Relating five bounded environmental problems to household consumption in China's 12th Five-Year Plan

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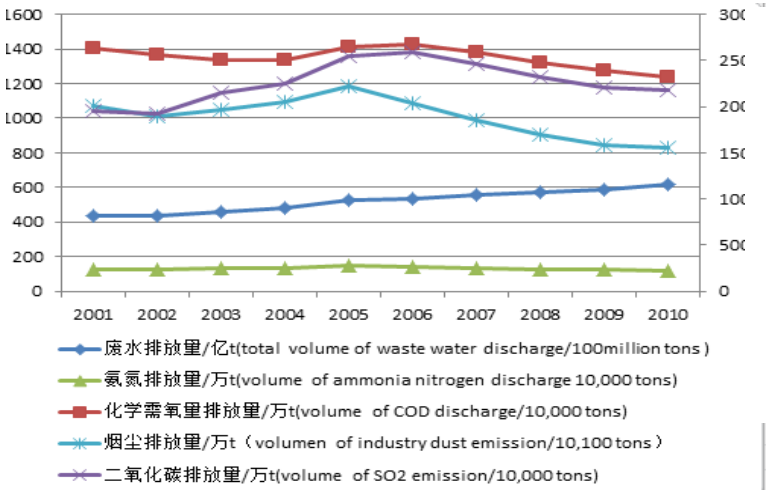
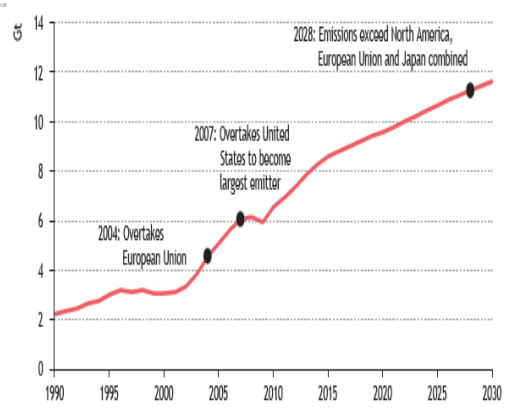
Outline

