UNNC - IUE, CAS Doctoral Training Partnership

Available PhD Topics

Formal applications should follow the instructions in 'How to apply' section.

PhD topic 1	**High resolution and accuracy air pollution mapping using multi-source data**
IUE Supervisor	Prof Yin Ren (www.iuecasforest.cn)
UNNC Supervisor(s)	Dr Nicholas Hamm
Short introduction & description of PhD project	Based on the weather, land use, satellite data, ground monitoring data, using spatial-temporal correlation and machine learning method to map the high resolution air pollution (e.g. PM, NO_2) distribution maps and evaluate the uncertainty of the maps. Many methods have been developed for the prediction of air pollution. These can be roughly divided into three categories: deterministic models, traditional statistical methods, and artificial intelligence (AI) methods. Deterministic models have been developed into third-generation air quality models based on the "single atmosphere". Statistical methods have been developed from traditional multiple linear regression methods. With the development of computer science and the continuous improvement and innovation of statistical prediction methods, traditional regression methods and spatial statistical methods have been combined into a complex analysis method. Artificial intelligence methods, which include machine learning methods, have emerged in recent years. Many studies have shown that the accuracy of artificial intelligence technology is superior to that of traditional statistical methods. Nevertheless, the trade-off between the resolution and the accuracy is the unsolved problem. Therefore, this project will focus on two major dimensions on (i) high resolution mapping and (ii) uncertainty evaluation of the maps.
Contact points	Informal inquiries may be addressed to Dr Nicholas Hamm (nicholas.hamm@nottingham.edu.cn) and Prof Yin Ren (yren@iue.ac.cn).
PhD topic 2	**Microfluidic fabrication of functional microparticles for removing heavy metal ions from waste water**
IUE Supervisor	Prof. Shaohua Chen

UNNC Supervisor(s)	Dr Yong Ren
Short introduction & description of PhD project	The development of effective methods for low concentration heavy metal ion separation from waste water remains a challenge for industrial applications, especially the electroplating industries. This project aims to develop microfluidic systems for fabrication of microparticles for heavy metal ion treatment by two approaches: the microparticles will be functionalized with chelating agents and photocatalysts. We will investigate the ion capture and conversion mechanisms, and compare the treatment efficiency.
Contact points	Informal inquiries may be addressed to Prof. Shaohua Chen (shchen@iue.ac.cn) and Dr. Yong Ren (yong.ren@nottingham.edu.cn)
PhD topic 3	**Research on the pathway of carbon peak carbon neutrality for building sector**
IUE Supervisor	Prof Jianyi Lin
UNNC Supervisor(s)	Dr Wu Deng
Short introduction & description of PhD project	President Xi Jinping announced to achieve carbon peaks by 2030, and strive to achieve carbon neutrality by 2060 at the United Nations General Assembly on September 22, 2020. Carbon neutrality has become an important national strategy. The visions of 2030 and 2060 provide clear goals and specific timetables for the country's energy revolution aimed at energy transition. As one of the three energy-consuming sectors of industry, transportation, and buildings, the building sector is closely related to energy consumption and carbon emissions. Energy transition and carbon neutrality will inevitably have a huge impact on the development of this sector. How to achieve carbon peaking and carbon neutrality in the construction sector is not only an urgent problem faced by relevant government departments, but also a hot topic of current research.
Contact points	Informal inquiries may be addressed to Prof Jianyi Lin (jylin@iue.ac.cn) and Dr Wu Deng (wu.deng@nottingham.edu.cn).
PhD topic 4	**Sustainable sediment extraction – a non-renewable resource from the coastal and fluvial ecosystems perspective**
IUE Supervisor	Prof Wei-Qiang Chen
UNNC Supervisor(s)	Dr Faith Chan
Short introduction & description of PhD project	Sediments (sand and gravel) from coastal and riverine environments are used extensively in construction, such as the preparation of concrete and building materials for the urban infrastructure (e.g. pavements, roads, etc.). For example, each tonne of cement may require about seven folds of sand and gravel. The global use of aggregates for concrete to be annually reached about 30 billion tonnes. That said, sediments are mined globally, account for the largest volume of soil materials, and rank the highest volume of raw materials used on earth after water resources.

