Supplement of

Long-term historical trends in air pollutant emissions in Asia: Regional Emission inventory in ASia (REAS) version 3

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Supplementary tables

Table S1 shows uncertainties of emissions of SO_2, NO_x, CO, CO_2, PM_{10}, $PM_{2.5}$, BC, and OC for each sector in China, India, Japan, Southeast Asia (SEA), East Asia other than China and Japan (OEA), and South Asia other than India (OSA) in 1955, 1985, and 2015. See Fig. 1 for the definitions of SEA, OEA, and OSA.

Table S2 presents uncertainties of emissions of NMVOC for each sector in China, India, Japan, SEA, OEA, and OSA in 1955, 1985, and 2015. See Fig. 1 for the definitions of SEA, OEA, and OSA.

Table S3 provides uncertainties of emissions of NH_3 for each sector in China, India, Japan, SEA, OEA, and OSA in 1955, 1985, and 2015. See Fig. 1 for the definitions of SEA, OEA, and OSA.

Table S1. Uncertainties [%] of emissions of SO_2, NO_x, CO, CO_2, PM_{10}, $PM_{2.5}$, BC, and OC for each sector in China, India, Japan, SEA, OEA, and OSA in (a) 1955, (b) 1985, and (c) 2015. Abbreviations for sectors are as follows: PP = Power Plants, IND = Industry, ROAD = Road transport, OTRA = Other transport, and DOM = Domestic. For OTRA of OEA in 1955, no emissions were estimated. See Fig. 1 for the definitions of SEA, OEA, and OSA.

(a) 1955

	SO_2	NO_x	CO	CO_2	PM_{10}	$PM_{2.5}$	BC	OC
China								
PP	±115	±125	±180	±97	±163	±163	±148	±163
IND	±117	±153	±177	±91	±127	±126	±187	±177
ROAD	±73	±102	±91	±53	±128	±129	±131	±124
OTRA	±130	±163	±200	±103	±182	±182	±182	±182
DOM	±170	±303	±316	±168	±361	±365	±359	±370
India								
PP	±93	±117	±142	±83	±147	±152	±139	±153
IND	±111	±171	±240	±137	±259	±283	±273	±323
ROAD	±71	±97	±90	±52	±133	±134	±137	±129
OTRA	±123	±131	±169	±96	±195	±184	±168	±138
DOM	±249	±292	±305	±169	±370	±374	±368	±375
Japan								
PP	±100	±129	±152	±84	±179	±177	±157	±161
IND	±92	±128	±93	±79	±120	±132	±176	±163
ROAD	±45	±49	±72	±25	±77	±77	±79	±77
OTRA	±96	±121	±147	±94	±193	±178	±158	±122
DOM	±92	±160	±234	±107	±256	±301	±308	±331
SEA								
PP	±114	±120	±147	±90	±165	±163	±140	±143
IND	±164	±212	±271	±162	±294	±309	±315	±328
ROAD	±70	±93	±116	±57	±129	±128	±131	±125
OTRA	±130	±163	±200	±103	±200	±200	±200	±200
DOM	±304	±294	±306	±164	±373	±375	±377	±374
OEA								
PP	±96	±138	±171	±97	±181	±180	±171	±163
IND	±100	±131	±157	±87	±152	±153	±162	±171
ROAD	±80	±135	±119	±64	±150	±152	±153	±147
OTRA	-	-	-	-	-	-	-	-
DOM	±224	±202	±254	±106	±276	±304	±282	±319
OSA								
PP	±91	±108	±137	±76	±169	±164	±130	±144
IND	±168	±203	±267	±142	±265	±296	±312	±327
ROAD	±69	±85	±96	±54	±139	±142	±142	±136
OTRA	±112	±144	±172	±86	±160	±160	±159	±162
DOM	±292	±320	±327	±179	±383	±383	±383	±383

