

Low Emission Planning: Policy Appraisal Annex

Tables updated using 2015 Damage Costs

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Low Emission Strategies

Building on Good Practice

The original Policy Appraisal Report was published in February 2015. This Annex (published June 2016) presents updated damage costs for the Reference Sites, using Defra 2015 and DECC 2015 damage cost factors.

- Defra (Sep-15) Air Quality: economic analysis. <https://www.gov.uk/guidance/air-quality-economic-analysis>
- DECC (Dec-15) Green Book Supplementary Guidance: valuation of energy use and greenhouse gas emissions for appraisal. <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

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Changes to Air Quality Damage Costs

References

The original Policy Appraisal report (published Feb-15) used Defra Damage Costs for NO_x and PM₁₀, which were current at the time (published in 2013). In Sept 2015, Defra issued revised damage costs to include new evidence regarding NO_x impacts.

The revised figures have significantly increased NO_x damage costs, and also introduced differentiation of NO_x damage costs by geographical location (to mirror the approach used previously for PM). PM damage costs have also been updated. All figures are now presented in 2015 prices. COMEAP also recommends a reduction in damage costs for NO_x if PM is also being valued at the same time. This is to take account of possible overestimation due to double counting of effects associated with PM. As such, Defra has published separate NO_x damage costs to be used when PM is also being valued.

The information on the link between exposure to NO₂ and health effects is still very uncertain. As such, the emission damage costs are described as 'interim', and likely to be subject to further change with ongoing review of evidence by COMEAP.

References are as follows:

- [1] Defra (Sep-15) **Air Quality: economic analysis** <https://www.gov.uk/guidance/air-quality-economic-analysis>
- [2] Defra (Sep-15) **Valuing impacts on air quality: Updates in valuing changes in emissions of NO_x and concentrations of NO₂**.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf
- [3] Defra (Sep-15) **Damage costs by location and source**.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460398/air-quality-econanalysis-damagecost.pdf

Impact on Figures

The changes to unit damage costs used within the original report are as follows:

Pollutant	Previous Figure (2010 prices, central estimate)	Revised Figure (2015 prices, central estimate)	Magnitude of change	Impact on LEP Policy Analysis report figures
NO _x	£955 / tonne [Unit cost]	£21,044 / tonne [Transport average, PM also valued]	Unit cost has increased by factor of 22	The report uses a 2016 base year. Changes to economic treatment moving from 2010 to 2015 reference prices reduce the differences slightly: NO_x factor of 20 increase (Unit cost modelled for 2016 changing from £1,098 to £21,570)
PM ₁₀	£48,517 / tonne [Transport average]	£58,125 [Transport Average]	Unit cost has increased by factor of 1.2	PM₁₀ factor of 1.1 increase (Unit cost modelled for 2016 changing from £55,795 to £59,578)

Changes to Non-traded Carbon Values

References

The original Policy Appraisal report (published Feb-15) used Carbon Values published by DECC, which were current at the time (published in 2013). In Dec-15, DECC issued an update, which includes minor changes to the non-traded carbon values.

References are as follows:

- [4] DECC (Dec-15) **Green Book Supplementary Guidance: valuation of energy use and greenhouse gas emissions for appraisal.**(incl. main report, and data tables) (Non traded carbon prices are listed in Table 3) <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>
- [5] DECC (Nov-15) **Carbon Valuation.** Online guidance. <https://www.gov.uk/government/collections/carbon-valuation--2>

Note, DECC issues a statement that if Carbon pricing is being used, a thorough review of the appropriateness of traded versus non-traded prices should be undertaken. (Non-traded prices are significantly higher than traded prior to 2030, then equal to traded afterwards.) At present, most local authorities are focussing on AQ damage costs. As such the CO₂ prices should be considered indicative.

