



Transformative governance: Exploring theory of change and the role of the law

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ABSTRACT

Transformative change is becoming a key concept in the scientific conceptualization of sustainability. We assess five environmental governance approaches: adaptive, earth system, evolutionary, transformative and transition governance. We ask 1) What characterizes the different governance approaches, and how do they understand the dynamics of change? 2) How is the role of law conceptualized in the context of these governance approaches? The five studied approaches present different and complementary ways of describing change and how it unfolds or can be steered. According to our literature review, collaboration, leadership, learning, plurality, empowering, innovation and vision are seen as key mechanisms for change, while law is often oversimplified in these governance approaches, either as an enabler of or as a barrier to change towards sustainability. Future avenues of research could include how disruptive elements could be introduced as a way of catalyzing change and how to strengthen legal analysis to transformative change.

1. Introduction

Transformative change is rapidly becoming a key concept in the scientific conceptualization of sustainability, in particular in the context of addressing interlinked challenges such as climate change, resource depletion, pollution, and biodiversity loss. Given the context-specific nature of transformative change, a shared definition is missing. Overall, transformative change is described as radical change (in opposition to minor, marginal, or incremental change) that brings about a fundamental shift in the status quo of a system as a unit of analysis. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which is currently developing a thematic assessment on transformative change related to biodiversity, defines it as a 'fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values' (IPBES et al., 2018a, p. XVIII).

In the context of sustainability, the term 'transformative change' is often applied both in reference to sustainability transformation and sustainability transition. These latter terms are sometimes used as synonyms by the same epistemological communities or even in the same documents. However, some authors suggest that transformation and transition are qualitatively different: '[...]in transitions research, Geels

and Schot (2007) considered transformation as one possible transition pathway. Other scholars differentiated transformation as more radical, large-scale and long-term changes from politically top-down and technocratic transitions—contrasting, for example, a transformation towards ecological agriculture and transitions towards sustainable intensification (Stirling, 2014; Brand, 2014; Hölscher et al., 2018, p. 1–2; Mai, 2024). Similarly, Salomaa and Juhola (2020) proposed that 'a transition can be understood as a gradual process of change, which does not have to be dramatic [...], whereas a transformation would mean fundamental change'. Scoones et al., classified the multiple forms of 'sustainability transformation' as 1) shaping and resisting structures, 2) reframing knowledge, 3) realising institutions and incentives, and 4) mobilising and networking. Patterson et al. (2017) suggested that 'transformations towards sustainability' refer to fundamental changes in the structural, functional, relational, and cognitive aspects of socio-technical-ecological systems that lead to new patterns of interactions and outcomes.

In terms of coinage, the two terms refer to two distinct bodies of literature (Hölscher et al., 2018; Patterson et al., 2017). For sustainability transitions, the unit of analysis is one or more socio-technical systems (e.g. energy, water, mobility, food), generally analyzed through a so-called multi-level perspective, i.e. an analytical framework

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that depicts change as a non-linear process happening at the interplay of three levels (micro-meso-macro). This includes niches (where innovation is developed, more unstable), regimes (established institutions, practices, and rules stemming from the co-evolution of science and culture), and landscape (very stable macro trends, such as globalization, wars, immigration, and environmental problems). Sustainability transformations generally focus on the analysis of socio-ecological systems or social-ecological industrial systems (e.g. agriculture, fisheries). The analytical lens is often on the resilience of the system to natural or human-induced perturbations and crises.

In addition to understanding what transformative change is or entails in socio-technical or socio-ecological systems, an important operative question is how change towards sustainability within and across different systems should come about and be fostered. In other words, who are the actors and what are the mechanisms concerning the governance of transformative change? Governance studies are a well-established field of research, with a plentiful amount of theoretical and empirical research available (Cox et al., 2016). In the context of environmental or sustainability studies, scholars have conceptualized or described a diversity of governance approaches (e.g. Partelow et al., 2020). However, given the emergent nature of the concept of transformative change, the role of governance in fostering such change remains an embryonic line of inquiry in research, with only a handful of scientific articles published on the topic (e.g. Chaffin et al., 2014 Pascual et al., 2022; Visseren-Hamakers et al., 2021). Transformative governance is thus only very recently emerging as a new concept, adding to the already rich and diverse literature on the governance of environmental, and more generally, sustainability issues.

As an additional research gap, while law is one of the central mechanisms in policy mixes aimed at governing transformative change, its role has not been explored in detail in sustainability governance studies, aside from few exceptions (e.g. Kotzé and Kim, 2019; Soininen et al., 2021). Law is often understood as something that can be easily adapted according to the political will and needs of a desired transformation. While legal systems can enable or even promote transformative governance, they also create institutional, procedural, and substantive barriers to the radical changes needed for sustainability transformation. To change legal systems, it is important to understand that they are complex and path-dependent systems based on the rule of law, legal certainty, and the contributions of different actors (Soininen et al., 2021).

In summary, we identify and aim at addressing two research gaps: Firstly, the existing literature does not explore whether governance approaches are expected to be transformative, and what would make them so (in other words, what is the underpinning theory of change for the various approaches). Secondly, policy studies often lack a thorough understanding of the potential contribution of law to environmental or sustainability governance. Our research questions are thus articulated as follows: 1) What characterizes different transformative governance approaches, and how do they understand the dynamics of change? 2) How is the role of law conceptualized in the context of these governance approaches? We focus on assessing five governance approaches: adaptive governance, earth system governance, evolutionary governance, transition governance, and transformative governance. The second question extends the understanding of how transformative change is supposed to occur: since law is identified as one of the key policy mechanisms for the change, it is crucial that its role be further explored without being diminished or misunderstood. In the discussion, we articulate how more established environmental governance approaches (adaptive governance, earth system governance, evolutionary governance, and transition governance) can contribute to the conceptual development of transformative governance, which has only recently emerged. We also further elaborate on the untapped potential for legal studies in such a context.

