



Supplement of

Gridded emissions of air pollutants for the period 1970–2012 within EDGAR v4.3.2

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S1 - Intercomparison of the air pollutant emissions of EDGARv4.3.2 with other global inventories

S1.1 - Intercomparison of the particulate EDGARv4.3.2 timeseries with other global inventories

Figures S1.1 and S1.2a-g show the regional comparison for the year 2010 of the EDGARv4.3.2 and ECLIPSE V5a aerosol emissions both as regional totals and as sector-specific emissions using the aggregation provided by

5 Klimont et al. (2017). Considering the higher uncertainty associated with the aerosol emission estimates compared to other pollutants, our comparison shows very good agreement for most of the regions, in particular for the top emitting regions, such as China+, India+ and Africa. Rather poor agreement is observed for Russia+ representing however less than 1% of the global PM₁₀ emissions.

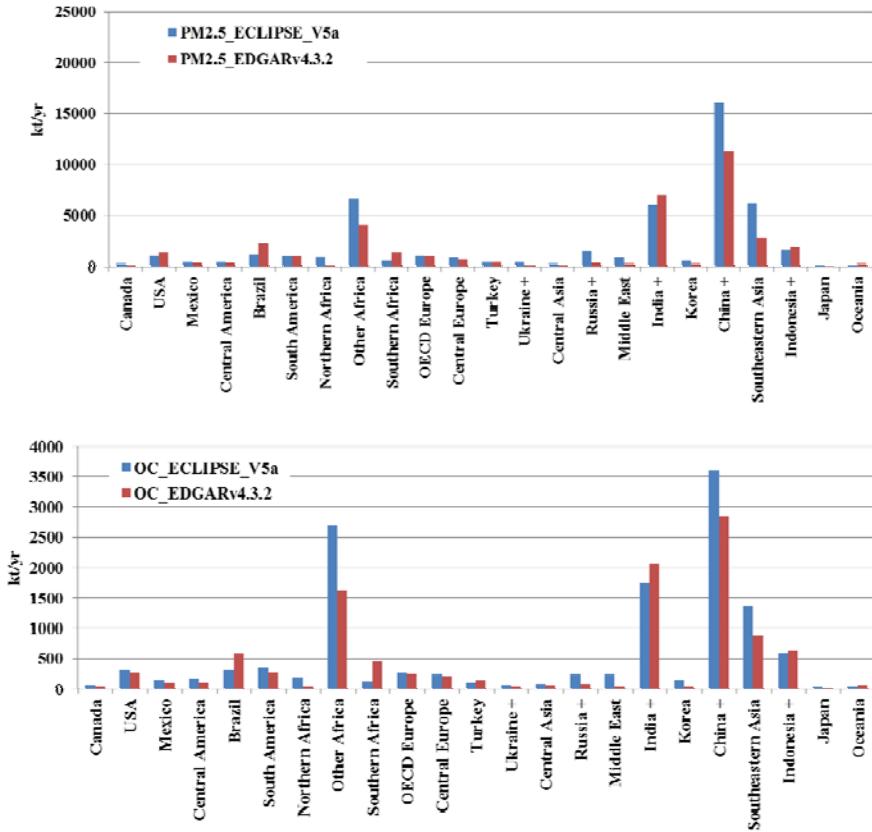
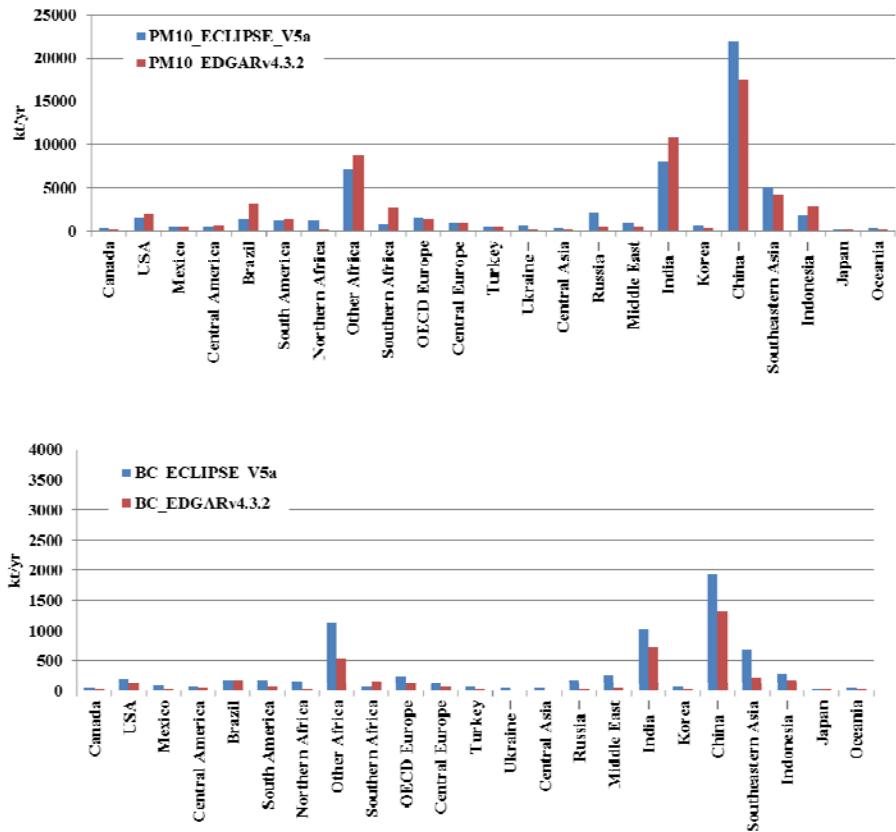
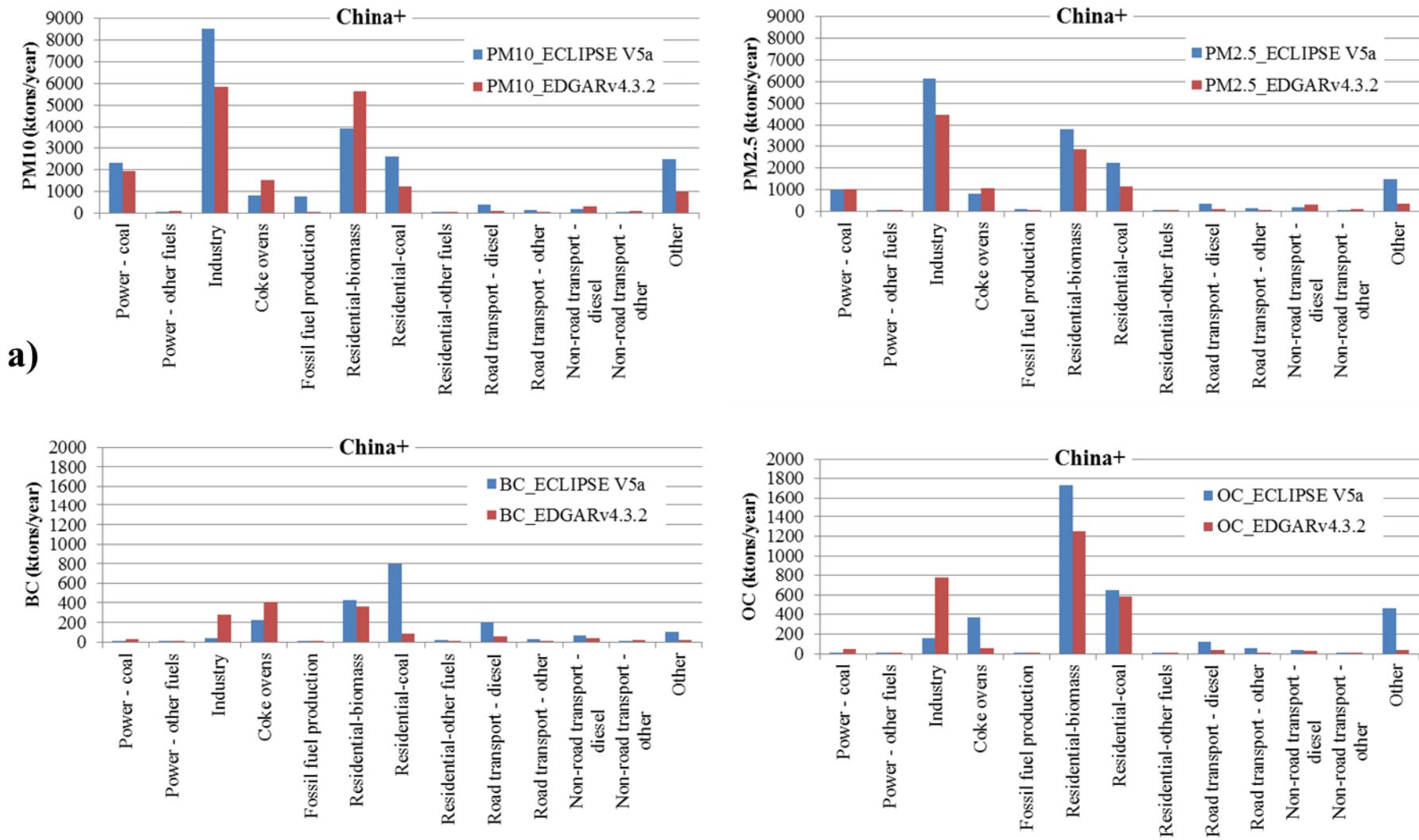
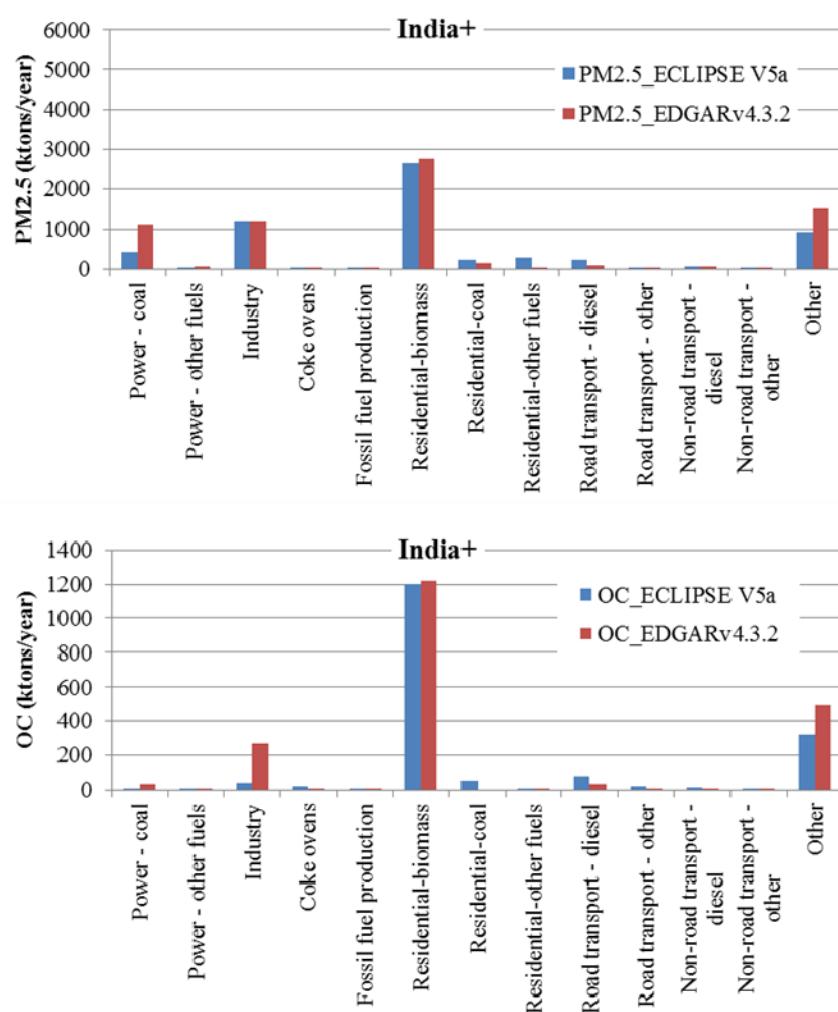
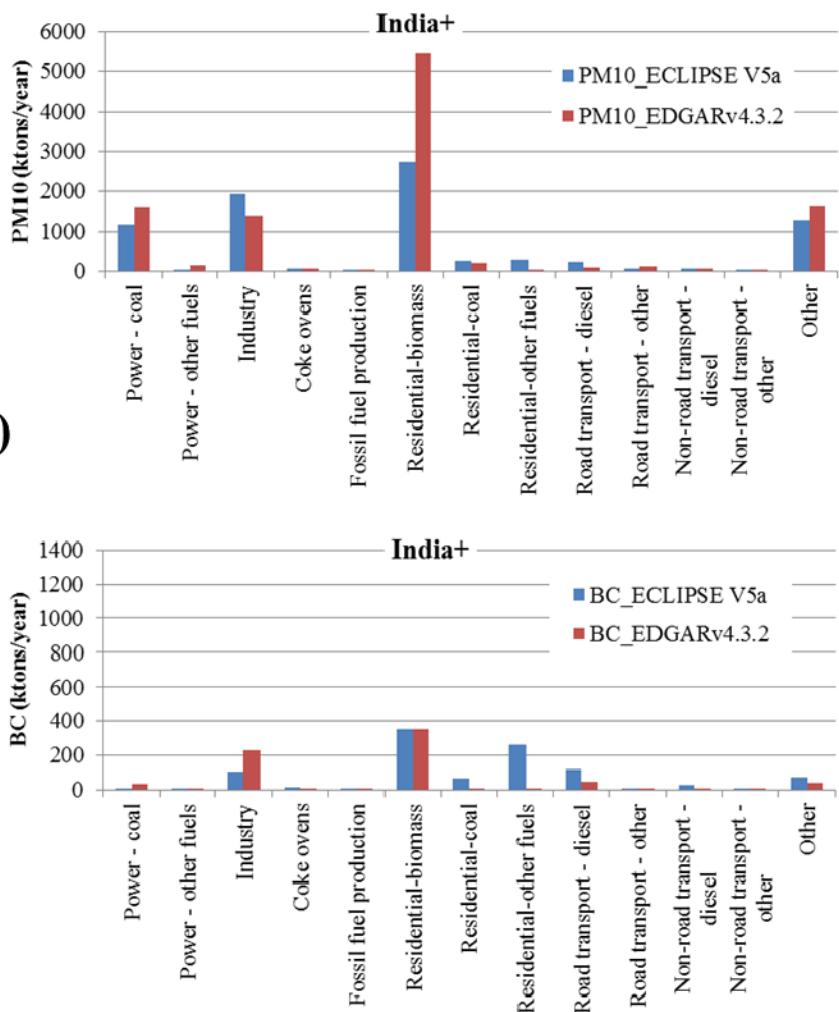
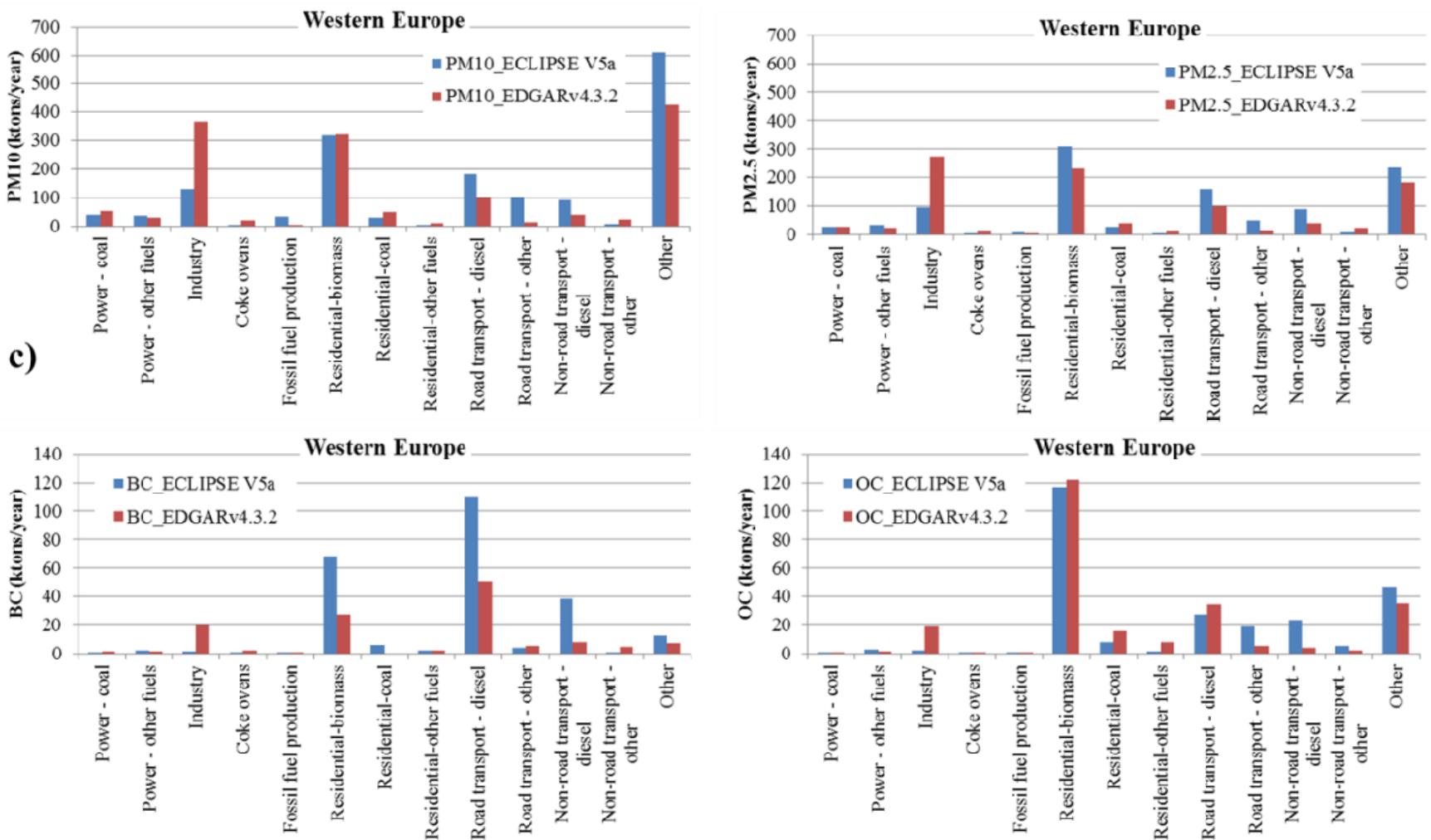
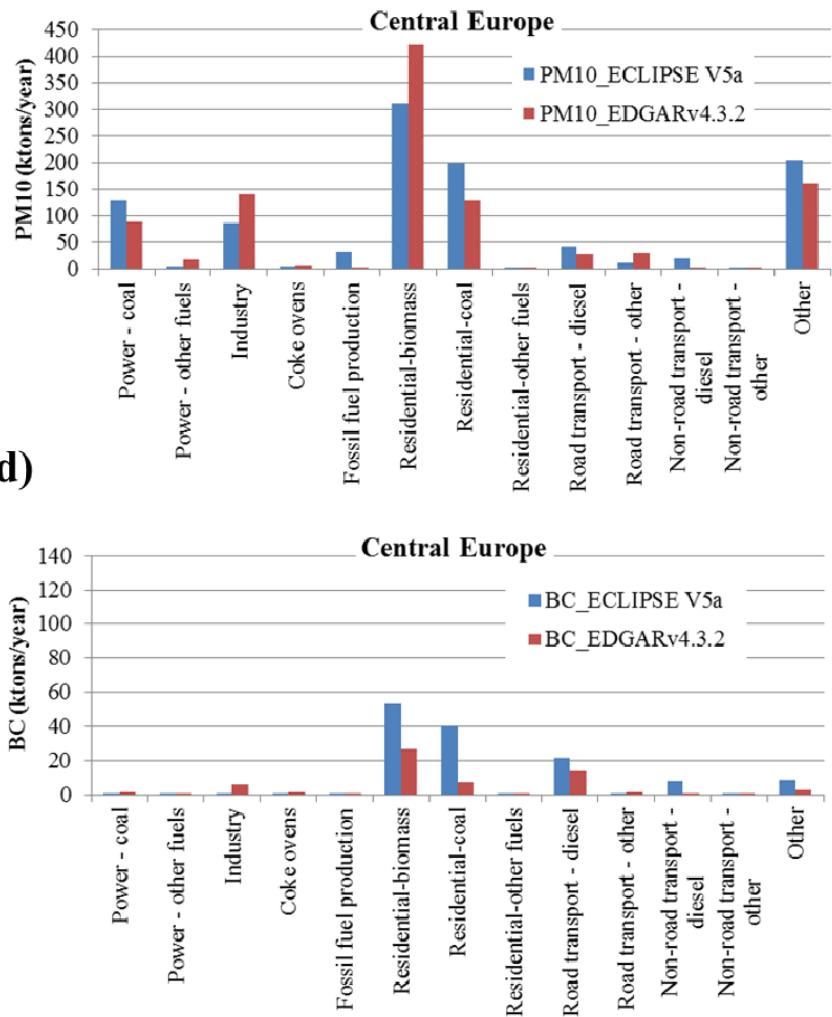
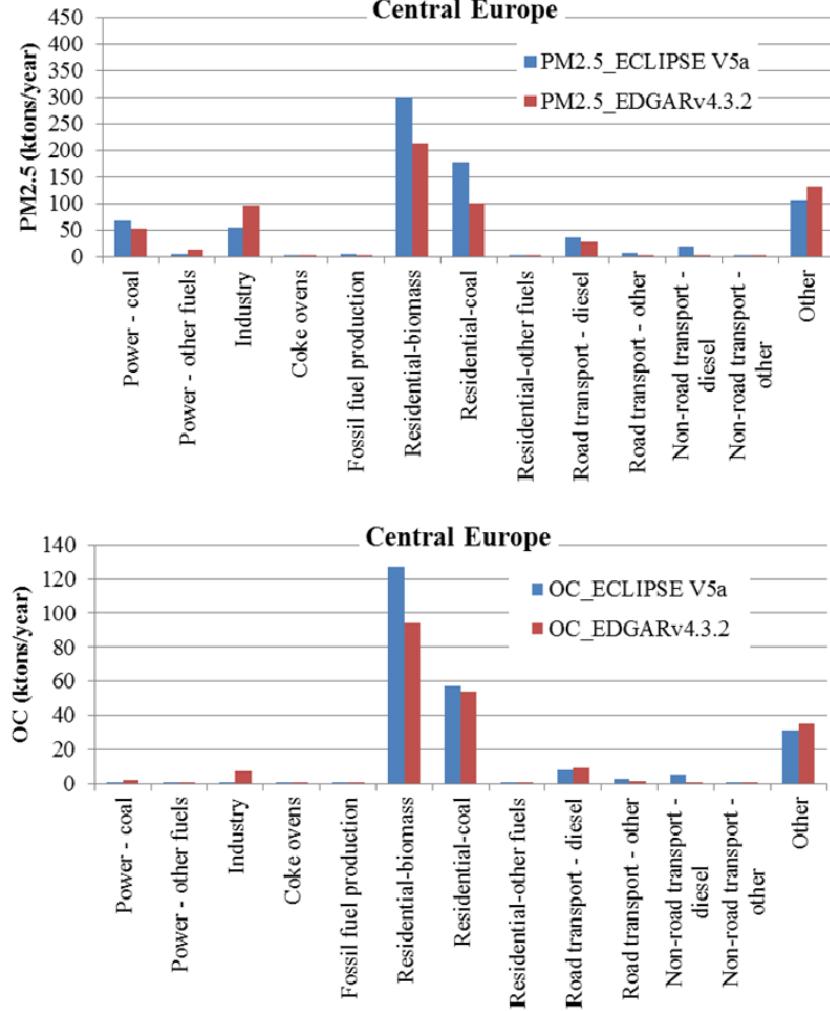


