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Stokols, Daniel

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Commentary

Social ecology, sustainability, and economics

Raul P. Lejano[a,*], Daniel Stokols[b]

[a] Department of Planning, Policy, and Design, School of Social Ecology, SE-I, Room 218G, University of California, Irvine, Irvine, CA 92697-7075, United States
[b] Department of Planning, Policy, and Design, Department of Psychology and Social Behavior, School of Social Ecology, SE-I, Room 206C, University of California, Irvine, Irvine, CA 92697-7075, United States

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ABSTRACT

What mode of analysis might be employed, that captures the confluent action of material and social systems acting together? The framework of Social Ecology, which first emerged as a rejoinder to the Chicago School of Human Ecology of the early 1900s, evolved over subsequent decades as an attempt at such integration. We revisit social ecology's historical origins and foundational assumptions. We propose that the social ecological framework can offer useful conceptual grounding to scholars of ecological economics. We illustrate how this analytical lens affords a deeper understanding of unsustainable systems and valuation problems.

1. Introduction

In his monumental work on modernization, Max Weber (1904-05/1958, 1922/1978) described the fundamental analytical problem of integrating the different value spheres or fields of human life. In his analysis, as society developed rational methods for planning and administration, decisions began to be made that focused on one field to the exclusion of the others. An example of this would be the evolution of the mass assembly plant that maximized material production to the detriment of social values such as worker satisfaction or job security. This process of rationalization involves the artificial separating of reasoning into different systems (e.g., cultural, financial, etc.), and allowing each system to operate autonomously. This problem looms especially large with the question of how to reconcile the twin demands of ecology and economy. Failure to reconcile these demands through enlightened public policies poses the potential danger of lapsing into what Weber called *zweckrationalität* — a narrow, means–end rationality that neglects to consider differing dimensions in an integrative way.

Even earlier, the phenomenologist, Edmund Husserl (1900), recognized the basic problem as one of reconciling the natural dimension (or the material plane) with the dimension of meaning (which we will sometimes refer to as the social-semiotic plane). He criticized the singular focus of scientific knowledge on the natural system, to the exclusion of the social-semiotic. Consider the river Ganges, which Hindu tradition holds sacred. Pollution of the river, on a material plane, registers simply as an increase of certain constituents in the water column. On the social-semiotic dimension, however, it can amount to a form of sacrilege, a moral trespass (Kelley, 1998). As another example, schemes for tradable market instruments for carbon suffer from a similarly insular mode of analysis. The transfer of carbon from one country to another, even with proper payment for such exchange, can engender unanticipated social conflict. At times, it can even be interpreted as a neo-colonialist oppression of the poor by the rich (Lejano et al., 2010).

Furthermore, the difference between these two distinct planes of reality is an *ontological* one, such that one cannot simply translate or subsume one dimension into the other. For example, simply being able to refer to consequences that lie outside one's utility function as externalities does not mean that there is a way to integrate them into a utilitarian framework (cf., Bithas, 2011 for a related argument). This incommensurability problem also extends to things, such as values, that lie within the social-semiotic (or cognitive) dimension. For example, Sen (1977) argues that moral commitments are a type of value that cannot be expressed in terms of individual utility. To illustrate his argument in a simplistic way, insistence on the universal commensurability of all values would suggest the possibility of creating a tradable market instrument for basic human rights. Elsewhere, we have tried to apply a vector payoff model of decision-making, but this can lead to other, equally intractable analytical problems (Lejano and Ingram, 2011). In the following discussion, we describe an analytical approach that may be useful to scholars of ecological economics. The main contention of this article is that the social ecological framework emphasizes certain analytical insights, including the basic separation of constructed and material systems and the notion of transactions that mediate between the two systems, that can help scholars diagnose fundamental issues around the non-sustainability of economic systems.

* Corresponding author.
E-mail addresses: rplejano@yahoo.com (R.P. Lejano), dstokols@uci.edu (D. Stokols).

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2. The Social Ecological Framework

Ecology refers to the various fields of study of the relationships between organisms and their respective environments. The earliest scholarship in this area (e.g., Darwin, 1859/1964; Haeckel and Lankaster, 1876) placed an emphasis on the processes of natural selection and adaptation whereby biotic and abiotic components of an ecosystem achieve dynamic equilibrium.

