The state-of-the-art in economic policy planning is through integrated, assessment models (IAMs). Such models represent the economy as a discrete set of centrally-planned regions where decision makers acting with perfect (or near-perfect) foresight within a perfectly well-behaved (equilibrium-seeking) market. Connection of the economy to the environment as essentially a one-way street. Economic activity impacts natural systems which then adapt/change in response. The loop is barely closed by modeling the impact of a changing environment upon economic activity, except as the cost of GHG abatement (climate change being the most common use of IAMs) *should society choose to pay such costs.* This is not surprising for a two primary reasons: (1) models of economic growth pay little attention to factors other than labor, (built) capital, and (endogenously determined) technological innovation, i.e. the only determinants of economic growth are human-induced and predicated on the (implicit) assumption that sufficient resources will always be available; and (2) the overwhelming majority of economic value that flows through the economy are independent of (currently) living natural systems (e.g. fossil fuels, metals) which changed only slowly over long time periods. Essentially, society forgot that our existence is dependent upon natural systems and could assume a static worldview.

In actual fact, we are depleting these resources. Economic models assume that substitution will solve this issue (thanks to technological innovation). However, dynamics within the human system lead to specialization and technological lock-in (increased complexity, decreased adaptability/resilience) that constrains options for substitution. Furthermore, some resources (energy) cannot be substituted.

In a resource constrained future, human society will again become more and more dependent on living natural systems to sustain our own existence. Society will have to better understand and adapt to the dynamic pattern of those systems. Additionally, the transition pathway from a static to a dynamic, nature-dependent worldview must be understood and elucidated.

Within our agent-based model (ABM), we propose to study the adaptation strategies available to a society in the transition from depleting non-renewable to renewable resources. ABMs are more realistic representations of the structure of real economies, which comprise multiple actors all seeking their own ends. The spurious assumptions of perfect foresight and central planning can be relinquished. Processes within the human systems include innovation, trading and investment which give rise to built capital (tools and machines), human capital (population) and social capital (technological know-how, labor specialization). Indicators of the state of the human system include inequality (in access to/production of resources and built capital), complexity (including built capital and labor specialization) and resilience/adaptability.

To encompass a broad range of transition pathways, we intend to be agnostic regarding the specific natural system. This powerful approach allows us to model a variety of dynamics through depletion of both renewable and non-renewable resources, and regeneration of renewable resources. Further dynamics can also be introduced to the natural system through perturbation to mimic effects such as seasonal variation, ecosystem degradation, sudden collapse, etc. These processes give rise to distribution in resources (temporal, geographic, ownership) and to resource scarcity (both absolute and in terms of accessibility).

Coupling between the human and natural systems takes the form of resource extraction, emission of wastes and the availability/cost of accessing resources. Investment and build-out of different technologies leads to differential extraction of resources leads to different resource depletion, distribution of resources and thereby different costs of accessing resources. These extraction costs then spur innovation and trading within the human society which leads to a change in investment in built capital. Adaptation is the ability to smoothly transition between resources as their availability and access changes. This is a function of the complexity and diversity of the human system.