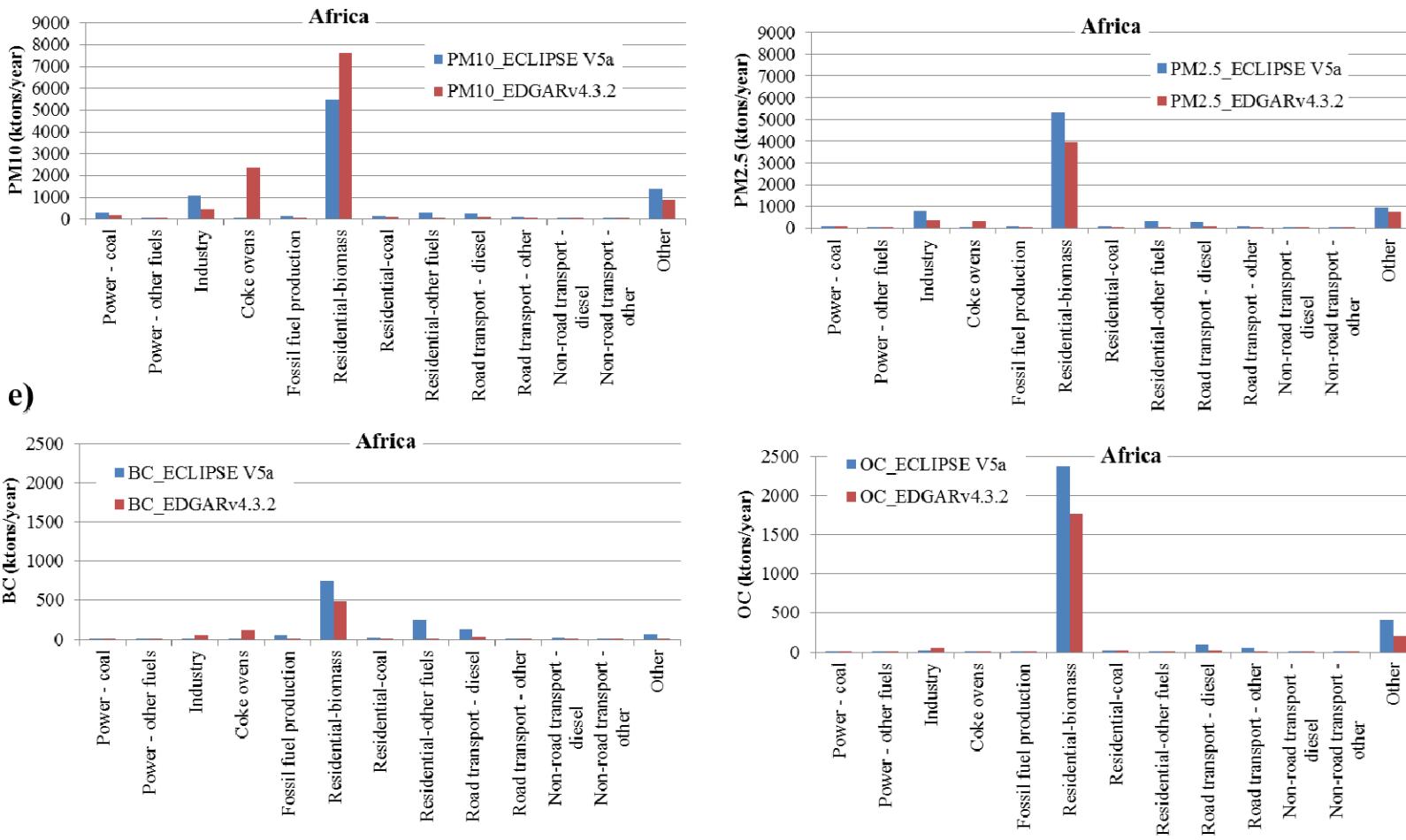
Figure S1.1 – Region-specific comparison of PM₁₀, PM_{2.5}, BC and OC emissions for 2010 estimated by EDGARv4.3.2 and by ECLIPSEv5a of Klimont et al. (2017).