In the 1920s and 30s, a group of sociologists at the University of Chicago took the concepts and methods of the 19th century bio-ecologists, particularly the insights on homeostatic processes of adaptation, and applied these to the study of human communities. This laid the foundations for what came to be known as the Chicago School of Human Ecology, which subsequently branched out to incorporate like-minded scholars from other institutions (Hawley, 1950; Park et al., 1925). Examples of their application of ecological principles to urban and social institutions include Haig's (1926) theory of highest and best land uses and Christaller's (1933) central place theory. These were employed to explain socio-economic and land use patterns observed in the different zones of the Chicago metropolitan region. For example, the ecological concepts of niche and succession are prominent in Burgess's (1923) "concentric zone" theory of urban development.

Other scholars began to note some limitations in the Human Ecology paradigm, however — e.g., the one-way influence of material conditions on the social (rather than reciprocal relationships). As an example, the concentric zone theory was seen to focus too exclusively on the biology and economics of society and paid scant attention to the sociopolitical, ethical, symbolic, and other dimensions of human communities (c.f., Michelson, 1970; also Firey, 1945). Alihan (1938) wrote an influential critique of the field of human ecology and called for the foundation of a more integrative framework, one that would be better able to incorporate the concepts and methods from fields such as anthropology, psychology, and ethical philosophy. She and other scholars (e.g., Emery and Trist, 1972) referred to this new conceptualization of human–environment relations as *Social Ecology*.

Subsequently, academic programs in Social Ecology were established at the University of Vermont (Bookchin, 2005) and the University of California, Irvine (Binder, 1972). Cornell's College of Human Ecology similarly espoused this broader conception of human–environment relationships, particularly Bronfenbrenner's (1992) pioneering work on multi-scalar analyses (i.e., at micro, meso, and macro-societal levels). Today, the term, *social ecology*, is broadly conceived as the study of communities from interdisciplinary perspectives, reflecting multiple scales and levels of analysis, and more deeply incorporating psychological, cultural, and institutional contexts of human–environment relations than the earlier human ecology research (examples of social ecological scholarship include Michelson, 1970; Moos, 1979; Ostrom, 2009; Peterson, 2010; Stokols, 1996).

3. Core Tenets of Social Ecology

The social ecology literature emphasizes a number of conceptual assumptions (Stokols et al., 2003; 2013), among which are the following:

(i). Multiple dimensions of socio-physical environments act in concert to produce outcomes observed in society; correspondingly, we need integrative modes of analysis that can account for their conjoint action. Much social ecological research focuses on conjoint phenomena occurring at different scales — e.g., Bronfenbrenner's (1977) analysis of phenomena at macro-, exo-, meso-, and micro-scales. In this article, we will focus less on scale and more on various dimensions or realms of human activity (e.g., social, moral, material).

(ii). Social ecology attaches great importance to the degree of fit or incongruity across multiple dimensions of activity. To some extent, we can observe and describe transactions between these different dimensions. For example, an increase in social capital of a community (e.g., formation of a neighborhood group) can to some degree address a decrement in other forms of capital (e.g., by establishing a children's arts program in response to a loss of open space and playgrounds). Resilience can be interpreted in a social ecological way — i.e., employment of some forms of capital to make up for changes in another.

(iii). It is instructive to think of differing, interacting forms of capital (Bourdieu, 1986; Stokols et al., 2003). Strictly speaking, however, there is no fungibility from one form to another (see Neumayer, 1999, with regard to climate change). Rather, social ecology is a transdisciplinary effort that seeks richer, often multiple modes of analytical description to describe how changes in one dimension (e.g., social capital) are related to changes in another (e.g., financial capital).

(iv). The interaction between multiple dimensions of activity (cultural, financial, ecological) is most deeply analyzed and understood in context. Contextual analysis entails close collaboration among multiple disciplines employing diverse analytics; methods such as action research, participant-observation, and ethnography assume as much importance as quantitative modeling and laboratory experimentation.

(v). Lastly, the social ecological paradigm traces failures in the management of socio-physical systems to underlying logics that are based on one aspect of value, to the exclusion of others, as well as to self-regulated, autonomic systems that operate in one dimension without reference to the others.

3.1. Related Conceptual Frameworks That Have Been Proposed by Other Groups of Scholars

Here, we briefly discuss some of the most important attempts at integrative analysis and then speak to what is distinct (and similar) about the social ecological framework. We focus especially on the integration of material and semiotic realms of human activity, especially in relation to the theme of sustainable economic systems. We emphasize that these different frameworks, which have each emerged in response to the integration problem discussed earlier, should not be seen as competing but, rather, complementary frameworks. Our intention is to simply highlight features of each that help distinguish one framework from another and then, focus more closely on the social ecological frame.

