

Low-carbon Path of China: economic and energy composition transition scenario of 2030

Mao Xianqiang

Center for Global Environmental Policy, Beijing Normal University
School of Environment, Beijing Normal University

[Email: maoxq@bnu.edu.cn](mailto:maoxq@bnu.edu.cn)

China's INDC Commitment

- In 2009, China committed that, by 2020, CO₂ emission per unit GDP will be reduced by 40-50% compared with 2005, and the proportion of non-fossil fuel energy in total will be improved to 15%
- In 2015, China announced the 2030 target: CO₂ emission will peak around 2030, CO₂ emission per unit GDP will be reduced by 60-65% compared with 2005, and the proportion of non-fossil fuel energy in total will be improved to 20%

Sourced from :强化应对气候变化行动——中国国家自主贡献 (全文)

<http://www.scio.gov.cn/xwfbh/xwfbh/wqfbh/2015/20151119/...>

How well have China's Recent Five-Year Plans Been Implemented?

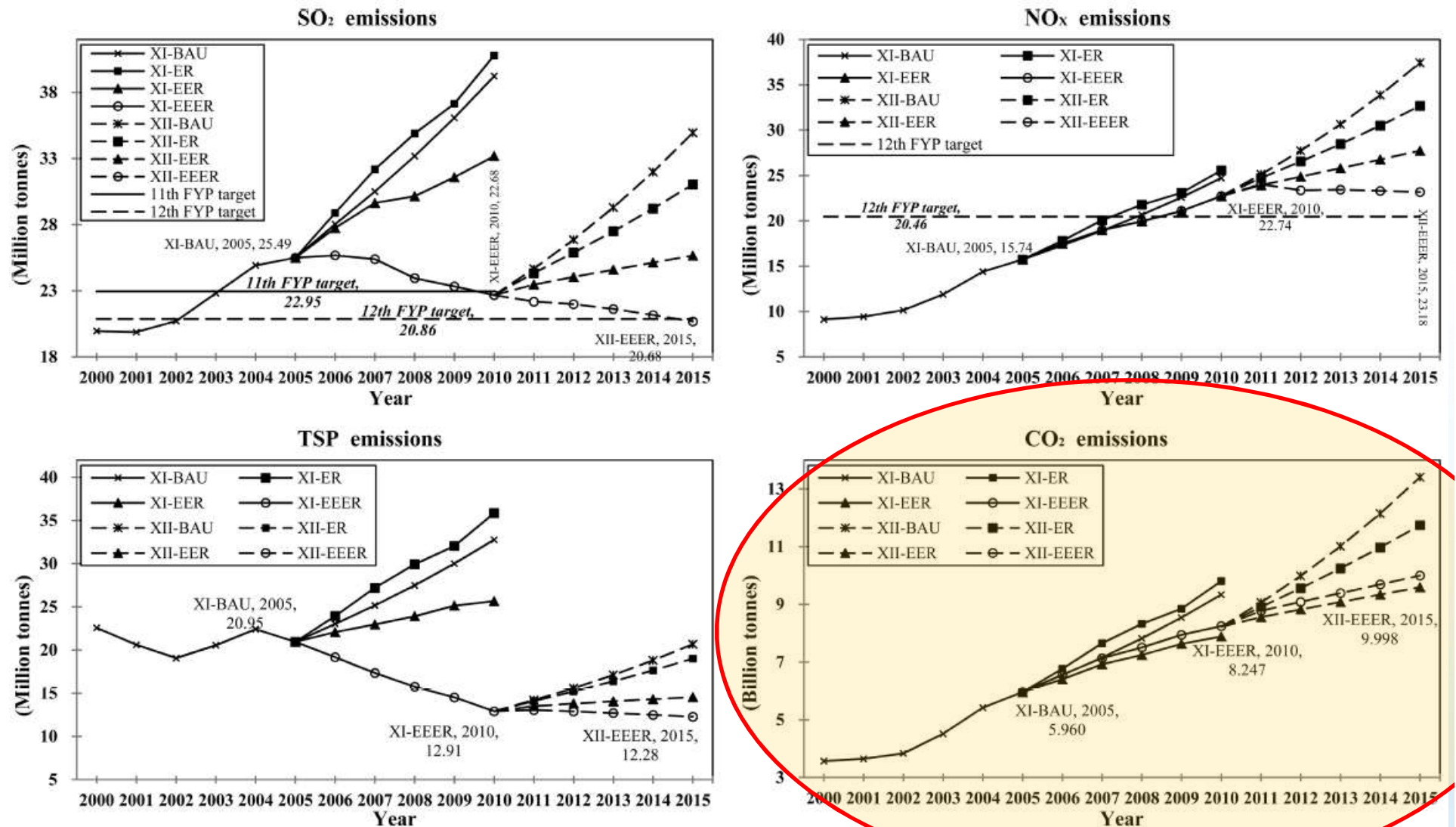
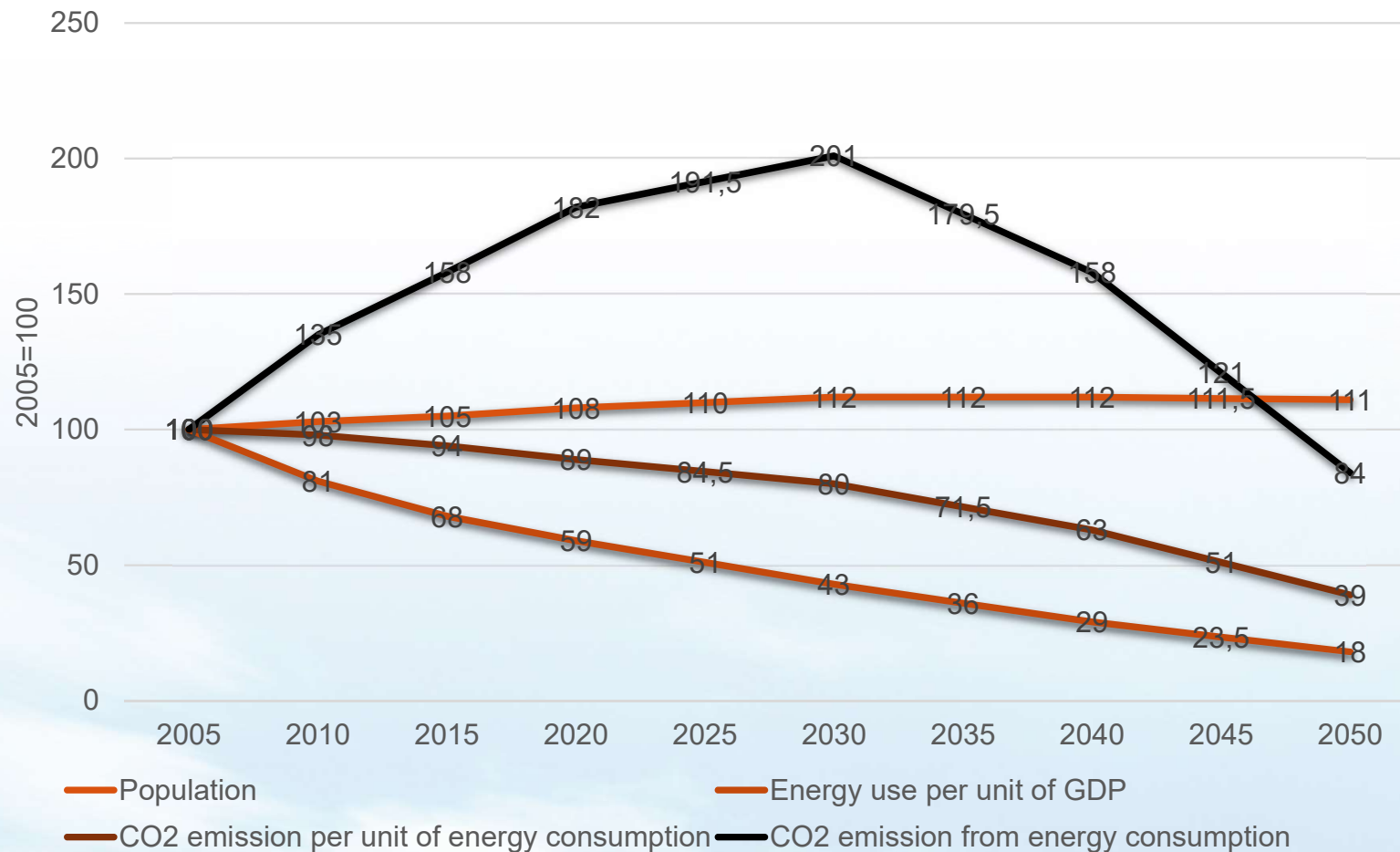


