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CHINA PROJECT NEWSLETTER

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Fall Semester Events

The China Project continued its seminar series this semester. Meeting its cross-university aims, the series included a talk held at the Graduate School of Design and co-sponsored by the Department of Urban Planning and Design, coordinated by China Project postdoc Dr. ChengHe Guan and Prof. Ann Forsyth. The speaker, Prof. Lingqian (Ivy) Hu (*below*) of the Department of Urban Planning at University of Wisconsin-Milwaukee, spoke on the relationship of urban structure and travel behavior in Chinese cities, using Beijing as a case study. Prof. Hu argued that while the transformation of monocentric to polycentric urban forms has had mixed results on travel behavior, balance of jobs and housing in urban centers reduces travel demand, highlighting the importance of coordinated urban planning practices and policies in China. Prof. Hu later consulted with the principals of the China Project's ongoing research on the effects of built environment and transportation planning on travel behavior in the city of Chengdu, based on the Project's eleven-year household survey dataset.



Programming Spotlight


Summer Undergraduate Research Program in China 2018

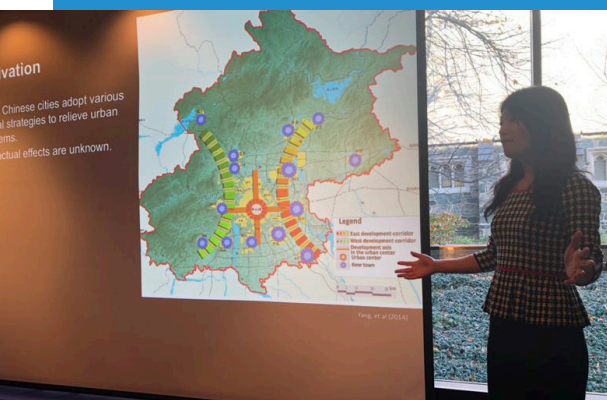
A group of eight Harvard undergraduates spent the summer in China from late June until mid-August, working on solutions to an array of environmental problems ranging from examining ozone pollution's effects on crops to assessing the sustainability of algal technology. They lived and worked at Tsinghua University and the Chinese University of Hong Kong. The internships were sponsored by a grant to the Harvard China Project from the Harvard Global Institute on the theme of "China 2030/2050: Energy and Environmental Challenges for the Future."

China Project faculty chair Prof. Michael McElroy said the internships foster relationships between Harvard and institutions in China, as well as help students understand the international dimensions of global environmental issues. "My hope is that our students will gain an important international perspective," McElroy said. "When they graduate from Harvard, they'll be citizens of the world. They will have a sense of at least some of the major problems that the world has to face."

One of the students, Katie Schluntz, worked at Tsinghua with Prof. Jing

Cao to develop a computer model that reflected household electricity demand, including variables such as the number of appliances in a household, the appliances' ages, and local weather data to estimate heating and cooling needs. "A lot of policy is not just on the supply side, but on the demand side, so it's really important to be able to understand how households are consuming this energy and how responsive they are to things like changes in the weather, especially now with climate change," said Katie.

Andrei Iliescu, another student, worked in the lab of Tsinghua Prof. Deyi Hou. His project involved arsenic contamination of groundwater that feeds residential wells. Much of the contamination, Andrei said, stems from natural geological factors common in various parts of the country, though some is because of industrial pollution. Iliescu conducted a literature search to compile a review article on arsenic contamination and strategies to fight it. He also traveled to a rural village with other students in Hou's lab to build residential arsenic filters. "I really enjoyed what I was doing and the broader experience there," Andrei said. 



Topics of the other seminars this semester included: top-down estimates of black carbon emissions in Jiangsu, China (Prof. Yu Zhao); the role of monsoon dynamics in extreme air pollution events in Delhi, India (Dr. Gufran Beig); health benefits of vehicular emission control in China (Prof. Haikun Wang); and the use of trace gas observations to detect a recent rise in halocarbon emissions in Asia, which contribute to stratospheric ozone depletion and climate change (Dr. James Elkins).

This is an abbreviated version of an article by Alvin Powell that originally appeared in the Harvard Gazette on September 26, 2018.



Tsinghua University Associate Professor and Project researcher, Jing Cao, sat down with us to discuss her recent study published in Journal of the Association of Environmental and Resources Economists that used econometric tools to analyze the effects air pollution has on health in Beijing.

