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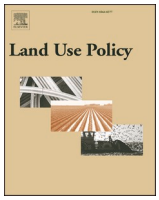

When, where, and how can land governance overcome path dependency? A trajectory of land governance change

Faris Salman *, Akihisa Mori

Graduate School of Global Environmental Studies, Kyoto University, Kyoto, Japan

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ABSTRACT

Land governance deals with the intersections of policies, processes, and institutions on access, use, and interest in land and its resources. Path dependence on land governance can lead to unsustainable land control, shaping people's livelihoods and well-being. Agency in land governance is well explored. The link between actors, their aims, and their agencies for transformative action has been established. However, these concepts have not sufficiently explained why land governance change can happen. Why certain governance is preferred over others is still open for interpretation. To address this gap, we incorporate insights from the social-ecological systems (SES) and socio-technical systems (STS) studies and add timing and strategic structures in analyzing the transformation process in land governance literature to build a trajectory of land governance changes that indicate ways out of the path dependency in land governance. The trajectory has scholarly novelty in adding 'where' (leverage points) and 'when' (triggers) to the existing strategic aspects of 'who' (actors) and 'how' (agency), and linking the four to indicate ways out of the path dependency. The agency of change in land governance emerges only when certain triggers destabilize incumbent land governance. Agencies and leverages are interrelated. Failure to gather momentum leads to inefficient utilization of design leverage, dropping key actors into a barrier of change, wasting the open moment, and missing the opportunity for change.

1. Introduction

Land can be considered as a resource or an infrastructure. When land is seen as a resource, it refers to its inherent value and potential for various uses such as natural resources, agriculture and forestry resources, or land conservation (Karrasch et al., 2019; Helming and Pérez-Soba, 2011). Land as infrastructure is viewed as a part of broader physical infrastructure that support human activities (Tian et al., 2019). The construction of roads, buildings, and other infrastructure can lead to habitat loss, fragmentation of ecosystems, and changes in land use patterns (Röder et al., 2015). The provision of infrastructure can enhance the value and productivity of land, such as through improved access to markets and services (Wu, 2022). Having a multifaceted view, of how land is governed plays a crucial role in managing the relationship between land as a resource and land as infrastructure.

Land governance is a multifaceted and systemic challenge, which has received relatively limited attention despite its significance for policy-makers (Azadi, 2020). In an upcoming issue, Land Use Policy will delve into the topic of governing land and natural resources from a systemic perspective. Effective land governance systems are essential for ensuring sustainable and equitable use of land resources, as well as for the planning and management of infrastructure development. Viewing land governance as a system is complex and ever-changing (Azadi, 2020). It deals with the intersection of policies, processes, and institutions on access, use, and interest in land and resources (Palmer et al., 2009). Land governance also becomes the place where competing interests of how land is managed (Enemark, 2012). Due to competing interests, land governance can change when multiple institutions, sometimes with diverging interests, interact with one another and influence governance practices (Tchatchoua-Djomo, 2018). These dynamics can also be viewed as a shared mechanism between multiple actors, affecting the users, landowners, and the available land resources (Ostrom, 2009. Viewed as a system, the dynamics of competing interests among users, the availability of resources, how users use the resources, and how governance structures regulate the resource use, produce outcomes that influence the resource, users, and the governance structure itself (Goldstein et al., 2023; Wittman and James, 2022).

Land governance functions to manage and administer land uses and

* Corresponding author.
E-mail address: faris.slmn@gmail.com (F. Salman).

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access to land, involving various processes such as decision-making, conflict of interest, institutional arrangements, and power relations (Borras and Franco, 2010; Sikor et al., 2013. However, in the land governance literature, the dominance of particular interest groups or actors has led to institutionalized path dependency, with historical decisions and events continuing to shape the direction of land governance (Lee et al., 2019; Biitir and Nara, 2016; Javid, 2011). Path dependence in land governance can be equal to unsustainable control of land, shaping livelihoods and people's well-being (Doyon et al., 2021; Goldstein et al., 2023; Wittman and James, 2022). As a result, path dependence in land governance limited the potential for change towards sustainable practices, compromising the functions of land governance (Zhang and Ye, 2021; Djelic and Quack, 2007). A systemic transformation is required to overcome path dependency (Djelic and Quack, 2007; Smith et al., 2005; Geels and Schot, 2007)

A system transformation can be divided into four phases in a cycle: exploitation, conservation, release, and reorganization (Westley et al., 2013). During the exploitation phase, the system experiences rapid growth and development. In the conservation phase, the system becomes more stable and efficient. The release phase is marked by a breakdown in the system, leading to a collapse or transformation. Finally, the reorganization phase involves the establishment of a new system. The literature on sustainable land governance has covered the first two phases of transformation: when a multitude of loosely interconnected ideas and the coexistence of diverse beliefs (exploitation) and how the system attains greater stability and efficiency, with well-established institutions and belief systems (conservation). They identified the importance of agency in influencing land governance (Andriamihaja et al., 2021; Lundsgaard-Hansen et al., 2018).

