

# Traps! An introduction to expanding thinking on persistent maladaptive states in pursuit of resilience

Keith Tidball<sup>1</sup> · Niki Frantzeskaki<sup>2</sup> · Thomas Elmqvist<sup>3</sup>

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## Introduction

This special feature is the result of a long collaboration between Stockholm University and the Stockholm Resilience Center (SRC) and Cornell University's Department of Natural Resources, focused upon resilience as a key lens for biosphere-based sustainability science. Over the course of this collaboration, many other partners have been invited and have participated in the collaborations, mostly focused on the *social* questions within social–ecological systems' thinking and sustainability, especially (but not exclusively) the most social places of all, cities. For example, the Dutch Research Institute for Transitions has contributed to governance questions in urban contexts, focused on drivers and transformations in European cities. The collaborations, ostensibly products of the Urban Theme at SRC, evolved into an intense thought-collective named for the island where it emerged, Karklö, Sweden. In June of 2013 the Karklö Group rallied around the conceptualization of social–ecological traps as presented by the Stockholm Resilience Center's Research Insight #5,<sup>1</sup> and followed Boonstra and de Boer's (2014) interrogation of the trap metaphor further into the realms of human action and social pattern and structure. In April of 2014 the group reconvened, this time in the Finger Lakes of Upstate New

York, at a farm on Cayuga Lake about an hour north of Cornell University, Ithaca. Here, the thinking about traps and social ramifications within a social–ecological systems framework gelled, and specific papers emerged, with a target of presentation at the Resilience 2014 conference in Montpelier, France. At the conclusion of a successful conference session featuring seven contributed papers,<sup>2</sup> the group further focused and refined their thinking, resulting in the special feature before you now.

In this special feature we revisit the conceptualization of poverty and rigidity traps (Carpenter and Brock 2008) by considering how perceptions and perspectives of representations of stability landscapes can affect spatial and temporal micro- and macro-dynamics which shape the very landscapes that contain these traps. Transformations are radical changes of micro- and/or macro-dynamics that reshape the possibilities to escape these traps by reshaping/changing the basins of attraction and the landscape. The popular practice of conceptualizing and then representing via heuristic models broader scale dynamics in the form of dynamic landscapes and smaller scale dynamics in the form of stability landscapes and basins of attraction raises new questions and new understanding of how the lenses with which we approach time and space dynamics impact the way SES develop and/or can be managed over time. In this thinking, institutions and how they operate in relation to micro- and macro-dynamics resemble some archetypical behavioral patterns conceptualized as institutional traps,

✉ Keith Tidball  
kgtidball@cornell.edu

<sup>1</sup> Department of Natural Resources, Cornell University, Ithaca, USA

<sup>2</sup> Dutch Research Institute for Transitions, Erasmus University Rotterdam, Rotterdam, The Netherlands

<sup>3</sup> Stockholm Resilience Center, Stockholm University, Stockholm, Sweden

<sup>1</sup> [http://www.stockholmresilience.org/download/18.3e9bddec1373daf16fa43c/INsights\\_Social-ecological+traps\\_111108-2.pdf](http://www.stockholmresilience.org/download/18.3e9bddec1373daf16fa43c/INsights_Social-ecological+traps_111108-2.pdf)

<sup>2</sup> Resilience 2014 Session 56 “Tips or traps? Advancing Understanding to Steer Clear of Impoverishment Traps and Tipping Points”—see <http://www.slideshare.net/kgtidball/session-56-tipsortraps>.

which are related to the more commonly referenced rigidity and poverty traps.

