

What will shape future Beijing haze events and air quality?

Explainer

Accessible research from Climate Science for Service Partnership (CSSP) China, for decision-makers No.04



Beijing haze event at Palace Museum Image: Pixabay.com

Focus

In China, air pollution is most severe in Beijing and its surrounding area. Understanding how changes in aerosol emissions influence both the frequency and intensity of haze events in the region is important for informing future mitigation strategies.

Importance

Air pollution has become one of the major issues in China due to the rapid economic development and urbanisation in recent decades and it poses a great threat to public health. Beijing (home to 20 million people) and its surrounding area is the most polluted region.

The Chinese Government implemented the 'Atmospheric Pollution Prevention and Control Action Plan' in 2013 and there have been dramatic reductions in emissions of the gases and particulates that contribute to poor air quality e.g., sulphur dioxide (SO₂) emissions reduced by 59% between 2013 and 2017 (Zheng et al., 2018). However, haze events still frequently occur in Beijing.

Changes in aerosol emissions may affect haze events through their influence on large-scale weather conditions in addition to their direct contribution to the haze composition. As rapid reductions in aerosol emissions in China are likely to continue in future, it is important to understand how these changes will influence both the frequency and intensity of haze events for mitigation strategy design.

Approach

As part of the CSSP China project, Zhang et al. (2020, in review) investigated future changes in weather conditions associated with haze events in the Beijing Region, and the severity of haze events during these weather conditions through the mid-21st century under two different aerosol emission scenarios. They have quantified the incidences of haze events in a

future climate and the influence of aerosol mitigation efforts, by modelling of conditions conducive to haze via the Haze Weather Index (HWI), which is related to the Air Quality Index (AQI).

They found that weather conditions that favour Beijing haze events (warmer conditions with weakened winds and increased moisture) will be more frequent in future, but the haze events may be less dangerous in terms of intensity if aerosol emissions continue to reduce in the future.

Next steps

There is large uncertainty in future aerosol emission pathways both in China and other adjacent countries, such as India which has overtaken China as the world's largest emitter of anthropogenic sulphur dioxide (SO₂) (Li et al. 2017). An improved understanding of the competing effects of aerosol emission changes on future haze events in the Beijing Region is beneficial to future policy making regionally and globally.

The study (Zhang et al. 2020, in review) implies that benefits to the local air quality, and hence human health, from air quality control policies outweigh their dynamic climate impact, which is of great importance to inform the future mitigation strategy. The air pollution control policy should continue.

Moving forward, a prototype climate timescale haze service with projections of HWI is currently under development at the Met Office and will allow for enhanced mitigation for downstream users.

References

- Li et al., 2017 DOI:10.1038/s41598-017-14639-8
Zhang et al., 2020 DOI:10.5194/acp-2020-957, in review
Zheng et al., 2018 DOI:10.5194/acp-18-14095-2018

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