2. Materials and methods

We applied an integrative literature review to comparatively assess how different governance approaches address change towards sustainability. An integrative literature review is a useful approach to assess and synthesize a research area to enable new theories, frameworks, or perspectives to emerge (Snyder, 2019). It is normally performed as a qualitative, semi-systematic review of the key literature on a topic. We started our explorative work for selecting governance approaches that contribute to an emerging field of transformative governance from those approaches that clearly focus on change as one of the core elements. Based on an overview of the environmental governance theories provided by Partelow et al. (2020), we selected those governance approaches that explicitly deal with or aim for change. We also wanted to focus on few illustrative new openings, while transition governance and Earth System Governance, not mentioned by Partelow et al., (2020), were chosen as they are established fields in sustainability studies analyzing transformation and transition. The approaches selected were adaptive governance, earth system governance, evolutionary governance, transformative governance (synonym transformation governance), and transition governance. We reviewed the salient scientific literature for all the approaches.

To collect relevant articles for each of these governance approaches, we performed five separate searches in the Web of Science in April 2023, finding a total of 315 records (Table 1, Fig. 1). To obtain a manageable number of documents to review, for each search string, we selected the first 20 papers listed as the most relevant by the search engine, as well as the 20 most cited papers. We removed double records and selected scientific articles, reviews, and editorials, thus excluding books, book chapters, and conference proceedings from the analysis.

Most of the journals that came up in the search represent multidisciplinary fields of Environmental Sciences and/or Environmental Studies. Other fields these journals cover include for instance Green and Sustainable Science and Technology, Regional and Urban Planning, Economics, Political Science, Law, International Relations and Development Studies.

While we strived to systematize our search, we recognize there are limitations to our data collection. First, the search strings might be skewed to collect more policy papers compared to legal ones. Second, the search engine we used to retrieve the records is not comprehensive when it comes to journals focusing on legal studies.

For each governance approach, we extracted information from the 65 articles using the following guiding questions: a) What is the focus system (e.g. social-ecological, socio-technical)? b) Is there a desired direction regarding change, and if so, what kind of change is envisioned (e.g. long term vs. short term, abrupt changes vs. incremental)? c) What is the role of exogenous factors (e.g. crises) vs. the role of endogenous factors (e.g. the human agency and the key actors involved) in fostering or hampering change? d) How is the role of law described in fostering or hampering change?

Overall, the analytical questions are inspired by the theory of change, which is a well-established tool to frame the evaluation of interventions, such as policies or projects. A theory of change explores why interventions are justified and what is the system to be intervened

Table 1
Search strings used for the selection of relevant articles in the Web of Science.

Governance approaches	Records in the Web of Science	Papers selected for the analysis
TI = 'Adaptive governance'	205	16
TI = 'Earth system governance'	56	19
TI = 'Evolutionary governance theory'	18	9
TI = "Transformation governance" OR "transformative governance"	20	12
TI = 'Transition governance'	16	9
Total	315	65

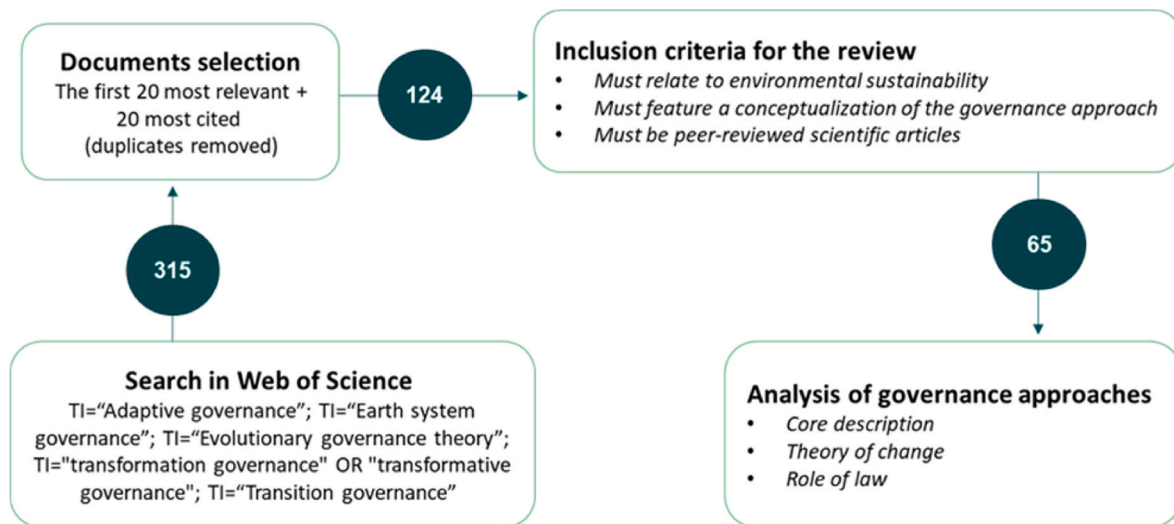


Fig. 1. Data collection and analysis for the literature review.

on, the mechanisms and actors through which they are supposed to generate change, and what kind of outputs are expected (Oberlack et al., 2019). To further tailor our questions to the concept of transformative change, we refer to an analytical framework developed by Feola (2015). The article suggests that it is possible to make sense of societal change by examining the system where change occurs (its boundaries, elements, and interrelations), the temporal scale involved, moving forces (exogenous vs human agency), and outcomes. It also suggests that change can be studied as a deliberate transformation with prescriptive outcome, as well as an unguided/unplanned transformation lacking prescriptive outcome. We use the lens of prescriptiveness to discuss our findings. Question 3 specifically delves into whether and how the reviewed articles understand the role of the law as a mechanism for transformative change.

