ChiNorBC project

Scenario WS Summary

A project internal workshop on Scenarios was held on 16. February 2022.
The agenda and presentation are attached.

Zheng Yixuan presented the progress that has been made on output 5. This included status of BC/OC control in China, scenario design and emission projection results.

- Between 2013 and 2019 the GDP grew by 48% and the consumption of energy grew by 15%, while the PM2.5 concentration decreased by 43%
- The scenario design is based on the energy projections and the database of measures. The latter consists of structural adjustments and end of pipe measures.
- The scenarios include Business as Usual (BAU), End of Pipe (EOP) and Ambitious Control (ABC). Based on these scenarios the emissions for four sectors (Power, Industry, Residential and Agriculture) have been projected.
- Amongst others, it is projected that by 2035 energy consumption will have increased 16% compared to 2018. At the same time the share of coal in the energy mix will decrease from 59% in 2018 to 33% in 2035.

The Outputs on AQ and Climate modelling as well as Health made first comments to the scenario data, but work is still in progress.

Chinese-Norwegian Project on Emission, Impact, and Control Policy for Black Carbon and its Co-benefits in Northern China

Agenda for Workshop on "Discussion on Scenario Design and Analysis**"/** Online Big Meeting

Time: 15:00-17:00(CST)/8:00-10:00(CET)
Date: Wednesday 16th Febryary 2022
Zoom Meeting ID: Zoom Meeting ID: 815 2655 3406
Pin code: 123456
Simultaneous translation in Chinese and English online

Time (Beijing time/Olso time)	**Content**	**Speaker**
Moderator: Dr. Cheng Miaomiao, CRAES, China		
16:00-16:30/ 9:00-9:30	Presentation on BC/OC control scenario design and emission projection results	Output 5 Dr. Wang Xuying, CAEP, China
16:30-17:15/ 9:30-10:15	Discussion	
Moderator: Dr. Wang Xuying, CAEP, China		
17:15-17:20/ 10:15-10:20	Status and next plan after receiving the emission projection data: Air quality modelling	Output 3
17:20-17:25/ 10:20-10:25	Status and next plan after receiving the emission projection data: Climate impact modelling	Output 3
17:25-17:30/ 10:25-10:30	Status and next plan after receiving the air quality data: Health effect analysis	Output 4
10:30-11:00	Risk discussion	
AOB		

SCENARIO DESIGN AND EMISSION PROJECTION RESULTS

Xuying Wang

Chinese Academy of Environmental Planning

2022/02/16

Outline

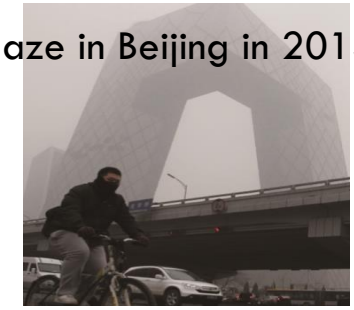
- Background： status on BC/OC control in China
- Scenario design: framework, principle and measure packages
- Emission projection: results and discussion

Clean air policy in China since 2013

Severe air pollution

- **Severe haze pollution in China has been a serious environmental and social problem and is attracting numerous attention**

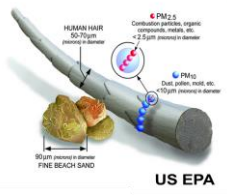
Haze in Beijing in 2013

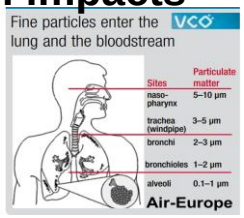


Haze in Shanghai in 2013

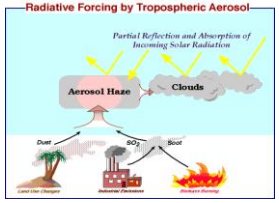
Visibility

Health impacts





Climate



The Action Plan

To address severe air pollution issues and protect public health, China introduced a series of clean air policy:

- **In Sep 2013, the state council of China promulgated the "*Air Pollution Prevention and Control Action Plan*" (the *Action Plan*, 2013-2017)**
- **In July 2018, the state council of China promulgated the "*Three-Year Plan on Defending the Blue Sky*" (2018-2020)**

Main measures attaining benefits of BC control

- 1. Coal fired boiler control
- 2. Clean heating campaign

Coal combustion

- 3. Transportation structure adjustment
- 4. Vehicle pollution control

Mobile sources

- 5. Backward capacity elimination
- 6. Strengthened industrial emission standards