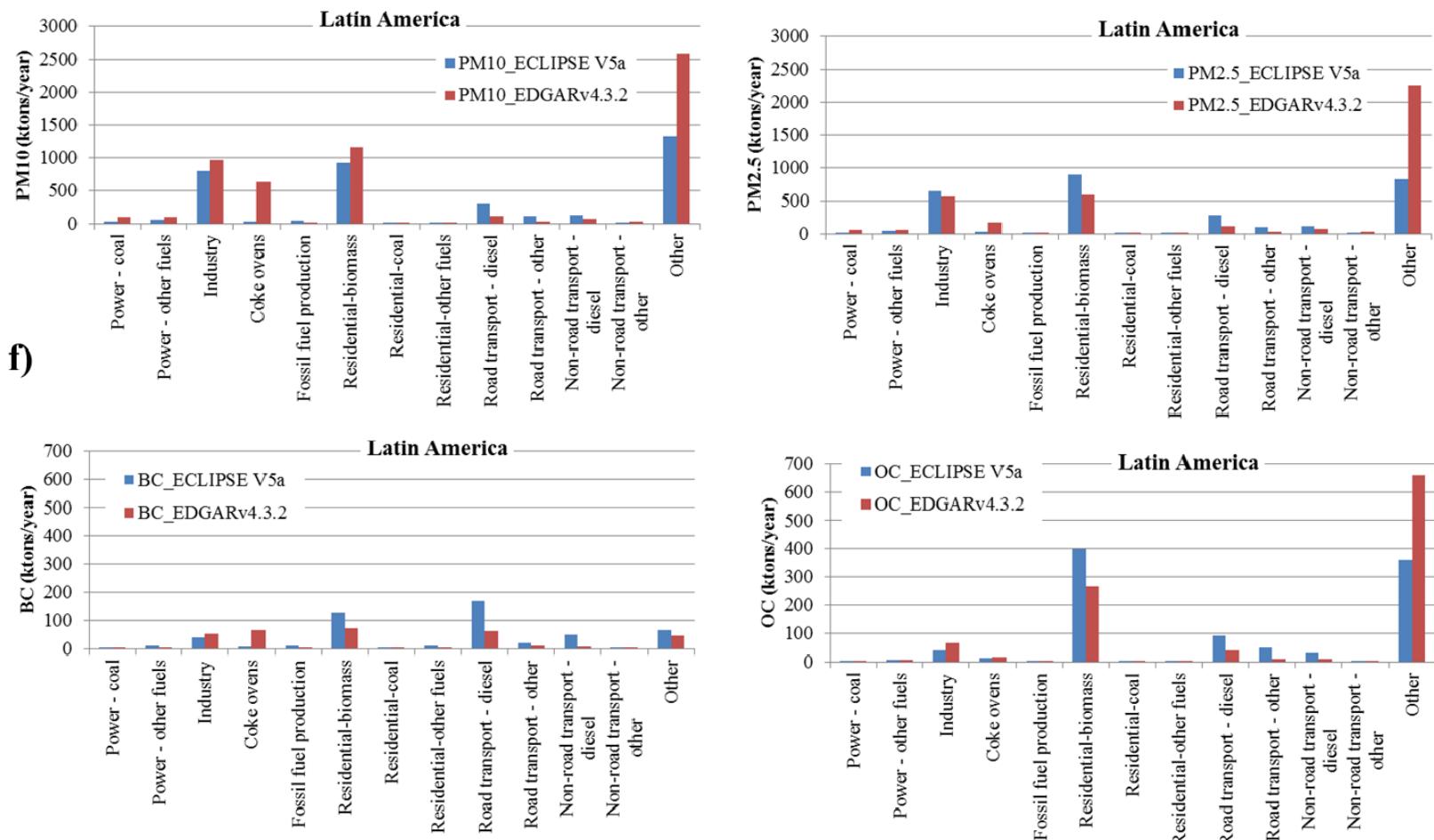


b)



d)**Central Europe**





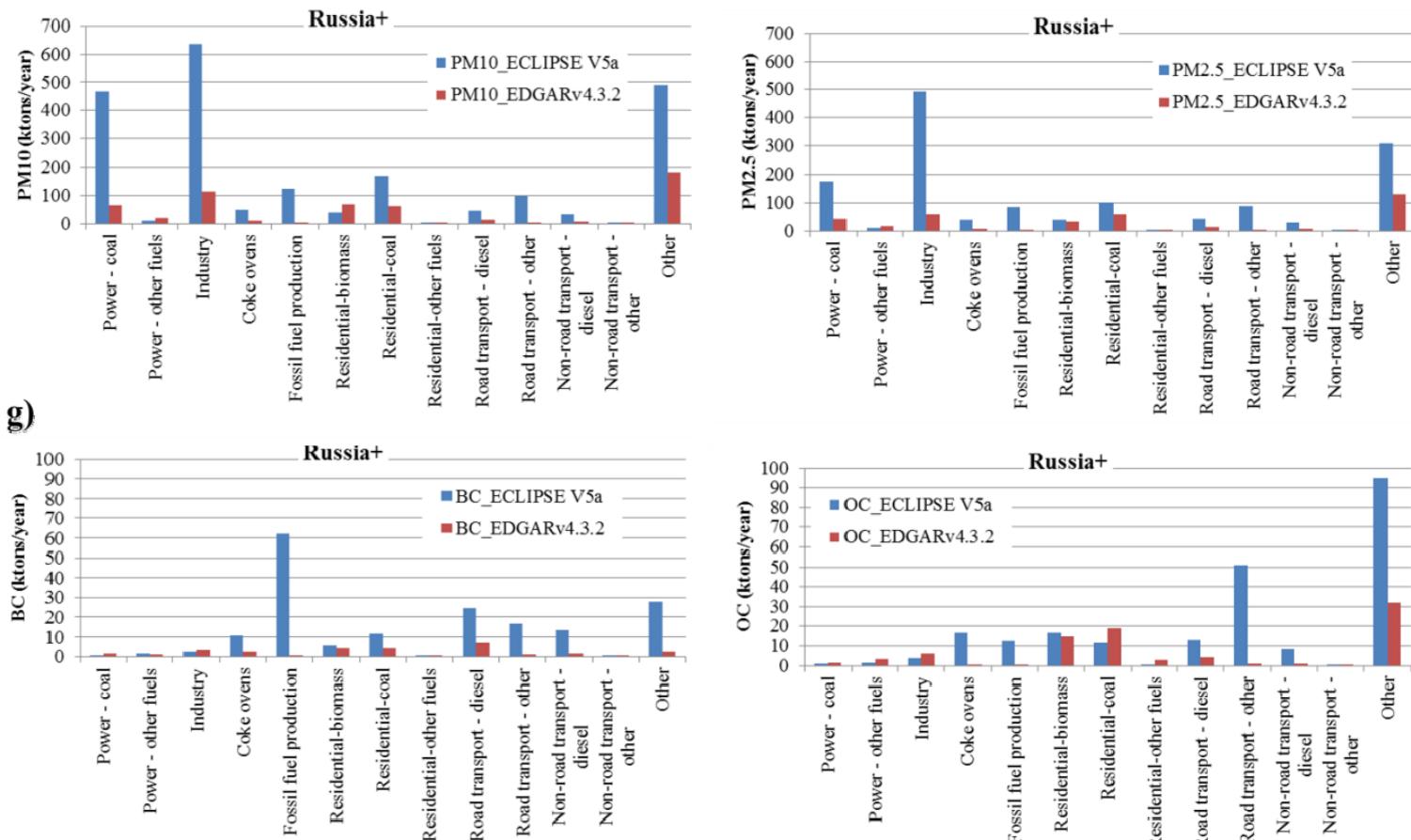


Figure S1.2 – Region- and sector- specific comparison of PM₁₀, PM_{2.5}, BC and OC emissions for 2010 estimated by EDGARv4.3.2 and by ECLIPSEv5a of Klimont et al. (2017). Detailed comparison of the sector-specific 2010 particulate emission species for different world regions estimated by EDGARv4.3.2 and ECLIPSEv5a (Klimont et al., 2017) are given in: (a) for China+, (b) for India+, (c) for Western Europe, (d) for Central Europe, (e) for Africa, (f) for Latin-America, and (g) for Russia+.

S1.2 - Intercomparison of the implied air pollutant emission factors of EDGAR v4.3.2

Tables S1- Implied EFs for all pollutants and sectors for selected regions and the world in 2010.

Implied EF - Energy (t/TJ)	SO2	NOx	CO	NMVOC	PM10	PM2.5	BC	OC
world median	7.5E-01	3.2E-01	8.3E-02	8.0E-03	1.4E-02	9.1E-03	1.2E-03	6.5E-04
EU28 median	1.0E-01	1.6E-01	4.5E-02	7.2E-03	1.1E-02	6.1E-03	3.4E-04	2.6E-04
USA	2.8E-01	1.2E-01	2.9E-02	2.8E-03	1.5E-02	9.0E-03	4.4E-04	2.5E-04
China	2.1E-01	2.5E-01	2.7E-02	3.4E-03	4.3E-02	2.2E-02	5.7E-04	1.2E-03
India	5.0E-01	3.3E-01	6.1E-02	6.0E-03	1.6E-01	1.0E-01	3.5E-03	3.7E-03
Russia	1.1E-01	1.7E-01	7.1E-02	6.7E-03	6.5E-03	4.6E-03	1.6E-04	2.3E-04
Japan	3.7E-02	8.5E-02	2.3E-02	5.1E-03	3.2E-03	1.8E-03	2.0E-04	1.1E-04

Implied EF - Industry (t/TJ)	SO2	NOx	CO	NMVOC	PM10	PM2.5	BC	OC
world median	1.8E-02	1.3E-02	6.8E-02	8.8E-02	1.2E-02	6.0E-03	9.1E-04	7.4E-04
EU28 median	1.1E-02	1.2E-02	1.2E-02	7.6E-02	3.5E-03	2.8E-03	2.3E-04	2.6E-04
USA	4.4E-03	6.5E-03	7.1E-03	4.2E-02	1.7E-03	1.6E-03	1.9E-04	3.4E-04
China	6.7E-02	3.3E-02	1.5E-01	6.0E-02	2.4E-02	2.0E-02	3.0E-03	3.7E-03
India	4.0E-02	2.2E-02	1.4E-01	3.9E-02	1.9E-02	1.7E-02	3.5E-03	4.1E-03
Russia	2.4E-03	3.2E-03	7.8E-03	4.2E-02	3.0E-04	2.3E-04	4.2E-05	4.9E-05
Japan	8.9E-03	1.1E-02	1.2E-02	3.5E-02	1.2E-03	9.1E-04	1.5E-04	9.2E-05

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Implied EF - Residential (t/TJ)	SO2	NOx	CO	NMVOC	PM10	PM2.5	BC	OC
world median	5.1E-02	5.2E-02	1.6E+00	2.1E-01	2.4E-01	1.3E-01	1.5E-02	5.7E-02
EU28 median	3.7E-02	5.7E-02	7.8E-01	7.2E-02	5.3E-02	3.9E-02	5.3E-03	2.0E-02
USA	9.8E-03	5.4E-02	2.1E-01	3.1E-02	2.9E-02	1.5E-02	1.8E-03	6.7E-03
China	1.3E-01	6.6E-02	2.9E+00	3.2E-01	4.2E-01	2.4E-01	2.7E-02	1.1E-01
India	8.2E-02	5.6E-02	3.2E+00	5.0E-01	5.0E-01	2.5E-01	3.1E-02	1.1E-01
Russia	7.0E-02	6.1E-02	3.4E-01	5.3E-02	4.0E-02	3.0E-02	2.6E-03	1.1E-02
Japan	5.2E-02	7.8E-02	6.0E-02	2.2E-02	7.0E-03	5.0E-03	4.9E-04	9.8E-04

Implied EF - Transport (t/TJ)	SO2	NOx	CO	NMVOC	PM10	PM2.5	BC	OC
world median	1.6E-02	3.5E-01	2.4E+00	3.9E-01	1.6E-02	1.6E-02	6.5E-03	4.6E-03
EU28 median	6.9E-03	2.5E-01	3.3E-01	5.5E-02	1.0E-02	1.0E-02	4.5E-03	3.1E-03
USA	1.8E-03	1.5E-01	1.0E+00	1.0E-01	4.1E-03	4.1E-03	1.2E-03	8.3E-04
China	9.7E-02	5.0E-01	1.2E+00	2.6E-01	4.5E-02	4.5E-02	1.2E-02	7.9E-03
India	4.1E-02	6.5E-01	4.8E+00	5.3E-01	4.9E-02	4.9E-02	1.5E-02	1.2E-02
Russia	2.1E-02	2.0E-01	7.6E-01	3.4E-01	4.9E-03	4.9E-03	1.8E-03	1.2E-03
Japan	3.7E-02	1.6E-01	5.8E-01	8.8E-02	8.9E-03	8.9E-03	2.7E-03	1.9E-03

Implied EF - Agriculture (t/thousand heads)	NH3
world median	2.4E-01
EU28 median	1.3E-01
USA	1.6E-01
China	8.3E-02
India	4.8E-01
Russia	8.0E-02
Japan	5.4E-04

5 S1.3 - Intercomparison of the per capita and per GDP air pollutant emissions of EDGAR v4.3.2

Table S2: Per capita emissions for all pollutants and sectors for selected regions and the world in 2010.

per capita emissions (kt/million people)	SO2	NOx	CO	NMVOC	NH3	PM10	PM2.5	BC	OC
world median	7.3	13.0	64.0	25.9	6.2	5.7	3.4	0.4	1.0
EU28 median	10.2	20.6	43.9	40.0	10.9	5.2	3.4	0.4	0.9
USA	31.1	40.7	154.7	63.8	13.3	6.7	4.2	0.4	0.9
China	20.8	18.8	79.1	22.7	11.0	12.9	8.3	1.0	2.1
India	7.4	6.6	51.9	9.5	6.1	7.2	4.8	0.5	1.3
Russia	16.6	27.7	58.6	59.4	6.5	3.7	2.5	0.2	0.6
Japan	8.1	16.6	31.2	26.2	2.8	1.9	1.2	0.2	0.1

Table S3: Emissions per income for all pollutants and sectors for selected regions and the world in 2010.

Emissions per GDP (t/million USD)	SO2	NOx	CO	NMVOC	NH3	PM10	PM2.5	BC	OC
world median	0.80	1.16	6.64	2.55	0.73	0.51	0.31	0.03	0.09
EU28 median	0.29	0.70	1.43	1.34	0.34	0.14	0.10	0.01	0.02
USA	0.63	0.83	3.14	1.30	0.27	0.14	0.09	0.01	0.02
China	2.26	2.05	8.59	2.46	1.19	1.40	0.90	0.11	0.23
India	1.63	1.46	11.42	2.09	1.35	1.59	1.05	0.11	0.30
Russia	0.77	1.28	2.71	2.75	0.30	0.17	0.12	0.01	0.03
Japan	0.23	0.48	0.90	0.76	0.08	0.05	0.03	0.01	0.00

S1.4 – Regional air pollutant emission uncertainties

5 **Tables S4- Uncertainty estimates (in %) of all air pollutants for top emitting regions based on Crippa et al. 2017.**

SO2 (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	24.7	23.2	22.1	21.4	21.4	21.5	21.7	21.6	21.7	21.7	22.0	21.8	22.0	22.2	22.1	22.2
σ India	54.8	54.1	51.6	51.3	51.3	51.0	51.1	50.7	50.1	49.6	49.0	48.7	47.7	46.4	45.4	45.5
σ Brazil	55.3	50.6	44.8	43.8	43.2	42.8	41.6	41.6	41.5	41.2	41.4	42.4	43.4	43.4	43.8	44.7
σ Rest non-Annex I	56.1	54.7	53.2	51.1	51.3	51.4	50.8	50.2	49.7	49.4	49.1	48.7	48.6	48.3	47.9	47.7
σ USA	10.7	12.3	16.1	13.4	13.5	14.0	13.6	13.3	13.3	13.0	13.1	12.8	13.0	12.5	13.0	14.6
σ Russia	18.7	18.6	18.5	17.7	17.9	17.5	17.3	17.2	16.4	16.3	16.2	16.3	16.0	15.5	15.5	14.4
σ EU28	29.3	29.5	31.6	35.0	34.8	34.9	34.3	34.0	33.5	33.4	33.4	32.9	32.5	31.8	31.8	31.8