When analyzing and discussing the findings on the role of law, we draw on the following notions: the three-level conception of legal systems, the external vs. internal perspective of law, and procedural vs. substantive law. According to Tuori (2017), legal systems operate at three different levels: i) the surface level, ii) the sub-surface level of legal culture, and iii) the deep structure of law. While the surface level consists of visible norms such as legal acts and court decisions, the sub-surface levels of legal culture and the deep structure include legal principles, concepts and foundations such as the rights to property and to a healthy environment and the rule of law (Tuori, 2017, p. 315). From an external perspective, law is seen as a set of specific social practices that have legal significance (Tuori, 2017, p. 285), while internal legal analysis aims to interpret and systemize law without regard to external purposes such as sustainability transformation (Schwartz, 1992, p. 180). Finally, substantive law refers to the content of the law, including rights and obligations, whereas procedural law includes the rules for decision-making processes, such as court and environmental permitting procedures, through which substantive law is enforced. For law to support sustainability transformation, both an internal understanding of the key elements of the legal system, including surface and sub-surface levels and substantive and procedural elements, and an external perspective on the desired direction of the change are needed (see Soinen et al., 2021).

3. Findings

Table 2 summarises the main characteristics of the selected governance approaches. Section 3.1 provides an overview of how change is expected to occur, or in other words, the theory of change underpinning each governance approach. Section 3.2 assesses the actual or potential

role of the law in fostering or hampering change, as described for each governance approach. A comparative overview of the findings is provided in Section 3.3.

3.1. Change in the selected governance approaches

3.1.1. Adaptive governance

Adaptive governance is about changing governance systems to be able to respond to new knowledge and changes in the socio-ecological system. It has gained prominence due to its ability to address the complex and uncertain nature of environmental challenges, especially in the face of rapid environmental change. ‘Adaptive governance attempts to address uncertainty through continuous learning, involvement of multiple actors in decision making processes and self-organisation of the governance system’ (Rijke et al., 2013). As such, it is a knowledge-intensive form of governance that is especially focused on society’s capacity to understand socio-ecological systems and respond to changing environments and knowledge.

The emergence of adaptive governance is driven by leadership and trust among stakeholders at the local level; community empowerment, community knowledge, and shared experiences; the self-organisational ability of networks of actors at different scales, which can conjure the necessary resources, knowledge, and social capital for response, learning, and innovation (Chaffin et al., 2014; Djalante et al., 2011; Folke et al., 2005; Platt et al., 2022).

A shift towards adaptive governance may be further promoted by endogenous or exogenous windows of opportunity, such as political, policy, or legislative changes, a natural disaster, or market pressures (Chaffin et al., 2014; Folke et al., 2005). ‘Adaptive governance aims at bringing about desired, resilient ecological outcomes, generally agreed upon by users of/participants in the social-ecological system by enabling adaptive management. As such, adaptive governance simultaneously affects and is affected by changes in the system through dynamic feedback links. It can thus be argued that desirable social and governance outcomes (e.g. good governance through legitimacy, transparency, accountability, inclusiveness, and fairness) may themselves be part of the change expected or envisioned (Brunner, 2010; Chaffin et al., 2014).

3.1.2. Earth system governance

Earth system governance builds on the idea that current environmental change is unprecedented, irreversible, human-caused, and marked by scientific uncertainty (Biermann, 2007; Biermann et al., 2010; Biermann and Gupta, 2011; Dellas et al., 2011; Reynolds and Horton, 2020). Thus, it analyses human responses to the changes of the

Table 2
Selected approaches and their main characteristics.

Governance approach	Brief description	Conceptual background	Empirical example
Adaptive Governance	Coordinates resource management regimes in the face of the complexity and uncertainty associated with (rapid) environmental change (e.g. Chaffin et al., 2014 ; Folke et al., 2005 ; Rijke et al., 2013)	Draws from the resilience of socio-ecological systems, community-based natural resource management, and collaborative environmental governance	The Great Barrier Reef Marine Park Authority & ecosystem-based management & transformation of the governance regime (see more Olsson et al., 2008)
Earth System Governance	Combines earth system analysis and governance theory, bringing the elements of multiple spatial and temporal scales of global environmental change into the governance and institutional analysis (e.g. Biermann, 2007 ; Biermann et al., 2010)	Emerged as ‘a new social phenomenon, a research program and a crosscutting theme of research in the field of global environmental change’ in the early 2000s (Biermann, 2007 , p. 327)	Conservation and sustainable use of marine biodiversity beyond national jurisdiction in creating international regulation (see more De Santo et al., 2019)
Evolutionary Governance	‘Radically evolutionary’; all elements of governance are subject to evolution, they co-evolve, and most of them are the product of governance itself (path-dependency) (e.g. Schlüter et al., 2020 ; Niedzialkowski and Putkowska-Smoter, 2021)	Relatively new framework, relying largely on the work of a few scholars; highly contextual and transformational; connects to post-structuralist thinking in a Foucauldian sense	Conflicting interests of the state and mining communities in Northern Sweden (see more Haikola and Anshelm, 2020)
Transformative Governance	Transformative governance refers to governance that is ‘transformative’ in nature, aims to create a desired shift in a system by altering the structures and processes that define the system (e.g. Bosomworth, 2018 ; Clements et al., 2023 ; Visseren-Hamakers et al., 2021)	New field, with roots in climate adaptation governance and biodiversity governance	Land reform process that was country-driven, inclusive, and founded on multi-stakeholder partnerships in South Africa (see more Jansen and Kalas, 2020)
Transition Governance	Proactive steering of societal transformations towards sustainability. Largely, a management approach with a direct and specific focus on sustainability as a predetermined target (e.g. Loorbach, 2010 ; Frantzeskaki et al., 2012)	A strand in transition theory that builds upon reflexive governance and adaptive management and is tightly connected to the methods of transition management	Experimental transition governance process for just, sustainable urban mobility in Rotterdam, the Netherlands; public-private-civil networks of actors to co-create a transition strategy based on zero-emissions, social

Table 2 (continued)

Governance approach	Brief description	Conceptual background	Empirical example
			and shared mobility in 2030, aiming for all vehicles left to be shared and free from tailpipe emissions (see more Loorbach, 2010)

Earth system, seeking to fundamentally transform existing practices so that societies can improve their abilities to prevent, mitigate, and adapt to environmental change. This is to be achieved in the normative context of sustainable development ([Biermann, 2007](#); [Biermann et al., 2010](#); [Biermann and Gupta, 2011](#)). That is why [Talberg et al. \(2018, p. 32\)](#) argue that ESG is ‘purposive’ (see also, [Biermann et al., 2010, p. 279](#)).

