The Dilemma of Scale: competing imperatives for global restoration

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Social–ecological restoration (SoER) embraces the nested interdependence of societies and ecosystems. An outpouring of SoER research has substantively shaped the global restoration agenda and will continue to play a critical role as the UN Decade on Ecosystem Restoration unfolds. In this article, I argue that global restoration ambitions are limited by two competing imperatives in SoER literature. The first imperative seeks to generalize restoration standards and metrics through rapid coordination and scaling. The second imperative seeks to upend problematic power dynamics, demanding social inclusivity and site specificity at levels that tend to resist scaling. Although these imperatives do not necessarily compete in theory, they often do in practice. Relying on a synthesis of key articles and expanding on the concept of “social-ecological mismatches” (Cumming et al. 2006), I examine how the prevailing SoER research discourse creates a confounding landscape for restoration practitioners, who face what I term the “Dilemma of Scale.” I explore how this dilemma perpetuates systems of global inequality and inhibits efforts to effectively animate initiatives like the UN Decade on Ecosystem Restoration. I suggest that the Dilemma of Scale can be effectively mitigated by (1) identifying values that span both imperatives and work to decouple SoER projects from systems of exploitation and oppression and (2) expressly incorporating historical methods into SoER research and projects.

Key words: community, history, inclusion, shared values, social-ecological restoration, UN Decade on Ecosystem Restoration

Conceptual Implications
- Restoration practitioners often face a “Dilemma of Scale” as they struggle to satisfy two competing demands: scale restoration globally; sensitize restoration locally.
- Thought leaders must address this dilemma, or risk advancing frameworks that are paralyzing in practice.
- Shared values serve as bridges between otherwise distinct local and global restoration spheres. Restoration must identify shared values and work exclusively within them.
- As a multifaceted science, restoration should embrace historical methods beyond those used for references-controls. Holistic historical analysis is key for understanding how legacies of colonialism persist, and for advancing meaningful social inclusion.
- Cogent theoretical frameworks can assuage the Dilemma of Scale by driving restoration resources toward spaces defined by shared values and informed by historical analyses.

Introduction
Social–ecological restoration (SoER) seeks to understand and guide nested social and ecological processes toward the goal of restoration (Fernández-Manjarrés et al. 2018). Celebrating the mutual embeddedness—even the fundamental indistinguishability—of nature and society, an outpouring of recent research has sought to instrumentalize SoER toward increasingly ambitious restoration goals (Perring et al. 2018; Fischer et al. 2020). Global restoration initiatives like the UN Decade on Ecosystem Restoration (the UN Decade) aim to transform those goals into reality.

Although social and ecological dynamics are existentially linked, the scales of human management and ecological processes can be “mismatched” (Cumming et al. 2006), leading to perverse management outcomes or poor “social-ecological fit” (Bergsten et al. 2014). Social-ecological mismatch is a central problem in the realm of SoER, where the mounting pressure to “fit” ecological interventions to social realities (and vice versa) leaves SoER suspended between two competing imperatives:
(1) Extensive ecosystem degradation exacerbates climate change, threatens the provisioning of fresh water, increases the incidence and severity of catastrophic natural disasters, erodes livelihoods, and pummels the well-being of communities across the globe (Van der Esch et al. 2017; IPBES 2019). If restoration is to be an effective antidote to this sobering reality, it must happen rapidly and be coordinated on a global scale (Diaz et al. 2019; Temperton et al. 2019).

(2) Restoration is a fundamentally social-ecological undertaking, and failure to approach it as such often brings harm to communities and ecosystems alike (Sigman & Elias 2021). Effective and durable restoration projects are culturally embedded and ecologically site-specific, and therefore tend to resist scaling (Fox & Cundill 2018).

These imperatives often compete in practice. As global restoration initiatives reverberate within communities, the first imperative can invite unintended, pernicious outcomes while the second can confound efforts to scale local-level restoration successes. Scale amplifies social-ecological mismatch and binds SoER in a troublesome dilemma.

A dilemma is “a problem offering two possibilities, neither of which is unambiguously acceptable or preferable” (Garner 2009, p 252). Steinwall (2015, p 32) introduced the concept of a “dilemma of intervention,” exploring how practitioners might discern how to intervene in nature. Hertog and Turnhout (2018, p 1222) presented a “dilemma of what to restore,” encapsulating a longstanding debate on the role of reference ecosystems (Denevan 1992; Harris et al. 2006).

