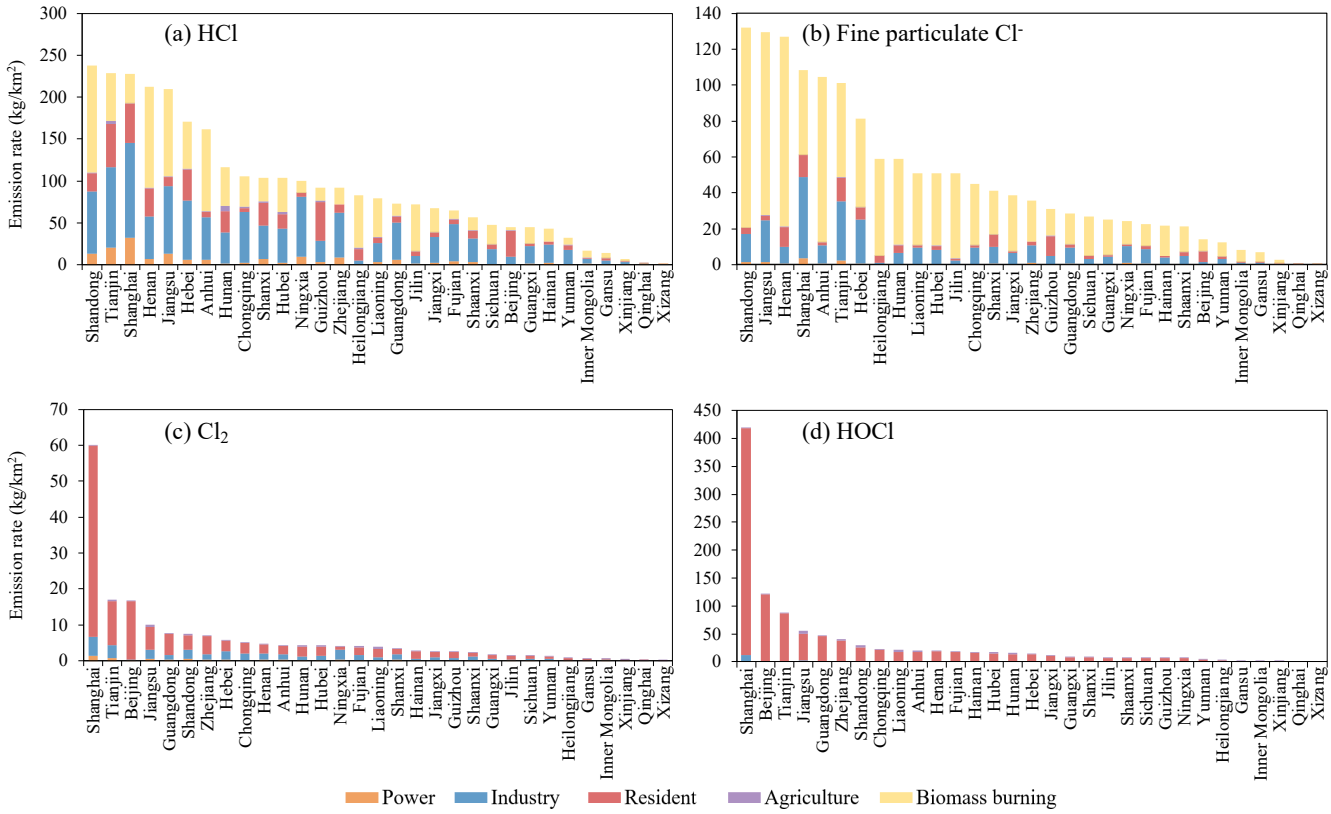

Figure S1 Per-unit-area emissions of HCl (a), fine particulate Cl^- (b), Cl_2 (c) and HOCl (d) by province.

