On an almost daily basis, catastrophic environmental events such as drought, evacuations due to forest fire or similar, black outs emerge in stories from media outlets. These events are occurring at greater frequency because energy, food, transportation and water infrastructure is becoming overtaxed, indicating serious and wide ranging challenges due to climate change/environmental degradgation, population migration, the balance between urban/rural utilization and increased economic turmoil. These challenges should have an oversized impact on rural/urban developmental thinking but a majority of speculative development decisions are based on decades old preconceptions and narrowly defined economic and politically motivated agendas. To proceed to properly balance the complex array of systems that come into any development decisions made by city officials or community members, must be more nuanced and intimate in their attention to structural details, casual effects, and systemic interrelationships.

Since the complex interrelationships between these systems are difficult to envision accurately, much of the discussion surrounding them is often overly abstract leading to emotionally charged discussions or debates. If better tools to visualize the potential ramifications of future developmental scenerios were avaiable, then communities could better plan and align development to the actual conditions of their surroundings. This could lead to more sustainable and stragetically intelligent growth for communities, especially those located in economically stressed and environmentally sesnstive areas. Our research proposes to develop criteria that specifically maps complex issues such as food water energy population growth run them through algorythms that can effectively plot future scenerios related to possible outcomes. These subsequent development models will be utilized nto visualization software that can plot the scenerios so communities and various stake holders can make informed decisions and constructive community dialogues can take place.

More specifically, our research proposes the following steps: (1) The development of detailed criteria to outline a valuation method enabling how compare food, energy, and water in a meaningful and systematic way; (2) we will define a simple, theoretical problem free from various complicated limitations of the real-word and derive a resilient solution using robust optimization; (3) we generalize our method by adding constraints (e.g., laws and institutions, climate and weather variation, etc.), and describe how these constraints should be handled; (4) we apply our generalized method to two case studies, one urbanized edge development that has already been tested for which we highlight how our methods would have avoided some of the mistakes as they relate to FEW systems, and one ongoing development project for which we form a collaboration with the developers to help them improve their design and outcomes around FEW systems; (5) finally, we develop a visualization tool to better communicate our outcomes with the authorities (e.g., city councils, city managers, etc.) and the general public (e.g., developers, community stakeholders, etc.).