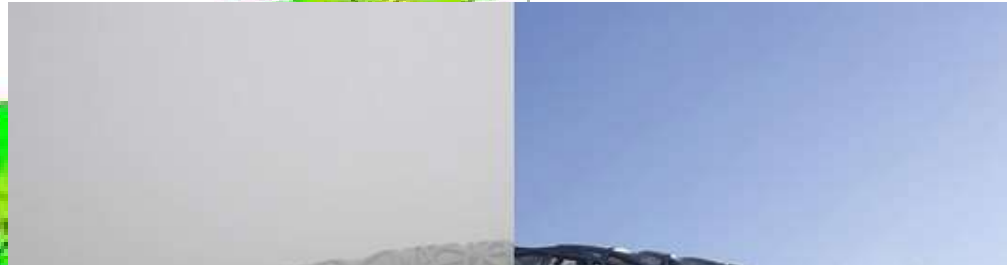
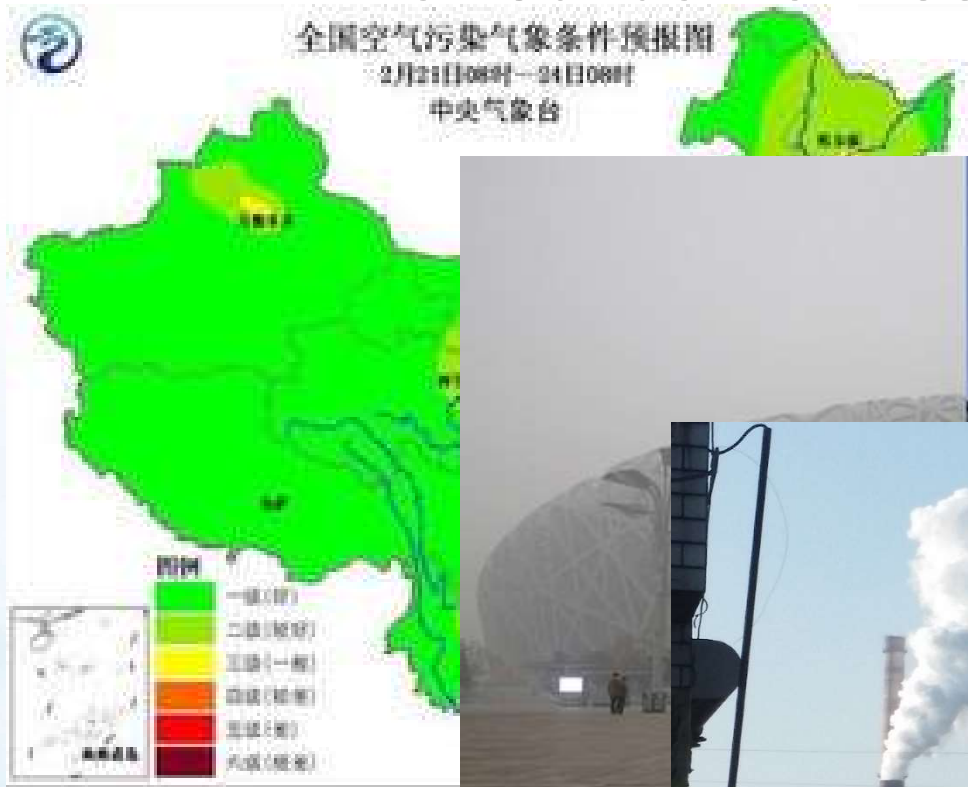
Figure 1. Effects of 3E policies on pollutants emission.

