Overview

The objective of this proposal is to test the hypothesis that interacting agents are unable to collectively manage a transition from non-renewable to renewable resources to avoid negative impacts of resource depletion. This research will explore the behavior of agents in a resource harvesting and investment 'game' where resource managers must forage for energy and natural resources while investing some of those resources towards the activities of foraging and maintenance of vital infrastructure. In autonomous mode (agents act according to simple algorithms), advantageous strategies for resource management can be 'evolved' through the process of 'natural selection'. In learning mode (researchers or learners take control of the agent behavior), successive rounds of the game will more closely resemble real-world locations. Researchers can better understand the context for resource and infrastructure management strategies with the aim of developing improved policies.

The proposed objective will be met over the 3-year time period of the project by carrying out the following tasks: (1) : (2) (3) :

Intellectual merit

The proposed activity will advance the current understanding of resource and infrastructure management and the conditions for successful transition from depleting resources (e.g. fossil fuels) to those that can be used sustainably (e.g. renewable energy). The novel aspect of the research is to employ techniques from social science to better understand resource and infrastructure management strategies.

Broader impacts

The 'game' will identify resource and infrastructure management strategies to better navigate the resource transition faced by our global society. These strategies will be translated into recommendations for resource and infrastructure management and policy decision makers. The knowledge gained will be helpful for (especially rural and isolated) communities to develop strategies for sustainable resource use. The game will be presented as a learning tool within existing courses at Clemson to highlight issues of sustainability and emphasize the role of energy literacy, especially in currently under-served populations through the use of the existing programs at Clemson University.

The long-term educational goal is to improve energy literacy and systems thinking to facilitate better-informed planning for a sustainable future. In pursuit of this goal, the educational objective of this proposal is to provide an interactive, simulated learning environment for learners to understand how individual behavior impacts collective opportunities for sustainable management of resources. Development of the experimental apparatus (game development) will be integrated into term projects, the classroom will be used as a test-bed for subsequent iterations of the game and to gain experimental data by having students play the game.