ONE Planet Doctoral Training Partnership

Natural Environment Research Council

Project title: How can blue-green infrastructure support climate change efforts? (Ref: OP2237)

Keywords: climate change, Blue-Green Infrastructure; multiple benefits; planning; adaptation; scenarios, mitigation, carbon

One Planet Research Theme:
Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☒ | Environmental Informatics ☒

Lead Supervisor: Dr Oliver Heidrich, Dr. Claire Walsh (Newcastle University)

Key Research Gaps and Questions:
1. What is the magnitude and extent of the current and future risks; which mitigation responses are suitable?
2. What are the financial, social and environmental costs and benefits of responses?
3. How can organisations & agencies collaborate to address risks and system-wide planning for adaptation?

Project Description: In England, 3.2 million households are located in areas at risk of surface water flooding, with annual damages exceeding £300 million. This cost of associated damage could increase by 40% by the 2050s, largely driven by climate change. Traditional 'grey' infrastructure for managing surface water, which has a sole purpose, removes water as quickly as possible through drains, gullies and sewers in a hidden way. Increased impermeable surfaces in urban areas with population growth, coupled with increased intense rainfall will result in additional stress and investment needed for drainage infrastructure. Blue-Green infrastructure (BGI) can provide a means of reducing the amount of water entering drainage via infiltration, interception, transpiration and providing both temporary and longer-term storage i.e. controlling the water source, slowing the conveyance and proving attenuation. BGI plays an important role in coping with projected impacts of climate change, and at the same time can reduce carbon emissions (e.g. through sequestration and reduced energy use). BGI also provides a wider range of economic, social and environmental benefits. However, there are a number of limitations that need to be considered: institutional factors e.g. multiple agencies involved in decisions and funding of solutions; uncertainty over maintenance costs and land ownership and performance in extreme events; limitations in comprehensive understanding of cost-benefits, as well as limitations on tools currently available to appraise BGI options both spatially and temporally.

Working with Case Partner, Stantec, in collaboration with NWG this project will identify the role of BGI in meeting climate change objectives and explore approaches using various tools e.g. CIRIA's Benefits Estimation Tool (B£ST). However, the ability of BGI to support adaptation is not currently well understood. Therefore, a particular area of need/opportunity is to enhance our understanding of the contribution of BGI to climate resilience. The project also considers spatial variability e.g. urban/semi-urban/rural, different parts of the country, in terms of (a) physical benefits from BGI (e.g. amount of carbon, number of visitors, flows to works and treatment requirements), and (b) monetary value of benefits. It also includes an approach to scenario modelling, useful for considering a range of climate futures, based on the COFAS method. More comprehensive understanding and quantification of climate adaptation, carbon and other benefits, will inform assessment, valuation and decision making.

Prerequisites: can come from an engineering, natural science or geography background; analytical, mathematical strong academic writing skills. For more information: oliver.heidrich@ncl.ac.uk or claire.walsh@ncl.ac.uk

Newcastle University

Northumbria University NEWCASTLE