- Introduction
- Motivation
- Methods
- Results and discussions
- Suggestions

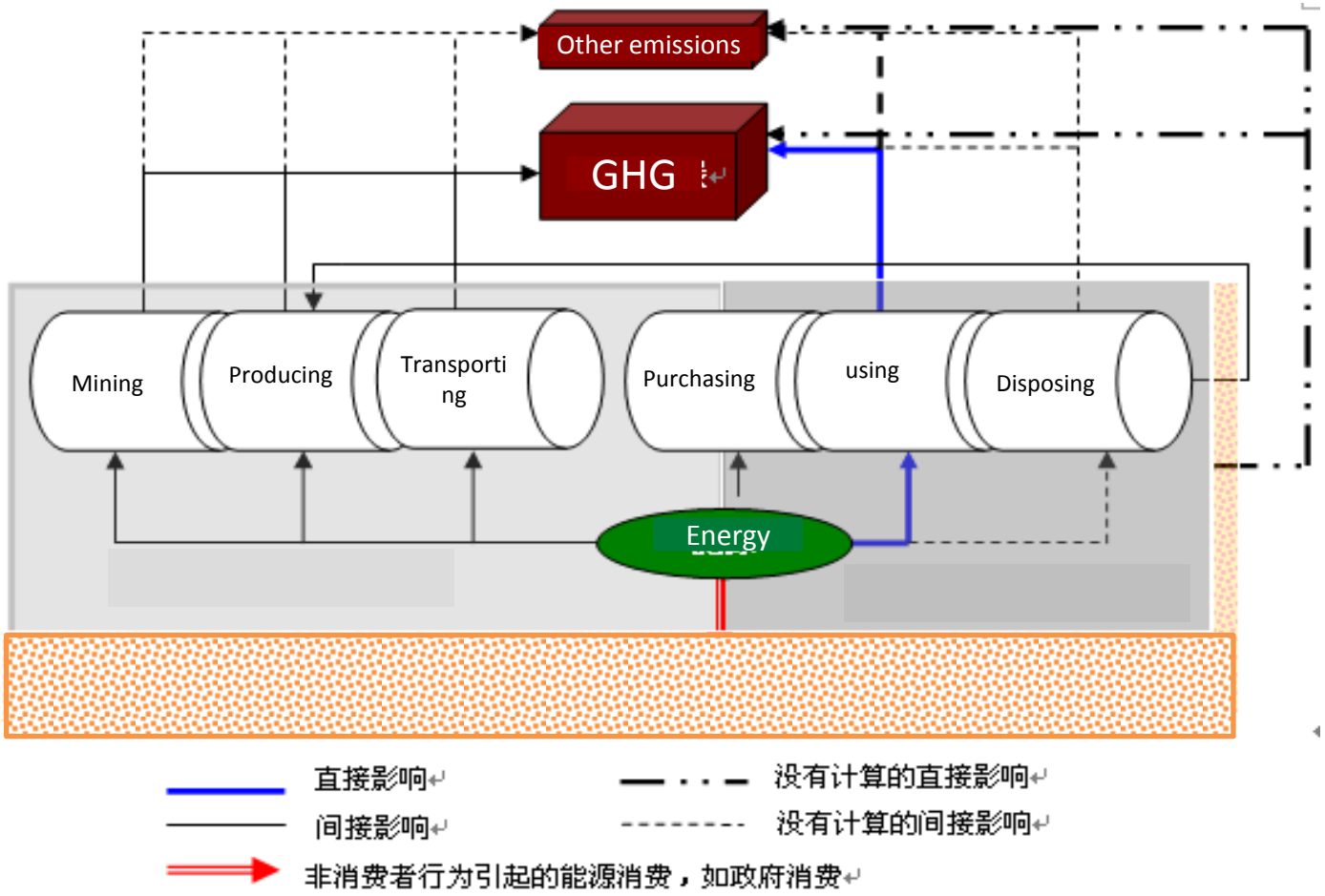
China's pollution emissions





- China's air pollution, water pollution, greenhouse gas emissions and other environmental problems are rampant.
- All these problems are linked to production and consumption
- China's government set bounded targets for emissions reductions of SO_2, COD (chemical oxygen demand), NOx, ammonia-nitrogen and the decline of CO_2 emissions intensity in its 12th Five-Year Plan (2011-2015).

The environmental impacts of household consumption



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Motivation of the study

- Cellura, M., Longo, S., Mistretta, M. The energy and environmental impacts of Italian households consumptions: An input–output approach. Renewable and Sustainable Energy Reviews 2011; 15(8): 3897-3908.
- Cellura, M., Longo, S., Mistretta, M. Application of the Structural Decomposition Analysis to assess the indirect energy consumption and air emission changes related to Italian households consumption. Renewable and Sustainable Energy Reviews 2012; 16(2): 1135-1145.
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- Kerkhof, A., Nonhebel, S., Moll., H. Relating the environmental impact of consumption to household expenditures: an input-output analysis. Ecol Eco 2009; 68: 1160-1170.
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- Roca, J., Serrano, M. Income growth and atmospheric pollution in Spain: an input-output approach. Ecol Econ 2007; 63:230-242.
- Sánchez-Chóliz, J. Duarte, R., Mainar, A. Environmental impact of household activity in Spain. Ecol Econ 2007; 62(2):308-318.

Motivation of the study

- What is the contribution of household consumption to multiple environmental impacts, including CO_2, SO_2, COD, NOx, and ammonia-nitrogen?
- Which consumption items are likely responsible for environmental impacts?
- Which consumption items can lead to different environmental impacts?

