



中國環境科學研究院
Chinese Research Academy of Environmental Sciences

Switch to Clean Energy from Coal in Rural Households: Benefits for Air Quality

JIN Wenjing

ZHI Guorui, DANG Hongyan, DU Jinhong,

Chinese Research Academy Environmental Sciences (CRAES)

綠水青山
就是金山銀山

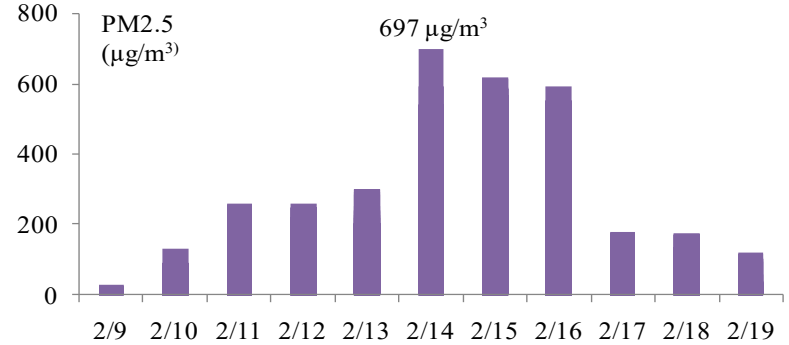
18th June 2020



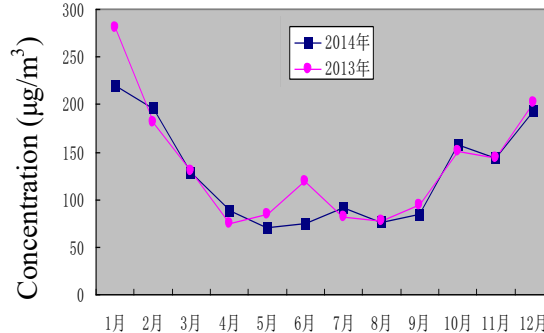
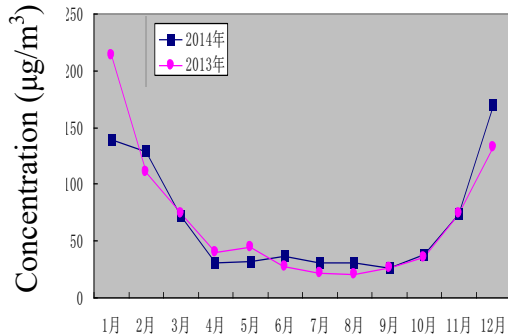
Hazard air in winter drives people crazy



2014 February Haze event in China



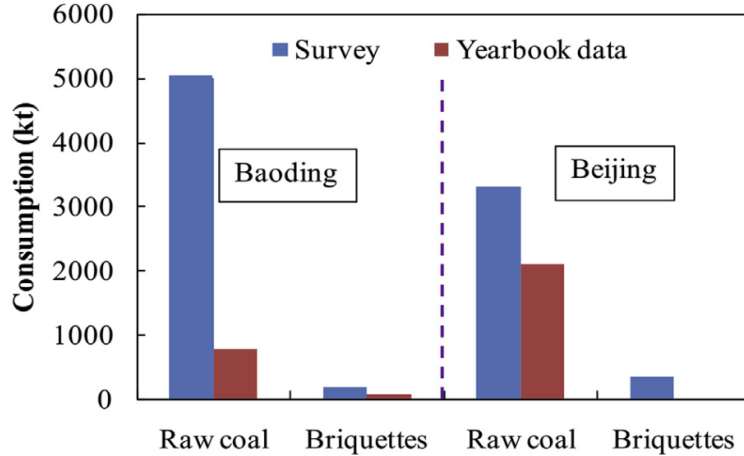
Comparison of 2013-2014 monthly concentration



Pollutant concentration coincided with heating season, implying the special role of coal heating in winter air quality



Hazard air in winter drives people crazy



(Zhi et al., 2017)



- **Although people know the annual consumption of heating coal in a region through typical village investigations, people don't know how to allot the annual total to every day. Therefore it makes the dynamic impacts of rural coal on air quality difficult to assess. Consequently a method to dynamically present daily coal consumption is necessary.**



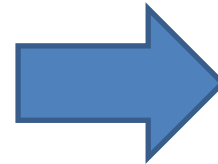
National Key R&D Program

A Project under the National Key Research & Development Program was launched for tackling of heavy air pollution