In this special feature, we ask “How might the ways scholars conceptualize and depict system properties and states influence either the managers of these systems or the systems themselves?” and “Could new and novel ways of characterizing and understanding as well as employing the notion of traps help us answer the first question posed?” To interrogate these possibilities, we revisit the conceptualization of poverty and rigidity traps as described by Carpenter and Brock (2008) and institutional traps as conceived of by Polterovich (2008) by speculating about how representations of traps within stability landscapes by social–ecological systems (SES) resilience scholars might potentially affect spatial and temporal micro- and macro-dynamics, which could sometimes influence or shape the very landscapes that feature these traps. The increasingly common practice of conceptualizing and then representing via heuristic models broader scale dynamics in the form of dynamic landscapes and smaller scale dynamics in the form of stability landscapes and basins of attraction raises new questions regarding how the lenses with which scholars approach time and space dynamics relative to traps impact the way SES develop and/or can be managed over time. In this thinking, some structures within social–ecological systems and how they operate in relation to micro- and macro-dynamics resemble some archetypical behavioral patterns conceptualized as institutional traps (Lebel et al. 2011).

According to Polterovich (2008), institutional traps are basically inefficient yet stable norms of behavior. Institutional traps are supported and reinforced by mechanisms of coordination, learning, linkage, and cultural inertia. The acceleration of economic growth, systemic crisis, the evolution of some cultural characteristics, and the development of civil society may result in breaking out of institutional traps (Polterovich 2008). Hence, within the field of SES resilience and transition studies, motivated by the possibility of breaking out of traps, understanding these traps from the stand-point of systems modeling, especially through visualizations such as the now almost ubiquitous ball and cup diagrams and stability landscapes, has become *de rigueur*.

Unquestionably, these visualizations have contributed in important ways to our collective understanding of SES, and to better illustrating not only traps, but also possibilities for escaping or avoiding them. We do not intend here to diminish the value of these important initial contributions, rather, our hope is to creatively and somewhat critically approach them for the purposes of expanding their

explanatory utility, to acknowledge both *limits* to as well new frontiers in that explanatory utility. In so doing, we must state clearly that we understand the nuances between metaphors and models, and the complexity of their use in scientific discourse (for an excellent review of this subject, see Kretzenbacher 2003), and that in the process of proposing novel perspectives on traps in social–ecological systems, we may fall into traps of our own making. We take this risk happily, confident that the contribution outweighs the consternation, especially if such risks lead to a wider discussion of traps and how we conceive of their existence, their emergence, and their ability to be mitigated, avoided, or deconstructed entirely.

### Understanding social–ecological systems via heuristics

By now, most scholars are familiar with some of the most ubiquitous heuristic visualizations arising out of SES resilience thinking, to include the adaptive cycle and threshold diagrams. Perhaps because of their general explanatory power, these evocative visualizations have in some circles come to symbolize the field itself (see the stylized infinity loop of the Resilience Alliance logo at <http://www.resalliance.org/>). Yet, even some of the originators of these heuristic visualizations have worried about their overuse, or about efforts to “squeeze everything” into the adaptive cycle or related models (Lance Gunderson and C. S. Holling, personal conversations).

Similarly, we have observed the proliferation of ball and cup type heuristic visualizations, and these visualizations have been productive in assisting researchers to better understand system states. However, little has been written about the limitations of these heuristics, or the implications of their application (or misapplication) in the fast-moving world of transdisciplinary research and theory. Our main point is that there may be traps within traps, and traps that lead to traps. The conceptualization and visual representation of such nested understandings has yet to be fully appreciated among scholars of resilience and sustainability science. In this special feature, we hope to contribute some new theoretical and empirical perspectives on traps that complement existing heuristics. The motivation is that for those involved in planning and governing towards avoiding these traps, there is a prerequisite skill; knowing how to recognize a trap before falling in. Therefore, in this introductory piece, we briefly review the literature on traps as currently described, followed by a synopsis of the contents of the special feature.

