

Rethinking systems: enlarged temporal and spatial scale of socio-natural interactions

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A cultural environment focus allows to broaden the actual discussion about human-nature interactions outside current paradigmatic mainstream frameworks. This is the case, for instance, related to the whole discussion about sustainability and the emergence of sustainability sciences. It is worth to mention that sustainability sciences tend to be positivist and future oriented, neglecting the study of the past and interrogations about the meaning of failure. The latter instigates a reflection about the following questions: what is unsustainability? If we consider that in the long history of planet earth large scale massive extinctions or large-scale transformations in ecosystems have occurred, is it possible to think that unsustainable paths exist within nature away from humans? It is evident that the notion of sustainability as articulated, for instance, in Agenda 2030 and the Sustainable Development Goals adopts a human centered conception of the world. In this light the notion gains relevance of sustaining the environmental balance of the planet for the benefit of preserving the human species from a potential extinction.

It is worth to mention that the human centered environmental debate has a long history, possibly earlier than the 1950s, much before sustainability as a concept gained notoriety. Among the notorious attempts it is worth to mention the international symposium on “Man’s Role in Changing the Face of the Earth”, funded by the Wenner-Gren Foundation for Anthropological Research, held in 1955 in Princeton. This symposium, which had been planned since the fall of 1952, engaged during its six days of discussions more than 140 scholars who collaborated as participants, contributing authors, chairs and co-chairs, and who were coming from varied disciplines of earth sciences, biological sciences, social sciences, humanities and applied fields, such as, administration and city planning. The theme, framed after discussions with the geographer Carl O. Sauer, placed man as the dominant ecological agent on the planet and aimed at linking together

a discussion about earth’s resources, the numerical pressure of population upon resources and man’s differing cultures, or ways of life. In these discussions, the past had a precise starting point: marked by the development of the modern scientific and technological advancements that allowed humans to intervene in most of the planet’s natural cycles.

When debating sustainability, it is important to clarify the relational framework in which it is embedded and the importance of dislocating the center of the viewpoints involved in that discussion. Among others, what lacks in the debate about sustainability for a more inclusive and relational sensibility is to enlarge the scale of the spatiality and temporality that are addressed. Several authors have already mentioned the importance of the enlarged spatio-temporal scale. The spatial awareness of interactions occurring at long-distances (telecoupling), or the cumulative effects of long-term interactions (Hull and Liu 2018; Tonini and Liu 2017). The study of the past not only supports the identification of cumulative processes in long-term interactions, but can also be useful to support the choices addressing potential futures. Based on a teleological approach, the definition of effective future orientations requires a deep understanding of a system’s potential to support the desired change. This has been discussed, for example, by researchers interested in observing the past patterns of rivers, in order to define the future approach of the management of a hydric system (Beller et. al 2016). The study of the past is also useful for understanding patterns of lock-in and path-dependence. Some authors have noted that the sustainability transition greatest challenges are intimately related to overcoming lock-in patterns (patterns of stability/change) and path-dependence (Wieczorek 2018).

In order to deepen the understanding of the cumulative effects of enlarged temporal/spatial interactions between human societies and local environments, new research programs have been created

* See Note

such as historical ecology, which focuses on landscapes as a “multidimensional physical entity that has both spatial and temporal characteristics” (Balee 2006). This effort towards comprehending cumulative effects and change at varied spatial scales, which are on the basis of sustainable transitions, may well be also complemented by other different viewpoints that extend the concept of life to the description of complex adaptive systems, for example in the attempt of defining the characteristics of “living things” (i.e. rivers, cities, markets...) (Le Fur 2013). Both historical ecology and complex systems theory take into consideration over an extended time frame the ability of a system to regulate its internal and external features towards continuity. However, historical ecology criticizes the systemic approach for its idealized reference based on an ideal balanced system. While the systemic view might have its shortcomings, it offers a valid framework for reflecting about the enlarged spatial and temporal aspects of socio-natural interactions.

Following recent interdisciplinary developments, it becomes relevant to discuss further which and how socio-technical transitions affect different types of complex systems (planet earth, ancient communities, forest landscapes, cities). The topic has been discussed within disciplinary boundaries, for example, in the treatment of forests as “complex adaptive system” (Filotas et al. 2014), an approach that allows to envisage alternatives for the maintenance of existing systems.

