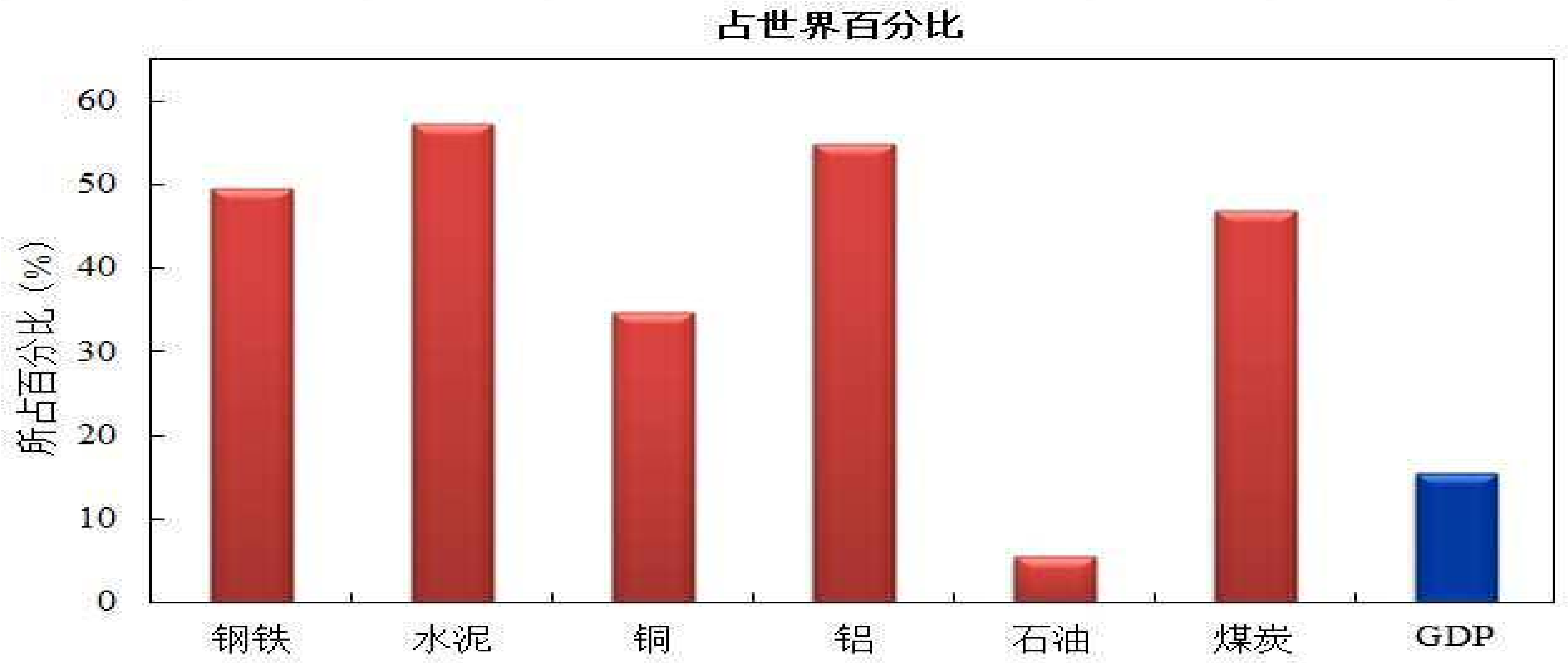
China's challenge on decarboning its society under the Paris agreement

Yong Geng

School of Environmental Science and Engineering
Shanghai Jiao Tong University

Resource consumption in China



➢China's steel/iron production is about 49.54% of the global production in 2015. Similarly, for cement the rate is 57.3%; for copper, the rate is 34.65%; for aluminum, the rate is 55%; for coal the rate is 47%; and for petroleum the rate is 5.51%.

➢China's GDP is about 15.5% of global GDP in 2015.

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Trends of natural resource footprints in the BRIC (Brazil, Russia, India and China) countries

Rui Wu [a,c], Yong Geng [b,*], Wenjing Liu [a,c]

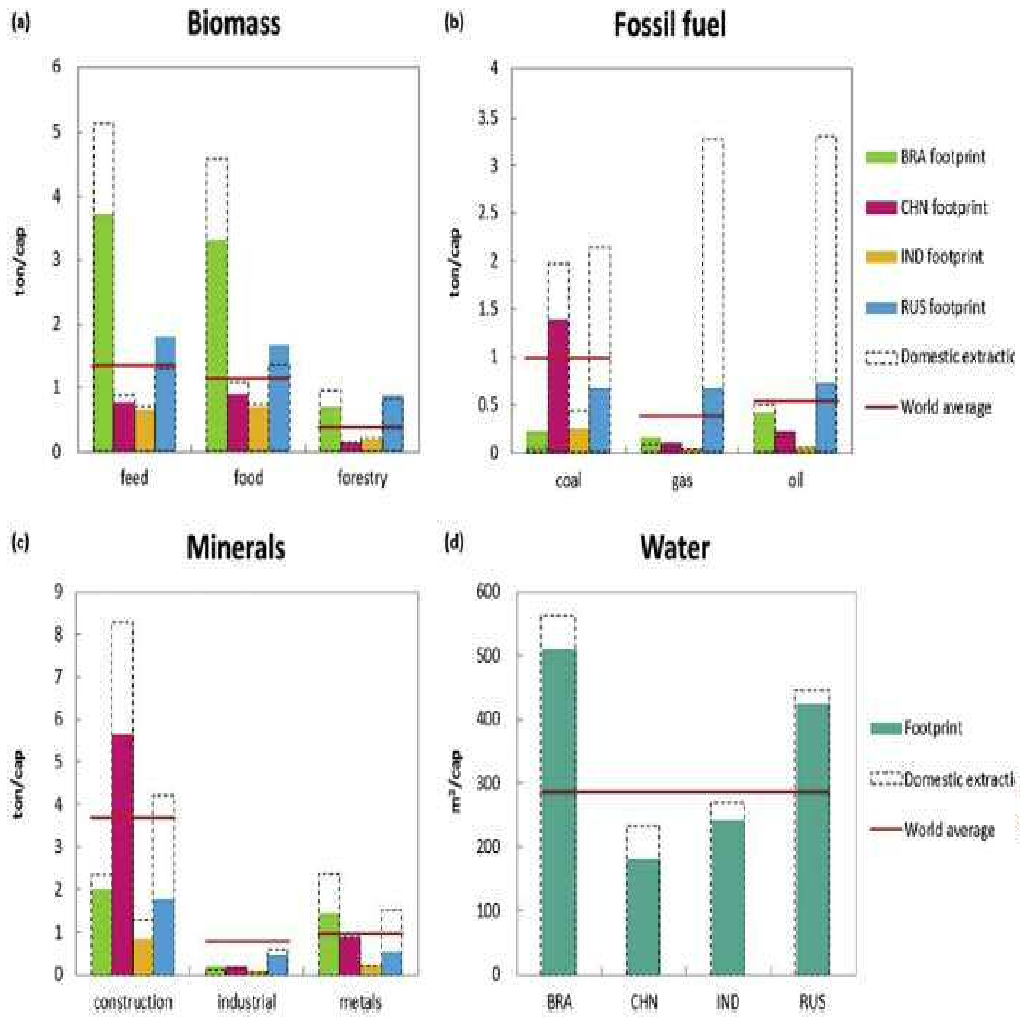


Fig. 2. Per capita natural resource footprints and domestic extractions for BRIC in 2008.

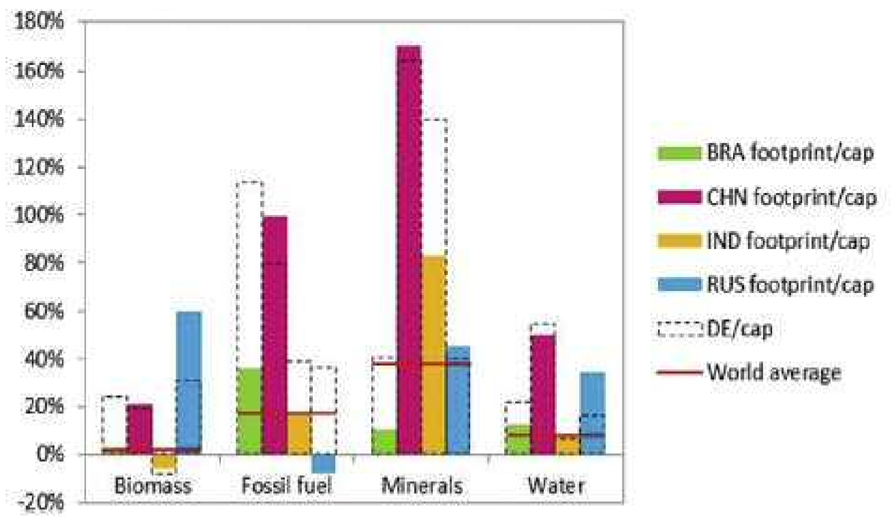
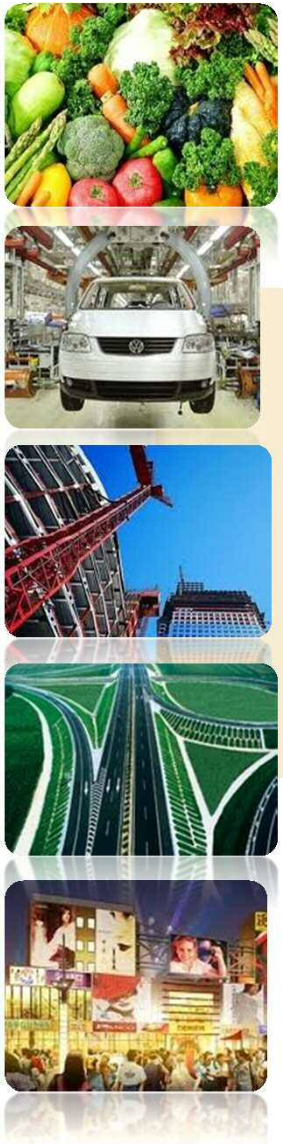
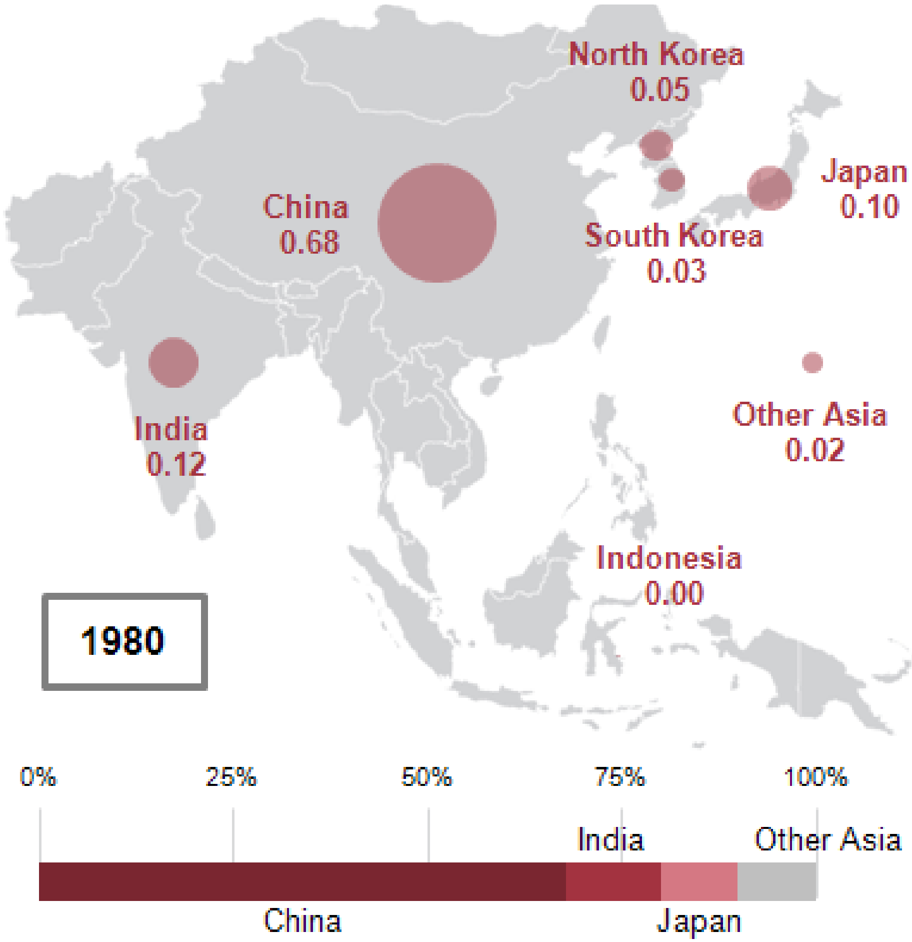


Fig. 4. Per capita natural resource footprints changes in BRIC for years of 1995 and 2008.

