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Review

Transformative pathways for social networks to navigate towards a nature-positive society: collaborate, challenge, and disrupt☆

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Social networks of actors and networks of networks are essential in transformative change for biodiversity. In particular, cross-boundary networks such as science–policy–society interface networks are relevant for exchanging ideas that may shift values, paradigms, knowledge, policies, and practices. On the basis of literature and a collaborative design process, we develop three pathways for social networks to navigate in advancing their transformative aspirations: 'collaborate', 'challenge', and 'disrupt'. The 'collaborate' pathway operates within existing systems, working with 'coalitions of the willing'. The 'challenge' pathway criticises the politics of unsustainable and inequitable practices and calls on powerful actors to take responsibility. The 'disrupt' pathway is aimed at removing elements of the current system that hinder transformative change for biodiversity. We suggest that the transformative potential of networks depends on their ability to navigate between the pathways. Networks of networks provide opportunities for networks to combine pathways and leverage each other's capacities.

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Introduction: the role of networks in sustainability transformations

'Bending the curve' of biodiversity decline implies building a 'nature-positive society'[1], which no longer contributes to the destruction of nature, but enables its restoration. This requires profound and widespread societal transformations, which involve shifts in modes of production and consumption, lifestyles, markets, governance, values, and paradigms [2,3]. It has become evident that traditional nature conservation, which tends to emphasise the direct drivers of biodiversity loss, is insufficient on its own, and that indirect drivers and underlying causes of biodiversity loss need to be

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targeted. Indirect drivers and underlying causes operate at multiple scales and levels and include regulations and policies, power asymmetries, and culture and value systems in the broadest sense [4]. It is widely acknowledged that transformative change requires not only environmental practices, structures, and views, but also the emancipation of currently marginalised groups and voices [3,5]. There are various 'theories of transformative change' describing what transformative change entails, categorised, for example, as 'structural', 'systemic', or 'enabling' [6*]. Structural approaches emphasise the way that societies and markets are organised and governed and how this constrains and perhaps even determines possibilities for change. Systemic approaches emphasise interrelations between the social and the ecological at multiple levels of scale, and often focus on the role of technological innovation, experimentation, and policy. Enabling approaches emphasise the role of agency, civic engagement, cultural change 'from the bottom up', and empowerment. The three approaches are interrelated and complementary [6].

With a focus on the role of social networks in transformative change for biodiversity, this paper adopts an agency lens while acknowledging the role of structures and the value of systems thinking, in particular related to networks aimed at maintaining and enhancing biodiversity [7]. Because of our focus on transformative change, we adopt a broad definition of social networks, embracing their plurality. With social networks, we refer to social relations between actors who are connected through formal or informal ties [8]. Social networks can be homogeneous or consist of different types of actors, such as farmers, scientists, and policy makers [9,10]. Social networks are not easily delineated: they can be conceptualised as networks of networks that are embedded and interconnected [11,12]. In many cases, while being emergent and self-organising, social networks have a certain intentionality: there is a reason for being connected [1,13]. With this article, we address social networks with transformative aspirations.

For transformative change, networks of actors and networks of networks are essential [9,13–17]. Networks and networks of networks can empower change agents because they enhance access to resources and a broader discourse and strengthen a sense of relatedness, autonomy, competence, impact, meaning, and resilience with their members [13,18]. In addition, it is through networks that ideas travel and are translated, people learn, practices change, and influence is exerted across boundaries of groups, organisations, and 'worlds' [19–24]. For system-wide reorganisation of society as advocated by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) [2,3] and a 'Whole-of-Society' approach as agreed at the CBD COP15 [25], ideas must travel across boundaries of societal institutions, such as policy, market, science, and civil society. Therefore, networks and networks of networks at the science–policy–society interface (SPSI) are particularly relevant [11,26–29]. This includes science–policy interfaces (SPIs) such as the IPBES and the Intergovernmental Panel on Climate Change, as well as the numerous SPIs at regional levels. By adding the 'S' of society, we further extend the SPI to acknowledge the inclusion and plurality of wider societal perspectives and forms of knowledge as well as the power of social movements in societal transformation [1,12,30]. Such SPSIs offer the opportunity to better meet the needs of communities and amplify transformative change from local to global scales, and from initiatives from society and science to policy and vice versa [13,26,31,32].

