University Alliance for Sustainability

Final Report: Junior Research Stay at Peking University

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Interaction between urban heat island and urban pollution island, comparison studies in Berlin and Beijing

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I visited the research group of Prof. Junfeng Liu at the College of Urban and Environmental Sciences, Peking University for one month. Prof. Liu has long-term experience in the study field of atmospheric environment with wide research interest. During my stay at Peking University, I talked with Prof. Liu many times and got a lot of new knowledge and ideas from him. Besides the contents of the current project, we also discussed some interesting topics about urban environment and urban system, involving climate change, air pollution, traffic, and energy use.

I also talked with the colleagues in this group. The group members are very young and excellent. They conducted different projects independently. Through the talking with them, I learned different new knowledge, which gives me some inspirations for the interdisciplinary research in the future. I should think more about the implications of my current and future work. It is better to connect the scientific work to economic and social development. The working environment is relaxed, but everyone in this group worked very hard. They achieved a lot of good results and published good papers. The graduated students got good positions at the world top universities and institutes.

There are some students doing their PhD or master degree defense during my stay at the College of Urban and Environmental Sciences. I attended some defenses and listened to their presentations carefully. Through this processes, I further learned about their research. Additionally, I saw the exhibition of the achievements of the college that I stayed and read their books and scientific reports in the library. I learned their past work and future development strategies of this college. During my first stay, I only learned about the progresses of the visiting group. During the second stay, I communicated with more people from other groups and learned more about the college. I found the college has robust research groups in the fields of urban and environmental sciences, involving environmental sciences, ecology, geography, climatology, urban planning, and sustainability. They

developed very fast in the recent years. They conducted a lot of big national and international projects and had wide international cooperation. PKU has good study and working environment and provides good opportunity for the international visitors.

In addition, I visited some other institutions in Beijing, including Chinese Academy of Sciences, Chinese Academy of Meteorological Sciences, and Beijing Normal University. I learned their current work and recent progress. We shared the ideas with each other about the progresses and future directions of the studies of urban climate and atmospheric environment in Germany and China. We established some preliminary cooperation intend in technique support and paper publications. This shorting visiting help me to learn the latest progress in the field of atmospheric environment in China. I made new friends and established potential cooperation with the scientists at PKU. This is a pretty good opportunity for the international cooperation.

Urban Heat Island (UHI) and Urban Pollution Island (UPI) are two major problems of the urban environment and have become more serious with rapid urbanization. The UHI and UPI could interact with each other. The UHI-related strong turbulent mixing can promote the diffusion of air pollution to a higher level, while the UPI can change the radiation transfer process, subsequently changing the urban thermal environment. In order to achieve a better urban environment and a sustainable development of a city, these two issues should be studied concurrently. However, scientists of environmental sciences and climatology usually only focus on their own fields. Most of the previous studies on UHI and UPI were conducted separately. Insufficient knowledge of the interaction between UHI and UPI inhibits the development of integrative mitigation strategies. Our study attempts to connect the study of urban climate and atmospheric environment, which is an important part of my PhD study. Berlin and Beijing are the capital cities of Germany and China, respectively. Both Berlin and Beijing shows UHI and UPI, especially Beijing. Although Berlin has little air pollution, the PM10 and NOX still cannot meet the requirement of European Union, because of intensive traffic, especially the diesel cars. In recent years, the air quality is becoming much better in Berlin through continuous efforts. Beijing can learn some experience from Berlin. Meanwhile, the two cities are facing more frequent extreme climate events, such as heat waves. In Beijing it is common to use air conditioning, while Berlin this is often not the case. In the future, one can assume that there will be an increasing demand for cooling systems in Berlin, which will increase the burden of energy supply. The study of Beijing also can provide some implications for the future city management of Berlin. I hope my study can improve the understanding of the interactive influence between the urban thermal environment and air pollution and provide scientific knowledge for the mitigation of these two problems (https://www.researchgate.net/profile/Huidong_Li3) .

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