Back ground for low carbon development in China

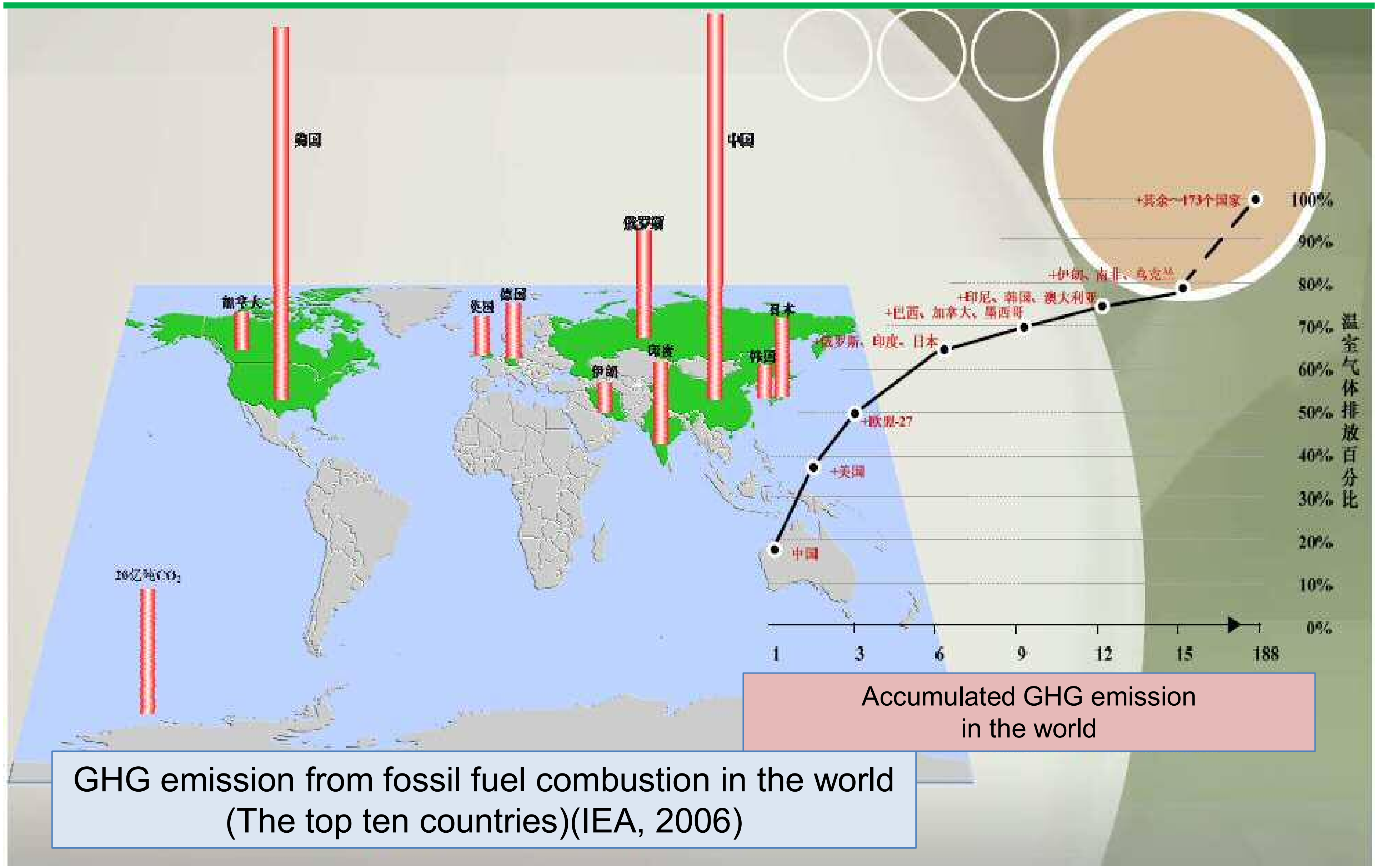


China coal consumption 1980-2010



Source: EIA

GHG emissions in the world



Accumulated GHG emission in the world

GHG emission from fossil fuel combustion in the world (The top ten countries)(IEA, 2006)

Performance evaluation: GDP vs Energy Consumption vs CO_2 emissions

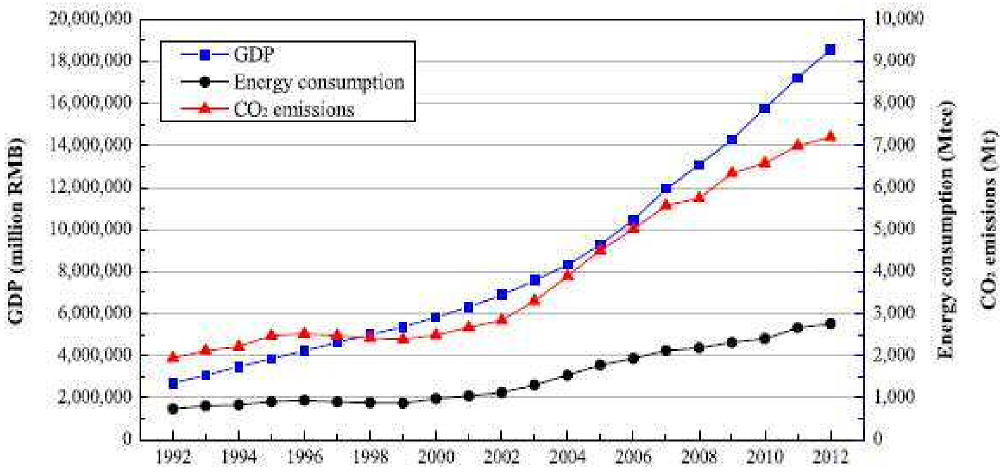


Fig. 1. GDP growth, energy consumption, and CO_2 emissions in China over 1992–2012.

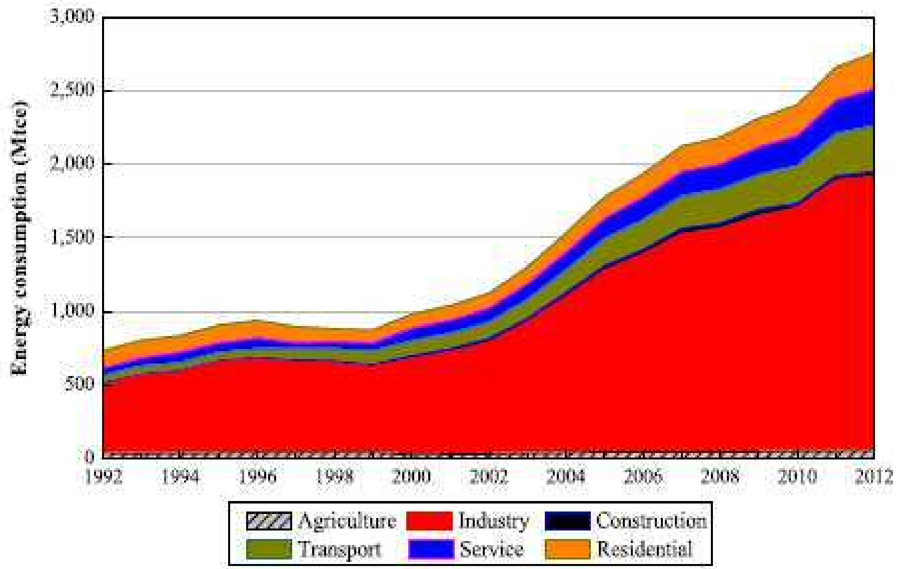


Fig. 2. Sectoral energy consumption in China over 1992–2012.

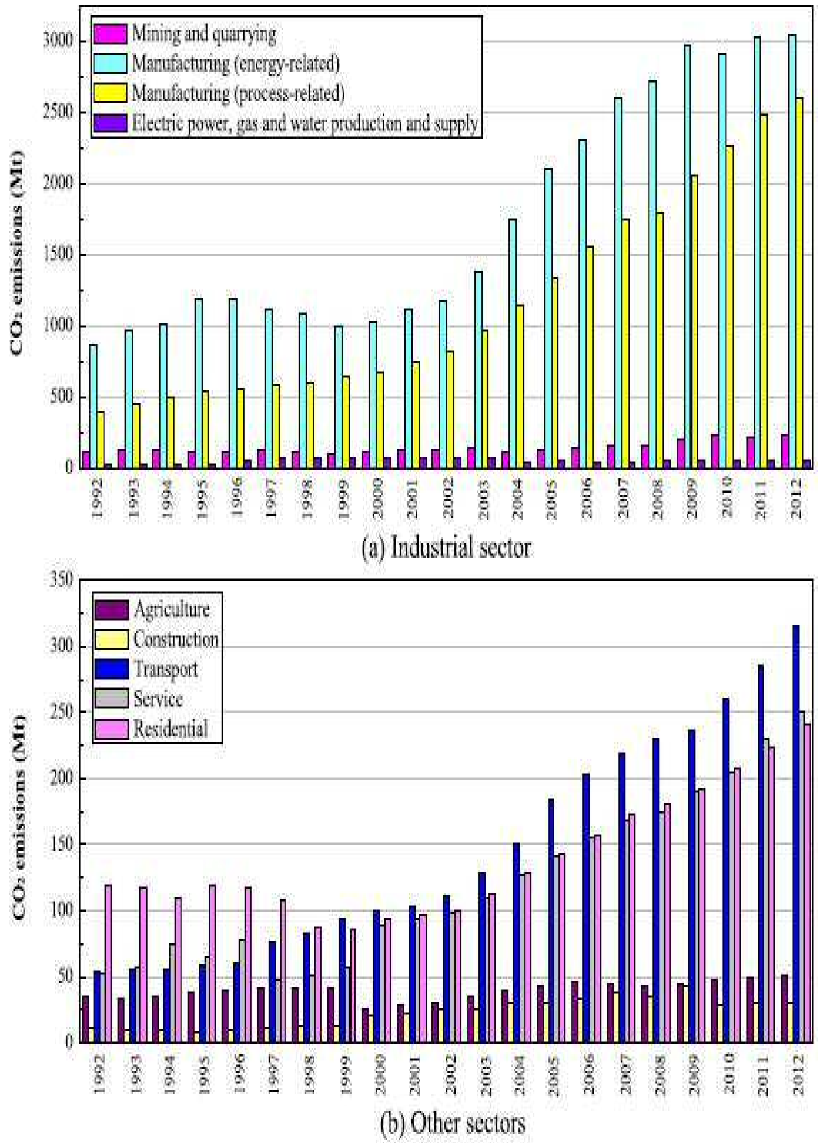


Fig. 3. CO_2 emissions from various sectors in China over 1992–2012.

nature climate change

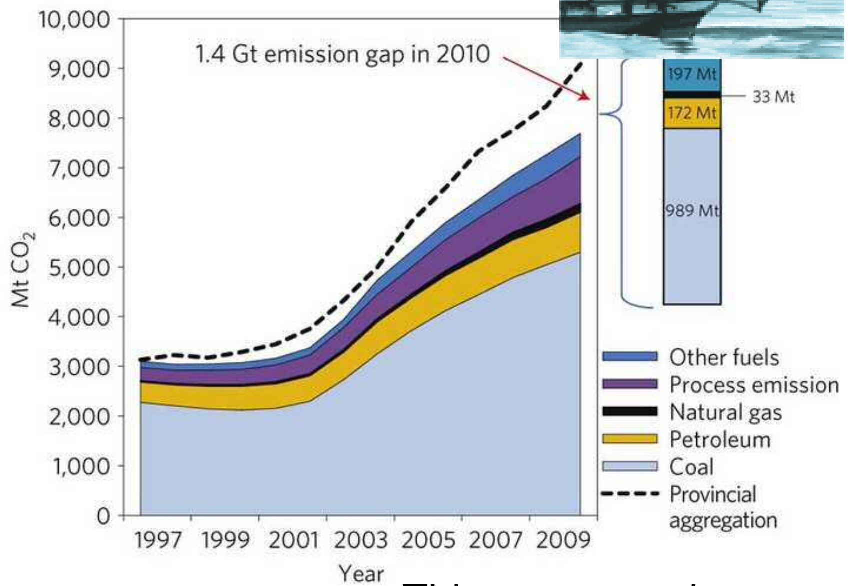
NATURE CLIMATE CHANGE VOL 2 SEPTEMBER 2012

PUBLISHED ONLINE: 10 JUNE 2012 | DOI: 10.103

The gigatonne gap in China's carbon dioxide inventories

Dabo Guan, **Zhu Liu*, Yong Geng***, Sören Lindner and Klaus Hubacek

This paper presents a new step to share and validate data and discuss methodologies towards better energy and emission data for China.