In considering the question of maintenance of systems, it is relevant to assess the main transitions affecting the continuity and decay of urban, rural and natural systems. It is known that the longevity of varied systems has depended upon dynamic interactions occurring at variable levels. In planning theory, theoretical streams linked evolutionary metaphors to the livability of cities, towns and villages: human settlements existed through vital forces and energy flows (vitalism), from a holistic-organic perspective (organicism) or from a viewpoint of urban dynamics based on natural evolutionary theories (Mehmood 2010). Looking from an urban studies viewpoint, theoreticians of cities wrote about the lifetime of human settlements, about urban expansion and retraction, and eventually, some interpreted the lifetime of human settlements with analogies to ecological cycles and evolutionary models. One of the earliest was the biologist Patrick Geddes,

who developed theories linking the livability of cities with their surrounding regions. Geddes broke apart with disciplinary boundaries, tried to integrate biological notions to social theories, and became a great advocate of “regional survey”. Following his steps, other figures worth to mention include the American journalist, Jane Jacobs who wrote about the death and life of American cities; the historian Lewis Mumford, who wrote about the natural history of urbanization, and the mathematician Christopher Alexander who wrote about the nature of order in an acclaimed statement about cities’ existence through networks. In Japan, one of the earliest to link together a theory of life to the formation of cities was the sociologist Okui Fukutaro since the pre-war period. Nowadays, an accumulated knowledge towards making cities comfortable has led cities to reach high-levels of livability, able to respond to the needs of many people. Urban concentration has steadily increased, in parallel to an increment in environmental problems, depopulation of rural areas and the emergence of other issues. It becomes urgent to discuss that urbanization is an inevitable outcome of human evolution as a species and how this affects several other systems. If we consider as a fundamental characteristic of the human nature to incessantly accumulate knowledge and create technology oriented towards the well-living of humans, probably people will continue to concentrate in cities. A deep interdisciplinary reflection about the consequences and the potential alternatives to this trend is needed.

Finally, the benefit of taking an interdisciplinary approach to the discussion of the longevity of social and natural systems is that it allows to link together phenomena that would usually be treated separately. Brazil and Japan have plenty of examples of unique experiences that discussed in parallel will open new scientific paths towards closing the earth’s loop at both ends of the planet. That the centrality of a city is shaped after retail and mobility is a common analysed phenomena in geography. That this could be linked to geo-social moments of the petroleum era extends temporally and geographically the possibilities of the analysis. Focusing on a systemic view of the varied components of the culture-nature coupled environments allows to illuminate a relational construction of the world and ultimately of living.

Reference

- Balée, W., & Erickson, C. L. (2015). Time, complexity, and historical ecology. (pp. 1-18). New York Chichester, West Sussex: Columbia University Press. doi:10.7312/bale13562-003
- Beller, E. E., Downs, P. W., Grossinger, R. M., Orr, B. K., & Salomon, M. N. (2016). From past patterns to future potential: Using historical ecology to inform river restoration on an intermittent california river. *Landscape Ecology*, 31(3), 581-600. doi:10.1007/s10980-015-0264-7
- Filotas, E., Parrott, L., Burton, P. J., Chazdon, R. L., Coates, K. D., Coll, L., Messier, C. (2014). Viewing forests through the lens of complex systems science. *Ecosphere*, 5(1), art1-23. doi:10.1890/ES13-00182.1
- Hull, V., & Liu, J. (2018). Telecoupling: A new frontier for global sustainability. *Ecology and Society*, 23(4), 41. doi:10.5751/ES-10494-230441
- Le Fur, J. (2013). Extending life concepts to complex systems. *Interdisciplinary Description of Complex Systems*, 11(1), 37-50. doi:10.7906/indecs.11.1.4
- Mehmood, A. (2010). on the history and potentials of evolutionary metaphors in urban planning. *Planning Theory*, 9(1), 63-87. doi:10.1177/1473095209346495
- Tonini, F., & Liu, J. (2017). Telecoupling toolbox: Spatially explicit tools for studying telecoupled human and natural systems. *Ecology and Society*, 22(4), 11. doi:10.5751/ES-09696-220411
- Wiczorek, A. J. (2018). Sustainability transitions in developing countries: Major insights and their implications for research and policy. *Environmental Science and Policy*, 84, 204-216. doi:10.1016/j.envsci.2017.08.008

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* We would like to express our gratitude to the support from the Kyoto University, Research Unit for Development of Global Sustainability (RUDGS)