UNNC-IGSNRR, CAS Doctoral Training Partnership

Available PhD research topics

1. A comparative study on the response of zonal vegetation phenology to major climatic factors in different vegetation regions in China

IGSNRR Supervisor	Prof Junhu DAI
UNNC Supervisor(s)	Dr Tengwen LONG
Short introduction & description of PhD	Vegetation phenology is a sensitive indicator to climate change, and is crucial for evaluation of responses of ecosystem to climate change in recent year. Unlike phenological studies in the past, which mainly discussed plant and vegetation seasonal growing changes and relations with climatic factors in temperate regions, current phenology has greatly broadened its scope for studying plant and vegetation phenophases' shifts in various biomes, such as for evergreen forests, rainforests, as well as for mountain and alpine vegetations. In this study, by application of multi-source data, namely ground observation network data, phenological cameral data and satellite remotely sensed data, we plan to study phenological shifts for different spatial scales. After that, we will explore the different climatic factors that affect phenological changes, and then study the mechanism for phenological changes under background of global change. So based on multi-source phenological data, the project will focus on two aspects: i) divergent phenological shifts for difference biomes, and ii) the main factors that affect the above phenological shifts and the driving factors, and the influence mechanism.
Contact points	Dr Tengwen LONG (Tengwen.Long@nottingham.edu.cn) Prof Junhu DAI (daijh@igsnrr.ac.cn)

2. Big data and artificial intelligence-based drought forecasting system in China

IGSNRR Supervisor	Prof Yanfang SANG
UNNC Supervisor(s)	Dr Faith CHAN
Short introduction & description of PhD	Drought, triggered by an intense and persistent precipitation deficit, is the most devastating water-related disaster affecting more people and larger areas than any other natural disasters. Decreasing precipitation coupled with increasing water demand can threaten agriculture, ecosystems and even human lives, resulting in severe socioeconomic impacts. A better understanding of the drought variability and its changes is important for managing the future drought risk. Numerous studies have focused on the drought studies including its definition, quantification, monitoring, forecasting, evaluation, and others. However, drought forecasting/monitoring is still a big challenge due to the complex variability of hydroclimatic cycle, as well as the data and methods used. Presently, more effective data-mining and deep-learning methods are expected to identify more detailed characteristics of drought and its changes, as well as improve the accuracy of drought forecasting. This project will focus on two major dimensions on (i) propose a theoretical model of heterogeneous big data architecture for the enrichment of drought-relevant time series analysis and (ii) establish the big data and artificial intelligence-based drought forecasting/monitoring system in China.
Contact points	Dr Faith Chan (Faith.Chan@nottingham.edu.cn) Prof Yanfang SANG (sangyf@igsnrr.ac.cn)

3. Current and historic air quality mapping in China

IGSNRR Supervisor	Prof Baozhang CHEN
UNNC Supervisor(s)	Dr Nicholas HAMM
Short introduction & description of PhD	Air quality is a hot topic of widespread concern in China. Maps of air pollutant concentration are important for monitoring the situation, for identifying the relationship with emissions and for supporting studies in epidemiology and public health. Models for air quality are typically process-based (e.g., atmospheric chemistry models that track emissions transport, atmospheric chemical reactions, chemical decomposition and deposition) or statistical (e.g., land-use regression, based on empirical relationships between human and environmental covariates and monitored values) or some combination of the two. Epidemiological studies of chronic disease require historic maps for the last 10 to 20 years and some papers have already been published on this topic. However, both process-based and statistical models are limited by data quality issues including currency, accuracy and missing values. This PhD will focus on the development and evaluation of air quality maps for China based on models, satellites and in situ measurements. Key issues to address are: development and quality assurance of an air quality database, including pre-2012 data, uncertainty evaluation of current and historic air quality maps, identification of the appropriate space-time resolution for analysis.
Contact points	Dr Nicholas HAMM (nicholas.hamm@nottingham.edu.cn) Prof Baozhang CHEN (baozhang.chen@igsnrr.ac.cn)

