System Dynamics to investigate sustainable urban water management in the Ebbsfleet Garden City

Presenters:

Irene Pluchinotta[1], Sangaralingam Ahilan[4]

Authors:

Irene Pluchinotta[1], Alessandro Pagano[2], Tudorel Vilcan[3], Sangaralingam Ahilan[4], Leon Kapetas[5], Shaun Maskrey[6,7], Vladimir Krivtsov[8], Colin Thorne[6] and Emily O'Donnell[6].

[1*]Institute for Environmental Design and Engineering, The Bartlett Faculty of The Built Environment, University College London, UK,

[2]Water Research Institute, National Research Council, Italy

[3]Department for Public Leadership and Social Enterprise, The Open University, UK

[4]Centre for Water Systems, College of Engineering, Mathematics and Physical Sciences, University of Exeter, UK

[5]Department of Engineering, University of Cambridge, UK

[6]School of Geography, University of Nottingham, UK

[7]Environment Agency, King's Meadow House, Reading, RG1 8DQ, UK

[8]School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, UK

Growing urban populations, changes in rainfall patterns and ageing infrastructure represent significant challenges for urban water management. Consequentially, there is increasing risk of future water scarcity, and a critical need for research into how cities should adapt to become more resilient to these impacts under an uncertain future. Within this context, a participatory modelling process was initiated in late 2017 to investigate the sustainable urban water management challenges in the Ebbsfleet Garden City and explore potential solutions to these using a System Dynamics approach.

The development of a participatory System Dynamics Model (SDM) for the Ebbsfleet Garden City has allowed us to explore sustainable urban water management in a more structured way, and to understand where crucial future policy interventions might be best focused. This method was useful for supporting decision-making at a strategic, system-wide level and exploring the long term consequences of alternative strategies, particularly those that are difficult to include in quantitative models (e.g. socio-institutional changes). While a SDM can be developed by experts alone, building it collaboratively allows it to benefit from the knowledge base held by local stakeholders, and results in a collective learning process. This talk summarises the extensive participatory process that led to the co-development of a SDM that was used to investigate a

number of physical measures and policy interventions which could impact on future sustainable urban water management in the Ebbsfleet Garden City.

Dr Irene Pluchinotta is a research fellow at the Institute for Environmental Design and Engineering of the Bartlett School of Environment, Energy and Resources, University College London. She is an environmental engineer using System Dynamics and Operational Research methodologies to support decision-making processes for environmental policies, sustainable water management strategies and urban planning for resilient cities. Based on a double PhD in environmental engineering and computer science, her work provides formal approaches to decision-makers involved in multi-stakeholder settings, working on group modelling approaches and structured stakeholders' engagement activities. She develops case-based research, designing and leading several participatory modelling workshops for generating and evaluating policy alternatives in case studies across Europe.

Dr Sangaralingam Ahilan is a research fellow in the Centre for Water Systems, University of Exeter. He has a civil engineering background with research interests in the mathematical modelling application in water and environmental engineering problems. Dr Ahilan obtained a PhD from University College Dublin, Ireland where he researched on influences of the floodplain on Irish flood estimation procedures. Over the last 10 years, he has worked on several high-profile EU and national research projects in Ireland and the UK. Dr Ahilan is currently involved in UK EPSRC funded research project on 'Achieving Urban Flood Resilience in an Uncertain Future', his research focuses on the catchment scale rainwater management on water supply augmentation and urban flood resilience, and urban water system modelling to integrate water, wastewater and material fluxes in the UK cities. Dr Ahilan is also an editor for Journal of Water and Climate Change, IWA Publishing.