Industrial sources

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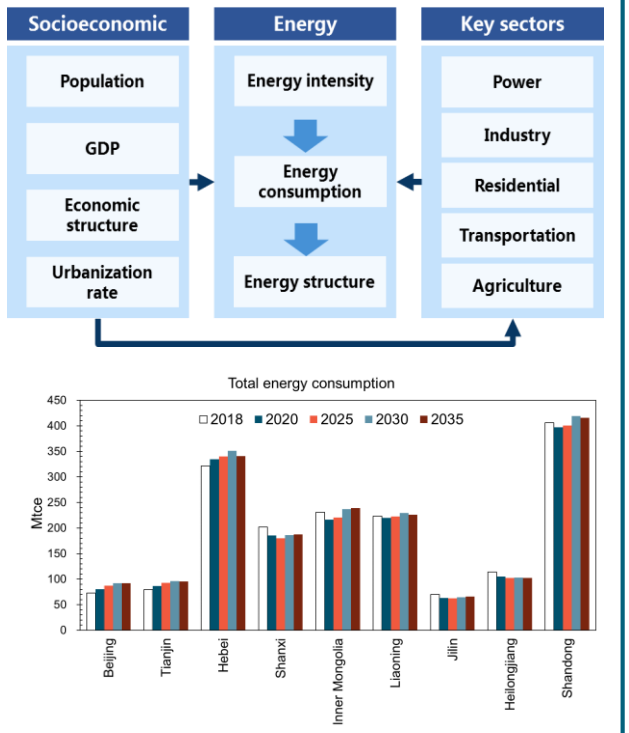
Analysis framework

Energy Projection



Measures Database

Structural adjustment

- Energy structure
- Industrial structure
- Transportation structure

End of pipe control

- Best available technology
- Ultralow emission retrofit
- Special emission limits
- In-depth control

Scenario Design

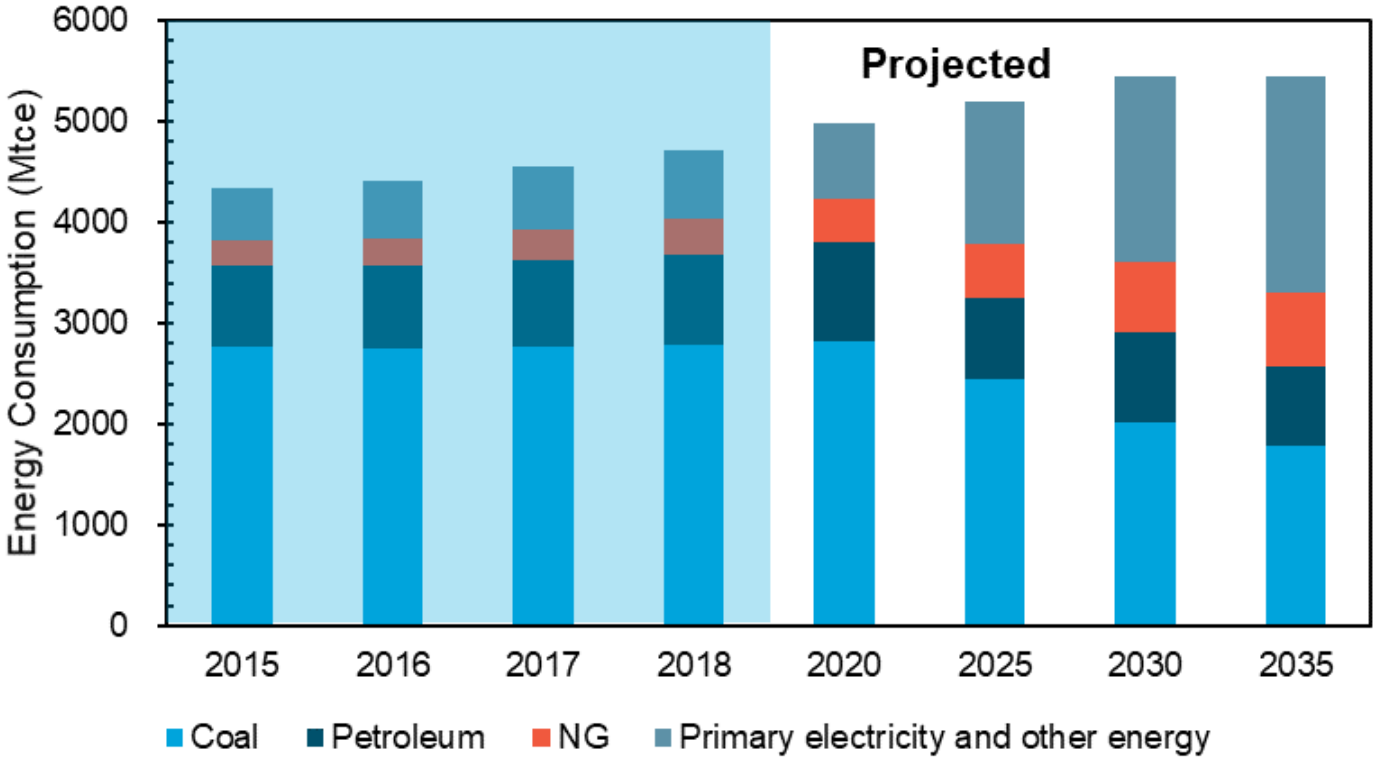
Control measure packages

- BAU
- EOP
- ABC

Emission Projection

- Emissions under BAU
- Emissions under EOP
- Emissions under ABC

Projected national energy consumption



- Total energy consumption in China is projected to keep increasing
- National energy consumption in 2035 in projected to be 16% higher than the 2018 level.