NOx (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	65.0	56.0	55.6	59.6	59.3	58.2	56.7	54.7	54.2	54.1	54.1	52.7	52.4	54.0	55.8	56.2
σ India	107.7	94.7	76.6	59.6	59.7	59.6	59.7	60.1	59.5	59.7	59.4	60.3	60.0	60.4	65.6	65.8
σ Brazil	120.5	127.6	129.6	121.1	120.2	120.4	117.1	117.3	115.9	115.1	115.9	115.9	119.2	117.9	120.8	123.5
σ Rest non-Annex I	83.1	77.5	78.7	76.5	76.4	75.2	73.6	72.0	70.8	68.9	68.2	67.3	66.8	67.2	68.3	69.4
σ USA	29.9	27.4	29.3	27.9	27.8	27.9	27.5	27.0	26.9	27.5	27.1	27.0	26.7	26.2	26.6	28.8
σ Russia	23.9	20.7	19.7	19.0	19.1	18.9	18.8	19.2	19.0	18.9	18.4	18.5	18.6	17.9	18.1	17.2
σ EU28	46.4	48.3	55.6	53.6	53.1	52.9	52.4	52.5	52.2	52.5	52.2	51.7	52.2	50.6	50.9	50.7

CO (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	151.1	138.0	135.4	115.2	115.2	115.4	112.3	108.5	106.0	103.8	102.2	100.0	99.5	98.5	95.4	94.4
σ India	148.0	149.2	134.7	131.1	131.7	131.3	132.3	132.5	132.4	130.9	129.4	127.8	124.7	121.2	119.0	118.7
σ Brazil	121.2	112.2	96.3	114.7	114.2	109.5	104.3	99.2	98.4	98.1	97.4	98.1	108.9	110.5	116.6	123.4
σ Rest non-Annex I	118.3	113.5	109.7	115.2	115.7	116.2	115.6	114.5	113.6	112.5	111.1	110.4	110.3	109.1	108.1	108.1
σ USA	44.5	46.1	47.0	46.4	46.5	46.6	45.9	45.5	44.8	45.1	44.7	44.3	44.6	44.2	44.1	44.2
σ Russia	32.4	31.2	31.6	30.9	31.1	31.5	31.3	31.4	31.3	31.0	30.0	29.5	28.7	27.3	27.1	25.9
σ EU28	75.0	78.0	83.3	75.2	73.7	72.5	70.0	67.7	65.8	64.5	63.5	63.1	64.4	64.7	63.9	64.6

NM VOC (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	150.8	139.1	132.7	124.4	125.7	126.8	128.8	130.7	133.1	134.0	135.4	136.2	137.7	138.2	138.6	138.6
σ India	153.4	151.8	139.7	131.1	131.0	130.4	130.6	130.4	130.3	129.3	128.1	127.4	125.9	124.2	122.9	122.4
σ Brazil	122.7	141.9	162.6	153.2	152.3	153.8	157.0	160.1	160.4	160.2	160.9	160.2	152.3	152.0	150.8	147.5
σ Rest non-Annex I	129.2	126.5	126.5	127.5	127.8	127.8	128.8	131.0	132.0	132.6	133.6	133.8	133.0	133.8	134.1	133.9
σ USA	33.9	33.7	33.5	33.8	34.2	34.0	34.0	34.2	34.0	34.1	33.9	33.9	33.7	33.8	33.7	33.6
σ Russia	32.9	32.3	30.1	31.8	31.9	32.2	32.3	32.4	32.5	32.5	32.5	32.4	32.6	32.6	32.6	32.7
σ EU28	64.3	65.6	66.1	69.0	69.2	69.6	69.6	69.7	70.1	70.5	70.8	71.7	71.9	73.3	73.5	73.6

NH3 (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	229.3	260.0	277.9	288.9	289.8	291.6	291.8	292.9	294.0	294.5	294.6	295.0	294.9	294.6	294.6	294.4
σ India	226.9	241.1	255.6	261.7	262.4	260.3	261.5	262.4	263.8	265.4	266.5	266.7	266.4	267.2	267.9	268.2
σ Brazil	238.9	251.6	258.8	271.0	270.3	269.6	269.8	267.7	267.9	267.5	268.0	268.4	272.0	271.0	272.6	272.1
σ Rest non-Annex I	233.8	248.8	258.0	263.8	264.1	264.9	265.6	266.2	266.5	267.1	267.6	267.9	268.2	267.5	267.5	267.3
σ USA	190.9	185.7	189.5	186.1	187.0	187.3	186.4	185.2	184.4	185.0	184.6	184.8	185.3	185.0	185.3	186.0
σ Russia	192.9	195.7	199.4	199.0	198.7	198.5	198.3	198.0	197.2	196.6	195.7	195.8	195.9	195.4	194.9	194.8
σ EU28	231.0	233.4	234.5	231.2	231.5	231.8	232.1	232.0	232.2	232.2	232.4	232.7	232.9	232.6	232.7	233.0

PM10 (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	149.0	135.7	125.0	107.1	108.0	108.0	103.6	99.3	96.3	93.6	90.9	89.1	87.4	86.0	83.6	81.7
σ India	157.0	155.0	139.4	136.1	135.4	135.1	134.7	132.0	130.3	128.1	124.3	122.4	119.0	114.9	111.2	109.1
σ Brazil	124.5	87.8	64.9	61.3	61.9	63.0	62.2	61.1	61.2	60.9	59.5	59.2	60.9	58.6	57.4	57.4
σ Rest non-Annex I	141.8	134.5	126.2	119.8	121.9	122.2	120.0	116.9	115.2	113.5	111.1	110.2	109.8	108.1	106.1	104.3
σ USA	48.8	53.7	67.0	63.0	62.4	63.5	65.1	64.5	66.0	62.5	64.9	68.1	70.4	68.3	69.2	70.0
σ Russia	127.2	125.0	120.0	90.2	92.7	85.6	81.9	78.0	76.0	75.4	75.1	79.5	76.8	74.1	71.9	62.6
σ EU28	92.4	83.0	78.6	83.0	84.2	84.0	84.4	85.2	85.0	86.5	85.7	89.5	95.3	98.2	95.4	96.8

PM2.5 (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	139.0	124.9	116.0	96.5	97.8	98.4	94.2	90.3	87.8	85.7	83.4	81.9	80.5	79.4	77.4	75.7
σ India	140.8	138.1	120.5	118.3	117.7	117.4	117.2	114.5	112.6	110.3	106.7	104.7	101.2	96.8	93.2	91.4
σ Brazil	127.5	93.7	67.5	62.0	62.4	63.9	63.7	62.6	62.9	62.4	60.3	59.6	60.7	58.0	56.7	56.5
σ Rest non-Annex I	127.5	93.7	67.5	62.0	62.4	63.9	63.7	62.6	62.9	62.4	60.3	59.6	60.7	58.0	56.7	56.5
σ USA	44.0	45.7	53.2	47.2	45.1	43.4	46.9	47.2	49.1	44.9	46.7	49.1	50.7	49.4	49.8	49.0
σ Russia	127.3	127.9	128.7	98.1	101.7	93.6	88.7	84.7	81.6	81.3	79.1	87.1	80.5	76.7	73.8	61.8
σ EU28	96.9	85.8	78.9	76.3	77.7	77.3	77.6	78.6	78.5	80.3	79.2	83.5	89.7	93.5	90.2	91.8

BC (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	160.2	144.1	124.9	99.8	100.4	101.4	96.3	87.6	85.7	83.8	80.7	80.2	79.2	77.9	76.1	74.3
σ India	113.3	116.0	104.7	114.3	115.7	115.9	117.1	116.7	115.7	113.9	111.9	109.6	104.6	99.1	94.1	93.1
σ Brazil	94.1	67.6	53.9	53.1	53.5	54.3	54.4	54.0	54.3	54.2	53.1	52.6	53.4	52.4	52.1	52.1
σ Rest non-Annex I	128.7	121.2	110.3	104.4	105.7	106.7	105.0	101.6	100.9	100.0	97.8	97.4	97.1	95.3	93.7	92.0
σ USA	37.0	36.3	41.4	42.5	40.9	38.4	40.7	40.9	42.9	40.2	41.2	46.9	48.3	47.6	47.7	46.8
σ Russia	98.0	99.1	98.7	85.6	88.8	81.9	77.6	73.5	70.5	70.6	71.5	75.7	66.7	67.1	65.3	59.5
σ EU28	68.8	61.6	59.2	61.9	62.6	63.2	64.3	65.4	66.5	67.8	67.9	71.2	75.3	80.3	78.7	79.4

OC (%)	1970	1980	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
σ China	178.3	172.2	168.5	150.9	151.8	152.5	148.4	142.7	140.1	138.4	136.7	134.1	133.2	133.0	130.2	129.2
σ India	180.4	178.0	169.4	168.3	168.2	167.3	167.6	166.1	164.4	162.6	160.3	159.2	156.1	151.2	147.2	147.4
σ Brazil	180.3	160.9	123.6	103.7	104.0	107.0	107.2	105.5	105.9	104.1	99.2	97.3	98.5	93.0	89.4	88.7
σ Rest non-Annex I	181.9	177.1	171.6	163.2	163.9	164.3	162.3	160.1	158.8	157.8	156.4	155.4	155.0	154.0	152.2	151.4
σ USA	75.5	91.3	88.9	83.6	77.8	73.9	83.2	84.7	89.7	79.5	84.1	88.3	92.9	89.8	92.2	93.1
σ Russia	175.9	175.8	175.9	168.8	171.0	166.4	163.1	160.6	147.1	147.6	147.1	149.1	139.9	137.2	135.4	127.5
σ EU28	160.7	152.4	140.6	130.2	131.8	131.4	133.3	135.2	136.4	139.5	138.7	143.9	149.2	154.1	151.7	153.2

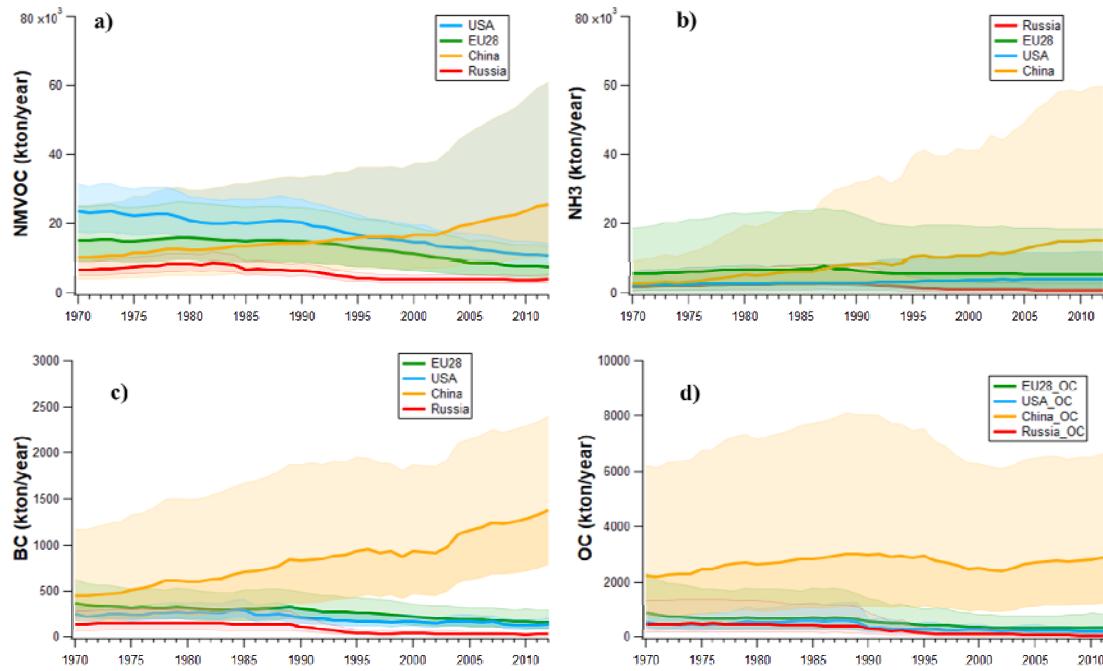


Figure S1.4 - Emission time series of NMVOC, NH₃, BC and OC with uncertainty bands for top emitting countries/regions (China, USA, Russia and EU28).

5 S1.5 - Countries aggregation based on their income

Table S5 reports for each world country the classification based on its income level (low income (LIC), low-middle income (LMC), upper middle income (UMC) and high income (HIC)). The definition of country groups based in their income is consistent with the approach adopted by Janssens-Maenhout et al. (2015). Country codes definition are consistent with the

10 International Organization for Standardization definition (ISO 3166-1).

Tables S5- Countries aggregation based on their income.

Country Code	Income Group	Code	Country Code	Income Group	Code
ABW	High income: nonOECD	HIC_non_OECD	ARM	Lower middle income	LMC
AND	High income: nonOECD	HIC_non_OECD	BOL	Lower middle income	LMC
ARE	High income: nonOECD	HIC_non_OECD	BTN	Lower middle income	LMC
ATG	High income: nonOECD	HIC_non_OECD	CIV	Lower middle income	LMC
BHR	High income: nonOECD	HIC_non_OECD	CMR	Lower middle income	LMC
BHS	High income: nonOECD	HIC_non_OECD	COG	Lower middle income	LMC
BMU	High income: nonOECD	HIC_non_OECD	CPV	Lower middle income	LMC
BRB	High income: nonOECD	HIC_non_OECD	DJI	Lower middle income	LMC
BRN	High income: nonOECD	HIC_non_OECD	EGY	Lower middle income	LMC
CHI	High income: nonOECD	HIC_non_OECD	FSM	Lower middle income	LMC
CUW	High income: nonOECD	HIC_non_OECD	GEO	Lower middle income	LMC
CYM	High income: nonOECD	HIC_non_OECD	GHA	Lower middle income	LMC
CYP	High income: nonOECD	HIC_non_OECD	GTM	Lower middle income	LMC
FRO	High income: nonOECD	HIC_non_OECD	GUY	Lower middle income	LMC
GNQ	High income: nonOECD	HIC_non_OECD	HND	Lower middle income	LMC
GRL	High income: nonOECD	HIC_non_OECD	IDN	Lower middle income	LMC
GUM	High income: nonOECD	HIC_non_OECD	IND	Lower middle income	LMC
HKG	High income: nonOECD	HIC_non_OECD	KGZ	Lower middle income	LMC
HRV	High income: nonOECD	HIC_non_OECD	KIR	Lower middle income	LMC
IMN	High income: nonOECD	HIC_non_OECD	KSV	Lower middle income	LMC
KNA	High income: nonOECD	HIC_non_OECD	LAO	Lower middle income	LMC
KWT	High income: nonOECD	HIC_non_OECD	LKA	Lower middle income	LMC
LIE	High income: nonOECD	HIC_non_OECD	LSO	Lower middle income	LMC
LTU	High income: nonOECD	HIC_non_OECD	MAR	Lower middle income	LMC
LVA	High income: nonOECD	HIC_non_OECD	MDA	Lower middle income	LMC
MAC	High income: nonOECD	HIC_non_OECD	MNG	Lower middle income	LMC
MAF	High income: nonOECD	HIC_non_OECD	MRT	Lower middle income	LMC
MCO	High income: nonOECD	HIC_non_OECD	NGA	Lower middle income	LMC
MLT	High income: nonOECD	HIC_non_OECD	NIC	Lower middle income	LMC
MNP	High income: nonOECD	HIC_non_OECD	PAK	Lower middle income	LMC
NCL	High income: nonOECD	HIC_non_OECD	PHL	Lower middle income	LMC
OMN	High income: nonOECD	HIC_non_OECD	PNG	Lower middle income	LMC
PRI	High income: nonOECD	HIC_non_OECD	PRY	Lower middle income	LMC
PYF	High income: nonOECD	HIC_non_OECD	PSE	Lower middle income	LMC
QAT	High income: nonOECD	HIC_non_OECD	SDN	Lower middle income	LMC
RUS	High income: nonOECD	HIC_non_OECD	SEN	Lower middle income	LMC
SAU	High income: nonOECD	HIC_non_OECD	SLB	Lower middle income	LMC
SGP	High income: nonOECD	HIC_non_OECD	SLV	Lower middle income	LMC
SMR	High income: nonOECD	HIC_non_OECD	SSD	Lower middle income	LMC
SXM	High income: nonOECD	HIC_non_OECD	STP	Lower middle income	LMC
TCA	High income: nonOECD	HIC_non_OECD	SWZ	Lower middle income	LMC
TTO	High income: nonOECD	HIC_non_OECD	SYR	Lower middle income	LMC
TWN	High income: nonOECD	HIC_non_OECD	TLS	Lower middle income	LMC
URY	High income: nonOECD	HIC_non_OECD	UKR	Lower middle income	LMC
VIR	High income: nonOECD	HIC_non_OECD	UZB	Lower middle income	LMC
			VNM	Lower middle income	LMC
			VUT	Lower middle income	LMC
			WSM	Lower middle income	LMC
			YEM	Lower middle income	LMC
			ZMB	Lower middle income	LMC

