Health and Economic Impact of Ozone Pollution in China

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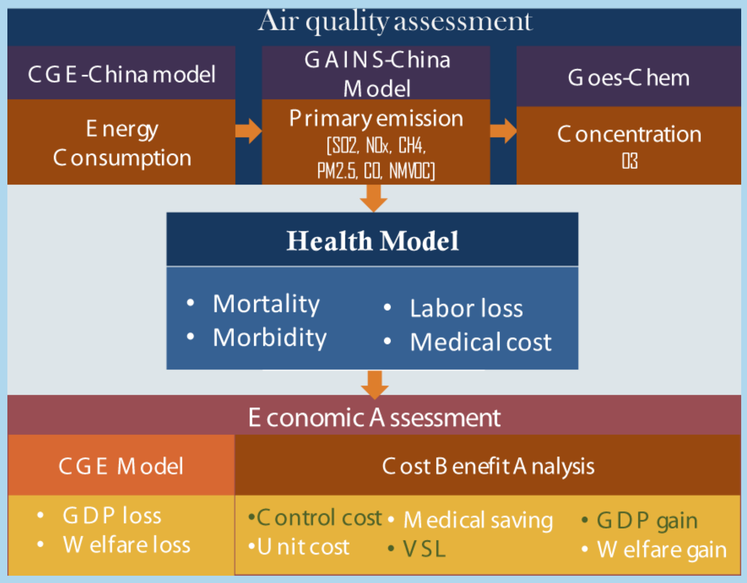
Introduction

- China has faced with severe challenges relating to its environment, particularly air pollution in recent years.
- Bad air quality poses a significant threat to human health, increases health expenditure and decreases labor attendance and labor supply.
- Air pollution obviously has negative impact on the economy. We aim to use CGE model combined with health module to forecast and evaluate the long-term economic impacts caused by air pollution in 30 Chinese provinces.

Method and scenario

This study uses a computable general equilibrium (CGE) model, Goes-Chem model and health model to quantify health and economic impact of ozone [1, 2].

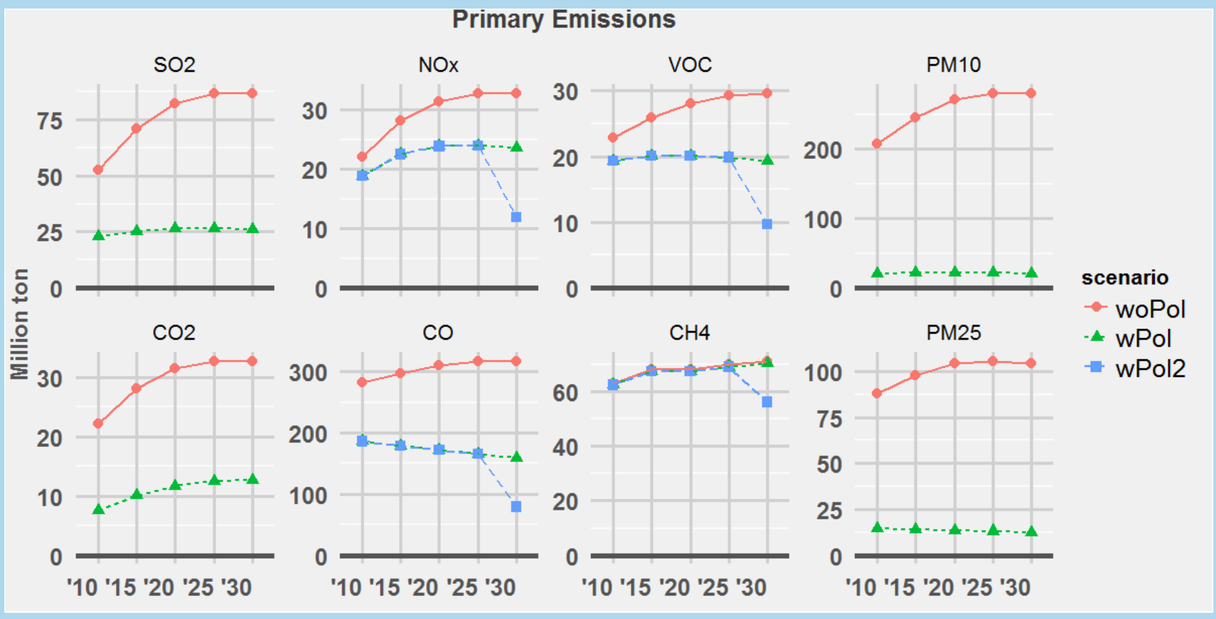
- AIM-CGE: provide energy data to GAINS-China;
- GAINS-China: calculate primary air pollutants emissions;
- Goes-Chem: simulate ozone concentration grid data;
- Health model: quantify health endpoints from ozone pollution;
- AIM-CGE: evaluate economic impact from ozone-related health impact.



