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Table S2. Major data sources of activity data of different emission sources.

Emission sources	Activity data	Major data sources ^a
Power plant	Fuel consumption	China Energy Statistical Yearbook, section 6: Regional Energy Balance Sheets Compendium of statistical data on the electric power industry, Table 2-2: Electricity generation by region
Industrial boiler	Fuel consumption	China Energy Statistical Yearbook, section 6: Regional Energy Balance Sheets China's Environmental Statistics (not publicly released) Industrial investigation (not publicly released)
Residential combustion	Fuel consumption	China Energy Statistical Yearbook, section 6: Regional Energy Balance Sheets China Statistical Yearbook, Table 14-23: Building areas
Transport	Vehicle population	China Statistical Yearbook, Table 16-20: Civil vehicle population China Transportation Statistical Yearbook, Table: Public transport population
	Fuel consumption	China Energy Statistical Yearbook, section 6: Regional Energy Balance Sheets International Energy Agency dataset: https://www.iea.org/ (last access: 25 April 2023)
Open burning	Biomass consumption	China Statistical Yearbook, Table 12-10: Major agricultural products production Satellite observation product of MODIS burned area: MCD64A1, http://modis-fire.umd.edu/ (last access: 25 April 2023)
Industrial process	Industrial product output	China Statistical Yearbook, Table 13-13: Industrial products output by region China Industrial Statistics Yearbook, Table 3-55: Industrial products output by region China Iron and Steel Industry Yearbook, Table 7: Artificial block ore output China Nonferrous Metal Yearbook, Table: Non-ferrous metal output by region China Building Materials Industry Yearbook, Table: Major building materials products output China Chemical Industry Yearbook, Table 8: Major products output China's Environmental Statistics (not publicly released) Industrial investigation (not publicly released) China Light Industry Yearbook, Table 2: Major products output China Paint Industry Yearbook, section 3: Architectural coatings market review and development trend outlook
Solvent	Solvent consumption	China Coating Industry Association dataset: https://www.chinacoatingnet.com/index2.php (last access: 25 April 2023) China adhesives and tape industry association dataset: https://www.catia-china.com/ (last access: 25 April 2023)
Oil storage and transportation	Oil production and sales	China Energy Statistical Yearbook, Table 3-5: Gasoline production by region; Table 3-6: Diesel production by region
Waste treatment	Waste disposal volume	China Environmental Statistical Yearbook, Table 10-6: Municipal wastewater discharge and treatment by region, Table 10-7: Urban appearance and environmental health by region
	Livestock stocking	Chinese Animal Husbandry and Veterinary Yearbook, Table: Annual slaughter of major livestock by region, Table: Annual stock of major livestock by region
Agriculture	Fertilizer application	China Rural Statistical Yearbook, Table 3-6: Chemical fertilizer application amount by region Compendium of cost and income data of national agricultural products, Table: Fertilizer input by crop

a: All data collected from national yearbooks can be retrieved from the official website of National Bureau of Statistics: <https://data.stats.gov.cn/english/>, last access: 25 April 2023.

Table S3. References of emission factors for calculating air pollutant emissions.

Emission sources	References
Powerplant and industrial sectors	Zhao (2008); Zheng et al. (2019)
Residential combustion	Li et al. (2009); Wang et al. (2009); Cai et al. (2018)
On-road vehicle	(Zhang, 2014; Wen et al., 2021)
Open burning	Li et al. (2007); Qiu et al. (2016)
Solvent and other VOCs-related sectors	Wei et al. (2008); Chang et al. (2022)
NH ₃ emission sectors	Dong et al. (2010)
Other sectors	Tian (2003); Lei (2008); Zhang (2008); Fu et al. (2013)

20 **Table S4. Comparison of considered emission sources of CO₂ between this study and other public datasets.**

Source	Subsector	This study ^a	MEIC ^b	CHRED	CEDS ^c	EDGAR ^d	IEA
Power	Power plant	√	√	√	√	√	√
Industry			√				
	Industrial boiler	√		√	√	√	√
	Iron and steel smelting	√		√	√	√	√
	Cement production	√		√	√	√	√
	Coke production	√			√	√	√
	Non-ferrous metal smelting	√			√		√
	Plate glass production	√			√	√	√
	Brick production	√					
	Lime production	√			√	√	√
	Ceramic production	√			√		√
	Crude oil processing	√			√		√
	Ethylene production	√			√		√
	Ammonia production	√			√		√
	Caustic soda production	√					
	Soda production	√					
	Calcium carbide production	√					
	Carbon black production	√					
Resident			√				
	Residential combustion	√			√	√	√
	Solid waste incineration	√			√	√	√
Transport			√				
	On-road vehicle	√		√	√	√	√
	Agricultural machinery	√		√	√	√	√
	Construction machinery	√			√	√	√
	Railway	√		√	√	√	√
	Inland waterway	√		√	√	√	√
	International shipping			√	√	√	√
	Aviation			√	√	√	√

a: CO₂ emissions in our studies have considered both those from the energy consumption processes such as fuel combustion in power plant, and those from the non-energy consumption processes such as carbonate decomposition during building material production.