Country Code	IncomeGroup	Code	Country Code	IncomeGroup	Code
AUS	High income: OECD	HIC	AFG	Low income	LIC
AUT	High income: OECD	HIC	BDI	Low income	LIC
BEL	High income: OECD	HIC	BEN	Low income	LIC
CAN	High income: OECD	HIC	BFA	Low income	LIC
CHE	High income: OECD	HIC	BGD	Low income	LIC
CHL	High income: OECD	HIC	CAF	Low income	LIC
CZE	High income: OECD	HIC	COD	Low income	LIC
DEU	High income: OECD	HIC	COM	Low income	LIC
DNK	High income: OECD	HIC	ERI	Low income	LIC
ESP	High income: OECD	HIC	ETH	Low income	LIC
EST	High income: OECD	HIC	GIN	Low income	LIC
FIN	High income: OECD	HIC	GMB	Low income	LIC
FRA	High income: OECD	HIC	GNB	Low income	LIC
GBR	High income: OECD	HIC	HTI	Low income	LIC
GIB	High income: OECD	HIC	KEN	Low income	LIC
GRC	High income: OECD	HIC	KHM	Low income	LIC
IRL	High income: OECD	HIC	LBR	Low income	LIC
ISL	High income: OECD	HIC	MDG	Low income	LIC
ISR	High income: OECD	HIC	MLI	Low income	LIC
ITA	High income: OECD	HIC	MMR	Low income	LIC
JPN	High income: OECD	HIC	MOZ	Low income	LIC
KOR	High income: OECD	HIC	MWI	Low income	LIC
LUX	High income: OECD	HIC	NER	Low income	LIC
NLD	High income: OECD	HIC	NPL	Low income	LIC
NOR	High income: OECD	HIC	PRK	Low income	LIC
NZL	High income: OECD	HIC	RWA	Low income	LIC
POL	High income: OECD	HIC	SLE	Low income	LIC
PRT	High income: OECD	HIC	SOM	Low income	LIC
SVK	High income: OECD	HIC	TCD	Low income	LIC
SVN	High income: OECD	HIC	TGO	Low income	LIC
SWE	High income: OECD	HIC	TJK	Low income	LIC
USA	High income: OECD	HIC	TZA	Low income	LIC
			UGA	Low income	LIC
			ZWE	Low income	LIC

Country Code	Income Group	Code
AGO	Upper middle income	UMC
ALB	Upper middle income	UMC
ARG	Upper middle income	UMC
ASM	Upper middle income	UMC
AZE	Upper middle income	UMC
BGR	Upper middle income	UMC
BIH	Upper middle income	UMC
BLR	Upper middle income	UMC
BLZ	Upper middle income	UMC
BRA	Upper middle income	UMC
BWA	Upper middle income	UMC
CHN	Upper middle income	UMC
COL	Upper middle income	UMC
CRI	Upper middle income	UMC
CUB	Upper middle income	UMC
DMA	Upper middle income	UMC
DOM	Upper middle income	UMC
DZA	Upper middle income	UMC
ECU	Upper middle income	UMC
FJI	Upper middle income	UMC
GAB	Upper middle income	UMC
GRD	Upper middle income	UMC
HUN	Upper middle income	UMC
IRN	Upper middle income	UMC
IRQ	Upper middle income	UMC
JAM	Upper middle income	UMC
JOR	Upper middle income	UMC
KAZ	Upper middle income	UMC
LBN	Upper middle income	UMC
LBY	Upper middle income	UMC
LCA	Upper middle income	UMC
MDV	Upper middle income	UMC
MEX	Upper middle income	UMC
MHL	Upper middle income	UMC
MKD	Upper middle income	UMC
MNE	Upper middle income	UMC
MUS	Upper middle income	UMC
MYS	Upper middle income	UMC
NAM	Upper middle income	UMC
PAN	Upper middle income	UMC
PER	Upper middle income	UMC
PLW	Upper middle income	UMC
ROU	Upper middle income	UMC
SCG	Upper middle income	UMC
SUR	Upper middle income	UMC
SYC	Upper middle income	UMC
THA	Upper middle income	UMC
TKM	Upper middle income	UMC
TON	Upper middle income	UMC
TUN	Upper middle income	UMC
TUR	Upper middle income	UMC
TUV	Upper middle income	UMC
VCT	Upper middle income	UMC
VEN	Upper middle income	UMC
ZAF	Upper middle income	UMC

S2 - Evaluation of emission ratios of co-emitted air pollutants in EDGAR v4.3.2

Figures S2 a and b give an overview of the current (2012) emission ratio of the air pollutants in EDGAR v4.3.2 with CO/CO₂, NOx/CO₂, SO₂/CO₂, PM₁₀/CO₂ and NH₃/CO₂ for world regions. The CO/CO₂ ratio shows the highest values for the residential and transport (in particular in regions with higher share of gasoline vehicles)

5 sectors due to the low combustion efficiency. On the contrary, the NOx/CO₂ ratio is higher for the energy sector due to the high combustion temperatures leading to the formation of NOx and for the transport sector in countries where the diesel share in the fleet is dominant. The SO₂/CO₂ ratio reflects the composition and quality 10 of the fuel (sulphur content), being larger in countries where the deployment of coal and dirty fuels is significant in particular for the energy and industrial sectors (e.g. Latin America, Africa, Middle East, etc.). The PM₁₀/CO₂ ratio is higher in the residential and partly in the industrial sectors, due to the deployment of less clean technologies and still poor abatement measures in place, in particular in African, Asian and Latin American countries. The NH₃/CO₂ ratio is dominant in the residential sector mainly due to the combustion of biofuels, in particular in Africa, Asia and Latin America.

15

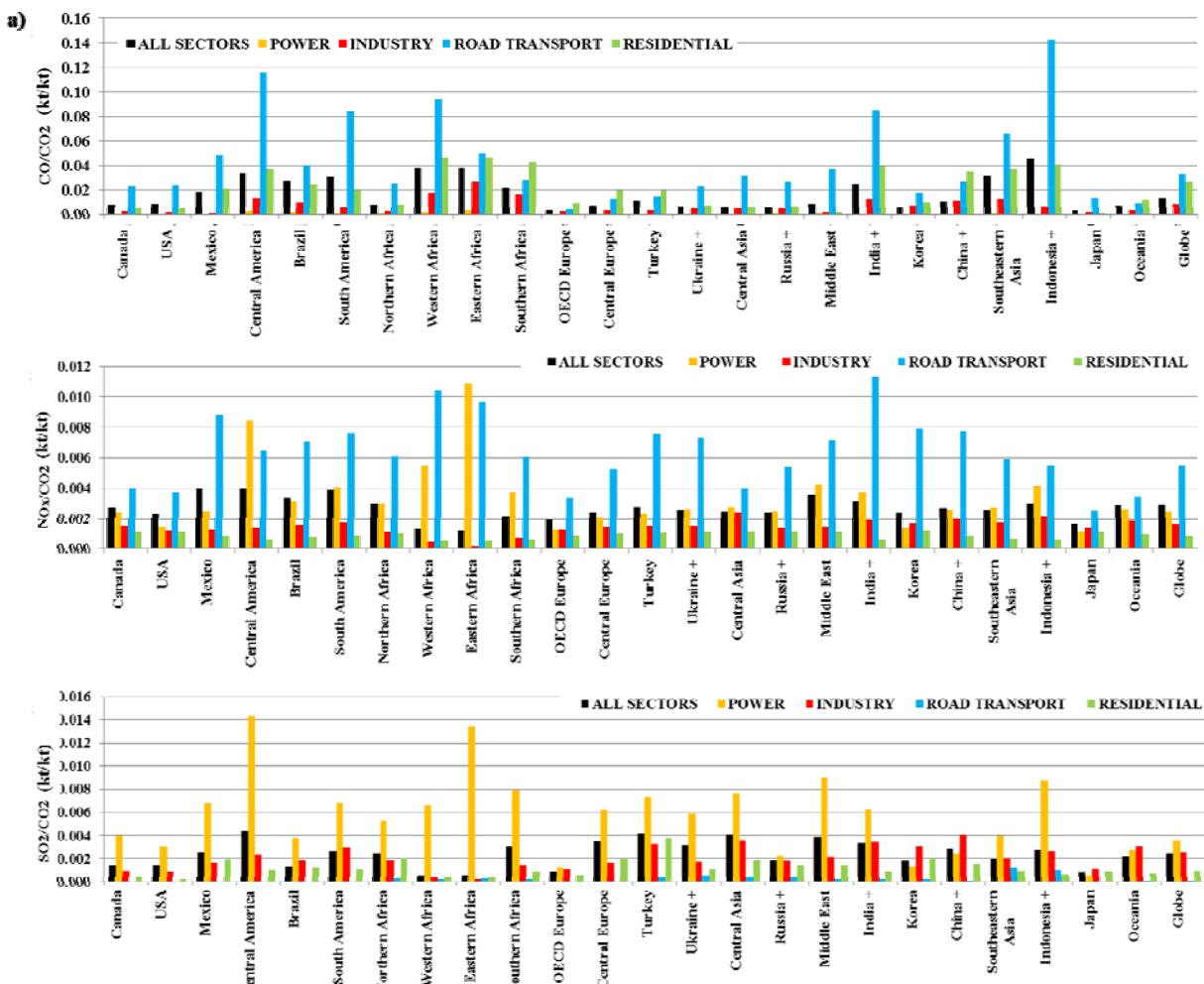


Figure S2a – CO/CO₂, NOx/CO₂ and SO₂/CO₂ emission ratios by sector and world region in 2012.

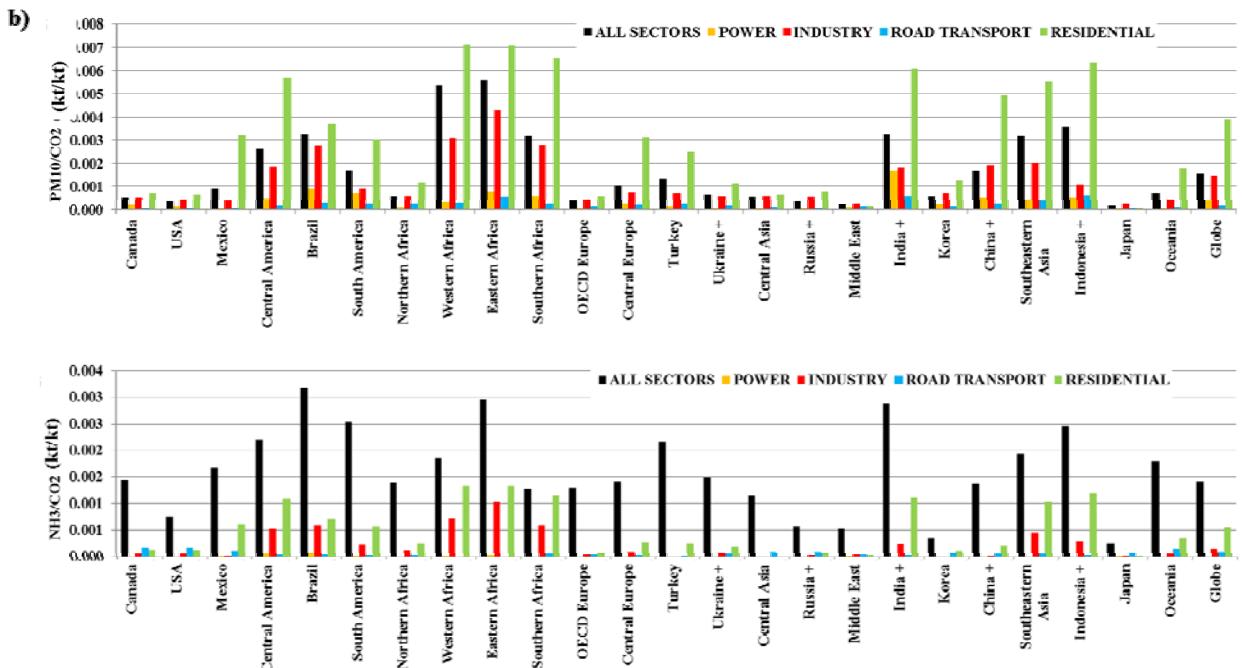
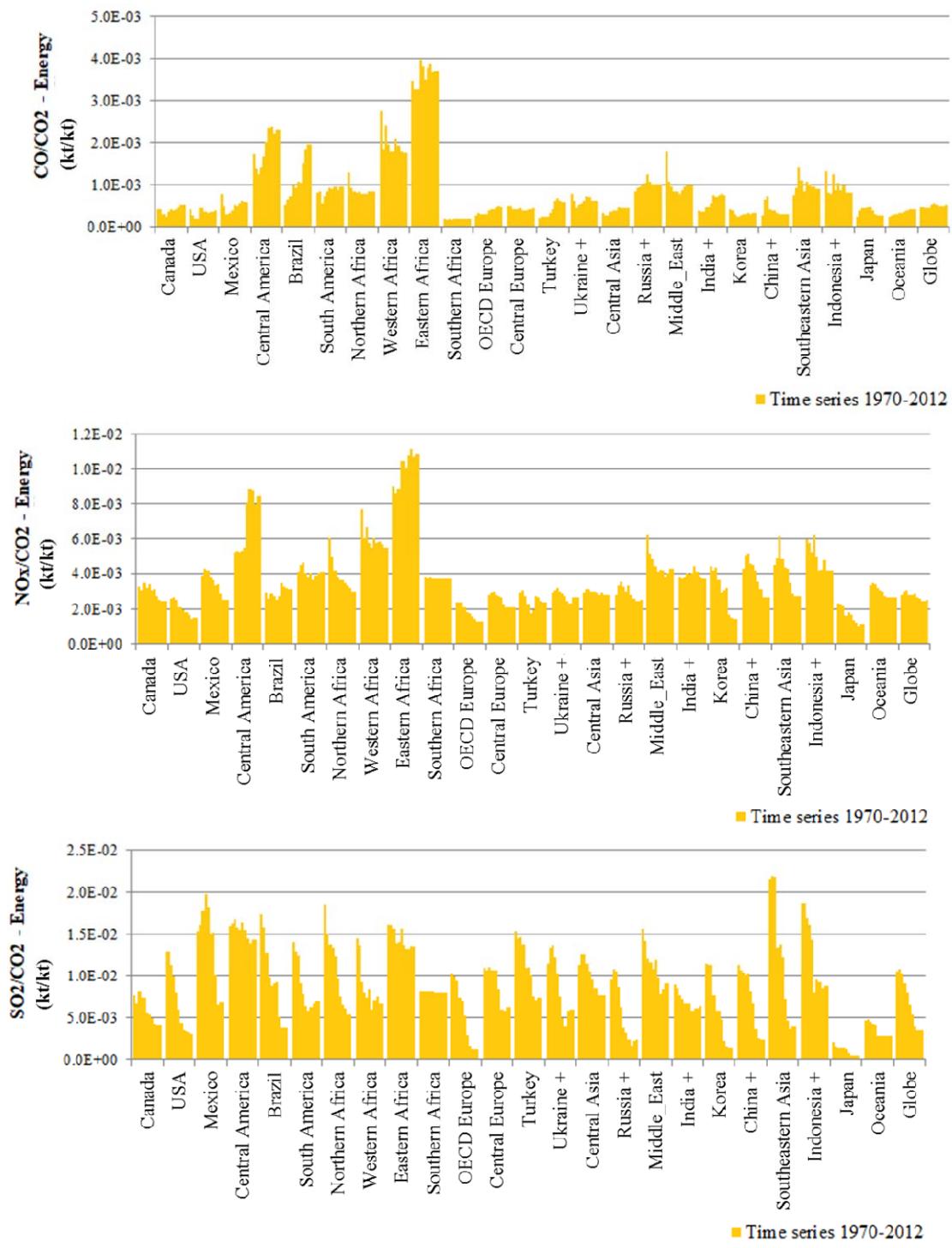