Earth system governance postulates that change should be revolutionary and abrupt. [Biermann and Gupta \(2011, p. 57\)](#) argue that the previous incremental model should be abandoned and propose that we need a ‘constitutional moment [...] akin to the major transformative shift in governance after 1945 that led to the establishment of the United Nations and numerous other international organizations, along with far-reaching new international legal norms on human rights and economic cooperation’. In an updated version of the earth system governance framework from 2019, this necessary change is further described as transformative. [Burch et al. \(2019, p. 3\)](#) use the term to refer to ‘shifts that involve fundamental changes in structural, functional, relational and cognitive dimensions of linked socio-technical-ecological systems’. However, they note that such transformative change will necessarily be coupled with incremental change ([Burch et al., 2019](#)).

Systemic change should be based on adaptation, which constitutes one of the key themes of earth system governance. Through adaptation, Earth System Governance seeks to ‘steer human development in a way that secures a “safe” co-evolution with natural processes’ ([Biermann, 2007, p. 328](#)). Since environmental changes have in part already occurred, earth system governance requires governing the ‘adaptation to social–ecological change as well as the processes of change and adaptation within governance systems’ ([Biermann et al., 2010, p. 204](#); see also, [Burch et al., 2019](#); [De Santo et al., 2019](#); [Talberg et al., 2018](#)). When updating the ESG research agenda, [Burch et al. \(2019\)](#) also stressed the importance of reflexivity in earth-system governance.

Five key research challenges and problems can be identified in the context of this governance approach: the architecture of earth system governance, agency beyond state, adaptiveness (the changes made by social groups when reacting to or anticipating environmental changes), the accountability and legitimacy of governance structures, and the fairness of allocation and access ([Biermann, 2007, pp. 331–334](#); [Biermann et al., 2010, pp. 203–205](#)).

Earth system governance studies not only focus on states and governments but also cover public and private non-state actors, such as agencies, multinational corporations, non-governmental organizations, and networks of experts ([Biermann, 2007, p. 329](#); see also, [Bouteligier, 2011](#); [Dellas et al., 2011](#)). This approach adopts a multi-level perspective of all levels of human society, be they international or national ([Biermann, 2007, p. 329](#); see also, [Biermann and Gupta, 2011](#); [Gupta and Lebel, 2010](#); [Reynolds and Horton, 2020](#); [Talberg et al., 2018](#)).

3.1.3. Evolutionary governance

In the Evolutionary Governance Theory (EGT), governance is conceptualized as a continuous process of making collectively binding decisions, which are constantly evolving through interactions between different actors ([Niedzialkowski and Putkowska-Smoter, 2021, pp.](#)

429–430). Simultaneously, the evolution of governance is structured by dependencies: ‘path dependencies (cognitive, organisational, material), current interdependencies between actors and institutions, and goal dependencies, associated with the impact of visions of the future on the reproduction of governance in the present’ (Niedzialkowski and Putkowska-Smoter, 2021, pp. 429–430). In this approach, the co-evolution of governance refers to a long-term gradual change which evolves as a result of the interplay between various societal actors across scales and material environments, in which governance is adapting to or altering the transforming materialities.

Institutions act as coordination mechanisms between actors—‘rules and tools of the game’—ranging from informal, unwritten rules to more complex formalities of laws and policies (Schlüter et al., 2020). Discourses can be seen as inseparable from governance, as discourses participate in framing ‘who is to be governed and how they are to be governed’ (Haikola and Anshelm, 2020, p. 2). Actors understand themselves and their goals through knowledge and narratives, and they strategically change themselves through interaction and discursive means (Schlüter et al., 2020, p. 2). As actors cannot place themselves and their goals outside of these narratives, and institutions work through the reinterpretation and inclusion of discourse, discourse also represents a limit to strategizing (Schlüter et al., 2020, p. 2).

Considering the co-evolutionary nature of governance and its elements, especially actors and institutions, governance transforms itself even without any steering attempt (Schlüter et al., 2020). Steering options are both restricted and enabled by co-evolution processes in the relations between actor/institution and knowledge/power configurations (Niedzialkowski and Putkowska-Smoter, 2021, p. 430). An alternative cannot even be implemented outside of these co-evolutionary processes, as it will necessarily emerge from these co-evolutions (Huntjens and Kemp, 2022, p. 8). As Alff puts it, ‘the governance path has a remarkable transformative influence on the interacting actors and institutions, while it is shaped in turn by those interactions’ (2020, p. 6).

3.1.4. Transformative governance

Transformative governance brings attention to the capacities of public policy to support and engage in governance that critically re-evaluates the current beliefs and values, as well as the associated institutions, and emphasises the understanding of policy sectors’ institutional logic (Bosomworth, 2018).

Regarding the theory of change, transformative governance models offer many different descriptions. Existing research describes the features of governance that are considered important for transformativity. Rijke et al. (2013) emphasise the importance of decentralised and informal governance approaches in the early stages of transformation processes and, in the later stages of the transformation, suggest that formal and centralised approaches are more effective. Clements et al. (2023) underline that at the core of transformative governance approaches is recognising and addressing both the social and ecological aspects of simultaneously occurring crises. Visseren-Hamakers et al. (2021) argue that governance is transformative only if it is integrative (accounts for undesired effects across other places and sectors), inclusive (involves multiple actors, interests, and values), adaptive (learns, experiments, and monitors progress), and pluralist (leverages multiple knowledge systems, beyond the scientific), and these approaches are implemented in conjunction, operationalised, and focused on (taking into account the indirect drivers underlying sustainability issues). Some of the other desired features of transformative governance are the facilitation of peace and conflict resolution (Leonardsson et al., 2021).