### Traps<sup>3</sup>

Human actions are believed to affect feedbacks and drivers in social–ecological systems, which can lead to regime shifts (see Stockholm Resilience Center Research Insight #2 at <http://www.stockholmresilience.org/21/news-events/research-insights/insights/2-28-2012-insight-2-regime-shifts.html>). Scholars (See Stockholm Resilience Center Research Insight #5 at [http://www.stockholmresilience.org/download/18.3e9bddec1373daf16fa43c/INsights\\_Social-ecological+traps\\_111108-2.pdf](http://www.stockholmresilience.org/download/18.3e9bddec1373daf16fa43c/INsights_Social-ecological+traps_111108-2.pdf)) have pointed out that changes such as this may alter ecosystem capacity to generate services on which human wellbeing depends, and this in turn may trigger societal responses. Therefore, recognition of these interactions reveals (or reinforces the already known but oft overlooked reality) that the dynamics of social and ecological systems are inextricably linked. These linkages create possibilities where human actors and institutions interact with other ecological dynamics and unwittingly lock development into a vulnerable pathway. In other cases, interactions reinforce the resilience of an already undesirable social–ecological state. These situations can be conceptualized as social–ecological traps (Kretzenbacher 2003).

Following from the work of the Stockholm Resilience Center mentioned above, resilience scholars describe a social–ecological trap as a case where social and ecological feedbacks mutually reinforce one another and maintain or drive a social–ecological system towards an undesirable state. Social–ecological traps are therefore difficult to escape and incremental change will generally be insufficient to break out of such traps (Enfors et al. 2008; Steneck et al. 2011). Importantly, social–ecological traps are similar to but not synonymous with poverty and rigidity traps that have primarily been described as a social phenomenon detached from ecosystems and how their dynamics feed into, are shaped by and affect social processes (cf Carpenter and Brock 2008). Social–ecological traps also share characteristics with studies of the pathology of natural resource management (e.g., Holling and Meffe 1996; Huitric 2005; Sterner et al. 2006) and sunk costs (Janssen and Scheffer 2004; Costanza et al. 2007).

Persistent poverty increases likelihood of succumbing to social–ecological traps. Without alternative income sources, declining revenues from a resource exacerbates poverty (Cinner 2011) as the impoverished are least likely to be able to change their livelihood (Cinner et al. 2009).

<sup>3</sup> The genesis of this Special Feature on Traps is in part a result of the Stockholm Resilience Center’s publication of their synthetic Research Insights, specifically Insight #2 and #5. This section of the introduction to the Special Feature thus follows these Research Insights closely, in order to provide appropriate background and context for the advancement of thinking that these insights initiated.

Potential for some actors to experience financial rewards can push social–ecological systems toward ever more impoverished and vulnerable states. Because of the high value of a natural resource, stakeholders and managers may be handicapped by a “blind-spot” regarding risks of unexpected sudden decline and associated social–ecological consequences (Steneck et al. 2011). And more well-off communities with profitable markets and government support may be less willing to change their livelihoods if resources decline (Daw et al. 2012). Traps of this nature are often obscured by technological advancements, exploitation of species at lower trophic levels, subsidies, and trade (Huitric 2005; Berkes et al. 2006; Crépin 2007; Thyresson et al. 2011). Yet near-term economic opportunities and masking effects impede or prevent long-term commitments to impede or reverse social–ecological degradation (Deutsch et al. 2007; Nyström et al. 2012).