Design principle

- **BAU(business as usual)**

  no more new end of pipe control policy get adopted, control intensity maintain current level.

  Activity rate: change based on the result of energy consumption projection.

  Efficiency: no change considered.

- **EOP(strengthened end of pipe control)**

  strengthened end of pope control policy get adopted.

  Activity rate: change based on the result of energy consumption projection.

  Efficiency: change by implementing best available technologies (BAT)

- **ABC(ambitious control by strengthening both end of pipe control and structural adjustment)**

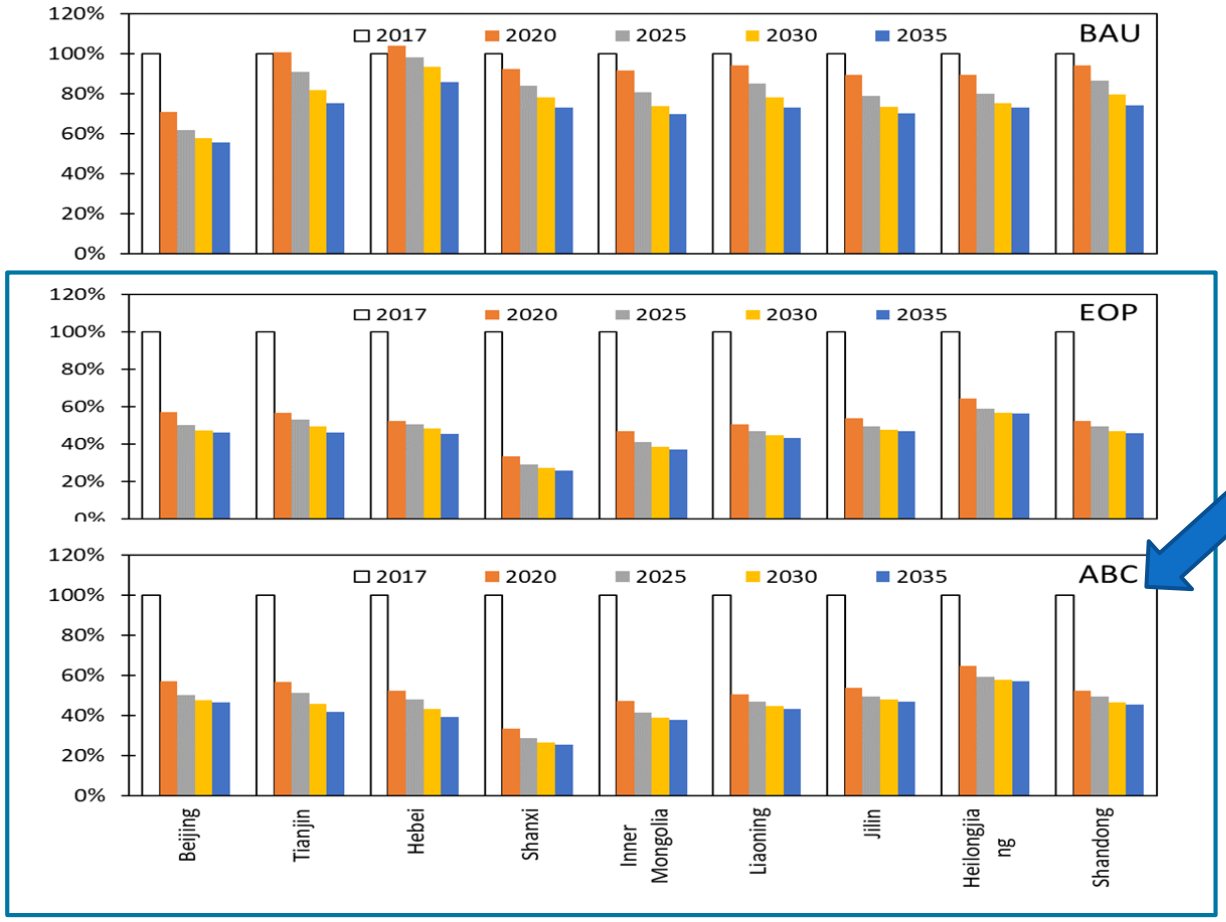
  both strengthened EOP control and more ambitious structural adjustment policy get adopted.

  Activity rate: reduce the capacity and activity rate of heavy polluting industries in areas where those industries are concentrated

  Efficiency: change by implementing BAT

Updates on measure packages: minor changes for ABC scenario

Emission projection results of previous presented version



Have made minor changes for ABC scenario:

- **Include more heavy polluting sectors while choosing structural adjustment measures (e.g., iron and steel, cement, residential coal)**

