

# Traps in and of our minds: relationships between human logic, dialectical traps and social-ecological traps

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**Abstract** Social-ecological traps are theorized to be present when human actions affect feedbacks and drivers in social-ecological systems, which, in turn, lead to regime shifts that may alter ecosystem capacity to generate services on which human wellbeing depends, and this, in turn, triggers societal responses, where actors and institutions interact with ecological dynamics and unwittingly lock development into a vulnerable pathway. The key dynamic in this theorization seems to be 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. However, what drives human action in this context? What logic, assumptions, decisions, world views, and other processes are implicated in this configuration? This paper first briefly reviews ecological identity and the problems of anthropocentrism, human exceptionalism, and human exemptionalism and 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. Drilling further down, the paper illustrates these traps with short vignettes, in each case, attempting to link the human logical traps with larger system dynamics. Finally, the author proposes a chain of reasoning to serve as an example of how the presence of human logic traps (or entrapment) in a number of different spheres has an impact

upon the larger system, and, perhaps, even predicts entrapment of the larger system. Future 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 system(s). This paper argues that failing to account for human traps within will render most efforts to avoid or escape social-ecological traps futile.

**Keywords** Social-ecological traps · Logical traps · Resilience · Ecological disenfranchisement · Human exceptionalism · Human exemptionalism · Agency

“The fox condemns the trap, not himself.”—William Blake<sup>1</sup>

## Introduction

One way that social-ecological traps are theorized to be present is when human actions affect feedbacks and drivers in social-ecological systems, which, in turn, lead to regime shifts that may alter ecosystem capacity to generate services on which human wellbeing depends, and this, in turn, triggers societal responses, where actors and institutions interact with ecological dynamics and unwittingly lock development into a vulnerable pathway (Stockholm Resilience Center 2012). In other cases, similar interactions reinforce the resilience of an already undesirable social-ecological state (Ibid.). The key dynamic in this theorization seems to be that human action predicates or initiates the series of cascading

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<sup>1</sup> From the Marriage of Heaven and Hell.

effects that determine the presence of, and, perhaps, the effectiveness of, social-ecological traps. Though there arguably may (or may not) be other forces that predicate or initiate social-ecological traps, I focus here explicitly on exploring what drives human action in this context? What logic, assumptions, decisions, world views, and other processes are implicated in this configuration?

First, what kind of human action might predicate or initiate the emergence of social-ecological traps? This question is similar to questions asked by the late Dr. Argyris, such as “Why do human beings produce results that are counter-productive to their own stated interests and intentions? Why do they seem unaware that they are producing the counter-productive consequences while doing so? Why if pressed to become aware do they deny their personal causal responsibility followed by denying that they are denying? Why, if pressing continues, do they claim that they are victims of the actions of others? Why do they express a sense of helplessness? Why do they express a sincere doubt that these patterns are correctable—that is, a sense of being in a Trap?” (Argyris 2010). In an effort to shed light upon these questions, Argyris wrote at length about “Model 1 Theory-in-use,” the values that drive people. These include a propensity for acquiring a sense of control (to include of our environment), a desire to maximize winning, a tendency to exist in the states of avoidance and denial, and a nasty habit of defensive rationalizing (see Argyris and Schön 1996, 1978 for further elaboration). Therefore, in brief answer to the question “what kind of human action”, one might answer that ultimately, however, initially well-intended, self-destructive and fallacious human values inform the kind of human action that might predicate or initiate the emergence of social-ecological traps.

Building on this point, I introduce the American political scientist Robert Horn (1983), who collected and categorized non-deductive fallacies, which he believes result from built-in limitations to everyday thinking patterns about the phenomena change and stability. In his writing, he attempts to show that they are related directly to and are somehow generated by the axioms of the traditional and dialectical logic. Horn writes that our thinking about change and stability, identity and transformation, stasis, and morphogenesis is so unconscious and so natural that we rarely pay attention to them. In addition, yet this thinking, he points out, often becomes inadequate when faced with complex, high interactive systems, and intricate policy matters such social-ecological systems in transition. Horn employs the metaphorical term “trap” to refer to the specific ways that the organization of our thinking about change and identity leads us astray (or into predictable error). We can learn something about the nature of traps, and our use of the terminology in the context of social-ecological resilience, by examining the source of this metaphor, which follows.

