

Macroscale Modeling linking Energy and Economics

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ABSTRACT

Natural resources, especially the energy fuels, play a significant role in human society, from economics to politics. A number of models have been built to study the relationship between natural resources and macroeconomics. There are biophysical models of population and natural resource uses, but they omit many important economic factors, such as debt, wages and employment. Also there are economic models of debt, employment, GDP, etc., but they omit basic relationships with energy and natural resources. The goal of this study is to continue the development of a model that links biophysical and economic fundamentals within a cohesive framework.

Based on the “HANDY” biophysical model and the Goodwin economic model, a merged model has been developed to simulate the dynamics of the integrated system associating energy and economics. With focus on the relationship between the energy consumption and the macroeconomic structure, the merged model has two industry sector – resource extraction and goods production. Both sectors produce output that is consumed by households, and the goods sector also produces investment goods that are allocated to each sector. In order to better understand how the different investment strategies act on the physical flows as well as the economic growth, several scenarios with changed investment choices have been tested in this study. The simulation results including the population, nature resources, GDPs, debts and etc. reveal the impacts of the investment adoptions and the mechanism can be further explored with this developing merged model.

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