Task1

Real-time quantification of emissions from area sources and unorganized sources



Real-time quantification of emission inventories

Industrial cluster

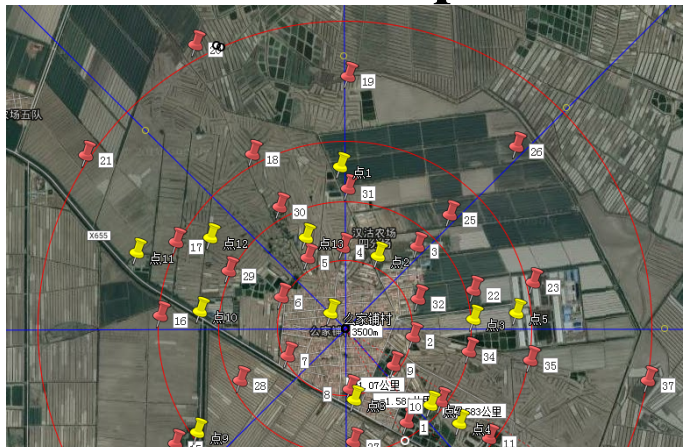
Rural heating coal



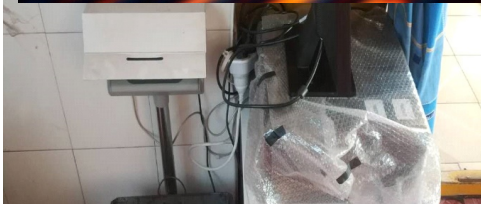
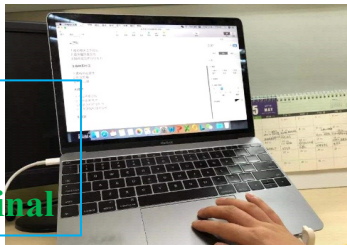
Area sources & unorganized sources



