Commentary: Transformative Change in Governance Systems
A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes

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Most environmental crises have their origin in governance failures. Resource management paradigms that focus on exploitation of provisioning ecosystem services are ill suited to deal with the complexity of human-environment interactions. They often have rendered human-environment systems vulnerable to shocks and crises. The need for profound paradigm shifts and transformative change of governance systems was thus advocated during the first decade of this millennium, when prospects of global and climate change became increasingly core matters of concern. Environmental governance was still a young research field. Comprehensive frameworks capturing the complex dynamics and structures of governance systems were lacking. The paper "*A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes*" (Pahl-Wostl, 2009), proved to be a major step in addressing these gaps.

Building on concepts from various social science disciplines, Pahl-Wostl (2009) presented a framework addressing the adaptive and transformative capacity of resource governance regimes, viewed as multi-level learning processes involving both design and self-organization. The paper highlighted the importance of networks, the interplay between formal and informal institutions, multi-level interactions and hybrid governance arrangements, and the need to connect bureaucratic hierarchies, markets and networks. Such an approach contrasts sharply with the promotion of simplistic panaceas (e.g. privatization) in policy reform for complex resource governance problems. Simplification is tempting and conveys an illusion of complete understanding and control. Embracing the complexity of governance systems

in research and policy design does not provide fast and simple solutions. Admitting that policy reform always has an experimental character and that transformative chfange is an emergent process that can be controlled only to a limited extent may be daunting for decision makers and scientists alike. However, this is unavoidable in the face of increasing rupture and uncertainty about the future.

Comparative analyses comprising case studies from a wide range of environmental and socioeconomic contexts have since provided evidence that polycentric water governance systems with flexible horizontal and vertical coordination by hybrid governance arrangements seem to have a high adaptive capacity and support transformative change (Pahl-Wostl, 2015). Despite these general insights, peculiarities of governance arrangements are context dependent, being shaped by processes of negotiation and enactment. This suggests that design principles should focus on the nature of processes that are required to support learning and reflexive governance rather than on fixed structural arrangements.

Learning processes have also proven to be particularly complex. Conceptualizing learning as moving from single (improvement of prevailing institutions and practices), to double (questioning prevailing institutions and practices) to triple loop learning (transformative change) in a stepwise fashion (as indicated in Pahl-Wostl, 2009) is too restricted. Multi-level and multi-loop learning needs to be understood as complex iterative processes with instances of transformative change, resistance, change in broader societal discourses, and niche developments (e.g. Pahl-Wostl, 2015). Crises as well as accelerating global environmental change (e.g. reduced water availability in many places, shifts in biodiversity/ecosystems, melting poles and glaciers) could stimulate transformative changes in governance, but this is by no means guaranteed (Anderson et al., 2018).

Societies no longer face only future global and climate change but must also deal with the dire consequences of crises and shifts that are

already ominously unfolding. Shocks and crises such as floods, droughts, wildfires, and the Corona pandemic destabilize governance structures and undermine trust in, and basic functionality of established institutions (formal and informal). Transformations in governance must include not only specific resource distribution arrangements, but also broader political institutions (e.g. law and policy making procedures, systems of representation, sources of authority, constitutional setups) to support equitable long-term decision-making (Patterson, 2021).

Global and climate change lead to unprecedented situations – experience and learning from the past may be of limited value in dealing with the future. This is both a threat and an opportunity – how governance adapts and transforms will depend on response capacities of societies. Social and societal learning thus needs to foreground anticipation and imagination about the future and its implications for human organization. For example, John Dryzek posits a notion of ecosystemic reflexivity, leading to questions about not only how societies might do things differently but also how they might decide to *become* something new (Dryzek, 2016).

Such learning and imagination processes will hardly be smooth and consensual. Ideally, they would be based on inclusive, transparent processes of (evidence-informed) deliberation and decision making, and constructive dialogue among multiple, diverse and at times conflicting perspectives – avoiding polarization. Such ideals will hardly ever be met. Struggles over transformation will most likely be deeply political and contested. While transformations may involve political conflict producing both winners and losers (Scoones et al., 2015), it seems clear that securing rapid transformative action in many spheres of society (e. g., water, biodiversity, climate change) will only be durable with broad buy-in and legitimacy. This raises interesting questions for scholars of social/societal learning to identify the conditions and processes by which such buy-in and legitimacy are achieved. In other words, how do diverse actors learn interactively about new ways of doing and being to institutionalize durable changes in governance?

What would be the role of different actor groups in such processes? It would be unrealistic and ignorant in face of the complex challenges ahead to expect that government will lay out an orderly plan for how to implement a multi-level process of transformative change. Ideally, government would set an overarching strategy and ensure an inclusive process. However, strategies must sometimes *follow* action. Funding needs to be made available for policy experiments at different levels, and legal flexibility may also be required to allow creative transgressions. For example, the emergence of innovation platforms is an example of (partly designed) hybrid governance regimes involving formal institutions (laws, regulations) and informal networks that can stimulate experimentation (Ansell and Miura, 2020). Such platforms could be expanded beyond a typical market emphasis to include wider societal actors and governance innovation to provide opportunities for transformative agency and knowledge/ideas generation within embedded networks.

Our understanding of processes of transformative change in governance is still quite limited. The call for societally engaged research is thus more relevant than ever. Scientists should not remain only in the role of distant observers. They must also actively engage in understanding and shaping processes of societal transformation. A transforming world requires transformed governance in which much is yet to be developed; governance must be continuously improved at the same time as it is deployed.

Declaration of Competing Interest

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