Q: You used the Chinese superstition about number 4 as part of the methodology of your paper. Can you take us through that?

A: Many researchers in the social sciences want to conduct experiments, but they can't because social experiments often cost too much. In this study, we took advantage of the policy shock generated by Beijing's special policy since the Beijing Olympics in 2008 of restricting all cars from driving on the road one day a week. The government restricts cars based on the last digit of the license plate number. On Tuesdays cars with license plate numbers that end with 4 and 9 are restricted, while on Wednesdays cars with plates that end with 5 and 0 are restricted, and so on. We focused on the number 4 because 4 is pronounced "si" in Chinese, which sounds like "si" (死, death) and many people try to avoid this unlucky number. We ran some statistics which showed that a very low percentage of car owners have plate numbers ending in 4. This means the restrictions have less effect on the days when these number 4 plates are restricted because there are few cars with such licenses, and on average there are more cars out on the road compared to other days.

Q: What were your findings?

A: On the days when plates ending in 4 are restricted, we found empirical evidence that there is higher traffic congestion and air pollution, and

that ambulance calls related to heart disease and fever increase. Of course, the health effects of air pollution are different for different age and gender groups, but we find that the rate of increase in the calls made by people in the working-age group on the number 4 restriction days is actually greater than that of the 65 or older age group.

By the way, I want to point out that the data used in this study was from the first two years of the license plate policy's implementation. I think that if we have more recent data, we will probably see that the differences across the days in the effect on congestion and air pollution get weaker over time. Mexico City has a similar car restriction policy based on license plates, and a paper examining the Mexico City policy shows that people's response there was to try to buy more cars—if they already have a car with an odd-number plate, they want to buy another with an even-number plate. One day I took a taxi while I was in Beijing and asked the driver why it was so congested: he told me it was because license numbers ending in number 4 were restricted that day—so people do notice the effects of these policies. Some of my friends in Beijing now try to pick license plates ending with number 9 [which is restricted on the same day as number 4] so that they can drive on less congested days.

Q: Are there any future questions raised?

A: We recently started a new project with Prof. Joe Aldy at Harvard Kennedy School of Government. Joe has conducted many studies on air pollution forecasting data and forecasting errors in the U.S. We compiled air pollution forecasting data from Beijing and linked it with the air pollution monitoring data, as well as the ambulance call data. Since you can't forecast very accurately, we observed two very interesting results. When the actual air pollution level is the same as the forecasted level and the air pollution index is forecasted to exceed 100 [unhealthy levels], there are fewer ambulance calls, which means people are responding to the forecasts by changing behavior. When the forecast is wrong and predicts a day of lower pollution when the actual air pollution level is high, there are more ambulance calls. This suggests that when people, especially those with more vulnerable health status, want to go out, they do take a look at the air pollution forecasting to help them decide whether they should go out and for how long they will remain outdoors. In other words, people respond to forecasting. This has very important policy and cost-benefit implications. 🇺🇸

Paper Cited: Nan Zhong, Jing Cao, and Yuzhu Wang. 2017. "Traffic congestion, ambient air pollution and health: Evidence from driving restrictions in Beijing." Journal of the Association of Environmental and Resources Economists, 4, 3, Pp. 821–856.

2018 Annual Meeting: CCICED

In early November, Prof. Michael McElroy, chair of the Harvard-China Project, attended the annual general meeting of the China Council for International Cooperation on Environment and Development (CCICED) in Beijing with Project Executive Director Chris Nielsen. The CCICED is the highest international advisory body providing recommendations on environment and development to China's top leaders. Its three-day annual meetings are co-chaired by Li Ganjie, Minister of Ecology and Environment, Xie Zhenhua, Special Representative for Climate Change

Affairs, and international counterparts from U.N. agencies and western governments.

Among topics debated at the annual meeting were innovation to achieve zero-carbon energy pathways, the environmental impacts of the Belt and Road Initiative, and green urbanization. Participation provides the China Project with an opportunity to introduce its research findings directly into discussions informing Chinese policy-making and to emphasize the role of independent research in understanding and addressing China's environmental and climate risks. It also



strengthens China Project relationships with leading decision makers and thought leaders on environment and development from across China and around the world.

Recent Publications

Meng Gao, Gufran Beig, Shaojie Song, Hongliang Zhang, Jianlin Hu, Qi Ying, Fengchao Liang, Yang Liu, Haikun Wang, Xiao Lu, Tong Zhu, Gregory Carmichael, Chris P. Nielsen, and Michael B. McElroy. 2018. "The Impact of Power Generation Emissions on Ambient PM_{2.5} Pollution and Human Health in China and India." *Environment International*, 121, Part 1, Pp. 250-259.