After explaining our approach, we summarise the recent literature on the transformative potential of networks. After that, we propose three pathways for social networks to combine and navigate in their transformative aspirations: pathways that collaborate, challenge, and disrupt. We conclude with suggestions for social networks with transformative aspirations and for future research.

Approach

The pathways proposed in this paper are based on iterations of design workshops and a narrative literature review [33]. The pathways were collaboratively produced by an international group of researchers (15 persons) from a range of social and natural sciences in the context of a Horizon Europe project. The pathways were developed in the course of eight online workshops with the aid of the online brainstorming tool Miro. Between these workshops, the participants worked on a joint document in which the collective knowledge of the literature was brought together. In this joint literature review, rather than exploring the general functioning of social networks, we focused on their transformative potential. The pathways emerged from our online discussions, in which we tried to create a joint understanding of the transformative potential of networks on the basis of the literature.

Transformative potential of networks

The transformative potential of networks consists both of contributing to transformative change (outcome) and working in transformative ways (process) [22,34,35]. To contribute to transformative change, networks must address the indirect drivers of biodiversity loss [36]. This includes, for example, challenging, altering, or replacing dominant institutions [13,35]. Addressing indirect drivers may occur intentionally or unintentionally; making a theory of change explicit may support networks in transformative strategy development [1,37,38]. For addressing indirect drivers, leverage is often proposed as a strategic lens to find places and ways to intervene in the system [39,40]. Potential levers identified by IPBES

Box 1 Pathways to combine and navigate for social networks with transformative aspirations.

Three pathways for networks to navigate in contributing to transformative change for biodiversity. All pathways work towards influencing indirect drivers of biodiversity loss and social injustices, but do so through different modes of working.

Collaborate.

The 'collaborate' pathway operates within existing systems, building relations of trust and working with 'coalitions of the willing'. The 'collaborate' pathway is aimed at constructive and inclusive forms of interaction and learning, seeking shared meaning that can be mobilised to move forward together (even despite disagreement) [64,65]. This pathway can contribute to transformative change, for example, by working with change agents within powerful institutions [16] and contributing to pluralised, depolarising debates. Examples of collaborative modes of working include developing principles and standards for businesses or sectors with high impacts on biodiversity; public–private partnerships; community-based natural resource management; living labs; and capacity building programmes [34,66].

Challenge.

The 'challenge' pathway is also constructive, but more critical and confronting [40]. The challenge pathway gives more attention to the politics of unsustainable and inequitable practices, and calls on powerful actors to take responsibility [67,68]. At the same time, the 'challenge' pathway seeks to empower biodiversity innovators and activate enabling players that could help create leverage [40]. Examples of challenging modes of working include analysing biodiversity impact chains that track direct negative biodiversity impacts back to underlying causes and actors responsible for this; ambitious policy to regulate actors impacting negatively on biodiversity [69]; co-creation of open science letters to government calling for higher environmental ambitions; and actions to centre and engage marginalised groups within policy and science [64].

Disrupt.