Outline

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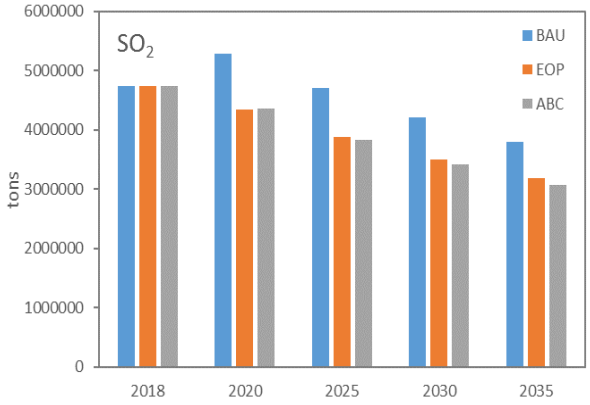
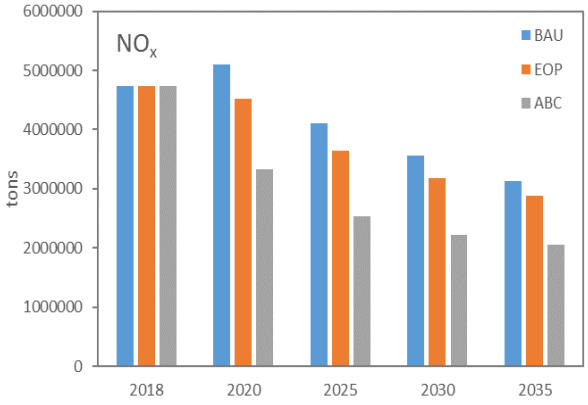
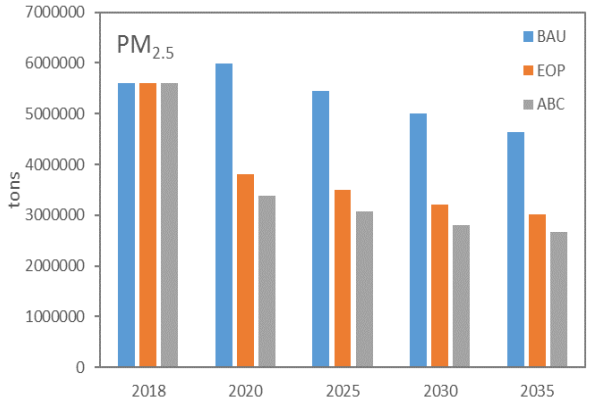
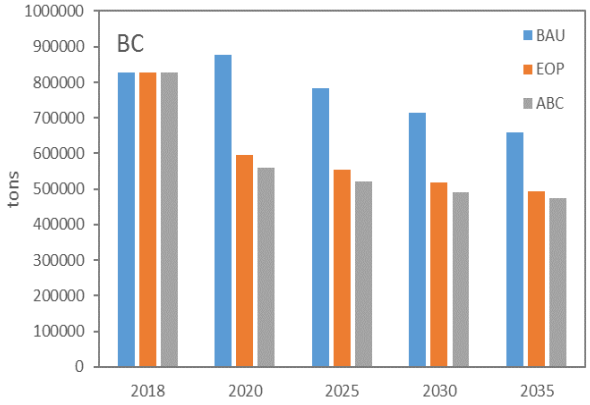
- Emission projection: results and discussion

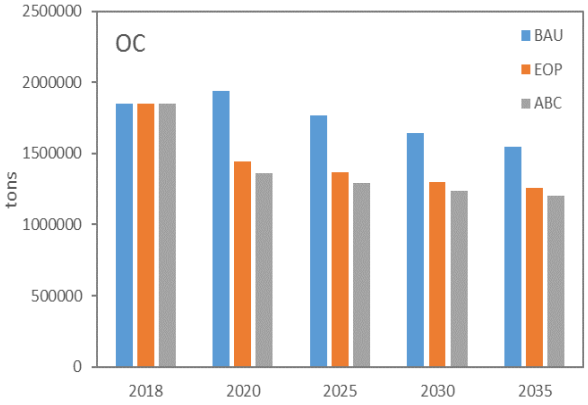
Results: Projected emissions of 2020-2035 for northern China





