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Supplement of

Inventory of anthropogenic methane emissions in mainland China from 1980 to 2010

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Table S1. Proxy data collected for mapping spatial distributions of CH₄ emissions for each source sector.

	Proxy data	Spatial resolution	Reference
Livestock	Gridded data for numbers of animals in 2005	1 km x 1 km	Robinson et al. (2011)
Rice cultivation	Gridded harvested area of rice	0.083° x 0.083°	Monfreda et al. (2008) China statistical
Biomass and biofuel burning	Gridded rural population in 2010	0.1° x 0.1°	yearbook for regional economy (2011)
Coal exploitation	Annual production from 4264 coal production sites	0.1° x 0.1°	Liu et al. (2015)
Oil and gas systems	EDGARv42 gridded 1B2a subcategory	0.1° x 0.1°	EDGARv42; Schwietzke et al. (2014)
FF combustion	Gridded GDP in 2005 and 2010	1 km x 1 km	Huang et al. (2014)
Landfills	Gridded total population in 2005 and 2010	1 km x 1 km	Huang et al. (2014)
Wastewater	Gridded total population in 2005 and 2010	1 km x 1 km	Huang et al. (2014)

Reference

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Table S2. IPCC default EFs.

Source Sector		Unit	EFs		
			Average	Low	High
Rice cultivation	Without organic input	g CH ₄ m ⁻² day ⁻¹	0.12	0.08	0.23
	With organic input	g CH ₄ m ⁻² day ⁻¹	0.25	0.16	0.57
Biomass and biofuel burning	Crop residues burnt in household	kg CH ₄ t ⁻¹	2.7	2.7	2.7
	Disposed crop residues burnt in open field	kg CH ₄ t ⁻¹	2.7	2.7	2.7
	Firewood burnt in household	kg CH ₄ t ⁻¹	6.1	1.8	10.4
	Burning efficiency	-	0.8	0.8	0.9
Coal mining	Underground mines: Mining	m ³ t ⁻¹	18	10	25
	Underground mines: Post-mining	m ³ t ⁻¹	2.5	0.9	4.0
	Surface mines: Mining	m ³ t ⁻¹	1.2	0.3	2.0
	Surface mines: Post-mining	m ³ t ⁻¹	0.1	0.0	0.2
Oil and gas systems	Oil	kg CH ₄ m ⁻³ oil	4.3	2.1	18.9
	Gas	-	2.0%	0.2%	6.2%
Fossil fuels combustion	Coal	kg CH ₄ TJ ⁻¹	1	0.4	1.6
	Oil	kg CH ₄ TJ ⁻¹	3	1.2	4.8
	Natural gas	kg CH ₄ TJ ⁻¹	1	0.4	1.6
Landfills	k in Eq. 3	-	0.09	0.08	0.1
	T _L in Eq. 3	years	15.40	17.32	13.86
	DOC in Eq. 3	%	15	12	18
	DOC _d in Eq. 3	-	0.5	0.4	0.6
	f in Eq. 3	-	0.5	0.5	0.6
	O _f in Eq. 3	-	0.1	0	0.1
Wastewater	MCF for domestic sewage treated by WTPs	-	0.165	0.1	0.3
	MCF for industrial wastewater treated by WTPs	-	0.467	0.2	0.5
	MCF for wastewater discharged into rivers, lakes or ocean	-	0.1	0	0.2
	B ₀ in Eq. 4	kgCH ₄ /kgCOD	0.25	0.175	0.325

Table S3. Total CH₄ emissions of each province in four snapshot years (1980, 1990, 2000 and 2010). Values are given in Tg CH₄ yr⁻¹ (mean [min-max]).