Carbon emission: a projection to the 2050



Quoted from: 傅莎, 邹骥, 刘林蔚. 2015. 对中国国家自主贡献的几点评论, 国家气候战略中心 <http://files.ncsc.org.cn/www/201512/20151209223357340.pdf>

Air pollution reduction is more urgent to China as an important sustainable development goal which has large Co-benefit of Carbon emission reduction



China's Recent Actions

- National Plan on Coping with Climate Change (2014-2020)
- 13th Five-year Plan of Ecological and Environmental Protection
- “Energy Conservation and Emissions Reduction Scheme for the 13th Five-year Plan
- National carbon market to be initiated this year
- Low-carbon city pilot program
- Local level plans and programs
- Etc.

Air quality target set for 2030

emissions reductions required to reach the national air quality improvement targets

Pollutants	SO ₂	NO _x	PM _{2.5}	NH ₃	VOC	CO ₂
reduction ratio (taking 2012 as 1)	51%	64%	53%	0%	21%	N/A

Local pollutant emission targets are based on report of Chinese Academy of Engineer:

郝吉明,尹伟伦,岑可法.《中国大气PM_{2.5}污染防治策略与技术途径》[M].北京:科学出版社,2016.

Scenario Design for economic development and policy intervention

GDP growth

13th Five Year Plan (2016-2020): **6.5%**

14th Five Year Plan (2021-2025): **5.0%**

15th Five Year Plan (2026-2030): **3.5%**

technical progress

Primary factors of production that drive economic development: **investment, labor and overall labor productivity (1.5% increase per year).**