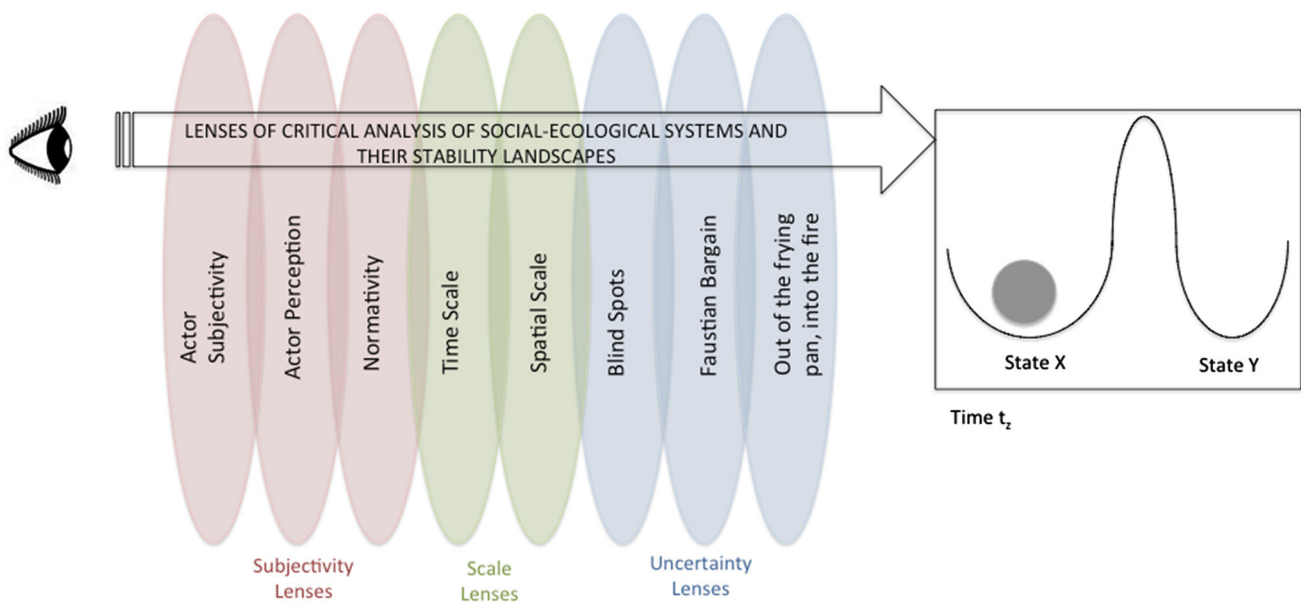
Rigidity traps occur in social–ecological systems when institutions become highly connected, self-reinforcing, and inflexible (Gunderson and Holling 2002). We explicitly include higher education and research institutions. Poverty traps (Azariadis and Stachurski 2005; Bowles et al. 2006; Carter and Barrett 2006; Barrett et al. 2011), with particular emphasis on non-monetary impoverishment traps, distinct from rigidity traps, represent a situation in which people are impoverished by circumstances beyond their immediate control (Bowles et al. 2006). Thresholds, or tipping points, indicate regime shifts in social–ecological systems and often imply or indicate “traps,” especially when we visualize traps in terms of multiple domains in stability landscape models (Herrfahrdt-Pähle and Pahl-Wostl 2012).

Carpenter and Brock (2008) emphasize the changing nature of traps in their efforts to model adaptive capacity. These scholars argue that traps represent persistent maladaptive states, and that the conditions that lead to rigidity or poverty arise in opposite phases of the adaptive cycle. Rigidity can set in when connectivity and potential have increased, while adaptive capacity has atrophied.

At the other end of the cycle, when connectivity or potential are low, impoverishment (poverty traps) can result. This is particularly evident in post-conflict and post-disaster contexts (Spring et al. 2014; Tidball et al. 2014) We take this notion of impoverishment to include multiple capitals, in addition to monetary, and expand upon this notion herein.

### Lenses to expand the understanding of traps in social–ecological systems

The authors in this special feature take a constructive critical approach via novel conceptual and empirical observations on traps, motivated by the existence of contested interpretations of traps among both scholars and lay



**Fig. 1** Proposed lenses to explore social–ecological system traps

persons and the landscapes within which they are described. Building on the work of the participants of the Resilience 2014 Session 56 “Tips or traps? Advancing Understanding to Steer Clear of Impoverishment Traps and Tipping Points” who mused about various “lenses” with which to see traps (see Fig. 1), the authors of this special feature ask “Can we surface qualitatively new types of traps? Or, are all traps describing ‘shades’ of the two archetypical traps (rigidity and poverty) already well known in the literature? With this in mind, but not decided, the authors herein aim to bring new insights and knowledge to the concept of traps from diverse perspectives while remaining constructively critical of the concept itself: examining the subjectivity of traps, issues of scale, and related unintended consequences.

## Contributions

The contributions of the special feature point out that there is space for theoretical plurality within the traps discourse in social–ecological systems. The contributions of both Tidball and Stedman offer views from the agency perspective considering motives, emotions, identity and interests, a perspective perhaps overlooked in earlier work on traps that remains ontologically and epistemologically at a systems’ level perspective. Kroeneberg and Huemback offer an economic perspective to the issue, breaking the ‘taboo’ on economic ideas for social–ecological systems’ resilience. These provide a ground for future theorization regarding the theme of persistence and how it relates to governance for sustainability in social–ecological systems.

