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Full biophysical and socio-economic carbon accounting for the UK

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This research proposes a framework for a carbon accounting system and analytical model for the UK that 1) accounts for embodied carbon in products and services of the UK economy able to distinguish between 120 economic product groups and services and their respective life-cycles; 2) accounts for effects of socio-economic changes on land use and land cover through integrated bio-physical and socio-economic models; and 3) models carbon fluxes in different land use and land cover categories, including vegetation, soil and hydrological dynamics; 4) serves as a basis for policy evaluation and modeling future change through scenarios. In this research, we develop an integrated accounting and analytical framework based on input-output model extended by a land use model and a bio-physical model accounting for carbon fluxes in different types of soils.

The framework will be used to model carbon fluxes between social, economic and ecological systems. In order to combine economic and ecological data within a consistent methodological framework, we extend the IO tables by a set of natural resource parameter that represent the flow of environmental resources to each economic sector, flows from the economy to the environment and interactions within the ecosystem. The key linkage of the natural and human systems is land use and land use changes regarding to the carbon flux. Changes in land use and management in agricultural and forestry also critically affect atmospheric GHG concentrations, in addition to emissions from social and economic systems.

Moreover, this research measures the biophysical and socio-economic carbon accounting at various spatial scales according to land use patterns. We will discuss how the dynamic aspects of such an modeling and accounting framework could be represent through a dynamic IO model. The spatial aspect is provided by a number of reasonably large and detailed geographical databases implemented in a geographical information system, including biophysical attributes of land cover, such as agriculture land, forest land, grass land *et al*., and their abilities of carbon sequestration. Scenarios representing changes in lifestyles, consumer choices or technical change can be evaluated by tracing all the ripple effects through an economic system and its implications for ecosystems and carbon cycles.