b: CO₂ emissions from four broad sources are shared in the public MEIC dataset, without detailed subsector information.

25 c: CO₂ emissions of CEDS dataset are basically related to the energy consumption processes calculated based on the IEA energy statistics.

d: CO₂ emissions of EDGAR dataset also include those from the energy consumption processes calculated based on the IEA energy statistics, and some emissions from part of non-energy processes, such as the lime and glass production processes.

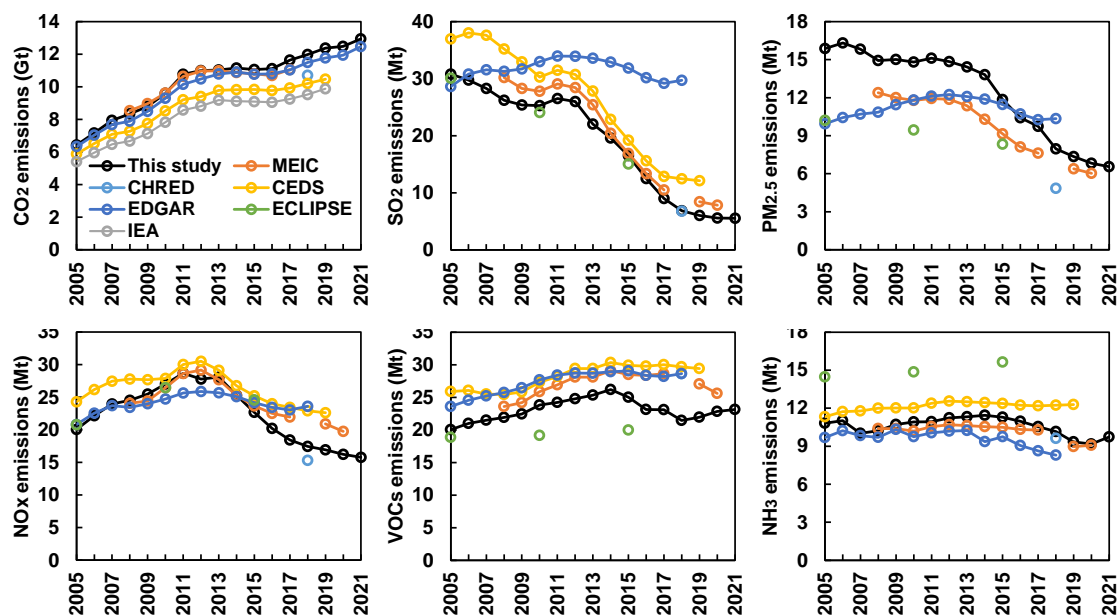


Figure S1: Comparison of China's emission inventories compiled in this study and in other studies.

