ONE Planet
Doctoral Training Partnership

Natural Environment Research Council

Project title: Is the future of urban drainage systems blue-green or grey? (Ref: OP2121)

Keywords: Blue-Green Infrastructure; multiple benefits; planning; adaptation; scenarios

One Planet Research Theme:

Climate & Climate Change ☒ | Earth System Processes ☒ | Anthropocene ☒ | Environmental Informatics ☒

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Key Research Gaps and Questions:

1. What is the magnitude and extent of the 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 work towards 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. It is projected that this cost of associated damage could increase by 40% by the 2050s. 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 systems via infiltration, interception, transpiration and providing both temporary and more longer-term storage i.e. controlling the water source, slowing the conveyance and proving attenuation. 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 NWL, maximizing current schemes and case studies, this project will explore approaches and tools e.g. CIRIA's Benefits Estimation Tool (B£ST) for assessing wider benefits of BGI e.g. biodiversity, amenity and cooling. B£ST is currently being moved to a spatial, GIS-based online platform. Therefore, a particular area of need/opportunity is to enhance our understanding of the spatial variability of different benefit categories in B£ST (e.g. urban/semi-urban/rural, different parts of the country), in terms of (a) physical quantities of benefits from BGI (e.g. number of visitors, flows to works and treatment requirements), and (b) monetary value of benefits. It also includes an approach to scenario modelling based on the COFAS method. More comprehensive understanding and quantification of benefits (e.g. Arup's social inclusion wheel and the TOMs framework), would better inform assessment, valuation and decision making around BGI. Considering future drivers (e.g. scenario analysis), the project will support development of tools to build and appraise adaptive pathways for urban drainage systems, taking obstacles and incentives to promote strategies into account.

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

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