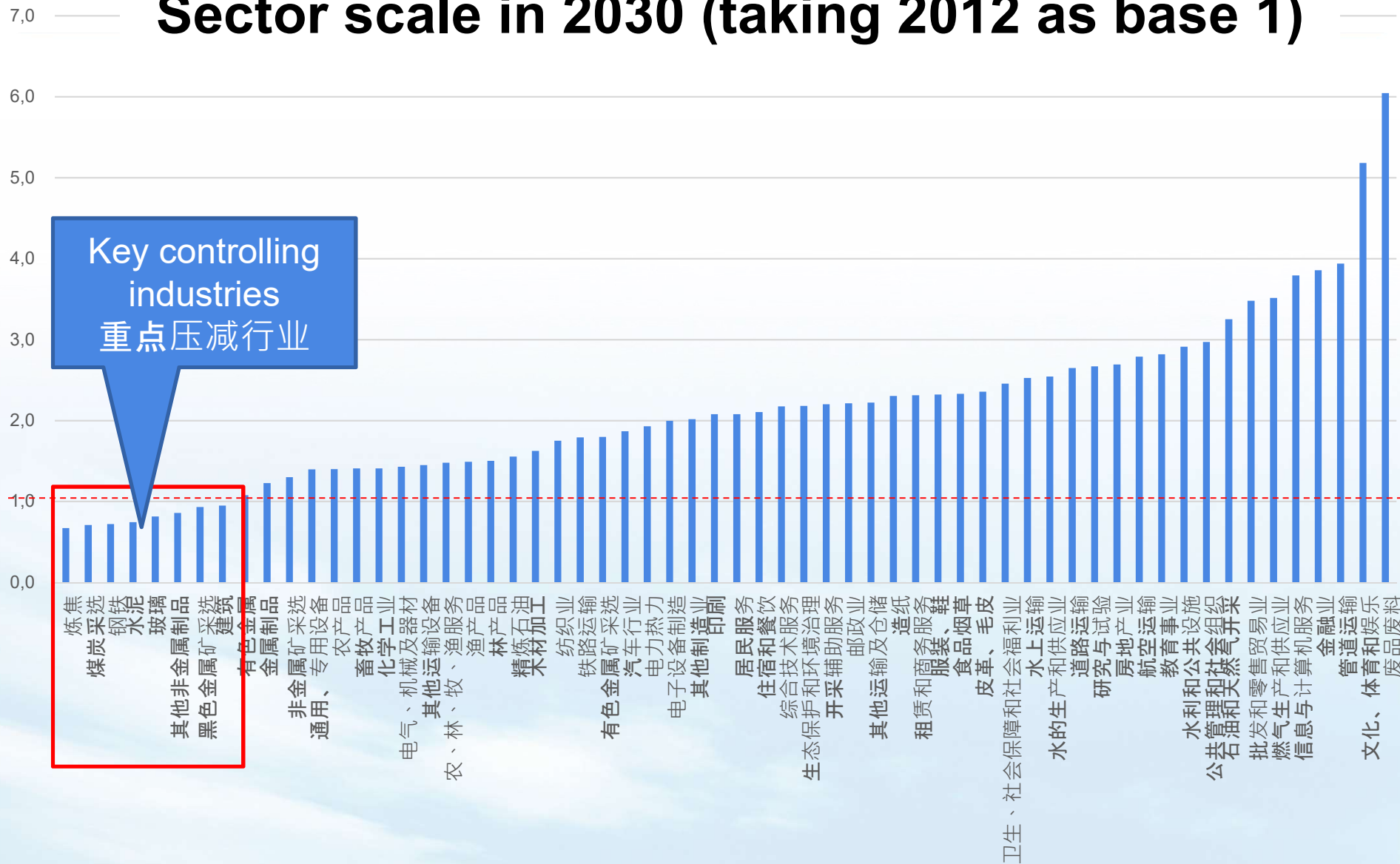
Stronger Policy intervention

Economic instruments
+
Command and Control (standard setting, ban, etc.)

Emission intensity reduction

Emission intensity will decrease by 30% in 2030 compare with that in 2012.

Sector scale in 2030 (taking 2012 as base 1)



Low carbon transformation path in the near future (2012 - 2030)

- Change rates of industry sector scale relative to 2012:

Shrinkage sectors:

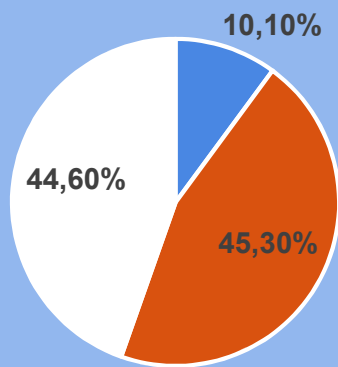
- Coking -33%
- coal -29%
- iron and steel -28%
- cement -26%
- Glass -19%
- other nonmetal mineral product :-14%

Etc.

Expansion sectors:

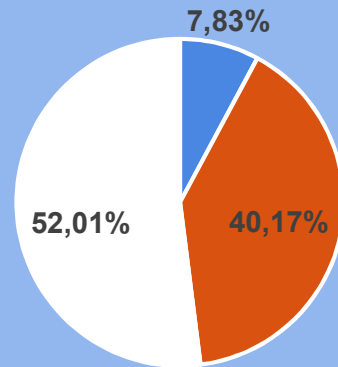
- cultural and entertainment +418%
- finance +285%
- information & software service +279%
- chemical refinery +41- 55%
- nonferrous metals +8%
- Etc.

Low carbon transformation path (2012-2030)



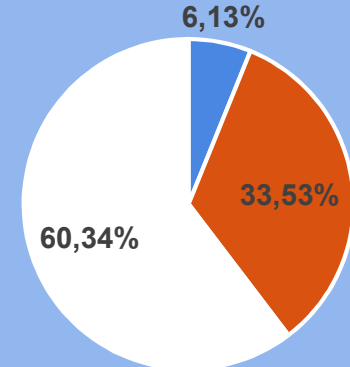
■ primary industry
■ secondary industry
■ tertiary industry

(2012)



■ primary industry
■ secondary industry
■ tertiary industry

(2020)



■ primary industry
■ secondary industry
■ tertiary industry

(2030)

Macro Economic Structure

consumption of fossil energy in 2030

(10,000 ton)

	coal	coke	Natural gas (10^8 m ³)	fuel oil	gasoline	kerosene	diesel
2030	260061	23764	5649	5016	13496	2988	14745
2020	340178	33243	3216	4239	11211	2685	15657
2012	331440	36737	1156	3139	6594	1869	15214