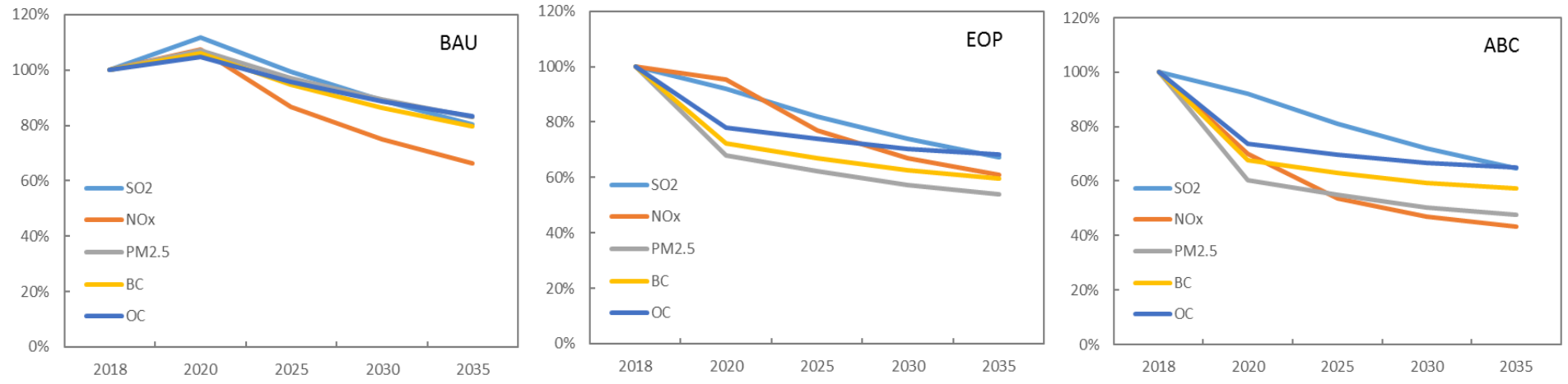






Comparison and discussion: changes by time

Normalized emission changes from 2018 to 2035 for different scenarios:

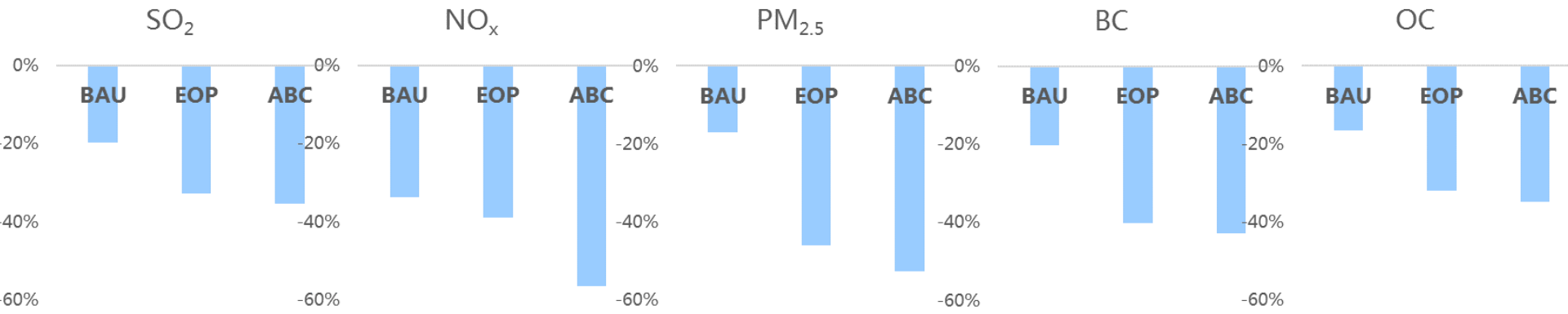


1) Emissions will rise in 2020 then decrease afterwards under BAU due to the similar change trend of projected activity levels, while emissions will keep decrease from 2018 to 2035 under EOP and ABC

2) For all major pollutants during 2018-2035, the emission reduction percentage: ABC>EOP>BAU

Comparison and discussion：reductions by 2035

Emission reduction percentages by 2035 for different pollutants under different scenarios：

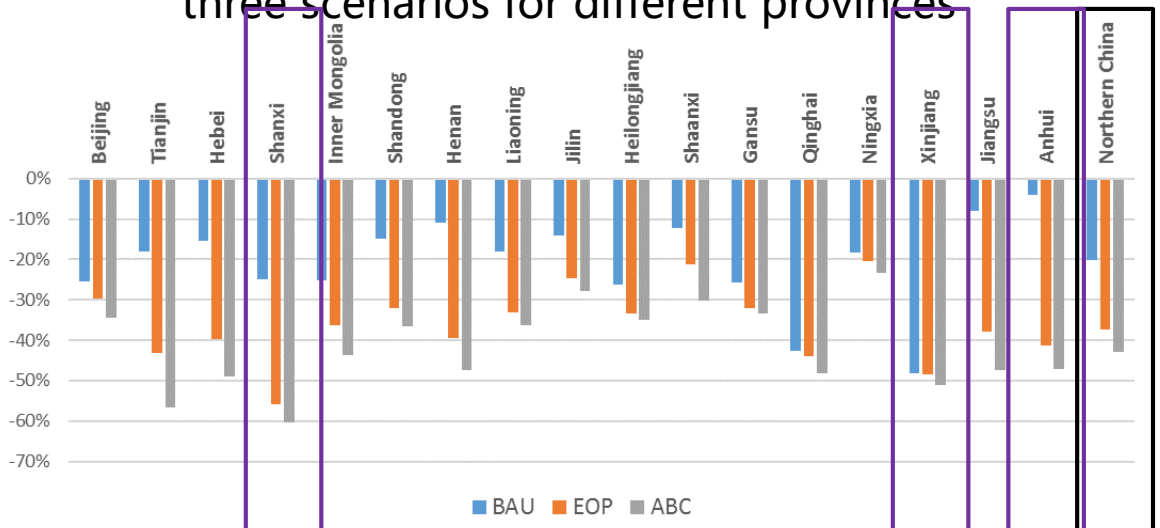


Mitigation potentials of different scenario: By 2035, emissions of major air pollutants (SO_2, NOx, $PM_{2.5}$, BC, OC) will reduce by:

