Black Carbon Inventory: China

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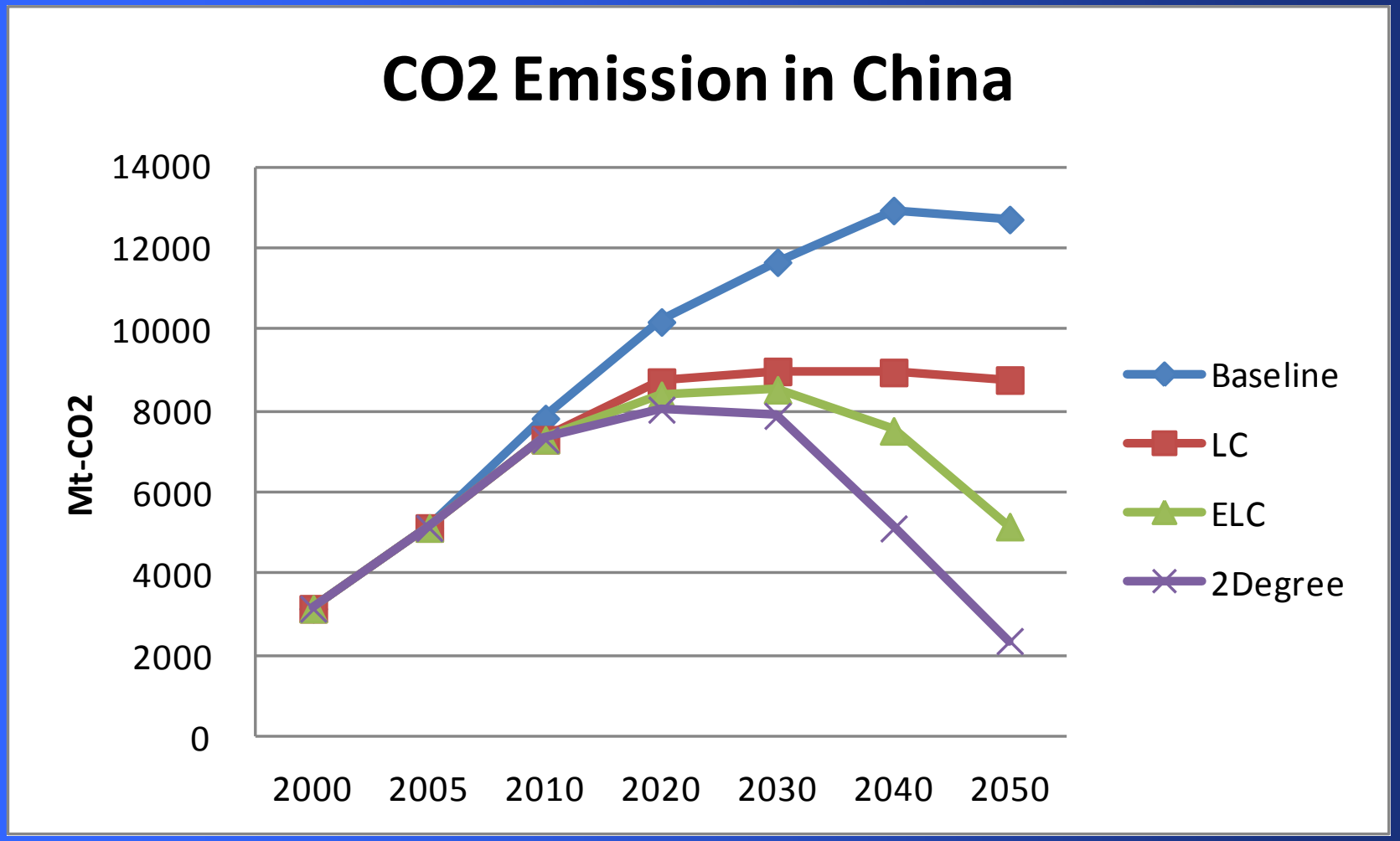
Transformation: CO2 emission, a rapid change



