

APPENDIX 3: ESTIMATION OF THE ANNUAL HEALTH BENEFITS FROM 1990-2001

Tables 2.5 and 3.9 shows the estimated annual health benefits in 2001 from the policies in the transport and electricity sectors.

An additional request was made to present annual benefits (numbers of health impacts) for intermediate years from 1990 to 2001. These values are presented below. The approach and numbers are consistent with the assumptions and caveats set out in the main report.

They are based on the pollution and impact modelling, using detailed pollution maps, with and without policies, in 2001. This analysis has been combined with emissions to calculate impacts per tonne of emissions in this year. These unit values (impact per tonne) have been applied to the emissions benefits in each year 1990 – 2001, from policies in the two sectors, for each pollutant. This does involve some assumptions, notably on the linearity of the modelling and impact analysis between years and at different emission levels, but it provides a reasonable basis for back-calculating benefits throughout the evaluation period. The values could be improved by additional detailed work in intermediate years, and with sensitivity analysis on the potential linearity of the effects with respect to meteorological year, distribution of emissions, etc.

The health benefits in each year for the two sectors are additive. Note all of the health benefits for the road transport sector can be attributed to air quality policy. The benefits shown for ESI represent the total reductions seen in the sector seen over the period. Not all of these can be directly attributed to air quality policy. We estimate that between 38% and 100% of benefits for the ESI could be attributed to air quality policy.

The total benefits across all years can be summed to give the total benefits of policies in the evaluation period for the two sectors, though some care should be taken in interpreting these total values¹.

¹ For example, the total number of deaths brought forward is not the total numbers of avoided deaths (as exposure to air pollution is not usually the only cause of death) but the total number of premature deaths.

Annual UK Health Benefits (Cases) from All Road Transport Policies. Benefit 1990 to 2001, relative to No Abatement Scenario.

Deaths brought forward												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	4	9	39	76	127	186	269	324	378	448	502
NO _x	0	1	6	18	30	41	53	72	92	109	129	151
SO ₂	0	3	2	4	4	11	21	27	30	36	40	42
PM ₁₀	0	0	2	16	42	75	113	170	201	233	279	309
Respiratory Hospital Admissions												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	4	9	38	75	124	183	264	317	370	439	492
NO _x	0	1	5	18	29	40	52	71	91	107	126	148
SO ₂	0	3	2	4	4	11	20	27	30	35	40	41
PM ₁₀	0	0	2	16	41	74	111	166	197	228	273	302
YOLL (low)												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	74	167	742	1466	2445	3593	5186	6234	7286	8635	9671
NO _x	0	16	107	349	575	780	1014	1391	1780	2100	2480	2913
SO ₂	0	54	30	85	76	216	399	529	585	695	779	812
PM ₁₀	0	4	30	308	815	1448	2179	3267	3869	4491	5376	5946
YOLL (high)												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	222	502	2226	4397	7335	10778	15559	18703	21857	25905	29014
NO _x	0	47	320	1048	1725	2341	3043	4172	5341	6299	7441	8739
SO ₂	0	162	90	255	227	649	1197	1586	1755	2085	2336	2436
PM ₁₀	0	13	91	923	2445	4345	6538	9800	11606	13473	16128	17839

See main report for caveats. These values have been estimated based on the unit pollution impacts in 2001. The table shows the benefit from the pollution change in the individual year (e.g. in 2001) compared with the predicted out-turns 'without' policy for that year. Note numbers only include UK benefits, and do not account for benefits arising outside the UK from the reduction in trans-boundary pollution. The health benefits above do not include benefits from reductions in ozone. A range is shown for life years gained ('central low' to 'central high'), to reflect the range of different risk factors for 'chronic mortality' effects.

Annual UK Health Benefits (Cases) from ESI Policies*. Benefit 1990 to 2001, relative to No Abatement Scenario.

Deaths brought forward	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	321	436	968	1433	1771	2311	2709	2774	3218	3216	3555
NO _x	0	35	38	74	89	106	132	156	167	178	174	185
SO ₂ as a gas	0	174	241	540	812	1004	1315	1540	1572	1834	1835	2033
SO ₂ secondary particulates	0	112	156	349	525	649	851	996	1017	1186	1187	1315
PM ₁₀	0	0	2	5	7	12	14	17	18	20	20	22

Respiratory Hospital Admissions	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	278	376	833	1229	1519	1982	2324	2380	2760	2757	3047
NO _x	0	34	37	73	87	104	129	153	164	175	170	181
SO ₂ as a gas	0	133	185	413	621	768	1006	1179	1203	1404	1405	1556
SO ₂ secondary particulates	0	110	153	342	514	636	833	976	996	1162	1163	1288
PM ₁₀	0	0	2	5	7	12	13	17	17	19	19	22

YOLL (low)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	2847	3759	8254	11964	14771	19189	22531	23149	26667	26596	29320
NO _x	0	678	723	1426	1711	2038	2541	3009	3216	3436	3346	3559
SO ₂	0	2162	3006	6726	10112	12507	16385	19187	19589	22853	22871	25332
PM ₁₀	0	7	30	102	141	227	263	336	344	379	379	429

YOLL (high)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
All pollutants	0	8542	11278	24763	35892	44314	57568	67594	69447	80002	79787	87961
NO _x	0	2033	2168	4279	5133	6113	7623	9026	9649	10308	10037	10677
SO ₂	0	6487	9018	20179	30335	37522	49156	57561	58766	68558	68612	75997
PM ₁₀	0	22	91	305	424	680	789	1007	1032	1136	1138	1287

See main report for caveats. These values have been estimated based on the unit pollution impacts in 2001. The table shows the benefit from the pollution change in the individual year (e.g. 2001) compared with the predicted out-turns 'without' policy for that year. Note numbers only include UK benefits, and do not account for benefits arising outside the UK from the reduction in trans-boundary pollution. The health benefits above do not include benefits from reductions in ozone. A range is shown for life years gained ('central low' to 'central high'), to reflect the range of different risk factors for 'chronic mortality' effects.

*All of the health benefits for the road transport sector can be attributed to air quality policy. The benefits shown for ESI represent the total reductions seen in the sector seen over the period. Not all of these can be directly attributed to air quality policy. We estimate that between 38% and 100% of benefits for the ESI could be attributed to air quality policy.