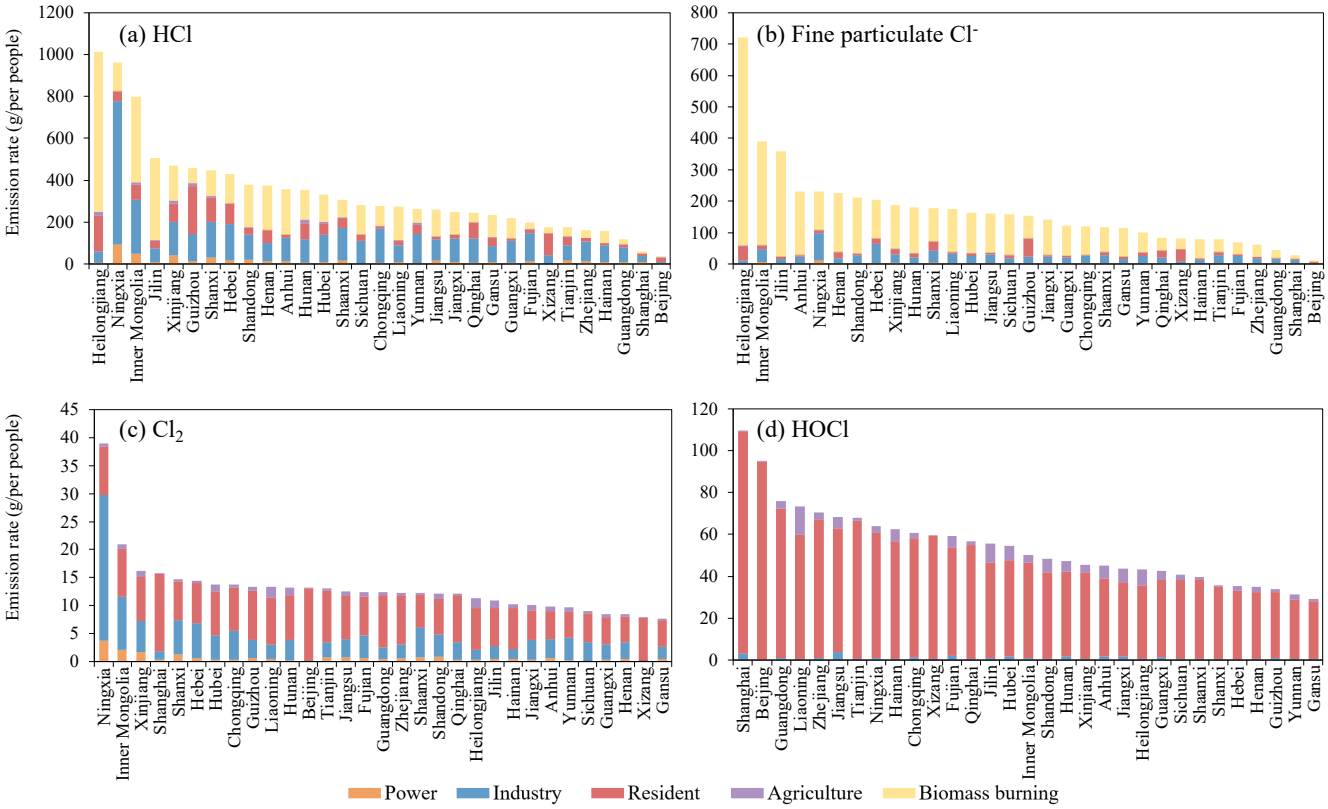

Figure S2 Per-capita emissions of HCl (a), fine particulate Cl^- (b), Cl_2 (c) and HOCl (d) by province.

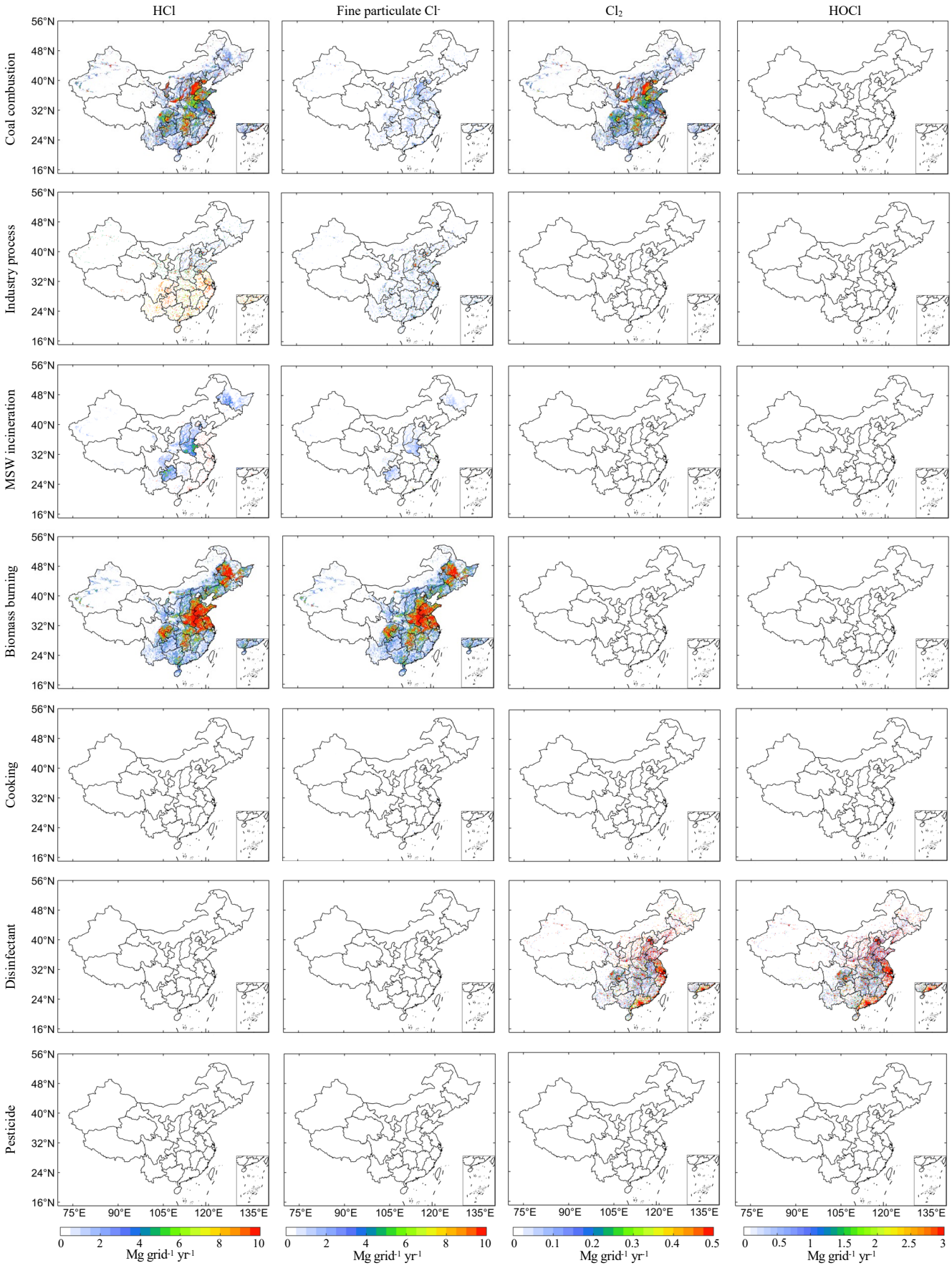

Figure S3 Spatial distribution of anthropogenic chlorine emissions by source category.