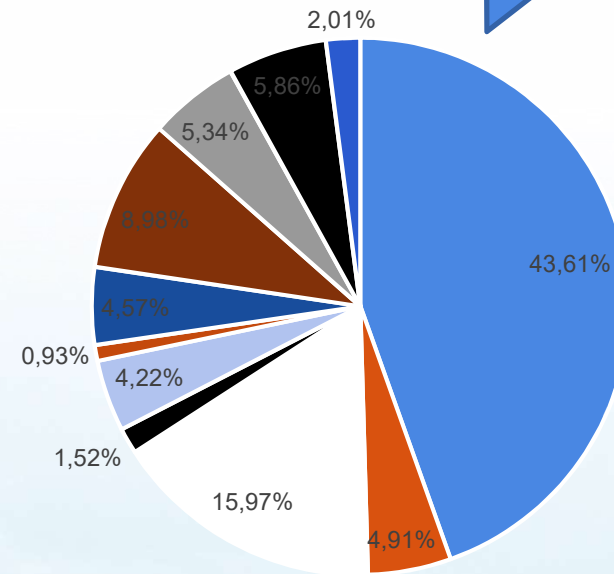
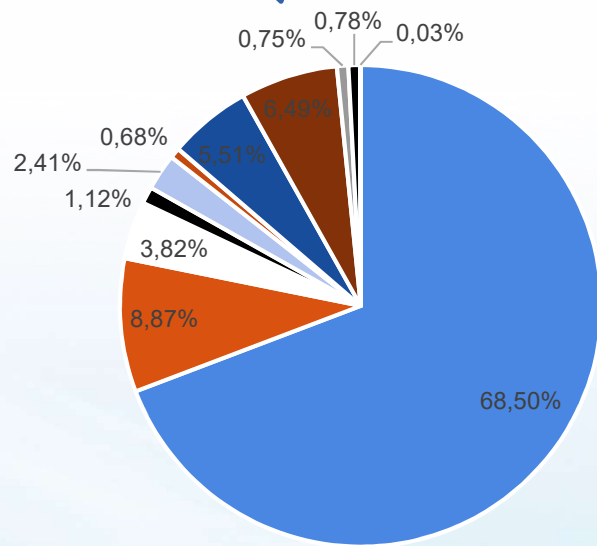
use of clean energy in 2030 10^8 kWh

	Hydropower	nuclear power	Wind power	Photovoltaic power
2030	14876	8843	9706	3334
2020	12743	4297	4699	1446
2012	8556	983	1030	36

Energy structure

4.02 Billion tce

4.74 Billion tce



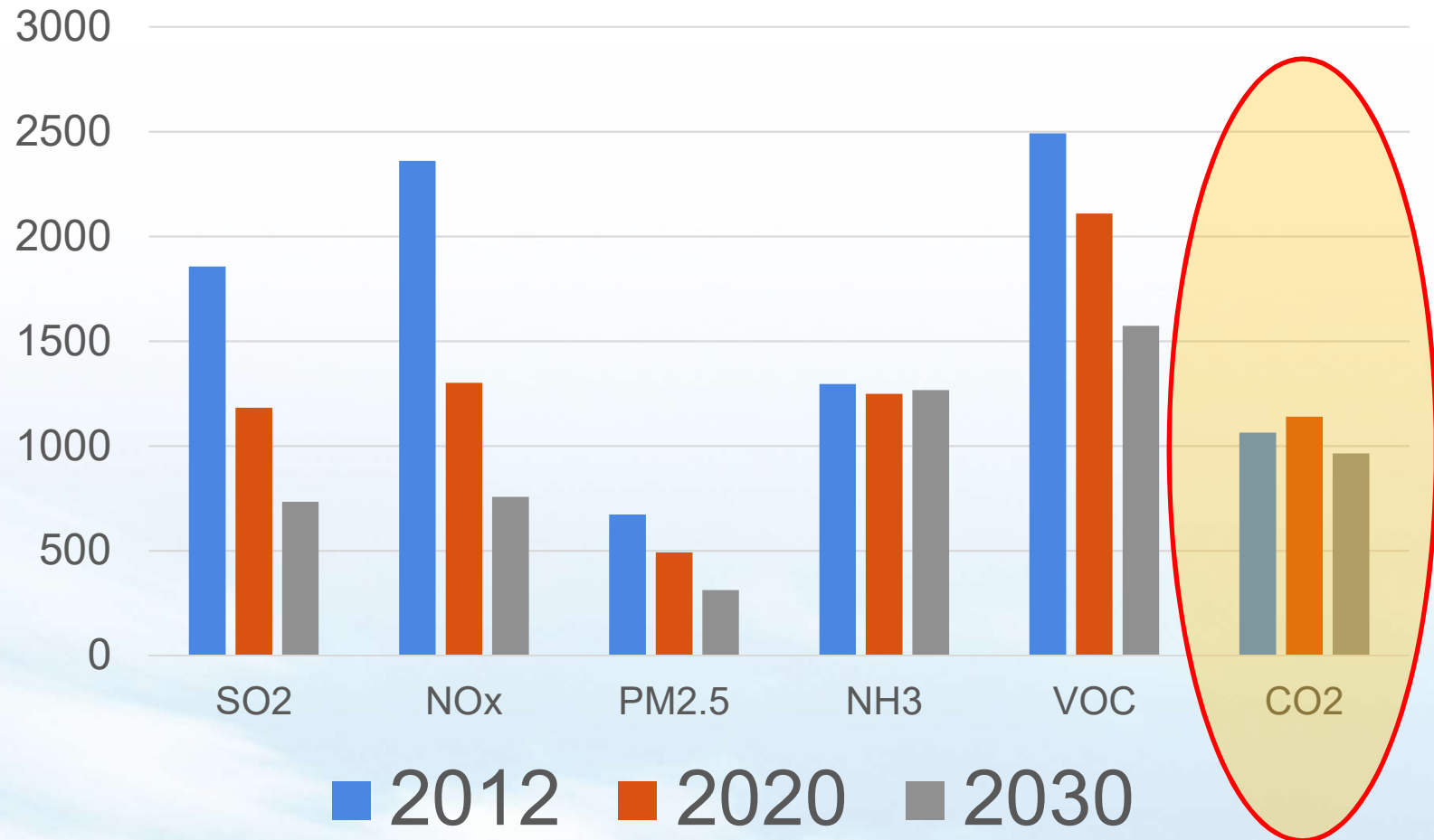
- coal
- fuel oil
- diesel
- wind power
- coke
- gasoline
- hydropower
- Photovoltaic power
- gas
- kerosene
- nuclear power

