	523.162643	523.162643	523.162643	564.183143	523.162643	523.162643	523.162643	523.162643	613.3085982	523.162643
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225
512.809799	**586.154484**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**3584.74547**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**607.096966**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**656.222421**	**566.076466**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077
276.8	283.2	289.7	296.4	303.2	310.2	317.3	324.6	332.1	339.7	347.5	355.5	363.7	372.0	380.6	389.3	398.3	407.5	416.8	426.4	436.2	446.3	456.5
109.0	110.7	112.3	114.0	115.7	117.4	119.2	121.0	122.8	124.6	126.5	128.4	130.3	132.3	134.3	136.3	138.3	140.4	142.5	144.7	146.8	149.0	151.3
266.3	270.3	274.3	278.4	282.6	286.9	291.2	295.5	300.0	304.5	309.0	313.7	318.4	323.1	328.0	332.9	337.9	343.0	348.1	353.3	358.6	364.0	369.5
431.9	438.4	444.9	451.6	458.4	465.3	472.2	479.3	486.5	493.8	501.2	508.7	516.4	524.1	532.0	540.0	548.1	556.3	564.6	573.1	581.7	590.4	599.3
-4678.4	-4748.5	-4819.8	-4892.1	-4965.4	-5039.9	-5115.5	-5192.3	-5270.1	-5349.2	-5429.4	-5510.9	-5593.5	-5677.4	-5762.6	-5849.0	-5936.8	-6025.8	-6116.2	-6208.0	-6301.1	-6395.6	-6491.5
-11427.0	-11598.4	-11772.4	-11949.0	-12128.2	-12310.1	-12494.8	-12682.2	-12872.5	-13065.5	-13261.5	-13460.4	-13662.4	-13867.3	-14075.3	-14286.4	-14500.7	-14718.2	-14939.0	-15163.1	-15390.5	-15621.4	-15855.7
-18534.0	-18812.0	-19094.2	-19380.6	-19671.3	-19966.4	-20265.9	-20569.9	-20878.4	-21191.6	-21509.5	-21832.1	-22159.6	-22492.0	-22829.4	-23171.8	-23519.4	-23872.2	-24230.3	-24593.7	-24962.6	-25337.1	-25717.1
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3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
4.68	4.82	4.96	5.11	5.27	5.42	5.59	5.76	5.93	6.11	6.29	6.48	6.67	6.87	7.08	7.29	7.51	7.73	7.97	8.21	8.45	8.71	8.97
-999.7	-985.2	-970.8	-956.7	-942.8	-929.0	-915.5	-902.2	-889.0	-876.1	-863.3	-850.7	-838.4	-826.1	-814.1	-802.3	-790.6	-779.1	-767.7	-756.5	-745.5	-734.7	-724.0
-2441.9	-2406.3	-2371.3	-2336.7	-2302.7	-2269.2	-2236.1	-2203.5	-2171.5	-2139.8	-2108.7	-2078.0	-2047.7	-2017.9	-1988.5	-1959.5	-1931.0	-1902.9	-1875.2	-1847.9	-1820.9	-1794.4	-1768.3
-3960.6	-3902.9	-3846.0	-3790.0	-3734.8	-3680.4	-3626.8	-3574.0	-3522.0	-3470.7	-3420.1	-3370.3	-3321.3	-3272.9	-3225.2	-3178.3	-3132.0	-3086.4	-3041.4	-2997.1	-2953.5	-2910.5	-2868.1

2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	523.162643	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	42.9138225	0	0	0	0	0	0	0	0	0	0	0	0	0	0
566.076466	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**566.076466**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
467.0	477.8	488.8	500.0	511.5	523.3	535.3	547.6	560.2	573.1	586.3	599.8	613.5	627.7	642.1	656.9	672.0	687.4	703.2	719.4	736.0	752.9	770.2
153.5	155.8	158.2	160.6	163.0	165.4	167.9	170.4	173.0	175.6	178.2	180.9	183.6	186.3	189.1	192.0	194.8	197.8	200.7	203.7	206.8	209.9	213.0
375.0	380.6	386.4	392.2	398.0	404.0	410.1	416.2	422.5	428.8	435.2	441.8	448.4	455.1	461.9	468.9	475.9	483.0	490.3	497.6	505.1	512.7	520.4
608.3	617.4	626.6	636.0	645.6	655.3	665.1	675.1	685.2	695.5	705.9	716.5	727.2	738.2	749.2	760.5	771.9	783.5	795.2	807.1	819.2	831.5	844.0
-6588.9	-6687.7	-6788.1	-6889.9	-6993.2	-7098.1	-7204.6	-7312.7	-7422.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-16093.6	-16335.0	-16580.0	-16828.7	-17081.1	-17337.3	-17597.4	-17861.4	-18129.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-26102.9	-26494.4	-26891.8	-27295.2	-27704.6	-28120.2	-28542.0	-28970.1	-29404.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.5%
9.24	9.51	9.80	10.09	10.39	10.71	11.03	11.36	11.70	12.05	12.41	12.78	13.17	13.56	13.97	14.39	14.82	15.27	15.72	16.19	16.68	17.18	17.61
-713.4	-703.0	-692.8	-682.7	-672.8	-663.0	-653.3	-643.8	-634.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1742.5	-1717.2	-1692.2	-1667.5	-1643.2	-1619.3	-1595.7	-1572.5	-1549.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-2826.3	-2785.1	-2744.6	-2704.6	-2665.2	-2626.4	-2588.2	-2550.5	-2513.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

year

Opening_year_mask

Appraisal_period

Non_traded_emissions_road_without_scheme
Non_traded_emissions_road_with_scheme
Non_traded_emissions_road_change