		2007	2008	2009	2010
CO_2 emission (Mt)	Provincial summation	7,334	7,731	8,240	9,084
	National total	6,359	6,848	7,266	7,693
	EIA	6,257	6,800	7,707	
	IEA	6,032	6,508		
	CDIAC	6,791	7,031	7,463	8,041
	World Bank	6,533	7,032		
	WRI	6,032	6,508		
	LBNL		6,666		
	EDGAR	6,953	7,649		
Raw coal (Mt)	Provincial summation	3,209	3,361	3,562	3,910
	National total	2,588	2,810	2,966	3,163
Crude oil (Mt)	Provincial summation	353	362	391	441
	National total	340	355	381	429
Natural gas (million m³)	Provincial summation	71,484	82,833	96,823	111,612
	National total	69,523	81,293	89,520	94,167

Sectoral contributions to the 747 Mt discrepancy of raw coal use between national total and provincial summation in 2010

Energy transformation and loss (56%)
- Thermal power production (2%)
- Heating supply (14%)
- Coal washing (37%)
- Coking and others (3%)
- Energy loss (<1%)

Final energy consumption (44%)
- Agriculture (1%)
- Manufacturing (37%)
- Construction (<1%)
- Transportation (1%)
- Commercial sectors (2%)
- Residential consumption (1%)
- Other final consumption (2%)

This paper marks a new step towards calculating energy consumption and CO_2 emission systematically, and also is a good start to future specify CO_2 emission accounting and reduce the uncertainty for China.

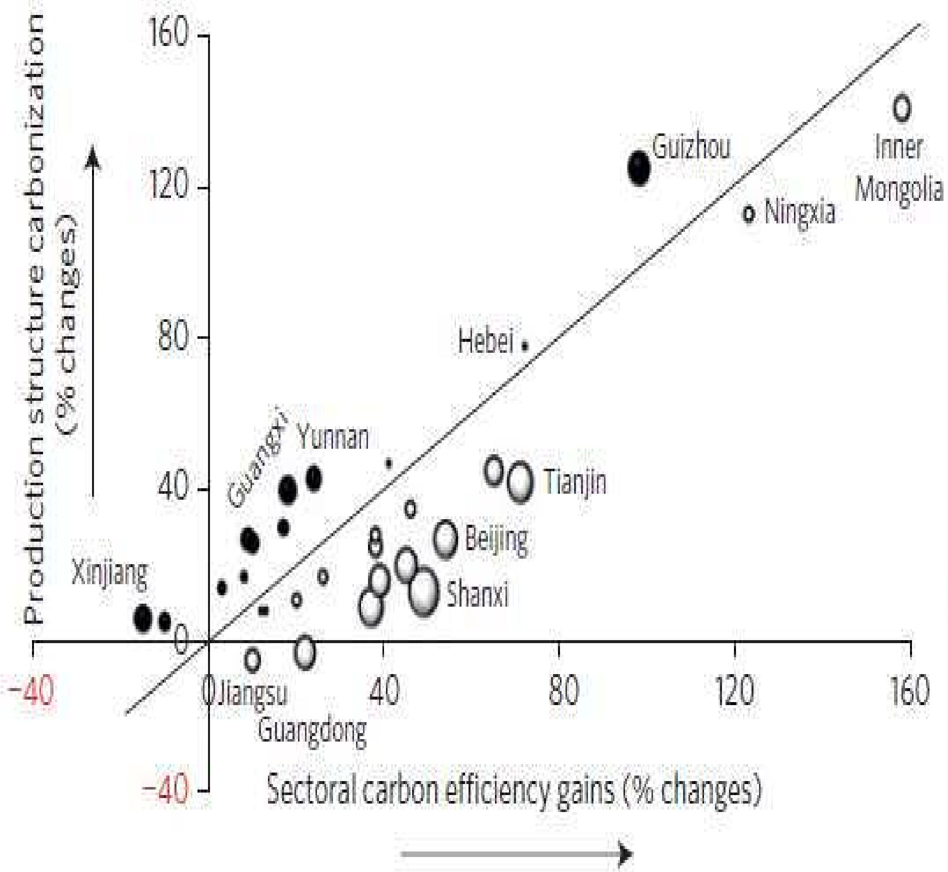
nature climate change

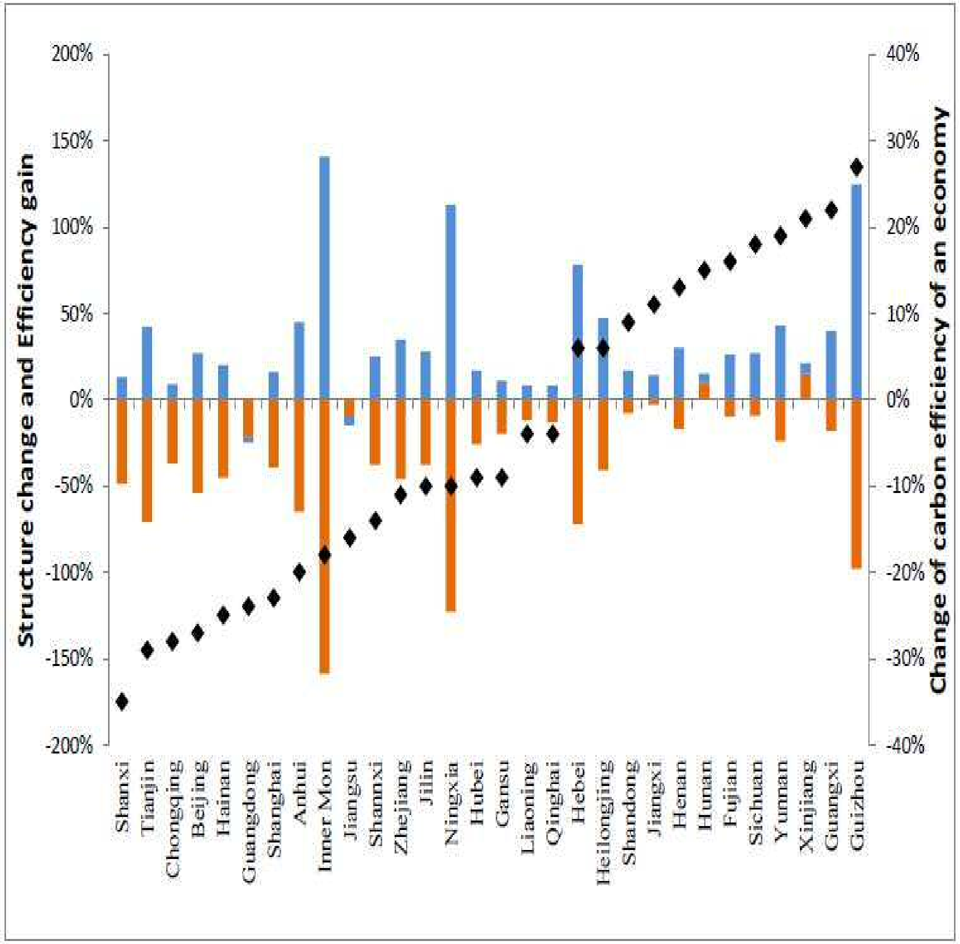
ARTICLES

PUBLISHED ONLINE: 5 OCTOBER 2014 | DOI: 10.1038/NCLIMATE2388

Determinants of stagnating carbon intensity in China

Dabo Guan[1,2]*, Stephan Klasen[3], Klaus Hubacek[4], Kuishuang Feng[4], Zhu Liu[5], Kebin He[6], Yong Geng[7] and Qiang Zhang[1]*





Journal of Cleaner Production 142 (2017) 3083–3094

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Allocation of carbon emissions among industries/sectors: An emissions intensity reduction constrained approach

Rui Zhao [a], Ning Min [a], Yong Geng [b, *], Yulong He [a]