Impact on Figures

The changes to unit damage costs used within the original report are as follows:

Pollutant	Previous Figure (2013 prices, central estimate)	Revised Figure (2015 prices, central estimate)	Magnitude of change	Impact on LEP Policy Analysis report figures
CO ₂	£62 / tonne [est for 2016]	£63 / tonne [est for 2016]	Unit cost has decreased by factor of 1.02	The report uses a 2016 base year. Changes to economic treatment moving from 2013 to 2015 reference prices reduce the differences: CO₂ factor decrease (*0.97) (Unit cost modelled for 2016 changing from £67 to £65 – due to changes in C Values being less than estimated through inflation.)

Changes to Report Tables

Table 1: Baseline damage costs for reference sites, over 5 years

Reference Site	£AQ Damage Costs (5 years)	£AQ+CO2 Damage Costs (5 years)
Housing (Central, 50 Units)	£28,000	£60,000
Housing (Edge, 500 Units)	£455,000	£950,000
Food retail (Edge, 10 000 m2)	£2,500,000	£5,000,000
Non-food retail (Edge, 3000 m2)	£195,000	£406,000
Commercial (Central, 1500 m2)	£60,000	£124,000
Fleet Depot (Edge, 50 HGV)	£610,000	£1,115,000

Notes on changes: Significant increases in AQ damage costs (and therefore combined damage costs) across all sites. AQ DC increases for housing, retail and commercial are in the order of factor of 4. The fleet depot has a greater increase (factor of 5) due to the different fleet mix (entirely HGV), with a higher relative proportion of NO_x emissions.

Table 2: Baseline Harm – annual emissions and damage costs by pollutant [Simple version –c.f. Table 5 below]

Reference Site	Annual journeys by vehicle fleet		Base Impacts (Annual)		
		annual vkm	t/yr	£DC/yr	
Housing (Med) (Central, 50 Units)	Domestic (cars)	711,000	NO _x	0.2	£4,300
	Service (LGVs, HGVs)	5,000	PM ₁₀	0.02	£1,400
			CO ₂	95	£6,100
			=> Total		£11,800
Housing (Large) (Edge, 500 Units)	Domestic (cars)	11,700,000	NO _x	3	£68,500
	Service (LGVs, HGVs)	5,000	PM ₁₀	0.4	£22,300
			CO ₂	1,537	£99,200
			=> Total		£190,000
Food retail (Edge, 10 000 m2)	Heavy fleet (HGVs)	1,390,000	NO _x	17	£377,000
	Commuting – staff (cars)	837,000	PM ₁₀	2	£115,000
	Public access (cars)	53,543,000	CO ₂	8,045	£519,000
			=> Total		£1,011,000
Non-food retail (Edge, 3000 m2)	Heavy fleet (HGVs)	59,000	NO _x	1.4	£29,800
	Commuting – staff (cars)	134,000	PM ₁₀	0.2	£9,400
	Public access (cars)	4,540,000	CO ₂	652	£42,100
			=> Total		£81,300
Commercial (Central, 1500 m2)	Commuting – staff (cars)	251,000	NO _x	0.4	£9,000
	Business (cars)	1,260,000	PM ₁₀	0.05	£2,900
	Service fleet (LGVs, HGVs)	5,000	CO ₂	200	£12,900
			=> Total		£24,800
Fleet Depot (Edge, 50 HGV)	Heavy fleet (HGVs)	2,400,000	NO _x	5	£101,900
			PM	0.3	£19,800
			CO ₂	1,570	£101,400
			=> Total		£223,100

Notes on changes: Significant increases in NO_x damage costs (and therefore combined damage costs) across all sites. (With slight increases in damage costs for PM₁₀ and slight decreases in CO₂).

Table 3: Baseline Harm – annual emissions and damage costs by vehicle fleet and pollutant

[c.f. Simpler table above. Relative contributions of the different fleets is useful in considering mitigation options]

