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	Anthropogenic carbon-water nexus, circular economy on the plastics and new pollutants under the climatic and non-climatic challenges of Global South 's Urban Future
IUE Supervisor	Wei-Qiang Chen (https://wqchen.org or https://macycle.org)
UNNC Supervisor(s)	Dr Faith Chan Dr Meili Feng Dr Matthew Johnson (UNUK)
Short introduction & description of PhD project	We expect to have a doctoral student working on the following aspects, which implies candidate can focus on these issues and draft the proposal to us for assessing your potential: (1) To build a database on material flows, trade, life cycle assessment of materials including plastics, and critical metals that related to water and carbon nexus such as investigating the complex coupling elements between water, energy, and environmental pollutant (WEE) subsystems, elements and indicators (various types of WEE), and production units. In prior also looking at the petrochemical WEE Nexus (WEEN) at different levels that includes developing a generic WEEN model suits for this study, providing caveats on material and energy flow analysis, and a WEEN analysis matrix; (2) To explore patterns of water uses among countries and over time, and the risks of materials flow in the global supply chains that related to new pollutants (e.g. PFAS (per- and polyfluoroalkyl substances (PFASs)), PFOS (perfluorooctane sulfonate), etc.) and the health exposure to water users;

(3) To identify priorities and policies for sustainable management of materials;

(4) The candidate is expected to also project the future nexus and MFA/LCA with climatic projections;

(5) Based on the above 4 points, the candidate is expected to create a state-of-art managing new pollutants in water spans the policy regimes of eco-toxicological management framework and provide suggestions to the governments and international governmental bodies (i.e. UNEP) for managing new pollutants from the perspective of policy integration, especially Global South countries (include China) currently are lacking of such policy instruments.

These policy instruments justified by the MFA/LCA as evident are urgently required and helping governments to inject the new insights and frontier visions for improving their future Action Plans and Practices such as the environmental impact assessment and green finance for enhancing more sustainable circular economy under climatic and non-climatic challenges.

The candidate is expected to have an excellent language skill (English and Chinese) and technical skills of handling big-data and relevant geo-spatial techniques and preferably a solid understanding of the industrial ecology, environmental engineering, circular economy on water, water footprint, climate change, water toxicity and assessment that related to the LCA and MFA with Wei-Qiang (IUE) and Faith and Meili and Matt' strengthening areas. For example, we expect candidate to be familiar about the current legislations and practices of the United States and the European Union specifically for managing the risks of plastics and new pollutants related to plastics through their life cycle, like the *US Toxic Substance Control Act*, and the *EU Registration* (i.e. *the European Green Deal's zero pollution*), Evaluation, Authorization and Restriction of Chemicals. floods, droughts and urban water knowledge. Existing evidence calls for urgent action to address these new plastic or/and chemical pollutants as part of the global action on plastic pollution, to protect human health and the environment, and transition to a toxic-free and sustainable circular economy.

We prefer candidates with a strong background in these research areas, such as finishing the relevant Bachelor and Master studies in GIS, Geography, Environmental Science and Engineering, Environmental Toxicology, Organic Chemistry, Chemical Engineering, Medical and Health Studies, Bio-geochemistry, pharmaceutical studies, Hydrology, Urban Planning, Computer Sciences in these research directions. In particular, we welcome candidates who are willing to develop novel open-source geospatial technology in the context of water nexus, water footprint, life-cycle assessment and material flow analysis.

Candidates are expected to have a good maturity and passions to take on the research pressure and challenges, with research experience from a High-Quality Master degree (i.e. from the CAS system or top Universities in China or from worldwide) or from your employment experiences (research assistantship experience from the CAS system preferable). Plus, the experience on publishing high-standard journal publications (i.e. CAS Q1 and Q2) also will show the advancement. By the research scope and the required tasks in this project, candidates should have an excellent writing, listening, reading and oral skills for both English and Chinese will be literally required.

We expect candidates to be independent, withstand high-pressure and have a very strong research interest and passion, and willing to publish and work with our research groups at the University of Nottingham (across campuses – CN and UK)