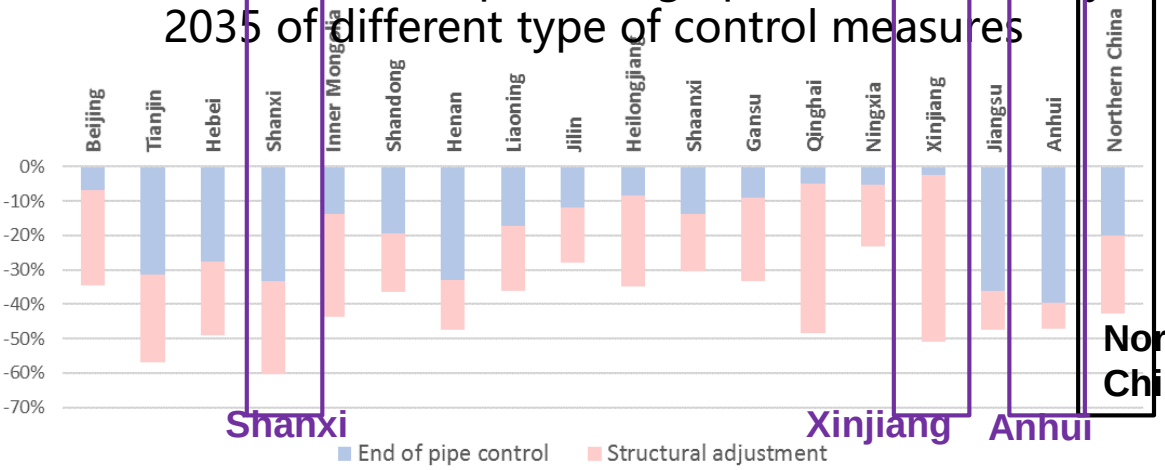
- BAU: ~17-34% ➡ Indicating activity changes and energy structure adjustment will have significant emission reduction effect.
- EOP: ~32-46% ➡ Indicating strengthened end of pipe control measures (especially for primary PM2.5, BC and OC) still will have remarkable emission reduction effect.
- ABC: ~35-57% ➡ Indicating strengthened structure adjustment measures will have considerable emission reduction effect.

Comparison and discussion: changes by province

Emission reduction percentages of BC by 2035 of the three scenarios for different provinces



Emission reduction percentage potentials of BC by 2035 of different type of control measures