4. Criteria and investigation of the original geographical features and ecological civilization model

IGSNRR Supervisor	Prof Yunqiang ZHU
UNNC Supervisor(s)	Dr Nicholas HAMM
Short introduction & description of PhD	The big Earth data depends on different acquisition methods, such as earth observation, ground monitoring, deep exploration, simulation calculation, real-time activities of people, voluntary collection and so on. It comes from different application purposes, scenarios, standards and processing methods. In this context, the biggest challenge of the integration, sharing and mining of big Earth data is the heterogeneity of data semantics. The state-of-art semantics, ontology, linked data, knowledge graph and others provide a basis for solving the problem of semantic heterogeneity of geospatial data. **Potential topics include (but are not limited to) the following: (optional, but recommended)** • Geospatial semantic mining on ubiquitous network • Geospatial semantic reasoning and information retrieval • Geospatial ontology alignment, fusion and integration • Crowdsourcing or volunteer geospation ontology construction • Geospatial data ontology and applications • Geospatial linked data • Geospatial knowledge graph • Geospatial data, models and computation sharing
Contact points	Dr Nicholas HAMM (nicholas.hamm@nottingham.edu.cn) Prof Yunqiang Zhu (zhuyq@igsnrr.ac.cn)

5. Evaluation of effects of the "Sponge City" program for urban water disasters control in China

IGSNRR Supervisor	Prof Yanfang SANG
UNNC Supervisor(s)	Dr Faith CHAN
Short introduction & description of PhD	How to evaluate the risks of urban water disasters and further to mitigate them is one key topic for the urban stormwater management, which is also the foremost challenge for the sustainable urban developments. The Chinese government proposed the concept of "Sponge City" in 2013 to handle the aggravating urban water disasters (i.e. urban surface water floods/waterlogging) over China. Over the last seven years, many measures and technologies have been developing for guiding the designs and implementation of the program in the 30 pilot cities. However, there still have many challenges that prevent the positive feedback of the "Sponge City" program, questioning its functions and effects. This project will focus on two major dimensions on (i) solve the key hydrology-related issues (e.g. estimation of proper rainfall threshold in various magnitude of precipitations) for guiding the design of the "Sponge City" program and (ii) evaluate the effects of the "Sponge City" program by considering the trade-off between the investment and its potential benefits.
Contact points	Dr Faith Chan (Faith.Chan@nottingham.edu.cn) Prof Yanfang SANG (sangyf@igsnrr.ac.cn)

6. Grassland monitoring based on satellites and a ground camera system

IGSNRR Supervisor	Prof Jinwei Dong
UNNC Supervisor(s)	Dr Fangfang Zhu & Dr Ping Fu
Short introduction & description of PhD	Grassland ecosystem is an important component of natural ecosystem. Timely grasp of grassland resource dynamics, forage growth, and yield is of great significance to guide the precise management of animal husbandry and realize the sustainable development of grassland ecosystem. We aim to present an accurate and real-time inversion algorithm of ecological indicators (e.g. canopy coverage, phenology, aboveground biomass and yield) to provide technical support for grassland resource monitoring and to promote intelligent grass husbandry based on mass multispectral remote sensing data, ground camera-based imagery, as well as a cloud-computing platform. This project will focus on three major dimensions on (i) algorithm and model for grassland monitoring and data acquisition, (ii) products of grassland monitoring dynamic, and (iii) grass-livestock balance assessment.
Contact points	Fangfang Zhu (fangfang.zhu@nottingham.edu.cn) Ping Fu (Ping.Fu@nottingham.edu.cn) Prof Jinwei Dong (dongjw@igsnrr.ac.cn)

7. Investigation into the sustainable development of wildlife tourism in China

IGSNRR Supervisor	Prof ZHONG Linsheng
UNNC Supervisor(s)	Dr Odette PARAMOR & Dr Yi WANG
Short introduction & description of PhD	This research focuses on ecotourism and the development of a sustainable wildlife tourism industry in China. An interdisciplinary approach will be employed to analyse how wildlife, natural ecosystems and market demand affect the development of wildlife tourism. Management tools and mechanisms to support the healthy, sustainable and ethical development of wildlife tourism industry in China will be investigated. Humans have had a close relationship with wild animals throughout history. In recent decades, a tourism industry centred on wildlife has developed in China in order to meet demand for encounters with non-domesticated animals in both their natural habitats and in captivity. This wildlife tourism often focuses on providing opportunities for humans to observe, feed, touch and photograph wild animals and there is an urgent need to better understand how to support the development of this industry to ensure that it is sustainable, ethical and healthy. Research on wildlife tourism tends to focuses how to provide satisfactory wildlife experiences for the tourists and is often part of a coordinated plan to develop a regional tourism industry. However, whilst tourist activities such as wildlife watching are considered to have a minimal impact on these animals, the tourism industry can have both positive and negative effects upon wildlife and natural landscapes. Thus far, there is a lack of comprehensive quantitative studies which aim to understand how factors such as natural resources, the environment and market demand influence wildlife tourism and the development of this industry. This project will focus on the development of wildlife tourism and its impacts from the three aspects of natural resources, environment and market demand. The purpose of this study is to better promote the development of wildlife tourism, better protect wildlife, and make wildlife tourism development sustainable and healthy.
Contact points	Dr Odette PARAMOR (Odette.PARAMOR@nottingham.edu.cn) Prof ZHONG Linsheng (zhongls@igsnrr.ac.cn)

