

Climate Impact of Finnish Air Pollutants and Greenhouse Gases using Multiple Emission Metrics

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Supporting Information

Table A1. Emissions in 2000, 2010 and 2030 from sectors energy and industry (ENE IND), industrial processes (PROC), transport road (TRA RD), off-road transport and machinery (TRA OT), domestic (DOM), waste (WST), agriculture (AGR),

10 and other (OTHER). Unit: Gg a⁻¹

Pollutant	Year	DOM	ENE_IN	PROC	TRA_RD	TRA_OT	WST	AGR	OTHER
BC	2000	2.7	0.2	0.1	2.0	1.8	0.0	0.0	0.0
BC	2010	3.7	0.1	0.1	1.6	1.1	0.0	0.0	0.0
BC	2030	2.7	0.0	0.1	0.2	0.2	0.0	0.0	0.0
OC	2000	2.5	0.1	0.2	1.5	1.1	0.0	0.0	0.1
OC	2010	3.4	0.1	0.2	1.2	0.7	0.0	0.0	0.1
OC	2030	2.3	0.1	0.2	0.7	0.2	0.0	0.0	0.0
CO	2000	147.0	80.2	45.0	390.2	87.0	4.2	0.6	0.0
CO	2010	209.0	66.9	32.0	134.2	57.2	4.3	0.2	0.0
CO	2030	154.8	76.3	35.3	45.7	68.3	4.4	0.2	0.0
NO _x	2000	11.0	62.0	2.3	85.9	51.7	0.0	0.0	0.0
NO _x	2010	13.0	69.7	7.4	53.3	34.5	0.0	0.0	0.0
NO _x	2030	10.3	49.1	9.2	12.8	18.6	0.0	0.0	0.0
VOC	2000	14.3	0.5	11.7	45.3	28.3	2.0	0.0	59.3
VOC	2010	19.2	2.2	8.5	18.5	17.2	0.6	0.0	35.2
VOC	2030	13.1	2.0	7.4	3.2	4.9	0.4	0.0	27.6
SO ₂	2000	3.9	52.5	17.7	0.1	2.6	0.0	0.0	0.0
SO ₂	2010	3.4	42.9	14.7	1.0	1.0	0.0	0.0	0.0
SO ₂	2030	2.3	16.6	17.0	0.1	0.4	0.0	0.0	0.0

NH ₃	2000	0.0	0.9	1.1	2.4	0.0	0.1	32.9	0.2
NH ₃	2010	0.0	0.9	0.6	1.6	0.0	0.1	35.0	0.2
NH ₃	2030	0.0	1.0	0.5	1.3	0.0	0.1	32.0	0.2
CH ₄	2000	6.0	0.0	0.5	0.0	0.0	154.6	92.5	0.0
CH ₄	2010	8.2	0.0	0.4	0.0	0.0	96.5	90.1	0.0
CH ₄	2030	6.7	0.0	0.4	0.0	0.0	55.0	90.1	0.0
CO ₂	2000	4467	31600	3600	10990	3143	0	0	170
CO ₂	2010	3572	38540	4400	11988	3005	0	0	150
CO ₂	2030	1852	20636	4400	8948	3299	0	0	150
N ₂ O	2000	0.1	0.1	4.4	0.0	0.0	0.5	10.6	2.0
N ₂ O	2010	0.2	0.1	0.5	0.0	0.0	0.5	10.9	2.0
N ₂ O	2030	0.1	0.1	0.5	0.0	0.0	0.5	10.9	2.0

Table A2: Mean(RTP(1-25yrs)) and mean(GTP(1-25yrs)) values (°C/Tg) for SLCF and GHG emissions. The normalized values of Table 3. The Arctic response for the GHGs is based on the latitudinal pattern for CH₄. The annual average is based on emissions in 2010.