In general, the literature on transformative governance encourages the re-imagining of policy instruments to set ecological sustainability as a priority rather than an option (see Coffey et al., 2022). However, a critical question related to the existing research is what qualities of governance are truly *transformative* and what are the preconditions for the transformation.

3.1.5. Transition governance

Sustainability transitions involve multiple domains and various stakeholders (see Section 1), and they may take several generations to unfold (Frantzeskaki et al., 2012; Kemp et al., 2007; Voß et al., 2009). Within this context, the purpose of ‘governance’ in transitions is to integrate an understanding of the complex and non-linear realities of contemporary societies and to outline what kind of steering can be most effective (Frantzeskaki et al., 2012; Loorbach, 2010).

The key problem that transition governance encounters is how the long-term objectives of radical sustainability transformation are attained through incremental steps, including the need for specificity, compromise, and implementation (Frantzeskaki et al., 2012). Consequently, the practical propositions of transition governance are discussed largely through the notion of ‘transition management’. Often, the notions of transition governance and management are used interchangeably, but in our interpretation, the purpose of ‘governance’ is to provide justifications, understanding, and guidelines for transition management and its methods.

The transition management discussion is divided into four spheres of governance in which actions and change occur: strategic, tactical, operational, and reflexive. The strategic sphere focuses on creating a long-term vision and anticipation on a societal level. The tactical sphere involves driving and negotiating transformative change at the level of societal subsystems. The operational sphere is the short-term horizon involving everyday decision making and practices which either transform or reproduce existing practices. Finally, reflexivity cuts across the three other spheres to monitor, evaluate, and assess transformative processes and make iterations to these spheres. Transition management methods often rely on the participation of forerunner actors to foster innovation and sustainability (Frantzeskaki et al., 2012; Halbe et al., 2020; Loorbach, 2010). However, a naïve consideration of politics and power can seriously hamper transition governance projects (Avelino and Grin, 2017; Bosman and Rotmans, 2016).

In summary, the main building blocks of transition governance (and management) are network governance, long-term collective goals, reflexivity, experimentation, and innovation and learning across complex multi-actor processes (Bosman and Rotmans, 2016; Halbe et al., 2020; Halbe and Pahl-Wostl, 2019).

3.2. The role of the law in the governance approaches

3.2.1. Law in adaptive governance

Legal and regulatory frameworks are seen in adaptive governance as either barriers, which require interventions or reforms, or as potential windows of opportunity (Chaffin et al., 2004; Folke et al., 2005). Adaptive governance emphasises the need for flexibility, learning, and adaptability in resource management regimes (Folke et al., 2005). The law can play a role in this, especially in enhancing legitimacy, accountability, and justice (Chaffin et al., 2014; Cosens et al., 2017). The law can provide the authority, procedural rules, and mechanisms for adaptive management. By creating a legal framework that aligns with the principles of good governance, it is possible to legitimise, support, and institutionalise adaptive governance practices (Craig et al., 2017).

In the theory of adaptive governance, the development of law should align with the core principles of adaptability, resilience, and effective response to environmental challenges. Therefore, legal frameworks should be designed with flexibility in mind (Craig et al., 2017; DeCaro et al., 2017). They should be capable of evolving and adapting to changing circumstances, particularly in response to environmental challenges. While major legal reforms may be necessary in some cases, implementing these reforms is often complex and politically difficult. Therefore, the development of the law should also consider incremental changes within existing legal institutions (Arnold and Gunderson, 2013; Craig et al., 2017).

Incremental changes may focus, for example, on improving conflict resolution mechanisms and participatory capacity and procedures,

which are requirements for science-based decision making, transparency, clear procedural rules, and stable government structures (Chaffin et al., 2014; Cosens et al., 2017; Craig et al., 2017; Ebbesson, 2010).

Instead of linear processes, the law should enhance iterative processes with feedback loops among multiple participants (Craig et al., 2017). The law should recognize the tension between the need for stability and the imperative for flexibility. Legal frameworks can strike a balance by allowing innovation and flexibility at the local or bioregional level while maintaining overall stability through substantive law and clear processes (Cosens et al., 2017; Craig et al., 2017). The key is to reform legal frameworks while ensuring that they align with the principles of good governance (Chaffin et al., 2014; Cosens et al., 2017).

3.2.2. Law in earth system governance

The interdisciplinary analysis of law is a focal element of earth system governance (Biermann, 2007, p. 328; Gupta and Lebel, 2010, pp. 379, 383; Mai and Boulot, 2021; Kotze and Kim, 2021). It studies formal and binding sources (see, e.g. Biermann and Gupta, 2011; De Santo et al., 2019; Gupta and Lebel, 2010) and also examines soft and non-binding instruments, such as guidelines or best practices, as part of the law. These can be used alone or together with binding instruments in hybrid systems if the binding instruments cannot be finalised (see, e.g. De Santo et al., 2019, p. 5). Furthermore, the law in relation to earth system governance recognises certification schemes, self-regulation, and private agents' participation in the regulation-making processes as legally relevant topics (see, e.g. Dellas et al., 2011). Given its background as a critique of international environmental law and its state-centricity, many related analyses seek to cross the traditional boundaries of legal research by combining the analysis of international and national legal systems (see, e.g. Biermann and Gupta, 2011; Gupta and Lebel, 2010; Reynolds and Horton, 2020).

Formal legal sources and 'traditional hierarchical State activity' may hinder the desired change and obstruct the achievement of sustainability targets (Biermann, 2007, p. 328; Biermann and Gupta, 2011; Dryzek and Stevenson, 2011). Yet, many of the proposed solutions rely on law, including the enactment of new formal instruments (see, e.g., Biermann, 2007; De Santo et al., 2019).

The most profound proposal for the development of the law in this area suggests the establishment of a separate field of legal studies called 'Earth System Law'. Kotzé and Kim (2019) criticise the inability of the current legal system, especially international environmental law, to bring about structural changes, the state-centrism of multilateral environmental law, its anthropocentrism, the assumed stability of the earth system, and the tendency to refrain from analysing law from the earth system perspective.