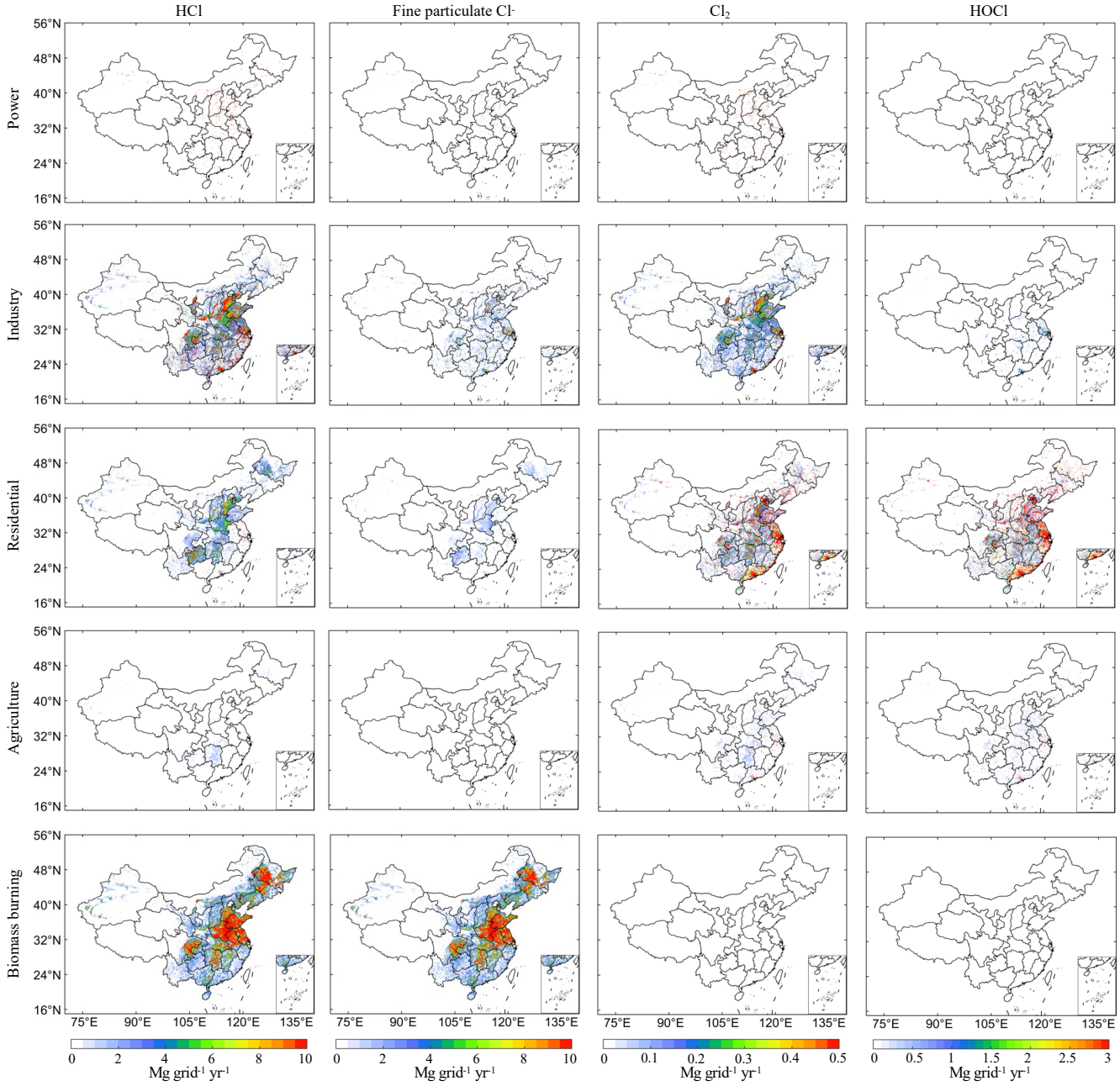

Figure S4 Spatial distribution of anthropogenic chlorine emissions by economic sector.

Table S1 Sources of activity data.

Source category	Sub-category	Activity level data	Source
Coal combustion	Power	Coal consumption of power plant	China Energy Statistical Yearbook 2019 (National Bureau of Statistics, 2019a)
	Industrial	Coal consumption for heat supply	
		Coal consumption of industry	
		Coal consumption of construction industry	
	Residential	Coal consumption of residents	
		Coal consumption of traffic	
		Coal consumption of business	
		Coal consumption of other	
	Agriculture	Coal consumption of agriculture	
Industrial production process	Cement production	Production of cement	China Industrial Statistics Yearbook 2019 (National Bureau of Statistics, 2019b)
	Iron production	Production of iron	
	Steel production	Production of steel	
	Flat glass production	Production of flat glass	
	HCl production	Production of hydrochloric acid	National Bureau of Statistics (https://m.sohu.com/a/335035620_775892/?pvid=000115_3w_a)
Waste incineration	Incineration station	Waste incineration amount	China Urban and Rural Construction Statistical Yearbook 2019 (National Bureau of Statistics, 2019c)
	Open burning	Population	
		Waste disposal rate	
Biomass burning	Household burning-Firewood	Rural population	China Population and Employment Statistical Yearbook 2019 (National Bureau of Statistics, 2019d)
		Rural household size	
	Household burning-Crop	Crop yield	China Rural Statistical Yearbook 2019 (National Bureau of Statistics, 2019e)
	Open burning	Crop yield	
Cooking	Household	Population	China Population and Employment Statistical Yearbook 2019 (National Bureau of Statistics, 2019d)
		Household size	
	Restaurant	Number of restaurants	Gaode' POI (point of interest) data
	Canteen-School	Number of students	China Education Statistics Yearbook 2019 (National Bureau of Statistics, 2019f)

		Number of teaching staff	
	Canteen-Unit	Number of public institutions	China Statistical Yearbook 2019 (National Bureau of Statistics, 2019g)
		Number of organizations	
Cooling tower	Cooling tower	Industrial water consumption	China Environmental Statistics Yearbook 2019 (National Bureau of Statistics, 2019h)
Water treatment	Water treatment	Tap water supply	China Urban and Rural Construction Statistical Yearbook 2019 (National Bureau of Statistics, 2019c)
Waste water treatment	Medical sewage	Number of hospital beds	China Health Statistics Yearbook 2019 (National Bureau of Statistics, 2019i)
	Domestic sewage	Sewage treatment capacity	China Urban and Rural Construction Statistical Yearbook 2019 (National Bureau of Statistics, 2019c)
Swimming pool	Public Swimming pool	Number of swimming pools	General Administration of Sport of China
	Private swimming pool	Per capita income of residents	China Statistical Yearbook 2019 (National Bureau of Statistics, 2019g)
Tap water use	Car washing	Number of car wash shops	Gaode' POI (point of interest) data
	Lawn watering	Afforested area	China Urban and Rural Construction Statistical Yearbook 2019 (National Bureau of Statistics, 2019c)
	Road watering	Road area	
	Water leakage	Leakage water volume	
Environmental disinfection	Hospital	Number of hospitals	China Health Statistics Yearbook 2019 (National Bureau of Statistics, 2019i)
		Total health expenditure in 2018	
		Total health expenditure in 2007	China Health Statistics Yearbook 2008 (National Bureau of Statistics, 2008)
	Breeding	Number on hand at the end of the pig year	China Rural Statistical Yearbook 2019 (National Bureau of Statistics, 2019e)
		Number of poultry on hand at the end of the year	
		Aquaculture area	
	Toilet	Number of public toilets	China Urban and Rural Construction Statistical Yearbook 2019 (National Bureau of Statistics, 2019c)
Pesticide	Insecticide	Pesticide usage	China Rural Statistical Yearbook 2019 (National Bureau of Statistics, 2019e)
	Herbicide	Pesticide usage	