8. Investigation on eco-city construction and urban ecological integrated management mechanism

IGSNRR Supervisor	Prof Xiangzheng Deng
UNNC Supervisor(s)	Prof Ali Cheshmehzangi
Short introduction & description of PhD	The PhD project aims to provide support for the construction and management of eco-cities, through clarifying lifestyle and consumption patterns of typical urban cities and quantifying their ecological environmental impact, and comparisons of the effect of urban ecological management mode on resource utilization efficiency and ecological environment in different eco-cities. New-type urbanization and eco-city constructions have been widely promoted in China since 2014. To optimize urban planning, mitigate the mismatch between urban scale hierarchy and urban functions, improve resource utilization efficiency and eco-efficiency, enhance the level of urban ecology and urban management and services, perfect the institutional mechanisms are of great importance to promoting the healthy development of ecological cities. At present, many cities in China put forward the goal of building ecological cities and communities, however, the research on integrated ecological management mechanisms is relatively underexplored. In this proposed project, there are three major dimensions: (1) clarify the characteristics of the lifestyles and consumption patterns in typical eco-cities, and further quantifies their impacts on the ecological environment; (2)quantify the resource utilization efficiency in selected domestic and foreign cities that with typical urban ecological management modes and estimates the impacts of different modes on the urban ecological environment; (3) estimate the urban eco-efficiency and environmental efficiency and identify their key limiting factors, and conduct systematic research from the perspectives of urban planning, industrial structure, resource policy, ecological and environmental protection measures and standards. All the research work will be summarized to refine urban ecological adaptive management modes, construct a set of method system for urban ecology adaptive management that meets the development needs of new-type urbanization, to provide scientific support for ecological community construction and integrated urban ecological management.
Contact points	Prof Xiangzheng Deng (dengxz@lreis.ac.cn) Prof Ali Cheshmehzangi (Ali.Cheshmehzangi@nottingham.edu.cn)

9. Multi-scale analyses of biodiversity and ecosystem functioning under climate change

IGSNRR Supervisor	Prof Shuli NIU
UNNC Supervisor(s)	Dr Tengwen LONG
Short introduction & description of PhD	How global climate change impacts biodiversity and ecosystem functioning has become one of the most important issues in recent decades. Biodiversity change also alters the magnitude and stability of ecosystem processes. Therefore, disentangling relationships between climate change-biodiversity-ecosystem functioning is vital to improve our understanding and better predict ecosystems' response to global climate change. The project aims to tackle three main issues by synthesizing multi-scale studies. The research may include but not limit to: (1) Large-scale biodiversity and ecosystem function (BEF) patterns; (2) (Fine-scale) BEF relationships along environmental gradients, (3) Scaling up BEF to predict global ecosystem responds to climate change.
Contact points	Dr Tengwen Long (Tengwen.Long@nottingham.edu.cn) Prof Shuli Niu (sniu@igsnrr.ac.cn)