3.2.3. Law in evolutionary governance

In accordance with the evolutionary governance approach, institutions such as laws and regulations provide a normative framework that functions as 'the rules of the game' (Van Assche et al., 2014, p. 21). These laws and regulations are flexible, as they are constantly evolving in interaction with other elements of governance, namely the economy and politics (Haikola and Anshelm, 2020, p. 2; Van Assche et al., 2014).

The law may either enable or restrict co-evolution, that is, the long-term gradual change of governance. For instance, while a lack of regulations leads to unsustainable change, an excessive number of regulations can result in inertia or a lack of governance in some instances (Boyes and Elliott, 2014; Schlüter et al., 2020). In addition, laws and regulations appear to follow their own path-dependent trajectories, leading to inconsistencies between these policy instruments and the ambitious targets they intend to meet.

According to the evolutionary governance approach, efforts to implement transitions must be institutionalised through the enactment of legal measures and the creation of specialised bodies responsible for monitoring and evaluating progress (Huntjens and Kemp, 2022, p. 19).

Legal measures should acknowledge strategic uncertainties, complex dependencies, and polyarchic power distributions (Huntjens and Kemp, 2022 p. 19). Additionally, the law should ensure that the benefits from development (for instance, in the case of renewable energy projects) are distributed fairly to enable a just transition (Huntjens and Kemp, 2022., p. 19).

3.2.4. Law in transformative governance

The role of law in transformative governance was also understood in a multitude of ways in the analyzed papers. The transformative governance model identifies legal structures beyond substantive legislation. The law was understood to set out the rules and responsibilities for different actors (Rijke et al., 2013). Another paper focused on the role of law from the perspective of non-compliance by discussing 'regulatory slippage' and situations in which 'laws go unenforced' (Ng, 2020). However, in the paper by Visseren-Hamakers et al. (2021), the role of law was relegated to just one part of the governance mix.

The role of law in transformative governance can be understood as a way to establish and maintain the status quo (Bosomworth, 2018; Rijke et al., 2013). In addition, the rule of law was seen as a means of providing accountability and justice in a wider approach to the different roles of the law in transformation governance (Jansen and Kalas, 2020). The law has a role to play in transparency, creating accountability, equity, and justice (Jansen and Kalas, 2020). On the flip side, it was identified that this stable rule of law can also be perceived as a 'bottleneck' restricting incentives for experimentation and reducing the flexibility and capacity to adapt to uncertainties (Bosomworth, 2018; Jansen and Kalas, 2020).

As re-imagining governance for environmental sustainability is central to transformative governance, Coffey et al. (2022) argue that "[w]hile current [policy] instruments continue to be necessary, transformative governance entails more ambitious and far-reaching instruments targeting institutional 'rules of the game', including often taken for granted structural conditions such as private property rights".

3.2.5. Law in transition governance

Transition governance is often seen through the complexity paradigm, according to which an exhibited behaviour cannot be reduced simply to the interaction of the composing parts of a complex adaptive system. Small changes in those parts, such as changes in institutions, including the law, may provide a space for niches and result in significant changes in nonlinear systems (see Avelino and Grin, 2017, p. 18). At the same time, transition governance research acknowledges that large-scale and long-term legal commitments, such as binding greenhouse gas reduction goals, may play a major role in providing a legal framework for transitions (Laes et al., 2014). In transition governance research, the law is one of the institutions related to socio-technical regimes and sustainability transition paths (Upham et al., 2015).

The law may support or slow down sustainability transitions. Pieces of the law may, on the one hand, support forerunners and the implementation of sustainability innovation as leverage points by offering public incentives for sustainability transitions, innovation pulls, and windows of opportunity. On the other hand, the law may strengthen existing regimes and cause barriers to the emergence of sustainability innovations. Thus, the law should be tailored to foster sustainability transitions and related learning and dialogue between niche actors and the existing regime (see Bosman and Rotmans, 2016; Halbe and Pahl-Wostl, 2019; Rotondo et al., 2020; Skjølsvold and Rygshaug, 2020).

To this end, the law should enable bottom-up and non-hierarchical collaborative relationships between different stakeholders and levels of governance. It should be reflexive and communicative rather than providing sector-specific and top-down governance steering (Hvelplund and Djørup, 2017). If necessary, the law needs to be changed or its interpretations clarified to allow for radical sustainability innovations. At the same time, legislation also plays a stabilising role in transition and its governance. Nevertheless, transition governance also acknowledges that

laws may include conflicting barriers and trade-offs related to the goals of sustainability transitions and public health protection (Bosman and Rotmans, 2016).

3.3. Comparative overview of the five governance approaches

Table 3 provides a comparative overview of the five governance approaches regarding the theory of change and the role of law. Adaptive governance and earth system governance focus, in particular, on socio-ecological systems. The former approach focuses on governing human-nature interactions at the ecosystem level and how to increase system resilience against natural or human-induced disturbances or crises, such as those caused by climate change that affect natural and semi-natural systems. In the face of human-induced crises, earth system governance calls for changes in governance structures and approaches, with a particular focus on the global level and the role of intergovernmental institutions. Evolutionary governance emphasises the co-evolution and path-dependency of socio-political systems in the face of, among others, sustainability challenges. The emphasis is on actors, institutions, and power relations, while physical materiality is seen as one of the causes of co-evolution and path-dependencies in governance. Transition governance articulates how change occurs in socio-technical systems, often from a national perspective, for example, how (sustainable) innovation can be nurtured and fostered against an established socio-technological

regime. Transformative governance refers to both socio-technical and socio-ecological systems. The focus is on creating deep change in the system by leveraging multiple knowledge types; experimenting with, learning from, and adapting governance approaches; ensuring inclusivity with respect to values and interests; and adopting a systemic perspective regarding potential undesired effects leaking into other places or sectors.