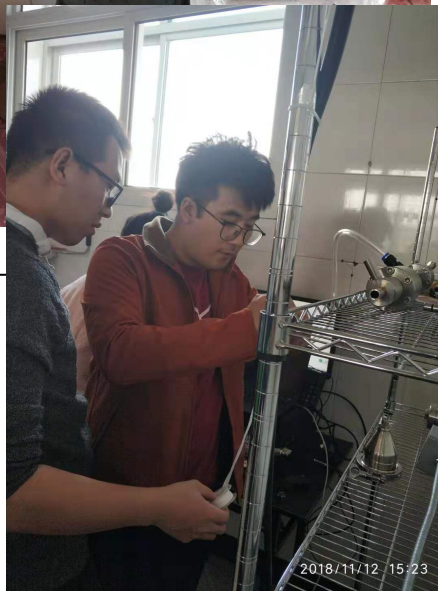
Algorithm for Dynamic Coal Consumption



Real-time coal consumption receiving terminal

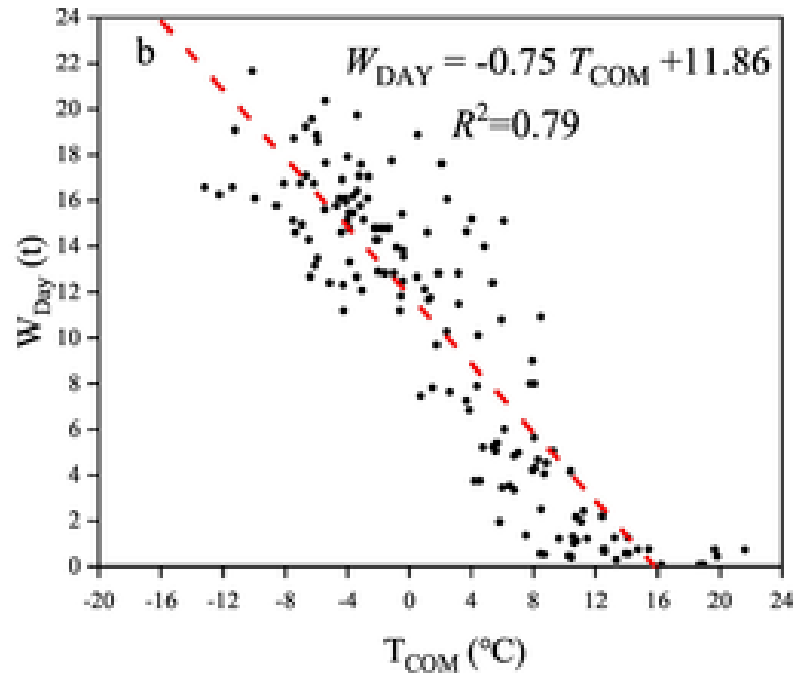
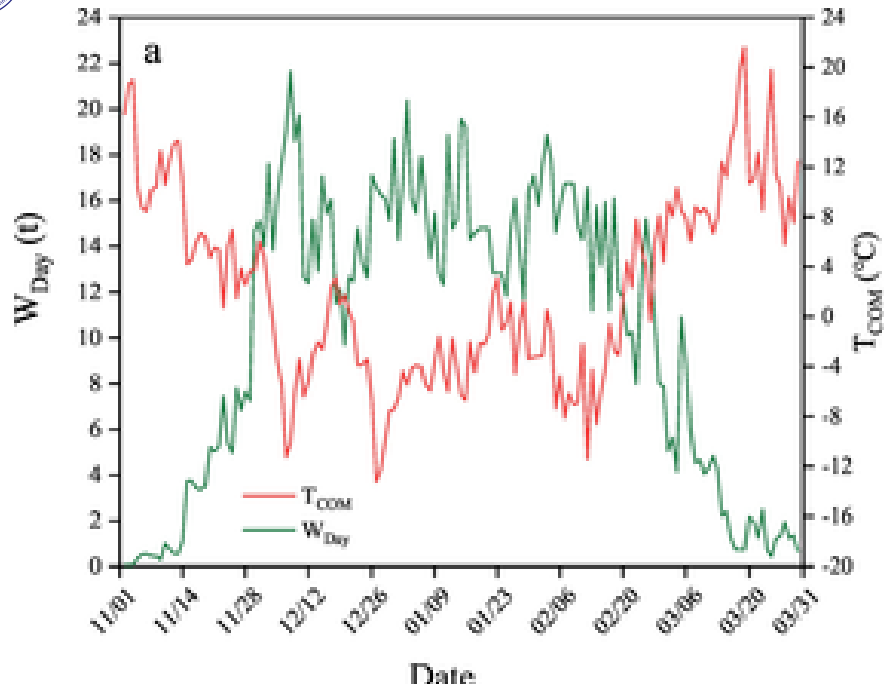


Automatic coal recording and real-time monitoring system





Algorithm for Dynamic Coal Consumption



T_{COM} is composite temperature, which integrates ambient temperature, relative humidity, wind speed and sunshine hours together.