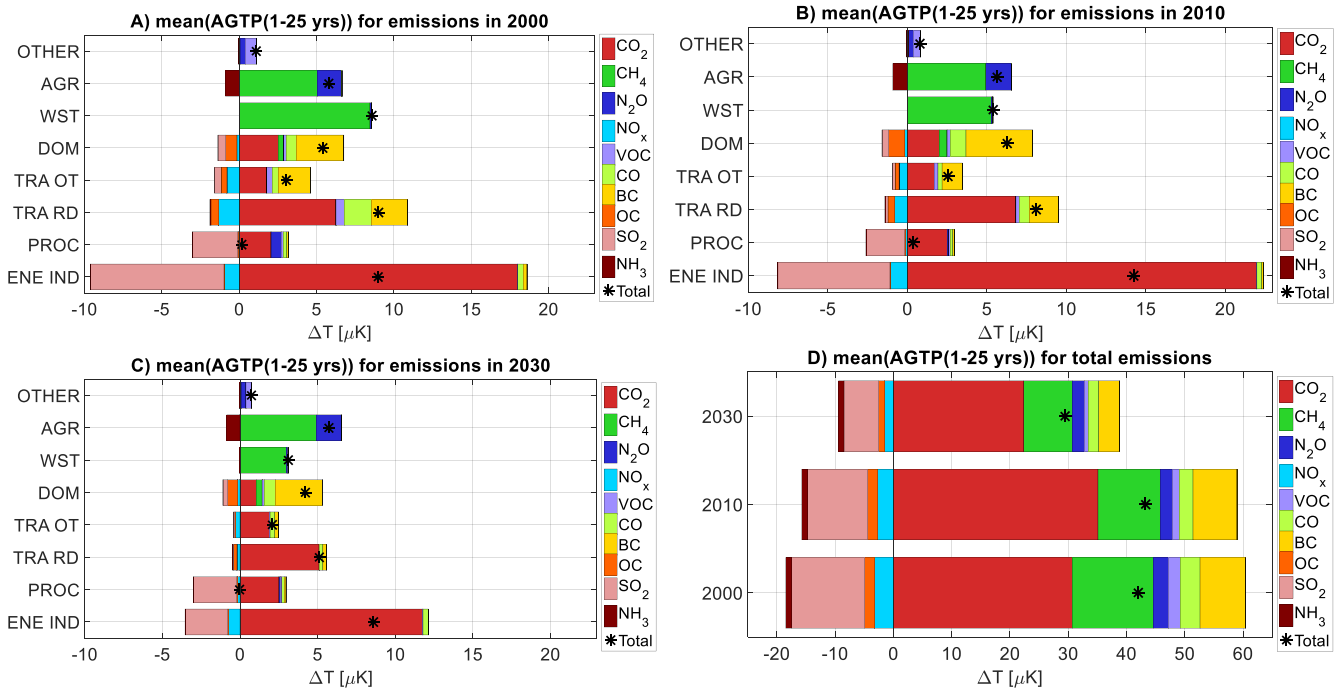
	Mean(1-25yrs), global response			Mean(1-25yrs), Arctic response		
	Annual average	Summer	Winter	Annual average	Summer	Winter
CO ₂ [CO ₂]	1	1	1	1	1	1
CH ₄ [CH ₄]	84	84	84	84	84	84
N ₂ O [N ₂ O]	262	262	262	262	262	262
NO _x [NO ₂]	-30	-41	-19	-23	-33	-14
VOC [VOC]	17	24	11	19	19	19
CO [CO]	7	7	8	6	6	7
BC [C]	3085	1950	3779	9111	4328	12036
OC [C]	-699	-986	-529	-989	-1450	-715
SO ₂ [SO ₂]	-346	-541	-159	-537	-853	-236
NH ₃ [NH ₃]	-65	-79	-51	-76	-92	-59

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Table A3: Temperature response (°C/Tg) in the Arctic with ARTPs from Sand et al. (2016). The climate sensitivity is adjusted making the estimates comparable to the other metric studies in our study. The sectors are those given by Sand et al. (2016), which deviate somewhat to the sectors in our study and a perfect match is not possible. The sectors ENE IND,

PROC, WST, and OTHER take the values from energy/industry/waste. The sectors TRA RD and TRA OT use transport.
 20 DOM is linked to domestic. AGR takes the values from agricultural waste burning. The climate metric values vary between the different emission sectors due to differences in spatial and temporal patterns of emissions.