Table S2 Emission factor of HCl from different sources

Source category	Sub-category	Emission factor	Reference
Industrial production process	Cement production (g/t)	16.30	Yi et al. (2020)
	Iron production (g/t)	0.60	Yi et al. (2020)
	Steel production (g/t)	0.80	Yi et al. (2020)
	HCl production (g/kg)	0.08	Yi et al. (2020)
	Flat glass production (g/t)	12.50	Ministry. (2011); Wang et al. (2014)
Waste incineration	Open burning（g/kg）	3.58	Fu et al. (2018)
Biomass burning	Rice straw (g/kg)	0.44	Yi et al. (2021)
	Wheat straw (g/kg)	0.60	Yi et al. (2021)
	Other crop straw (g/kg)	0.52	Yi et al. (2021)
	Firewood (g/kg)	0.06	Yi et al. (2021)

Table S3 Emission factors of Cl_2 and HOCl.

Sub-category	Thi-category	Chlorine dose (mg/L)	Free chlorine (mg/L)	Cl volatilization rate	Cl_2 emission factor (mg/L)	HOCl emission factor (mg/L)	Reference
Flat glass production (g/t)		-	-	-	0.615	-	Ministry. (2011); Wang et al. (2014)
Cooling tower		1	0	1	0.84	0.11	Wong et al. (2017); Wang et al. (2002)
Water treatment		2.2	0.86	0.2	0.22	0.03	Li et al. (2020); Wong et al. (2017)
Waste water treatment	Medical sewage	10	0.5	0.2	1.60	0.21	Li et al. (2020); Wong et al. (2017)
	Domestic sewage	2.8	0	0.2	0.47	0.06	Li et al. (2020); Wong et al. (2017)
Swimming pool	Indoor swimming pool	1.8	0	0.2	0.30	0.04	Wong et al. (2017); (Wang et al., 2002)
	Outdoor swimming pool	1.125	0	0.2	0.19	0.02	Wong et al. (2017); (Wang et al., 2002)
Tap water use	Car washing	0.86	0	1	0.72	0.09	Li et al. (2020); Wong et al. (2017)
	Lawn watering	0.86	0	1	0.72	0.09	Li et al. (2020); Wong et al. (2017)
	Road watering	0.86	0	1	0.72	0.09	Li et al. (2020); Wong et al. (2017)
	Water leakage	0.86	0	0.1	0.07	0.01	Li et al. (2020); Wong et al. (2017)

Table S4 Emission factor of fine particulate Cl^- from different sources

Source category	Sub-category	Emission factor (g/kg)	Reference	Cl^- in $PM_{2.5}$ (%)	Reference
Industrial production process	Cement production	0.5	Yi et al. (2020)	0.73	Yi et al. (2020)
	Iron production	0.17	Yi et al. (2020)	3.54	Yi et al. (2020)
	Steel production	0.2	Yi et al. (2020)	3.54	Yi et al. (2020)
	Flat glass production	0.546	Pan et al. (2015)	2	Wen et al. (2019)
Waste incineration	Open burning	9.8	Wiedinmyer et al. (2014)	13.8	Wiedinmyer et al. (2014)

Table S5 Straw-to-product ratio, dry matter fraction, and combustion efficiency for biomass burning (Zhou et al., 2017).

Crop type	Straw-to-product ratio (R)	dry matter fraction (D)	combustion efficiency (C)
Rice	1.323	0.89	0.93
Wheat	1.3	0.89	0.83
Corn	1.269	0.87	0.92
Bean	1.6	0.91	0.68
Potato	0.5	0.45	0.68
Cotton	3	0.83	0.9
Peanut	1.5	0.94	0.82
Rapeseed	1.5	0.83	0.9
Sesame	2.2	0.83	0.9
Hemp	1.7	0.83	0.9
Sugar cane	0.3	0.45	0.68
Sugar beet	0.1	0.45	0.9

Table S6 Percentage of biomass domestic burning and open burning by province (Zhou et al., 2017).

Province	Percentage of domestic burning	Percentage of open burning
Beijing	0.0923	0.096
Tianjin	0.42	0.165
Hebei	0.35	0.165
Shanxi	0.45	0.2
Inner Mongolia	0.338	0.246
Liaoning	0.396	0.2
Jilin	0.3	0.259
Heilongjiang	0.26	0.5
Shanghai	0.2	0.148
Jiangsu	0.3	0.225
Zhejiang	0.3	0.3
Anhui	0.29	0.319
Fujian	0.3	0.188
Jiangxi	0.23	0.2
Shandong	0.45	0.2
Henan	0.3	0.2
Hubei	0.283	0.197
Hunan	0.4	0.2
Guangdong	0.17	0.1976
Guangxi	0.2226	0.2273
Hainan	0.45	0.2
Chongqing	0.4922	0.1211
Sichuan	0.45	0.2
Guizhou	0.35	0.2
Yunnan	0.2	0.1
Xizang	0.338	0.148
Shaanxi	0.338	0.159
Gansu	0.338	0.159
Qinghai	0.338	0.159
Ningxia	0.338	0.159
Xinjiang	0.143	0.137

Table S7 Emission factors for biomass burning (Yi et al., 2021).

Crop type	$PM_{2.5}$ Emission Factors (g/kg)
Rice straw	0.4635
Wheat straw	0.5271
Corn straw	0.4146
Bean straw	0.233
Rapeseed straw	0.246
Other straw	0.37684
Firewood	0.16

Table S8 Parameters of emission factors for cooking.