10. Patents "coming in and going out": Industrial upgrading and mechanism

IGSNRR Supervisor	Prof Jiaoe Wang
UNNC Supervisor(s)	Prof Cong Cao
Short introduction & description of PhD	Patent is one of the most important intellectual properties, and invention patent is especially key to industrial upgrading and economic development in China today as innovation has driven the Chinese economy. Existing studies mainly focus on the growth and spatial distribution of patents in China. Since 1990s, a lot of foreign-funded enterprises have registered patents in China in order to protect their products and occupy the market. Meanwhile, more and more Chinese enterprises have sought to invest abroad. In 2015, China's outbound investment exceeded inbound investment for the first time. In this context, Chinese enterprises are registering more and more patents abroad. This proposed doctoral project will examine emerging corporate patenting activities along two major dimensions: 1) Distribution of patents registered by foreign enterprises in China and their constituencies with inbound investment, local industrial development in the last decades; and 2) Dynamics of patents overseas registered by Chinese firms and the relationship with outbound investment from China. We expect that the doctoral candidate will integrate the theories and methodologies of economic geography and innovation studies, and empirically examine the two dimensions mentioned above, and compare the values of patents in industrial upgrading of China and other countries.
Contact points	Prof Cong Cao (Cong.Cao@nottingham.edu.cn) Prof Jiaoe Wang (wangje@igsnrr.ac.cn)

11. Regional ecological environment changes

IGSNRR Supervisor	Prof Fenzhen SU
UNNC Supervisor(s)	Dr Fangfang ZHU
Short introduction & description of PhD	The project will focus on the regional ecological environmental changes of China and Southeast Asia region, multi-source remote sensing, GIS data will be applied for the research.
Contact points	Dr Fangfang Zhu (fangfang.zhu@nottingham.edu.cn) Prof Fenzhen SU (sufz@lreis.ac.cn)

12. Responses of river morphology to human activities and climate change

IGSNRR Supervisor	Prof He Qing HUANG
UNNC Supervisor(s)	Dr Tengwen LONG
Short introduction & description of PhD	Rivers are self-adjusting systems and yet their self-adjusting mechanism has remained unclear. Over the last century, rivers have adjusted their morphology dramatically in many parts of the world due to the effects of intensive human activities and climate change. An understanding of the way by which rivers have responded to human activities and climate change is helpful not only for uncovering river self-adjusting mechanism but also for making plans on conserving or restoring river eco-systems. Focusing on rivers in a typical geographical region, this project will perform a detailed investigation of the characteristics of rive morphological change using long-term field measurements and/or satellite observations and then identify the key factors controlling the characteristics. Finally, a physical model will be developed to explain the self-adjusting mechanism of the rivers focused.
Contact points	Dr Tengwen Long (Tengwen.Long@nottingham.edu.cn) Prof He Qing Huang (huanghq@igsnrr.ac.cn)

13. 1) Spatiotemporal big data analysis of cancers
2) Spatial statistic trinity: a generic framework of spatial sampling and inference

Title	1) Spatiotemporal big data analysis of cancers. Grant from the Ministry of Science and Technology of China 2) Spatial statistic trinity: a generic framework of spatial sampling and inference. Grant from the Natural Science Foundation of China Applicants' interests are mostly important.
IGSNRR Supervisor	Prof Jinfeng Wang
UNNC Supervisor(s)	Dr Nicholas HAMM
Short introduction & description of PhD	The main core research topics: Trinity theory and spatial analysis methods; cancer-related research based on big data. Based on the research direction given by the supervisors, combined with the applicant's research interest and willingness, the specific research direction is determined without mandatory regulations.
Contact points	Prof Jinfeng Wang (wangjf@lreis.ac.cn) Dr Nicholas HAMM (nicholas.hamm@nottingham.edu.cn)

14. Spatial and temporal changes characteristics and influencing mechanism of freshwater ecosystem services in the Guangdong-Hong Kong-Macau Greater Bay Area

IGSNRR Supervisor	Prof Erfu DAI
UNNC Supervisor(s)	Dr. Meili FENG
Short introduction & description of PhD	Ecosystem services have become an important part of the integrated watershed management strategy. Freshwater ecosystem service, as one of the important service types of ecosystem, has a strong supporting role for other services. Climate change, human activities and other factors directly change the hydrological cycle conditions of the river basin, affect the changes of its water quantity and quality, and thus have a cascading impact on fresh water supply and services. Therefore, it is of scientific significance to study the quantification and influence mechanism of freshwater ecosystem services for the promotion and sustainable development of regional integrated ecosystem. The detailed research contents are as follows: (1) quantitative assessment of typical freshwater ecosystem service supply in the study area; (2) quantitative analysis of spatial and temporal variability in ecosystem services and trade-offs and synergistic relationships;(3) relevant models are used to reveal the impact of land use, climate change and human activities on key freshwater ecosystem services.
Contact points	Dr Meili Feng (meili.feng@nottingham.edu.cn) Prof Erfu Dai (daief@igsnrr.ac.cn)