Building on this, I introduce another SoER dilemma: “the Dilemma of Scale.” Research highlights restoration projects, animated by the global restoration agenda, which were ecologically ineffective and harmful for communities (McElwee 2009). As the UN Decade expressly aims to link restoration to the sustainable development goals (SDGs) (UN Decade 2020), outcomes that cause harm to ecosystems and communities are—in dilemma parlance—unacceptable. Likewise, focusing only on local-scale restoration without a “coherent strategy” leads to “a thousand random acts of restoration” (Metcalf et al. 2015, p 319). This will not keep the planet habitable for life as we know it (Diaz et al. 2019), which, clearly, is not preferable.

How do we escape the horns of this dilemma? This article examines the two SoER imperatives, exploring their motivations and impacts. It focuses on the ways that global restoration ambitions distort local-scale restoration activities and entrench systems responsible for environmental degradation and social injustice. It then offers two suggestions to lessen this tension. The first encourages restorationists to identify shared values across scales, and work within them to upend untenable power structures. The second advocates for the incorporation of historical perspectives and methodologies into restoration initiatives across scales.

The Impetus for Global Restoration

“We Are Caught in an Inescapable Network of Mutuality, Tied in a Single Garment of Destiny (King 1968).”

Earth’s disparate ecosystems are inextricably linked (Bennett et al. 2015). This immutable fact—coupled with staggering levels of global environmental degradation—necessitates an international restoration movement. Degradation anywhere is a threat to restoration everywhere.

By some estimates, more than 2 billion hectares of degraded land hold potential for restoration (Verdone & Seidl 2017), and a constellation of global initiatives are setting restoration targets and mobilizing resources (Chazdon et al. 2017; Holl 2017; Temperton et al. 2019). The UN Decade promises to “massively scale up degraded and destroyed ecosystems” (UN Environment 2019). “Massive” scaling requires commensurate funding, and international institutions ultimately control the majority of restoration finance (Rohr et al. 2018). These institutions shape how restoration is conceived and carried out by national governments, and by smaller units working within the confines of state regulations and resources. Calls for increased investment in large-scale ecological restoration projects (Liu et al. 2017) galvanize the scaling process and enhance the power of international organizations who continue to set the terms of restoration unchecked.

Impetus for Local Restoration

Although ambitions may be global, restoration is local in practice (Sewart et al. 2018). Restoration projects often aim to directly improve lives and/or livelihoods in local communities (McDonald et al. 2019; Reyes-Garcia et al. 2019). The UN Decade links ecosystem restoration with the SDGs, localizing restoration in “developing countries,” where some 1.5 billion people live among or in close proximity to the ecosystems that directly provision their livelihoods (Peci et al. 2017). Often such communities have been marginalized by colonialism and other extractive histories (Cockerill & Hagerman 2020). At scale, SoER may reinforce, rather than remediate, this asymmetry.

Local communities play active roles in restoration projects and are increasingly incorporated in multiscalar environmental governance frameworks (Randhir 2016; Fox & Cundill 2018). Small, community-managed patches may serve as key starting points for framing and propagating restoration programs (Bennett et al. 2016). Local and traditional ecological knowledge can help identify relevant baselines and targets (Eckert et al. 2018), appropriate species (Garibaldi & Turner 2004), and key linkages between restoration and livelihoods (Cuerrier et al. 2015).

Built on the view that communities self-organize to manage common resources (Ostrom 2009), emerging SoER best practices promote the involvement of local people in codesigning restoration activities (Shaffer 2010; Upreti et al. 2012), monitoring those activities (McCall et al. 2016), and evaluating their success (Reyes-Garcia et al. 2019). This engagement helps build trust (de Vente et al. 2016), facilitates learning (Reed et al. 2018), and addresses value conflicts (Fox et al. 2017).

In contrast, a lack of local engagement can cause restoration projects to fail outright (Druschke & Hychka 2015; Fox et al. 2016; Heldt et al. 2016). Practitioners must also contend with the realities of globalization, which in many instances have
eroded the enabling conditions for successful commons governance (Randhir 2016). In other words, even successful commons governance may not be readily transferable to many existing social-ecological systems.