Shanxi

Xinjiang

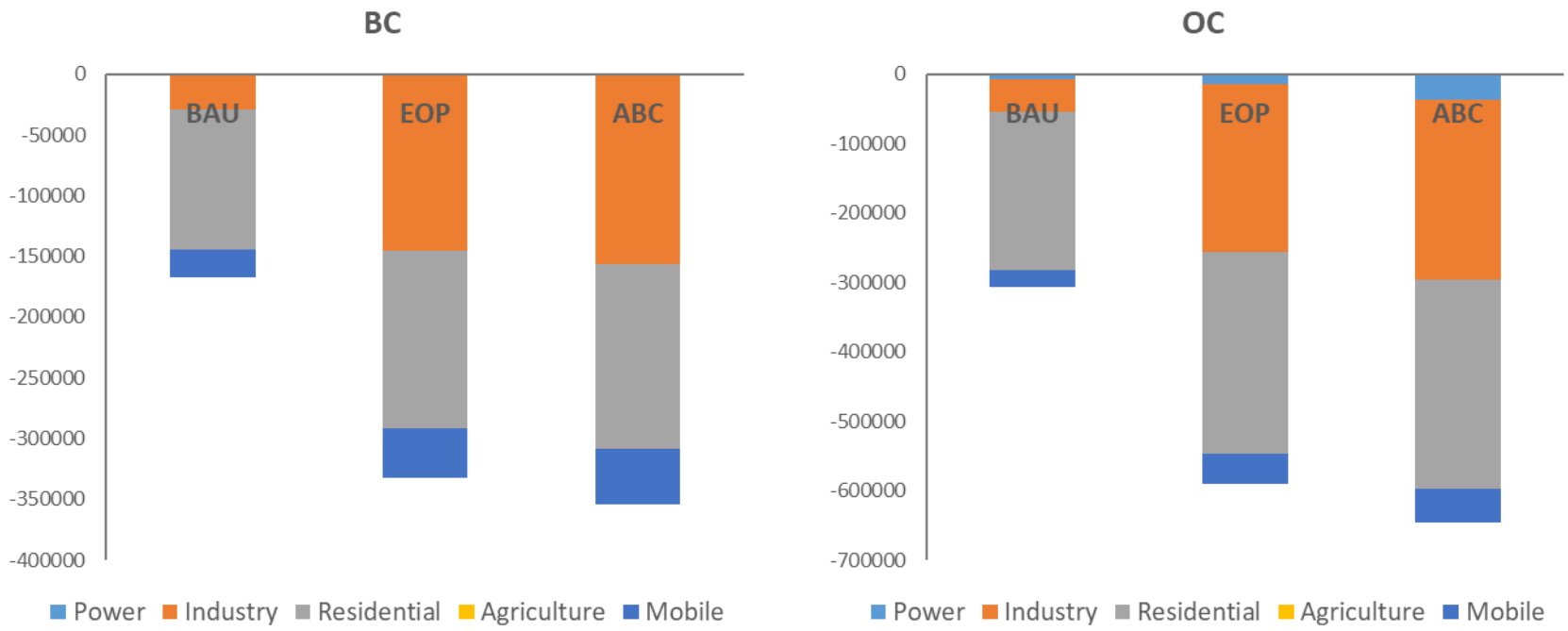
Anhui

Northern China

- For **northern China,** BC emission reduction potentials of end of pipe control and structural adjustment are both important.
- For different provinces, BC emission reduction potential varies, where: **Shanxi** has the largest total reduction percentage potential; **Anhui** has the largest reduction percentage potential in end of pipe control ; **Xinjiang** has the largest reduction percentage potential in structural adjustment.

Comparison and discussion：contributions by sector

Emission reductions by sector of BC, OC for northern China during 2018-2035 under different scenario

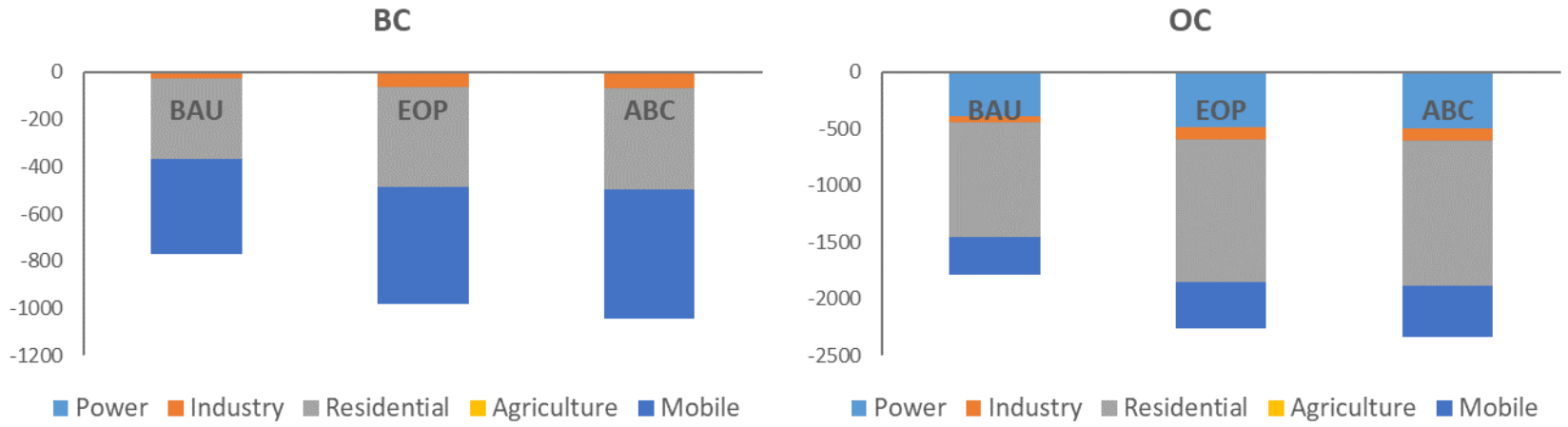


Residential sector will be the most important sector for both BC and OC reduction of northern China under BAU; while residential and industry will be both important for BC and OC reduction under EOP and ABC.

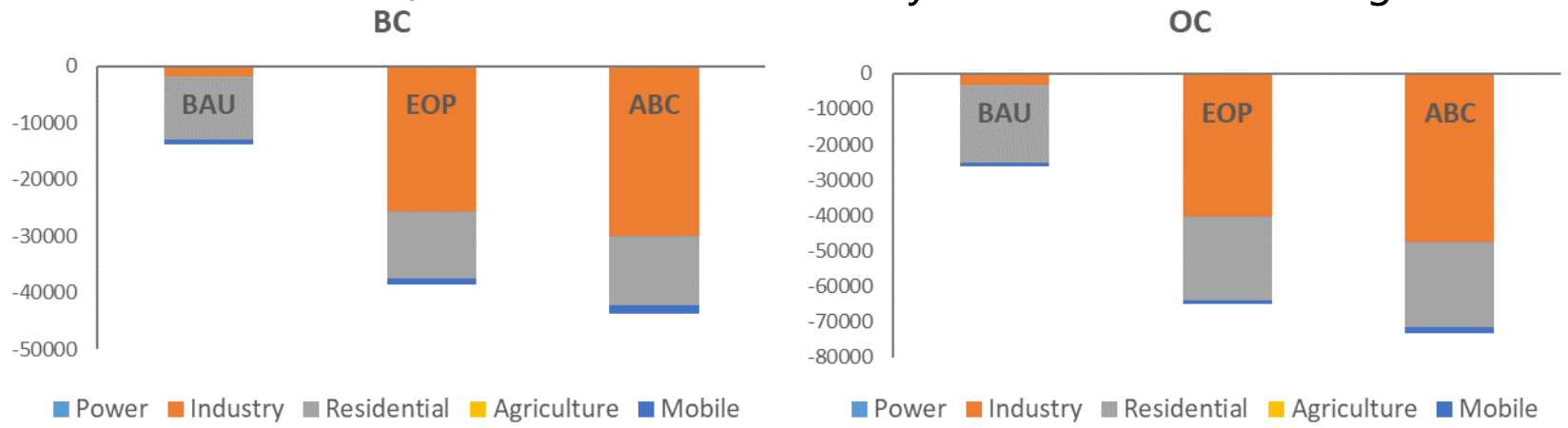
Indicating: residential and industry contribute major emission reduction potential.