One important way that the organization of our thinking about change and identity can lead us that astray has to do with ecological identity and our human self-concept within the systems within which we reside. According to Rees (2003), modern humans are unaccustomed to conceiving of themselves as ecological or biological entities. It is as if we as individuals—and indeed, entire societies—have forgotten our ecological identities, or are suffering a kind of environmental amnesia (Tidball and Stedman 2013), enduring a self-imposed humanity–nature apartheid (Hettinger 1996), a legacy of the enlightenment in western culture’s reductionist mindset that sees the human enterprise as somehow separate from and above the natural world (Hayward 1994). This formulation of our ecological selfhood, or lack thereof, and the subsequent discourse among members of our societies lead us into a number of traps, as shall be seen in the following paragraphs.

In this paper, I will first briefly review ecological identity and the problems of anthropocentrism, human exceptionalism<sup>2</sup> (Dunlap and Catton 1994; but see also, Pickering 2008), and human exemptionalism (Cairns 1999). Then, I will introduce logic and dialectical traps, as described by Horn and colleagues. Next, I will focus on a specific subset of these traps, and relate them to the problems of ecological identity, ecological selfhood, and ecological disenfranchisement. Finally, I will situate the discussion about logic and dialectical traps, specifically those related to ecological identity, within the larger discourse about social-ecological traps and their ramifications for social-ecological system resilience.

### Exceptionally human-trapped in ecological disenfranchisement

Researchers from across many disciplines are engaged in the studies of aspects of ecological identity, such as philosophy (Merchant 1992), psychology (Axelrod 1994, Stern and Dietz 1994), biology (Wilson 1984, 1993), social ecology (Kellert and Wilson 1993; Kellert 1997a, b), deep ecology (Naess 1988), ecospsychology (Roszak 1992; Thomashow 1995; Winter 1996; Thomashow 1998), environmental justice (Clayton and Opatow 2003), environmental education (Chawla 1999), and ecological anthropology (Tidball 2012, Tidball and Stedman 2013). Although a clear and rigorous definition of ecological identity has yet to fully emerge, Clayton and Opatow bring us close in describing how environmental identity includes

<sup>2</sup> Human exceptionalism is the notion that humans are categorically or essentially different than all other organisms. Human exemptionalism, based on human exceptionalism, is the tendency to place the human world outside of the natural world, and thus render the human exempt from the rules, processes and cycles of the natural world.

“the way in which we define the environment, the degree of similarity we perceive between ourselves and other components of the natural world, and whether we consider nature and non-human natural entities to have standing as valued components of our social and moral community” (Clayton and Opatow 2003, p. 8). Clayton gets a step closer to a definition when she proposes that environmental identity is “one part of the way, in which people form their self-concept: a sense of connection to some part of the of the non-human natural environment, based on history, emotional attachment, and/or similarity, that affects the ways in which we perceive and act toward the world; a belief that the environment is important to us and who we are” (Clayton 2003, pp. 45–46).

Ecological disenfranchisement refers to a condition when human actors “forget” (both as individuals and as communities and societies) their own “inherent capacity to be deeply, empathetically resonant with the earth and life itself” brought about by ecosystems damaged by “materialist addictions, fraught with enormous disparities, and underpinned by diverse social, cultural, and political histories” and occurring in a “traumatized world... a trauma that is grounded in place, literal, and visceral within the land itself” (Williams 2012, p. 397). Overcoming ecological disenfranchisement includes recovering and remembering ecological identities as above, such that humans redevelop the capacity for “empathetic resonance or deep interconnectedness” (Ibid.) with the rest of nature (including other humans).

When ecological disenfranchisement is present when ecological identity is muted, distorted, or absent, one can conceive of a predictive pre-condition also being present, one that predisposes the individual or collective to both “be trapped” in a discreetly human sense, and simultaneously to be contributing to or catalyzing inputs or feedbacks which result in larger social-ecological traps; traps within traps.

