UNNC - IUE, CAS Doctoral Training Partnership

It's essential that you have contacted the UNNC and/or IUE supervisors before applying.

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

Research areas

- Urban Ecology and Health
- Urban Pollution Control and Restoration
- Urban Environmental Engineering and Circular Economy
- Urban Environmental Planning and Management

Available PhD Topics

PhD topic	**Research on the pathway of carbon peak carbon neutrality for building sector**
IUE Supervisor	Prof. Jianyi LIN
UNNC Supervisor(s)	Prof. 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 Prof Wu Deng (wu.deng@nottingham.edu.cn).
PhD topic	**Peri-urban agricultural biodiversity**
IUE Supervisor	Yao-Yang Xu
UNNC Supervisor(s)	Meili Feng

Short introduction & description of PhD	Peri-urban agricultural systems are critical interfaces where food production, biodiversity conservation, and urban expansion converge, often resulting in highly heterogeneous but ecologically fragile landscapes. These systems are increasingly exposed to diffuse pollution, atmospheric deposition, and climate-driven environmental variability, which may influence biodiversity not only through direct stress but also via complex environmental processes. Growing evidence suggests that ecological responses to such pressures are frequently nonlinear and may exhibit threshold behavior, highlighting the limitations of traditional linear frameworks in capturing ecosystem vulnerability in peri-urban agricultural environments. This PhD project aims to investigate how environmental stressors and land-use intensification jointly shape biodiversity patterns in peri-urban agricultural landscapes, with a particular focus on identifying nonlinear responses and ecological thresholds. The project will integrate multi-source datasets encompassing biodiversity indicators, land-use characteristics, pollution proxies, and climatic variables. Advanced statistical approaches will be applied to detect critical transition points and disentangle direct and indirect drivers of biodiversity change. By emphasizing process-based interactions and threshold behavior, this research seeks to reveal tipping points beyond which biodiversity loss may accelerate, thereby providing scientific evidence to support resilient land management and biodiversity-informed planning in rapidly urbanizing regions. We seek highly motivated candidates with strong background in ecology, environmental science, geography, or a related field. Essential skills include quantitative data analysis, statistical modelling, and geospatial handling (e.g., in R, Python, or GIS). Prior research experience in community or landscape ecology and a solid foundation in applied statistics is highly valued.
Contact points	Informal inquiries may be addressed to Yao-Yang Xu (yyxu@iue.ac.cn) and Meili Feng (Meili.Feng@nottingham.edu.cn).
PhD topic	**High-resolution mapping of plastic metabolism and environmental footprints integrating remote sensing and multi-source data fusion**
IUE Supervisor	Prof. Wei-Qiang Chen
UNNC Supervisor(s)	Prof. Jun He and Prof. Faith Chan
Short introduction & description of PhD	Plastic lifecycle management is increasingly recognized as an important pressure on ecosystems and planetary boundaries. However, current management strategies still rely largely on aggregated statistics at city or national scales. As a result, this top-down framing provides limited spatial granularity, which hampers the identification of localized hotspots and high-impact sources. Crucially, plastic flows exhibit strong spatial heterogeneity shaped by urbanization, economic activity, and consumption patterns. Consequently, a critical gap remains in quantifying plastic life-cycle stocks and flows at refined subnational and intra-urban scales, calling for data-driven spatial analysis. Meanwhile, advances in satellite Earth observation, machine learning, and geospatial analytics offer a practical pathway to bridge this gap. This project will focus on two major dimensions: (i) constructing a spatially explicit model to quantify plastic production, consumption, and waste flows by fusing multi-source datasets (e.g., night-time light imagery and Points of Interest identifying functional zones), and (ii) assessing the lifecycle environmental footprints based on these digitized material flows to support precision plastic management and sustainable circularity.