Among the most influential attempts at integration traces back to scholars including Herman Daly (1993), Nicholas Georgescu-Roegen (1977), and Boulding (1981). These scholars emphasized the degree to which economic systems for material exchange are supported, materially and thermodynamically, by the natural resource base. Daly's formulation, in particular, portrays economy as a subsystem within the larger ecological or natural system. Our understanding of the social ecological paradigm is greatly influenced by Daly's (1993) notion of steady-state economics, which portrays the economy not as a closed (or autopoietic) system but an open one with a constant exchange of resources to and from the larger system.

Another important frame of analysis draws from the field of integral ecology (Esbjörn-Hargens and Zimmerman, 2009; O'Brien, 2010). In this framework, human–environment relationships are understood as the coming together of four different dimensions of interaction: the *social*, *cultural*, *behavioral*, and *intentional*.

The third analytical system we discuss here is Ostrom et al. (2007) IAD (Institutional Analysis and Development) framework. Within this framework, researchers strive to characterize the complex norms and strategies ("rules-in-use") employed by communities regarding resource use. These directly or indirectly influence resource use, while the state of the resource ("outcomes") influences the same norms, rules, and strategies through feedback loops.

The social ecological approach, like Daly's analysis, understands sectors of activity in society to be open systems. Like the integral ecologists, our intention is to describe social problems as phenomena that result from the conjoint action of different dimensions of action. Like Ostrom et al., we understand environmental systems to be closely intertwined, through feedback relationships, with social systems of rules. What is highlighted in our Social Ecological framework is the degree to which it attempts to describe the interaction between different systems. Social ecological analyses draw from Bourdieu's (1986) prescription for examining, not the system of different objects of study, but the relationships between and across these objects. To use an analogy based on social network analysis, we focus most closely not on the nodes within the network, but on what transactions occur between the nodes (in a word, their relationships). In Ostrom's formulation, the focus is on systems of rules and norms that govern interaction with the environment. However, we see transactions in terms other than (but including) rules — e.g., changes in organizational, communicative, cultural, and emotional forms of 'capital'. One attempt at description of these human–environment interactions in fact claims *narrative* to be the primary medium rich enough to capture these transactive relationships (Lejano et al., in press). Indeed, rules are but a part of the whole human–environment equation.

At the same time, Social Ecology explicitly considers the degree and mode of fit that exists across differing scales and dimensions of activity within a particular ecosystem, irrespective of whether the multiple dimensions are coherent or dissonant. With the Integral Ecology approach, often, the analysis involves taking different perspectives simultaneously or sequentially, until a holistic view emerges (e.g., Tissot, 2005). In Integral Ecology, the analysis preserves the distinct features of each differing dimensions or quadrants without insisting that these "collapse" into a single plane of description. As Esbjörn-Hargens and Zimmerman (2009, pg. 58) describe them, these quadrants are "irreducible ontological dimensions" but, at the same time, inseparable. While the conjoint irreducibility and inseparability of dimensions is recognized by researchers in Social Ecology, too, there is in the latter some tendency to seek common planes of description. For example, in paying close attention to the interrelationships (whether positive, perverse, or non-existent) between different stores of capital, Social Ecology attempts to evoke the notion of "capital" as a general descriptive concept (but not to be understood as a common "metric").

The primary focus on transactions across ontologically different domains (e.g., the cultural and the material) requires openness to multiple methods of research as well as innovative modes of inquiry. Stokols et al. (2013) have discussed different approaches by which transmutation between different forms of "capital" might be analyzed. In this work, drawing from Bourdieu's (1986) notion of multiple, but not equivalent, types of capital, decrements in one form of capital (e.g., impacts on air quality in a lower-income community) activate community processes that then translate to a host of reactions including changes in moral capital (e.g., sense of outrage and yearning for social justice), leading to new forms of social capital (e.g., formation of community action groups). But these transactional relationships are complex and cannot be captured by assumptions of simple fungibility (or commensurate translation of all forms of capital into a singular measure or *numeraire* good). Certainly, this aspect of the social ecological framework poses new problems for analysis, but this is part of an ever-evolving field. Our focus on the dynamic transactive process differs from Ostrom's notion of a rule or norm or strategy or the input–output relationships found in her and Daly's formulations. For instance, the ways in which moral outrage transmutes into a series of organizational changes, leading to new community action groups, is beyond representation as rule, norm, or material/energy exchange.

