Structure and function of coupled human—natural systems: from fitting to sustainability

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Under the intense disturbances of human activities, the global resources and environment are facing unprecedented stresses. Now, because the earth has entered a new era of “anthropocene”, coupling natural and social systems, analyzing the structure and function of the human-land system has become the key to ensuring the sustainability of the earth system. Human-land coupled systems, whose structures are the relationships between internal components and functions are their properties to meet a certain demand, are composed of a natural ecological subsystem and a human social subsystem with their interactions. A human-land coupled system has structural and functional characteristics that are different from social or natural systems’ respectively. While structure determines function, functional feedback structure. “Fit” is a sustainable system structure configuration. Here, we summarized the four main types of “fit” within coupled human-land system. (1) Fit of totality: to the allocation of the total amount of key indicators does not exceed the threshold; (2) Fit of structure: the interaction relationships configuration to sustain good performance of the system; (3) Fit of dynamic: adjusting and optimizing the configuration when new changes or disturbances occurred; (4) Fit of scale: the rational configuration of the structure-function effect relationship between different scales. Coupled human-land systems researches are aiming at the aspects of quantity, order, time, and space to propose ways to regulate and control the structure of the system to achieve sustainable functions, so as to keep fit. In the future, priority can be given to the following three aspects: (1) Developing theories and methods of coupled human-land systems’ structure; (2) Analyzing the changes in the structure of the coupled system and their functional effects; (3) Further identifying and clarifying the approaches to keep fit.