- coal
- fuel oil
- diesel
- wind power
- coke
- gasoline
- hydropower
- Photovoltaic power
- gas
- kerosene
- nuclear power

2012

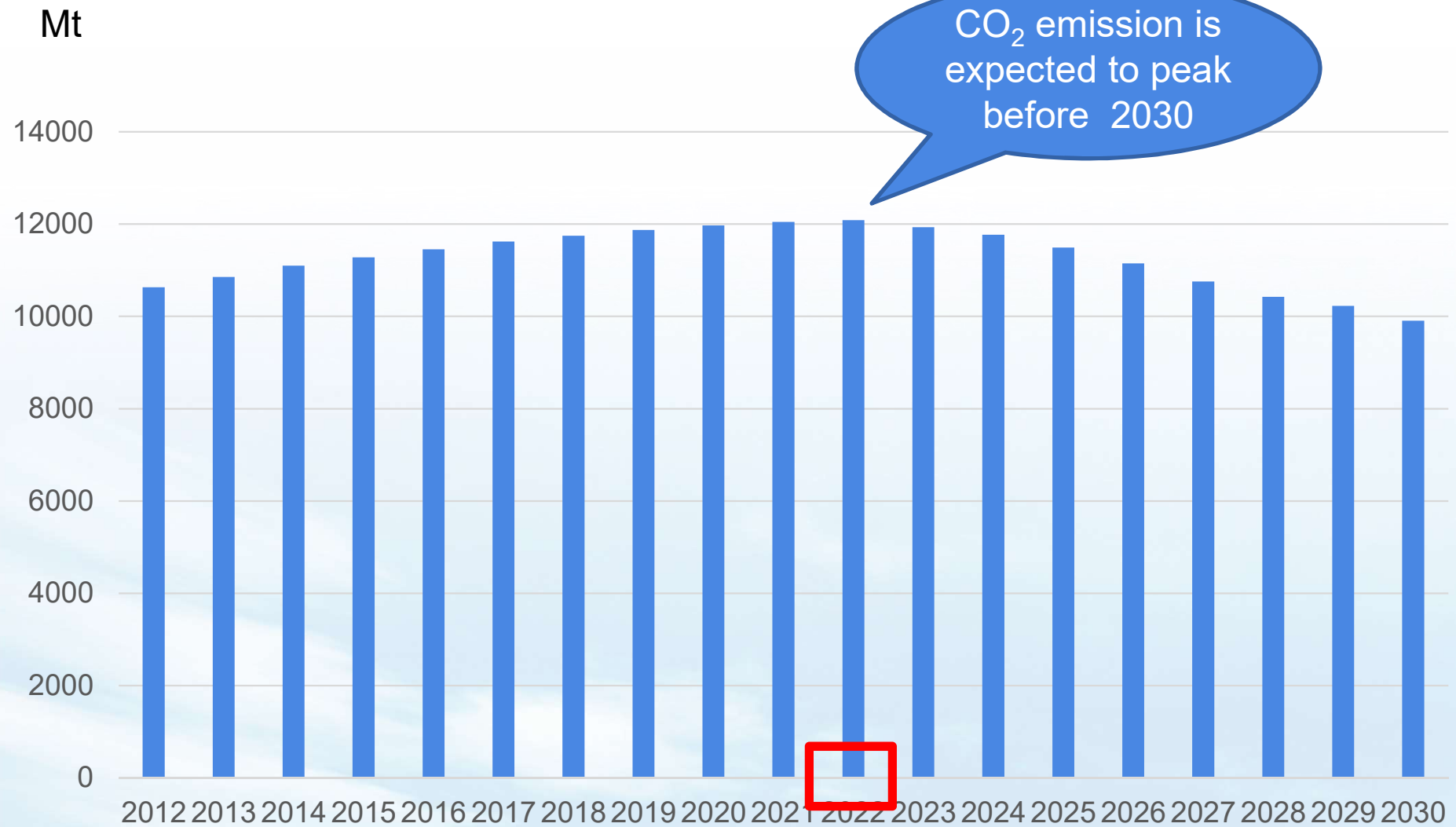
2030

Pollutants and CO₂ emissions in China

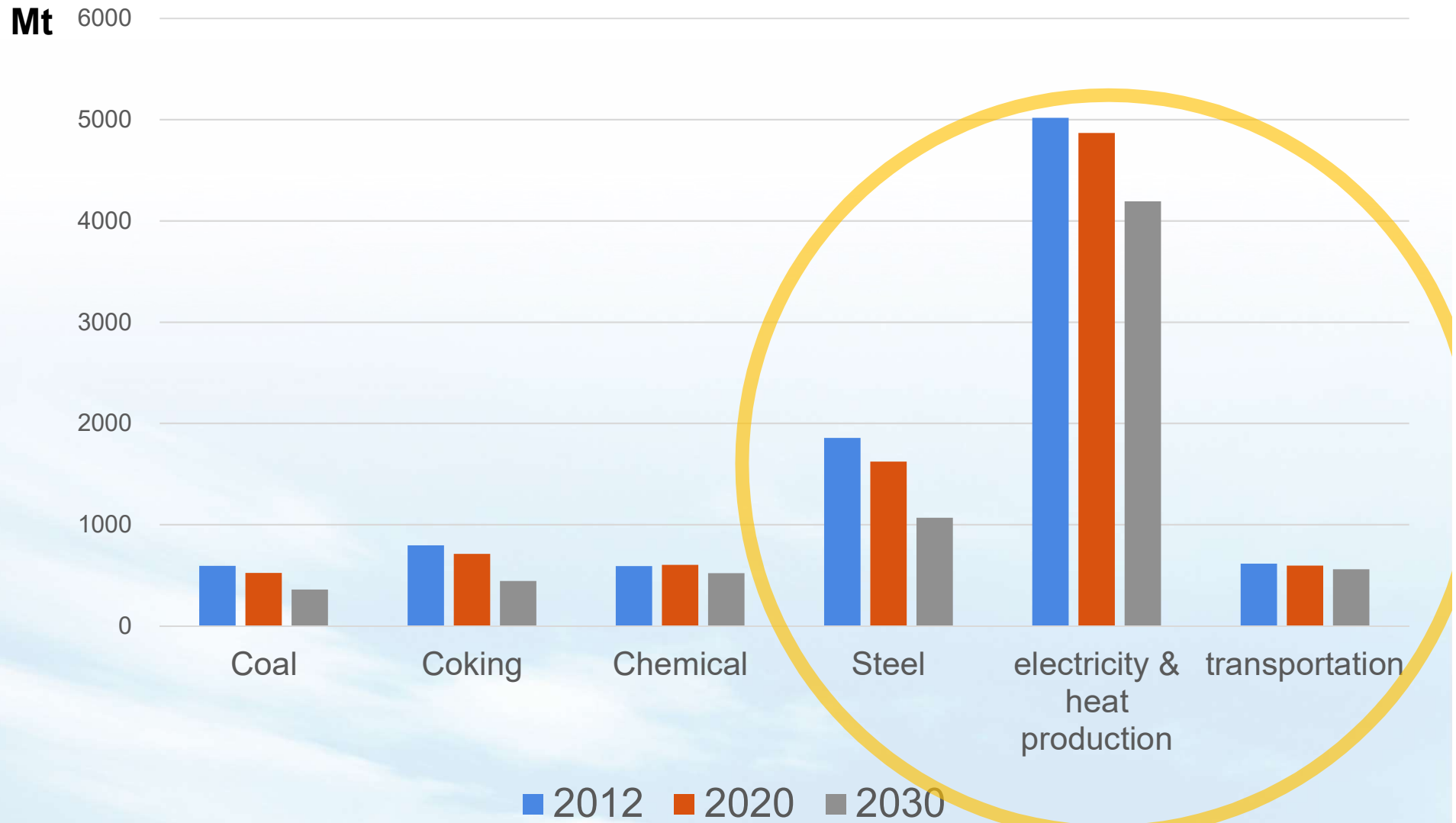


(Unit: 10⁴ Tonne; CO₂: 10⁷ Tonne)

CO₂ emissions from 2012-2030



CO₂ emissions in key sectors (2030)