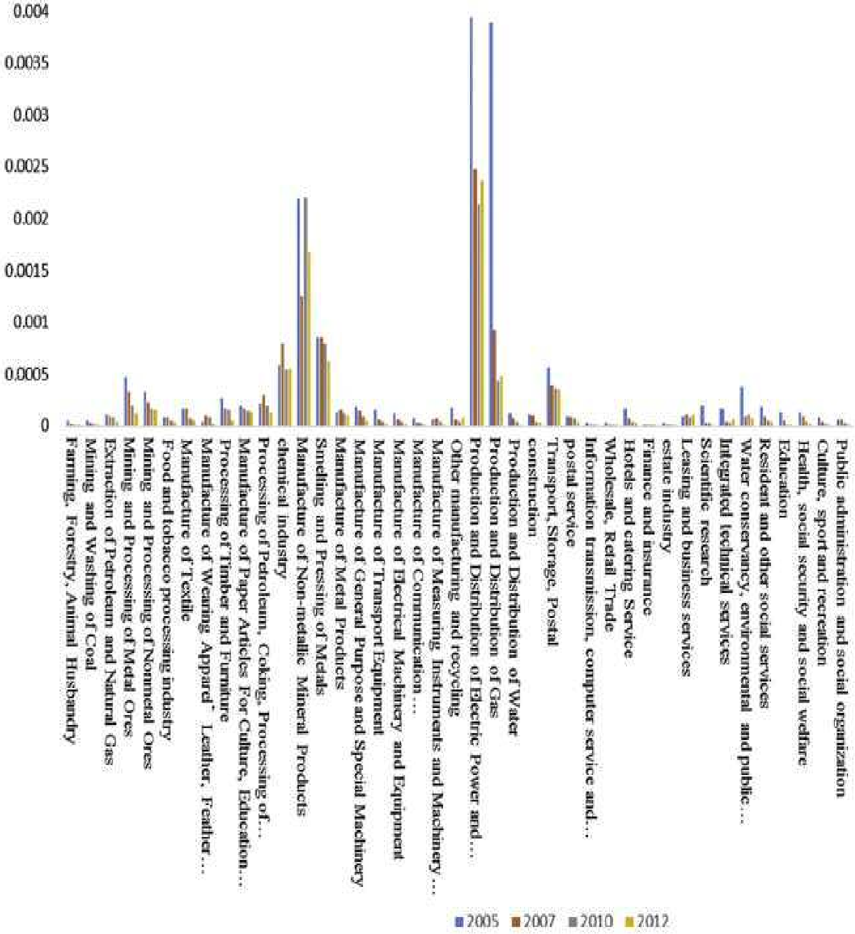
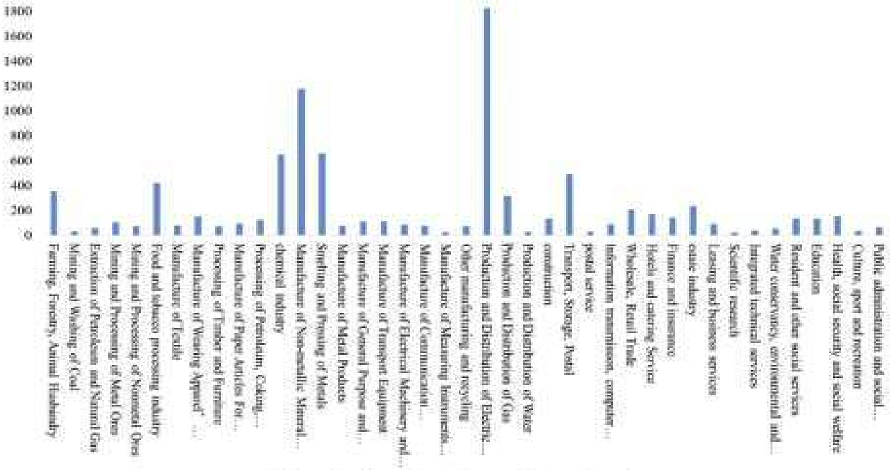
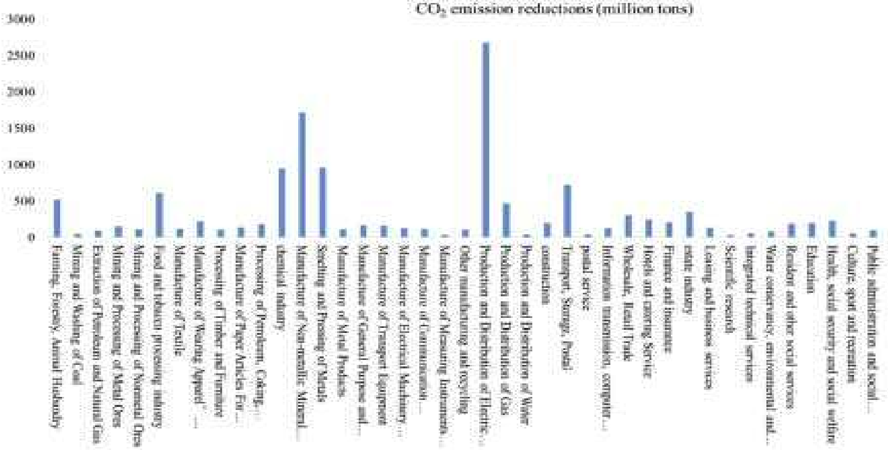


Fig. 1. Distribution of carbon emission intensity among industries/sectors.



a. 60% reductions in carbon emissions intensity

CO$_2$ emission reductions (million tons)



b. 65% reductions in carbon emissions intensity

Contents lists available at ScienceDirect

Resources, Conservation and Recycling

journal homepage: www.elsevier.com/locate/resconrec

Full length article

Energy-related GHG emissions of the textile industry in China

Beijia Huang[a,b,*], Juan Zhao[a], Yong Geng[c], Yihui Tian[d],

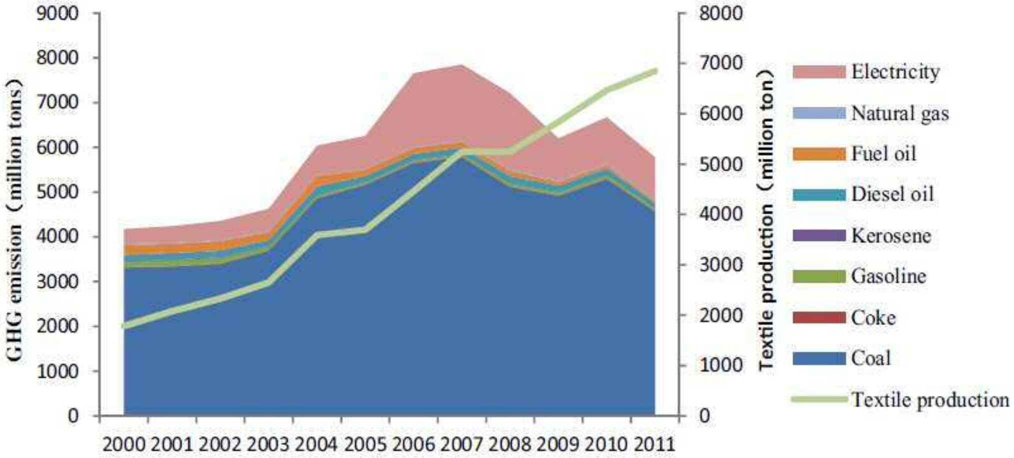


Fig. 1. Textile production and GHG emission (2000–2011).

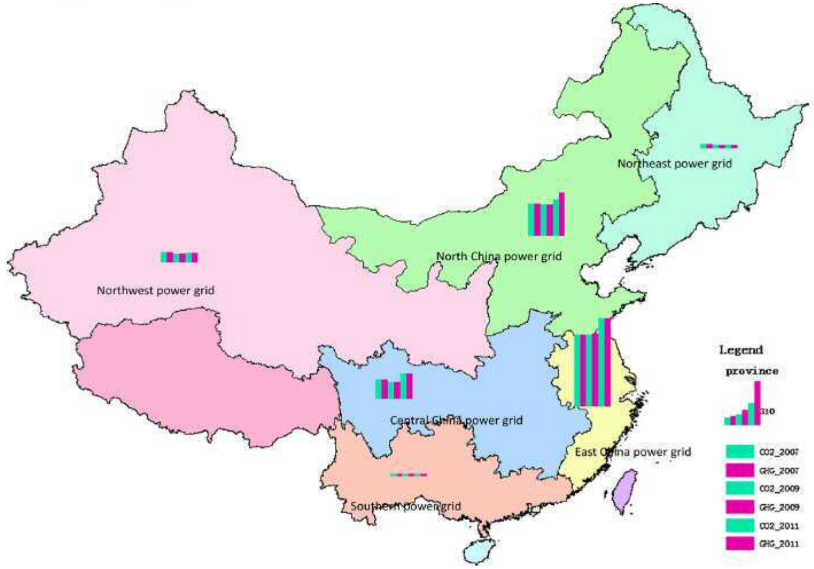


Fig. 2. Indirect GHG emissions of textile industry in China.

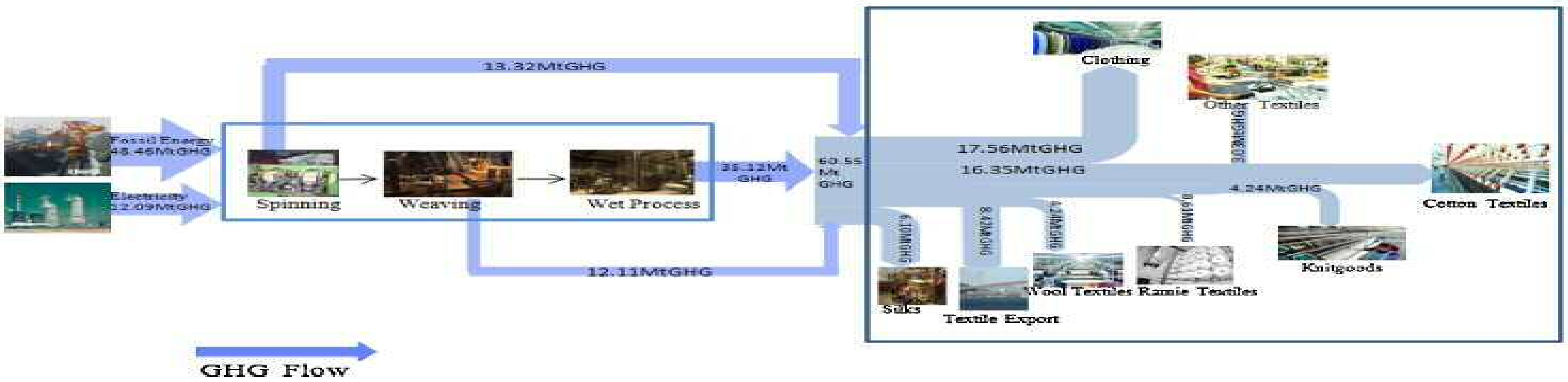


Fig. 4. GHG emission flows of China's textile industry in 2011.

Evaluating CO_2 emission performance in China's cement industry: an enterprise perspective

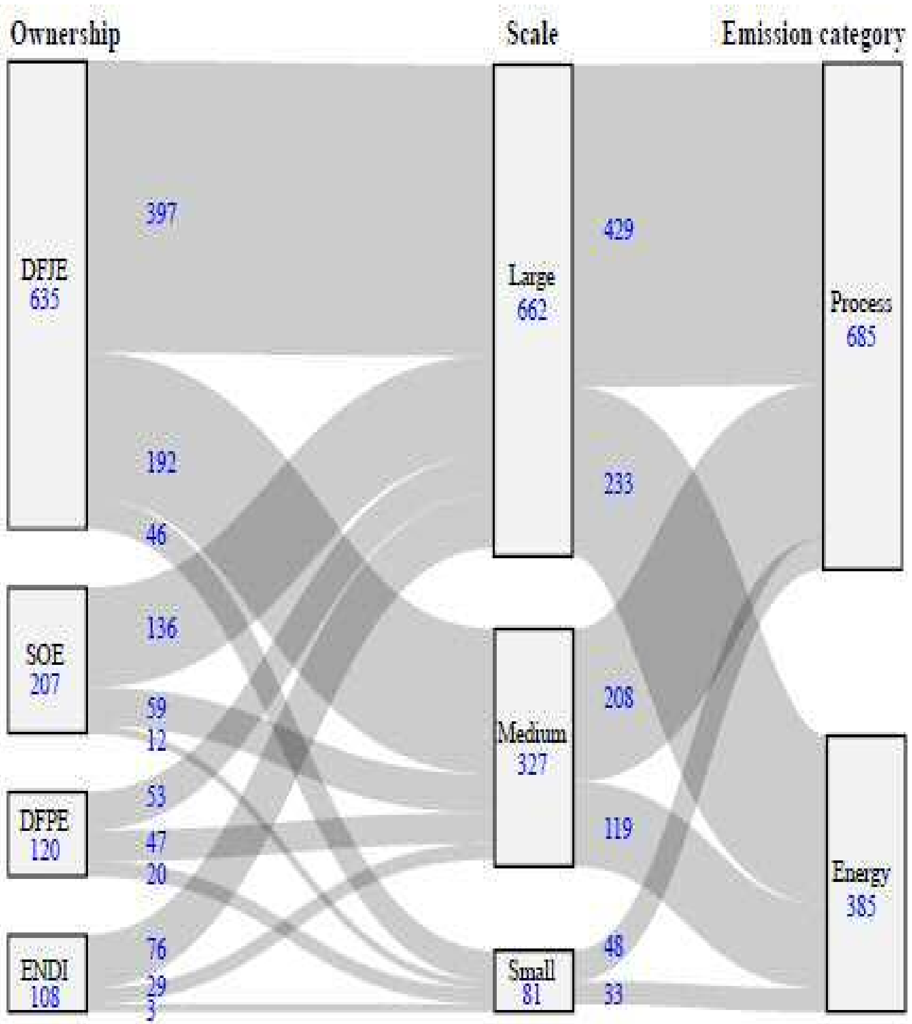


Fig. 1. CO_2 emissions from China's cement facilities with different ownerships and scales