## Traps—a primer

As reported by Cinner (2011), there is a lengthy history of research on social traps, those situations where individuals or even whole societies “get started in some direction or some set of relationships that later prove to be unpleasant or lethal and that they see no easy way to back out or to avoid” (Platt 1973, p. 641). Social traps as defined by Platt often involve the exploitation of natural resources for some short-term gain that leaves future generations in worse shape than those before them. Perhaps, a defining characteristic of the social trap is that the initial behavior is intentional, not inadvertent or accidental. An oft used example is the Dust Bowl of the 1930s, which was caused

by, among other things, an intentional over-tilling of the land that loosened and dried out the topsoil of farmland. In this case, farmers in these prairie states of the US likely had no idea that such over-farming and depletion of natural resources would have devastating consequences. Instead, they were intentionally focused on the short-term financial gains from farming as much as possible at that particular point in time, yet their initial actions led to a period of devastating dust storms, the effects of which are still being felt today.<sup>3</sup>

Though, as reflected above, the idea of social traps appears in debates about the governance of natural resources (See Hardin 1968, Costanza 1987), this idea is not often discussed in the context of linked social-ecological systems (but see these important exceptions—Allison and Hobbs 2004, Carpenter and Brock 2008, Cinner 2011, Haider et al. 2012), which emphasize feedbacks between social and ecological domains and the potential for shifts to alternative, less socially desirable, stable states (Hughes 1994). In addition, though these social traps represent situations where individuals, groups, or organizations are unable to cooperate owing to mutual distrust and lack of social capital, even where cooperation would benefit all, effectively trapped in a reality where people will cooperate only if they can trust that others will also cooperate, little has been written on how to escape this (Rothstein 2005, Ostrom 2008).

To fill this gap, I offer these thoughts. In the introduction to this paper, I mention, following from Horn (1983), counter productive varieties of thinking which are thought to determine our actions. Horn described these varieties of thinking as similar to the traps on a golf course. In golf, writes Horn, if we land in a trap, it is likely due to a combination of faulty calculation (of distance, wind and lay of the land), lack of skill, and faulty action (not keeping the head down, following through, choosing the wrong club). However, in golf, he goes on to say, we know right away when we have landed in a trap, because we cannot find the ball on the fairway, a simple feedback. In this sense, we can see that traps of reasoning are often different. They lack the immediate and obvious feedback. We may suspect that something has gone wrong, or that we are in the wrong place, but often we are not sure why. Returning to Horn’s golf analogy, on the golf course, we know that as a result of finding ourselves in a trap, we are going to waste strokes, but we will eventually reach the green. Therefore, from Horn’s standpoint, metaphorically, traps are areas of thinking which we stumble into even though we may have the best of intentions and skill, and once in them, we find it

<sup>3</sup> This and other examples of social traps can be found in Study.com’s Social Psychology: Tutoring Solution/Psychology Courses—Chapter 3, lesson 11.

hard to extricate ourselves from. Therefore, he argues, by knowing about the traps for thinking and recognizing which trap we have wandered into, we can often correct our thinking before we move from plan of action to action itself. Thus, reacquainting ourselves with a description of traps can help us further understand our conceptualization of social-ecological traps, the associated feedbacks, and drivers in social-ecological systems, the consequent regime shifts that may alter ecosystem capacity to generate services on which human wellbeing depends, and the resulting societal responses that lock development into a vulnerable pathway.

### Horn's traps of the traditional logic

The traditional logic, as articulated by Horn, comprises those general rules of thinking derived from Aristotle's *Organon* (2012). It deals with space; it does not deal with time, change, and interrelatedness, and it is concerned only with identity and non-contradiction. Thus, traditional logic traps the result from unconscious acceptance of the point-of-view implicit in the axioms of the traditional logic (see Table 1). The traditional logic traps share a commonality in that they all ignore that concepts, persons, and things are processes which change on varying temporal scales and are interrelated with each other. The seven traps that derive from the traditional logic according to Horn (1983) are depicted and briefly described in Table 2.