Source category			Number of heats [a]	Smoke discharge (m^3/h) [b]	Cooking time (h/d) [b]	Day (d) [b]	$PM_{2.5}$ Emission Factors (mg/m^3) [b]	Removal rate (%) [b]	Percentage of domestic burning (%) [c]
Household			1	600	0.5	360	1.32	30	1.545
Restaurant	Small and medium-sized (80%)		4	2000	4	360	0.68	30	1.545
	Large-sized (20%)		6	2000	4	360	0.68	30	1.545
Canteen	Middle school	Student	-	2000/150 (people)	6	300	1.32	30	1.545
		Teaching staff	-	2000/150 (people)	1.5	300	1.32	30	1.545
	University	Student	-	2000/150 (people)	6	200	1.32	30	1.545
		Teaching staff	-	2000/150 (people)	1.5	200	1.32	30	1.545
	Unit		1	2000	1.5	240	1.32	30	1.545

a Wu et al. (2018) and Ministry. (2001); b Wu et al. (2018); c Li et al. (2018).

Table S9 Size of swimming pool (Li et al., 2020).

Size Type	Public swimming pool		Private swimming pool
	Standard swimming pool	Semi standard and non-standard swimming pools	
Length (m)	50	25	10
Width (m)	21	21	8
Depth (m)	1.8	1.8	1.4

Table S10 Parameters of breeding disinfection (Li et al., 2020).

Breeding type	Breeding density (m^2/per)	Disinfectant usage per unit area (g/m^2)	Sterilization frequency (times/year)	Chlorine volatilization rate
Livestock	1.2	1	52	0.3
Poultry	0.05	1	52	0.3
Aquaculture	-	0.3	18	0.2

Table S11 Sources of spatial allocation factors

Sector	Sub-sector	Thi-sector	Four-sector	Resolution	Space allocation factor
Power	Power coal combustion	Power plant		Point	Location of thermal power plants (WRI dataset https://datasets.wri.org/dataset/globalpowerplantdatabase)
Industry	Industrial coal combustion	Heat supply		Point	Location of heating enterprises (http://www.sz-w.com/hyqyml.php)
		Industry		Area (1km×1km)	Total population data (LandScan 2018)
		Construction industry		Area (1km×1km)	Total population data (LandScan 2018)
	Industrial production process	Cement production		Point	Location of cement enterprise (http://www.sz-w.com/hyqyml.php)
		Iron production		Point	Location of metallurgical enterprises (http://www.sz-w.com/hyqyml.php)
		Steel production		Point	Location of metallurgical enterprises (http://www.sz-w.com/hyqyml.php)
		HCl production		Point	Location of chemical enterprises (http://www.sz-w.com/hyqyml.php)
		Flat glass production		Point	Location of glass enterprises (http://www.sz-w.com/hyqyml.php)
	Industrial usage of disinfectant	Cooling tower		Point	Location of thermal power plants (WRI dataset https://datasets.wri.org/dataset/globalpowerplantdatabase) and chemical enterprises (http://www.sz-w.com/hyqyml.php)
Residential	Residential coal combustion	Residents		Area (1km×1km)	Total population data (LandScan 2018)
		Traffic		Area (1km×1km)	Total population data (LandScan 2018)
		Business		Area (1km×1km)	Total population data (LandScan 2018)
		Other		Area (1km×1km)	Total population data (LandScan 2018)
	Residential usage of disinfectant	Water treatment		Point	Location of water plants (http://www.sz-w.com/hyqyml.php)

		Waste water treatment	Domestic sewage	Point	Location of sewage-treatment plants (https://www.dowater.com)
			Medical sewage	Point	Location of hospitals (Gaode's 2018 POI data)
		Swimming pool	Public swimming pool	Point	Location of swimming pools (Gaode's 2018 POI data)
			Private swimming pool	Area (1km×1km)	Total population data (LandScan 2018)
		Environmental disinfection	Hospital	Point	Location of hospitals (Gaode's 2018 POI data)
			Toilet-Public toilet	Point	Location of public toilets (Gaode's 2018 POI data)
			Toilet-Domestic toilet	Area (1km×1km)	Total population data (LandScan 2018)
		Tap water use	Car washing	Point	Location of car washing stations (Gaode's 2018 POI data)
			Lawn watering	Area (1km×1km)	Urban population data (LandScan 2018)
			Road watering	Area (1km×1km)	Urban population data (LandScan 2018)
			Water leakage	Area (1km×1km)	Total population data (LandScan 2018)
	Waste incineration	Incineration station		Point	Location of waste incineration stations (Information Platform for Municipal Solid Waste Incineration www.waste-cwin.org)
		Open burning		Area (1km×1km)	Rural population data (LandScan 2018)
	Cooking	Household		Area (1km×1km)	Total population data (LandScan 2018)
		Restaurant		Area (1km×1km)	Total population data (LandScan 2018)
		Canteen	School	Area (1km×1km)	Total population data (LandScan 2018)
			Unit	Area (1km×1km)	Total population data (LandScan 2018)
Agriculture	Agricultural coal combustion			Area (1km×1km)	Rural population data (LandScan 2018)
		Livestock		Point	Location of poultry breeding bases (Gaode's 2018 POI data)

	Agricultural usage of disinfectant	Poultry		Point	Location of poultry breeding bases (Gaode's 2018 POI data)
		Aquaculture		Point	Location of fisheries (Gaode's 2018 POI data)
	Agricultural usage of pesticide	Insecticide		Area (1km×1km)	Rural population data (LandScan 2018)
		Herbicide		Area (1km×1km)	Rural population data (LandScan 2018)
Biomass burning	Biomass household burning	Crop		Area (1km×1km)	Rural population data (LandScan 2018)
		Firewood		Area (1km×1km)	Rural population data (LandScan 2018)
	Biomass open burning			Area (1km×1km)	Rural population data (LandScan 2018)

Table S12 Monthly allocation factors.