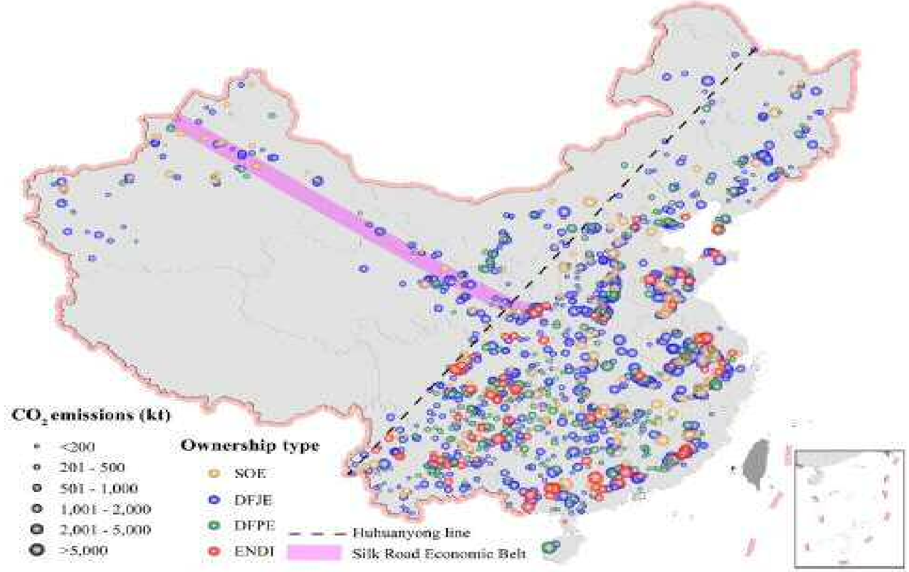


Fig. 5. Spatial distribution of ownerships and CO_2 emissions of cement facilities in China

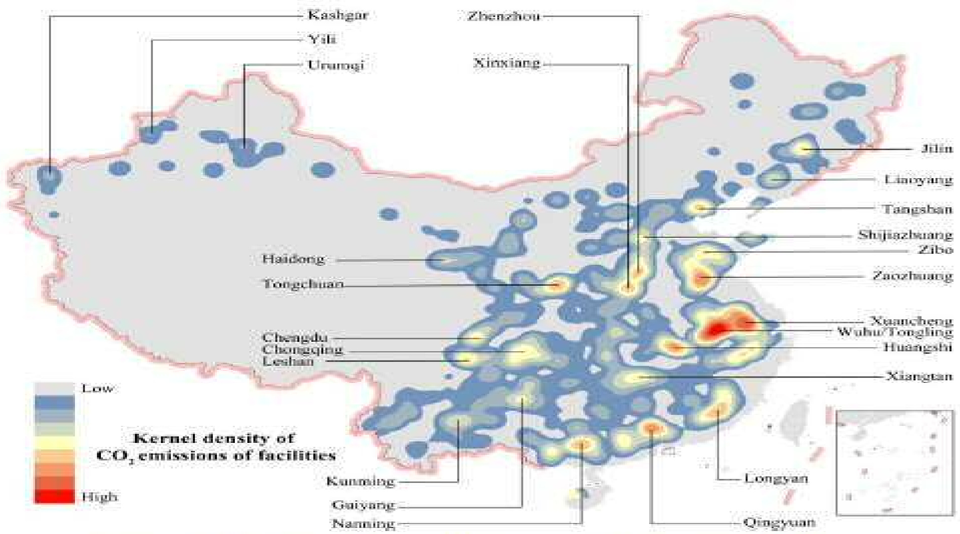
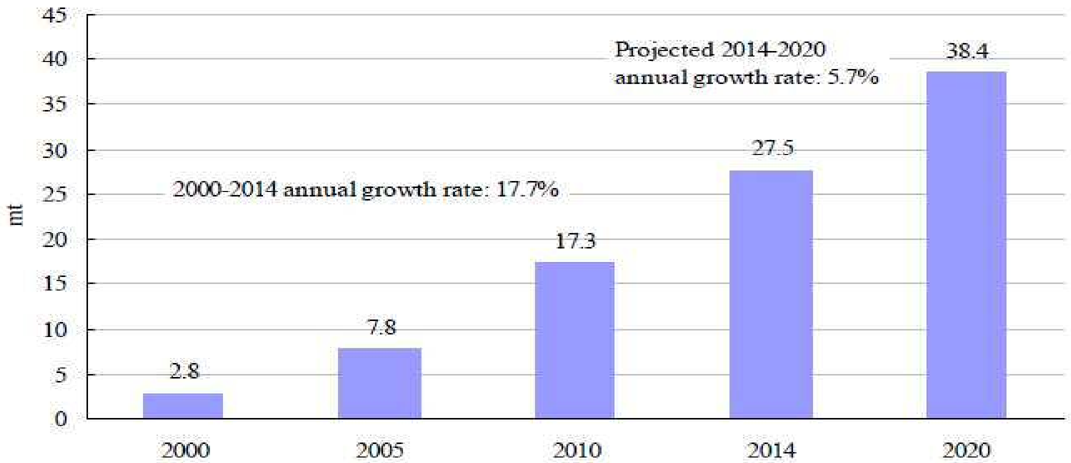


Fig. 6. Kernel densities of CO_2 emissions from China's cement facilities

Applied Energy
Available online 28 May 2015
In Press, Corrected Proof — Note to users

GHG emissions from primary aluminum production in China: Regional disparity and policy implications

Han Hao[a], Yong Geng[b], Wen Hang[c]



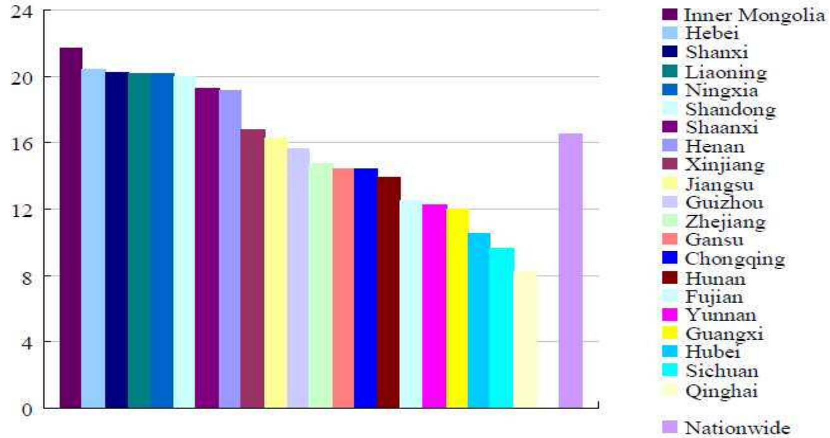


Figure 6 Provincial GEFs of primary aluminum production in 2013

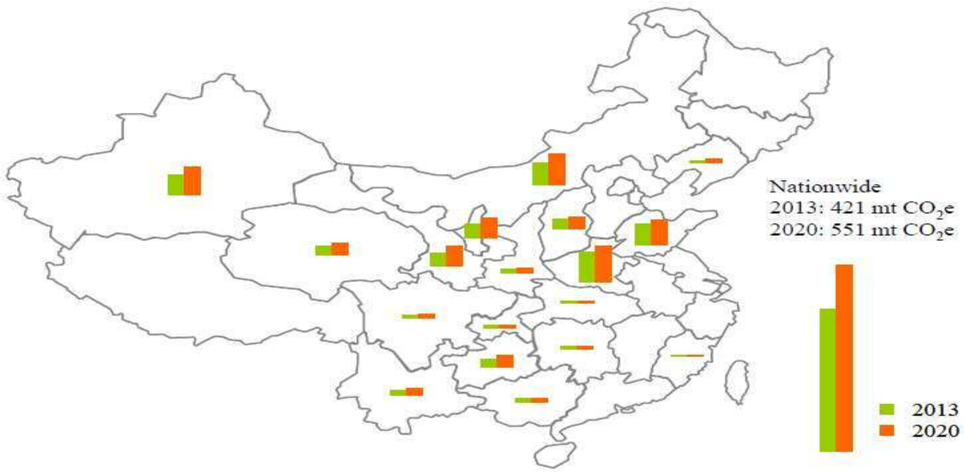


Figure 9 Spatial distribution of GHG emissions from China's primary aluminum production

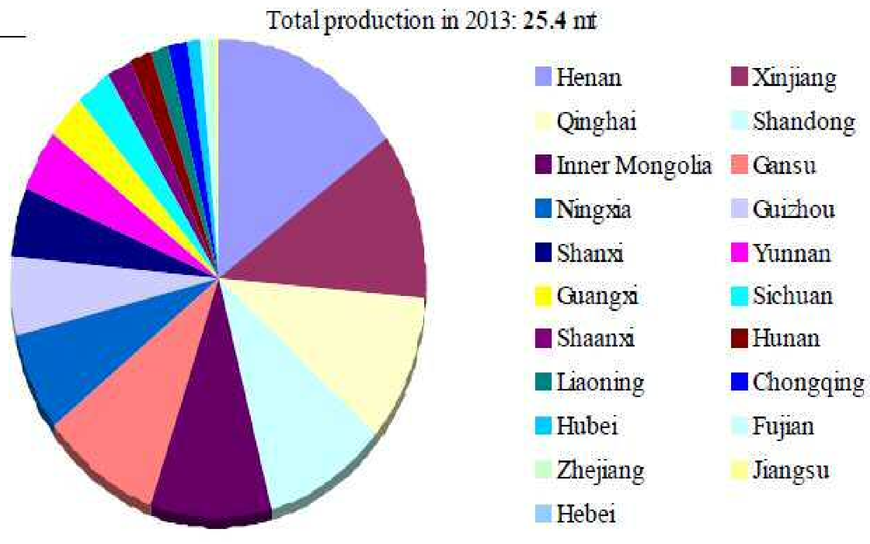


Figure 3 Provincial primary aluminum productions in 2013

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

A life cycle co-benefits assessment of wind power in China

Bing Xue [a,b,c,*], Zhixiao Ma [a,e,g], Yong Geng [a], Peter Heck [b], Wanxia Ren [a], Mario Tobias [c], Achim Maas [c], Ping Jiang [d], Jose A. Puppim de Oliveira [e], Tsuyoshi Fujita [f]

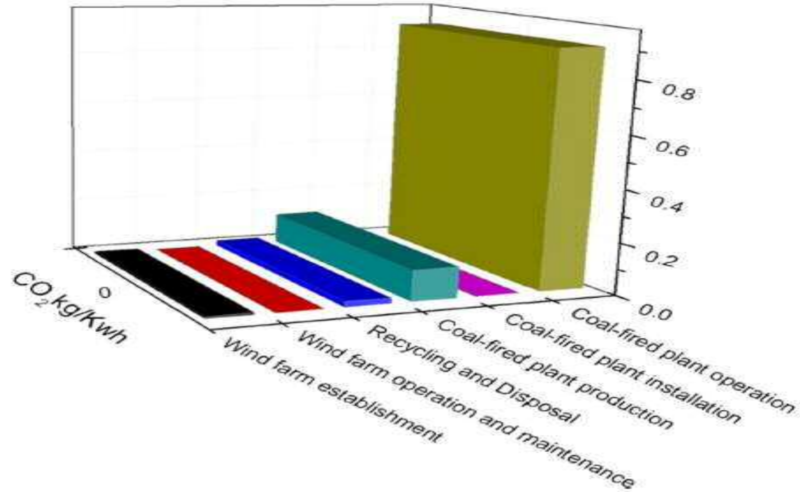


Fig. 3. Comparison of CO_2 emissions for each unit process of the wind power system and coal-fired power system.

