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Web Service Based Approach to Link Heterogeneous Climate-Energy-Economy Models for Climate Change Mitigation Analysis

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Abstract

Climate change mitigation analysis requires understanding the causes and identifying the possible alternative actions that could be taken. We linked heterogeneous models that focus on climate, energy, and economy for the purpose of climate change mitigation. The models were originally developed to serve as standalone tools for some specific purposes. The models operate at various levels of complexity, different temporal and spatial scales, from individual to global. They were developed using quite different assumptions and modeling paradigms and tools. One of them is a Computable General Equilibrium model, the second is an Integrated Assessment Model, and the third one is an Agent-based Model. We present the integration process and the internal details of the integrated systems so that it can be applied to similar integrated assessment studies. Extensive pre-integration assessment was performed to identify the 'appropriate' models and to formulate the linkage between them. We used the web service based approach for coupling since it enables interoperability between heterogeneous systems and it provides open access of information to a wider community. The other advantage of this approach is that once the wrapper web services are developed they can be reused in other integration frameworks. The linked models can be applied to simulate various climate change mitigation policy scenarios, which could be difficult to do using stand-alone model components.

Keywords: Integration of models; Web service; Climate change mitigation; Interoperability; Components.