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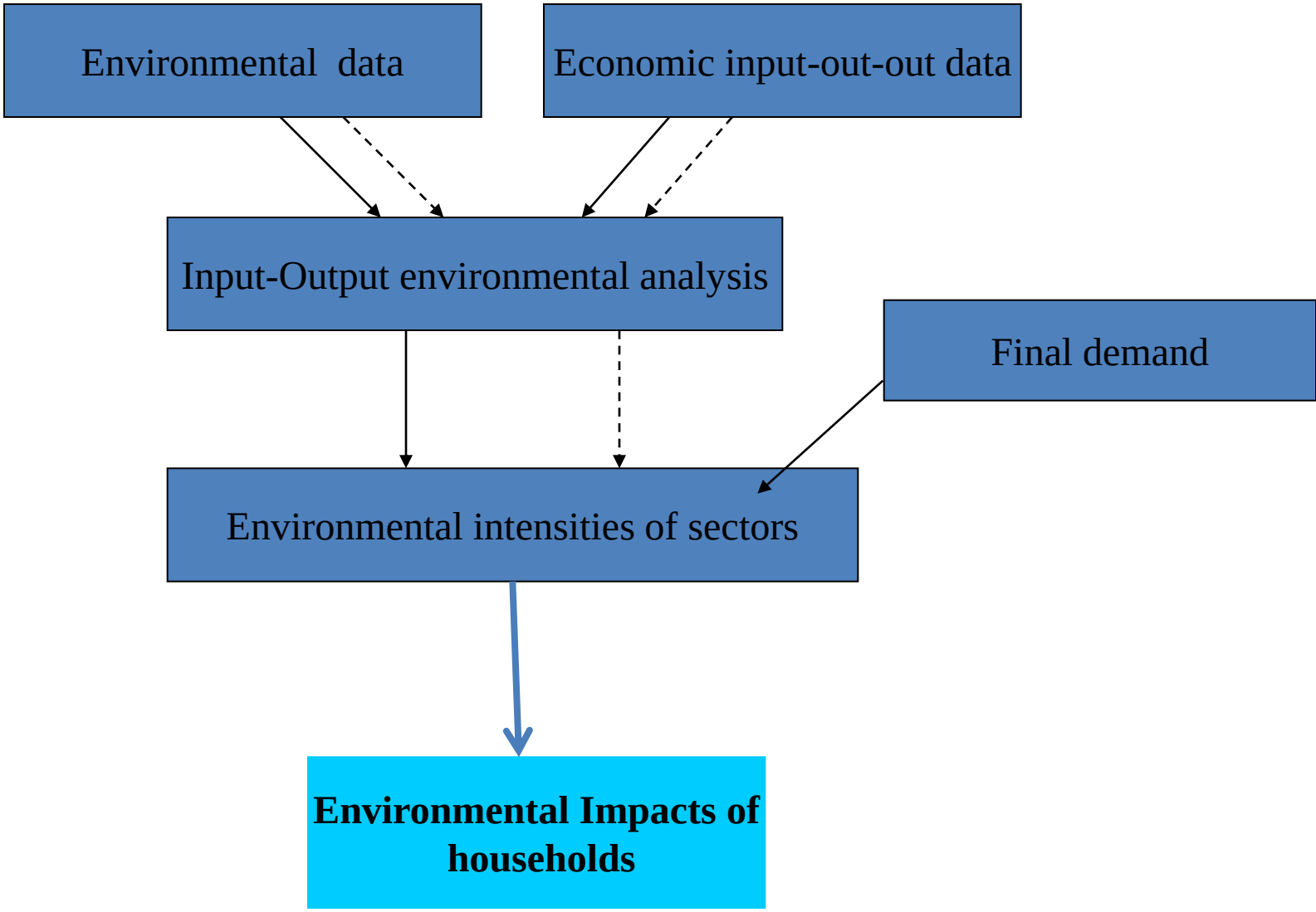
Method

- Pollutant emissions via household consumption are measured by considering the sum of: a) indirect emissions arising from productive sectors and b) direct emissions caused by household consumers.
- Indirect environmental impact is defined as the impact occurring during a product's production process or its waste treatment.
- Direct environmental impact refers to the impact that occurs as the consumer uses the product..