These points of comparison and difference are summarized in Table 1.

4. The Relevance of the Social Ecological Framework

As an example of the broad applicability of the framework, consider Fig. 1, which provides a simple social ecological representation of a system. Depicted herein are two separate dimensions or subsystems, each governed or unfolding according their own respective dynamics. There are, of course, many more such subsystems, but the figure simplifies it to two. The focus of interest is in dynamic, transactive processes that connect the systems — processes that may be active or missing, supportive or perverse. Also depicted in the figures is the possibility that these two systems "spin in opposite directions" or, in other words, do not obey parallel or similar logics as some of the human ecologists had though — we will see these differential logics in the case study later in this paper. It is the focus on the dynamics of the transactions across systems that the social ecological framework emphasizes. The social framework, more than others, focuses on the relationship that occurs between different systems, sometimes portraying these relationships most vividly as the activation of different, non-fungible forms of capital in each. The idea of transactions moves us beyond certain "weak" notions of sustainability that posit fungibility across domains (e.g., technology, natural resources, education). Rather, the social ecological framework prompts us to study how the different forms of capital interact, support, or conflict with each other.

The figure is a useful corrective to the practice of modeling the economy as a self-referential (or autopoietic) system. It gives us pause when we, in recent times, hear policymakers speak of the need to stimulate or reheat the economy. The social ecological framework forces us to recognize that simply to make the demand–supply cycle spin ever faster requires an ever-increasing rate of input from the material basis of the economy. However one measures economic stimulus, the calculus invariably leaves out consideration of these material inputs. When we remove explicit and analytical links to these material foundations (leaving the upper half of Fig. 1 by itself), we then have a system that is self-referential. Because values are determined endogenously in a self-referential way, the demand–supply cycle can accelerate its rate of turnover without recognizing the increasing stress on the material stratum (also, see discussion in Heilbroner and Thurow, 1981) and breeding a culture of excessive risk-taking (McDowell, 2010).

A similar problem occurs when we attempt to value ecosystem services (cf., Norgaard, 2010). The conceptual problem highlighted in Norgaard's critique of ecosystem services modeling is that of one-dimensional reasoning — in this case, the material is translated into purely constructionist terms (utility). And one cannot do this, strictly speaking, while still keeping material and social-semiotic dimensions whole. The ecosystem services concept involves a strong assumption that these other dimensions can be properly translated into utilities. The social ecological framework, however, underscores the fact that these resources are not fungible — i.e., there is no "exchange rate" that translates one type of resource into another (e.g., Stokols et al., 2013). Rather, different modes of analysis are required to deeply understand their complex interactions. For this reason, social ecological analyses refer to such exchanges between one type of resource and another not as "transformations" but "transactions" (Altman and Rogoff, 1987). In contrast, economic valuation aspires to an analytic alchemy whereby one type of capital is transmutable into another. The social ecological paradigm tends not to express all entities with a common metric, or even to reduce them all to a *numeraire* good (cf., Costanza and Hannon, 1989; Patterson, 1998). Other authors have stated this in different ways. Bithas (2011), for example, rejects the weak form of sustainability (i.e., complementarity between goods) in favor of a rights-based approach that respects future generations. Similar arguments were made by Munda (1997) and Vatn and Bromley (1994) — mainly that valuation invariably leaves out important characteristics of the good being valued.

Table 1
A comparison of various integrative analytic frameworks.

Framework	Dimensions	key insights	Mode of integration
Social ecology	Social-semiotic and material-ecological; macro-, meso-, exo-, micro-scales	Differing logics of economic and ecological systems; degree and mode of fit across systems	Dynamic transactions across systems.
Chicago school of human ecology	Economic and biological	Parallel logics in economic and ecological systems	Common processes (homeostasis, competition) across systems
Bio-economics	Socio-economic and biological	Economic system subsumed by ecological	Ecological constraints on economic system
Integral ecology	Social, cultural, behavioral, and cognitive	Degree of fit among parallel systems	Simultaneous analysis of quadrants, leading to holistic understanding.
Institutional analysis and development	Socio-economic and material	Ecological system governed by social-institutional system	Rules drive resource use and consumption; Feedback loops