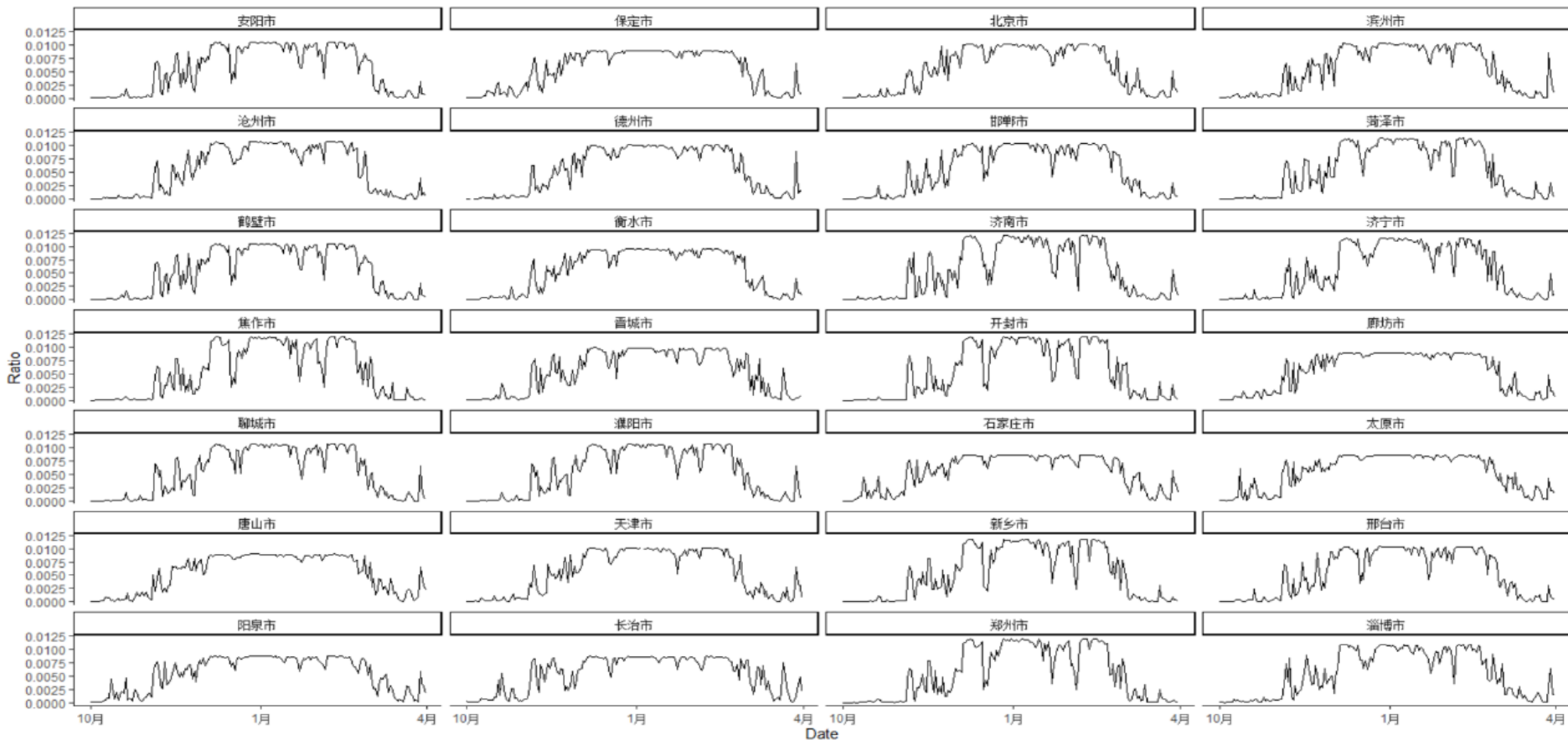
With this relation or algorithm, we can calculate coal consumption every day.



Time Profile of Coal Consumption

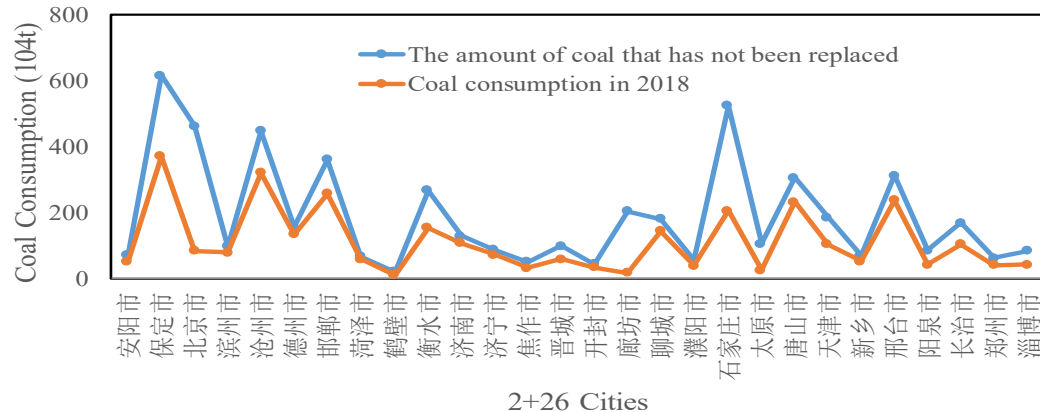
Plot Zoom

- □ ×





Effects: substitute coal with clean energy (gas and electricity)