Some Researches on Black Carbon Inventory Available

Y. Qin and S. D. Xie, Spatial and temporal variation of anthropogenic black carbon emissions in China for the period 1980–2009

Guoliang Caoa,b,, Xiaoye Zhanga, Fangcheng Zhengb, Inventory of black carbon and organic carbon emissions from China

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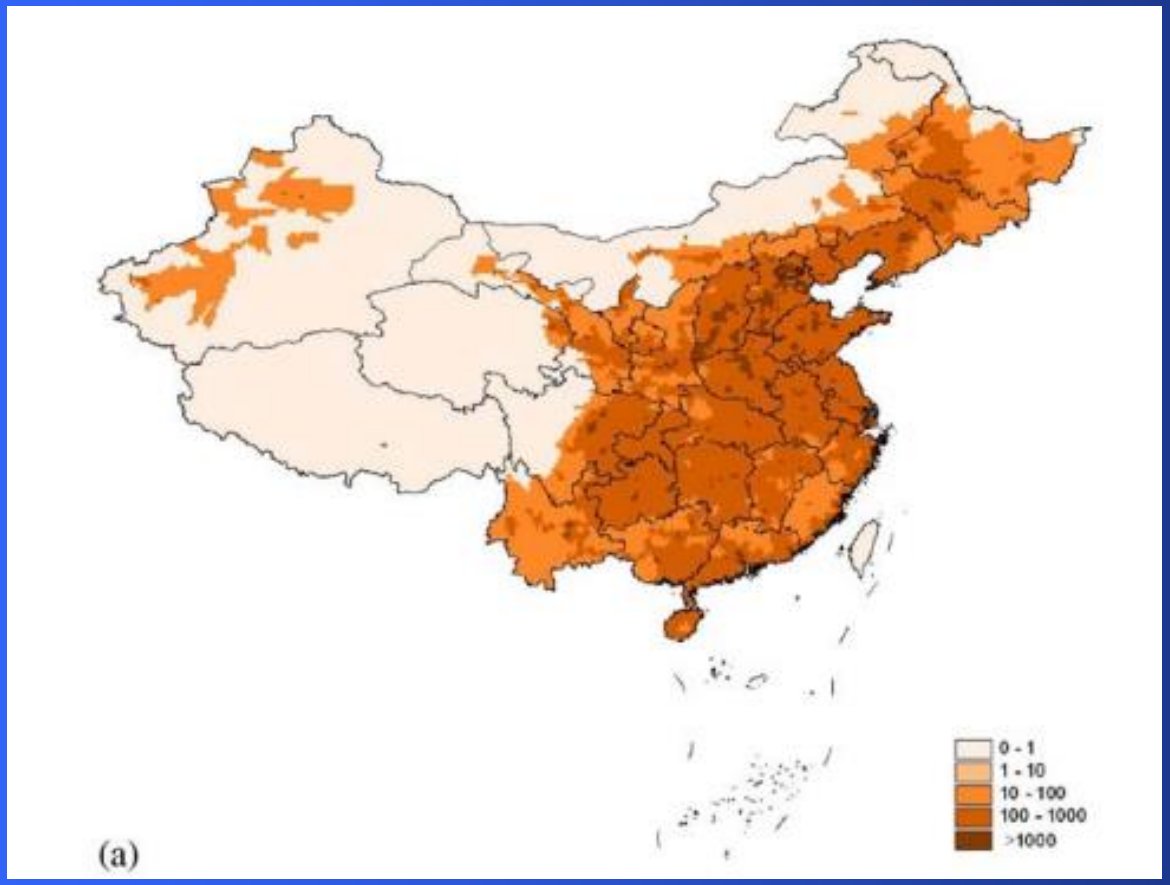
Black Carbon Emission in 2000, China



Provincial inventories of BC and OC emissions in 2000 (Gg)