	CH ₄ emissions (Tg CH ₄ yr ⁻¹)			
	1980	1990	2000	2010
Beijing	0.1 [0.1-0.1]	0.1 [0.1-0.2]	0.2 [0.1-0.2]	0.2 [0.1-0.2]
Tianjin	0.1 [0.0-0.1]	0.1 [0.1-0.1]	0.1 [0.1-0.2]	0.2 [0.2-0.5]
Hebei	0.5 [0.4-0.7]	0.8 [0.5-1.0]	1.3 [1.0-1.7]	1.5 [1.1-2.0]
Shanxi	0.7 [0.5-0.8]	1.5 [1.1-1.8]	1.3 [1.0-1.7]	3.3 [2.6-4.2]
Inner Mongolia	0.5 [0.4-0.6]	0.7 [0.5-0.9]	0.9 [0.7-1.2]	3.3 [3.0-3.8]
Liaoning	0.7 [0.6-1.0]	1.0 [0.8-1.3]	1.1 [0.8-1.4]	1.4 [1.1-1.7]
Jilin	0.4 [0.3-0.4]	0.6 [0.4-0.7]	0.8 [0.6-1.0]	1.1 [0.9-1.4]
Heilongjiang	0.8 [0.6-1.2]	1.4 [1.1-2.0]	1.5 [1.1-2.1]	2.0 [1.6-2.7]
Shanghai	0.2 [0.1-0.2]	0.1 [0.1-0.2]	0.1 [0.1-0.2]	0.2 [0.1-0.2]
Jiangsu	1.0 [0.8-1.2]	1.0 [0.7-1.2]	1.0 [0.7-1.3]	1.1 [0.7-1.4]
Zhejiang	1.3 [0.8-1.6]	1.2 [0.8-1.5]	0.8 [0.6-1.0]	0.7 [0.5-0.9]
Anhui	0.9 [0.8-1.1]	1.2 [1.0-1.4]	1.4 [1.1-1.7]	1.5 [1.2-1.8]
Fujian	0.8 [0.6-1.1]	0.8 [0.6-1.0]	0.6 [0.5-0.8]	0.6 [0.5-0.8]
Jiangxi	1.5 [1.1-2.0]	1.6 [1.1-2.1]	1.4 [1.0-1.8]	1.6 [1.1-2.0]
Shandong	0.8 [0.5-1.2]	1.3 [0.9-1.8]	2.0 [1.4-2.6]	2.1 [1.5-2.8]
Henan	0.9 [0.7-1.1]	1.6 [1.3-2.0]	2.2 [1.7-2.7]	2.7 [2.3-3.2]
Hubei	1.0 [0.9-1.2]	1.2 [1.0-1.4]	1.1 [0.8-1.3]	1.1 [0.8-1.3]
Hunan	2.1 [1.5-2.8]	2.2 [1.6-2.9]	2.1 [1.5-2.7]	2.4 [1.9-2.9]
Guangdong	2.1 [1.4-2.7]	1.8 [1.2-2.3]	1.6 [1.1-2.2]	1.6 [1.0-2.2]
Guangxi	1.5 [1.0-1.9]	1.6 [1.1-2.1]	1.6 [1.1-2.1]	1.4 [0.9-1.8]
Hainan	0.0 [0.0-0.0]	0.3 [0.2-0.3]	0.3 [0.2-0.3]	0.2 [0.2-0.3]
Chongqing	0.0 [0.0-0.0]	0.0 [0.0-0.0]	0.7 [0.6-0.8]	1.1 [1.0-1.2]
Sichuan	2.8 [2.5-3.1]	3.3 [2.9-3.7]	2.5 [2.1-2.8]	3.0 [2.6-3.4]
Guizhou	0.9 [0.8-1.0]	1.3 [1.1-1.5]	1.3 [1.2-1.5]	2.9 [2.7-3.3]
Yunnan	1.1 [0.9-1.2]	1.3 [1.1-1.5]	1.4 [1.2-1.6]	2.0 [1.7-2.2]
Tibet	0.3 [0.3-0.5]	0.4 [0.3-0.5]	0.4 [0.3-0.5]	0.4 [0.3-0.6]
Shaanxi	0.3 [0.3-0.4]	0.5 [0.4-0.6]	0.5 [0.4-0.7]	2.3 [2.2-3.1]
Gansu	0.2 [0.2-0.3]	0.4 [0.3-0.5]	0.4 [0.3-0.6]	0.7 [0.6-0.9]
Qinghai	0.4 [0.3-0.5]	0.4 [0.3-0.6]	0.4 [0.3-0.5]	0.5 [0.4-0.8]
Ningxia	0.1 [0.1-0.1]	0.1 [0.1-0.2]	0.2 [0.2-0.2]	0.5 [0.4-0.5]
Xinjiang	0.4 [0.3-0.5]	0.5 [0.4-0.7]	0.8 [0.6-1.1]	1.4 [1.2-2.3]

Figure S1. The annual output of biogas (Tg CH₄/yr) from 1980 to 2010. The biogas data is assumed a linear increase from 1980 to 1996. The biogas data from 1996 to 2010 is available from Feng et al. (2012).