Therefore, a trap is any common way that the organization of a person's (and I would argue, a group of people) thinking leads him or her (or them) astray or into predictable error (Ford and Ford 1994). We experience a trap when the application of a seemingly logical worldview ceases to work for us, resulting in frustration, inadequate explanations, and ineffective actions (Hedberg et al. 1976, Ford and Ford 1994). When we insist on forcing a once-useful way of thinking despite noticing it increasing ineffectiveness, its continued application can get us trapped or "stuck" (Smith and Berg 1987). In fact, argue Ford and Ford (1994), continued application can exacerbate the

problem and make it harder for people to extricate themselves from the trap they find themselves quagmired in. As they point out, and as evidenced by the extensive research on escalation to a decision (see Staw 1981), a person can become trapped by a logic and end up doing more of the same actions without producing the desired result.

### Traditional logic traps applied

What might be examples of these traditional logic traps as applied to social-ecological systems thinking? In this section, I will briefly illustrate each of the traditional logic traps using familiar examples from the SES literature. In each trap type, the description will move from a general description via example, to an extrapolation to a larger SES trap that results from the interplay of these at once subordinate yet predominate logical traps. This understanding of the scalar nestedness of these traps is informed by Wimberley (2009).

#### The forever changeless trap

In this trap, individuals or groups of people are "stuck" in believing that the current conditions are or will be the same forever. This is familiar territory for anyone who has studied natural resources and industrialization from the period of about 1850–1910 in the United States. For example, in the Adirondacks (in upstate NY), while timber and mining tycoons were busy extracting what many proclaimed as "limitless" possibilities, commercial hunters and anglers, and the hospitality industry that prospered on their backs, overfished, and overhunted the already reeling ecosystems of the area, all happily laboring under the assumption that the Adirondacks, and more broadly, wilderness in America, were forever changeless (see Keller 1980 among many Adirondack histories). Of course, being stuck in this trap cannot be permanent, as the resources inevitably run out, or diminish, and realization occurs. However, recovery will often lag, as in the case of some resource-dependent communities still struggling today, in some cases, more than 100 years after falling into this trap.

Understanding this logic trap from the stand point of implications for SES requires a critical assessment of the dominant paradigm in western society regarding ecological identity. In this vein, westerners, and increasingly non-westerners alike, are said to be in a process of losing an eco-identity, which is being replaced by a more urban, digital, technological identity, and associated self-image and discourse espousing the near-infallibility of modern science to solve nearly any problem. In the larger sense, then, this loss of ecological identity in favor of a belief that humans have been and always will be exempt from natural

**Table 1** Interrelation of traditional logic axioms and traps. Adapted from R.E. Horn (1983) and Johnson (1984)

Axiom	Trap
Identity (A is A)	Forever changeless trap
	Process-event trap
	Solve it by redefining it trap
Contradiction (A is not A)	Independent self-trap
	Isolated problem trap
Exclusion (A is not both A and not A)	Single-effect trap
	Exclusive alternatives trap

**Table 2** Traditional logic traps and their description. Adapted from R. E. Horn (1983)

Trap name	Trap description
The forever changeless trap	The current conditions are/will be the same forever
The process-event trap	Error of thinking in terms of object like “events” where we would do better to think in terms of processes
Solve it by redefining it trap	Attempts to solve problems by redefinition alone
The independent self-trap	When we separate organism from environment, ourselves from our interdependence with others
The isolated problem trap	When we regard problems as unconnected to their wider contexts
The single-effect trap	Error of thinking we can cause a single effect with no “side effects”
The exclusive alternates trap	Dichotomous, “either-or” analysis that fails to consider or take into account more than two alternatives

processes and exceptional in the sense of needing to adapt to the vagaries of some of nature’s processes lulls us into a false security, an idea that since we seem to have the proverbial tiger by the tail now, we will always have the tiger by the tail. However, with the hand-wringing over human vulnerability in the context of climate change, or even the concerns of mutating and evolving viruses that are overpowering our vaccines, it would seem that we, as a society, are naively comfortable in the forever changeless trap, and confident that our species will prevail, because we always have.