In transformation and transition governance, and to some extent, earth system governance, change is generally conceptualized as a radical, profound disruption of the previous system, whereas the other approaches interpret it as a more gradual process of improving the status quo. The polycentricity of governance is acknowledged and appreciated by all five approaches, but earth system governance, compared to the others, is more strongly centered on the need for change to be led by (international) institutions and embedded in regulatory processes.

Transformation governance, adaptive governance, and earth system governance are more explicitly normative, calling for a more sustainable (and just) system as the desired goal and rationale for change. The directionality of change (see Feola, 2015) is not a pivotal consideration in evolutionary governance and transition governance, although justice is also emphasized in evolutionary governance. Consequently, transformation governance, adaptive governance, transition governance, and earth system governance are oriented towards finding and prescribing certain solutions or avenues for change, while evolutionary governance

Table 3

A comparative overview of the governance approaches assessed in this article, including their focus system, the theory of change envisioned, and the role of the law.

Governance approach	System boundaries	Direction and pace of change	Theory of change Mechanisms and actors of change	Role of the law
Adaptive governance	Socio-ecological systems (local, generally circumscribed by ecosystem-level spatial boundaries)	Governance towards resilient systems in response to rapid environmental change	<ul style="list-style-type: none"> • Enhancing resilience through good leadership • Community empowerment and knowledge • Self-organisation ability of actors (including civil society) and networks • Learning and innovation 	Either a barrier to change, which requires law reforms, or a catalyst for change (e.g. legislation can support actors' self-organisation); focus is mainly on how law affects the social system, rather than the ecological one. The law can also help stabilise and legitimise adaptive governance systems.
Earth system governance	Socio-ecological (global)	Rapid change towards environmental sustainability	<ul style="list-style-type: none"> • Current environmental change constitutes a 'crisis' • Abruptness of change/ adaptation • Combination of multiple levels (global-local) • Combination of actors (governments, private actors) • Anthropocene • Change is long-term and gradual • Emerges through collaborative, multi-actor, multi-scalar, and multi-location decision making • Co-evolution and path-dependency 	Central component in the theory of change; interdisciplinary approach; the law on all levels; informal and formal (binding) legal sources; has led to calls for establishing <i>Earth system law</i> ; has emerged as a critique to international environmental law.
Evolutionary governance	Socio-political (often local, but also regional and/or national level)	Incremental change, end-state not prescriptive	<ul style="list-style-type: none"> • Fundamentally alters structures and processes within systems • Inclusive: current values and institutions underpinning behaviours and policies • Pluralism, adaptation, inclusivity • Systemic change • Nurturing and developing radical innovations (niche) • Facilitating radical innovations to challenge socio-technological status quo (regime) • Visioning, networking, learning, and political facilitation 	Transition endeavours need to be institutionalised; laws and regulations may need to lead change; either enables or restricts co-evolution.
Transformative governance	Any system (esp. Socio-ecological/socio-technical)	Radical/abrupt change towards a more sustainable system		Stabilising factor, creating justice; bottleneck for experiments; results in sanctions if no compliance.
Transition governance	Socio-technical system (usually at the national level)	Pace of change driven by emergence of innovation and regime destabilization, end-state not prescriptive		The law may support or slow down sustainability transitions. Stabiliser, e.g. large-scale and long-term legal commitments, but also an accelerator.

is more prone to describing rather than intentionally steering change.

4. Discussion

The discussion touches on three points. First, a summary of differences and similarities among the approaches. Second, a perspective on how the four more established governance approaches of adaptive, earth system, evolutionary and transition governance can further inform the development of transformative governance. Third, reflections in relation to all the papers reviewed on how law can be further engaged as a force for sustainability transformation.

Transformation governance, adaptive governance, and earth system governance are more normative and prescriptive than the evolutionary governance and transition governance approaches. This may be because, unlike the latter two approaches, their foundations are strongly embedded in sustainability science, which is typically explicitly normative (Spangenberg, 2011). The five approaches also take different stances on how rapidly change should occur, which reflects the diversity of opinions on the nature of societal change as a continuum between disruptive/radical and gradual/evolutionary (e.g. see D'Amato et al., 2016).

Some assumptions and/or strategies are shared among the approaches on how to steer towards transformation. Agency is neither fully located in the public sphere of governments and intergovernmental organizations nor in the private sphere of non-governmental organizations and business actors. It emerges in different geographies and at different times as a crucial mix of public and private resources, roles and responsibilities' (Stripple and Pattberg, 2010, p. 138). However, earth system governance, compared to the others, is more strongly centered on the need for change to be led by (international) institutions and embedded in regulatory processes, although the role of multiple actors in change is not irrelevant in that body of literature (see Dellas et al., 2011).

All the approaches highlight the importance of collaboration between different actors, although emphasizing different scales (e.g. Chaffin et al., 2014; Visseren-Hamakers et al., 2021). All the approaches rely on mechanisms of adaptiveness to a certain degree. Not only does adaptive governance rely on the ability of actors and structures to adapt in changing circumstances, but also transition governance, earth system governance, and transformative governance apply adaptive strategies that are characterized by learning and reflexivity (e.g. Biermann et al., 2010; Burch et al., 2019).

In real-world situations, different governance approaches are merged and can be strategically applied in a complementary manner. Considering that compared to the other four approaches, transformative governance is an emerging field, we argue that its conceptual foundations for a theory of change could be further developed by drawing from elements other approaches assume to contribute towards change, namely: collaboration (at all levels and between all actors), leadership, learning, plurality, inclusiveness, innovation and vision. It should be noted, however, that more empirical evidence is needed on whether such elements are in fact conducive to transformative change, and in which context-specific circumstances (e.g. Jagannathan et al., 2020).

As the idea of transformation is gaining ground in research and policy, it is worth asking whether transformative governance has the potential to become a new umbrella concept in sustainability. As Hirsch and Levin (1999) noted that too many related ideas spread thin makes broader phenomena hard to comprehend. Thus, frameworks that combine those ideas under unifying banner are needed. Umbrella concepts are met usually with excitement and the benefit of such construct it can give solid foundation for action, but these are also quite unstable constructs due to diversity of building blocks (ibid.).