In the context of land governance, actors' agency plays a crucial role in shaping the governance processes and outcomes. Actors' agency is closely linked to their aims. It can be defined as their goals, interests, values, and motivations, and may include economic, social, and environmental objectives (Andriamihaja et al., 2021). For example, actors may aim to promote sustainable land use practices, protect indigenous land rights, ensure equitable access to land resources, or maximize profit from land development (Novotny et al., 2021; Andriamihaja et al., 2021).

There are links between actors, their aims, and their agencies to transformative actions. For example, actors who aim to promote sustainable land use practices may engage in activities such as conservation, reforestation, or sustainable agriculture. On the other hand, actors who prioritize economic development may engage in activities such as land conversion for industrial or urban development (Novotny et al., 2021). Actors who aim to advocate for land reform or the recognition of indigenous land rights may challenge existing power dynamics and institutional arrangements (Chiaravalloti et al., 2017). Similarly, actors who engage in collaborative governance processes may contribute to the emergence of new governance structures and practices (Lo et al., 2018). Actors who challenge existing land tenure systems or advocate for the implementation of new land policies can contribute to institutional change (Busscher et al., 2018).

Little research details the other two phases of system change: when the current stable beliefs or ideas are unable to solve existing problems (release), or when ideas different from the previous practices emerge to solve existing problems (reorganization). Few tried to link these phases of transformation as causality to governance change. Debates such as what causes a stable (conservation state) system to enter the release, and reorganization phase (Busck-Lumholt et al., 2022; Hauer and Nielsen, 2020; Munroe et al., 2019), why land governance change can happen, or why certain governance is preferred over others are still open for interpretation (Abson et al., 2017).

The literature about transformation, especially from SES and STS, may give insights into causality in land governance change; it also demands timing and targeting specific structures (Olsson et al., 2006; Geels, 2006; Olsson et al., 2004). Triggers and opportunities provide the causal explanation for timing, while leverages are relevant to 'specific structures' in explaining changes (Fischer and Riechers, 2019; Moore et al., 2014). In SES, sustainable transformation, and transition studies, a transformation from path dependency is possible when shocks occur (Herrfahrdt-Pähle et al., 2020; Geels et al., 2017). The shock sometimes influences human actors or disturbs the governance mechanism creating windows of opportunity for change (Goldstein et al., 2023; Geels et al., 2017; Sutherland et al., 2014). Deliberate human agencies also make changes possible (Westley et al., 2013; Ostrom, 2009; Walker et al., 2004).

Linking resourceful economic actors (network and physical) with less resourceful (transformative) sustainable actors can lead to transformative actions in land governance (Andriamihaja et al., 2021; Lundsgaard-Hansen et al., 2018). The link allows sustainable influence 'flow' and changes resourceful actors' aim towards sustainability. However, this argument assumes that actors with different objectives can influence change regardless of power. While agencies can be in-line with organizational aims, agencies should be analyzed as strategic actions (Andriamihaja et al., 2021; Geels, 2004; Giddens, 1984). It is difficult to analyze why changes have not happen only by observing the network allowing transformative action, actors, and their aim or agency.

Against this backdrop, this study asks how land governance started to change, who or what was responsible, and who took advantage of it? To answer these questions, we refer to the overlapping concept in different fields of SES and STS studies on shocks and path dependence (Goldstein et al., 2023; Herrfahrdt-Pähle et al., 2020; Gowdy and Baveye, 2019). Then we make a systematic literature review on peer-reviewed literature to synthesize the textual narrative about land governance system change, especially the release and organization phases (Westley et al., 2013; Geels and Schot, 2010).

This article contributes to the scholarly literature by synthesizing a trajectory of land governance system changes and indicating ways out of path dependency (Andriamihaja et al., 2021; Ansoms et al., 2014; Moss, 2004). Unlike previous studies, this study includes four strategic aspects of 'when' (triggers), 'who' (actors), 'where' (leverage points), and 'how' (agency) to analyze land governance transformation. We add 'where and when' to the existing strategic aspects of 'who and how' (Andriamihaja et al., 2021 and link the four to indicate the ways out of the path dependency (Ansoms et al., 2014). Through the interplay of four strategic aspects, our analytical framework provides a way to anticipate where or when transformation possibly happens (Moss, 2004).

The remainder of this paper proceeds as follows. Section 2 reviews the systemic change in socio-technical and SES as a reference point for the change in land governance. The methodology for the systematic literature review is presented in Section 3. Section 4 provides the review results, and Section 5 links triggers, actors, agencies, and leverages to build a trajectory in land governance change. Finally, Section 6 concludes the study and provides suggestions for future research. We understand that this article borrows terminologies from transition studies (Geels, 2004, 2020), social-ecological systems (Ostrom, 2009; Abson et al., 2017), and political science. To allow a diverse range of disciplines and interest groups to interact with our article, we summarize the terminologies and the definition or context we applied in Table 1.