Reference Site		Annual vkm		NO _x	PM ₁₀ (exh)	PM ₁₀ (non-ex)	CO ₂	Total
Housing (Med) (Central, 50 Units)	Domestic (cars)	711,000	t/a	0.19	0.003	0.017	93	
	Service (LGVs, HGVs)	5,000	t/a	0.005	0.00004	0.00026	1	
	=>Total	716,000	t/a	0.2	0.003	0.018	95	
			£/a	£4,259	£172	£1,199	£6,112	£11,742
Housing (Large) (Edge, 500 Units)	Domestic (cars)	11,702,000	t/a	3.17	0.05	0.32	1,535	
	Service (LGVs, HGVs)	5,000	t/a	0.005	0.00004	0.00026	1	
	=>Total	11,707,000	t/a	3.18	0.05	0.32	1,537	
			£/a	£68,486	£2,785	£19,479	£99,241	£189,991
Food retail (Edge, 10 000 m2)	Heavy fleet (HGVs)	1,390,000	t/a	2.73	0.03	0.16	909	
	Commuting – staff (cars)	837,000	t/a	0.23	0.004	0.026	110	
	Public access (cars)	53,543,000	t/a	14.51	0.21	1.5	7,026	
	=>Total	55,769,000	t/a	17.47	0.2	1.7	8,045	
		£/a	£376,762	£14,850	£99,981	£519,483	£1,011,076	
Non-food retail (Edge, 3000 m2)	Heavy fleet (HGVs)	59,000	t/a	0.12	0.002	0.008	39	
	Commuting – staff (cars)	134,000	t/a	0.04	0	0	18	
	Public access (cars)	4,538,000	t/a	1.23	0.02	0.12	595	
	=>Total	4,731,000	t/a	1.38	0.02	0.13	652	
		£/a	£29,807	£1,192	£8,175	£42,080	£81,254	
Commercial (Central, 1500 m2)	Commuting – staff (cars)	251,000	t/a	0.07	0.001	0.009	33	
	Business (cars)	1,265,000	t/a	0.34	0.005	0.035	166	
	Service (LGVs, HGVs)	4,000	t/a	0.005	0.00004	0.00026	1	
	=>Total	1,521,000	t/a	0.42	0.006	0.044	200	
		£/a	£8,964	£363	£2,538	£12,935	£24,800	
Fleet Depot (Edge, 50 HGV)	Heavy fleet (HGVs)	2,400,000	t/a	4.72	0.06	0.27	1,570	
			£/a	£101,887	£3,314	£16,465	£101,398	£223,064

Table 4: Action packages for reference sites (These are **site fleet impacts**, combining impact of measure and the relative size(s) of the target sub-fleet(s))