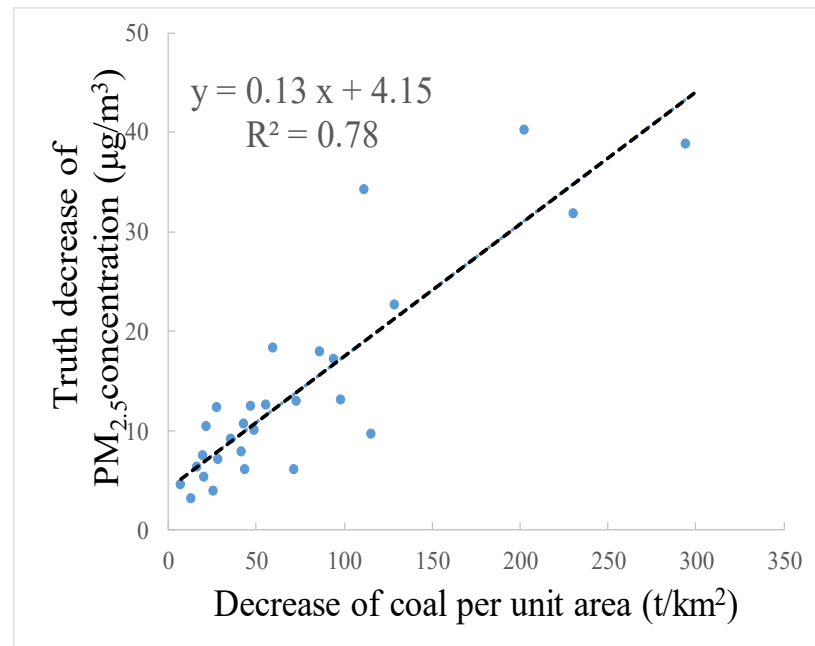
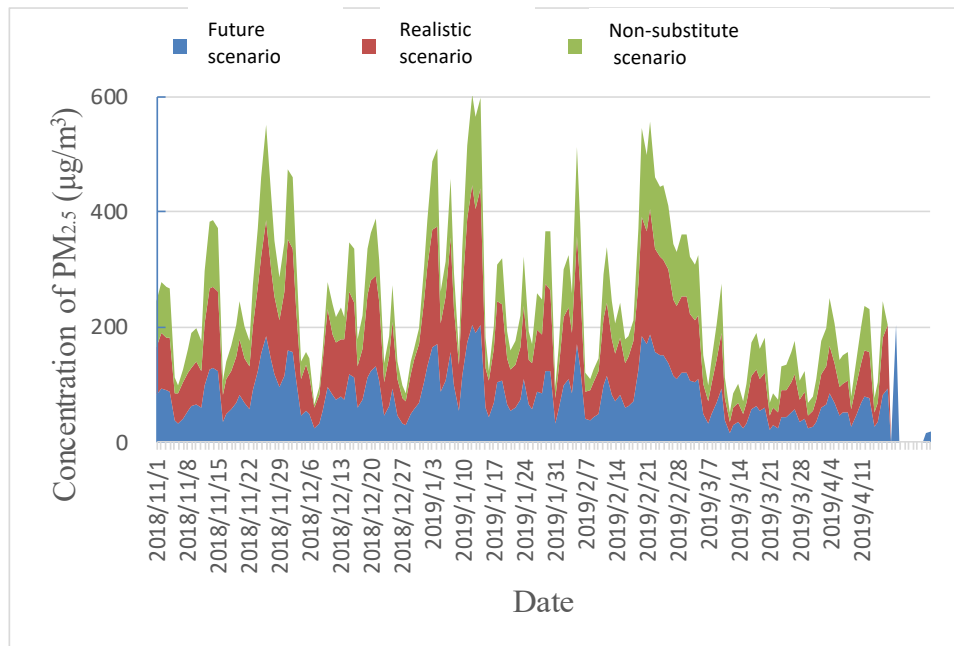
Estimation method:

- **Realistic scenario:** the effects of substitution by the end of 2018
- **Future scenario:** plain area 100% while mountain area 50% substituted
- **Meteorological condition:** same as 2018 to calculate coal consumptions
- **Model:** The third generation of CAMx model which is international with Euler regional air quality grid

By the end of 2018, about **8.6 million households** in "2+26" cities had realized the substitution of coal with clean energy, of which about **65%** were from coal to gas and **35%**, from coal to electricity. From **53 million tons** in 2015 to **31 million tons** in 2018, about a **40% reduction**.