### Process-event trap

This trap is characterized by the error of thinking in terms of object like “events” where we might do better to think in terms of processes. An excellent example of this trap is the disaster event called Hurricane Katrina. The story of New Orleans’ struggle to endure weeks of inundation and devastation, and months of disorganized efforts to recover from the disaster, is, by now, well known (United States 2006; Waugh 2006; Brunsma et al. 2007). Because of rapid wetland loss since the first half of the 20th century, New Orleans’ infrastructure and population are said to be more vulnerable to hurricane-related storm surges than they were in the past.<sup>4</sup> The scientific consensus is that every 2.7 miles of coastal marsh lost between solid land and open water add one foot to the height of a storm surge reaching solid land (U.S. Army Corps of Engineers 2000). In the last 80 years, 1500 square miles of coastal wetlands were lost, and loss of urban tree canopy and coastal trees can compound the effects of less buffering of storm surge and, consequentially, large inflows of storm wind and water (Harada and Imamura 2005; Nowak and Dwyer 2007; Cochard et al. 2008). Yet, despite all of this known process level information, policy makers and, even for a time, scientists were wholly preoccupied with Katrina the event, as opposed to the disaster spawned by Katrina as a result of

ongoing processes. To wit, despite 11 billion dollars (US) invested in hurricane risk reduction and an additional 2 billion for coastal restoration, only 45 miles of new land, in the form of constructed barrier islands and berms, have been created.

New Orleans flooded, because the levees designed to protect it failed. The floodwaters remained, though because of the bowl-shaped configuration of the city. The bowl is only getting deeper, some contending that it is sinking at the rate of 4 feet every 100 years. Accounting for that subsidence, sea level in New Orleans and surrounding areas is expected by some scientists to rise as much as 20 in or more by 2050, representing a rate two to three times the global rate of mean sea level rise. However, this process level information is not front page news. The next flood event will be, unfortunately.

### Solve it by redefining it trap

This trap stems from efforts or attempts to solve problems by redefinition alone, which is, as some have argued, a great way to just stop thinking about a problem instead of struggling to solve it. For example, imagine, you are a small farmer with a field bordering a road. As a result of traffic along the road, noxious invasive weeds have taken a hold in your ditch, field, and yard which are unsightly and potentially poisonous to humans and livestock. You could work hard on eradicating the invasive noxious weeds, so that they do not multiply or become more of a problem or you could decide that only superficial farmers care about appearances. Deciding upon the second option implies that you have “solved” your noxious weed problem by defining yourself as more substantial in character and less vain, a person who is too principled to care about appearances.

At a global scale, we see this problem frequently as governments and international organizations redefine the problem of reckless consumption by the developed world as an education problem among the members of the developing world. However, as we now see, this is simply kicking the problem down the road to be dealt with by ourselves, or those who follow us, some other time.

<sup>4</sup> See [http://www.nrdc.org/water/files/ClimateWaterFS\\_NewOrleansLA.pdf](http://www.nrdc.org/water/files/ClimateWaterFS_NewOrleansLA.pdf).



### The independent self-trap

This trap manifests when we separate organism from the environment, ourselves from our interdependence with others. This trap reflects something in opposition to an ecological view, something that is more akin to parsing, more akin to convenient and self-serving reductionism (Tidball and Stedman 2013), and, perhaps, to a “...failure of many humans to locate themselves ecologically” (Kretz 2009, p. 116). Examples of the Independent Self-Trap are ubiquitous, from the justifications heard by individuals who are against recycling, renewable energy, and so forth, often claiming that their individual actions are their own and affect no-one else. This intellectual posture reflects a particular human exemptionalism, one that separates the human from so-called natural worlds by privileging human consciousness and the societies that it produces as unique and distinct, an anthropocentric tendency exhibited by humans for most of modern history (Williams 2007). Thankfully, in the 21st century, we have, in important ways, begun to escape the human exemptionalist paradigm, in favor of a new ecological paradigm (Dunlap and Van Liere 1978; Dunlap 1980; Dunlap and Catton 1994; Rideout 2005; Manoli et al. 2007) and partially reflected in the pursuit of ecological economics (Costanza et al. 1997; Rockström 2009). However, even today, many scholars are of two minds about this debate. As Williams (2007) explains it, on the one hand, scholars point out that the market, a social institution, causes significant amounts of environmental disorder, yet on the other hand, some of these scholars suggest choice and rationality can fix these problems. We see this, because, as Murphy (1995) recognized, a strong bias persists for perspectives that prioritize agency and the power of social actors. However, Williams counters, even in the predominately secular thinking of sociology “agency has a mythic grasp ... to question our ability to choose and to choose rationally is to question the exemptionalism of our consciousness; it is to question our humanity and the self-conception of ourselves as special and unique creatures of evolutionary history” (Williams 2007, p. 138).