Reference Site	Base Impacts (Annual)			Actions considered	Benefit Assessment			
	t/yr	£DC/yr			NOx	PM10	CO2	
Housing (Med) (Central, 50 Units)	NO _x PM ₁₀ CO ₂ => Total	0.2 0.02 95	£4,300 £1,400 £6,100 £11,800	M1: Resid. Travel Plan: 10% ↓ dom. car trips M2: Resid. EV: assume ~5% dom. car exhaust	M1: M2: =>All	↓ 10% ↓ 5% ↓ 15%	↓ 10% ↓ 1% ↓ 10%	↓ 10% ↓ 5% ↓ 15%
Housing (Large) (Edge, 500 Units)	NO _x PM ₁₀ CO ₂ => Total	3 0.4 1,537	£68,500 £22,300 £99,200 £190,000	M1: Resid. Travel Plan: 10% ↓ dom. car trips M2: Resid. EV: assume ~5% dom. car exhaust	M1: M2: =>All	↓ 10% ↓ 5% ↓ 15%	↓ 10% ↓ 1% ↓ 11%	↓ 10% ↓ 5% ↓ 15%
Food retail (Edge, 10 000 m2)	NO _x PM ₁₀ CO ₂ => Total	17 2 8,045	£377,000 £115,000 £519,000 £1,011,000	M1: Site Travel Plan: 10% ↓ public car trips M2: Site EV: assume ~1% public car exhaust M3: Staff Parking: No staff parking M4: Site based LEZ (HGVs Euro V+)	M1: M2: M3: M4: =>All	↓ 8% ↓ 1% ↓ 1% ↓ 5% ↓ 16%	↓ 9% ↓ 0.1% ↓ 1% ↓ 1% ↓ 11%	↓ 9% ↓ 1% ↓ 1% ↓ 0.04% ↓ 11%
Non-food retail (Edge, 3000 m2)	NO _x PM ₁₀ CO ₂ => Total	1.4 0.2 652	£29,800 £9,400 £42,100 £81,300	M1: Site Travel Plan: 10% ↓ public car trips M2: Site EV: assume ~1% public car exhaust M3: Staff Parking: No staff parking M4: Site based LEZ (HGVs Euro V+)	M1: M2: M3: M4: =>All	↓ 9% ↓ 1% ↓ 3% ↓ 3% ↓ 15%	↓ 9% ↓ 0.1% ↓ 3% ↓ 0.4% ↓ 12%	↓ 9% ↓ 1% ↓ 3% ↓ 0.02% ↓ 13%
Commercial (Central, 1500 m2)	NO _x PM ₁₀ CO ₂ => Total	0.4 0.05 200	£9,000 £2,900 £12,900 £24,800	M1: Staff Travel Plan: 10% ↓ staff car trips M2: Staff EV: assume ~5% staff car exhaust M3: Site Travel Plan: 10% ↓ other car trips M4: Site EV: assume ~1% other car exhaust	M1: M2: M3: M4: =>All	↓ 2% ↓ 1% ↓ 8% ↓ 1% ↓ 12%	↓ 2% ↓ 0.1% ↓ 8% ↓ 0.1% ↓ 10%	↓ 2% ↓ 1% ↓ 8% ↓ 1% ↓ 12%
Fleet Depot (Edge, 50 HGV)	NO _x PM CO ₂ => Total	5 0.3 1,570	£101,900 £19,800 £101,400 £223,100	M1: Site based LEZ (HGVs Euro V+)	M1:	↓ 33%	↓ 8%	↓ 0.3%
<p>Note: The percentage reductions presented in the benefit assessment represent impacts on the site fleet as a whole. These can be compared with the impacts on the sub-fleets as described in Error! Reference source not found. above. For example, “No staff parking” results in a 100% emissions reduction for the staff cars sub-fleet, but only 1% emissions reduction across the site as a whole. This reflects the baseline emissions impact of the staff cars sub-fleet, compared with the site as a whole.</p>								

Table 5: Benefits of measures for reference sites, over 5 years

Reference Site	Actions	Benefits Assmt	Damage Avoided (5yr)	
			£AQ	£AQ+CO2
Housing (Med) (Central, 50 Units)	Travel Plan: 10% ↓ car trips EV: ~5% car exhaust	NO _x ↓ 15% PM ₁₀ ↓10% CO ₂ ↓15%	£3,800	£8,400
Housing (Large) (Edge, 500 Units)	Travel Plan: 10% ↓ car trips EV: ~5% car exhaust	NO _x ↓ 15% PM ₁₀ ↓11% CO ₂ ↓15%	£63,100	£137,500
Food retail (Edge, 10 000 m2)	Travel Plan: 10% ↓ car trips EV: ~1% car exhaust Parking: No staff parking LEZ (HGVs Euro V+)	NO _x ↓ 16% PM ₁₀ ↓11% CO ₂ ↓11%	£357,800	£643,700
Non-food retail (Edge, 3000 m2)	Travel Plan: 10% ↓ car trips EV: ~1% car exhaust Parking: No staff parking LEZ (HGVs Euro V+)	NO _x ↓ 15% PM ₁₀ ↓12% CO ₂ ↓13%	£28,500	£55,300
Commercial (Central, 1500 m2)	Travel Plan: 10% ↓ car trips EV: ~5%/1% staff / car exh	NO _x ↓ 12% PM ₁₀ ↓10% CO ₂ ↓12%	£6,600	£14,100
Fleet Depot (Edge, 50 HGV)	M1: LEZ (HGVs Euro V+)	NO _x ↓ 33% PM ₁₀ ↓8% CO ₂ ↓0.3%	£175,800	£177,400
Note: It would be useful to have reference capital/operating costs to the developer for implementation of the various measures, as a means of contextualising the emissions benefits. The LET includes some reference costs (although these are 2010 prices). Further work is required to develop this information.				
Notes on changes: Proportionate increases in damage avoided for each site (higher increase for fleet depot, due to fleet mix).				

