University: The University of Hong Kong (HKU)

Faculty: Business and Economics

Title of case study: The Extraordinary Success of China's "War on Pollution"

1. Summary of the impact (indicative maximum 100 words)

- Attracted wide media coverage and public attention (e.g., New York Times, AP, Reuters, NPR, Bloomberg, China Daily, People's Daily, SCMP, TVB, etc.);
- Helped the international communities understand China's success in improving environmental quality, and raised public awareness about how improvement in environmental quality will affect health, productivity, and social welfare in China;
- Improved the reliability of environmental data in China, which matters for scholars, citizens, and policymakers;
- Encouraged citizen participation in environmental governance and significantly improved China's environmental quality in 2020;
- Supported regulators and other public sector actors in policy- and decision-making processes to deal with emerging environmental challenges.

2. Underpinning research (indicative maximum 500 words)

China's unprecedented economic growth, heavy reliance on fossil fuels, and lax environmental regulations have significantly degraded the country's environmental quality during the past decades. Since 2013, the Chinese government shifted away from its long-standing strategy of prioritizing economic growth over environmental concerns, launched the "war on pollution," and has made significant achievements. Dr. He's studies aim to understand the impact of these achievements, the costs and benefits of the "war on pollution", and lessons from China's experience.

In Greenstone, He, Li, and Zou (2021), Dr. He and his collaborators document recent trends in Chinese environmental quality and review recent studies on the impacts and policy interventions of environmental pollution with more readily available data. They show that seven years after China's "war on pollution," the country's $PM_{2.5}$ level has decreased by more than 40%, which will significantly improve mental and physical health, enhance cognitive ability, boost labor productivity, save defensive expenditure, and affect long-term industry structure in China. Notably, Dr. He and his collaborators (Greenstone, He, and Lee, 2022) estimate that an average Chinese citizen could gain two more years in their lives if China sustains its pollution reductions.

In Greenstone, He, Jia, and Liu (2022), Dr. He and his collaborators study how better environmental monitoring technology can boost data reliability and improve governance. They show that automated environmental monitoring network significantly reduces local regulators' cheating behaviors (e.g., manipulating data), improving the accuracy of air quality measurement across China. They also find that more reliable data encouraged individuals to protect themselves against pollution, as people's purchase of air filters and face masks increased when air quality data become more accurate. Moreover, Dr. He and his collaborators corrected the pre-automation-era air quality in Chinese cities with machine learning.

In Buntaine et al. (2022), Dr. He and his collaborators conducted a nationwide field experiment in China to evaluate the impacts of citizen participation on environmental governance. Firms are assigned to receive public or private appeals from citizens as treatments when they violate pollution standards, filed by recruited volunteers to local regulators. Dr. He and his collaborators find that public appeals to the regulator through social media substantially reduce violations and pollution emissions, while private appeals cause more modest environmental improvements. In addition, experimentally adding "likes" and "shares" to social media appeals increases regulatory effort, suggesting visibility as an important mechanism. Their national experiment significantly

reduced emission violations (by 60%) in China and improved the country's water (12%) and air quality (3–4%).

Dr. He also led a team of researchers from the Chinese Center for Disease Control and Prevention, Peking University, and the University of Hong Kong to investigate how COVID-19 lockdowns in China unintendedly reduce non-COVID mortality in Qi et al. (2021). Results show that the improvement in air quality during the lockdown periods in 2020 significantly reduced cardio-respiratory mortality, especially in heavily polluted cities. This finding highlights air pollution as a major health risk for the vulnerable population, implying that improving air quality after the COVID-19 pandemic would bring about significant health benefits.

3. References to the research (indicative maximum of six references)

1. Greenstone, Michael, Guojun He, Ruixue Jia, and Tong Liu "Can Technology Solve the Principal-Agent Problem? Evidence from China's War on Air Pollution," *American Economic Review: Insights*, 2022, 4(1): 54-70.

2. Greenstone, Michael, Guojun He, Shanjun Li and Eric Zou. "China's War on Pollution: Evidence from the First Five Years," *Review of Environmental Economics and Policy*, 2021, 15(2), 281-299.

3. Greenstone, Michael, Guojun He, and Ken Lee, "The 2008 Olympics to the 2022 Olympics: China's Fight to Win its War Against Pollution," *Air Quality Life Index White Paper*, University of Chicago, 2022.

4. Buntaine, Mark, Michael Greenstone, Guojun He, Mengdi Liu, Shaoda Wang, and Bing Zhang. "Does the Squeaky Wheel Get More Grease? The Direct and Indirect Effects of Citizen Participation on Environmental Governance in China," *NBER Working Papers*, 2022, https://doi.org/ 10.3386/w30539.

5. Qi, Jinlei, et al. "Short and Medium-Term Impacts of Strict Anti-Contagion Policies on Non-COVID-19 Mortality in China," *Nature Human Behaviour*, 2021, https://doi.org/10.1038/s41562-021-01189-3.

4. Details of the impact (indicative maximum 750 words)

Dr. He's engagement in KE activities has promoted understanding and awareness of China's success in its "war on pollution" in recent years. The following parties benefit from Dr. He's KE activities: (1) Citizens who care about environmental pollution and life well-being; (2) Public organizations that promote environmental quality; (3) Policymakers who want to develop a new understanding and awareness of how to balance the costs and benefits of environmental regulations; (4) Corporate owners and workers in related fields.