2. Systemic change in land governance trajectory: insight from socio-technical and social-ecological perspective

Land is multifaceted and can be viewed as a resource or a physical infrastructure. Governing the land involves processes that deal with the intersection of policies, processes, and institutions on access, use, and interest in land and resources (Palmer et al., 2009). Land governance also becomes the place where competing interests of how land is managed (Enemark, 2012). Due to competing interests, land governance can change when multiple institutions, sometimes with diverging interests, interact with one another and influence governance practices (Tchatchoua-Djomo, 2018).

Table 1
Key terminologies and their definitions.

Terminologies	Definitions or Contexts	References
Land governance system	A system where sets of policies, processes, and institutions on access, use, and interest in land and resources intersect with competing interests of how land is managed. Due to competing interests, land governance can change when multiple institutions, sometimes with diverging interests, interact with one another and influence governance practices.	Palmer et al. (2009), Enemark (2012), Tchatchoua-Djomo (2018)
Path Dependency	Timing and sequence of specific historical or political events shape the decisions and choices made by institutions in a way that becomes difficult or costly to reverse. It implies that past decisions or events can set a particular trajectory or path for future developments, even if there might be more efficient or better alternatives available.	Goldstein et al. (2023),Ho (2018)
Agency	The capacity of individuals or groups to act and make decisions within a social system.	Vervoort et al. (2012)
Strategic agency	A deliberate agency with goal different from the existing rules and regulation (i.e. institutions)	(Westley et al., 2013; Moore et al., 2014; Andriamihaja et al., 2021)
Actors	Active agent enacting the insitutional rules, keeping the institutions produced and reproduced. Actors can include individuals, organizations, institutions, and governments that have a stake in land governance and are involved in decision-making processes	Jackson (2010),Vervoort et al. (2012),Teklemariam et al. (2015)
SES	A system where interaction among its basic features interact, providing feedback, and produce outcomes influencing the features themselves. The features within SES are a resource, resource users, and public infrastructure.	Colding and Barthel (2019), Ostrom (2009)
Exploitation phase	One of the system transformation cycle in SES. The system undergoes rapid growth and development, characterized by a multitude of loosely interconnected ideas and the coexistence of diverse beliefs. Dominant or concurrent ideas are gaining access to economic, social, and ecological resources.	(Westley et al., 2013; Dorado, 2005
Conservation phase	One of the system transformation cycle in SES. The system attains greater stability and efficiency, with well-established institutions and belief systems. Existing economic, social, and ecological resources effectively underpin the integrated ideas within the institutional framework.	(Westley et al., 2013; Dorado, 2005
Release phase	One of the system transformation cycle in SES. Challenges to the established order emerge in the system, stable institution can't solve the problem. Institutions and beliefs are open to reinterpretation.	(Westley et al., 2013; Dorado, 2005)
Reorganization phase	One of the system transformation cycle in SES. Stable institution lose their dominance and are open to reinterpretation. New ideas emerge in the system to solve the new problem. Proliferation of ideas and recombinations of resources in new and novel forms emerges.	(Westley et al., 2013; Dorado, 2005)
STS	The integration of social and technical components in a system. The social elements refer to the people and their relationships, while the technical elements refer to the tools, machines, or other physical infrastructure.	(Geels, 2004)
Regime	A set of interconnected components or structures of social and technical (for STS) or social and ecological resource (for SES) that govern the functioning and behavior of a system.	(Geels and Schot, 2010; Hastings and Wysham, 2010)
Niche	A specific space or position within a larger system where certain actors or components can develop and thrive. For STS, niche refers to new practices, or innovations relative to social and technical interaction. For SES, niche refers to new practices, or behaviors relative to social and resource interaction.	(Geels, 2004; Smith, 2012)
Institution	A set of established rules, norms, and practices that guide the behavior and interactions of individuals and groups within a social system. It includes the legal frameworks, policies, and governance structures that regulate technical elements (STS) or resource use (SES)	(Geels and Schot, 2010; Thiel et al., 2015)
Triggers	a perturbation or crisis that serves as an opportunity for change	(Moore et al., 2014)
Windows of opportunity	specific situations in which favorable conditions emerge for the introduction, adoption, or diffusion of new practices, or innovations	(Wu et al., 2017; Moore et al., 2014; Geels, 2004)
Leverage points	Places in a system where relatively minor interventions can lead to relatively major changes in certain outcomes. Shallow leverage points are points at which interventions are easy but limited in their potential to bring about transformative change. Deep leverage points are points where interventions are difficult but have great	Abson et al. (2017),Meadows (1999)

(*continued on next page*)

Table 1 (*continued*)

Terminologies	Definitions or Contexts	References
	potential to bring about transformative change	

When viewed as a system, land governance contains dynamics of competing interests among users, the availability of resources, how users use the resources, and how governance structures regulate the resource use, produce outcomes that influence the resource, users, and the governance structure itself (Goldstein et al., 2023; Wittman and James, 2022). Sometimes, path dependency happens, leading to unsustainable control of land, shaping livelihoods and people's well-being (Doyon et al., 2021; Goldstein et al., 2023; Wittman and James, 2022), as historical decisions and events institutionalize particular interest groups or actors in land governance (Lee et al., 2019; Biitir and Nara, 2016; Javid, 2011). As a result, path dependence shapes the status quo and limits the potential for change toward sustainable land governance (Zhang and Ye, 2021; Djelic and Quack, 2007).

