Abstract:
The vast majority of modern buildings are constructed from highly processed materials such as synthetic insulation, concrete, and steel. Making and processing these building materials account for 15% of global warming impacts, 20% of global energy demand, and up to 40% of global solid waste. Essentially, it has been shown that relying on these conventional building materials is draining global natural resources. One prominent solution to this problem is using natural, minimally processed building materials. Specifically, earthen building materials and methods (EBMM) offer a waste-free, also known as cradle-to-cradle lifecycle. They require less energy to be produced, they lower energy costs of heating and cooling, and they provide much healthier, non-toxic, living environments. Furthermore, at their end of life, earthen materials are easily recyclable, but even if not, they are biodegradable in a way that creates a waste-free system. However, despite their environmental advantages, EBMM have not been implemented comprehensively, because they are missing technical data, perceived negatively as low-tech, and are not represented in building codes.
To address these hurdles, the proposed research aims to integrate EBMM within mainstream construction using three critical steps: (1) by developing an environmental Life Cycle Assessment (LCA) of EBMM compared to conventional building materials, (2) by identifying how negative perception on EBMM can be replaced, and (3) by conducting a policy repair analysis for EBMM codes and standards. In addition, as part of steps (2) and (3), the research will include a synthesis of known EBMM performance data from the literature, taking into account thermal, structural, durability, indoor air quality, and economic parameters.
The proposed research will contribute to the development of environmental and policy measures that could be used by policy makers and EBMM advocates in their endeavors to catalyze the use of modern earthen construction in mainstream projects. The long term implications this research hopes to achieve are the catalysis of EBMM construction in mainstream projects through the development of a complete, safe, and user-friendly earthen building representations in building codes worldwide.