	In this project, the candidate has opportunities to develop the research ideas on: 1. Assess the colossal quantities of sediment being extracted by riverine and coastal (river beds and coastal shoreline or shallow coastal sea beds); 2. Investigate the most significant impacts through the sediment extraction on the fluvial and deltaic (coastal) geomorphological impacts on our environments; 3. Evaluate alternatives to sediment for construction, such as using manufactured sand and secondary sources; 4. Develop the material flow analyses (MFA) and find the relevant information on contributing the global data on aggregates (riverine and coastal sediments) mining that improves the assessment (i.e., Strategic Environmental Assessment – SEA and Environmental Impact Assessment – EIA); 5. Contribute to achieving the sustainable development goals (SDGs) in terms of long-term global sediment extractions, including the life-cycle of aggregates.
Contact points	Informal inquiries may be addressed to Dr Faith Chan (faith.chan@nottingham.edu.cn) and Prof Wei-Qiang Chen (wqchen@iue.ac.cn).
PhD topic 5	**Sustainable urbanization form, green, and metabolism: pattern, process and mechanism**
IUE Supervisor	Dr. Prof. Tao Lin
UNNC Supervisor(s)	Dr Nicholas A. S. HAMM
Short introduction & description of PhD project	Urbanization is one of the most powerful anthropogenic forces visible in the world and exert huge impact on global ecosystem. Currently, more than half the global population lives in cities, a proportion that is expected to increase to 70% by 2050 driven by continued urban growth in the developed economies and by urbanization in the Global South. Urbanization not only affects urban areas and urban systems (via population increase and areal expansion) but also the settlements and non-urban areas connected to urban areas. China has been experiencing the most rapid urbanization process on the earth and the interactions between the urban area and natural landscapes have cause multiple social-ecological effects. To explore the sustainable urbanization, we try to (1) analyse the spatial temporal process of urban spatial expansion, (2) connect the urban form and its functions, such as urban metabolism, green infrastructure, and (3) assess the ecological impact and environmental health effect by using spatial modelling techniques and big data.
Contact points	Informal inquiries may be addressed to Prof Tao Lin (tlin@iue.ac.cn) and Dr Nicholas A. S. HAMM (nicholas.hamm@nottingham.edu.cn).
PhD topic 6	**Urban Agriculture by using the Nature-Based Solution" – the case of urban China**
IUE Supervisor	Prof Yong-Guan Zhu and Prof Gang Li

UNNC Supervisor(s)	Dr Faith Chan
Short introduction & description of PhD project	China like many other countries is facing food security issues for the growing population under climate and other uncertainties. The nation keeps importing major grains (e.g. soybeans, wheat, corn, etc.) overseas to supply the local intakes is not a sustainable option. The Nature-Based Solution (NBS) and urban agriculture, these concepts provide incentives for extra options for food supply to increase Chinese urban populations but also deliver multiple benefits such as addressing urban health issues, providing green spaces and reducing carbon emissions. In this project, the candidate may consider these remits including the latest ideas on zero-pesticides and herbicides that combine with the "One-Health" concept and practice in this project that addresses the sustainable development goals (SDGs) for the Chinese urban future.
Contact points	Informal inquiries may be addressed to Dr Faith Chan (faith.chan@nottingham.edu.cn) and Prof Yong-Guan Zhu (ygzhu@iue.ac.cn) and Prof Gang Li (g.li@iue.ac.cn).
PhD topic 7	**Urban emerging contaminants and river ecosystem health**
IUE Supervisor	Prof Yaoyang XU
UNNC Supervisor(s)	Dr Meili Feng Dr Faith Chan
Short introduction & description of PhD project	Urban emerging contaminants such as microplastics, antibiotics and pharmaceuticals have increasingly been recognized as an important threat to river ecosystem health. However, there is still a lack of data-supported evidence on how river ecosystem health is threatened worldwide by urban emerging contaminants. As such, we seek candidates for the DTP program to develop a systematic workflow of data mining that can be applied to quantify the pressure-state-response relationships between urban emerging contaminants and river ecosystem health across the world. Our research team is studying a wide range of research questions related to river ecosystem health by developing a set of meta-data tools and data products that are specified to freshwater biodiversity and emerging contaminants. Competitive candidates should be highly motivated. The ability to study both independently and collaboratively in a team environment is required.
Contact points	Informal inquiries may be addressed to Dr Meili FENG (meili.feng@nottingham.edu.cn), Dr Faith Chan (Faith.Chan@nottingham.edu.cn) and Prof Yaoyang Xu (yyxu@iue.ac.cn).
PhD topic 8	**Urban Green Infrastructures for human health: Issues, Implications, and Optimal Solutions**
IUE Supervisor	Prof Yin Ren

	(www.iuecasforest.cn)
UNNC Supervisor(s)	Prof Ali Cheshmehzangi
Short introduction & description of PhD	Based on the high accuracy air pollution map to estimate the exposure risk and then explore the reasonable relation among the urban green infrastructures, air pollution and human health outcome. Along with the acceleration of global urbanization, the air pollution issues have attracted increasing attention. Concerning the mitigation measures, besides the source emission reductions, nowadays, promoting the absorption and circulation of pollutants through vegetation (e.g., trees) is also one of the main ways to deal with environmental pollution. A considerable volume of literature investigating the associations between green space and air pollution was carried out in different disciplines. Although the air regulation effect of green space received much attention, the influence mechanism among green space, air quality, and human health remain unclear. Studies have reported that urban vegetation would negatively affect urban residents under certain urban forms and plant configurations. The conventional wisdom deems that urban green space improves air quality by reducing gas pollution concentrations and PM, thereby reducing direct harm to human health. However, the actual impact of green space on air pollution remains uncertain. Therefore, this project plans to focus on (i) exploring the relationship between the air influences of green space and human health and (ii) optimizing the urban green space design for a healthier life.
Contact points	Informal inquiries may be addressed to Prof Ali Cheshmehzangi (Ali.Cheshmehzangi@nottingham.edu.cn) and Prof Yin Ren (yren@iue.ac.cn).