

RCN-SEES-SHBE



Project Summary (Award Abstract #1338851*)

Overview: The objective of the proposed RCN is to develop a collaborative research platform centered on overcoming bottlenecks in engineering, software and social/economic sciences that impede wider application of sustainable building technology. The network activities will focus on defining an innovative, new interdisciplinary area, “Sustainable Human-Building Ecosystem (SHBE),” that integrates human behavioral science, social and economic sciences in tandem with sciences of building design, engineering, and metrology for data validation of building energy consumption and occupant comforts. The developed collaboration strategies and standardized data platform will lead to significant reductions of the uncertainty in predicting human adaptation to energy efficiency and sustainability of building ecosystems, which will also address fundamental questions such as “what are the benefits of sustainable building investment to people at a personal, business, or urban planning level?” The activities of the new SHBE-RCN include: Collectively develop a consensus-based mechanism for a cyber-enabled, data-networked research platform that allows sharing the connectivity methods from different models of building ecosystem elements; create the networking mechanism to recruit additional participants or update the working groups; develop the new research directions for identified subareas; evaluate the success of the SHBE network; and develop an innovative learning program for graduate students of diverse backgrounds. The steering committee members are from engineering, architecture, computer science, construction, environmental science, business and social science with national and international collaboration experience and access to data from various sustainable building projects: Yong Tao, Derrick D’Souza, and Ruthanne Thompson of the University of North Texas, William Tolone and Mirsad Hadzikadic of the University of North Carolina at Charlotte, David Cartes and Richard Feiock of Florida State University, Yimin Zhu and Thomas Spiegelhalter, of Florida International University, Wei Yan of Texas A&M University, Kee Poh Lam of Carnegie Mellon University, and Carol Menassa of the University of Wisconsin-Madison.

Intellectual Merit: The SHBE RCN aims to foster a new understanding of the complex interactions among the key elements of human-building ecosystems and to work towards a set of new theories for integration of predictive models to explore the following hypothesis: *Integrating occupant behaviors with built environment performances validated from large field data sets can lead to significant reductions of the uncertainty in predictive models for human adaptation to energy efficiency and sustainability of building ecosystems.* It will bring together researchers from different fields, who otherwise would not be able to network together, to form working groups focusing on understanding the interoperability (or inputs and outputs) of predictive models from different disciplines within the five thematic frameworks: I-Building physical system and environment modeling; II-Human behavior modeling; III-Social/policy impact modeling; IV-Dynamic life cycle assessment (LCA) and business ecosystem modeling; and V-Model integration and validation. All five themes are linked in such a way that no single theme will produce meaningful outcomes without the significant input from other themes.

Broader Impact: This network’s research agenda will allow researchers to work towards solutions impacting people, their communities, and future of their lives. Providing a viable platform for meaningful research collaboration in quantifying the sustainable building ecosystem will enable the development of new theories and methods that could help city planners and political and financial decision makers to develop the most balanced sustainable solutions for both human and natural environment. The network management team will also implement a mechanism to promote diversity by recruiting graduate assistants and network participants through workshops and lab visits. This will be achieved by working with the Center for Diversity in Engineering and Computing at Florida International University, a Hispanic Serving Institution (HSI), and similar initiatives in the participating institutions. The network participants will also contribute to the development of a unique interdisciplinary learning program, based on the concept of an outcome-driven, diverse, and individualized learning mechanism, for any graduate student who has an interest in the research subjects covered in this proposal.

*Ref: [NSF](#) site