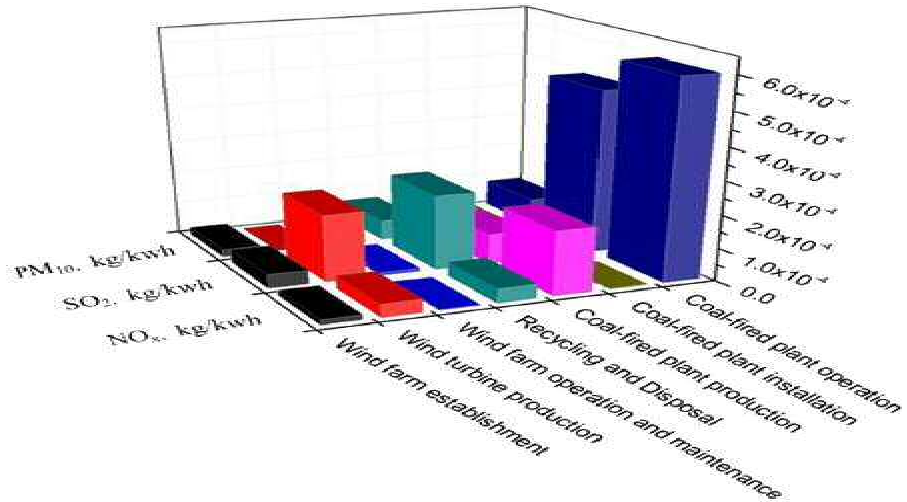


Fig. 4. Comparison of air pollutants emissions for each unit process.

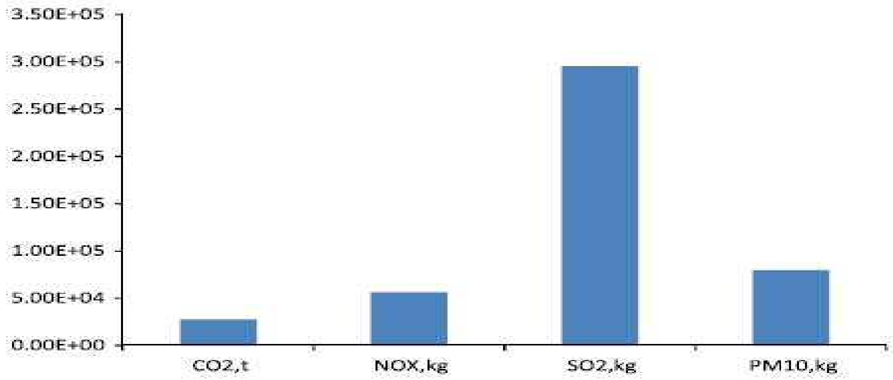


Fig. 5. Additional emission reduction from end-of-life recycling and disposal for one wind power system.

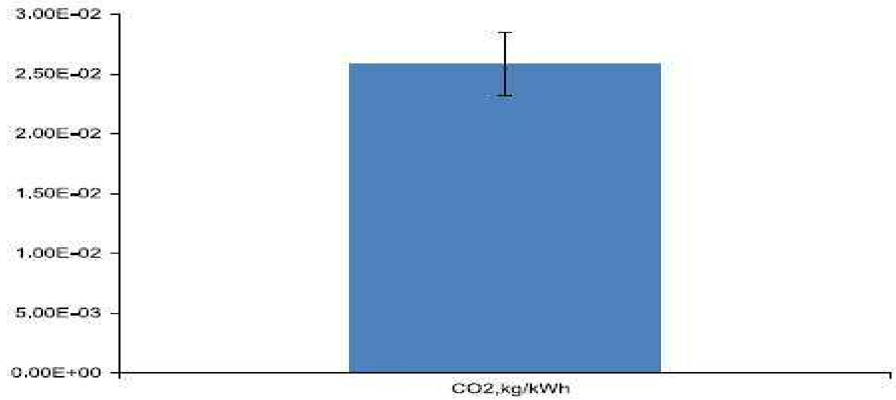


Fig. 6. Environmental impacts from configurations under 95% confidence range uncertainties.

ELSEVIER

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

ENERGY POLICY

Comprehensive development of industrial symbiosis for the response of greenhouse gases emission mitigation: Challenges and opportunities in China

CrossMark

Zhe Liu[a,*], Michelle Adams[a,*], Raymond P. Cote[a], Yong Geng[b], Qinghua Chen[c], Weili Liu[d],

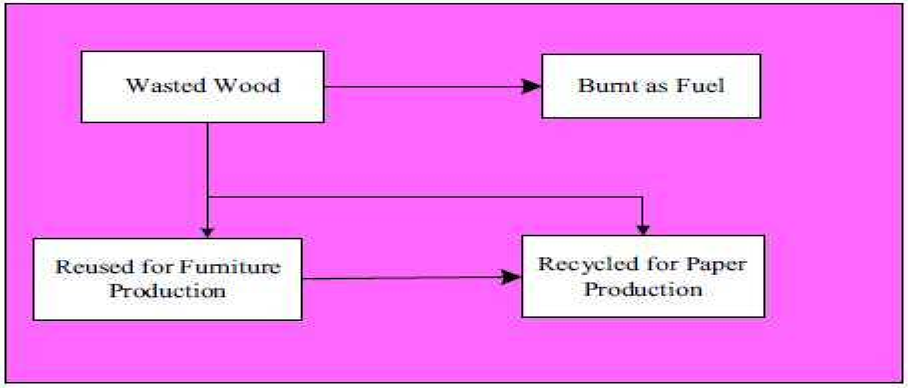


Fig. 2. Conceptual diagram for IS of waste wood.

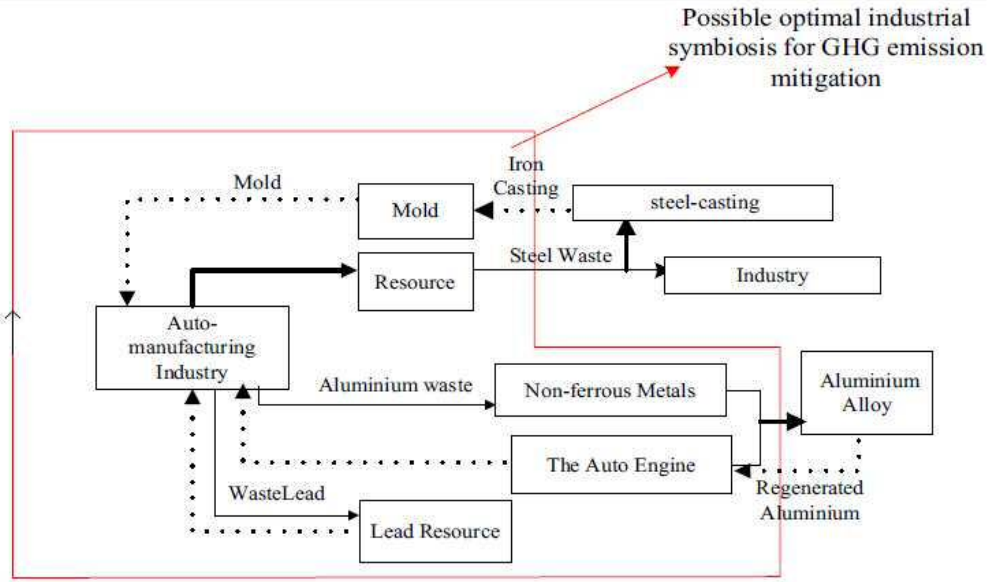


Fig. 4. Conceptual configuration for IS associated with GHG emission reduction.

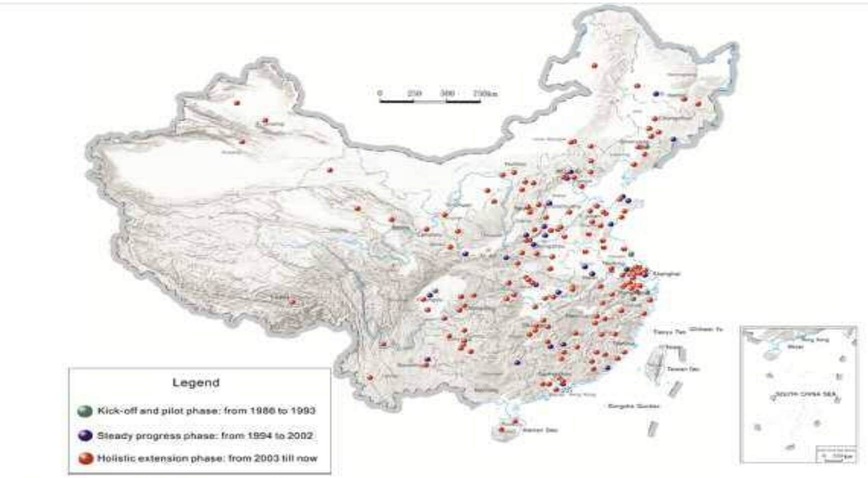


Fig. 1. Spatial-temporal distribution of state-level CNSCs.

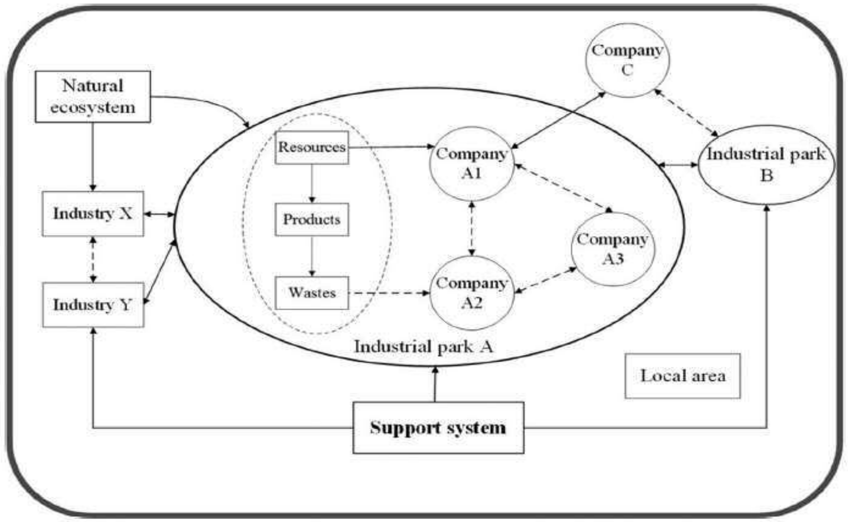


Fig. 3. Option chosen for industrial symbiosis.

Contents lists available at ScienceDirect

Applied Energy

journal homepage: www.elsevier.com/locate/apenergy

Achieving China's INDC through carbon cap-and-trade: Insights from Shanghai

Rui Wu [a,d], Hancheng Dai [b,*], Yong Geng [c,*], Yang Xie [b,e], Toshihiko Masui [b], Xu Tian [a,d]

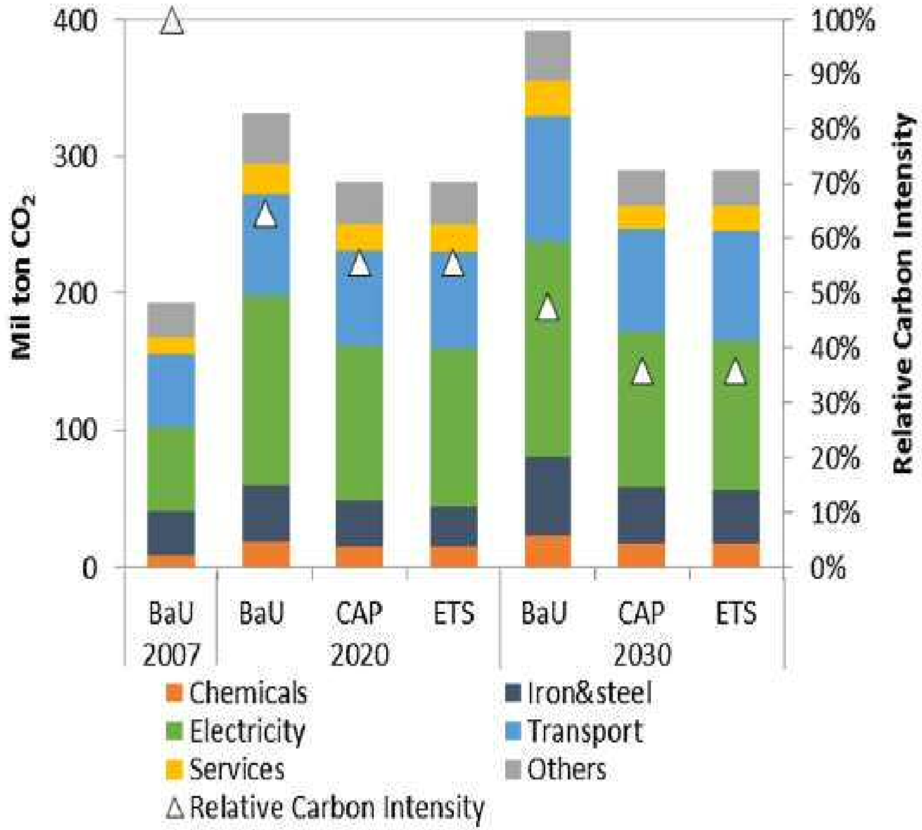


Fig. 2. Sectoral CO_2 emissions and carbon intensity under different scenarios.