Source category	Sub-category	Month											
		1	2	3	4	5	6	7	8	9	10	11	12
Coal combustion	Power plant	8.6%	7.8%	8.2%	7.7%	8.0%	8.0%	9.2%	9.4%	7.7%	7.4%	8.2%	9.7%
	Heat supply	25.8%	23.3%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	25.8%
	Industrial process [a]	7.1%	6.5%	7.9%	8.2%	8.1%	8.7%	8.2%	8.4%	8.9%	8.7%	9.2%	10.1%
	Residential coal combustion [a]	9.5%	10.1%	9.6%	8.5%	8.3%	7.5%	7.7%	7.7%	7.5%	7.8%	7.5%	8.3%
	Other coal combustion	8.5%	7.7%	8.5%	8.2%	8.5%	8.2%	8.5%	8.5%	8.2%	8.5%	8.2%	8.5%
Industrial	Cement production	5.3%	4.8%	7.0%	9.5%	9.7%	9.0%	8.8%	9.0%	9.4%	9.9%	9.3%	8.3%
production process	Iron production	7.8%	7.1%	7.9%	7.9%	8.8%	8.6%	8.9%	8.7%	8.7%	8.9%	8.4%	8.3%
	Steel production	7.8%	7.0%	8.0%	8.3%	8.7%	8.6%	8.8%	8.7%	8.7%	8.9%	8.4%	8.2%
	HCl production	7.1%	6.5%	7.9%	8.2%	8.1%	8.7%	8.2%	8.4%	8.9%	8.7%	9.2%	10.1%
	Flat glass production	8.0%	7.2%	8.1%	8.3%	8.4%	8.7%	8.5%	8.5%	8.5%	8.6%	8.4%	8.9%
Waste incineration [b]		8.4%	8.9%	7.5%	6.6%	6.8%	8.7%	10.1%	9.7%	8.0%	8.5%	8.3%	8.4%
Biomass burning [c]		1.9%	4.8%	4.1%	3.1%	2.5%	11.2%	14.6%	4.2%	10.0%	24.7%	13.9%	5.0%
Cooking [d]		9.2%	9.4%	8.5%	8.5%	8.5%	7.2%	6.6%	6.6%	8.5%	8.5%	8.5%	10.0%
Disinfectant	Cooling tower	8.6%	7.8%	8.2%	7.7%	8.0%	8.0%	9.2%	9.4%	7.7%	7.4%	8.2%	9.7%
	Water treatment[e]	7.5%	6.9%	8.0%	8.0%	8.4%	8.3%	9.0%	9.3%	8.8%	8.9%	8.4%	8.5%
	Waste water treatment[e]	7.5%	6.9%	8.0%	8.0%	8.4%	8.3%	9.0%	9.3%	8.8%	8.9%	8.4%	8.5%
	Swimming pool	3.4%	3.1%	3.4%	3.3%	10.8%	18.0%	18.6%	18.6%	10.7%	3.4%	3.3%	3.4%
	Environmental disinfection	8.5%	7.7%	8.5%	8.2%	8.5%	8.2%	8.5%	8.5%	8.2%	8.5%	8.2%	8.5%
	Tap water use[e]	7.5%	6.9%	8.0%	8.0%	8.4%	8.3%	9.0%	9.3%	8.8%	8.9%	8.4%	8.5%
Pesticide		9.8%	8.8%	9.9%	9.5%	8.9%	8.4%	6.9%	7.4%	6.6%	7.3%	8.1%	8.4%

[a] Hong et al. (2020); [b] Wang et al. (2021); [c] Wu (2009); [d] Wu et al. (2018); [e] Wang et al. (2007).

Table S13 Variation coefficient of activity data.

Source category		Distribution type	Variation coefficient	Reference
Coal combustion	Coal consumption of power plant	Normal	5%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption for heat supply	Normal	5%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of industry	Normal	10%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of residents	Normal	20%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of traffic	Normal	30%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of business	Normal	30%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of construction industry	Normal	30%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of agriculture	Normal	30%	Fu et al. (2018); Yi et al. (2021)
	Coal consumption of other	Normal	30%	Fu et al. (2018); Yi et al. (2021)
Industrial production process	Production of cement	Normal	10%	Fu et al. (2018); Yi et al. (2021)
	Production of iron	Normal	10%	Yi et al. (2021)
	Production of steel	Normal	10%	Yi et al. (2021)
	Production of hydrochloric acid	Normal	20%	Fu et al. (2018); Yi et al. (2021)
	Production of flat glass	Normal	10%	Fu et al. (2018); Yi et al. (2021)
Waste incineration	Waste incineration amount	Normal	10%	Fu et al. (2018); Yi et al. (2021)
	Open incineration amount of garbage	Normal	30%	Fu et al. (2018); Yi et al. (2021)
Biomass burning	Biomass combustion	Normal	30%	Fu et al. (2018); Yi et al. (2021)
Cooking	Household	Normal	20%	Zheng et al. (2022)
	Restaurant	Normal	30%	Zheng et al. (2022)
	Canteen	Normal	10%	Zheng et al. (2022)
Cooling tower	Supplementary water volume	Normal	30%	Yi et al. (2021); Li et al. (2020); Zheng et al. (2022)
Water treatment	Treatment water volume	Normal	10%	Yi et al. (2021)
Waste water treatment	Domestic sewage treatment volume	Normal	10%	Yi et al. (2021)
	medical wastewater treatment volume	Normal	30%	Yi et al. (2021)
Swimming pool	Number of swimming pools	Normal	30%	Li et al. (2020)
	Volume of pools	Normal	50%	Li et al. (2020)
Tap water use	Tap water consumption	Normal	50%	Li et al. (2020)

Environmental disinfection	Disinfectant usage	Normal	50%	Li et al. (2020)
Pesticide	Usage of disinfectants	Normal	40%	Yi et al. (2021)

Table S14 Variation coefficient of emission factors.