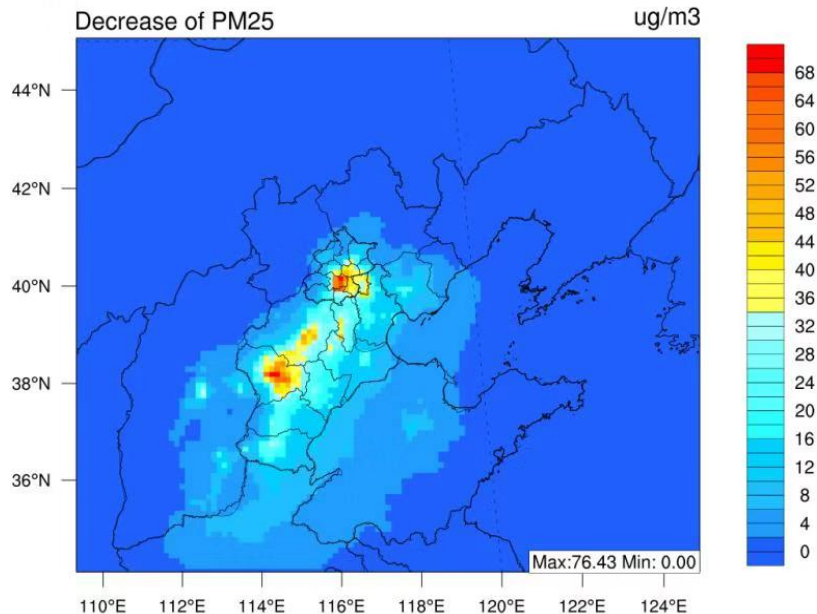
Daily Effects in 2+26 Cities



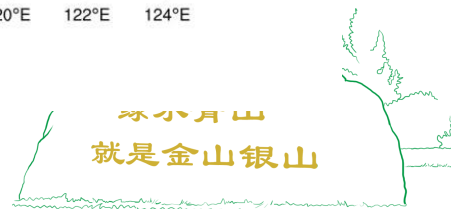
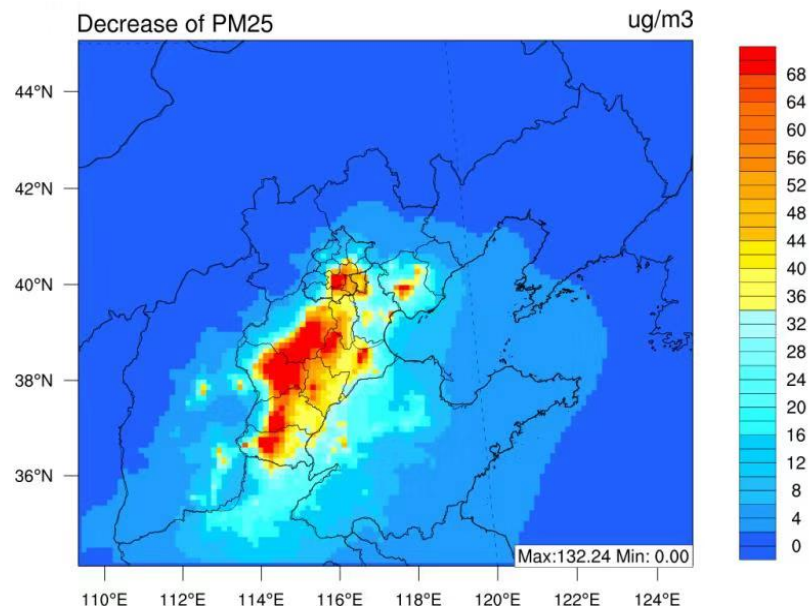