### The isolated problem trap

This trap emerges when we regard problems as unconnected to their wider contexts. An example comes from farming in my home state of New York. As farmers are experiencing higher volume and intense rains, they have a desire to mitigate this problem with the installation of field drainage tiles. The drainage tiles outlet or “daylight” in municipal ditches, which as a result of field tiles, are receiving larger volumes of water more quickly, and contribute to overwhelming local streams and creeks, which

cause erosion and results in conspicuous plumes in larger lakes. Lake advocates then blame both municipal highway personnel and farmers for the plumes; however, though these management decisions contribute to the problem, they are not the source of the problem. Changing weather patterns and increased frequency and duration of heavy rainfall events are the problem, but in this case, larger wider context is disconnected from the discourse, causing conflict stemming from the isolated problem trap (see <http://climatechange.cornell.edu/re-plumbing-our-water-sheds/> for further elaboration).

### The single-effect trap

The single-effect trap is the error of thinking we can cause or manage for a single effect with no “side effects.” The natural resources management field is rife with the examples of this trap, as in the fisheries management, where one “desirable” species is managed for abundance at the expense of other species (see Sanchirico and Hanna 2004, Vinther et al. 2004). Similar studies exist within terrestrial wildlife literatures, especially dealing with ungulates, where the more management decisions focus on the single effect of greater abundance of a desirable species, such as white-tail deer, the larger the “side effects” are in the form of trophic and cascading effects in terms of forest composition, changes in predation, etc. (Riley et al. 2003).

### The exclusive alternates trap

Dichotomous “either-or” analysis that fails to consider or take into account more than two alternatives is what leads to the exclusive alternates trap. When we are presented with two choices, we tend to rush to an assumption that the options before us are mutually exclusive. A classic example is the age-old nature vs nurture debate, which typifies an exclusive alternatives trap. In this discourse, we think of nature and human nurturing as two separate spheres, instead of recognizing that all of our human nurturing are informed by and occurs within nature (from a biospheric perspective, at least). The exclusive alternatives trap forces an unnecessary kind of zero-sum game thinking rather than leaving open the possibilities of both, neither, or other options.

Each of the traps above can characterize a given situation, and in some cases, a trap may appear as a hybrid of two or more of the types above.

## Discussion

How might we contextualize the above descriptions of traps in a larger scale real-world challenge? In the larger climate change and human vulnerability discourse, I have