Sometimes, the problem involves the exclusion of social and semiotic dimensions altogether. Consider the cap-and-trade system for carbon mitigation, which is the essence of the Clean Development Mechanism (CDM) program of the United Nations Framework Convention on Climate Change (UNFCCC). The program is based on a mass balance approach, whereby so long as one unit mass of carbon is sequestered in one part of the world, then another unit of carbon can be released elsewhere. This aggregate mass balance ignores the social, or semiotic, dimension. When carbon is traded, it is not simply a transfer of carbon that occurs — rather, entire social landscapes are reworked. This occurs in manifold ways, whether it is the social conflict arising from incompatibility between the tradable instruments and the common-property rights in Mexico, or the social exclusion of community forest harvesters from local development programs in Uganda (Lejano et al., 2010). A similar criticism has been made of the payment for ecosystem services movement (McAfee and Shapiro, 2010).

5. Example: The Real Estate Bubble

Let us illustrate the wide applicability of the social ecological framework. In this example, we will use this framework to show how the recent real estate meltdown in the U.S. can be depicted as an issue of ecological sustainability.

To interpret the U.S. real estate bubble in light of this framework, we remind ourselves that the foremost problem, from a social ecological perspective, is the failure to incorporate both social and material dimensions in decision-making. A bubble is essentially the uncontrolled overvaluation of a commodity, exacerbated by opportunist manipulation, no doubt, but fundamentally grounded in consumers' belief that the commodity's price is bound to keep spiraling upward. This certainly was the case for the U.S. real estate market, which saw the ratio of mortgage payments to household income approach unprecedented levels by 2007 (Campbell and Cocco, 2010; Steverman and Bogoslaw, 2008), at which point the ratio of total household and nonprofit debt (including mortgages) to disposable personal income had risen to a high of 138% (US Federal Reserve, 2012). At first glance, a ratio of total aggregate debt over annual income of 138% may not be much, but this value conceals subgroups in particular distress. Perhaps a more meaningful figure is that of average household monthly debt service to income, which rose to 18.6% by 2007 for the country (up from 16.7% in 2001). In particular, debt-to-income levels exceeded 40% for 14.7% of these households (up from 11.8% in 2001). During this same window of time, the proportion of households in the 60–79.9 percentile income range with debt-to-income ratios above 40% almost doubled (Federal Reserve, 2009).[1]

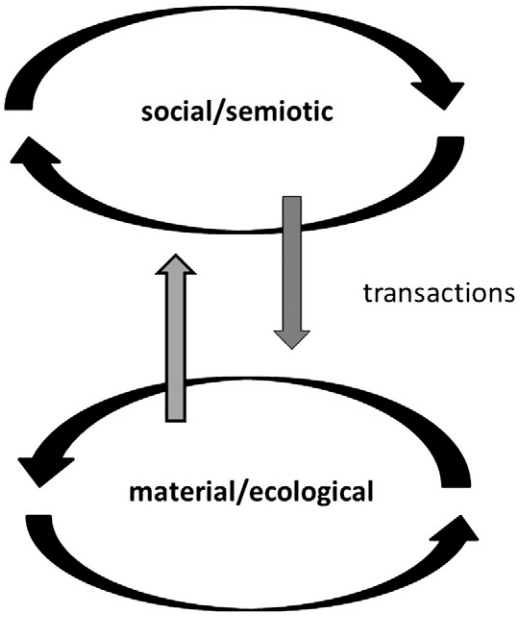

Fig. 1. Social ecological representation of system.

In keeping with the social ecological framework we ask: what element of value was absent from decision-making, in the case of the U.S. real estate bubble? Clearly, one important element, which neither buyers nor sellers properly accounted for, was the foreseeable potential earnings of the typical household. This potential for income generation, which is underpinned by the economy's capacity for job creation, ultimately is rooted in the material foundations of the economy. And for many households, as monthly debt payments began to rise above 40% of their monthly income, this began to outstrip the household's capacity to manage such debt. This was exacerbated by the sudden fall in property values, which meant that many of the homes were then worth less than the amounts owed. Most of all, these loans were extended to the so-called sub-prime borrowers, whose income streams were questionable, tenuous, and fragile. Subprime loans quickly rose from around 8% of originations in 2003 to 20% in 2005 and 2006 (Joint Center for Housing Studies, 2008). These mortgages were simply unsustainable vis-a-vis the real material basis of economic production. For subprime debtors, the disconnect was even greater. It is helpful to understand this in terms of *resilience*, which is the capacity of persons and communities to draw from multiple resources during periods of stress (cf., Walker et al., 2004). Subprime debtors are, by definition, those with a deficit of such resources, including for example other forms of capital to use as collateral, previous credit histories, stable employment, and reliable income streams. The social construction of the housing market did not incorporate sufficient linkages (or, in our terminology, transactions) among the financial, social, and cultural resources of these cash-strapped households. Rather than cycle back to equilibrium, the system sought out a new (in this case, degraded) state — this is a dynamic referred to by resilience scholars as panarchy (Gunderson and Holling, 2002).