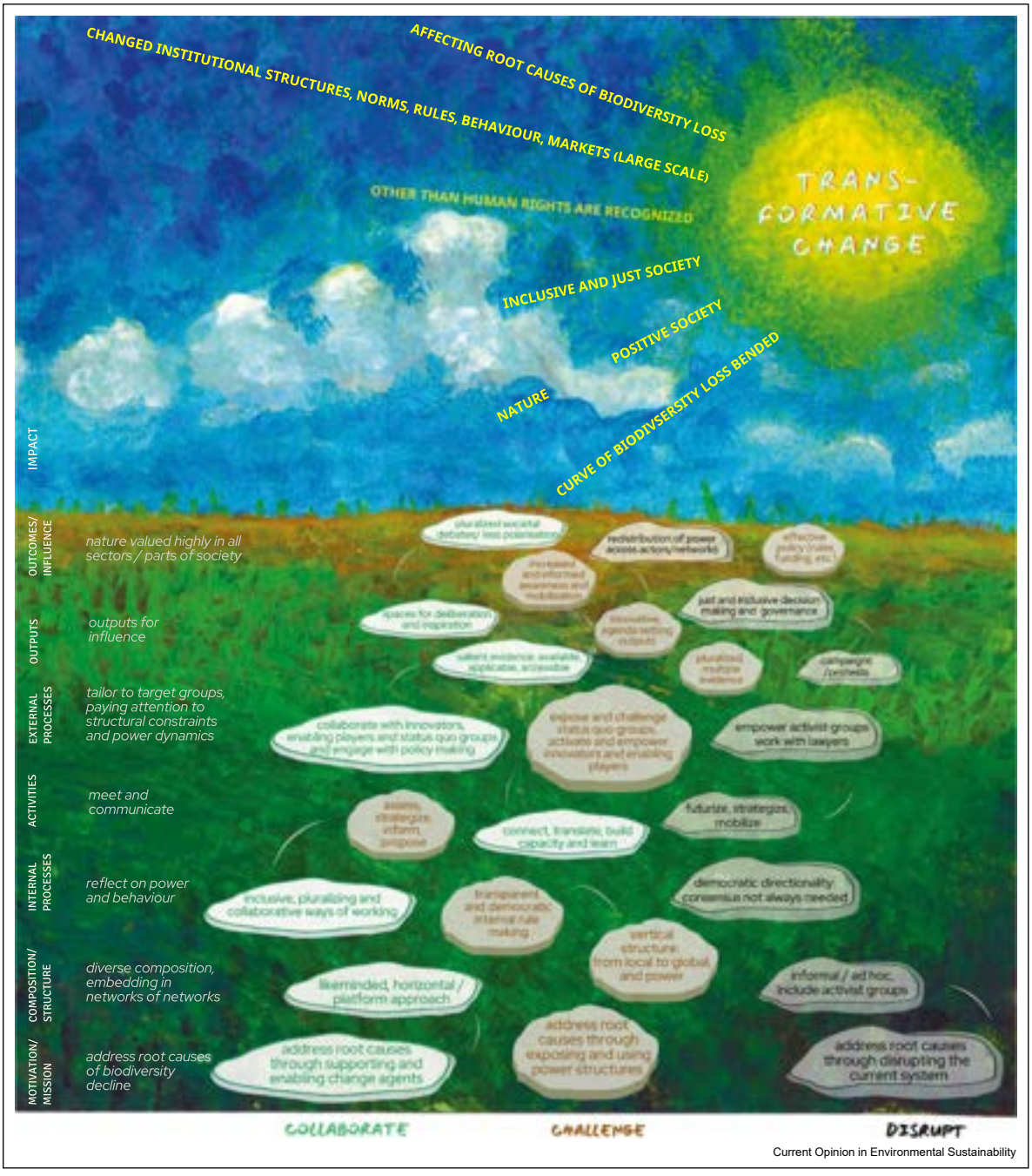
The 'disrupt' pathway is aimed at breaking down and removing elements of the current system that prevent transformative change for biodiversity (i.e. 'phasing out'), and at re-configuring the whole of society to have a positive impact on biodiversity and equity outcomes (i.e. 'phasing in') [42,70,71]. Disruption does not necessarily include violence: nonviolent strategies of networks include supporting or working with activist groups and social-environmental lawyers to stop harmful production or consumption processes or perverse incentive systems. Examples of disruptive pathways include activism, providing evidence to support social-environmental litigation, providing science support to social movements, and disruptive communication [63,72,73].

include 'cross-sectoral cooperation', creating cross-boundary networks for change [2]. Thus, social networks are crucially strategic for transformative change because they can spark change as well as provide places to intervene in the system. In addition, social networks, as actors, can strategically position themselves to intervene for societal transformations [14].

In addition to contributing to transformative change, transformative potential entails working in transformative ways. In the context of transformative governance, this has been described as integrated, inclusive, adaptive, transdisciplinary, and anticipatory [41]. Transformative networks can be expected to have a transformative vision, knowledge of systemic change, and adaptive and emancipated agency [42]. Boundary work, co-production, inclusion, critical reflection, pluralising, and understanding and challenging power structures are important for the transformative potential of SPSI networks [27,29,43–45]. 'Working in transformative ways' has been conceptualised as interweaving the principles of pluralising, empowering, politicising, and embedding (PEPE) [46]. *Pluralising* requires acknowledgement and making sense of the diversity of values and knowledge systems by actively bringing them to the fore in debates and collective action [4,37,47–50]. *Empowering* involves mobilising and enabling oneself and others to engage in collective action for biodiversity, change practices and speak up, often with a special emphasis on marginalised perspectives and groups [18,24,51,52]. *Politicising* acknowledges the role of power in transformations and addresses power lock-ins through engaging with politics, policy, and decision-making, and also critiquing power imbalances, for example, at the SPI [24,29,49,53,54]. *Embedding* implies actively promoting reflexivity and learning in societal institutions [55,56], and sustaining transformative collective action in public and private policies and practices [57]. These four principles complement and reinforce each other.