Figure S2b – $\text{PM}_{10}/\text{CO}_2$ and NH_3/CO_2 emission ratios by sector and world region in 2012.

Figures S3a-c represent the regional comparison of CO/CO_2 , NOx/CO_2 and SO_2/CO_2

5 emission ratios in 5 year time steps from 1970 to 2012 for the power generation, transport and residential sectors, respectively, as discussed in the manuscript.



5 Figure S3a - Regional comparison of CO/CO₂, NOx/CO₂ and SO₂/CO₂ emission ratios in 5 year time steps from 1970 to 2012 for the power generation sector.

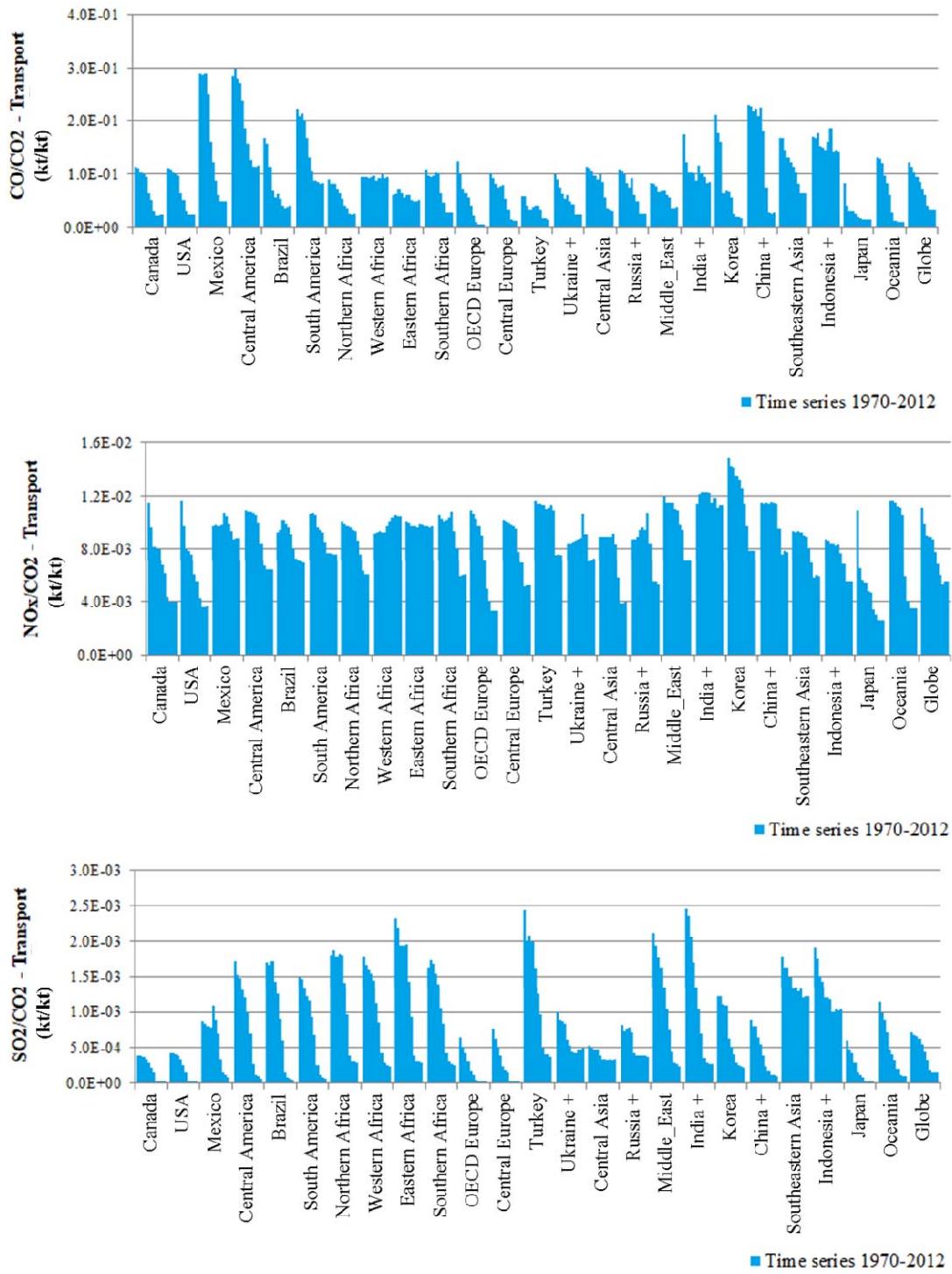


Figure S3b - Regional comparison of CO/CO₂, NOx/CO₂ and SO₂/CO₂ emission ratios in 5 year time steps from 1970 to 2012 for the transport sector.

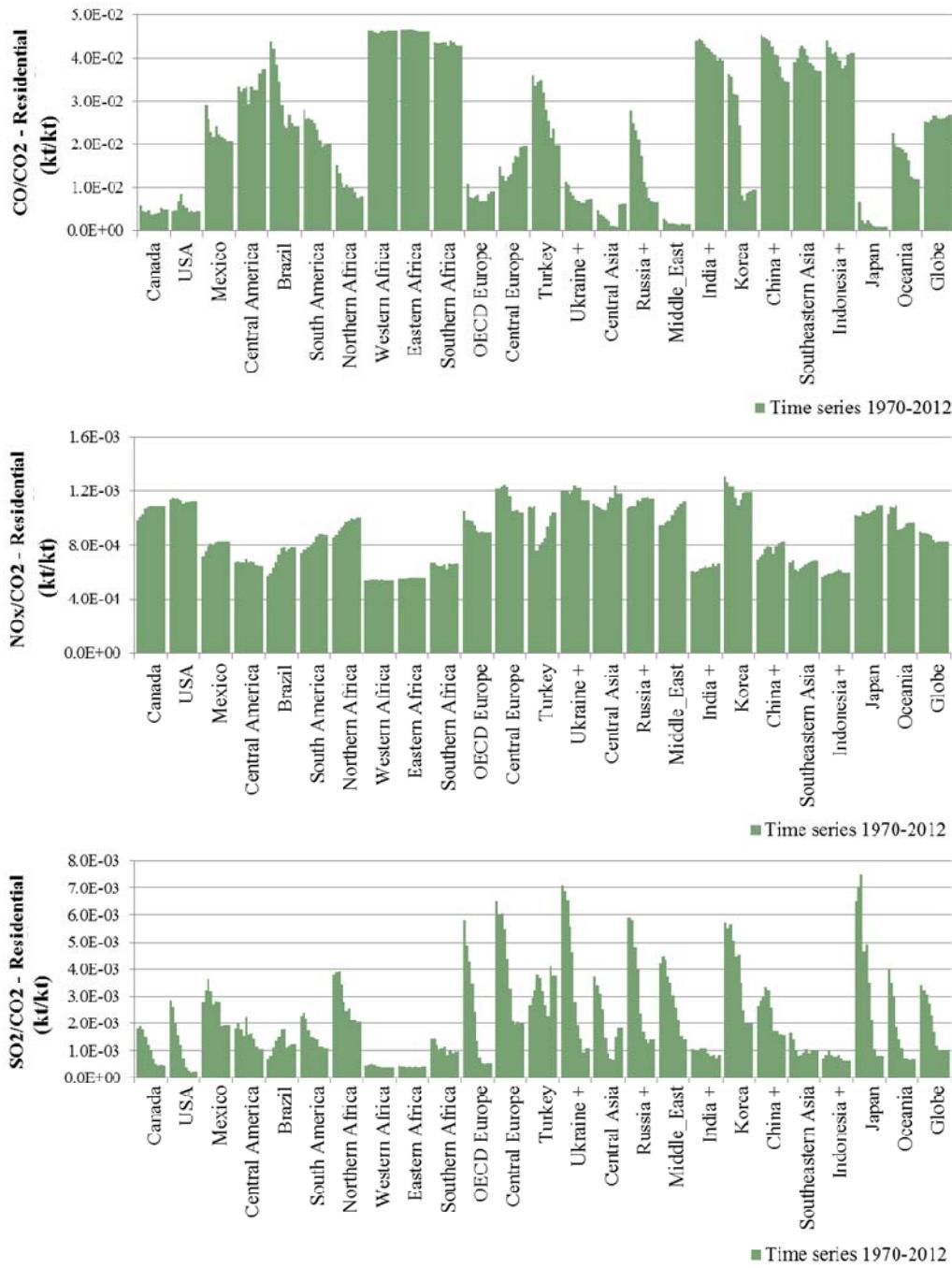


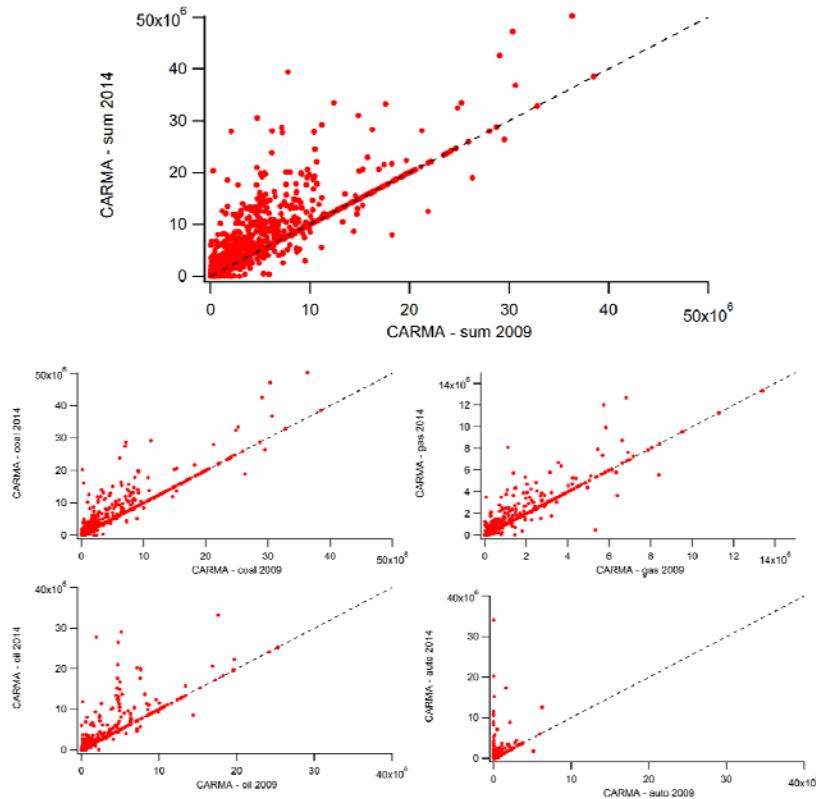
Figure S3c – Regional comparison of CO/CO₂, NOx/CO₂ and SO₂/CO₂ emission ratios in 5 year time steps from 1970 to 2012 for the residential sector.

S3 - Gridded emissions in EDGARv4.3.2

S3.1 - Impact of proxy data

As discussed in Sect. 3.5 of the manuscript, the shares at gridcell level for the energy sector are strongly affected by the spatial proxies used to distribute the energy emissions. In EDGAR v4.3.2 we use the CARMAv3.0 (2012)

5 which reports the location, capacity etc. of point sources for power plants all over the world differentiating three fuel types (coal, gas and oil), intensities and time series (years 2004, 2009 and 2014). Therefore the EDGAR v4.3.2 power emissions in 2007 are distributed using the 2009 CARMA spatial proxies and the 2012 emissions with the 2014 point sources. As shown in Fig. S4, the number of points which are not on the 1:1 line are 1441 which are in the same order of magnitude of the number of cells which are outside the 20% deviation band of the
10 emission scatter plots of Fig. 12 (they are 1.12E+03 for SO₂, 9.50E+02 for NOx, 5.55E+02 for CO, 6.68E+02 for PM_{2.5} and 8.72E+02 for CO₂). When using the same proxy data the same proxies from CARMA (e.g. 2010 vs 2007 comparison), only 0.7% of the points of the energy share are outside the 20% band deviation, as shown in Fig. S5.