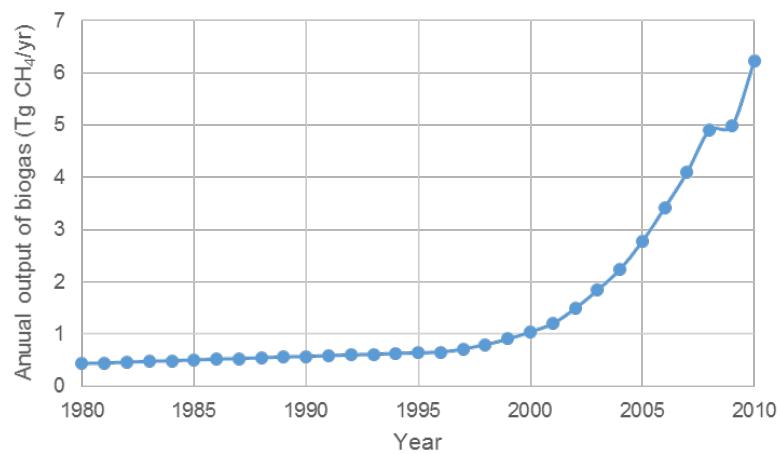


Figure S2. The total chemical fertilizer input and fraction of rice paddy with organic matter (OM) input from 1980 to 2010 in China.

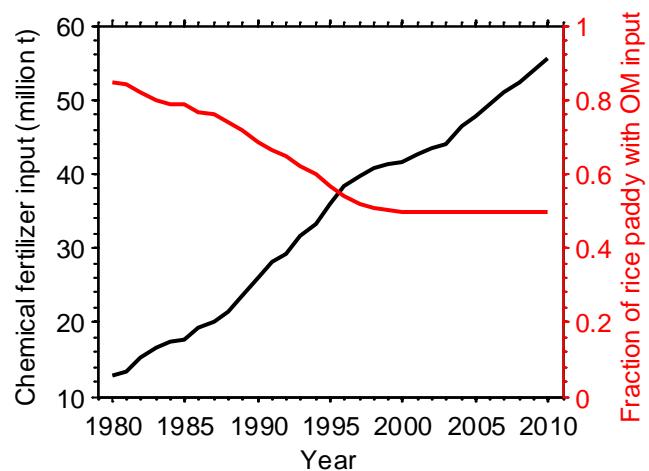


Figure S3. The relationship between Gross Domestic Product (GDP) and the fraction of municipal solid waste (MSW) treated by landfills.

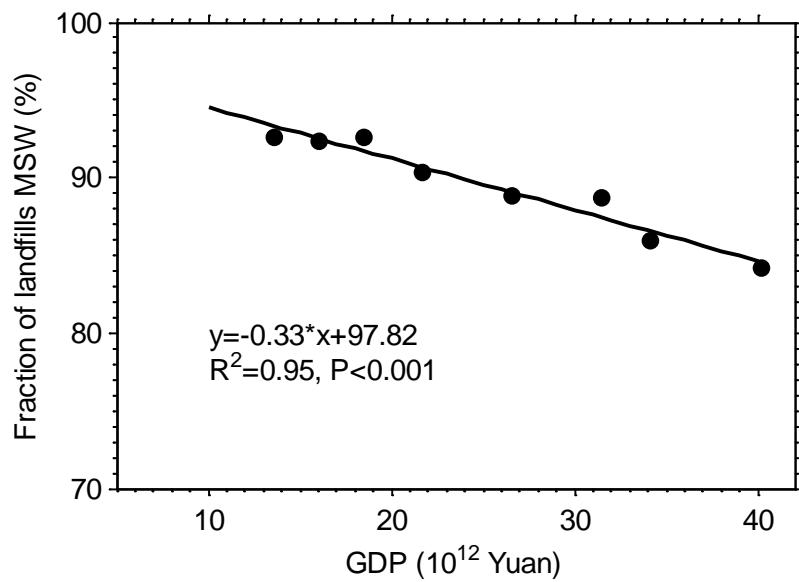


Figure S4. (a) The relationship between Gross Domestic Product (GDP) and COD in domestic sewage treated by wastewater treatment plants (WTPs). (b) The relationship between population and the total of COD in domestic sewage.