Strasser et al. [16,35,58] propose that transformative changes occur across networks through 'network leadership' roles and practices, which can contribute to the development of 'transformative capacities'. Transformative capacities are viewed here as the collective abilities among transformative networks that are required to achieve 'transformative impacts' at a societal level, across three dimensions of change (depth, width, and length). Network leadership is assessed based on the extent to which complementary roles and practices are distributed across a range of individuals and organisations, to support the development of transformative capacities. Eleven common network leadership roles are identified, such as platform host, broker, organiser, weaver, and advocate. The transformative capacities these roles support and enable can be assessed by the extent to which the networks can expand their reach to involve diverse people, places, and contexts (width); attain fundamental changes in rules and incentives, values, and discourses (depth); and strengthen continuity, acceleration, and evolution over time (length).

Figure 1



Theory of transformative change for social networks with three pathways navigating towards a nature-positive society. The 'stepping stones' follow a theory of change approach starting from the motivation/mission of the network, to composition/structure, via internal processes, activities, and external processes to outputs, and finally contributing to transformative impacts. The three pathways collaborate, challenge, and disrupt are based on the external processes of social networks. The stepping stones visualise the possibility of combining and navigating pathways. Some aspects are valid for all pathways: these are listed on the left. The figure was made by Angela de Lang.

Three pathways for transformative networks

To foster transformative change effectively, a better understanding is needed of how to deal with tensions, trade-offs, and different levels of agency in multi-agency processes [59]. Views differ on how networks, and in particular those at the SPSI, should position themselves in promoting transformative change. Some prefer to change the system from the inside through collaborative

modes of operation [27,60]. Others believe that transformative change can only be achieved by disrupting the system [61,62]. Shrivastava et al. [40] propose a complementary set of transformative pathways for intervening in the system: doing change, co-creating change, directing change, and forcing change. These pathways are located between the axes creation–destruction and collaboration–confrontation and connected to the categorisation of leverage points by Abson et al. [39]. We similarly argue that multiple modes of working are needed for social networks with transformative aspirations, proposing three complementary pathways: collaborate, challenge, and disrupt (see Box 1). In addition, we propose that the transformative potential of networks can be enhanced by their capabilities to combine and navigate these transformative pathways, depending on the situation and the target group(s). For example, a strategy to *challenge* status quo actors to take responsibility for their impact on biodiversity can include *collaborating* with or supporting change agents such as NGOs or journalists. *Disruptive* action may include supporting an NGO or a citizens' initiative against such powerful status quo actors in a court of law, or *collaboration* between activist groups [63]. Importantly, all pathways work towards a nature-positive society by tackling indirect drivers and underlying causes of biodiversity loss and social injustices (Figure 1).

In this line of thought, the transformative potential of a network would start with reflecting collectively on its transformative aspirations and its position in a network of networks. Such a reflection forms the basis for a 'theory of transformative change' for the network, as it has consequences for the network's mission and vision, organisational structure and composition, internal processes, activities, and external processes and outputs [1,74] (see Figure 1). These steps will ultimately affect the network's outcomes in terms of influence and its impact in terms of transformative change and bending the curve of biodiversity loss [16] (which in turn should be part of its mission and vision: a theory of change is future-oriented, but not necessarily linear [37]). Because theories of transformative change will differ across networks [1], they will combine and navigate the pathways in different ways [cf. 47]. However, in our conception, some aspects are essential for all networks aspiring to contribute to transformative change (Figure 1): they share an ambition to address underlying causes of biodiversity loss and a commitment to equity and justice [16].

All three pathways have strengths and pitfalls. The 'collaborate' pathway seems suitable for interactions with allies in the transformative aspirations of the network, and in situations that require exploration and learning [23,31,65]. However, the 'collaborate' pathway could involve the risk of being used for greenwashing, which delays transformation [75]. The 'challenge' pathway seems more appropriate in situations that require behavioural change, and in interactions with powerful actors who could become enabling players in transformation [52,68]. A potential pitfall of the 'challenge' pathway is ostracising influential players needed in the transition and delegitimising political efforts to support and institutionalise transformative initiatives [61]. The 'disrupt' pathway seems suitable in confronting powerful actors with vested interests, who are not inclined to respond to collaborative or challenging modes of interaction, and in situations that require mobilising the public [63,72]. However, disruption could also intensify public unrest and human conflict [76]. Explicit attention to these risks improves the ability to anticipate and manage them.