Drawing on insights from socio-technical and social-ecological perspectives, we explore opportunities for systemic change that overcome path dependence and foster sustainable and equitable land use practices.

2.1. Socio-technical system stability and change

STS considers linkages between production, distribution, regulation, and the use of technology to fulfill societal functions (Geels, 2004). STS follows a stable trajectory within certain institutional rulesets embedded in deep cognitive structures (belief systems, problem agendas, search heuristics) (Geels and Schot, 2010). The structures constrain action and limit variations to a particular development direction, resulting in incremental developments along a specific path (Rip and Kemp, 1998; Geels and Schot, 2010). The constraining structures do not exist autonomously but rather from the previous and existing actions, experiences, and knowledge of actors (Geels, 2004; Geels and Schot, 20100. Taking into account the agency as conscious and strategic actions of actors, their agency reproduces rules and operates in the context of rules, practices, or belief systems (Giddens, 1984; Geels, 2004). These agency mechanisms are described in the socio-technical literature as a morphogenetic cycle that preserves the stability of the structure (Geels and Schot, 2010; Geels, 2004). The structures are often referred to as a regime.

Under a stable regime, a seed of change can arise from radical novelties developed in the niche, a place of not-so-strict rules and regulations where deviations from the regime are possible (Geels, 2004). These radical novelties have niche structures and are geared to solve socio-technical problems (Geels, 2004; 2020). In the socio-technical perspective literature, some 'windows of opportunity' or breakthroughs need to happen for niches to be adopted. While stable, a regime is semi-coherent. Semi-coherent regime means that several less dominant institutional rulesets can guide actions with similar purposes (Fuenfschilling and Truffer, 2014). Usually, these different rulesets are coordinated, dampening tensions (Geels, 2004. At times, there can be fluctuations within a semi-coherent regime, causing tensions, misalignment, and instability (Geels, 2011; Fuenfschilling and Truffer, 2014). During the instability, these rulesets users compete for resources and legitimacy, providing multiple interpretations of a problem and its solution. Some rulesets are capable of gaining more resources and legitimacy compared to others. These rulesets then become dominant, gain retention, and become the ones influencing the future development trajectory (Geels, 2020).

Changes in the landscape level can also influence regime stability. Changes in the landscape level in socio-technical landscape cover a wide variety of things, from climate change, negative environmental externalities, or changing user preferences (Geels, 2004). These landscape changes become a problem for the regime when there are no solutions or problematized by external groups of actors. Niches may develop with some promising answers. Novel institutional structures are developed and adopted by the regime. Their adoption into the regime will require some adjustments in the regime structure and influence the development trajectory (Geels and Schot, 2010).

The trajectories of STS transformation are non-linear. It is determined by the availability of resources in the regime to withstand instability and the agency of actors over their network (i.e., resource, power, and network) (Frantzeskaki et al., 2012; Smith et al., 2005). Rich and coordinated regimes can withstand instability through endogenous renewals, whereas rich and uncoordinated regimes will have to reorient their trajectories every time instability occurs. Poor and coordinated regime can purposefully follow societal expectations as the next successor, whereas poor and uncoordinated regimes will experience unintended, emergent transformations. In this perspective, external intervention works with niches through a safe space to withstand the agency of regime actors (Smith et al., 2005). Radical change is then about timing whether a landscape shock can make a regime uncoordinated enough to lead to purposeful or emergent transformation.

2.2. Land governance as a social-ecological system and its transformation

While there is a lack of unifying definition of social-ecological systems, we follow the recommendation from Colding and Barthel (2019) to define SES as a system where interaction among its basic features interact, providing feedback, and produce outcomes influencing the features themselves. The features within SES are a resource, resource users, public infrastructure, and is used by resource users (private actors or general public) and public infrastructure providers (government). In governing the resource use, public infrastructure is established. Public infrastructure refers to the institution, i.e. the rules used by those governing, managing, and using the system including monitoring and enforcement of these rules (Ostrom, 2009; Anderies et al., 2013).