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Figure S4- Comparison of point sources provided by CARMA to distribute energy emissions for the year 2009 and 2014.

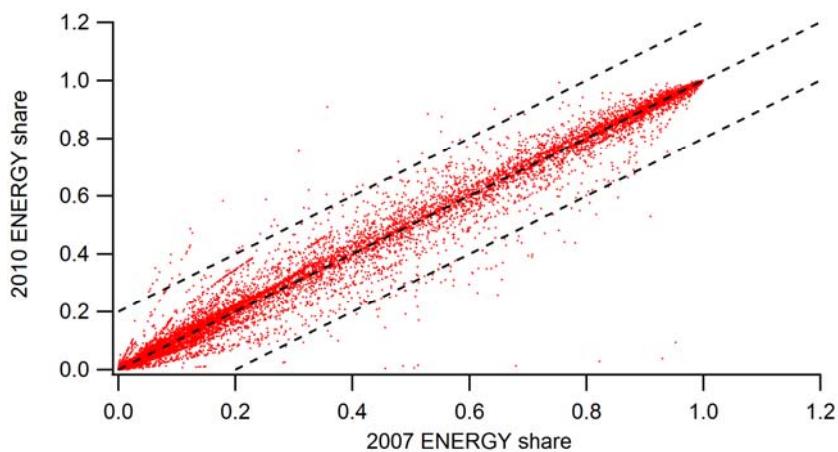
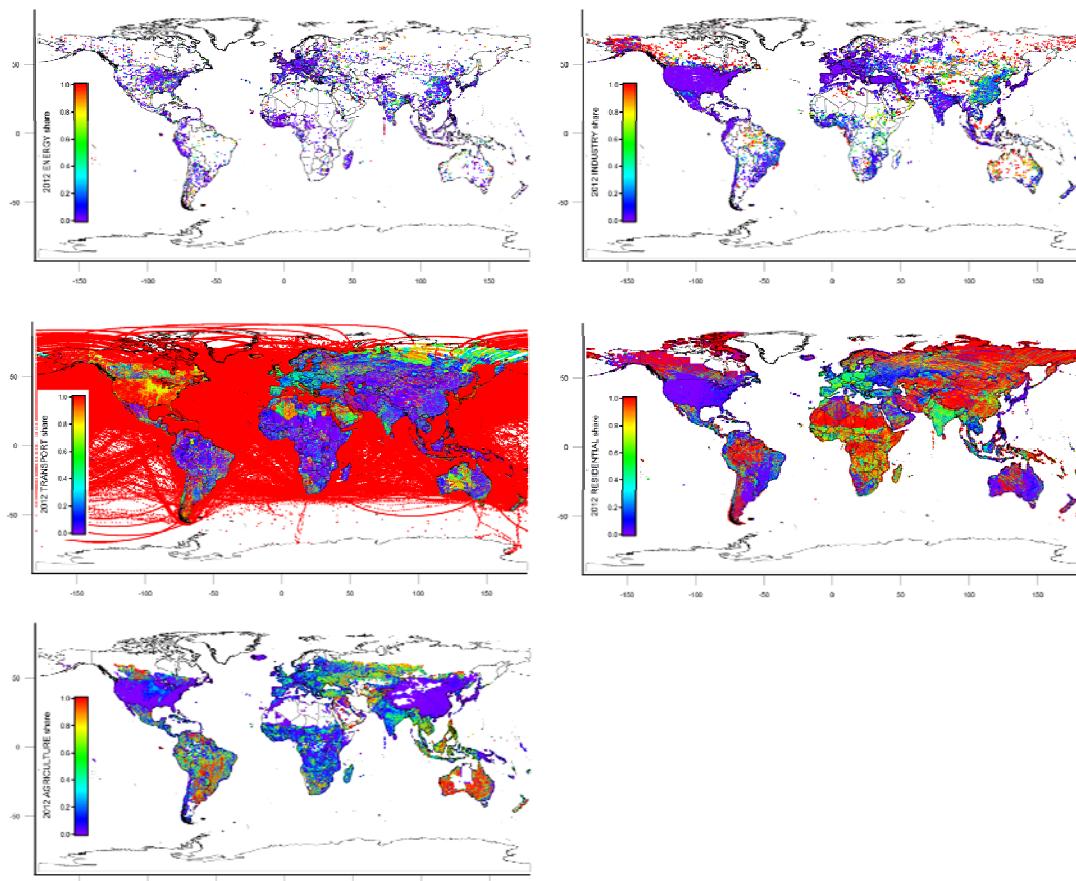


Figure S5 – Comparison of CO₂ energy emission shares in 2010 and 2007 (using the same spatial proxy data).

S3.2 – Gridded emission sector shares



5

Figure S6 – CO₂ emission sector shares for the year 2012 at gridcell level.

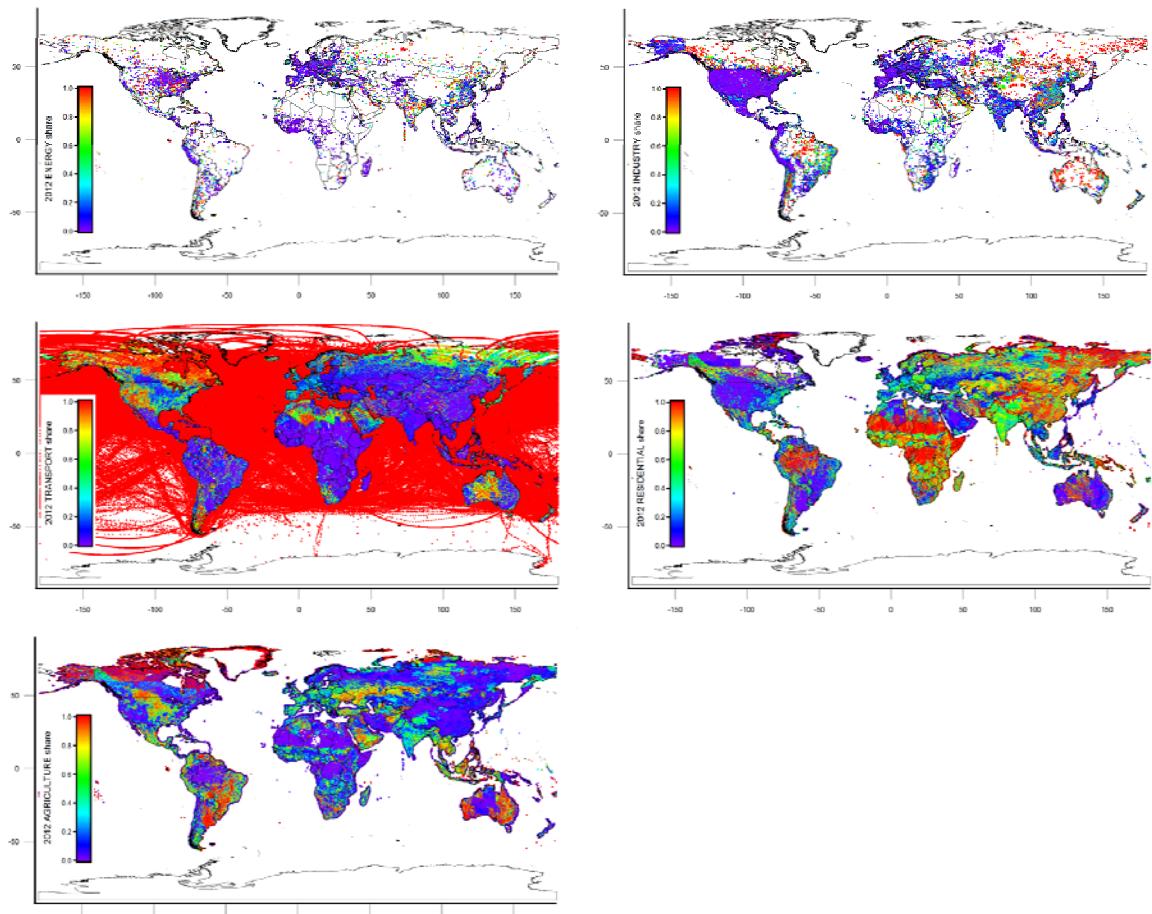


Figure S7 – PM_{2.5} emission sector shares for the year 2012 at gridcell level.

S3.3 – Hot spots evolution over time

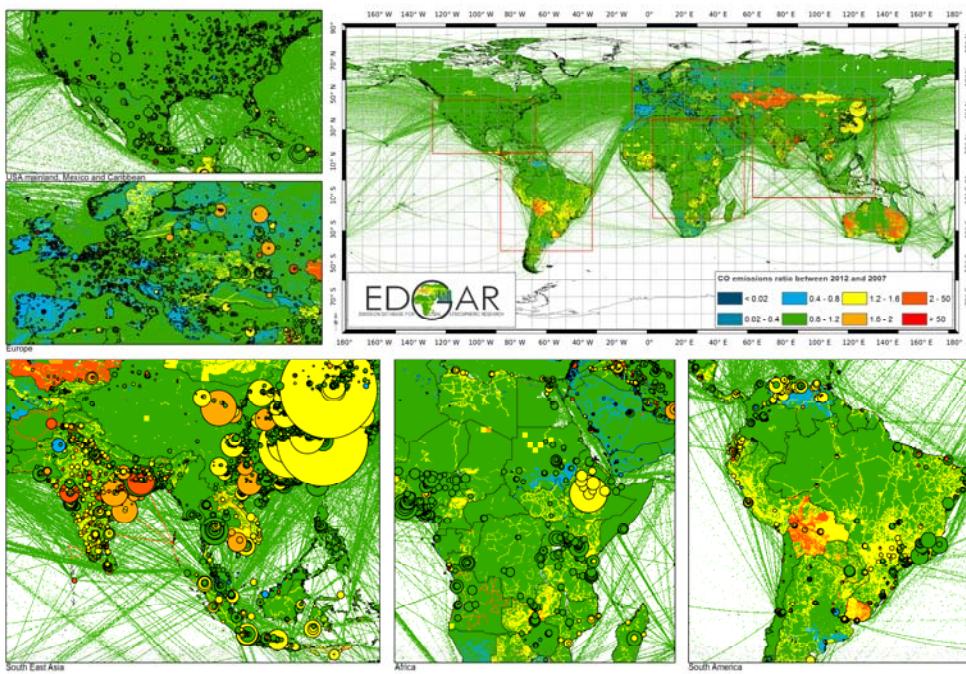
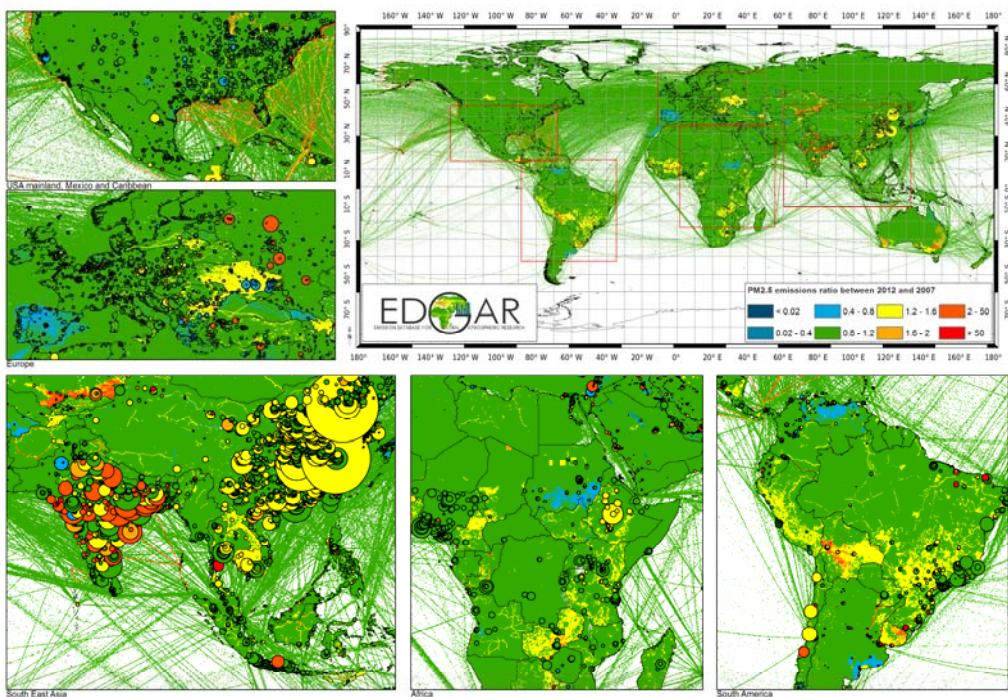


Figure S8a – Ratio of all sectors CO emissions between 2012 and 2007 at gridcell level. The colored bubbles represent the top emitting cells, as described in the text.



5 Figure S8b – Ratio of all sectors PM_{2.5} emissions between 2012 and 2007 at gridcell level. The colored bubbles represent the top emitting cells, as described in the text.

S3.2 – Spatial proxies used in EDGAR v4.3.2

Table S6a - Overview of the spatial proxy data used for distributing the sector-specific country totals of EDGAR v4.3.2 to 0.1degx0.1deg gridmaps from Janssens-Maenhout et al. (2017).