Specifically, the following impacts are achieved:

1. Helped the international communities understand China's success in improving environmental quality and significantly raised public awareness that improvement in environmental quality will affect health, productivity, and social welfare in China:
   - Dr. He's KE activities introduced to the public recent trends in environmental quality in China and reviewed recent studies on the consequences of environmental pollution and policy interventions that have taken advantage of more readily available data.
   - Dr. He highlighted that an average Chinese citizen could gain two more years in their lives if China sustains its pollution reductions, which has been widely covered by international and domestic news outlets (examples in references and slides).
   - Dr. He gives 20 to 30 talks in seminars, conferences, and forums each year on average. In

2021 and 2022, Dr. He delivered several *non-academic* lectures to the general public, including the CNKI-Global Lectures on the Chinese Economy (全球中国经济大讲堂) and HKU Ming De Lecture (香港大学明德讲堂). His most recent webinar on China's achievements in its "war on pollution" attracted over 244,000 online participants (see slide).

- Dr. He manages a Public WeChat Account (微信公众号) called "环境与发展经济学" (Environmental and Development Economics). With more than 10,000 subscribers, it is among the most popular public accounts in economics.

2. Improved the reliability of air quality data in China, which matters for scholars, citizens, and policymakers:
   - Dr. He's research showed that China's official air quality data were generally unreliable before 2013, but improved afterward. The turning point is the central government's introduction of an automated air quality data monitoring network in 2013, which is a key factor for its success in the "war on pollution."
   - Dr. He identified potential manipulations of air quality data in different Chinese cities before 2013. With machine learning, he corrected these data and made them available to scholars and the public at https://www.openicpsr.org/openicpsr/project/125321/version/V1/view.

3. Encouraged citizen participation in environmental governance and significantly improved China's environmental quality:
   - Dr. He's research team engaged many volunteers to participate in environmental governance. They, alongside the research group, monitored nearly 25,000 major polluting firms in 333 China's prefectures and filed nearly 3,000 appeals to local regulators about firms violating emission standards.
   - The research team's efforts significantly improved China's environmental quality in 2020: they reduced emission violations by more than 60% in China, water pollution emissions (measured by COD) by 13%, and air pollution emissions (measured by SO_2) by 4%.

4. Supported regulators and other public sector actors in policy- and decision-making processes to deal with emerging environmental challenges:
   - Dr. He's research deepens the understanding of environmental issues in China and offers lessons for other developing countries. Some of his research findings have affected China's environmental policies. For example, after the Chinese government learned that the coal-fired central winter heating system significantly reduced life expectancy in China (based on work from Dr. He), a large-scale clean energy program was launched to replace coal with natural gas as the main heating fuel.
   - Dr. He serves as a consultant for the CICC Research Institute and advised on the carbon trading system and pathways for China to achieve carbon neutrality.
   - Dr. He serves as a consultant for the Asian Development Bank and writes background papers for its 2023 Asian Development Outlook.
   - Dr. He sits on the board of directors for the Green Development Research Institute of Beijing Municipal Administrative Center (北京城市副中心绿色发展研究院) and offers policy consultations to regulators in Beijing.

5. Disseminated his research findings to a broader audience through various media channels and other outreach activities:
   - Dr. He collaborates with external partners in the publication of white papers, organization of conferences, and research projects. For example, jointly with Tsinghua University, Dr. He co-organized yearly conferences on environmental economics in 2021 and 2022. The

2021 Conference attracted over 3,500 participants (online & offline) and the 2022 conference attracted over 25,000 participants (online & offline). The participants include scholars, policymakers, and the general public.

- As the co-editor of the *Journal of Environmental Economics and Management* and *China Economic Review*, Dr. He has been actively engaged in promoting research findings in these journals.
- Dr. He teaches UG, TPG, and RPG courses on environmental economics, and discusses his research findings with the students. Dr. He is also actively engaged in executive education programs at HKU Business School, where he talks about climate finance, ESG Investment, and carbon neutrality.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. People's Daily: China's war against pollution extraordinarily successful, Released date: March 25, 2022. http://en.people.cn/n3/2022/0325/c90000-9976159.html

2. China Dialogue: Olympic gains: Study highlights China's progress on air pollution since 2008, Released date: February 24, 2022. https://chinadialogue.net/en/pollution/chinas-air-pollution-progress-since-2008/

3. AP News: How China got blue skies in time for Olympics, Released date: February 8, 2022. https://apnews.com/article/winter-olympics-explainer-beijing-blue-skies-4707798bac96bdb68ad7250d450e902f

4. China Daily: 外媒感叹北京"奥运蓝" 称中国空气质量取得了"翻天覆地"的变化, Released date: February 10, 2022. https://cn.chinadaily.com.cn/a/202202/10/WS620497a3a3107be497a05d0c.html

5. 清华大学 CIDEG、香港大学北京中心: 活动回顾 | 第二届环境经济学前沿系列论坛：气候变化、能源与碳市场, Released date: November 15, 2022. https://mp.weixin.qq.com/s/VSASBGXvMIo8G-S9Xzl60A

6. 《中国环境报》专访, Released date: March 15, 2022. https://www.cenews.com.cn/news.html?aid=960795

7. TVB 无线新闻："大湾区解码" 节目专访. https://news.tvb.com/programmes/decodingthegba/62610547c652e99051b5a2ac/0/%E5%A4%A7%E7%81%A3%E5%8D%80%E6%8A%97%E7%96%AB

8. SCMP: Chinese social media offers powerful tool against pollution, study finds, Released date: October 15, 2022. https://www.scmp.com/news/china/science/article/3196023/chinese-social-media-offers-powerful-tool-against-pollution-us

9. Bloomberg: China's Censors Allow Environmental Criticism to Flourish Online, Released date: October 14, 2022. https://www.bloomberg.com/news/articles/2022-10-13/china-s-censors-allow-environmental-criticism-to-flourish-online

10. NPR Interview: Social media engagement increases government action, reduces pollution, Released date: October 6, 2022. https://www.npr.com.ng/social-media-engagement-increases-government-action-reduces-pollution-study/