15. Study on the Natural Resource Management of National Parks in China

IGSNRR Supervisor	Prof Linsheng Zhong
UNNC Supervisor(s)	Dr Meili Feng
Short introduction & description of PhD	National Park is approved by the state and leading management with clear boundary, in order to protect the large area of natural ecological system as main objective, implementation of the protection and rational utilization of natural resources science particular area of land or sea. Natural resource management in national parks is a system for the protection and sustainable utilization of natural resources. At present, studies on national parks in China and abroad mainly focus on the impact of national parks to the ecological environment, the livelihood of indigenous people and the operation mechanism. However, there is a lack of in-depth discussion on the natural resource management of National Parks in China, a vast country with diversified ecological environment. In the UK, natural resource management in national parks is relatively mature. The management method is flexible, always adheres to the principle of sustainable development, encourages community participation, and forms a relatively unique system for addressing conflicting interests within the parks. This approach is worthy of consideration for the China National Park Pilot. This project with the purpose of providing references and suggestions for the natural resource management of national parks in China thereafter. More precisely, the natural resource development and management of China's national parks are discussed on the basis of the construction experience of UK national park, especially with the eco-tourism development model and its ecological environment vulnerability and ecosystem services value to establish a flexible, adaptive protection mode, so as to provide the reference of reasonable natural resource management construction in China's national park system control target, the strength of development, community co-construction and sharing mechanism, etc. The results of this study will be of great theoretical and practical significance for the formulation of China's national park system on the basis of China's national conditions.
Contact points	Prof Linsheng Zhong (zhongls@igsnrr.ac.cn) Dr Meili Feng (meili.feng@nottingham.edn.cn)

16. Sustainable urban-rural transformation development path in China based on Eco-service and socio-economic performance

IGSNRR Supervisor	Prof Hualou Long
UNNC Supervisor(s)	Prof Ali Cheshmehzangi
Short introduction & description of PhD	With the rapid urbanization and industrialization, urban-rural transformation development causes various socio-economic and environmental issues in the fringe of metropolis, the so-called suburbs. Therefore, how to realize the sustainable development of suburbs is not only a significant challenge of being the safeguard of integration between urban and rural areas, but also a huge problem to be solved in the current geography research. The student in this project is expected to use spatio-temporal analyses on socio-economic factors as well as environmental conditions through integrated information modelling of suburbs. The final requirement is to propose a planning strategy to optimise the sustainability of development in a Chinese suburb area from the perspective of urban-rural flexibility.
Contact points	Prof Ali Cheshmehzangi (Ali.Cheshmehzangi@nottingham.edu.cn) Prof Hualou Long (longhl@igsnrr.ac.cn)

17. Restructuring Cultural Landscapes originated from Historic Water Management on River Systems of Chinese Megalopolis

IGSNRR Supervisor	Prof Xiaolu GAO
UNNC Supervisor(s)	Dr Yu-Ting Tang & Dr Jing Xie
Short introduction & description of PhD	Cultural landscape preservation is an important issue for China during this era of intensive urbanisation. To evaluate what and how to preserve in a landscape for its cultural value during the process of urbanisation, the methodology of Landscape Character Assessment (LCA) has been established for policy making and infrastructure planning. While the practice of LCA in UK and European continent have been quite mature, the practice in China is still in its infancy. Further, the established and available LCA methods based on the contexts of Western socio-cultural setting may need adjustments to accommodate the situation in China. This PhD project aims to establish an LCA process from the aspect of technical feasibility and cultural/historic characteristics that is considered suitable for China. The LCA procedure is expected to be applied to evaluate an area of mega or large city in China where historically, water hydraulic structures have been constructed for managing water and now the structure has become part of the cultural landscape. During the process of the modern urbanisation, the water management system may need updating to fulfil the new city plan. Thus, the case may demonstrate a way to protect, transform and restructuring historic cultural landscapes while modernising water management infrastructure during a speeding urbanisation process.
Contact points	Dr Yu-Ting Tang (Yu-Ting.Tang@nottingham.edu.cn) Prof Xiaolu GAO (gaoxl@igsnrr.ac.cn)