(b) 1985

	SO_2	NO_x	CO	CO_2	PM_{10}	$PM_{2.5}$	BC	OC
China								
PP	±48	±62	±119	±37	±110	±109	±94	±108
IND	±57	±93	±127	±37	±102	±94	±148	±144
ROAD	±29	±69	±63	±17	±92	±93	±94	±89
OTRA	±69	±116	±154	±49	±144	±144	±144	±144
DOM	±81	±178	±231	±88	±255	±265	±250	±276
India								
PP	±47	±75	±107	±37	±128	±129	±119	±91
IND	±58	±96	±155	±61	±175	±194	±190	±260
ROAD	±32	±76	±65	±18	±105	±106	±109	±100
OTRA	±61	±80	±106	±39	±155	±132	±112	±103
DOM	±152	±203	±247	±110	±307	±313	±303	±315
Japan								
PP	±51	±69	±86	±19	±107	±103	±88	±142
IND	±50	±78	±88	±26	±101	±112	±115	±146
ROAD	±29	±38	±55	±22	±66	±66	±67	±66
OTRA	±44	±120	±129	±27	±135	±135	±135	±135
DOM	±45	±103	±119	±19	±110	±120	±133	±157
SEA								
PP	±55	±65	±105	±29	±125	±121	±102	±162
IND	±64	±101	±202	±63	±167	±182	±222	±264
ROAD	±30	±68	±86	±18	±87	±87	±90	±85
OTRA	±70	±116	±154	±49	±154	±154	±154	±154
DOM	±181	±195	±253	±107	±314	±317	±316	±317
OEA								
PP	±52	±75	±111	±37	±115	±114	±111	±95
IND	±63	±91	±114	±39	±122	±125	±123	±132
ROAD	±41	±111	±100	±23	±125	±127	±130	±122
OTRA	±59	±116	±135	±44	±135	±135	±135	±135
DOM	±84	±105	±134	±40	±163	±162	±161	±165
OSA								
PP	±56	±58	±81	±26	±102	±101	±88	±91
IND	±55	±96	±184	±58	±169	±184	±203	±258
ROAD	±32	±75	±83	±20	±110	±111	±112	±107
OTRA	±53	±90	±115	±34	±105	±105	±105	±106
DOM	±200	±233	±273	±120	±325	±325	±324	±326

	SO_2	NO_x	CO	CO_2	PM_{10}	$PM_{2.5}$	BC	OC
China								
PP	±55	±65	±97	±34	±85	±85	±84	±81
IND	±66	±71	±78	±28	±92	±95	±127	±127
ROAD	±22	±41	±45	±15	±65	±65	±71	±60
OTRA	±82	±94	±118	±35	±122	±116	±113	±116
DOM	±71	±129	±204	±58	±235	±245	±227	±259
India								
PP	±60	±55	±106	±32	±102	±101	±93	±189
IND	±54	±74	±103	±37	±147	±160	±152	±241
ROAD	±27	±54	±55	±13	±67	±68	±72	±63
OTRA	±53	±103	±121	±35	±122	±122	±122	±122
DOM	±130	±161	±230	±89	±289	±297	±286	±300
Japan								
PP	±49	±57	±98	±23	±95	±97	±80	±131
IND	±50	±68	±81	±23	±94	±100	±93	±136
ROAD	±21	±27	±37	±13	±51	±51	±52	±51
OTRA	±38	±109	±117	±19	±119	±120	±120	±121
DOM	±47	±82	±111	±13	±107	±106	±116	±121
SEA								
PP	±70	±56	±96	±30	±111	±112	±105	±167
IND	±59	±79	±155	±41	±149	±164	±194	±246
ROAD	±28	±57	±78	±14	±70	±70	±72	±72
OTRA	±53	±103	±122	±35	±122	±122	±122	±122
DOM	±169	±158	±241	±89	±296	±300	±296	±302
OEA								
PP	±51	±47	±81	±26	±93	±90	±83	±80
IND	±65	±82	±109	±34	±108	±108	±110	±116
ROAD	±34	±92	±82	±16	±99	±100	±101	±97
OTRA	±48	±103	±125	±35	±123	±122	±122	±122
DOM	±76	±116	±161	±46	±178	±203	±184	±220
OSA								
PP	±53	±48	±72	±23	±78	±77	±70	±87
IND	±58	±86	±163	±45	±131	±144	±165	±243
ROAD	±27	±55	±79	±15	±81	±82	±87	±81
OTRA	±52	±103	±121	±35	±122	±122	±122	±122
DOM	±243	±202	±259	±100	±311	±311	±310	±312