The special feature begins with a paper by Tidball (2016). The author argues that, given the theorization that human action often predicates or initiates the series of cascading affects that determine the presence of, and perhaps the effectiveness of, social–ecological traps, we must better understand what drives human action in this context. The author asks what logic, assumptions, decisions, world-views, and other processes are implicated in this configuration? He works at this question by interrogating the concepts of ecological identity and the problems of anthropocentrism, human exceptionalism, and human exemptionalism, and then introduces the term ecological disenfranchisement. Building upon this, the author invokes Horn’s logic and dialectical traps as a lens for understanding human roles and the prevalence of issues with ecological identities, within social–ecological traps. He concludes that efforts to either understand social–ecological traps or navigate away or out of them must first take stock of the human logical traps that actors within the systems are influenced by, and that influence the large systems(s).

Our second paper is that of Boonstra et al. (2016). The authors use a series of cases to introduce three interrelated concepts: motivations, abilities, and opportunities to help theorize the variety of human responses to trap situations.

Moving from the cognitive individual level and small-scale community level to the more broadly social structural level, the third paper of the special feature is by Stedman (2016). The author contends that constructs such as system identity, stability and changes (tips, transitions, transformations from one identity to another), are subjectively perceived, and acted upon by the social actors that occupy these systems, but that this relative lack of recognition of

subjectivity has become a “rigidity trap” for Social–Ecological Systems and sustainability scholars. Sense of place theory, which emphasizes the creation of meaning as systematically distributed throughout society, is offered as a mechanism for helping SES researchers more fully engage subjectivity.

Our fourth paper by Kronenberg and Hubacek (2016) builds upon the social science of economics to challenge perspectives. The authors put forward an ecosystem service curse hypothesis that points to counterintuitive negative development outcomes for countries and regions rich in ecosystem services. The social and economic problems that they depict in many Payments for Ecosystem Services schemes reflect the persistence of maladaptive states (traps) in pursuit of sustainability, they argue.

The fifth paper of the special feature by Nair and Howlett (2016) addresses policy and management issues at larger organizational scales. The authors point out that even when a policy may be effective in the short-term, changes in problem or policy contexts may render it ineffective over time. The design of ‘robust’ policies, meaning those which are able to self-adjust to linear changes in their environment can be contrasted with ‘resilient’ ones which are able to adjust not only to linear but also non-linear shifts in their contexts. With this in mind, they explore three strategies to address policy traps due to climate change.

The sixth paper by Enqvist et al. (2016) concludes the special feature on a hopeful note. The authors argue that social movements can be an important source of change in trapped social–ecological systems. Through a case study of civic engagement, they show that ecological restorations have the potential to counteract trap mechanisms by restoring ecological functions.

## Conclusion

This special feature contributes to *Sustainability Science*’s efforts to probe interactions between global, social, and human systems, the complex mechanisms that lead to degradation of these systems, and concomitant risks to human wellbeing. The proposed “traps” special feature presents a unique, novel, and transdisciplinary effort to simultaneously understand phenomena and solve problems, such as uncertainty and application of the precautionary principle, the co-evolution of knowledge and recognition of problems, and trade-offs between global and local problem solving.

We acknowledge that our societies are far from the end-state referenced as sustainability. The cascading crises—environmental, financial, political, and social—create a moment in history that scientists, policy makers, and

corporate actors either consider as windows of opportunity or as situations of entrapment. This on-going tension can be enlightened with the concept of “traps,” especially by unraveling how traps are understood, perceived and what sustains them. The discussion on traps in social–ecological–technological systems will advance sustainability science by creating new meaning and deepening the thinking on what inhibits our societies from escaping unsustainability traps, by bringing interdisciplinary perspectives from social sciences into the sustainability debate and also by bridging multiple scholarships that actively address the sustainability debate.

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