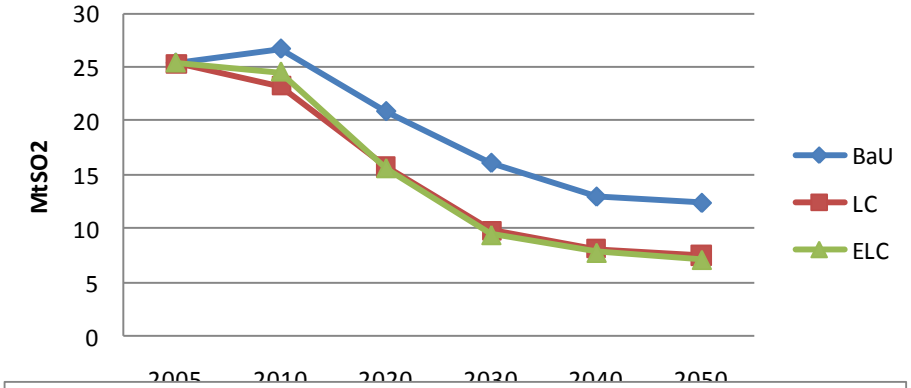
Provnce	BC						OC					
	Biomass burning	Power plant	Transp ortion	Industry	Reside-ntial	Total	Biomass burning	Power plant	Trans-portion	Industry	Reside-ntial	Total
Beijing	1.2	0.1	0.9	7.1	7.6	16.9	5.0	0.2	1.4	11.7	25.8	44.1
Tianjin	0.8	0.2	0.7	5.5	7.2	14.4	3.5	0.2	1.1	9.8	22.8	37.4
Hebei	8.6	0.7	2.1	42.4	71.6	125.3	35.4	0.8	2.9	83.1	193.7	315.9
Shanxi	2.4	0.4	1.0	37.8	74.1	115.7	9.4	0.5	1.4	81.1	153.3	245.7
Nei Mongol	4.3	0.4	0.7	5.0	15.5	25.8	19.1	0.5	0.9	8.6	54.0	83.1
Liaoning	3.9	0.4	1.2	21.4	29.8	56.8	12.1	0.5	1.7	38.2	101.9	154.5
Jilin	7.1	0.2	0.7	11.5	22.4	41.9	20.8	0.2	1.0	23.2	72.5	117.8
Heilongjiang	8.9	0.3	0.8	9.6	31.4	51.0	34.2	0.4	1.1	18.0	110.9	164.5
Shanghai	0.5	0.3	0.6	14.5	0.4	16.3	2.1	0.4	0.8	18.9	11.9	34.0
Jiangsu	7.6	0.8	1.2	36.7	31.1	77.4	35.6	1.0	1.8	72.1	143.7	254.2
Zhejiang	2.9	0.4	1.3	37.3	15.5	57.3	12.2	0.5	1.8	76.1	66.1	156.7
Anhui	3.7	0.2	0.7	26.9	33.0	64.5	17.1	0.3	0.9	58.3	127.6	204.3
Fujian	2.0	0.1	0.6	8.1	4.7	15.5	12.1	0.1	0.8	18.3	18.1	49.4
Jiangxi	1.9	0.1	0.5	13.8	21.8	38.1	8.0	0.2	0.7	32.5	72.1	113.4
Shandong	13.6	0.8	2.0	43.9	57.4	117.7	57.8	1.0	2.9	87.8	204.4	353.9
Henan	8.1	0.5	1.7	42.3	66.3	118.9	37.5	0.6	2.4	88.3	188.1	316.9
Hubei	3.8	0.2	0.8	27.1	33.9	65.7	16.4	0.2	1.1	62.3	129.2	209.3
Hunan	2.7	0.2	0.8	30.3	45.5	79.6	10.4	0.2	1.2	66.2	146.8	224.8
Guangdong	3.2	0.5	3.0	22.8	18.4	47.9	12.6	0.6	4.3	43.6	88.6	149.7
Guangxi	1.7	0.1	0.5	17.7	18.8	38.8	6.5	0.1	0.8	42.4	81.8	131.6
Hainan	0.3	0.0	0.1	0.9	7.6	9.0	1.3	0.0	0.2	1.8	35.0	38.3
Chongqin	1.5	0.1	0.3	7.6	21.7	31.3	5.9	0.1	0.5	15.2	67.0	88.8
Sichuan	4.5	0.1	1.1	35.2	44.3	85.3	19.0	0.2	1.6	74.9	148.1	243.7
Guizhou	1.1	0.2	0.5	5.6	41.7	49.2	4.5	0.2	0.6	11.2	105.6	122.2
Yunnan	1.2	0.1	1.1	8.4	23.0	33.7	4.4	0.1	1.6	20.3	77.0	103.4
Xizang	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.3
Shannxi	1.8	0.2	0.6	16.5	24.3	43.3	7.5	0.2	0.8	35.2	73.4	117.2
Gansu	1.2	0.1	0.4	6.1	20.0	27.8	5.4	0.1	0.6	14.1	59.0	79.2
Qinghai	0.1	0.0	0.2	0.3	4.7	5.3	0.6	0.0	0.2	0.4	13.8	15.0
Ningxia	0.5	0.1	0.2	0.4	4.4	5.6	1.9	0.1	0.3	0.5	11.4	14.3
Xinjiang	1.8	0.1	0.7	1.4	19.3	23.3	7.5	0.1	0.9	1.8	47.1	57.5
Total	103.0	7.9	26.8	543.9	817.6	1499.2	425.9	9.8	38.4	1116.1	2650.8	4241.1