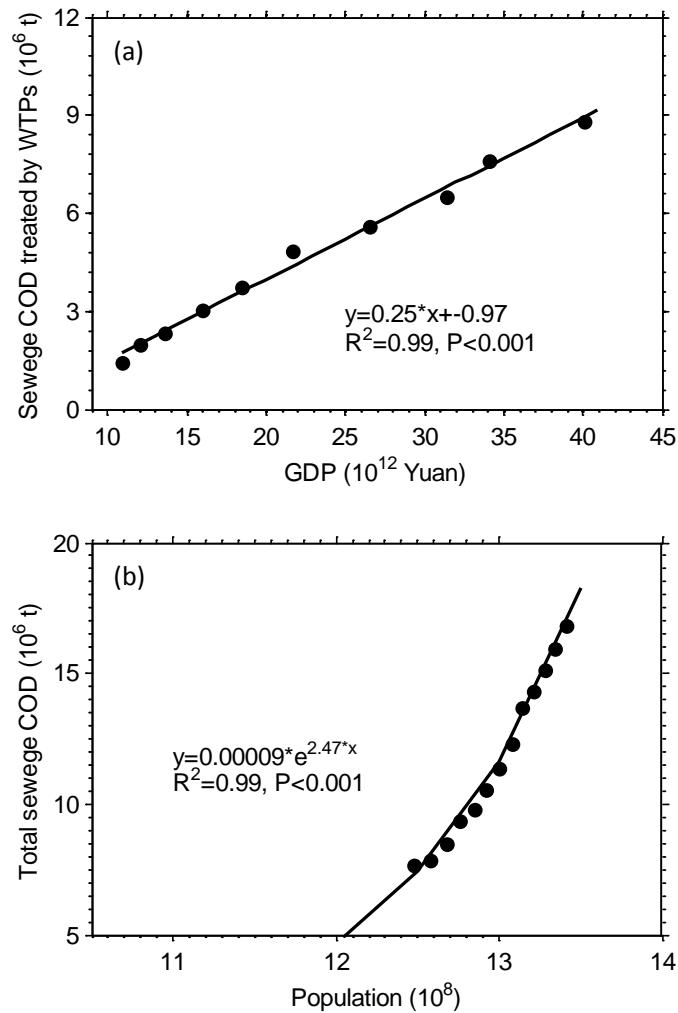


Figure S5. (a) The relationship between industrial Gross Domestic Product (GDP) and COD in industrial wastewater treated by wastewater treatment plants (WTPs). (b) The relationship between GDP and the fraction of COD in industrial wastewater discharged into rivers, lakes and ocean to the total COD in industrial wastewater.

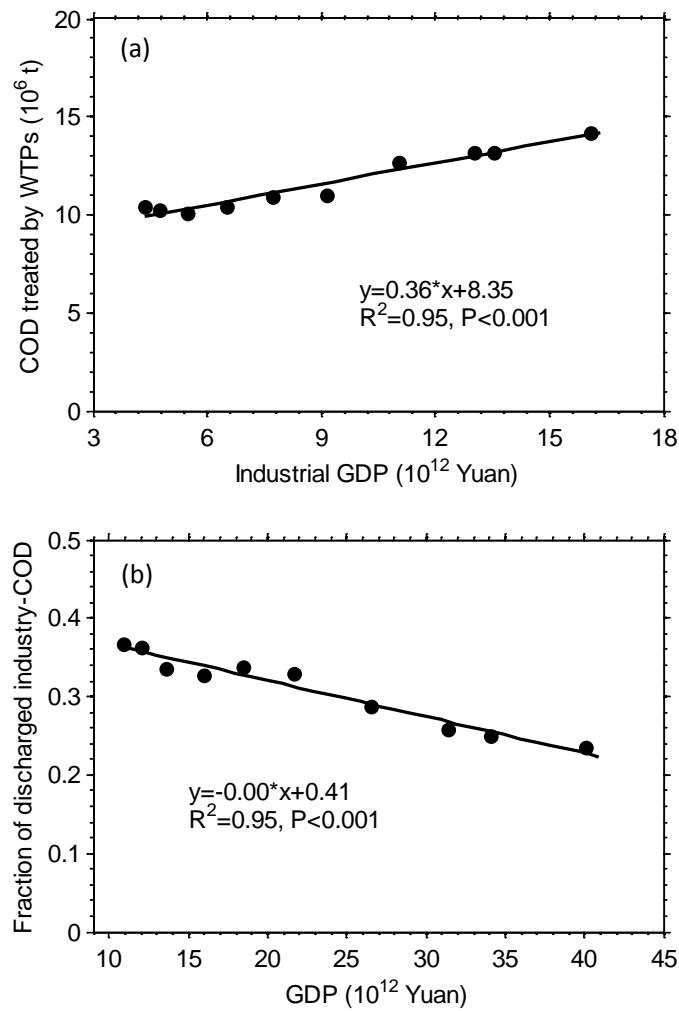


Figure S6. (a) Provinces and (b) regions in Mainland China.