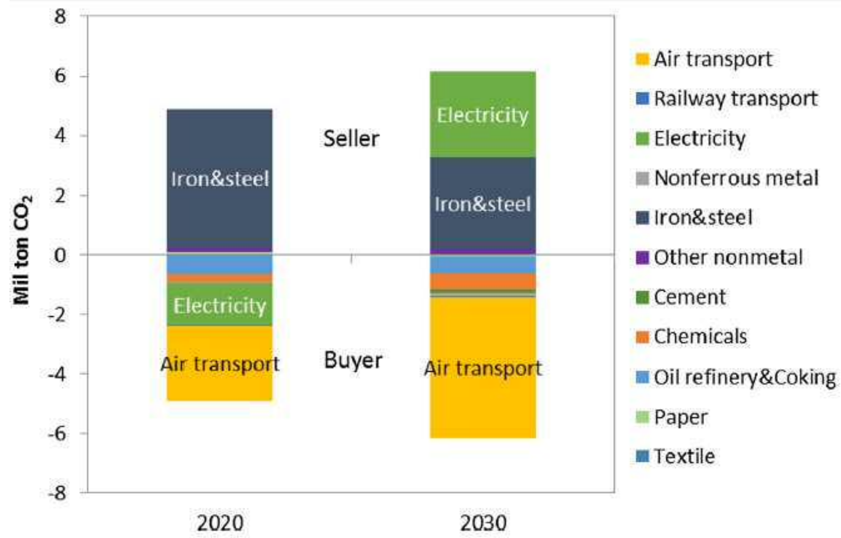
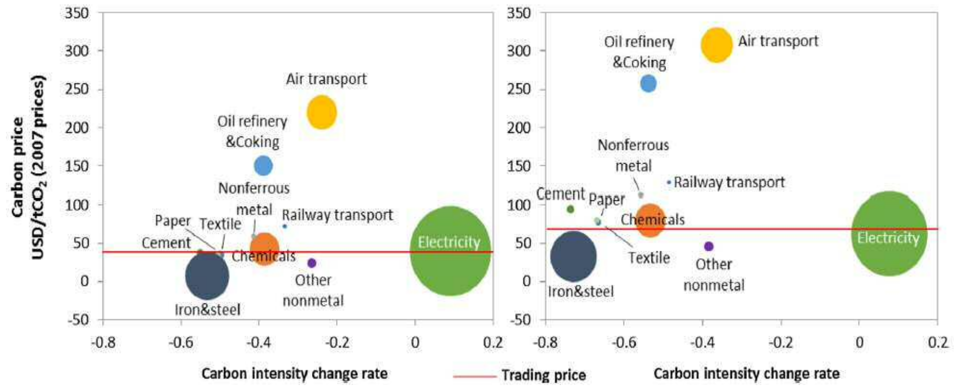


Fig. 4. Trade volumes among different sectors in the ETS scenario.



Renewable and Sustainable Energy Reviews 54 (2016) 15–24

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

Energy-related greenhouse gas emission features in China's energy supply region: the case of Xinjiang

Bin Guo [a,b], Yong Geng [c,*], Huijuan Dong [d], Yaxuan Liu [e]

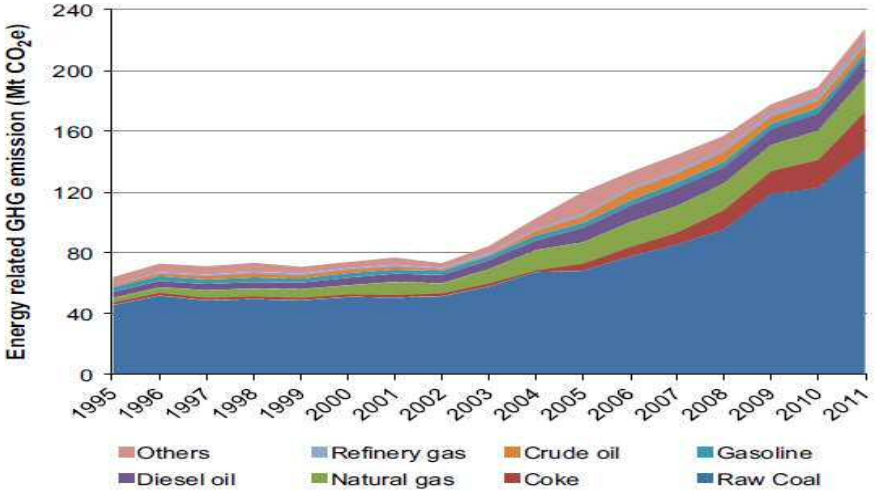


Fig. 4. Trajectory of energy-related GHG emissions from different energy sources in Xinjiang.

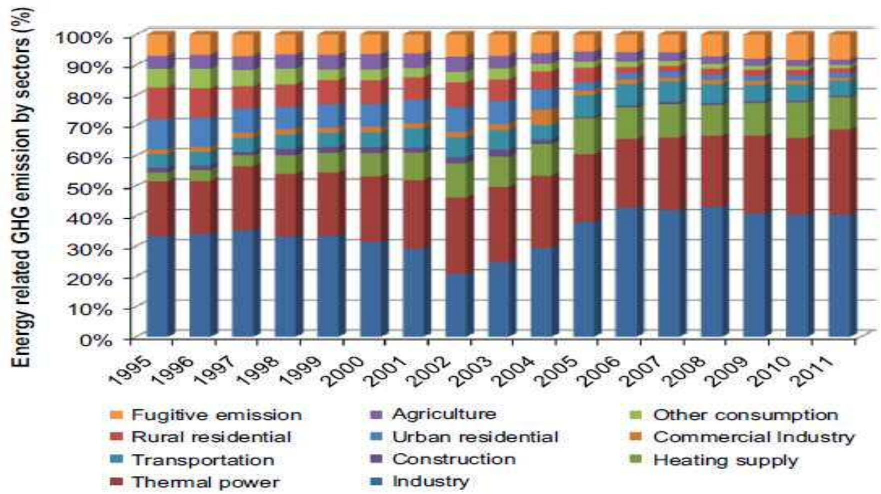


Fig. 6. Trajectory of energy-related GHG emissions from different sectors in Xinjiang.

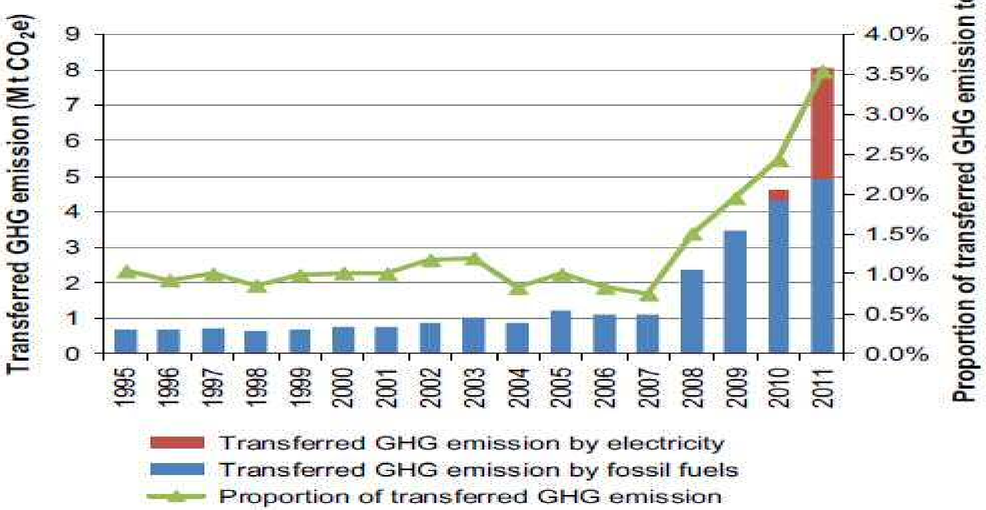


Fig. 7. Transferred GHG emissions in Xinjiang from 1995 to 2011.

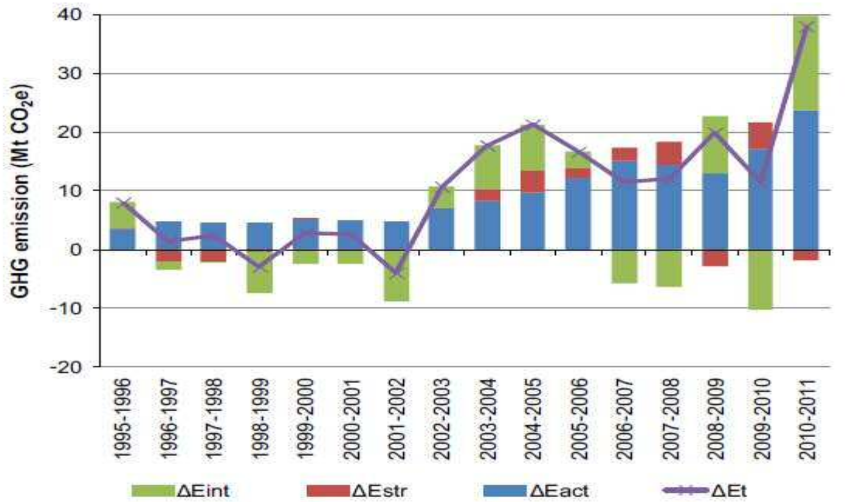


Fig. 8. Annual effects of driving forces for energy-related GHG emission increment in Xinjiang (1995-2011).

Co-benefits for developing renewable energy

Renewable Energy 57 (2013) 35–42

Contents lists available at SciVerse ScienceDirect

Renewable Energy

journal homepage: www.elsevier.com/locate/renene

Co-benefits analysis on climate change and environmental effects of wind-power: A case study from Xinjiang, China

Zhixiao Ma [a,d], Bing Xue [a,*], Yong Geng [a], Wanxia Ren [a], Tsuyoshi Fujita [b], Zilong Zhang [c], Jose Puppim de Oliverira [e], David A. Jacques [f], Fengming Xi [a]

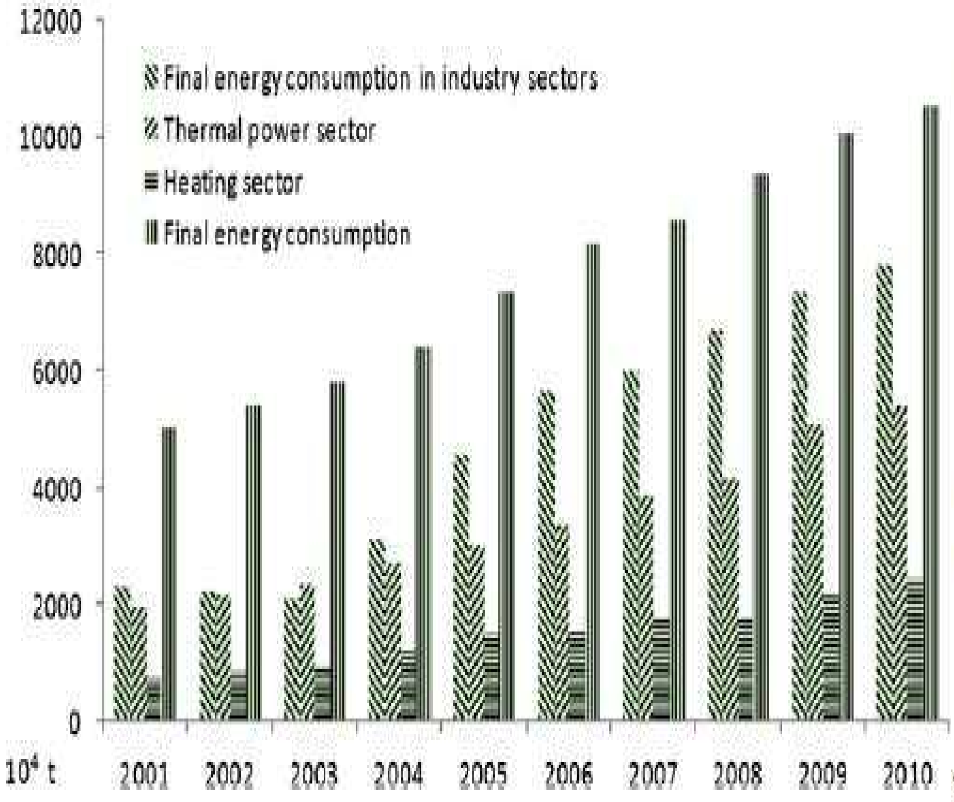


Fig. 1. CO_2 emission from 2001 to 2010.