	and the CAS IUE in Xiamen Terminal Centre in Wei-Qiang's research group. You are expected to spend equity of time during the funding period of 36 months. Exact research proposal is encouraging the submission of your application that discuss concepts and present models and methods for building strategies, plans, and actions to accomplish with your own ideas are welcome.
Contact points	Informal inquiries may be addressed to Dr Faith Chan (Faith.Chan@nottingham.edu.cn), Dr Meili Feng (meili.feng@nottingham.edu.cn), Dr Matthew Johnson (m.johnson@nottingham.ac.uk) and Prof Weiqiang Chan (wqchen@iue.ac.cn).
PhD topic	**Emerging contaminants in estuarine aquatic ecosystem**
IUE Supervisor	Prof Yaoyang Xu and Prof Jianfeng Tang
UNNC Supervisor(s)	Prof Jun He
Short introduction & description of PhD project	Rapid urbanization has increasingly transformed natural landscapes into urban landscapes, blurring the boundaries between rural and urban areas. Estuaries are formed between terrestrial and marine environments with complex biogeochemical processes, which is the hotspots of emerging contaminants. Estuarine ecosystems are ecologically vulnerable and increasingly threatened by anthropogenic disturbances in the form of large amounts of emerging contaminants discharged into the estuarine environment. There are many interesting process mechanisms and scientific phenomena. Emerging contaminants are easily discharged into the environment during their manufacture, transport, and use. The environmental fate of emerging contaminants has been extensively investigated due to their potential risk to ecological safety and human health. The Yangtze River Delta (YRD) in eastern China is one of the world's most urbanized and industrialized areas. To make it clarify, we plan to conduct a systematic investigation of emerging contaminants in their migration and transformation, and further explore the potential physiochemical mechanisms to control environmental pollution problems. The main influencing factors and key drivers of emerging contaminants in water environment will be revealed. In this project, we would like to recruit PhD students who have robust academic backgrounds and bilingual communication skills. Successful candidates not only have an opportunity to do research at the University of Nottingham (across campuses – CN and UK) and the CAS IUE in Ningbo but also gain a fund in a period of 36 months.
Contact points	Informal inquiries may be addressed to Prof Jianfeng Tang (jftang@iue.ac.cn) and Prof Jun He (Jun.He@nottingham.edu.cn).
PhD topic	**Geospatial applications in urban science**
IUE Supervisor	Prof Tao LIN
UNNC Supervisor(s)	Dr Nicholas HAMM
Short introduction & description of PhD project	We would like to recruit PhD students who are interested in developing applications of geospatial technology within urban science. This includes aspects of urban planning, urban metabolism and urban health. Examples of specific topics include:

	- Quality, access and accessibility of urban greenspace and its relationship to health and well-being - Urban compactness and energy usage and its relationship to city planning. Current thinking proposes that urban cities may lead to greater efficiencies, for example in terms of transportation and energy usage. However, there are potential downsides in terms of access to greenspace, urban ecology and urban microclimate. - Understanding urban form and function. These topics can be better understood through the application and development and application of modern geospatial technologies. On the one hand this means data – supported by increased access to both traditional datasets and novel, big datasets. On the other hand, development of geostatistical and machine learning models supports our analysis and interpretation of these datasets. Datasets may include traditional surveys, remote sensing and big data such as points of interest, volunteered data and movement data. Novel analysis methods include geo-enabled machine learning, geographically weighted regression and models of geospatial heterogeneity. The candidate is expected to have excellent English language skills and geospatial technical skills and preferably a solid understanding of urban environmental science. We prefer candidates with a strong background in these research areas, such as finishing the relevant Bachelor and Master studies in GIS, Geography, Environmental Science, Urban Planning or Computer Sciences. Candidates are expected to have a good maturity and passion to take on the research challenges, with research experience from a Master degree or employment. We expect candidates to be independent and have a strong interest to work with our research groups at the University of Nottingham (across campuses) and the CAS IUE in Xiamen. In particular, we welcome candidates who are willing to develop novel open-source geospatial technology. Potential candidates will need to develop their own proposal as part of the application process. They are advised to first contact the supervisors to discuss this (contact details below).
Contact points	Informal inquiries may be addressed to Prof Tao LIN (tlin@iue.ac.cn) and Dr Nicholas HAMM (nicholas.hamm@nottingham.edu.cn)
PhD topic	**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	**Investigation on electrochemical oxidation/reduction degradation of emerging pollutants (e.g. pesticides, pharmaceuticals or dyes) in industrial and domestic effluents**
IUE Supervisor	Prof. Hang Xiao
UNNC Supervisor(s)	Prof Jun He
Short introduction & description of PhD project	Ozone photochemical pollution has gradually become a constraining factor in the continuous improvement of the regional atmospheric environmental quality in China. To actively address the increasingly prominent environmental issue of ozone pollution in Zhejiang Province, this study, based on extensive reference to domestic and international research and control experiences related to ozone pollution, plans to conduct a systematic investigation into the ozone issues in three major urban clusters in Zhejiang Province: northern Zhejiang (Hangzhou-Ningbo), western Zhejiang (Jinhua-Quzhou), and southern Zhejiang (Taizhou-Wenzhou).
	Firstly, by studying the response relationship between ozone and environmental air parameters, meteorological elements, and optical parameters, the main influencing factors of ozone pollution in each urban cluster will be revealed. Secondly, through model analysis, the study aims to quantify the impact of meteorological conditions on the recent changes in atmospheric ozone in each urban cluster and explore the influence of complex meteorological conditions on the evolution of ozone patterns. Thirdly, utilizing observation-based box models, the research will analyze the chemical mechanisms of ozone pollution in the region and investigate its formation mechanisms. Finally, using ozone source identification technology, the study will decipher the main sources of ozone in the region, analyze ozone generation sensitivity, and consequently propose pollution control strategies and plans tailored to each urban cluster.
	The research outcomes are expected to provide technical support for the implementation of regional air pollution prevention and control, contributing to a comprehensive and coordinated approach to addressing atmospheric pollution.
Contact points	Prof. Jun He, email: Jun.He@nottingham.edu.cn Prof. Hang Xiao, email: hxiao@iue.ac.cn
PhD topic	**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	**Statistical models of emerging contaminants and aquatic biodiversity**
IUE Supervisor	Prof. Yaoyang Xu
UNNC Supervisor(s)	Dr Fangfang Zhu
Short introduction & description of PhD project	Both of emerging contaminants and aquatic biodiversity is at research wave in Environmental Science and Ecology with dramatic increase in publications. Advanced Statistics is the core of machine learning and deep learning to analyze large dataset of environmental and ecological variables. This topic is looking for a doctoral student to develop statistical models with the utilization of published data to quantify the complex relationships between emerging contaminants and aquatic biodiversity. A doctoral student would be welcomed with both of independent and collaborative abilities to make a difference at research wave by taking less time and energy in an honest way than that in a conventional way. This topic does not recruit a doctoral student who always worked so hard but got nothing or less to share with himself/herself, family, friends, and colleagues.