Contact points	Informal inquiries may be addressed to Prof. Jun He (Jun.He@nottingham.edu.cn), Prof. Faith Chan (Faith.Chan@nottingham.edu.cn) and Prof. Wei-Qiang Chen (wqchen@iue.ac.cn).
PhD topic	**Mechanisms of Microbially Mediated Pollutant Degradation/Immobilization in Typical Farmland Soils**
IUE Supervisor	Prof. Gang Li
UNNC Supervisor(s)	Prof. Jun He
Short introduction & description of the PhD project	The research focuses on pollution scenarios dominated by single pollutants with moderate inclusion of co-contamination. Based on field sampling surveys, representative pollutant-soil type combinations (e.g., paddy soil–arsenic and cadmium, red soil–emerging contaminants and cadmium, black soil–nitrogen/phosphorus and herbicides) will be selected. A microcosm incubation system will be established to systematically analyze changes in soil microbial community structure, functional gene expression, and metabolic pathways under varying conditions of pollutant or nitrogen/phosphorus input.By integrating multi-omics techniques (metagenomics, transcriptomics, proteomics, enzyme activity profiling) and dynamic monitoring of soil physicochemical properties, the ecological adaptation mechanisms of microorganisms under typical pollution stress will be identified, along with key functional microbial groups and their potential in pollutant degradation and nitrogen/phosphorus immobilization. The study will emphasize elucidating the central role of microorganisms in the transformation and environmental fate of pollutants and nitrogen/phosphorus.A functional microbial inoculant repository and gene database for pollutant/nitrogen/phosphorus degradation/immobilization in farmland soils will be constructed. Through enzyme three-dimensional structure prediction and molecular dynamics simulation, the molecular mechanisms underlying pollutant transformation and nitrogen/phosphorus immobilization will be revealed. Additionally, a limited number of co-contamination treatments will be included to explore the effects of synergistic or antagonistic interactions on microbial functional expression, ultimately constructing a regulatory network linking pollution type, microbial response, and degradation/immobilization efficiency.
Contact points	Informal inquiries may be addressed to Prof. Jun He (Jun.He@nottingham.edu.cn) and Prof. Gang Li (gli@iue.ac.cn)
PhD topic	**Coastal city climate Resilient incluSive toolkit for Urban REgeneration and REgreening (ReSURE2)**
IUE Supervisor	Dr Nicholas Hamm
UNNC Supervisor(s)	Prof Tao Lin
Short introduction & description of the PhD project	Coastal cities, as the "first responders" to climate change, demonstrate unique leadership and urgency in risk response. Introducing nature based solutions (NbS) into the urban planning and design process, fully utilizing the natural service conditions of ecosystems to construct green infrastructure with corresponding carrying capacity, and enhancing the ability to adapt to future climate change, has dual importance in scientific research and practice. This project aims to conduct research and design on three shortcomings in the current research and practice of resilience to climate change in coastal cities, including (1) neglecting the cascading effects of disasters and the cumulative impact on population health; (2) neglecting the multifunctional role of blue-green infrastructure (GBI) in disaster prevention; (3) neglecting systematic solutions that couple social resilience and physical resilience. This project brings

	together research teams with rich theoretical and practical experience in urban ecology, industrial ecology, urban planning, and geographic information modeling from multiple disciplines and interdisciplinary fields in China and the Netherlands, and conducts joint research based on complementary advantages. The project aims at improving the social and physical resilience of coastal cities to cope with climate change based on NbS, focusing on the extreme scenarios caused by water (rainstorm, spring tide, typhoon, sea level rise coupling) and heat (heat island heat wave coupling) disasters, and carrying out the research and development of methods and technologies for coastal cities to improve social and physical resilience based on NbS from the regional (planning oriented) and local (design oriented) scales: (1) Systematically diagnose the spatial zoning and risk levels of urban risk from the perspective of social resilience, taking into account the cascading effects of industries and population health and welfare risks; (2) the construction potential of coastal cities' blue-green infrastructure (GBI) and its contribution to coping with climate change risks are quantitatively evaluated from the physical resilience dimension; Based on this, (3) coupling the research results of social and physical resilience, through case studies of typical coastal cities in China (Shanghai, Xiamen) and the Netherlands (Amsterdam, Rotterdam), a NbS strategy for typical urban functional areas to address climate change is proposed; And (4) to meet the application needs of the government and the public, develop a digital toolkit for urban renewal and re greening decision-making. In developing our guidance and toolkit, three overarching questions will be investigated: (1) How to synergistically integrate physical and social resilience to provide a systematic solution for coastal cities to adapt to climate change? (2) How can innovative green-blue infrastructure and traditional grey infrastructure be combined to effectively enhance the climate resilience of coastal cities? and (3) How can urban regeneration move beyond ad-hoc adaptation to holistically enhance the climate resilience, nature inclusivity and wellbeing of urban residents? The results of this project will form a technology application toolkit with international wide promotion value, which will help enhance the practical application of NbS in coastal urban renewal and response to climate change disasters, and form a systematic solution for the social physical resilience coupling of coastal cities to cope with climate change risks.
Contact points	Informal inquiries may be addressed to Dr Nicholas Hamm (nicholas.hamm@nottingham.edu.cn) and Prof Tao Lin (tlin@iue.ac.cn).

Other potential supervisors

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