EDGAR sector	Sector description	Gridmaps	Reference
AGS	Agricultural soils	Animals: buffaloes, cattles, chickens, ducks, goats, pigs, poultry, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html
		Crops: barley, beans, broad bean, cassava, chick peas, cow peas, pasture, lentils, maize, millet, oats, other cereals, other pulses, other roots tubers, peas, potatoes, rice, rye, sorghum, soy bean, sugar beet, sugarcane, sweet potatoes, wheat, yams	Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. Global Biogeochemical Cycles 22, GB1003, doi:10.1029/2007GB002952.
		Histosols	FAO Geonetwork, 2007
		Grassland	Global Land Cover map JRC (2000)
AWB	Agricultural waste burning	Crops: barley, beans, broad bean, cassava, chick peas, cow peas, pasture, lentils, maize, millet, oats, other cereals, other pulses, other roots tubers, peas, potatoes, rice, rye, sorghum, soy bean, sugar beet, sugarcane, sweet potatoes, wheat, yams	Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. Global Biogeochemical Cycles 22, GB1003, doi:10.1029/2007GB002952.
		Grassland	Global Land Cover map JRC (2000)
CHE	Production of chemicals	adipic acid, ammonia, caprolactam, glyoxal, nitric acid, sulfuric acid	In-house EDGAR proxy
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
ENE	Power industry	Power plants: auto-producers, coal, gas, oil	CARMA v3 (http://carma.org/) and local data for China
ENF	Enteric fermentation	Animals: buffaloes, cattles, goats, pigs, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html

		Grassland	Global Land Cover map JRC (2000)
FOO	Production of foods	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
FFF	Fossil Fuel Fires	coal fires	In-house EDGAR proxy
		gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
IND	Combustion for manufacturing industry	cement	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPTRR (http://ptrr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		chemical	In-house EDGAR proxy
		mining	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		paper	In-house EDGAR proxy based on EPTRR (http://ptrr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		steel	In-house EDGAR proxy
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
IRO	Iron and steel production	Blast furnace, Basic oxygen furnace, Open hearth furnace, Crude steel, Electric furnace, Sinter, Steel	In-house EDGAR proxy
MNM	Manure management	Animals: buffaloes, cattles, chickens, ducks, goats, pigs, poultry, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html
		Grassland	Global Land Cover map JRC (2000)
NEU	Non energy use of fuels	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
NFE	Non-ferrous metals production	Aluminum production (primary and secondary)	In-house EDGAR proxy
		Copper production (primary and secondary)	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		Magnesium production (primary and secondary)	In-house EDGAR proxy
		Lead production (primary and secondary)	In-house EDGAR proxy
		Zinc production (primary and secondary)	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)

		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
NMM	Non-metallic minerals production	cement	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		lime	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
PAP	Production of pulp and paper	paper	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
PRO	Fuel exploitation	Coal mining: brown and hard coal	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and USGS (https://www.usgs.gov/) and Global Energy Observatory (http://globalenergyobservatory.org/)
		gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
		Gas pipelines transmission	In-house EDGAR proxy
		oil pipelines	In-house EDGAR proxy
		oil terminals	In-house EDGAR proxy based on World Port Index (PUB 150) (http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/WPI/Pub150bk.pdf)
		shipping tankers	In-house EDGAR proxy based on LRIT and Wang et al. (2007)
		population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
		Roads: commercial heavy duty, residential	In-house EDGAR proxy based on OpenStreetMap
PRU	Production and use of other products	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/

RCO	Energy for buildings	fishing	In-house EDGAR proxy based on KNB (Benjamin Halpern, Melanie Frazier, John Potapenko, Kenneth Casey, Kellee Koenig, et al. 2015. Cumulative human impacts: raw stressor data (2008 and 2013). KNB Data Repository. doi:10.5063/F1S180FS.) https://knb.ecoinformatics.org/#view/raw_2013_inorganic_mol_20150714095441
		Rural population, urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
REF_TRF	Oil refineries and Transformation industry	coke	In-house EDGAR proxy
		gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
		Iron Blast furnace	In-house EDGAR proxy
		mining	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		oil refinerie	In-house EDGAR proxy
		oil terminals	In-house EDGAR proxy based on World Port Index (PUB 150) (http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/WPI/Pub150bk.pdf)
		Residential Roads	In-house EDGAR proxy based on OpenStreetMap
SOL	Application of solvents	Urban population, rural population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
	Solid waste incineration	Solid waste incineration	In-house EDGAR proxy based on EPTRR (http://prtr.ec.europa.eu)
SWD_INC	Solid waste landfills	Solid waste landfills	In-house EDGAR proxy based on EPTRR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
TNR_Aviation_CDS	Aviation climbing&descent	domestic aviation climb-out/descending, international aviation climb-out/descending	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_Aviation CRS	Aviation cruise	domestic aviation cruise, international aviation cruise	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_Aviation_LTO	Aviation landing&take off	domestic aviation takeoff landing, international aviation takeoff landing	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_Aviation_SPS	Aviation supersonic	supersonic aviation	In-house EDGAR proxy

TNR_Other	Railways, pipelines, off- road transport	Residential Roads	In-house EDGAR proxy based on OpenStreetMap
		railways	In-house EDGAR proxy
TNR_Ship	Shipping	Shipping: cargo, passengers, tankers	In-house EDGAR proxy based on LRIT and Wang et al. (2007)
		inland waterways	In-house EDGAR proxy
TRO	Road transportatio n	Roads: commercial heavy and light duty, residential	In-house EDGAR proxy based on OpenStreetMap
WWT	Waste water handling	Waste water treatment	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Urban population, rural population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/

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Table S6b – Temporal profiles used in EDGARv4.3.2 to distribute emissions monthly.

Geographical zone	Sector	subsector	temporal profile	Data source
Northern temperate zone	energy	Power industry	based on LOTOS	Veldt (1992), Builtjes (1992)
	waste	solid waste and waste water	constant	
	fuel production & use	Mining	constant	
		non-energy use of fuels	constant	
		Refineries	constant	
	process industry	metal	constant	
		chemical	constant	
		manufacturing and other	constant	
	solvents	production & application	German data for paint, ink, glue of 90s	Friedrich (2000)
	residential	gaseous fuel use	based on GENEMIS	Friedrich & Reis (2004)
		solid fuel use	based on GENEMIS	Friedrich & Reis (2004)
	transport	ground	national data of the Netherlands, UK and USA	Friedrich (2000)
		shipping	Inland and international	Wang et al. (2008)
		domestic & int. aviation	AERO2K	Eyers et al. (2004)
	agriculture	agricultural soils	based on agricultural model	Asman (1992)
		agricultural waste burning	based on agricultural model	Asman (1992)
		enteric fermentation	based on agricultural model	Asman (1992)
		manure management	based on agricultural model	Asman (1992)
Equator	all		constant	
	transport	ground	national data of the Netherlands, UK and USA	Friedrich (2000)
		shipping	Inland and international	Wang et al. (2008)
		aviation	AERO2K	Eyers et al. (2004)

For the Southern temperate zone the same temporal profiles are applied as for the Northern

temperate zone but shifted with 6 months.

S4 – Technologies and abatements in EDGAR v4.3.2

In this section an overview on the technologies and abatements implemented in EDGAR v4.3.2 is reported in Table S7. Additional details on the energy, industry and road transport sectors can be found in the supplementary material of Crippa et al. (2016) as well as in Tables S8-S11 for the energy sector and in Tables S12 and S13 for the transport sector, while table S14 gives an overview of the technologies implemented for the buildings sector.

5 Table S7 - Overview of the main technologies and abatements implemented in EDGAR v4.3.2.

Aggregated sectors	EDGAR sector	Sector description	References for technologies	References for abatements	Additional details
Agriculture	AGS	Agricultural soils	FAOSTAT (2014); IPCC (2006); Bouwman et al. (2005)	Not applied	Janssens-Maenhout et al. (2017)
	AWB	Agricultural waste burning			
	ENF	Enteric fermentation			
	MNM	Manure management			
Energy industry	ENE	Power industry	UCI Platts Power Plant Database (2008); Zhao et al. (2012)	IEA Clean coal power DB, 2008, http://www.iea-coal.co.uk/ ; EPRTR (2012), EPA (1992), Zhao et al. (2012)	Crippa et al. (2016)
Non-energy Industry	IND	Combustion for manufacturing industry	mainly from EMEP/EEA Emission Inventory Guidebook 2009; Bond et al., (2007) for coke ovens and cement plants	Abatement measures (e.g. fuel quality: sulphur and ash content) are included in the implied EFs calculations	Crippa et al. (2016)
Energy for buildings	RCO	Energy for buildings	EMEP/EEA Emission Inventory Guidebook 2009 (sect. on Small Combustion Installations)	No abatements applied	-
Transport	TRO	Road transportation	International Road Federation (IRF, 1990, 2005, 2007); Borken et al. (2007), CONCAWE; COPERT IV; GAINS; ACEA	CONCAWE (CONCAWE, report 6/1997 and 2/2001; dieselnet; ADB; Faiz, 1996; CAI ASIA; UNECE Corinair Guidebook,	Crippa et al. (2016)

			May 2008); RAINS model (IIASA, 2007); ACEA (2008); Eurostat (2007); UNECE transport statistic database (2007).	
	TNR_Aviation_CDS	Aviation climbing&descent		
	TNR_Aviation CRS	Aviation cruise		
	TNR_Aviation_LTO	Aviation landing&takeoff		
	TNR_Aviation_SPS	Aviation supersonic	Eyers et al. (2005)	Not applied
	TNR_Other	Railways, pipelines, off-road transport	Not applied	Not applied
	TNR_Ship	Shipping	Dalsoeren et al. (2009)	Not applied
Production processes	CHE	Production of chemicals	EMEP/EEA Guidebook (2009)	Not applied
	FOO	Production of foods	Not applied	Not applied
	IRO	Iron and steel production	EMEP/EEA Guidebook (2009)	Not applied
	NEU	Non energy use of fuels	EMEP/EEA Guidebook (2009)	Not applied
	NFE	Non-ferrous metals production	EMEP/EEA Guidebook (2009)	Not applied
	NMM	Non-metallic minerals production	CEMBUREAU	Kupainen and Klimont (2007)
	PAP	Production of pulp and paper	Not applied	Not applied
	SOL	Application of solvents	Not applied	Not applied
	PRU	Production and use of other products	Not applied	Not applied
Fuel production and transformation	PRO	Fuel exploitation	EMEP/EEA Guidebook (2009)	Not applied
	REF_TRF	Oil refineries and Transformation industry	EMEP/EEA Emission Inventory Guidebook 2009 (furnaces, gas turbines and internal combustion engines)	Abatament measures (i.e. sulphur and ash content) are included in the implied EFs

				calculations	
Other	FFF	Fossil Fuel Fires	Not applied		Not applied
Waste	SWD_INC	Solid waste incineration (including hazardous wastes)	Not applied	Not applied	Janssens-Maenhout et al. (2017)
	SWD_LDF	Solid waste landfills (including composted wastes)	Not applied	Not applied	
	WWT	Waste water handling	IPCC (2006);Van Drecht et al. (2009); Doorn and Liles (1999);Doorn et al. (1997)	Not applied	

Table S8 – Overview of the technologies used in the energy sector in EDGAR v4.3.2.

Power industry (ENE)			
Process	Description	Technology	Description
ENE.PEL	public electricity production	NSF	Non-specified technology
ENE.CHP	public cogeneration of heat and electricity	GF0	grate firing
ENE.DHE	public district heating	PW0	Pulverized coal wet bottom
ENE.AEL	Autoproduced electricity	PD0	Pulverized coal dry bottom
ENE.AHP	Autoproduced cogeneration of heat and electricity	FB0	Fluidized bed
ENE.AHE	Autoproducer heat plants	BO0	Boiler for gas/liquids
ENE.POW	own of electricity and heat (no emission)	IC0	Internal combustion engine
ENE.PUM	pumped storage of electricity (no emission)	GT0	Gas turbine

Table S9 reports the control measures of NOx emissions from the Platts and IEA Clean Coal databases and applied in EDGAR v4.3.2 for the energy sector. Note that NOx abatement measures also influence NH₃ emissions, increasing them by a factor 5.5 and 11.2 for SC1/SC2 and SN1/SN2, respectively.

Table S9 – Overview of the NOx abatements implemented for the energy sector in EDGAR v4.3.2.

Abatement code	Description	Emission reduction
CLN	Combustion modification: low nox burners	30%
CL0	Combustion modification: low excess air	30%
CAF	Combustion modification: air staging in furnace	30%
CFF	Combustion modification: flue gas recirculation - in furnace	30%
CR0	Combustion modification: reduced air preheat	30%
CSF	Combustion modification: fuel staging (burn or low nox)	30%
SC1	Secondary: selective catalytic reduction	60%
SC2	Secondary: selective catalytic reduction+ combustion modification	90%
SN1	Secondary: selective non-catalytic reduction	30%
SN2	Secondary: selective non-catalytic reduction+ combustion modification	60%
NSN	SOxNOx combined measures	90%
NSF	Non-specified	0 %
NOC	No control	0 %

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Table S10 reports the control measures of SOx emissions implemented in EDGAR v4.3.2 for the energy sector.

Table S10 – Overview of the SOx abatements implemented for the energy sector in EDGAR v4.3.2.

Abatement code	Description	Emission reduction
SND	Non-regenerative-dry (dry FGD)	50%
SNS	Non-regenerative semidry	90%
SNW	Non-regenerative wet (wet FGD)	90%
SRN	Regenerative	90%
NSN	SOxNOx	90%
NSF	Non-specified	0 %
NOC	No control	0 %

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Table S11 reports the control measures of PM emissions implemented in EDGAR v4.3.2 for the energy sector.

Table S11 – Overview of the PM abatements implemented for the energy sector in EDGAR v4.3.2.

Abatement code	Description	Reduction PM10	Reduction PM2.5	Reduction BC	Reduction OC
ESP	Electrostatic precipitator	99.95 %	98.30 %	96.50 %	96.50 %
FBF	Fabric filter	99.95 %	99.60 %	99.60 %	99.60 %
CYC	Cyclone	90 %	0 %	0 %	0 %
SCR	Wet scrubber	99.90 %	99.50 %	98.50 %	98.50 %
COM	Combination of measures	99.95 %	98.30 %	96.50 %	96.50 %
NSF	Non specified	0 %	0 %	0 %	0 %
NOC	No control	0 %	0 %	0 %	0 %

Abatement measures for the road transport sector were mainly retrieved from CONCAWE (CONCAWE, report

5 6/1997 and 2/2001; National Communications, dieselnet, <http://www.dieselnet.com>, ADB, Faiz, 1996, CAI ASIA, UNECE Corinair Guidebook, May 2008). Also the information of the EU27 of the emissions standards of the RAINS model (IIASA, 2007) was taken into account and percentage reduction (non control measures to EURO 4 standard, US and Japans regulated standards) from 1970 onwards for the respective technology and substance was implemented. Specific methodologies for non-EU countries were developed both for the
10 technologies and abatements for this sector.

Table S12 – Technologies implemented for the road transport sector in EDGAR v4.3.2.

Process	Technology	Description
TRO.ROA	BS0	Buses
	HD0	Heavy Duty vehicles
	LD0	Light Duty vehicles
	PC0	Passenger cars
	MC0	Motorcycles
	MP0	Mopeds (Scooters)

Table S13 – Abatements implemented for the road transport sector in EDGAR v4.3.2 in Europe and USA.

Abatement measure (EU)	Description
NOC	Non controlled or conventional
PEU	Pre Euro standards (EU technologies before 1990 were combined together to PEU)
EU1-EU5	From Euro standard 1 to 5
For bus (globally)	
PEU	Pre Euro standards
EU1-EU3	From Euro standard 1 to 3
EEV	Standard for Enhanced Environmental Vehicles
Abatement measure (North America)	
NOC	Non controlled or conventional
PEU	Pre standards (technologies before 1990 were combined together to PEU)
UT1-UT3	From US Tier 1 to 3
PH1-PH2	From US Phase Tier1 to 2 (used for HDV)

Table S14 – Technologies implemented for the buildings sector in EDGAR v4.3.2, based on the EMEP/EEA Guidebook (2009).

	Technology	Description
RCO	NSF	non-specified combustion technology
	FRP	Fireplace (both heating and esthetical)
	STV	Stoves (either for cooking or heating)
	SBO	Small boilers (<50 kWth) for single household heating
	MBO	Medium boilers (50 kWth-50MW) for multi-residential or commercial buildings
	CHP	Combined heat and electricity production (in large buildings)

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