Land is seen as a resource, it refers to its inherent value and potential for various uses such as natural resources, agriculture and forestry resources, or land conservation (Karrasch et al., 2019; Helming and Pérez-Soba, 2011). Land is a critical resource that flows from one shape to another depending on its use. Land influences value and potential for various uses such as natural resources, agriculture, forestry resources, or land conservation (Karrasch et al., 2019; Helming and Pérez-Soba, 2011). Unlike technology, the land is not something that is being produced but an existing ecological component that interacts with human activity as a social system (Markolf et al., 2018). The interaction between land as an ecological component and humans as a social component to fulfill societal function resulted in a land-use decision or land-use change (Redman et al., 2004). Regardless, this facet of land is influenced by governance processes. Land governance deals with the intersection of policies, processes, and institutions on access, use, and interest in land and its resources (Palmer et al., 2009). It includes competing interests in how land is managed (Enemark, 2012) and the possibility of change depends on the interaction outcome (Tchatchoua-Djomo, 2018).

Transformation occurs when a system becomes untenable from a dramatic external shock, requiring adjustment not only on the individual practice, but also on institutions and rules (Barnes et al., 2017). Such dramatic external shock occurs in the broader context of 'ecological, economic, or social (including political) conditions' (Olsson and Galaz, 2012; Walker et al., 2004). Transformation also happens through social-ecological (SE) innovation. In response to ongoing external shocks, actors prepare new configurations of institutions to 'prepare for change' (Moore et al., 2014; Olsson et al., 2004). Changes in the broader context can open windows of opportunities (Olsson and Galaz, 2012). Transformation is achieved when actors capitalize on windows of opportunities and link the SE innovation to the existing organization and institutions (Olsson and Galaz, 2012; Olsson et al., 2004.

Transformations influencing the regime in SES are deliberate

(Walker et al., 2004; Olsson et al., 2004). Deliberate action from the interplay of actors, strategic agencies, and structure influences the transformation trajectory (Andriamihaja et al., 2021; Moore et al., 2014; Westley et al., 2013). Further, deliberate transformations are strategic, where influential actors target specific structures in the regime (e.g., institutional or technological fixes) (Westley et al., 2013; Geels, 2006; Olsson et al., 2006). Strategic agencies are capable and conscious actions with a certain intended goal (Geels, 2004; Giddens, 1984). Strategic agencies have an embedded element of power. If certain actors are powerless, they would be unable to enact certain agencies (Giddens, 1984). Strategic agencies are typically not concerned with individuals but rather groups of individuals or actors taking actions to influence change (Westley et al., 2013).

Deliberate regime structure change is possible and within the scope of individual and collective agency (Moore et al., 2014; Giddens, 1984). Overcoming the structural dependency of agency can start from having 'different' power relations to the existing system, such as aligning with other powerful actors (Johansen and van den Bosch, 2017; Avelino and Rotmans, 2009; Giddens, 1984). During the system change, there are four phases: exploitation, conservation, release, and reorganization (Westley et al., 2013). Institutions are assumed to lose dominance during the release and reorganization. Here, institutions and beliefs are open to reinterpretation (Westley et al., 2013; Geels and Schot, 2010). Triggers, such as protests or social resistance from actors dependent on certain environmental resources, are often considered potential turning points for reinterpretation. These triggers provide opportunities to be captured or responded to by other actors (Moore et al., 2014; Westley et al., 2013). In this phase, actors (individuals or collectives) capitalize 'windows of opportunity' through strategic agencies and leverage for change (Abson et al., 2017).

From the above description, we can see that there are conceptual similarities and key differences between the non-linear trajectory of instability and change in both SES and STS (Fig. 1). We further explain through the figure by using the strategic aspects of 'when', 'who', 'how', and 'when'. The instabilities are caused by the development of an exogenous context of ecological, economic, or social (landscape). 'When' landscape shocks destabilize structures power relations and norms are being questioned (1). Around the same time, the landscape change also influences some actors' perceptions. The changes in perception led certain actors to innovate and try to resolve problems (2). They 'who' try to resolve the problem, trying to prevent the system from tipping into untenable or unsustainable conditions through their deliberate strategic actions ('how'). The strategic actions would be able to push alternative practices for broader change (3) through certain leverage points ('where'). If the push succeeds and the alternative practices are widely adopted, a structural change may be happening (4). However, there is a possibility that the structure can withstand the shock (2′). This often results in trajectory reorientation of the structure, when some rules change but not radical ones.

The transformation in SES may follow a similar non-linear trajectory of instability and change as in STS. Similarly, SES views the trajectory changes through the interaction of a broader landscape, actors' coordination, and agency. However, in SES, the landscape influences the agencies through perception changes. The timing is then related to the time when the perception of the landscape condition changes (Mathias et al., 2020). The difference between non-linearity among STS and SES is in how both view innovations and make their way into the regime. Traditional STS emphasizes the selection process (e.g. market selection) where reproduction or transformation of the emergent institutional configuration occurs (Geels, 2020). SES selection emphasizes increasing the legitimacy of the said innovation, influencing the regime configuration, and being adopted as is (Moore et al., 2014; Smith, 2012). Nevertheless, analyzing governance transformation should include actors, agencies for change, timing, and specific structures in the scope.