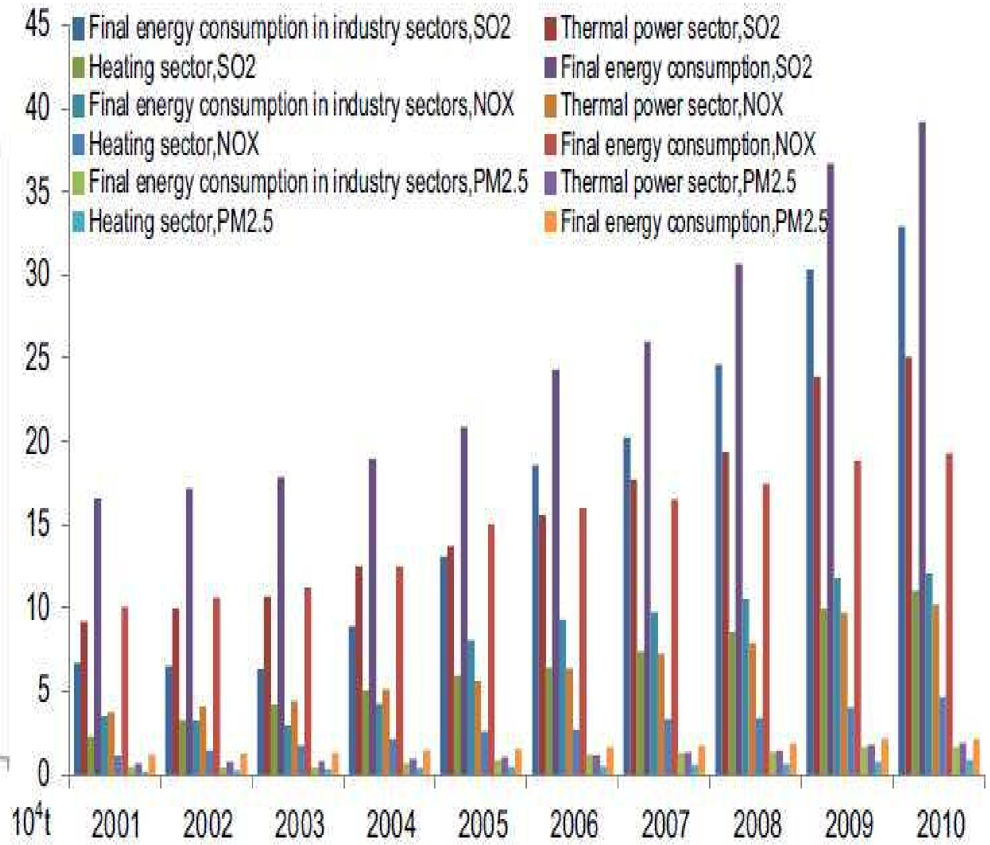


Fig. 2. Air pollutant emissions from 2001 to 2010.

Contents lists available at ScienceDirect

Energy

journal homepage: www.elsevier.com/locate/energy

The effects of household consumption pattern on regional development: A case study of Shanghai

Xu Tian [a, d], Yong Geng [b, *], Hancheng Dai [c, **], Tsuyoshi Fujita [c], Rui Wu [a, d], Zhe Liu [a],

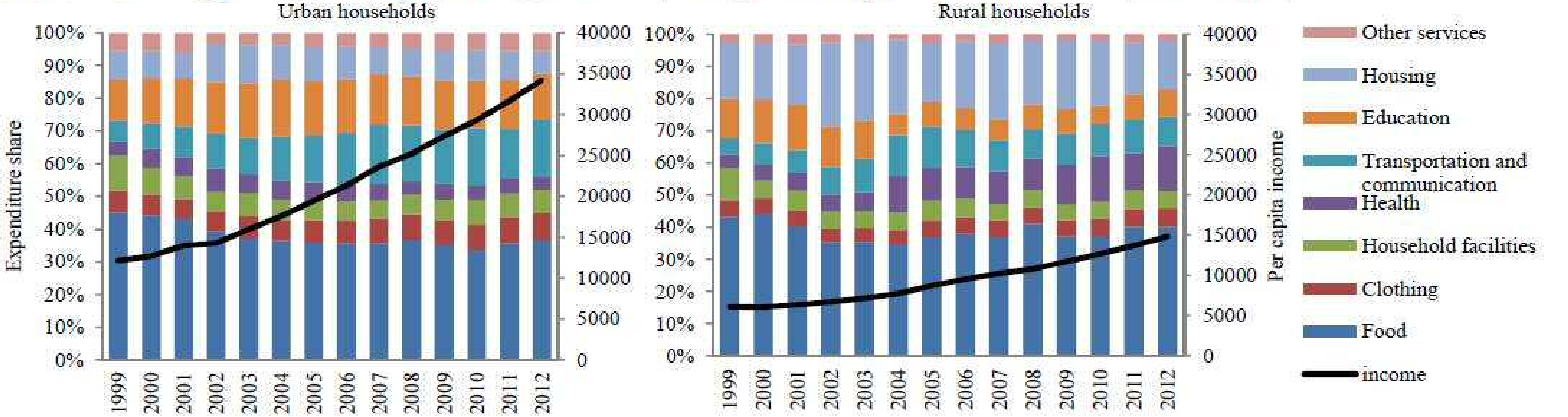


Fig. 2. Urban and rural household expenditure shares in Shanghai from 1999 to 2012 at the current price; The black lineshows changes of per capita incomes at 2007 price

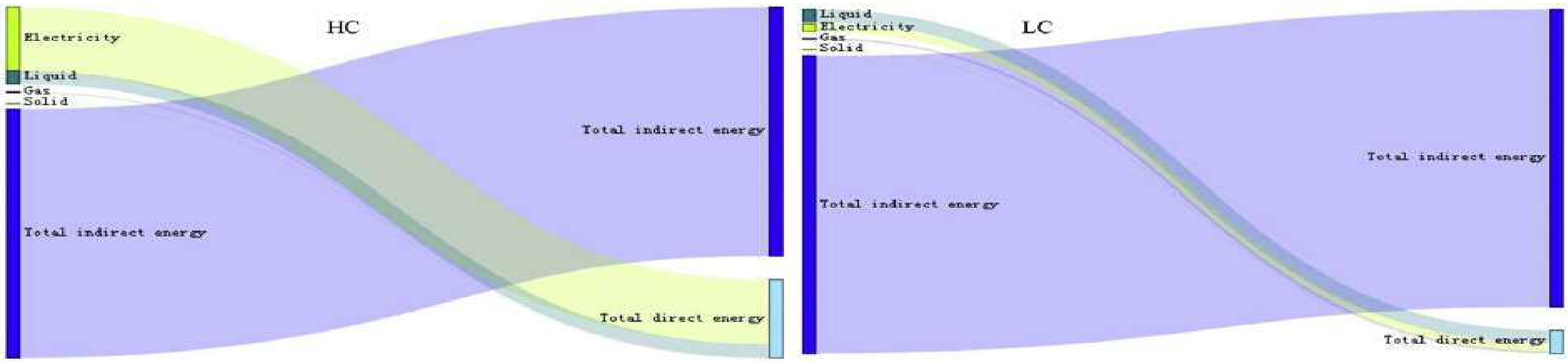


Fig. 6. Total direct and indirect energy consumption in 2030 (unit: Mtce)

Co-benefits for developing renewable energy

Contents lists available at SciVerse ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

Regional application of ground source heat pump in China: A case of Shenyang

Yong Geng[a,b,*], Joseph Sarkis[c], Xinbei Wang[a], Hongyan Zhao[a], Yongguang Zhong[d]

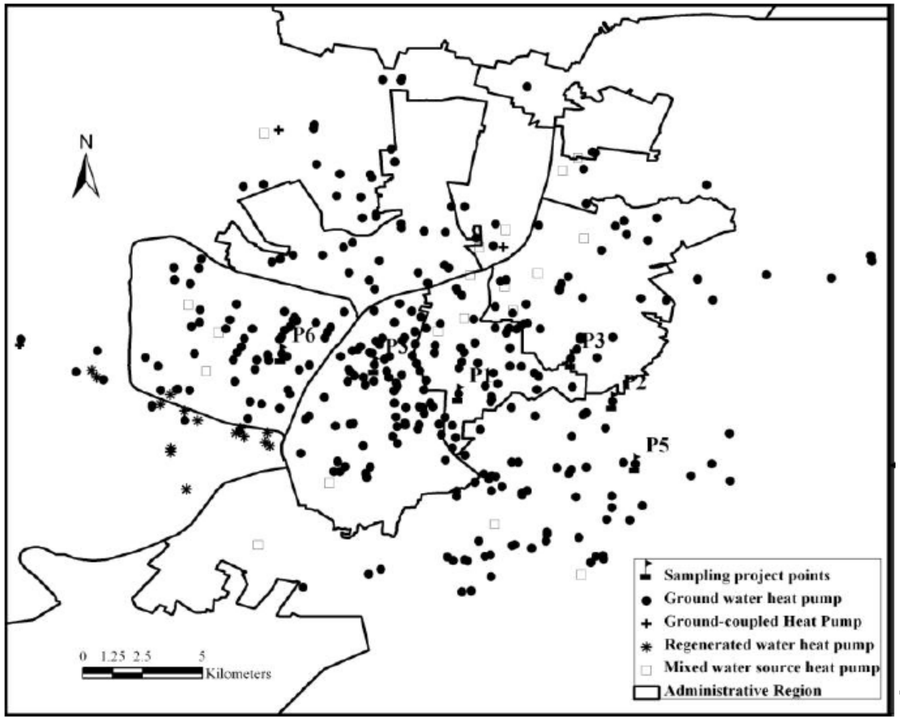


Table 2
GHG emission reduction from GSHP application from 2006 to 2010.

	GCHP (10^4 ton)	GSHP (10^4 ton)	SWHP (10^4 ton)
2006	1.41	4.09	0.89
2007	4.47	26.20	6.15
2008	16.92	42.06	12.05
2009	26.74	61.17	16.91
2010	26.83	77.78	16.91
Sub-total	76.37	211.30	52.51

Table 3
Energy savings from GSHP projects during 2006–2010.

Year	GCHP (TJ)	GSHP (TJ)	SWHP (TJ)
2006	464.30	1639.25	356.41
2007	1471.01	10504.43	2465.46
2008	5570.11	16862.73	4831.50
2009	8801.33	24525.05	6780.41
2010	8832.80	31185.10	6780.41
Sub-total	25139.55	84716.56	21214.19

Thank you for your attention!