Emission factors are quite diverse

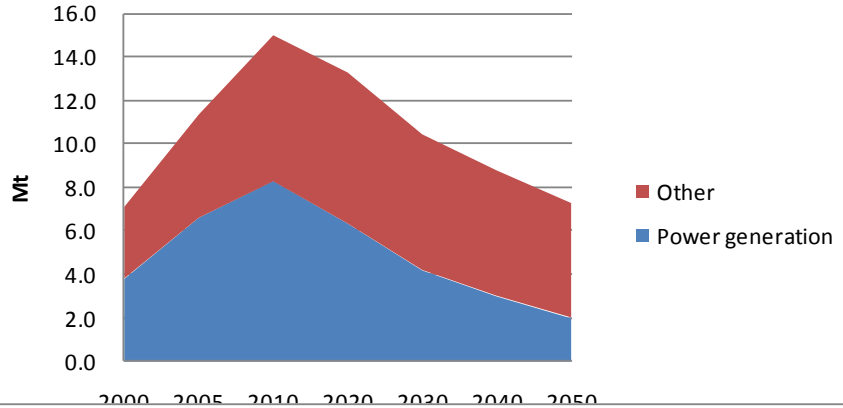
Table 1
Emission factors used in this work ($g\,kg^{-1}$)

Sector	Fuel type	BC	OC
Industry	Coal	0.32[a], 1.1–1.58[d]	2.1[d]
	Oil	0.07–0.36[a], 0.15[j]	0.19–0.27[b], 0.25[d], 0.04[j]
	Biofuel	1.0[a], 0.59[c]	4.0[c]
Power generation	Coal	0.003–0.32[a], 0.0095[g]	0.25[f]
	Oil	0.25–0.36[a], 0.15[j]	0.27[b], 0.04[j]
Biomass burning	Agriculture waste	0.73[a], 0.69[c], 0.47[f]	3.3[c], 0.7[f]
	Forest fire	0.56[c], 0.98[f]	8.6–9.7[c], 6.1[f]
	Grassland fire	0.48[c]	3.4[c]
Transportation	Diesel	1.0[a], 2[d], 1.3[e], 0.29[g], 0.11–0.87[l]	0.03–0.18[b], 0.5[e], 0.22[g], 0.96–6.7[l]
	Gasoline	0.08[a], 0.03[d], 0.035[e], 0.07[g], 0.006–0.03[l]	0.01–0.13[b], 0.053[e], 0.5[g], 0.042–0.24[l]