Table 6: Benefits assessment for reference sites (incl. pollutant details)

	Base Impacts (Annual)		Actions	Damage Avoided (Annual)		Residual Impacts (Annual)	
	t/yr	£DC/yr		t/yr	£DC/yr	t/yr	£DC/yr
Housing (Med) (Central, 50 Units)	NO _x 0.2 PM ₁₀ 0.02 CO ₂ 95 => Total	£4,300 £1,400 £6,100 £11,800	All measures M1: Travel Plan (10% ↓ car trips) M2: EV (5% ↓ car exhaust)	NO _x 0.03 PM ₁₀ 0.002 CO ₂ => 14 Total	£623 £144 £904 £1,670	NO _x 0.17 PM ₁₀ 0.021 CO ₂ => 81 Total	£3,636 £1,227 £5,208 £10,071
Housing (Large) (Edge, 500 Units)	NO _x 3 PM ₁₀ 0.4 CO ₂ 1,537 => Total	£68,500 £22,300 £99,200 £190,000	All measures M1: Travel Plan (10% ↓ car trips) M2: EV (5% ↓ car exhaust)	NO _x 0.48 PM ₁₀ 0.04 CO ₂ => 230 Total	£10,257 £2,364 £14,873 £27,494	NO _x 2.7 PM ₁₀ 0.33 CO ₂ => 1,307 Total	£58,228 £19,901 £84,368 £162,498
Food retail (Edge, 10 000 m2)	NO _x 17 PM ₁₀ 2 CO ₂ 8,045 => Total	£377,000 £115,000 £519,000 £1,011,000	All measures M1: Travel Plan (10% ↓ car trips) M2: EV (1% ↓ car exhaust) M3: Parking (100% ↓ staff trips) M4: LEZ (HGVs Euro V+)	NO _x 3 PM ₁₀ 0.2 CO ₂ => 886 Total	£58,774 £12,792 £57,176 £128,742	NO _x 14.7 PM ₁₀ 1.7 CO ₂ => 7,159 Total	£317,988 £102,039 £462,306 £882,334
Non-food retail (Edge, 3000 m2)	NO _x 1.4 PM ₁₀ 0.2 CO ₂ 652 => Total	£29,800 £9,400 £42,100 £81,300	All measures M1: Travel Plan (10% ↓ car trips) M2: EV (1% ↓ car exhaust) M3: Parking (100% ↓ staff trips) M4: LEZ (HGVs Euro V+)	NO _x 0.2 PM ₁₀ 0.02 CO ₂ 83 => Total	£4,527 £1,166 £5,372 £11,065	NO _x 1.2 PM ₁₀ 0.14 CO ₂ 568 => Total	£25,280 £8,202 £36,708 £70,189
Commercial (Central, 1500 m2)	NO _x 0.4 PM ₁₀ 0.05 CO ₂ 200 => Total	£9,000 £2,900 £12,900 £24,800	All measures M1: Travel Plan (10% ↓ staff trips) M2: EV (5% ↓ staff exhaust) M3: Travel Plan (10% ↓ car trips) M4: EV (1% ↓ car exhaust)	NO _x 0.05 PM ₁₀ 0.005 CO ₂ => 23 Total	£1,033 £294 £1,498 £2,826	NO _x 0.37 PM ₁₀ 0.044 CO ₂ 177 => Total	£7,931 £2,607 £11,437 £21,975
Fleet Depot (Edge, 50 HGV)	NO _x 5 PM 0.3 CO ₂ 1,570 => Total	£101,900 £19,800 £101,400 £223,100	All measures M1: LEZ (HGVs Euro V+)	NO _x 2 PM ₁₀ 0.03 CO ₂ => 5 Total	£33,623 £1,545 £304 £35,471	NO _x 3 PM ₁₀ 0.31 CO ₂ 1,565 => Total	£68,264 £18,235 £101,094 £187,593