Parameter		Distribution	Variation coefficient	Reference
Coal combustion				
Cl release ratio	Pulverized coal boiler	Uniform	78%, 98.5%	Fu et al. (2018); Yi et al. (2021)
	Stoker furnace	Uniform	75%, 99%	Fu et al. (2018); Yi et al. (2021)
	Circulating fluidized bed boiler	Uniform	86%, 99.6%	Fu et al. (2018); Yi et al. (2021)
	Traditional stove	Normal	50%	Yi et al. (2021)
	Strengthen stove	Normal	50%	Yi et al. (2021)
	Tea bath	Normal	50%	Zheng et al. (2022)
Removal efficiency	Wet scrubber	Uniform	40%, 60%	Fu et al. (2018); Yi et al. (2021)
	FF	Uniform	9.5%, 11.3%	Fu et al. (2018); Yi et al. (2021)
	ESP	Uniform	0.9%, 12%	Fu et al. (2018); Yi et al. (2021)
	Mechanical dedusting	Uniform	16.8%, 27.8%	Fu et al. (2018); Yi et al. (2021)
	Wet desulfurization	Uniform	93%, 99.4%	Fu et al. (2018); Yi et al. (2021)
	Other desulfurization	Uniform	85%, 94%	Fu et al. (2018); Yi et al. (2021)
Cl content in coal	Cl content in coal	Lognormal	50%	Fu et al. (2018)
Industrial production process				
HCl emission factor	Cement production	Lognormal	10%	Yi et al. (2021)
	Iron production	Lognormal	50%	Fu et al. (2018); Yi et al. (2021)
	Steel production	Lognormal	50%	Fu et al. (2018); Yi et al. (2021)
	HCl production	Lognormal	30%	Yi et al. (2021)
$PM_{2.5}$ emission factor	Cement production	Lognormal	50%	Zheng et al. (2022)
	Iron production	Lognormal	50%	Zheng et al. (2022)
	Steel production	Lognormal	50%	Zheng et al. (2022)
	Flat glass production	Lognormal	50%	Zheng et al. (2022)
Fine particle Cl^- percentage	Cement production	Uniform	0.3%, 1.92%	Yi et al. (2021)
	Iron production	Uniform	0.74%, 8.37%	Yi et al. (2021)
	Steel production	Uniform	0.74%, 8.37%	Yi et al. (2021)
	Flat glass production	Lognormal	50%	Zheng et al. (2022)
Flat glass production	Reference air displacement	Lognormal	50%	Zheng et al. (2022)
	HCl emission concentration	Lognormal	50%	Zheng et al. (2022)
	Cl_2 emission concentration	Lognormal	50%	Zheng et al. (2022)
Waste incineration				
HCl emission factor	Incineration station	Lognormal	50%	Zheng et al. (2022)
	Open burning	Lognormal	50%	Fu et al. (2018)

$PM_{2.5}$ emission factor	Incineration station	Lognormal	50%	Zheng et al. (2022)
	Open burning	Lognormal	50%	Zheng et al. (2022)
Fine particle Cl^- percentage	Incineration station	Lognormal	50%	Fu et al. (2018)
	Open burning	Lognormal	50%	Fu et al. (2018)
Biomass burning				
HCl emission factor	Rice straw (g/kg)	Uniform	0.0393, 0.8065	Yi et al. (2021)
	Wheat straw (g/kg)	Uniform	0.0201, 1.0034	Yi et al. (2021)
	Other crop straw	Lognormal	50%	Yi et al. (2021)
	Firewood (g/kg)	Uniform	0.0376, 0.087	Yi et al. (2021)
Cl^- emission factor	Rice straw (g/kg)	Uniform	0.187, 0.83	Yi et al. (2021)
	Wheat straw (g/kg)	Uniform	0.1317, 0.939	Yi et al. (2021)
	Corn straw (g/kg)	Uniform	0.059, 1.026	Yi et al. (2021)
	Bean straw (g/kg)	Uniform	0.068, 0.361	Yi et al. (2021)
	Rapeseed straw	Lognormal	50%	Yi et al. (2021)
	Other straw	Lognormal	50%	Yi et al. (2021)
	Firewood (g/kg)	Uniform	0.086, 0.276	Yi et al. (2021)
Cooking				
$PM_{2.5}$ emission factor	Cooking	Lognormal	50%	Zheng et al. (2022)
Fine particle Cl^- percentage	Cooking	Lognormal	20%	Yi et al. (2021)
Cooling tower				
Cl_2/HOCl emission factor	Cooling tower	Lognormal	50%	Yi et al. (2021)
Water treatment				
Cl_2/HOCl emission factor	Chlorine dose	Lognormal	50%	Yi et al. (2021); Li et al. (2020)
	Free chlorine	Lognormal	5%	Yi et al. (2021); Li et al. (2020)
	Emission factor	Uniform	10%, 30%	Yi et al. (2021)
Waste water treatment				
Cl_2/HOCl emission factor	Chlorine dose	Lognormal	50%	Yi et al. (2021); Li et al. (2020)
	Free chlorine	Lognormal	30%	Yi et al. (2021)
	Emission factor	Uniform	10%, 30%	Yi et al. (2021)
Swimming pool				
Cl_2/HOCl emission factor	Chlorine dose	Lognormal	50%	Li et al. (2020)
Tap water use				
Cl_2/HOCl emission factor	Free chlorine	Lognormal	10%	Yi et al. (2021)
	Emission factor	Uniform	5%, 15%	Yi et al. (2021); Li et al. (2020); Zheng et al. (2022)
Environment disinfectant				
Cl_2/HOCl emission factor	Emission factor	Uniform	20%, 40%	Yi et al. (2021); Li et al. (2020)
Pesticide				
Cl_2/HOCl emission factor	Pesticide	Lognormal	50%	Yi et al. (2021); Zheng et al. (2022)

Reference:

Fu, X., Wang, T., Wang, S. X., Zhang, L., Cai, S. Y., Xing, J., and Hao, J. M.: Anthropogenic Emissions of Hydrogen Chloride and Fine Particulate Chloride in China, Environ Sci Technol, 52, 1644-1654, 10.1021/acs.est.7b05030, 2018.

Hong, Y., Liu, Y., Chen, X., Fan, Q., Chen, C., Chen, X., and Wang, M.: The role of anthropogenic chlorine emission in surface ozone formation during different seasons over eastern China, Sci. Total Environ., 723, 137697, https://doi.org/10.1016/j.scitotenv.2020.137697, 2020.