3. Methodology

3.1. Exploring the literature

We explore the previous studies on deliberate governance change in general and land governance change. The exploration is done using a systematic literature search. The nature of our exploration is descriptive with the aim of synthesizing a textual narrative (Xiao and Watson, 2019). While Google and Google Scholar combination is known to perform the best, especially for open access coverage and gray literature (Xiao and Watson, 2019), we consider excluding them to enable our exploration focus on peer-reviewed academic articles and book chapters written in English. We explored the two largest academic research electronic databases, Scopus (June 26, 2022) and Web of Science (WoS) (March 26, 2023), using the combinations of keywords listed in Table 2. The search covered published literature up to July 2022. Our search resulted in 186 articles from Scopus and 86 articles from WoS, excluding duplicates.

The complete flow of our literature search is shown in Fig. 2. In

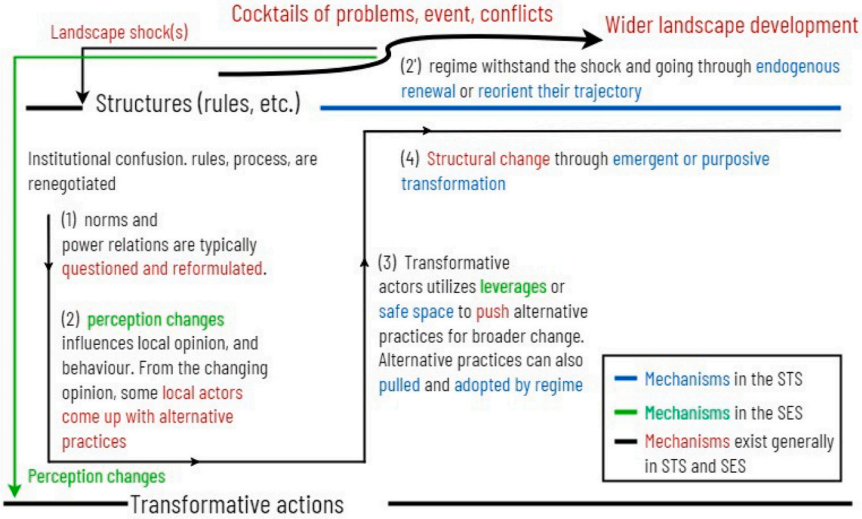

Fig. 1. Similarities and key differences in system transformation mechanism in STS and SES. Modified from literatures (Mathias et al., 2020; Frantzeskaki et al., 2012; Geels and Schot, 2010; Smith et al., 2005). Blue lines and blue text denote processes taken from the STS perspective. Green lines and text denote processes taken from the SES perspective. Black lines and red text denote processes described in both STS and SES.

Table 2
Scopus search parameter for systematic literature search.

Keywords and syntax combination	Subject area
"deliberate" AND "governance" AND ("change" OR "transformation") AND ("structure" OR "regime")	environmental science (ENVI), social sciences (SOCI), agriculture (AGRI), economics (ECON), energy (ENER), business and management (BUSI), and earth and planetary science (EART)
"land" w/2 "governance" AND "change AND" ("structure" OR "regime")	
"deliberate" AND "governance" AND ("change" OR "transformation") AND ("structure" OR "regime")	All databases (TS)
"land" NEAR/2 "governance" AND "change" AND ("structure" OR "regime")	

The proximity operators (Scopus: "w/2"; WoS: "NEAR/2") are used to find records where the terms joined by the operator are within 2 words of each other. The Boolean operator "AND" finds records with all terms specified through the keywords. The operator "OR" finds records containing any of the keywords specified.

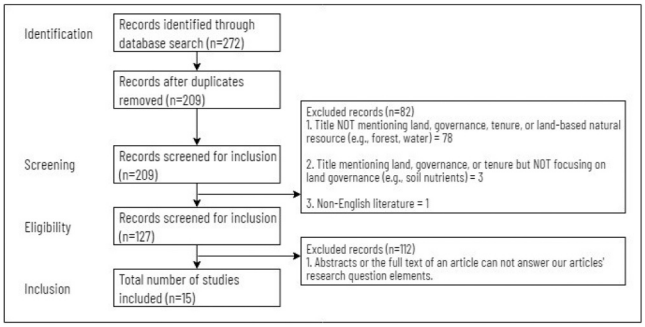

Fig. 2. Literature search and evaluation for inclusion.

reviewing the literature, we screen for duplicates before we screen for inclusion. We found 64 duplicates, resulting in 208 articles that were selected for inclusion based on their titles and abstracts. We screen based on the research question of this article following the systematic literature review guidance (Xiao and Watson, 2019). The abstracts or the full-text of the reviewed literature have to be able to answer at least one of our research question elements, between how land governance change was started, who or what was responsible, or who took advantage of the governance change. We ended up with 15 articles for analysis. A complete list of 15 articles about land governance literature used is available in Supplementary Table S1.