In order to distinguish itself from the other approaches and to establish itself as an umbrella concept, transformative governance should encompass multiple systems: social-ecological, socio-technical and even socio-economic (see EEA – European Environmental Agency,

2017). Moreover, new transformative governance approaches need to operate in societies where old practices and governing mechanisms are to phase out or steer towards new ways of doing. Some system theories (such as leverage points, see Abson et al., 2017) and transdisciplinary approaches to change (see e.g. Chambers et al., 2020) advocate for introducing disruptive elements that challenge the current system. Transition governance also discusses disruption, but mainly in the context of distributive innovations and how such processes are facilitated (Avelino and Grin, 2017; Frantzeskaki et al., 2012; Loorbach, 2010). What would introducing disruption look like in the context of a governance approach for sustainability transformations? This might be the subject of future research.

In the reviewed papers, the law is usually discussed at the level of its visible elements, such as written laws and international treaties, which belong to the surface level in Tuori's (2017) three-level conception of law. The role of law in relation to change towards sustainability is mostly approached from an external perspective (see, e.g., Biermann, 2007; De Santo et al., 2019), while an internal understanding of the complexity of the legal systems, and thus their potential for change, remains largely absent from the governance approaches studied. However, some papers in, for example, adaptive governance (e.g. Arnold and Gunderson, 2013; Cosens et al., 2017; Craig et al., 2017) and earth system governance (e.g. Mai and Boulot, 2021; Kotzé et al., 2022) research also illustrate a deep understanding of law and provide new insights for legal and sustainability research.

In general, the reviewed papers portray law as either enabling or hindering change towards sustainability. The stabilising role of the law, linked to the sub-surface levels of law, is sometimes seen as preventing change, and sometimes as increasing legitimacy and accountability and creating a framework for flexible and inclusive decision-making. Some articles provide suggestions on how law should be improved to foster transformation, ranging from the concrete (e.g. improving participatory rights, enabling bottom-up and non-hierarchical collaborative relationships between different stakeholders and levels of governance) to the abstract (law should be reflexive and communicative). Both procedural and substantive law perspectives are considered in the papers.

Focusing mainly on the surface level of law and the external perspective risks failing to capture the complexity of the legal system. This often reduces the analysis of the law in governance approaches to a listing of legal provisions and their required changes, without a broader systemic understanding. However, the interpretation and systematization of law from an internal perspective would also be necessary to understand how to change the system.

There is therefore a need for legal scholars to become more involved in exploring what kind of governance helps to achieve transformative change, and to provide an internal understanding of the role that law can play in this. Dogmatic legal research with a focus on interpretation and systematization can assist in providing a thorough understanding of the legal system and its fundamental concepts, principles, and institutions, i. e. its deeper legal structure in relation to sustainability transformation (Schwartz, 1992, p. 180).

It is important to understand that in order to enable transformative change, the entire legal system requires a radical change (Soininen et al., 2021). This kind of radical change takes place not only through visible laws and regulations, but also through the deeper legal structure, which consists of fundamental legal principles, concepts, and institutions at the levels of legal culture and the deep structure of law (Tuori, 2017). To change the legal system to support sustainability transformation, it is necessary to understand its internal mechanisms and the tensions between different parts of the system. Without an internal understanding of the legal system, external assessments will inevitably be based on insufficient information.

To advance legal research for the purpose of fostering transformative change, one must adopt a systemic approach that encompasses an understanding of both external and internal perspectives, as well as facilitating and constraining elements within the legal framework. These

elements encompass various dimensions, including substantive and procedural aspects, which are often rooted in the fundamental principles of the law. For example, while strict adherence to constitutional rights and the rule of law can bolster the acceptability of change, an overly rigid interpretation of constitutional provisions (e.g. property rights) and legal principles, such as legal certainty, can impede progress towards more sustainable governance. Change in the interpretation of key legal principles is continuous and it is affected by the developments of surface level, albeit usually slowly. This creates a need to balance the different areas of law and legitimate expectations (e.g. the right to property vs. the right to a healthy environment) over time, which is influenced by a variety of factors, including changes in legal instruments and shifts in legal culture.

5. Conclusion

Based on our review, we recognize that all the examined environmental governance approaches (adaptive, earth system, evolutionary, transformative and transition governance) can contribute important perspectives into understanding and advancing sustainability transformations.

Nonetheless, operationalizing the emerging notion of transformative change – increasingly recognized in academia, policy-making and practice as necessary to address the root causes of interlinked sustainability challenges – requires an ad hoc governance approach to enable societal steering. Transformative governance is developing in academia and policy, but still lacks both solid theoretical foundations and empirical analyses. Drawing from more established realms of governance studies can further strengthen the conceptual understanding of transformative governance and develop analytical frameworks for its empirical analysis and evaluation in real-life situations. Furthermore, we suggest that through this interdisciplinary uptake of existing literature, transformative governance has the potential to serve as an umbrella concept, further enabling an integrated and systemic approach to sustainability transformations. However, to reap the benefits of becoming and being an umbrella concept, theoretical and practical cracks of the construct must be taken seriously. Future research lines should focus on applying transformative governance to different empirical contexts, experimenting on how change can be initiated or accelerated.

When zooming in on the role of law in the context of sustainability transformations, our study revealed that all the governance approaches discuss it in a simplistic way, depicting it dualistically as either an enabler of or a barrier to change. We suggest that the role of the law in sustainability transformation must be understood and analyzed from the so-called internal perspective established in legal studies in addition to external one. Therefore, legal scholars could take a stronger role as part of the research on transformative change. Without an internal understanding of the legal system, external assessments will inevitably be based on insufficient information on law, which does not provide a basis for changing the legal system to better enable transformative changes.

CRedit authorship contribution statement

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Declaration of competing interest

The authors have no competing interests to declare that are relevant to the content of this article.

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Data availability

Data will be made available on request.

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