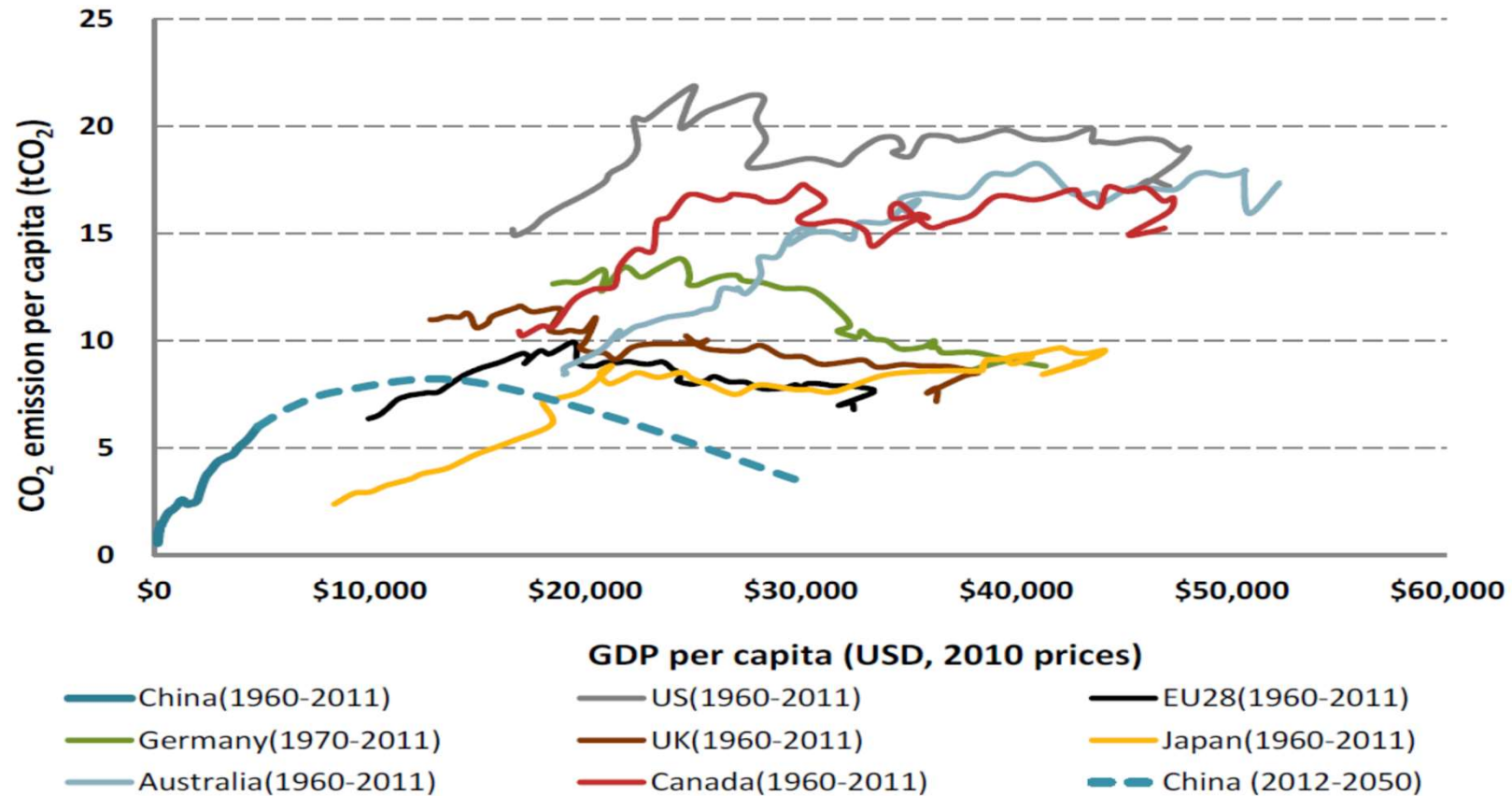
2030 Emissions Reductions ratio compared with 2012

	SO ₂	NO _x	PM _{2.5}	NH ₃	VOC	CO ₂
2030 emissions reductions ratio compared with 2012	60%	68%	54%	2%	37%	9%
emissions reductions target to reach the air quality standards	51%	64%	53%	0%	21%	N/A

Fulfilling of NDC commitment of China

- Carbon Emission per unit GDP will be reduced by 52-55% in 2020, and will be reduced by 73-75% by 2030.
- CO₂ emission per unit (ton CO₂/10,000RMB) was 3.79 (2005), its is expected to be :
 - 1.71-1.83 (2020) and
 - 0.94-1.01 (2030)
- Proportion of non-fossil fuel energy will reach 22%.

Long term consideration?



Note: Includes only energy-related CO₂ emissions.

Source: Historical CO₂ emissions data from 1960 to 2012 is from CDIAC. Population and GDP data is from the World Bank. Data after 2012 is calculated based on INDC targets.

Table 2.2: China's projected peak emissions per capita are considerably lower than those experienced by advanced industrialized economies

Quoted from: 傅莎, 邹骥, 刘林蔚. 2015. 对中国国家自主贡献的几点评论, 国家气候战略中心 <http://files.ncsc.org.cn/www/201512/20151209223357340.pdf>

Some key points

- China's economic and energy composition transition in the near future (2030) shall be driven by its low-carbon target and low-pollution targets together.
- low-carbon target and low-pollution target shall be integrated, because, achieving one single target can bring about co-benefits, while an integrated GHG and air pollutant co-reduction strategy will maximize co-benefits and minimize costs, which are desirable domestically and globally

Some key points

- to fulfil INDC commitment, more radical/ambitious policy countermeasures are required, such as supply side reform, structural adjustment, standard setting, among other command and control instruments, in association with market based instruments.
- longer term and Mid-century scenarios/goals will be deeply affected by the near future scenario, which will essentially shape the direction of long term projection, and thus near future scenario is decisive to the future of the future.

Thank you!

谢谢!

maoxq@bnu.edu.cn