Seminar

Department of Civil Engineering and Engineering Mechanics
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644 Mudd

Measuring and Mitigating Urban Greenhouse Gas Emissions: Integrating Transboundary Infrastructures with Social Actors in Sustainable City-Systems

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Greenhouse gas (GHG) accounting at the spatial scale of cities and towns is confounded by the transboundary nature of essential infrastructures serving cities (such as electricity, water and transportation networks), as well as the trade of goods and services across cities. This presentation describes an emerging methodology for community-wide GHG emissions accounting and carbon footprinting at the city-scale that integrates infrastructures with urban metabolism and industrial ecology to overcome the boundary challenges listed above. The methodology yields an infrastructure-based expanded GHG emissions footprint for cities. Field-tested in eight US cities, the expanded GHG emissions footprint method is found to track well with national benchmarks, and to stimulate innovative low-carbon infrastructure design strategies and policies in buildings, transportation, energy, water, waste and food sectors. Select examples of sustainable infrastructure research projects that reduce the GHG emissions footprint of cities will be discussed.

The city-scale GHG footprint method anchors a broader social-ecological-infrastructural systems (SEIS) framework for inter-disciplinary study of sustainable city-systems. The SEIS framework integrates city-scale water-, energy- and carbon-footprints with various social actors – e.g., individual users, infrastructure designer-operators, firms/businesses, and policy actors - who shape urban infrastructures toward sustainability goals. Inter-disciplinary research based on the SEIS framework is illustrated via quantitative analysis of carbon stabilization wedges for US cities, addressing social actor participation rates in various infrastructure interventions. The framework stimulates ongoing inter-disciplinary research across infrastructure engineering, environmental engineering, industrial ecology, architecture, urban planning, public policy, health and behavioral sciences, essential for building sustainable city-systems of the future.