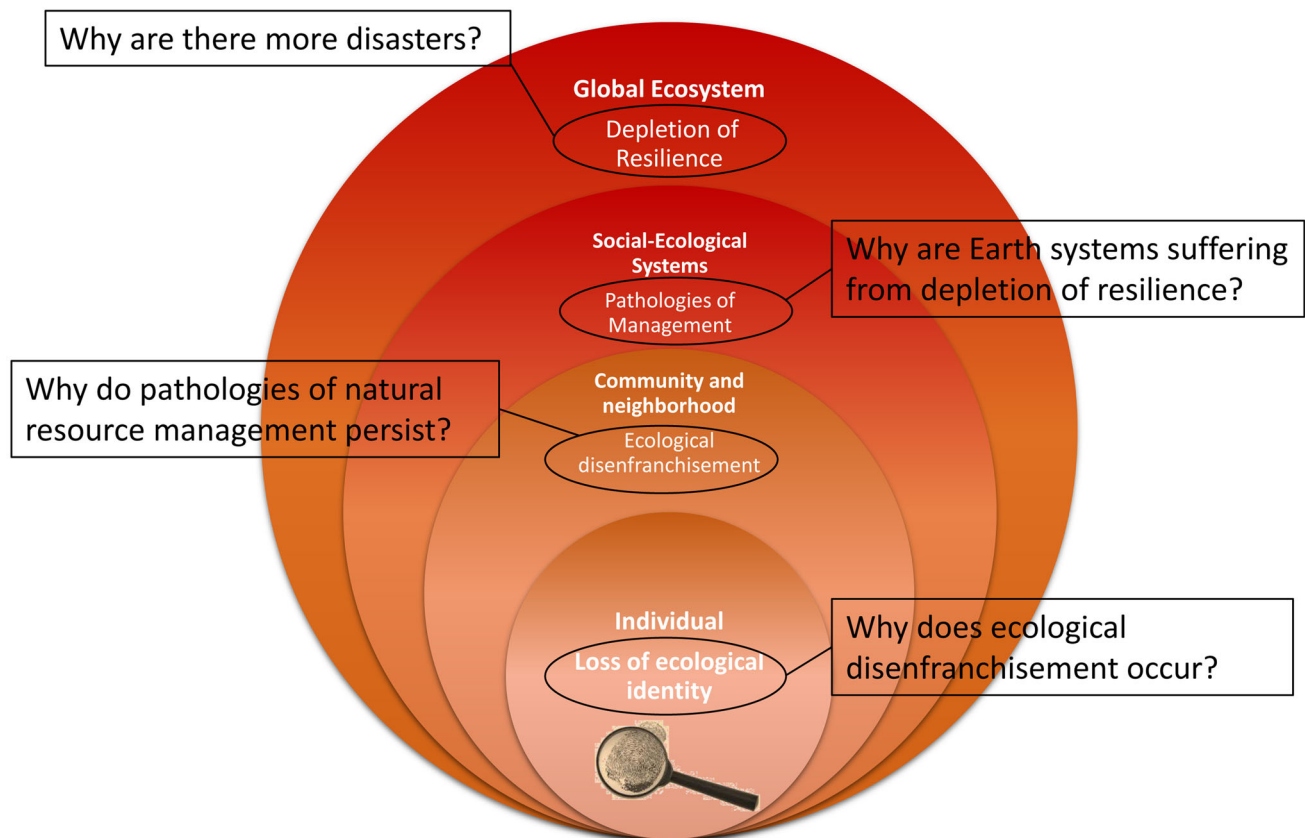
proposed a chain of reasoning that, though admittedly limited, illustrates in a heuristic sense the presence of traps (or entrapment) in a number of different spheres (see Fig. 1). At global scales, there are claims that large climatic systems are facing a depletion of resilience and are at risk of losing critical function, resulting in increased severity and frequency of extreme weather events. Therefore, in the first sphere, to the question “why are there more disasters?” we can say, “because there is a loss of resilience on a global systems scale. Drilling down from there, one might logically ask, “why are Earth system’s facing a depletion of resilience? A possible answer here is that, at the scale of social-ecological systems, there is a preponderance of the pathologies of management (Holling and Meffe 1996). These pathologies of management are drivers of system change and are pushing system states across new thresholds, depleting resilience. They are also a result of falling into one or more of the above-described traps.

Drilling down further still into the scale of communities and neighborhoods, one might ask why these pathologies of natural resources management persist? Answering that question requires us to acknowledge yet again the prevalence of traps in the realities we navigate the frequency and quantity of instances of finding ourselves in these traps,

and, perhaps, most disturbingly, the net effect of being trapped so often (or ecological disenfranchisement, see description above).

Finally, drilling down to the individual scale, one might ask how does one become ecologically disenfranchised? Here, I suggest that ecological disenfranchisement is a result of a loss of ecological identity. However, this loss is, perhaps, not loss in the sense of losing, but in the sense of succumbing, resigning to either being trapped, or to being unable to avoid traps.

Now, in fairness to those who may find themselves skeptical of what is argued herein, or who are uncomfortable with the idea of abandoning self and societal conceptions of ourselves as exceptional and exempt, one must acknowledge that a certain amount of human ingenuity comes precisely from our abilities to conceive of ourselves as capable of escaping the limitations of our own biology and even our cosmology. Our imagination and creativity as a species may well be exceptional, and the purpose of this paper is not to interrogate humanist perspectives, or to diminish the value and agency of humans so much as it is to locate the origins of social-ecological system entrapment in the human social element, in our logics and consequent actions. The overarching implications of these descriptions,



**Fig. 1** An illustration of traps begetting traps at different scales

then, are that we cannot continue to apply the logic that got us trapped to escape the trap. Thus, the foundations (and fallacies) of the logic that increase the likelihood of human contribution to system entrapment are proposed, with the expectation that the conversation regarding human agency and social-ecological traps is just beginning.