Our limited scope in searching only peer-reviewed articles and book chapters thus points to the limitation of our research, which may insufficiently capture the complexities of land governance change. We will revisit this limitation in the conclusions.

3.2. Analyzing the 'when', 'where', 'how', and 'who' of land governance change

To analyze the literature, we use the concept of 'when', 'where', 'how', and 'who'. We derive these concepts from the relevant literature on sustainable transformations. 'When' is a shorthand for triggers, 'where' is for leverage, 'who' is for actors, and 'how' is for their agency. We start with the concept of leverage points for sustainable transformation (Abson et al., 2017; Meadows, 1999). Leverage points provide a conceptual place to poke, jump starting a systemic transformation. Different leverage points that can contribute to sustainable transformation. Shallow leverage points involve parameters such as taxes and incentives, while deep leverage points are more difficult to influence but can lead to substantial change (Abson et al., 2017). We also understand that system transformations have to do with temporal elements (i.e., shocks or triggers) (Fischer and Riechers, 2019; Moore et al., 2014). These triggers can create windows of opportunity, critical junctures that, when seized, can lead to a turning point and change (Geels et al., 2017; Olsson and Galaz, 2012). Seizing the windows of opportunity is the job of agents of change. They are actors with a particular sets of aims, resources, and network (Andriamihaja et al., 2021). These actors are capable to do transformative agency, conscious actions with a certain intended goal (Westley et al., 2013; Moore et al., 2014).

4. More than actors and agency in land governance change: triggers and leverages

Literature on land governance change combined actors and agencies to understand a few possible configurations for sustainable land governance. They identified that actors with predominantly economic aims tend to have high access to resources and good social networks (e.g., state representatives and cash crop intermediaries). On the contrary, actors with social aims tend to have low access to resources and poor social networks (e.g., farmers and local associations). Actors with environmental aims tend to have access to physical resources (international NGOs, conservation NGOs) (Andriamihaja et al., 2021). Actors with predominantly economic aims are targets for transformation actions due to good access to economic and social resources. However, the reliance on an actor-centric approach leaves out the details on agency and institutional configuration (Westley et al., 2013; Smith, 2012; Olsson et al., 2006).

Literature on agency discussed three types of strategic agency for change: sensemaking, envisioning, and gathering momentum (Moore et al., 2014; Westley et al., 2013). Fig. 3 illustrates how the strategic agencies fit to the concepts of systemic change Fig. 1. Sensemaking agencies actively analyze the current problem and assert their interpretation of a problem (Westley et al., 2013; Rip and Kemp, 1998). Sensemaking can also be an action in which key actors create common stories and purposes to motivate action). Envisioning involves figuring out alternative pathways for alternative solutions. It often involves scenario planning or other participatory planning processes (Moore et al., 2014). Gathering momentum is an action to move the system toward the vision created in the envisioning process, typically by forming a coalition of supporters (Moore et al., 2014). Gathering momentum also works as a self-organization mechanism to amass power (Dorninger et al., 2020; Meadows, 1999). A summary of the actors, agencies, triggers, and leverages from land governance literature used in the sub-chapters below are available in Supplementary Table S2.

4.1. Triggers, agency, and actors

During the release and reorganization phases, the old institutional arrangements lose their dominance, and new understandings emerge about how a problem or crisis should be understood (Westley et al., 2013). The literature on land governance change provides evidence that

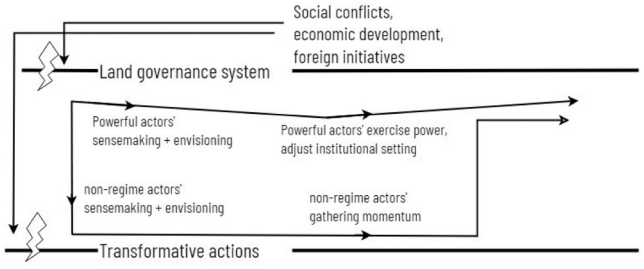

Fig. 3. Illustration of landscape shocks triggers strategic agencies using the concepts from Fig. 1. Thunders represent the landscape shocks. Arrowheads represent agencies enacted by actors.

actors utilize sensemaking agency and try to understand their existing problems during such times. Some actors can influence systemic change by gathering momentum (network and collaboration) and bridging their vision to a larger scale. In comparison, other actors are powerful enough to impose their vision on a broader scale.