Comparison and discussion: contributions by sector

Contributions of BC/OC emission reduction by sector for Beijing during 2018-2035

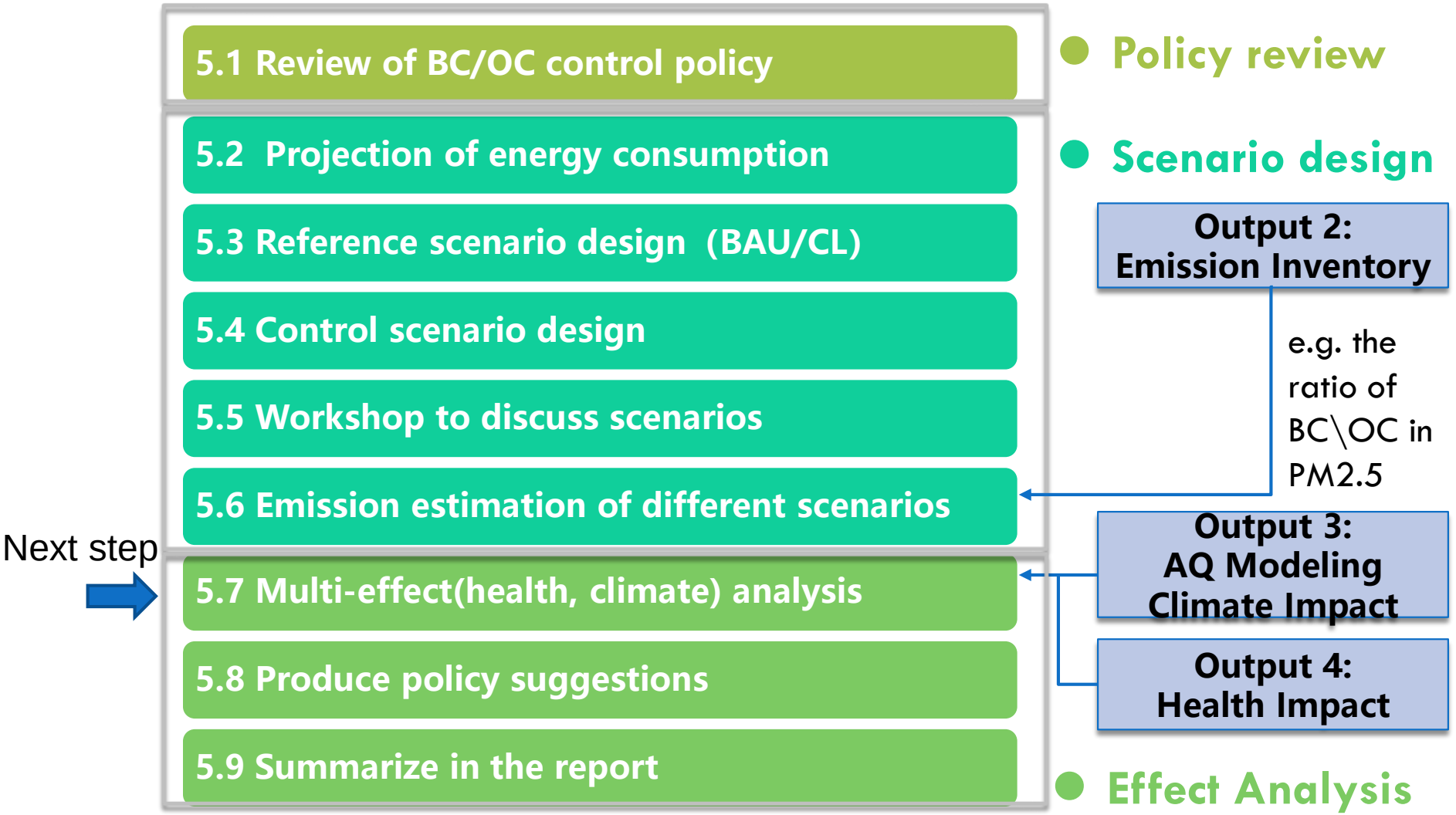


Contributions of BC/OC emission reduction by sector for Hebei during 2018-2035



Contribution of emission reduction by sector varies for different provinces due to the variations in industrial structure and baseyear emission.

Connection between output5 and other outputs



Thanks for your attention !

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