**Competition in Practice**

Emerging research suggests that successful SoER projects must deftly synchronize ecological, legal, ethical, technical, financial, and political dynamics (Guariguata & Brancalion 2014; Mansourian et al. 2017; Miller et al. 2017; Evans & Davis 2018). Because of this complexity, a significant number of SoER projects fail, stall, or never get started (IPBES 2019). As “action lags behind aspiration,” community enthusiasm for participating in internationally backed SoER projects often deflates (Perring et al. 2018, p 1018). This feeds a negative loop wherein the failure to meet local SoER goals undermines faith in the global restoration agenda all together.

The 5 Million Hectares Reforestation Program (5MHRP) in Vietnam exemplifies this negative feedback loop. This large-scale, internationally funded, and state-mandated campaign promised to substantially increase the country’s forest cover as a strategy for social—and especially rural—development (Choi et al. 2019). Yet, as McElwee (2009) demonstrates, this centralized project not only negatively and disproportionately impacted women and poor households; it also decreased environmental function by supplanting diverse ecosystems with monocrop exotic tree plantations. Despite these pernicious outcomes, 5MHRP is still touted as a successful example of “the importance of international-level cooperation” (Choi et al. 2019). The failure of the international restoration community to meaningfully address the unintended casualties of 5MHRP diminished local confidence in the integrity of the project. It also contributed to an enduring distrust of international restoration projects—like REDD+ and the Bonn Challenge—among academics and practitioners. The UN Decade’s success will hinge on its ability to correct the course and regain the trust of local communities and skeptics alike.

Responding to criticism, the international restoration community has pushed for increased standardization in SoER guidelines and indicators (Evju et al. 2020). This has led to a profusion of SoER frameworks and proposed standards (Prach et al. 2019). Though increasingly comprehensive, such frameworks still struggle to encapsulate and enlive inclusive and effective SoER (Aronson et al. 2010; Lamouroux et al. 2015; Martin & Lyons 2018). The search for globally applicable performance standards remains elusive (Higgs et al. 2018), and in the meantime, restoration has not kept pace with degradation.

Writing about prospects for Community-Based Resource Management (CBRM) in the United States, McDermott (2009, p 255) convincingly argues that meaningful local participation in restoration only becomes possible when “localities wrest or receive some authority and control over natural resources from the central state.” Yet as global restoration initiatives become wider in scope, deeper in pocket, and more codified in standards, they risk concentrating more, rather than less, power in national governments and other centralized power systems, to the exclusion of meaningful local participation. This effect is amplified when projects fail to meet local expectations, and trust-based relations—a key asset in natural resource management—deteriorate (Metcalf et al. 2015). The dilemma can become increasingly fraught amid attempts to wrangle restoration into a set of globally applicable principles. Likewise, many externally led SoER projects can appear (and sometimes are) performative, particularly within communities inured to practices choreographed by international organizations and national governments.

**Seeking Shared Values**

“Value thinking” has long been a part of the restoration discourse (Hull et al. 2003). Recent work amplifies the concept, insisting that biophysical and cultural systems are inextricably linked (Hertog & Turnhout 2018; Winter et al. 2018; Evans & Davis 2019), that cultural values of ecosystems are central to the task of restoration (Cross et al. 2019), and that ecosystem restoration is a reflection of commonly held values and beliefs (Martin 2017). It demands explicit stakeholder equity (McDermott 2009), it centers social justice within the restoration framework (Winter et al. 2020), and it situates SoER as part of a larger remediation process for communities (Fernández-Manjarrés et al. 2018).

In order for this process to unfold locally, the global restoration agenda must interrogate the uncomfortable realities of its own origins and identity. A lively exchange of articles recently took place in these pages, between Evans and Davis (2018, 2019) and McDonald et al. (2019). Evans and Davis rightly point out the problematic thinking that underlay the field of restoration ecology at its outset, namely the ways settlers justified taking indigenous lands by framing indigenous people as a part of nature, instead of agents responsible for cultural landscapes.

The tendency to naturalize cultural landscapes persists. For example, in an extensive and highly cited review on restoration, Guan et al. (2019, p 650) identify a longstanding trend wherein the vast majority of restoration articles emanate from the United States. The authors attribute this to an “artifact of opportunity” afforded to western researchers by the “considerable natural habitat available when rapid population growth and urbanization began.” This inclination to consider vast areas as “natural” or “wild,” rather than cultural, has become canonized into the bibliography of restoration, what Murphy (2011) has highlighted as a type of epistemological authority of western thinking. This mentality permeates the perception of landscapes within “developing countries,” where the UN Decade stakes its claims.