Geographical Distribution of Effects

Realistic scenario

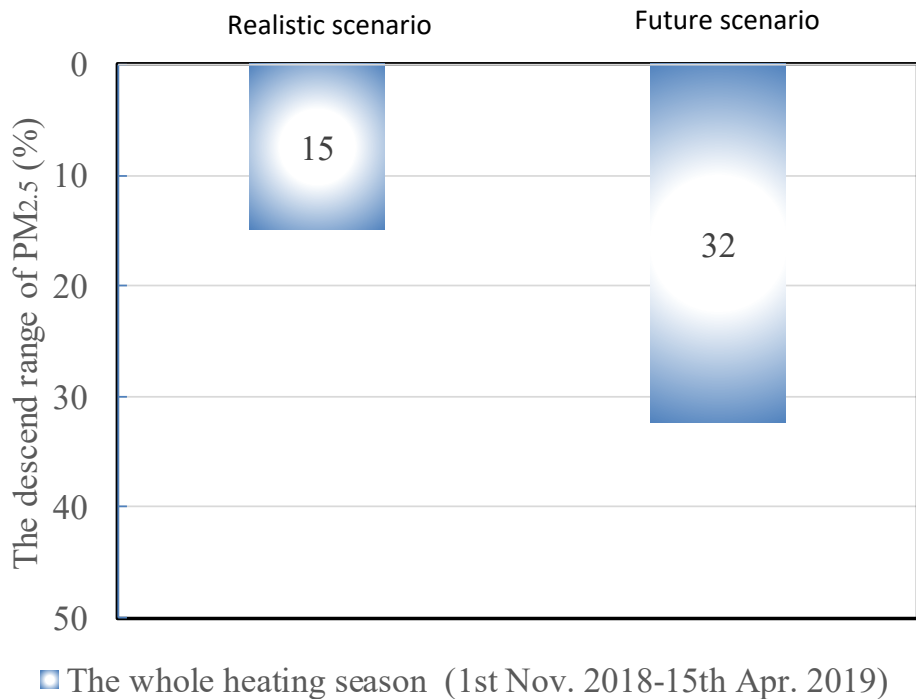


Future scenario





Geographical Distribution of Effects



Clean energy engagement can increase the number of good days while reducing that of heavy pollution.

Scenario	Realistic	Future forecast
Fine weather days up	20	15
Heavy pollution weather days down	6	10

绿水青山
就是金山银山



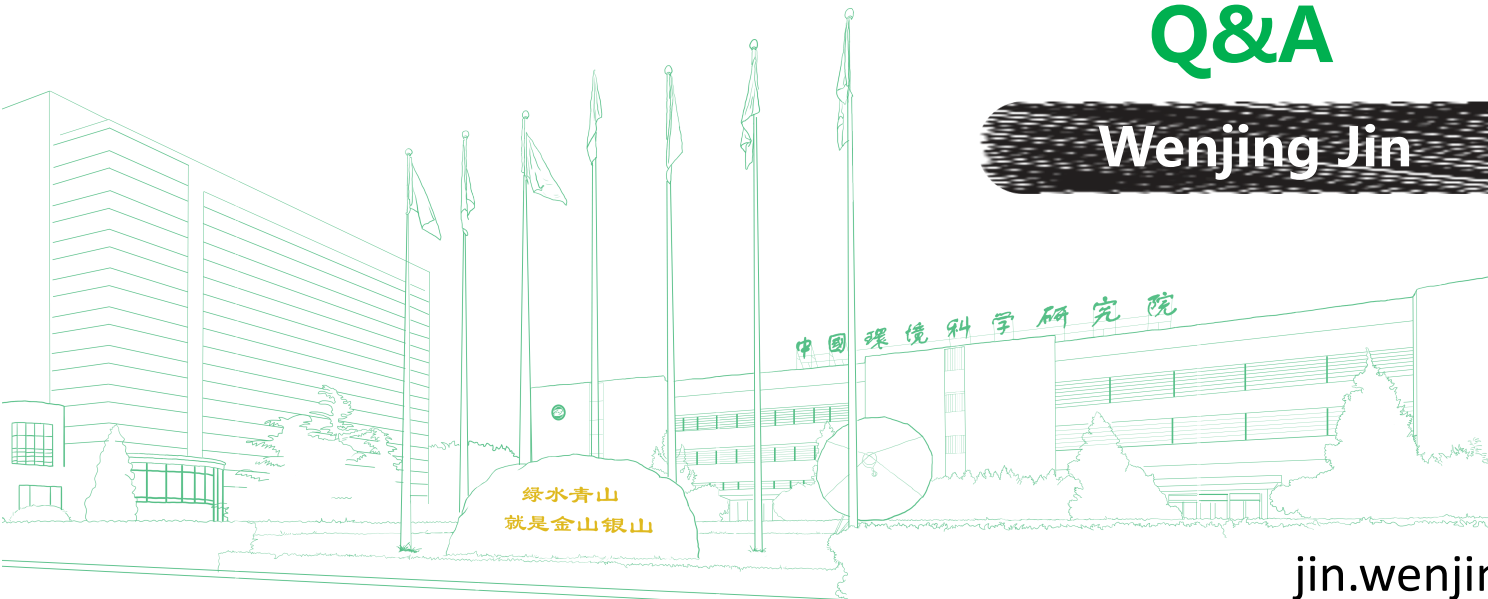
中國環境科學研究院

Chinese Research Academy of Environmental Sciences

Thank you for watching

Q&A

Wenjing Jin



jin.wenjing@craes.org.cn