Non_traded_emissions_rail_without_scheme
Non_traded_emissions_rail_with_scheme
Non_traded_emissions_rail_change

Non_traded_emissions_TOTAL_change

Traded_emissions_road_without_scheme
Traded_emissions_road_with_scheme
Traded_emissions_road_change

Traded_emissions_rail_without_scheme
Traded_emissions_rail_with_scheme
Traded_emissions_rail_change

Traded_emissions_TOTAL_change

CO2e_emissions_TOTAL_change

Carbon_budget_1_mask
Carbon_budget_2_mask
Carbon_budget_3_mask
Carbon_budget_4_mask
Carbon_budget_5_mask
Carbon_budget_6_mask

CO2e_values_traded_adjusted_market_low
CO2e_values_traded_adjusted_market_central
CO2e_values_traded_adjusted_market_high

CO2e_benefits_undiscounted_low
CO2e_benefits_undiscounted_central
CO2e_benefits_undiscounted_high

Discount_period_1_mask
Discount_period_2_mask
Discount_period_3_mask

Discount_rate_profile
Discount_factor

CO2e_benefits_discounted_low
CO2e_benefits_discounted_central
CO2e_benefits_discounted_high

Greenhouse Gases Workbook - Outputs 1

Scheme Name: Shrewsbury NWRR - Low Economy

Present Value Base Year	2010	Unit of account	Market prices
Current Year	2024		
Proposal Opening year:	2025		
Project (Road/Rail or Road and Rail):	Road		

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):
(Sum of traded and non-traded emissions - see note below on accounting for UK allowances in the traded sector)

-£9,592,745

*positive value reflects a **net benefit** (i.e. CO2e emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

81,282

*negative value reflects a **net benefit** (CO2e emissions reduction)

Of which Traded

2,826

Change in carbon dioxide equivalent emissions in opening year (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

15,521

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£):
N.B. This value has been adjusted to account for the cost of emissions covered by the UK Emissions Trading Scheme (UK ETS), ***under the assumption that all assessed traded emissions are within the scope of the UK ETS****. For further information, including guidance on the valuation of traded emissions outside the scope of the UK ETS, please refer to TAG Unit A3, section 4.1.*

-£172,497

*positive value reflects a **net benefit** (i.e. CO2e emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4	Carbon Budget 5	Carbon Budget 6
Traded sector	0	0	0	48.46966299	281.6675588	297.2084967
Non-traded sector	0	0	0	41955.13041	3046.521571	3097.782373

Qualitative Comments:

(Low Economy Scenario)
The scheme has an estimated whole-life carbon impact of +81,282 tCO2e of which 78,456 tCO2e is non-traded and 2,826 tCO2e is traded. This impact is made up of:
- User emissions (B8/D) - an estimated increase of +40,061 tCO2e over 60 years as quantified using strategic model outputs and Defra's EFT tool, and also accounting for a slight reduction in vehicle kilometres due to modal shift (using outputs of the AMAT). This increase in user emissions is associated with additional vehicle kilometres travelled with the scheme, which outweigh potential savings from alleviation of congestion.
- Capital carbon - an estimated impact of +33,317 tCO2e during the construction phase, inclusive of product (A1-A3) and construction process (A4-A5) impacts.
- Operational carbon - an estimated impact of +5,066 tCO2e over 60 years, inclusive of repair (B3), replacement (B4), and operational energy use (B6) impacts.
- Land use change (B1) - an estimated net impact of +2,838 tCO2e over the construction and operational phases (62 years).

Sensitivity Analysis:
(Traded and non-traded)

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):	-£14,411,203
Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):	-£4,780,064

Data Sources:
User Carbon: Link by link model outputs, EFT
Infrastructure Carbon: Bills of Quantities, NH Carbon Tool, ICE v3, RICS
Land Use Change Carbon: BNG Assessment, Natural England, Woodland Carbon Code

Greenhouse Gases Workbook - Outputs 2 (Carbon Metrics)

For detailed guidance on carbon metrics, please refer to TAG Unit A3, Appendix D.

Scheme Name: Shrewsbury NWRR - Low Economy

Net Social Value (Scheme NPV)		***Required for calculating carbon metrics**. Units: £, 2010 prices.*

Carbon Metrics

Carbon Effectiveness Indicator (CEI)	N/A	*The net non-carbon social impact of a scheme per tonne of its net impact on carbon emissions (in tCO2e). Units: £/tCO2e.*
Weighted Average Cost Comparator (WACC)	118.02	*The monetary value of a scheme's net carbon impacts per tonne of its net impact on carbon emissions (in tCO2e). Units: £/tCO2e.*
Carbon Efficiency Metric (CEM)	N/A	*A ratio that captures the value of a scheme's carbon impacts per £ of its net non-carbon social impacts. This is essentially the scheme's "carbon BCR", and it allows different schemes (with potentially different profiles of carbon emissions) to be ranked in terms of their overall carbon cost-effectiveness.*