[1] Debt-to-income ratios are defined as the ratio of all total scheduled loan payments (interest plus minimum payment of principal) and disposable personal income for the household (Federal Reserve, 2009).

The social ecological framework thus reminds us of the lack of coherence between ontologically different planes of action — i.e., the plane of value, as socially constructed, and the plane of material activity, income generation and personal resources. This framework also points out the lack of transactions across these planes that led to the crisis. What transactions were these, that were missing? We can name a few — e.g., psychological, affective, and normative mechanisms that translate households' increasing levels of indebtedness into greater caution in financial obligations; accounting practices that translate increasing leveraging into greater credit risk ratings; market surveys that translate long-term trends in demand for housing into signals to reduce the rate of construction of single-family homes. These transactions are the mechanisms that translate across different forms of social, moral, intellectual, and financial capital which, in the case of the real-estate bubble, were missing. Unlike the Chicago School's human ecological framework, which might have assumed a high level of coherence between natural and social constructed dimensions, the social ecological analytic allows us to understand that these dimensions might be operating along very differing logics, and that incoherence that results when there are no transactive mechanisms to coordinate their respective movements.

When a consumer expresses her individual preferences in the real estate market, she does so subject to individual income constraints. However, there is a difference between income expectations derived from long-run, sustainable sources of employment and the primarily speculative expectations of profit from subjective values within the same real estate market. To put it another way, bidding a high value for a home on the expectation of high revenues from price escalation of the same asset is a self-referential system, autonomous and delinked from the material basis of the household. Whereas the Chicago School might have presumed some automatic translation of values to highest and best usage of the land, the social ecological framework focuses on the disconnect between pure speculative valuation of property and real usage, the jobs and income base, and resources required by single-family housing. This goes beyond the materialist notion of "use value" (Marx, 1867/1930), since we understand value to emerge from the interaction of both material and semiotic dimensions, not one or the other.

And what of the interaction between different forms of capital? In the case of the real estate bubble, runaway property valuation was supported, in a perverse feedback system, or what Maruyama refers to as deviation-amplifying (1963), by cultural capital stored up in popular beliefs in the virtue of home ownership, supported by other cultural capital in the form of an influential ideology that resisted state intervention in the market, and perversely fueled by a repertoire of lending practices that concealed the true burden of debt vis-a-vis the earning potential of the household.

The social ecological framework can also be useful in developing proposals for remedying problematic systems. What transactive mechanisms would have helped in the above example? One example might have been the use of social capital, in the form of consumer protection organizations and programs that could have been activated as a response to the increased riskiness and leveraging of the household. Another might have been additional legal resources (e.g., in the form of government regulations and legal advice) to address the increasing vulnerability of the subprime borrower.

6. Conclusion

The social ecological framework prompts a critical reevaluation of certain rigid assumptions made about the nature of value. For instance, a foundational tenet of neoclassical economics is that value is, simply and completely, determined by the intersection of supply and demand curves. Such a system, which is mapped onto a state space measured in pure utility – a social construct – is conceptualized in a way that is disconnected from the material, ethical, and communitarian bases of the economy. Beyond analysis, the social ecological lens points toward potential institutional remedies that are needed to reconnect these otherwise autonomous systems. These renewed connections, which we refer to as transactions, need to restore signals in each system (whether economic, cultural, or material) that register or respond to changes in other, linked domains.

We saw how the social ecological framework was useful in portraying the example of the property bubble as a problem of sustainability. Future work should explore how these systems might be reformed, not simply by seeking some steady-state economy, which may or may not be realistic, but using the notion of transactions to see how an evolving, changing economy might employ different forms of capital strategically to chart reasonable ways forward.

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