Table S2. Uncertainties [%] of emissions of NMVOC for each sector in China, India, Japan, SEA, OEA, and OSA in 1955, 1985, and 2015. Abbreviations for sectors are the same as in Table S1 except for EXT = Extraction processes, SLV = Solvent and paint use, and WST = Waste treatment. Note that uncertainties of emissions from non-combustion sources in Japan based on MOEJ (2017) were not assessed in this study. For OTRA of OEA in 1955, no emissions were estimated. See Fig. 1 for the definitions of SEA, OEA, and OSA.

	China	India	Japan	SEA	OEA	OSA
1955						
PP	±164	±124	±134	±147	±159	±134
IND	±147	±251	±160	±267	±242	±262
ROAD	±89	±83	±64	±125	±114	±102
OTRA	±200	±131	±117	±200	-	±155
DOM	±327	±324	±223	±326	±294	±329
EXT	±191	±164	-	±184	±216	±180
SLV	±167	±151	-	±167	±146	±155
WST	±245	±245	-	±245	±245	±245
1985						
PP	±103	±102	±84	±94	±105	±77
IND	±109	±159	±100	±169	±121	±148
ROAD	±65	±75	±51	±100	±96	±86
OTRA	±154	±107	±129	±154	±135	±105
DOM	±268	±269	±116	±273	±146	±275
EXT	±130	±117	-	±127	±137	±135
SLV	±161	±173	-	±177	±179	±180
WST	±200	±200	-	±200	±200	±200
2015						
PP	±94	±91	±97	±91	±76	±69
IND	±99	±115	±81	±133	±166	±136
ROAD	±64	±84	±50	±104	±82	±88
OTRA	±111	±122	±117	±122	±122	±122
DOM	±241	±256	±129	±259	±189	±262
EXT	±126	±114	-	±130	±141	±136
SLV	±153	±150	-	±158	±141	±146
WST	±173	±173	-	±192	±188	±200

Table S3. Uncertainties [%] of emissions of NH_3 for each sector in China, India, Japan, SEA, OEA, and OSA in 1955, 1985, and 2015. Abbreviations for sectors are the same as in Table S1 except for MISC = Human (perspiration and respiration) and latrines. Note that uncertainties of emissions from agricultural sources based on REASv1.1 (Yamaji et al., 2004; Yan et al., 2003) and REASv2.1 (Kurokawa et al., 2013; JPEC 2012a, b, c; 2014) were not assessed in this study. For OTRA of OEA in 1955, no emissions were estimated. See Fig. 1 for the definitions of SEA, OEA, and OSA.

	China	India	Japan	SEA	OEA	OSA
1955						
PP	±279	±236	±264	±238	±279	±263
IND	±129	±377	±243	±384	±325	±383
ROAD	±151	±187	±161	±215	±157	±193
OTRA	±260	±249	±250	±260	-	±228
DOM	±384	±382	±360	±375	±380	±383
MISC	±161	±161	±140	±161	±161	±161
1985						
PP	±217	±202	±300	±314	±206	±212
IND	±77	±199	±307	±241	±129	±151
ROAD	±126	±148	±144	±151	±142	±159
OTRA	±213	±185	±207	±213	±213	±205
DOM	±325	±324	±141	±318	±316	±326
MISC	±148	±161	±122	±161	±161	±161
2015						
PP	±192	±297	±290	±280	±158	±218
IND	±79	±157	±263	±185	±114	±138
ROAD	±145	±145	±162	±176	±142	±174
OTRA	±193	±200	±193	±200	±200	±200
DOM	±311	±310	±124	±305	±308	±312
MISC	±137	±137	±108	±137	±137	±137

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