PhD
STEPCHANGE
seminar series

ABSTRACT

The development of hydropower dams in the Mekong region has historically been seen as a means to support economic growth in Southeast Asia. However, water availability varies on both seasonal and interannual time scales, raising the prospect that an unstable supply of hydroelectricity may curb the expected benefits of hydropower mega-projects. To verify this hypothesis, we bank on tree ring data to produce the first large-scale streamflow reconstruction (~800 years of mean annual flow) at multiple gauging stations. Our reconstruction reveals the riparian footprint of megadroughts, showing that simultaneous droughts have often occurred in the Mekong and Chao Phraya River Basin. To assess the impact of these droughts, we then rely on a coupled water-energy model representing the relationship between hydro-climatological conditions, water availability, and power system behaviour. We show that compound droughts in the two basins largely influence hydropower production, increasing the reliance on coal and gas and, therefore, power production costs and CO2 emissions. Our analysis exemplifies how the use of streamflow reconstructions can expand our understanding of hydro-climatic variability, ultimately informing the design and operations of water-energy systems.

Dr. Stefano Galelli
Associate Professor at the Singapore University of Technology

COHERENT STREAMFLOW VARIABILITY IN SOUTHEAST ASIA CURBS THE EXPECTED BENEFITS OF HYDROPOWER MEGA PROJECTS

Event date:
December 2nd, 2022

Time:
11:00 am

Location:
DEIB - building 21
Alario Room

BIOGRAPHY

Dr. Stefano Galelli is an Associate Professor at the Singapore University of Technology and Design (SUTD) and an Adjunct Research Scientist at the Lamont-Doherty Earth Observatory, Columbia University. His research focuses on the development of analytics for the operation of interconnected infrastructure systems and the characterization of hydro-climatological risks. Dr. Galelli carried out his studies at Politecnico di Milano, where he earned a B.Sc. and M.Sc. in Environmental Engineering (2004, 2007) and a Ph.D. in Information and Communication Technology (2011). His previous experience includes a two-year period at the Singapore-Delft Water Alliance, National University of Singapore, where he led the Hydro-informatics group. Dr. Galelli was awarded the Early Career Research Excellence Award (2014) by the international Environmental Modelling & Software society and the 2017 SUTD Excellence in Research Award. His work has been recognized by multiple international journals, including Hydrology and Earth System Sciences, the Journal of Water Resources Planning and Management, and Earth's Future.

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