## Implications and conclusions

Hopefully, it has become clear to the reader that when we accept the supposition made by colleagues at the Stockholm Resilience Institute referenced in the introduction regarding the necessary human component of social-ecological traps, and then consider the chain of events leading to the emergence of a social-ecological traps,<sup>5</sup> a key consideration is that human action predicates or initiates the series of cascading effects that determine the presence of, and, perhaps, the effectiveness of, social-ecological traps. Furthermore, this human action is subject to traps within traps, or more simply, the logical traps that we as humans find ourselves in, may predict, the social-ecological traps we might expect to experience. Thus, understanding and appreciating the role of these human logical traps are important components of understanding a given system's likelihood of becoming trapped or escaping being trapped? Furthermore, knowing how to avoid the logical traps would seem to be imperative in navigating systems towards sustainability.

A caveat or two may be in order here. First, this paper does not rule out the possibility of other than human drivers or catalysts when describing social-ecological traps, but rather explores assertions regarding human roles in them, and associates ecological identity and ecological disenfranchisement as potential preconditions for humans to become actors in a system becoming trapped. The inverse logic of this is, of course, that if humans were not themselves trapped by exceptionalism, exemptionalism, and/or ecological disenfranchisement, they would likely not behave (actions, decisions, policies, etc.) in ways that become the preconditions for the subsequent trapping of the social-ecological system in question. However, it is conceivable that ecological processes occurring completely or nearly completely independent of human intervention or management (though the resilience school of thought is that this is nearly impossible today) might lead to a system being trapped.

<sup>5</sup> The chain being: (1) Human actions affect feedbacks and drivers in social-ecological systems; (2) this leads to regime shifts that may alter ecosystem capacity to generate services on which human wellbeing depends; (3) this in turn triggers societal responses where actors and institutions interact with ecological dynamics and unwittingly lock development into a vulnerable pathway.

Second, a vast literature on logical fallacies in the psychology, economic, and management contexts exists (see for example Dorner 1996; Stanovich 1999; Kahneman 2011) as does a literature specifically in the environmental sciences (Moxnes 1998, 2000; Sterman 2008). Some of these fallacies are based on misunderstanding dynamical systems, others on misunderstanding statistics, and others on purely logical fallacies, and it is unclear as to what relation exists, if any, between these and the fallacies (Horn 1983) described herein. This is an acknowledged area for further inquiry. At the same time, other scholars discuss logical fallacies within a more “natural” context (Woods 2013) and reevaluate their role in human thought. It is possible that the same could apply to the traps discussed here, and as such interrogating the work of Woods in the context of logic and dialectical traps and social-ecological traps would seem to be a next step. This is particularly relevant to the discussion about ecological disenfranchisement. The fallacies mentioned earlier arise in several applications (economics, management, accounting, etc.) and the three axioms of human thought also apply to any domain. Can we know to what extent, then, are the seven traps peculiar to social-ecological systems? Do these traps occur in other systems too? If yes, then why are social-ecological problems different? At the risk of this paper asking more questions than it answers, it is clear that there is a rich and fertile field before us in the domain of traps in social-ecological systems (hence, the special issue of which this paper is, but, a single part).

In this paper, I first briefly reviewed ecological identity and the problems of anthropocentrism, human exceptionalism, and human exemptionalism, and introduced the term ecological disenfranchisement. Building upon this, I invoked 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. Drilling further down, I illustrated these traps with short vignettes, in each case, attempting to link the human logical traps with larger system dynamics. Finally, I proposed a chain of reasoning to serve as an example of how the presence of human logic traps (or entrapment) in a number of different spheres has an impact upon the larger system. Future 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 larger systems(s). It may be that failing to do so will render most efforts to avoid or escape social-ecological traps futile.

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