Li, L., Yin, S., Huang, L., Yi, X., Wang, Y., Zhang, K., Ooi, C. G., and Allen, D. T.: An emission inventory for Cl2 and HOCl in Shanghai, 2017, Atmos. Environ., 223, 117220, https://doi.org/10.1016/j.atmosenv.2019.117220, 2020.

Li, Q., Wu, A., Gong, D., Wang, B., and Luan, S.: Characteristics of PM2.5 emitted from cooking emissions: a review, Environmental Science & Technology (in Chinese), 41, 41-50, 10.19672/j.cnki.1003-6504.2018.08.008, 2018.

Ministry of Ecology and Environment of the People's Republic of China.: Emission Standard of Cooking fume, 2001.

Ministry of Ecology and Environment of the People's Republic of China: Emission standard of air pollutants for flat glass industry, 2011.

National Bureau of Statistics of China.: China Health Statistical Yearbook (2008), Peking Union Medical College Press, Beijing, China, 2008.

National Bureau of Statistics of China.: China Energy Statistical Yearbook (2019), China Statistics Press, Beijing, China, 2019a.

National Bureau of Statistics of China.: China Industry Statistical Yearbook (2019), China Statistics Press, Beijing, China, 2019b.

National Bureau of Statistics of China.: China Urban-Rural Construction Statistical Yearbook (2019), China Statistics Press, Beijing, China, 2019c.

National Bureau of Statistics of China.: China Population & Employment Statistics Yearbook, China Statistics Press, Beijing, China, 2019d.

National Bureau of Statistics of China.: China Rural Statistical Yearbook (2019), China Statistics Press, Beijing, China, 2019e.

National Bureau of Statistics of China.: Educational Statistics Yearbook of China, China Statistics Press, Beijing, China, 2019f.

National Bureau of Statistics of China.: China Statistical Yearbook (2019), China Statistics Press, Beijing, China2019g.

National Bureau of Statistics of China.: China Statistical Yearbook of Environment (2019), China Statistics Press, Beijing, China, 2019h.

National Bureau of Statistics of China.: China Health Statistical Yearbook (2019), Peking Union Medical College Press, Beijing, China, 2019i.

Pan, Y., Li, N., Zheng, J., Yin, S., Li, C., Yang, J., Zhong, L., Chen, D., Deng, S., and Wang, S.: Emission inventory and characteristics of anthropogenic air pollutant sources in Guangdong Province, Acta Scientiae Circumstantiae (in Chinese), 35, 2655-2669, 10.13671/j.hjkxxb.2014.1058, 2015.

Wang, G., Zhang, H., Jia, M., and Cheng, W.: Investigation and Analysis on Relevant Factors of Household Domestic Waste Production, Urban Management and Science and Technology (in Chinese), 22, 30-34, 10.16242/j.cnki.umst.2021.01.011, 2021.

Wang, S., Qin, W., Liu, Y., and Wei, S.: An Experimental Study on the Disinfection of Swimming Pool Water with Strong Chlorogen, China Chlor-Alkali (in Chinese), 31-33, 2002.

Wang, X., Zhang, F., Wang, H., Zhu, J., Zhang, C., Cui, Y., and Shu, Y.: Analysis and Research on Emission Concentration of Heavy Metals, Fluorine and Chlorine from Glass Furnaces, The 18th National Symposium on Sulfur Dioxide, Nitrogen Oxide, Mercury Pollution Prevention and Fine Particulate Matter (PM2.5) Treatment Technology, Luoyang, China2014.

Wang, Y., Wu, X., and Xu, G.: Analysis of change law of water consumption invGuangzhou City, Water Economics, 43-45+83, 2007.

Wen, J., Li, B., Zhang, X., Tian, Y., Huang, B., Zhu, H., and Feng, Y.: PM2.5 Profiles of Typical Industrial Emissions in Yantai City, China, Research of Environmental Sciences (in Chinese), 32, 1333-1339, 10.13198/j.issn.1001-6929.2019.04.06, 2019.

Wiedinmyer, C., Yokelson, R. J., and Gullett, B. K.: Global Emissions of Trace Gases, Particulate Matter, and Hazardous Air Pollutants from Open Burning of Domestic Waste, Environ Sci Technol, 48, 9523-9530, 10.1021/es502250z, 2014.

Wong, J. P. S., Carslaw, N., Zhao, R., Zhou, S., and Abbatt, J. P. D.: Observations and impacts of bleach washing on indoor chlorine chemistry, Indoor Air, 27, 1082-1090, https://doi.org/10.1111/ina.12402, 2017.

Wu, X.: The Study of Air Pollution Emission Inventory in Yangtze Delta, Master, Fudan University, 2009.

Wu, X., Chen, W., Wang, K., Xiu, A., Zhang, S., Zhao, H., and Zhang, X.: PM2.5 and VOCS emission inventories from cooking in Changchun City, China Environmental Science (in Chinese), 38, 2882-2889, 10.19674/j.cnki.issn1000-6923.2018.0303, 2018.

Yi, X., Yin, S., Tan, X., Huang, L., Wang, Y., Chen, Y., and Li, L.: Preliminary study on the inventory of sources of hydrogen chloride and particulate chlorine in the atmosphere in

Shanghai, Acta Scientiae Circumstantiae (in Chinese), 40, 469-478, 10.13671/j.hjkxxb.2019.0376, 2020.

Yi, X., Yin, S., Huang, L., Li, H., Wang, Y., Wang, Q., Chan, A., Traoré, D., Ooi, M. C. G., Chen, Y., Allen, D. T., and Li, L.: Anthropogenic emissions of atomic chlorine precursors in the Yangtze River Delta region, China, Sci. Total Environ., 771, 144644, https://doi.org/10.1016/j.scitotenv.2020.144644, 2021.

Zheng, J., Huang, Z., Sha, Q., Zhong, Z., and Xu, Y.: Ucertainty Analysis of Emission Inventory and Chemical Transport Model, Science Press, Beijing, China2022.

Zhou, Y., Xing, X., Lang, J., Chen, D., Cheng, S., Wei, L., Wei, X., and Liu, C.: A comprehensive biomass burning emission inventory with high spatial and temporal resolution in China, Atmos. Chem. Phys., 17, 2839-2864, 10.5194/acp-17-2839-

2017, 2017.