This dynamic is exacerbated by the fact that global restoration schemes rely heavily on funding flowing from countries with economies that reward the degradation of ecosystems (Perring et al. 2018). Such countries became affluent and maintain their economic advantages by systematically oppressing those now charged with the task of restoring the planet. The monetary support offered as remediation is fickle; north–south flows of monetary assistance declined dramatically in 2008, and are predicted...
A Place for History

Restoration is no stranger to backward-looking approaches. The early premise of restoration ecology—Bradshaw’s “acid test”—was that degraded ecosystems could be returned to their former (usually “pre-settlement” or “pre-disturbance”) states (Bradshaw et al. 1992, p. 25). Decades-long debates in restoration ecology have criticized this paradigm. “Reference ecosystems” are now less frequently set as goalposts, but rather as data about social-ecological dynamics shifts occurring in response to environmental change (Bradley et al. 2009; Bennett et al. 2015). That history then suggests, or “reveals,” what may happen in the future (Higgs et al. 2014, p 503).

Likewise—building on the concept of Long-Term Ecological Research (LTER—Callahan 1984)—some literature advocates for Long-Term Social-Ecological Research (LTSER) to facilitate a deeper understanding of how social-ecological systems operate (Collins et al. 2011; Wells et al. 2019). LTSER bemoans the lack of historical data on restoration projects and calls upon restorationists to design and document long-term research projects to serve the restorationists of the future (Wilson et al. 2019).

There is a greater role that history can play in improving SoER prospects. While many social science and artistic methods have been brought to bear on the field, historical methods have been less inventively employed. Inviting historians to collaborate and bringing methods of historical analysis to restoration projects would do much to advance the practice.

Historical methods can help expand the social-ecological landscape. Every potential restoration site has a unique and important history. A deep study of that history—not only of the “natural” processes, but of the social-ecological relations that have shaped and been shaped by those processes—provides a strong contextual basis for the sound ethical judgments needed to ensure that common values are upheld (Fig. 1).

History also elucidates how present-day power structures came into being and illuminates what may be keeping them in place. This is critical for understanding the social structures that have caused—and continue to cause—degradation, and for understanding how restoration activities might be entrenching problematic systems. Seemingly untenable situations tend to arise when insufficient awareness of such histories meets with restoration in practice, inflaming social-ecological mismatches and evoking the Dilemma of Scale.

Cockerill and Hagerman (2020) provide an example of what historical integration can offer in their recent paper on community-based conservation (CBC) in Kenya. They employed mixed historical methods to trace CBC in Kenya from 1895 to 2016 and expose the roots of current dilemmas. They uncovered the colonial worldviews that persisted in the project and elaborated how these views were reified by international agendas and donors, thereby severely limiting community authority.

As the CBC study demonstrates, historical analysis can enable a deeper understanding of how a particular project fits within a greater arc of social-ecological relations. This widening of the restoration scope illuminates how unjust and unsustainable legacies impact present-day activities, and how restorationists can interact with them to bring about desired changes. The incorporation of history into SoER initiatives helps assure the
Dilemma of Scale by identifying which of the many complex aspects of a social-ecological system deserve to be scaled, and which attributes are antithetical to environmental justice.

Conclusion
SoER has gained significant momentum in recent years and the UN Decade on Ecosystem Restoration has transformed SoER into a rallying cry of global proportions. Two key, and often competing, restoration imperatives have emerged from recent research and rhetoric; one demands rapid standardization and scaling, while the other insists upon small-scale specificity. This “Dilemma of Scale” can confound SoER initiatives; at once disenfranchising local communities and limiting the impact of the international restoration movement. Approaches to restoration that can lessen this tension will be central to the advancement of effective and durable SoER initiatives.

Evidence suggests that escaping the dilemma will require more than increased standardization in pursuit of quantifiably better “social-ecological fit.” To avoid causing untold damage within communities, global-scale restoration should be accompanied by careful, values-focused thinking. Similarly, historical inquiry should inform efforts to scale up existing community-level successes. Historical inquiry can help to unveil problematic power relations and prevent restoration from perpetuating environmental injustice. Together, values-thinking and historical inquiry can relax the tension between opposing restoration imperatives. By confining restoration to a realm of shared values while simultaneously situating restoration within a broader history, practitioners can more easily locate intersections of inclusivity and effectiveness. These intersections offer a navigable pathway between otherwise competing demands, guiding restoration safely away from social-ecological mismatch and carefully through the horns of the Dilemma of Scale.

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