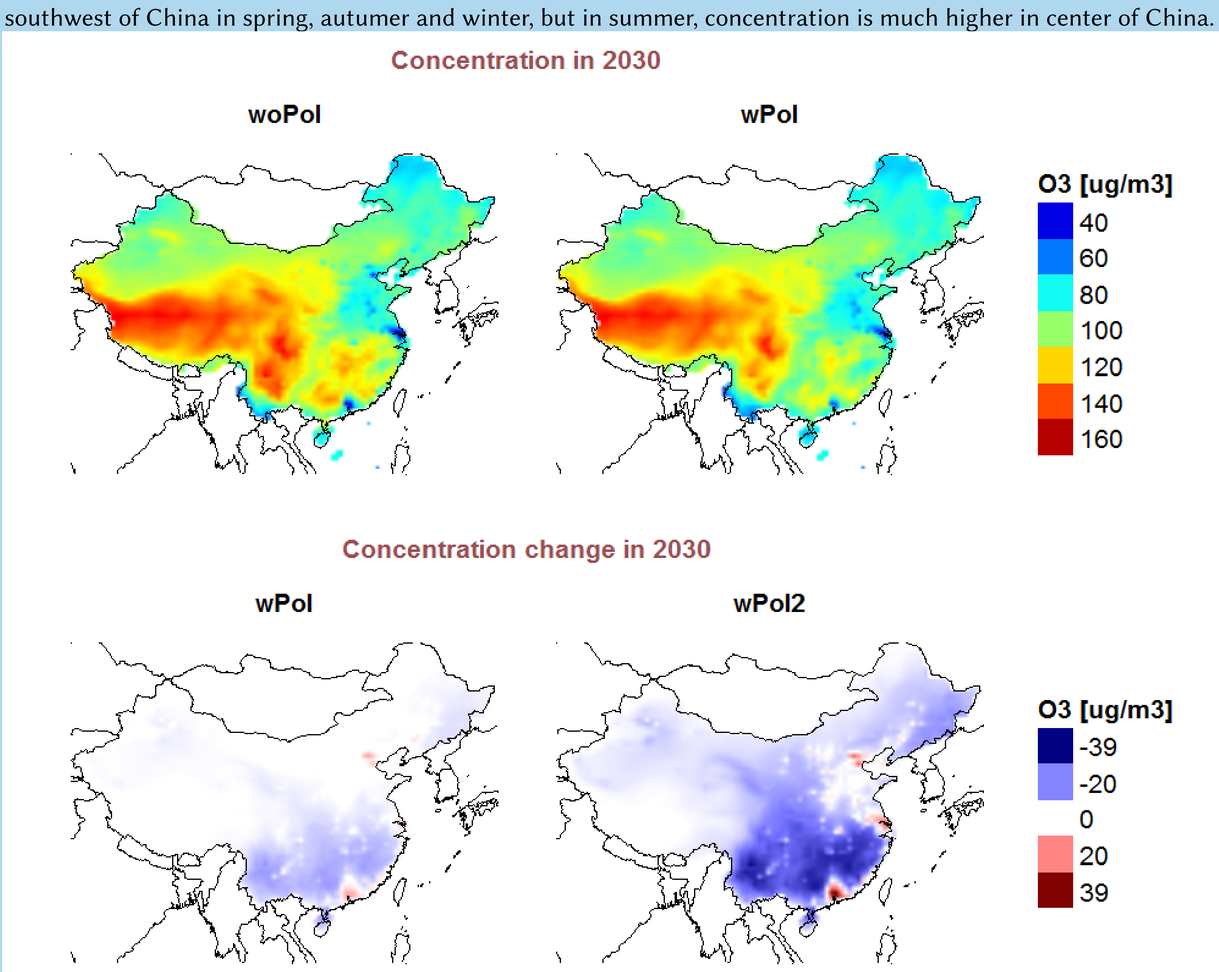
There are three scenarios.

- WoPol: penetration rate of mitigation technology remains the same as 2005 and additional emissions from energy combustion remain uncontrolled throughout the modeling period. It does not represent reality but is meant to show the impact of pollution control policies.
- WPol: reflects current air pollution policies in China, considering sectoral and provincial differences with respect to emission limit values and time of their introduction. wPol assumes that various air-pollution-control technologies are used to reduce pollutant emissions and ozone concentration to levels much lower than those in the woPol scenario.
- WPol2: more intensive air pollutant control technology is adopted, and emissions of NOx, VOC, CO are further reduced by 50% and CH4 is further reduced by 20% from the WPol scenario in 2030.

Results



Air pollutants emissions are very high in WoPol scenario and it is reduced a lot in WPol scenario and WPol2 scenario. Ozone concentration in different seasons and different scenarios.Ozone concentration is higher in southwest of China in spring, autumer and winter, but in summer, concentration is much higher in center of China.