Mean(ARTP(1-25 yrs)), Arctic response in °C/Tg	Domestic	Energy/industry/waste	Transport	Agricultural waste burning	Grass/forest fires	Flaring
BC	1.1E-2	9.6E-3	1.0E-2	4.6E-3	1.8E-2	1.3E-2
OC	-1.5E-3	-1.4E-3	-1.5E-3	-6.5E-4	-2.9E-3	-1.7E-3
SO ₂	-6.4E-4	-1.2E-3	-1.6E-3	-4.7E-4	-4.4E-3	-6.6E-3



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Figure A1: The same as Figure 3, but based on AGTPs in Aamaas et al. (2016), and not ARTPs. The temperature response (μK) due to emissions in 2000 (A), 2010 (B), and 2030 (C) from sectors energy and industry (ENE IND), industrial processes (PROC), transport road (TRA RD), off-road transport and machinery (TRA OT), domestic (DOM), waste (WST), agriculture (AGR), and other (OTHER). The sum of all sectors is shown in (D). The climate metric applied is mean(AGTP(1-25 yrs)) for pulse emissions.

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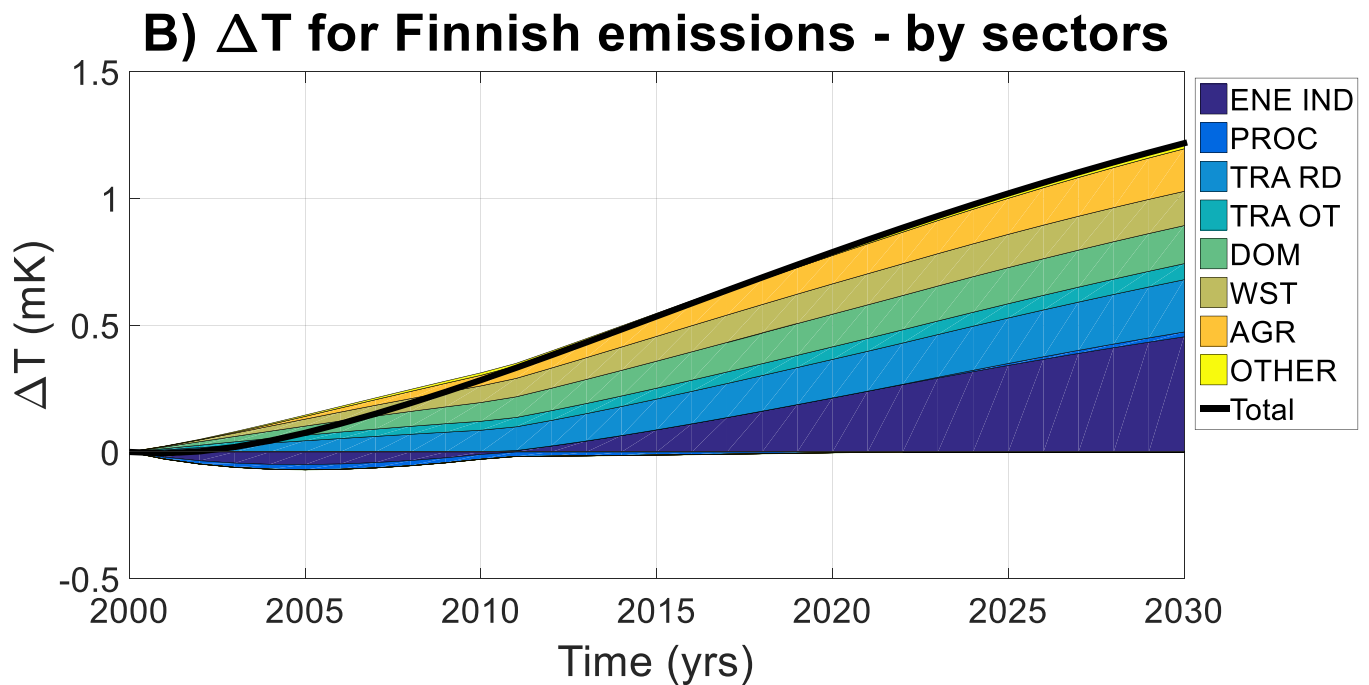
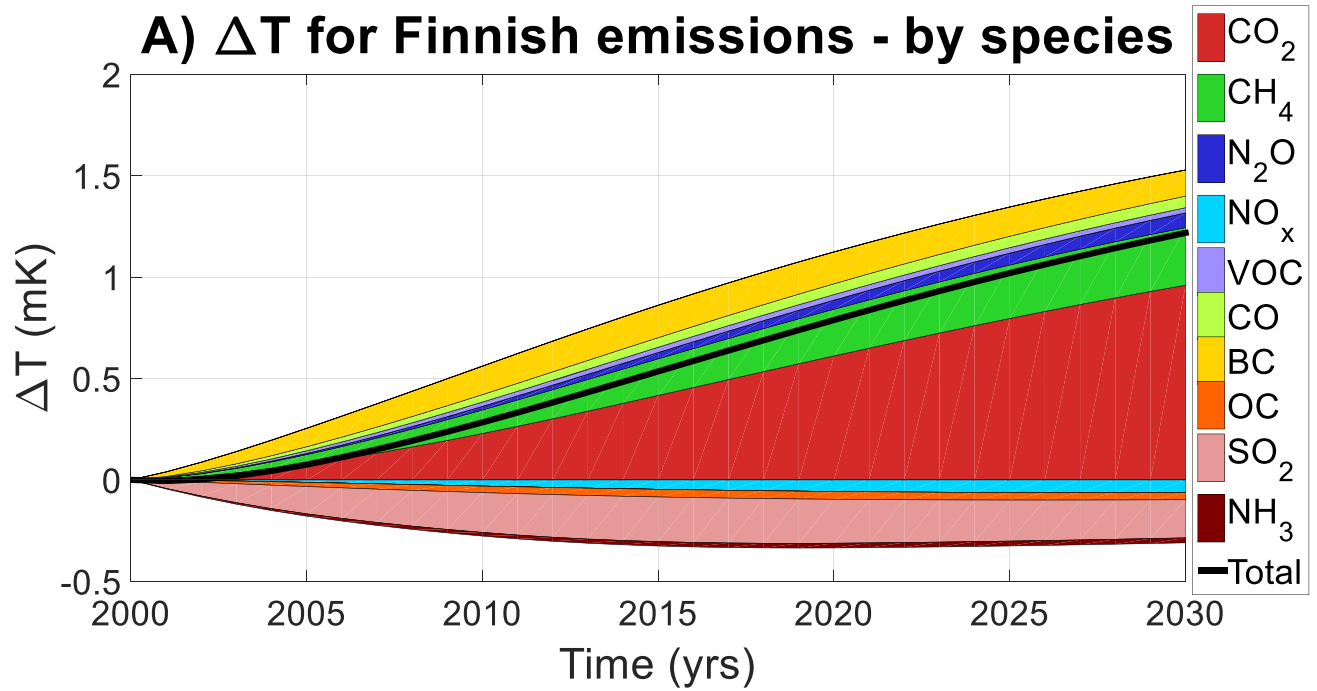


Figure A2: The same as Figure 4, but based on AGTPs in Aamaas et al. (2016), and not ARTPs. The global temperature development (mK) of Finnish emissions for the period 2000-2030. Temperature is given by pollutants in (A) and by sectors in (B).