Input-output Model



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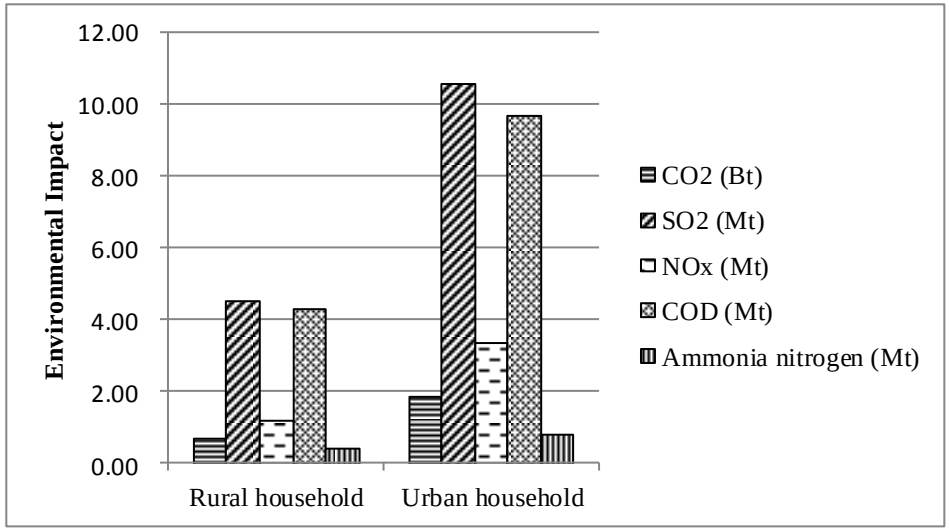
The total environmental impact of household consumption

- CO_2, SO_2, COD, NOx, and ammonia-nitrogen emissions of household consumption in 2007 contributed 42.17%, 33.67%, 33.11%, 28.83% and 30.38% of China's national total emissions, respectively.



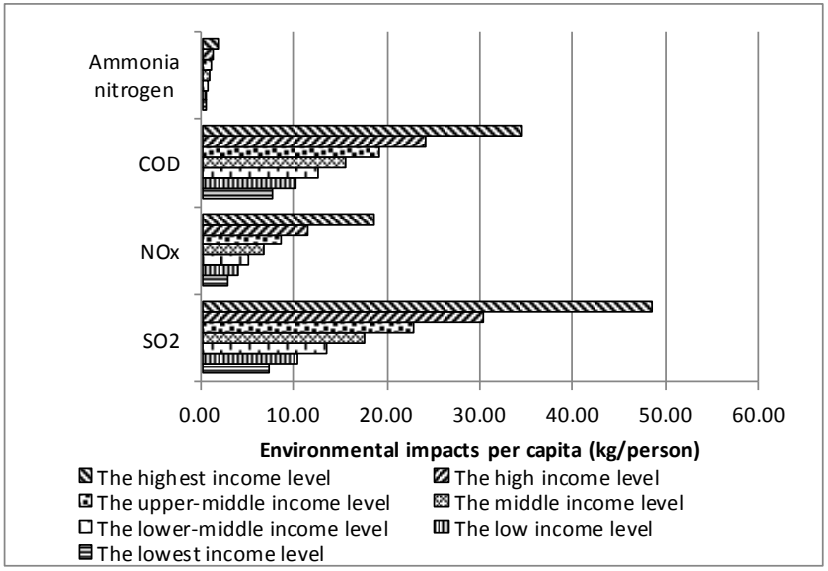
The total environmental impact of household consumption

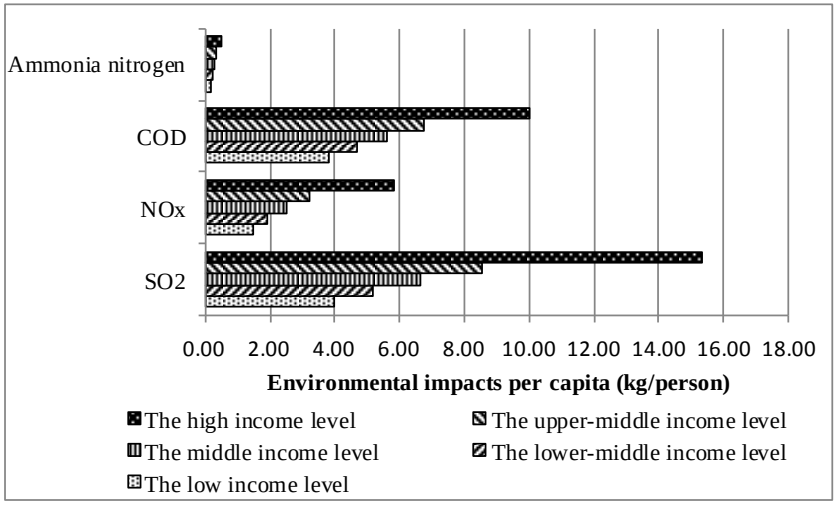
CO2	**“Generation and Supply of Electricity and Heat” “Food and Tobacco Manufacture”**
SO2	
NOx	
COD	Agriculture “Food and Tobacco Manufacture.”
Ammonia-nitrogen	

