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The maturation of biodiversity as a global social–ecological issue and implications for future biodiversity science and policy

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ABSTRACT

Achieving the future targets for 2020 under the Convention on Biological Diversity, including that to halve the rate of habitat loss, will require rapid transformation to more effective governance. We present a global analysis of the transformative pathway of biodiversity using the social maturation framework of issue progression through six phases: Observation, Theorization, Popularization, Challenge, Governance and Normalization. Biodiversity is currently caught at a critical juncture between the Challenge and Governance phases. Movement from the Popularization to Challenge phase around 1990 occurred with intensified public discourse about biodiversity. The ongoing decline in biodiversity could be expected to trigger public concern and movement into the Governance phase, but this has not yet occurred. We hypothesize that benefits from expansion of the human ecological footprint acting in the opposite direction to biodiversity decline dampen system response. This dampening limits resolution of key debates and societal consensus about incorporating biodiversity into legislative and market systems. High quality independent science that connects with public discourse is needed to mobilize decision-makers at multiple scales. Ensuring the new Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) connects to non-government actors who catalyze issue-based social discord about biodiversity risks would help ensure future governance and normative responses.

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1. Introduction

Biodiversity continues to decline world-wide [1]. Global commitments made in 2002, through the Convention on Biological Diversity (CBD), to deliver a significant reduction in biodiversity loss rates by 2010 were not met. Despite increased, more effectively targeted conservation efforts—reflected in system-oriented approaches including ecosystem stewardship [2], common-property local and Indigenous initiatives [3], payment for ecosystem services [4], and restoration [5]—responses have not kept pace with the steady growth in pressures driving biodiversity loss. These drivers differ across the realms, with habitat clearing associated with land-use change being dominant in terrestrial ecosystems, overexploitation in marine systems, while climate change is ubiquitous in its impacts across realms [6,7]. The continuation of these drivers presents the risk of a future mass biodiversity extinction event that either removes or drastically reduces the human population [8,9]. Future commitments have now been made under the CBD to (by 2020): at least halve the rate of

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habitat loss; increase protected areas to 17% of terrestrial and inland water areas and 10% of marine and coastal areas; and restore at least 15% of degraded areas [10].

These new targets highlight the challenge of integrating biodiversity protection into global governance arrangements, incorporating the necessary regulations and incentives into legislative and market systems, and addressing underlying social drivers of biodiversity loss [11–14]. It is widely argued that effective governance arrangements are those that account for the complexity of linked social–ecological systems [15]. Understanding the conditions and pathways to more dynamic and effective governance arrangements in the future is critical for both governments and business in developing appropriate policy agendas. We use a social maturation framework developed for diagnosis of social issue–progression [16] to present a global analysis, and consider implications for current and future policy, of the transformative pathway of biodiversity as a linked social–ecological issue.

Recent research has recognized that future policy paths depend on institutional dynamics, including both regulatory, cognitive and normative dimensions, and that institutions change over time [17]. An S-curve pattern has been identified in social–ecological transitions involving pre-development, take-off, acceleration and finally stabilization into a new dynamic balance [18]. These S-curves are the equivalent of the “revolt” phase in the resilience theory of complex adaptive systems, involving movement of social–ecological systems across scales in a panarchy of nested adaptive cycles [19]. Distinctions between the key sequential stages in the S-curve, and the conditions and order of stages through which issues move into current and future transformative pathways are at an early stage of identification [2,11,13,20]. Past societal choices are recognized as often generating path-dependency, constraining the ability to move an issue in a different direction [15,21,22]. However, studies focusing on *path generation* identify how mechanisms of social stability that oppose system shifts can be countered through actions along the pathway that enable system transformation [15,23]. For example, societal actors can shape the formal and informal institutions that comprise governance to overcome economic inefficiencies in current systems, equalize power relations, and change shared social beliefs that previously constrained change [23]. Such transformative path generation involves social change and interactions between many levels nationally and internationally. These transformations take substantial time with each stage building on the previous one along the pathway.

Studies of the sequence of events in these transformative pathways have identified that shifts stem from a gradual succession of incremental steps during periods of relative stability, and critical junctures where transition into new pathways is more rapid [15,23]. Place-based ecosystem management studies suggest three phases: preparing for transformation, navigating the transition and building the resilience of the new governance regime. The “preparing for transformation” phase can be further subdivided into stages such as emerging protest, polarization and symptoms of change [24]. A limitation of these models is that they consider only parts of the transformative pathway. The recently developed social maturation framework [16] which includes six phases—Observation, Theorization, Popularization, Challenge, Governance and Normalization—provides the first visualization tool that allows a social–ecological issue to be analyzed from its initial appearance as an idea through to stabilization as a social norm [16]. We synthesize information from a number of sources to apply this framework to biodiversity as a linked social–ecological issue globally, identify that biodiversity is at a critical juncture between the Challenge and Governance phases, and consider implications for biodiversity policy and science regarding future movement into the Governance and Normative phases.

2. Development of the social maturation curve for biodiversity

The social maturation curve framework was developed originally in relation to progression of social issues [16]. A highly interdisciplinary approach informed the framework development, applying theoretical insights from technical disciplines such as lifecycle analysis, technology maturation and diffusion analysis, together with sociological understandings of how public perception of risk, triggered by factors including moral relevance, knowability/uncertainty, and level of responsiveness to public concern, influences issue maturation. Multiple case studies were examined, including in relation to global climate change and the health risks and benefits of asbestos; iterations between case studies and theoretical insights have enabled ongoing refinement of the framework.

The framework provides clearly observable phases, with indicators and outcomes for each phase, that allow the maturation of an issue to be plotted over time (Table 1). Data plotting involves two steps (1) documentary data analysis, including of published histories, journal papers, web pages, newspaper articles and various informal reports, and memoranda; and (2) interviews with relevant experts adapting the ‘Delphi’ technique. Movement through the phases is generally sequential, involving path-generation, although with overlap and slippage between adjacent phases. The case study of climate change [16], for example, identified that Governance is the dominant phase but also noted the highly complex nature of the maturation process, with some advocacy and pushback characteristics of the Challenge phase still evident. Nevertheless, and despite the controversies surrounding the Copenhagen climate summit, evidence for human-induced climate change, and policy agendas and legislation to lower human impacts, continue to be advanced globally, with indicators of socialization through new energy efficiency and food consumption behaviors. Moral dimensions and vigorous challenge appear essential to legitimize action and any associated social adjustments—and also provide the conditions under which there is, in effect, no “going back” [16].

We applied the framework to biodiversity firstly through a Delphi process, interviewing ten international biodiversity experts with disciplinary backgrounds ranging across ecology, botany, zoology, systematics, economics and sociology. Analysis of key documents, including those identified by the experts, was also undertaken using a conceptual cluster analysis

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