Archana Dayalu, William Munger, Steven Wofsy, Yuxuan Wang, Thomas Nehrkorn, Yu Zhao, Michael McElroy, Chris Nielsen, and Kristina Luus. 2018. "Assessing biotic contributions to CO₂ fluxes in northern China using the Vegetation, Photosynthesis and Respiration Model (VPRM-CHINA) and observations from 2005 to 2009." *Biogeosciences*, 15, Pp. 6713-6729.

Xinyu Chen, Junling Huang, Qing Yang, Chris P. Nielsen, Dongbo Shi, and Michael B. McElroy. 2018. "Changing carbon content of Chinese coal and implications for emissions of CO₂." *Journal of Cleaner Production*, 194, Pp. 150-157.

Govinda R. Timilsina, Jing Cao, and Mun S. Ho. 2018. "Carbon tax for achieving China's NDC: Simulations of some design features using a CGE model." *Climate Change Economics*, 9, 3.

Chenghe Guan and Richard B. Peiser. 2018. "Accessibility, urban form, and property value: Toward a sustainable urban spatial structure." *Journal of Transport and Land Use*, 11, 1, Pp. 1057-1080.

Bo Zhang, Xueli Zhao, Xiaofang Wu, Mengyao Han, Chenghe Guan, and Shaojie Song. 2018. "Consumption-based accounting of global anthropogenic CH₄ emissions." *Earth's Future*, 6, 9, Pp. 1349-1363.

Qing Yang, Hewen Zhou, Xiaoyan Zhang, Chris P. Nielsen, Jiashuo Li, Xi Lu, Haiping Yang, and Hanping Chen. 2018. "Hybrid life-cycle assessment for energy consumption and greenhouse gas emissions of a typical biomass gasification power plant in China." *Journal of Cleaner Production*, 205, Pp. 661-671.

Xinyu Chen, Michael B. McElroy, Qiuwei Wu, Yinbiao Shu, and Yusheng Xue. 2018. "Transition towards higher penetration of renewables: an overview of interlinked technical, environmental and socio-economic challenges." *Journal of Modern Power Systems and Clean Energy*.

Yaowen Zhang, Ling Shao, Xudong Sun, Mengyao Han, Xueli Zhao, Jing Meng, Bo Zhang, and Han Qiao. 2018. "Outsourcing natural resource requirements within China." *Journal of Environmental Management*, 228, Pp. 292-302.



Researcher Spotlight: Meng Gao

When Meng Gao was in high school in Nanjing, he remembers seeing a distinct haze settling on the city one night. "The next day, my teacher told us it wasn't fog, because that's what we thought," says Meng, a Postdoctoral Fellow at Harvard-China Project. "And our teacher told us that if we breathed it, it wouldn't be good for our health." For Meng, it was a revelation. "I'd like to do something to contribute to solving that," he thought at the time.

That mission brought him to the Nanjing University of Information Science and

Technology, where he earned a degree in atmospheric physics in 2012, and then to the University of Iowa, where he earned his PhD in chemical engineering in 2015. Soon after graduating from Iowa, he applied for a position at the Harvard-China Project, hoping to broaden his research. "I knew that clean energy was a solution for the haze problem—and the climate change problem, and the China Project conducts research in all of these areas" says Meng. "So, I wanted to gain some new expertise."

While much of his PhD work had focused on researching specific "haze" events, his current research is focused on the long-term trends in these events in China, as well as in India—and the impact of climate change on these trends. He's also collaborating with Prof. John Evans of the Harvard T. H. Chan School of Public Health, looking at the health impacts of fine particulate matter,

and working with other Harvard-China Project researchers to examine the long-term effects of climate change on the potential of wind power. "I've enjoyed getting experience in this really diverse group," Meng says of his work at the Harvard-China Project, "because I can learn a lot from people with different backgrounds."

In the end, his goal remains the same one he's had since high school: finding a solution to the haze. We know what causes the problem, of course, says Meng: energy consumption and the resulting emissions of air pollutants. "But for economic development it's not realistic for government to cut emissions altogether," he notes. "The goal for my research is to help the government efficiently reduce emissions and air pollution." 🌱

— Dan Morrell