	Intensive indicators					Extensive indicator	
	CO2	SO2	NOx	COD	AN	Rural	Urban
Generation and Supply of Electricity and Heat	343	663	765	40	38	71	87
Food and Tobacco Manufacture	39	57	59	666	356	615	578
Agriculture	28	50	44	417	327	721	282

Different types	Consumption items
Type 1: **Higher CO_2, SO_2 and NOx emissions intensity but lower COD and Ammonia-nitrogen emissions intensity**	Coal Mining and Washing; Metal Ore Mining and Processing; Non-metallic Mineral Products Manufacture; Metal Products Manufacture; Generation and Supply of electricity and Heat; Construction
Type 2: **Higher COD, Ammonia-nitrogen, CO_2, SO_2 and NOx emissions intensity**	Chemical Industry
Type 3: **Higher COD and Ammonia-nitrogen emissions intensity but lower CO_2, SO_2 and NOx emissions intensity**	Agriculture; Food and Tobacco Manufacture; Textile Industry; Leather, Fur, Feather and Related Products Manufacture; Timber Processing and Furniture Manufacture; Sanitation, Welfare, and Insurance; Cultural, Sports and Recreation; Other Manufacture
Type 4: **Higher SO_2 and NOx emissions intensity but lower CO_2, COD and Ammonia-nitrogen emissions intensity**	Oil and Natural Gas Mining; Non-metal Ore Mining and Processing; General and Special Purpose Machinery Manufacture; Electrical Machinery and Equipment Manufacture; Production and Supply of Water
Type 5: **Higher CO_2 emissions intensity but lower COD, SO_2, NOx and Ammonia-nitrogen emissions intensity**	Processing of Petroleum, Coking, Processing of Nuclear Fuel; Production and Supply of Gas; Transportation and Warehousing;
Type 6: **Lower CO_2, SO_2, NOx, COD and Ammonia-nitrogen emissions intensity**	Metals Smelting and Pressing; Transport Equipment Manufacture; Communication Equipment, Computers and Other Electronic Equipment Manufacture; Measuring Instruments and Machinery for Cultural Activity and Office Work Manufacture; Recycling and Disposal of Waste; Post; Wholesale and Retail Trade; Educational Services; Resident Services; Other Services
Type 7: **Lower CO_2 emissions intensity but higher COD, SO_2, NOx and Ammonia-nitrogen emissions intensity**	Paper, Publishing, Cultural and Educational Products Manufacture

Environmental impact of household consumption at different income levels





Emissions of household at higher income level are related to the consumption of necessities and luxuries, while for household at low income level, emissions are related to the consumption of necessities.

Challenges for mitigating household environmental impacts

- Increasing household income

  -----The scale of household expenditure

  -----The structure upgrade of household expenditure

- Inducing household consumption behavior ***now***

  -----Conservation consciousness of household

- Inducing household consumption behavior ***tomorrow***

  -----The formation of household consuming behavior

Suggestions

- There is a trade-off among stimulating household consumption, mitigating COD and ammonia-nitrogen emissions and mitigating CO_2, SO_2 and NOx emissions.
- For CO_2, SO_2 and NOx emissions, the deployment of higher energy-efficient technology and the substitution of fossil fuels with clean and renewable energy will help reduce household consumption emissions.
- Reducing food and clothes waste will help cut COD and ammonia-nitrogen emissions.
- It is necessary to identify and label products with lower emissions in order to provide enough information for consumers to choose green products, especially for households at higher income levels.

Suggestions for the cooperation

- **The Studies for green household consumption**

  (1) Green household consumption pattern

  (2) The methodology

  (3) the relationship between green production and green consumption

  (4) The policies for inducing green consumption

Suggestions for the cooperation

- **The studies for green development assessment**

  (1) Green development indicators

  (2) Green development index

  (3) Green development policies

Thanks for your attention!