Recent publications for the proposal of this topic:

1. Guo Z., Boeing W.J., Xu Y*., Borgomeo E., Liu D., Zhu Y. 2023. Data-driven discoveries on widespread contamination of freshwater reservoirs by dominant antibiotic resistance genes. Water Research, 229: 119466.

2. Liu D., Guo Z., Xu Y*., Chan F., Xu Y., Johnson M., Zhu Y. 2022. Widespread occurrence of microplastics in marine bays with diverse drivers and environmental risk. Environment International, 168: 107483.

3. Liu D., Xu Y*., Junaid M., Zhu Y., Wang J., 2022. Distribution, transfer, ecological and human health risks of antibiotics in bay ecosystems. Environment International, 158: 106949.
4. Guo Z., Boeing W.J., Xu Y*., Borgomeo E., Mason S.A., Zhu Y., 2021. Global meta-analysis of microplastic contamination in reservoirs with a novel framework. Water Research, 207: 117828.
5. Liang Z., Liu Y., Xu Y*., Wagner T., 2021. Bayesian change point quantile regression approach to enhance the understanding of shifting phytoplankton-dimethyl sulfide relationships in aquatic ecosystems. Water Research, 201: 117287.

6. Qiu Q., Liang Z., Xu Y*., Shin-ichiro S. M., Komatsu K., Wagner T. 2021. A statistical framework to track temporal dependence of chlorophyll–nutrient |

	relationships with implications for lake eutrophication management. J. Hydrol., 603: 127134.
	7. Xu Y., Schroth A.W., Isles P.D.F., Rizzo D.M., 2015. Quantile regression improves models of lake eutrophication with implications for ecosystem-specific management. Freshwater Biology, 60(9): 1841-1853.
Contact points	Informal inquiries may be addressed to Prof Yaoyang Xu (yyxu@iue.ac.cn) and Dr Fangfang Zhu (Fangfang.zhu@nottingham.edu.cn).
PhD topic	**"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 climatic extremes (Floods and Droughts) 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) /Prof Gang Li (gli@iue.ac.cn).
PhD topic	**Urban resilience and adaptation to Climate changes**
IUE Supervisor	Prof Tao LIN
UNNC Supervisor(s)	Dr Faith CHAN & Dr Nicholas HAMM
Short introduction & description of PhD project	We would like to recruit PhD students who are interested in Urban resilience and its adaptation to Climate Change. This includes aspects of urban heat island, urban waterlogging, urban planning, and urban green. Examples of specific topics include: - Understanding urban adaptation to Climate Changes from urban policy, urban planning, and people's recognition - Urban form and function compactness and its relationship to urban resilience and human well-being and health - Availability and accessibility of urban greenspace and its relationship to urban heat island and adaptation to Climate Changes - Human exposure to urban greenspace and its effect on mental, physical and social health - Understanding urban compactness and its relationship with sustainable urbanization

	These topics can be better understood through the application and development and application of Remote sensing, internet Big data, and modern geospatial technologies. On the one hand, we will try to explore the novel data set from all kinds of resources on urbanization and climate change adaptation. On the other hand, new modelling and analysis processes will be developed based on Geographical information systems and AI techniques.
	Datasets may include traditional surveys, remote sensing and social network big data such as points of interest, media big data analytics such as GDELT, volunteered data and movement data. The analysis methods will come from both social and natural sciences. Novel analysis methods include geo-enabled machine learning, geographically weighted regression and models of geospatial heterogeneity.
	The candidate is expected to have an excellent language skill (English and Chinese) and technical skills of social surveys, big-data mining and relevant geospatial techniques and preferably a solid understanding of urban planning, urban ecology, and environmental science. We prefer candidates with a strong background in these research areas, such as finishing the relevant Bachelor and Master studies in Ecology, Urban planning, GIS, Geography, Environmental Science, Urban Planning, and Computer Sciences in these research directions. Candidates are expected to have good maturity and passion to take on the research pressure and challenges, with research experience from a Master's degree or employment. We expect candidates to be independent and have a strong research interest to work with our research groups at the University of Nottingham (across campuses) and the CAS IUE in Xiamen by spending equity of time during the funding period of 36 months.
	Potential candidates will need to develop their proposal as part of the application process. They are advised to first contact the supervisors to discuss this (contact details below).
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