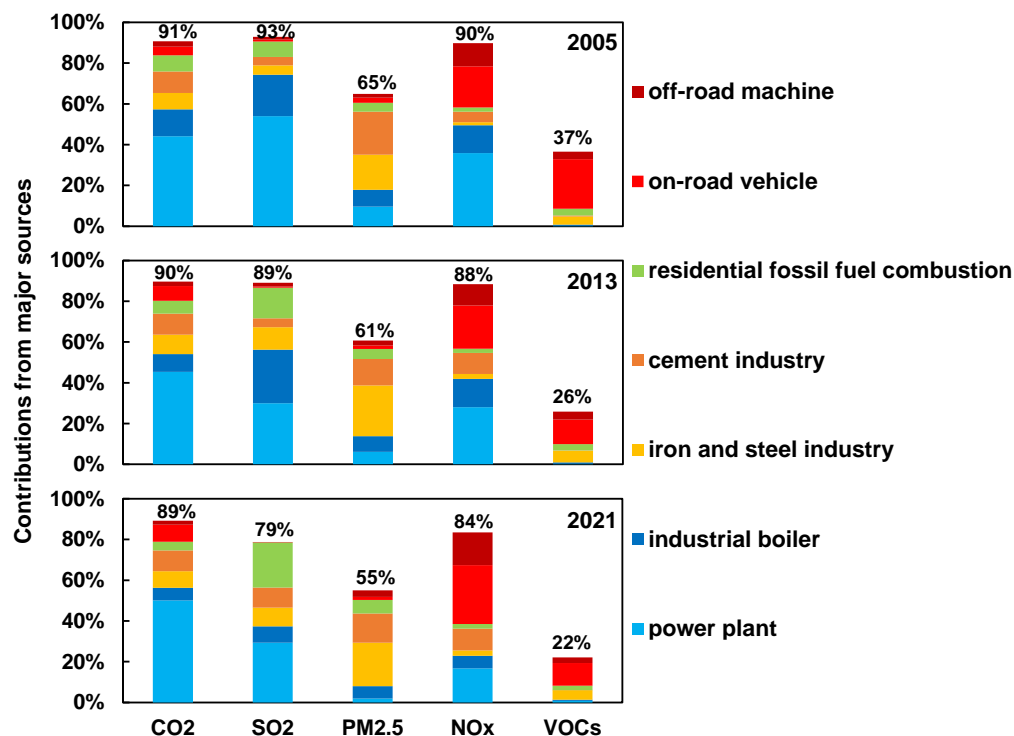


Figure S2: Major Sectoral contributions on air pollutants and CO₂ emissions in 2005, 2013 and 2021 in China.

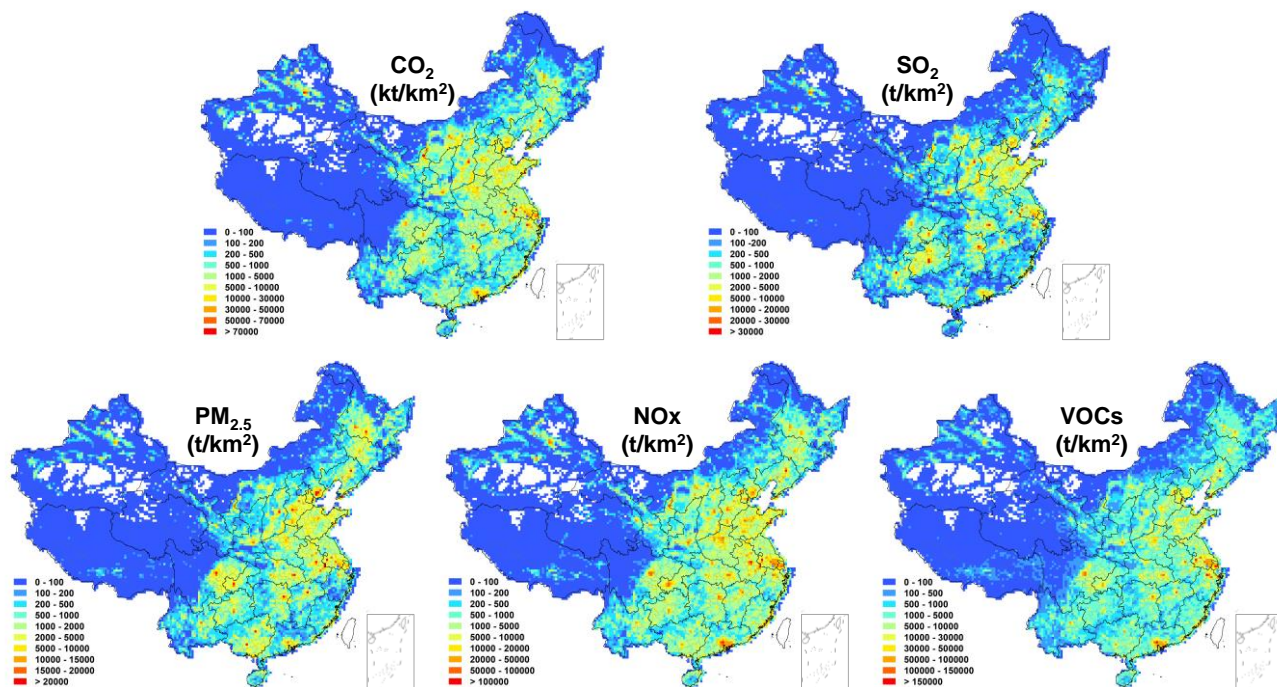


Figure S3: Spatial distribution of grid (27 km \times 27 km) air pollutants and CO_2 emissions in 2021 in China.

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