

Urban-scale Energy Analysis of the Built Environment

Dr. Ruchi Choudhary, Associate Professor

Energy Efficient Cities Initiative, Engineering Department, University of Cambridge

www.eeci.cam.ac.uk



Annual energy intensity per building and per street calculated for the City of Westminster, London

The use of transient computer simulations (e.g. TRNSYS, EnergyPlus) for quantifying energy use of individual buildings is now standard in both research and industry. However, their use has been computationally prohibitive at larger scales, in the context of thousands or millions of buildings within districts and cities. As a result, city scale analyses of the built environment, even when bottom-up, have to neglect or simplify dynamic and transient features of buildings. Yet, it is often that time-varying features (concurrence of peak energy demand) and dynamically interacting components (diurnal heat storage) yield the most economically achievable energy efficiencies. Furthermore, quantification of exogenous influences on built environment – such as socio-economic characteristics – necessitates flexible spatial and time scales of analysis.

We present a new city-scale energy simulation platform that offers a spatially differentiated, hourly analysis of energy consumed by the built environment. The City of Westminster, within central London, was chosen for the first pilot application of this simulation platform due to diversity of building types and high-energy demand. The lecture will highlight the challenges associated with its development, as well how it supports the assessment of synergistic energy systems in cities.