

# Towards a Earth System based Understanding of Social Ecological Landscapes in the Anthropocene

\*Chakraborty Abhik<sup>1</sup>

\*Abhik Chakraborty<sup>1</sup>

1. 和歌山大学

1. Wakayama University

This paper analyzes the conceptually challenging endeavor of integrating an earth science based perspective with social ecological landscapes. Social ecological systems (SES) emerged as a key idea in ecology in the 1980s, with concepts such as ‘ecological resilience’ (Holling 1973) and ‘emergence’ (or nonlinear, non-equilibrium dynamics) (Holling, 1986, 1996) initially coming under focus. Over the years, sophistication of SES models progressed, leading to understanding of episodic buildup-conservation-release-reorganization of energy in the landscape (also referred to as ‘panarchy’ or ‘adaptive cycle theory’ ; described in Gunderson and Holling 2002), and the crucial role of ‘ecological memory’ or ‘path-dependence’ in unfolding of landscape-level processes (Stuart Chapin III et al. 2009). Those insights have obvious implications for management of complex systems that defy linear modeling and stability based solutions. Specifically referring to watersheds, Holling et al (1995) observed that short-sighted engineering based approaches can erode the resilience of complex systems by interfering with hydrological and ecosystemic components and their mutual interaction pathways. However even as considerable attention was given to the integration of ecological and human components and calls were made to study them from ‘cross-scale frameworks’, relatively little attention was given to land-formation and erosional processes operating over geological time (deep time). With the emergence of the Anthropocene concept (Davies 2016), it has now become imperative that we extend our understanding of complex adaptive social ecological landscapes to appreciate how land-formation evolved over deep time, and how and to what extent human agency (anthropos) is an endogenous component of such processes (in geological time and geomorphic scale). This paper reflects on the continuum of mountain uplift and denudation, flow and deposition dynamics of river systems, and episodic transformation events to argue that this new understanding of landscapes must incorporate humans to posit them in a geological ‘context’ . This requires at once a descriptive and reflexive (based on the critical deconstruction of the concept) understanding of the Anthropocene; one that allows us to understand the true scale of the human ‘blip’ on the evolving landscape.

Works referred:

Davies, J.D. (2016). *The Birth of the Anthropocene*. UC Berkeley Press.

Gunderson, L.H. and Holling, C.S. (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press.

Holling, C.S. (1973). Resilience and Stability of Ecological Systems. *Annals Review of Ecology and Systematics* 4. pp 1-23.

Holling, C.S. (1986). The Resilience of Terrestrial Ecosystems: Local Surprise and Global Change. In Clark, W.C. and Munn, R.E. (Eds). *Sustainable Development of the Biosphere*. Cambridge University Press. pp 292-320.

Holling, C.S. (1996). Engineering Resilience versus Ecological Resilience. In Schulze, P.C. (Ed). *Engineering within Ecological Constraints*. NAP. pp 31-44.

Holling, C.S. Schindler, D.W., Walker, B. and Roughgarden, J. (1995). Biodiversity in the Functioning of Ecosystems: An Ecological Primer and Synthesis. In Perrings, C. Maler, K.G., Folke, C. Holling, C.S. and

Janson, B.O. (Eds). *Biodiversity Loss: Ecological and Economic Issues*. Cambridge University Press.  
Stuart Chapin III, F, Kofinas, G.P and Folke, C (Eds) (2009). *Principles of Ecosystem Stewardship*. Springer.

キーワード：社会生態系、複合的システム、河川流域システム、地球惑星システム、人新世

Keywords: Social Ecological Landscape, Complex system, River system dynamics, Earth system perspective, Anthropocene