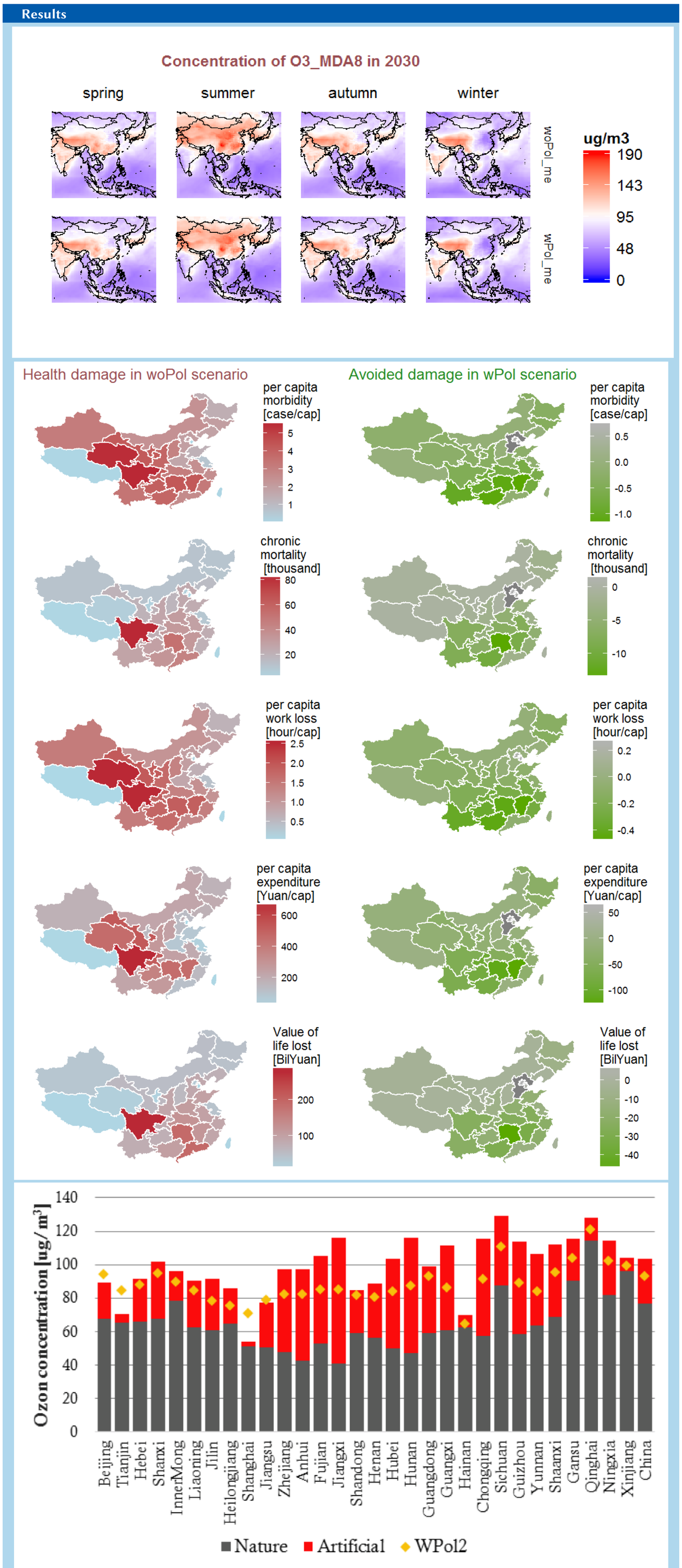
Ozone concentration decreases in most of provinces in China with primary emission reduction, but increases in Beijing, Shanghai and Guangzhou province.

References

[1] Yang Xie, Hancheng Dai, Huijuan Dong, Tatsuya Hanaoka, and Toshihiko Masui. "Economic impacts from PM2.5 pollution-related health effects in China: A provincial-level analysis". In: *Environmental science & technology* 50.9 (2016), pages 4836–4843.

[2] Yang Xie, Hancheng Dai, Tatsuya Hanaoka, and Toshihiko Masui. *Health and Economic Impacts of $PM_{2.5}$ Pollution in Jing-Jin-Ji Area.* 2016.

Results



Discussion and Conclusion

- In 2030, GDP loss is 0.034%. Welfare loss is 0.048% in woPol scenario.
- Save 113 thousand in woPol scenario and 90 thousand in wPol scenario people from pemature death.
- The VSL is 416.69 billion yuan(0.42% of GDP) in woPol scenario and 34.44 billion yuan(0.33% of GDP) in wPol scenario.
- Impact from ozone pollution is lower than PM2.5. But it is quiet hard to lower down ozone concentration in China .

Acknowledgements

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