Conclusions and directions for future research and practice

Different networks may afford different priorities to working with pathways that collaborate, challenge, or disrupt [77]. However, in working to change the status quo, we suggest that the transformative potential of networks can be enhanced by their ability to collectively navigate between these three pathways, to anticipate and combine or change strategies based on the changing context, the target groups, and the opportunities and needs of the moment. It is not necessary (or perhaps even desirable) for all networks to be proficient in all three pathways. For example, some networks might focus more on collaboration, building strong alliances and partnerships to achieve incremental changes. Others might prioritise challenging existing systems by questioning and pushing back against dominant unsustainable and inequitable practices, while some may focus on disruption, seeking to radically alter or replace existing structures and systems. However, pursuing fast effects by targeting a narrow audience can suffer backlash in a broader movement and not achieve the desired social shift [78]. Therefore, networks should be able to recognise that the capacities of other networks in relation to the three pathways, although seemingly at odds with each other, may mutually reinforce societal transformation [16,77].

SPSIs, as networks of networks, can play a central role in navigating between the three pathways. For example, some networks lack the skills for organising campaigns or for high-level interactions with policy or business sectors. Furthermore, engaging in such activities without an intermediary might conflict with members' institutional policies [cf. 13]. This particularly applies to government institutions, which are generally more constrained to 'challenge' and 'collaborate' than science and society organisations. Boundary-crossing SPSIs as networks of networks provide access to complementary

capacities and pathways, weaving to support transformative pathways that would otherwise be out of reach. Further research can seek to better understand the extent to which it is feasible, necessary, and effective to weave these three pathways and leverage each other's capacities across networks of networks.

Some unresolved questions remain in the literature regarding (i) the combining of different pathways in networks, (ii) the governing of networks, and (iii) stimulating network monitoring, learning, and adaptation. First, further research is needed on the promise and pitfalls of combining different pathways both within and across networks: Under which contexts and conditions is it feasible and desirable to link the different pathways? What are the key synergies, tensions, and trade-offs in combining the different pathways, and can these be effectively navigated? What is the link — or potential conflict — between the three pathways and various forms of democracy?

Second, the governing of networks that aim for transformative change is relatively unresearched, particularly in the context of informal networks. This applies to both internal governance of networks, as well as governance aiming to promote the transformative potential of networks and networks of networks. In particular, the governance of SPSIs in relation to transformative change is a promising angle of research [cf. 12,26]. What mitigation strategies in relation to potential pitfalls associated with the pathways are needed? To what extent can networks of networks combine different pathways, while still maintaining the integrity and authenticity of each contributing network? What dilemmas do researchers face as potential boundary spanners or bridging agents across the different pathways?

Third, further empirical research is needed to provide examples and evidence of combining the three pathways in practice. To what extent does the weaving of the three pathways help social networks, networks of networks, and SPSIs in particular achieve their transformative ambitions? What monitoring and learning processes are needed to support these networks in combining and navigating the pathways, and adjusting course where needed to leverage each other's efforts in changing the status quo?

CRediT authorship contribution statement

JW: Conceptualization, Investigation, Methodology, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. **JN:** Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing. **RD:** Conceptualization, Investigation, Writing – review & editing. **EK:** Conceptualization, Funding acquisition, Investigation, Writing – review & editing. **SK:** Conceptualization, Investigation, Writing – review & editing. **KK:** Conceptualization, Funding acquisition, Investigation, Supervision, Writing – review & editing. **KL:** Conceptualization, Investigation, Writing – review & editing. **MO:** Conceptualization, Investigation, Writing – review & editing. **SR:** Conceptualization, Investigation, Supervision, Writing – review & editing. **SS:** Conceptualization, Funding acquisition, Investigation, Writing – review & editing. **MV:** Conceptualization, Funding acquisition, Investigation, Supervision, Writing – review & editing. **RW:** Conceptualization, Investigation, Writing – review & editing. **AW:** Conceptualization, Investigation, Writing – review & editing.

Data Availability

No data were used for the research described in the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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- •• of outstanding interest

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