Residential	Biofuel-rice straw	0.86[h], 0.5[i], 1.0[j], 0.52[m]	0.94[i], 0.32[j], 1.96[m]
	Biofuel-wheat straw	1.2[h], 0.8[i], 0.52[m]	2.2[i], 3.83[m]
	Biofuel-corn stover	0.96[h], 0.75[i], 0.78[m]	1.8[i], 2.21[m]
	Biofuel-cotton stalk	0.82[m]	1.83[m]
	Biofuel-others	1.0[a], 0.59[c], 0.78[i]	5.0[b], 4.0[c], 1.9[i]
	Firewood	1.0[a], 0.59[c], 0.41[f]	0.27[f]
	Coal	0.12-3.7[a], 1.58–4.1[d], 1.83[g], 5[j], 0.28[k]	0.12–3.0[b], 4.77[d], 7.8[g], 4[j], 7.82[k]
	Oil	0.36–0.7[a]	0.1[d]

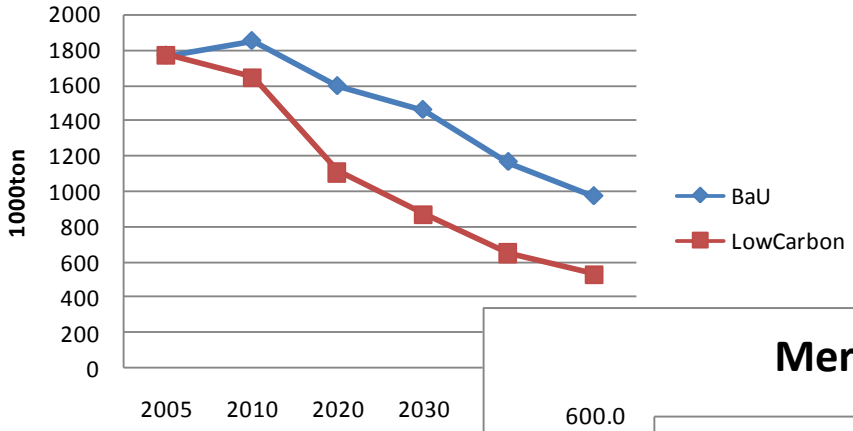
SO2 Emission



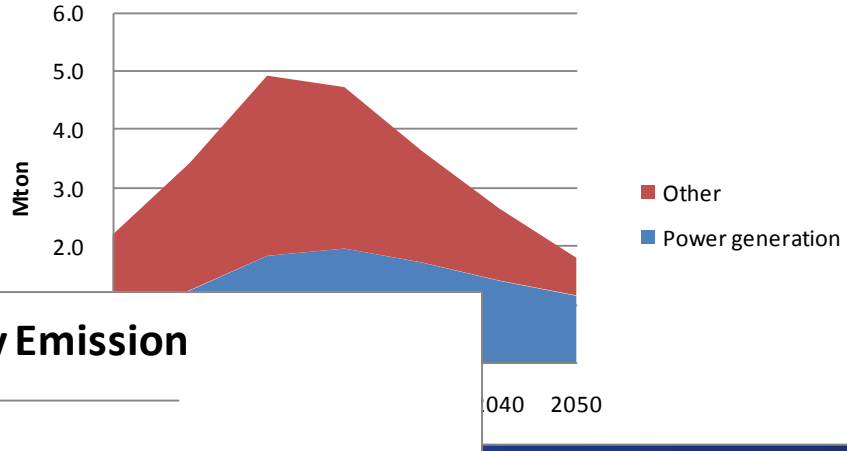
NOx Emission in China, ELC scenario



Black Carbon Emission in China



PM2.5 Emission



Mercury Emission