

# Homework 1 Air quality in China and India

## Background

Air quality in the developing world, especially in big cities in China and India, has been a hot topic in the energy and environmental news. China's Ministry of Environment and Ecology (MEE) announced that the air quality in major cities has been improving over time especially in recent years, though citizen's perceptions sometimes are not the same.

## Questions

Please use the hourly PM2.5 data in Beijing to verify if MEE's claim is valid or not? Comparing with the air quality trends in India and try to associate the trends with energy consumptions, social economic indicators, and environmental regulations.

You can download all historical data of [Beijing](#) and [New Delhi](#).

Please note one monitoring station is not sufficient to show the complexity within the city or represent the whole country, we will use those data for homework data processing practice only.

You can show your results in tables and/or charts, please briefly explain your work and results. You can do this HW in Excel, SQL, R, Python, or any programming language you use. [Total 10pts]

1. Demonstrate ability to search and collect the needed data. [2pts]
2. Analyze the annual average trends for both cities. [2pts]
3. Able to show some in-depth pattern of the data (seasonal, monthly, weekday vs. weekend) for both cities. [2pts]
4. Demonstrate basic skills to visualize the data. [2pts]
5. Discuss reasons of the trend, and pattern. [2pts]

## Further readings

Zhang et al. (2019), Guan et al. (2014), and Apte and Pant (2019).

## References

- Apte, Joshua S., and Pallavi Pant. 2019. "Toward Cleaner Air for a Billion Indians." *Proceedings of the National Academy of Sciences* 116 (22): 10614–16. <https://doi.org/10.1073/pnas.1905458116>.
- Guan, Dabo, Xin Su, Qiang Zhang, Glen P. Peters, Zhu Liu, Yu Lei, and Kebin He. 2014. "The Socio-economic Drivers of China's Primary PM2.5 Emissions." *Environmental Research Letters* 9 (2): 024010. <https://doi.org/10.1088/1748-9326/9/2/024010>.

Zhang, Qiang, Yixuan Zheng, Dan Tong, Min Shao, Shuxiao Wang, Yuanhang Zhang, Xiangde Xu, et al. 2019. “Drivers of Improved PM2.5 Air Quality in China from 2013 to 2017.” *Proceedings of the National Academy of Sciences*, November. <https://doi.org/10.1073/pnas.1907956116>.