There are several triggers in the current literature on land governance. Most of the triggers come from social conflicts and economic development (Zhang et al., 2021; Varkkey, 2020; Lundsgaard-Hansen et al., 2018; Zhong et al., 2014; Ansoms et al., 2014; Bollens, 1993). In some cases, triggers are social conflicts, and direct or indirect influence of foreign initiatives (Akolgo-Azupogo et al., 2021; Ónega-López et al., 2010). Foreign initiatives directly influence land governance through land titling programs (Musinguzi et al., 2021; Boutthavong et al., 2016; Biitir and Nara, 2016), whereas indirectly through REDD+ or other forest carbon initiatives (Robiglio et al., 2014; Higgins et al., 2014; Cenamo and Carrero, 2012).

4.1.1. Sensemaking

Triggers create crises that result in society changing opinions about the current structural arrangement or having unsolved problems. Some actors try to understand their existing problems through sensemaking (Westley et al., 2013). Examples of sensemaking include farmers from Galicia in Spain, and Nongnong Project in China, who linked the 'increasing farm cost and related labor' to reason with the increase in land parcels with different owners (Zhang et al., 2021; Ónega-López et al., 2010). Some rural landowners and international NGOs in Apui thought that deforestation is caused by farmers claiming land titles and turning over their lands to other owners (Cenamo and Carrero, 2012). Farmers in certain African marshes had difficulties finding land to cultivate food and narrowed the problem down to the way customary leaders allocate land (Ansoms et al., 2014). Clan leaders in Ghana believed that 'the growing practice of land governance violates traditional practice' as land rent and distribution practices changed (Biitir and Nara, 2016).

Powerful actors such as customary leaders and governments also do sensemaking, although it can be different with less-powerful actors. We observe such sensemaking from separate cases in the land governance literature. The US government was concerned with increasing congestion and housing and narrowed the cause to decrease the control of local land allocation (Bollens, 1993). Increasing urbanization and industrialization in China threatened farm preservation, and to prevent further threats, the Chinese government must prevent illegal farm conversion (Zhong et al., 2014). The Malaysian government sees an increasing increase in global palm oil consumption, while it does not produce as much palm oil as its competitor (Varkkey, 2020).

4.1.2. Envisioning

Envisioning in land governance literature follows a rather linear path from sensemaking, regardless of the actors. Envisioning follows the problem understanding from sensemaking. Actors utilized envisioning and came up with alternative solutions to solve the existing problems (Westley et al., 2013). For example, reallocating land to create larger parcels to increase efficiency as costs increased (Zhang et al., 2021; Ónega-López et al., 2010). Clan leaders in Ghana created an institution to record land ownership to counter changing land distribution practices (Biitir and Nara, 2016). International NGOs bundled the REDD+ economic benefits agreement with a land titling mechanism to prevent land turnover (Cenamo and Carrero, 2012). Powerful actors such as the US government created new financing and development agencies to intervene in the decrease in local land control (Bollens, 1993). The Chinese government improved their surveillance by including additional remote sensing data to counteract illegal farm conversion (Zhong et al., 2014). The Malaysian government utilized idle ancestral land to increase palm oil production (Varkkey, 2020).

4.1.3. Gathering momentum

There are two types of changes: with and without gathering momentum. Local community members, local leaders, and local organizations are involved in changes gathering momentum. Often it is accompanied by transnational organizations, NGOs, and governments. The agency of gathering momentum serves to bridge the result of sensemaking and vision that actors have done towards a goal or a problem (Lundsgaard-Hansen et al., 2018; Moore et al., 2014; Westley et al., 2013) to a larger scale. For example, sharing and discussing in a farmer community to socialize changes in practice (Ónega-López et al., 2010), communicating with governmental departments (Lundsgaard--Hansen et al., 2018), or spreading information and resolving conflicts (Zhang et al., 2021). The network built from the gathering momentum agency is important for change (Westley et al., 2013; Moore et al., 2014; Andriamihaja et al., 2021).

Gathering momentum agency for land governance change is more likely to be observed where a bottom-up relation is built. Case studies from Galicia in Spain, and one from the Nongnong Project in China, provided evidence that farmers and landowners held community meetings to advance their vision and resolve conflict by discussing new land governance mechanisms (Ónega-López et al., 2010; Zhang et al., 2021). In these cases, there were disagreements about the solutions from other farmers. Community meetings were held to increase participation and resolve conflicts. The community meetings resulted in greater adoption and legitimacy of proposed new land governance mechanisms. Both cases were self-organized movements. They highlighted the exclusion of government entities or market mechanisms during the community meetings (Ónega-López et al., 2010; Zhang et al., 2021). However, there was government involvement in duplicating the community solution to other locations, diffusing it with the help of additional incentives such as financial incentives and technical support (Zhang et al., 2021). In some cases, the government may exercise gathering momentum, as seen in colonizing customs lands in palm oil in Malaysia (Varkkey, 2020).

Conversely, changes without gathering momentum coincide with government-dominant involvement or top-down relation. To bridge the incumbent sensemaking and vision, powerful actors often exercise power through regulatory or institutional changes toward a goal or a problem. For example, to improve land rights management, the Laos government rezoned and formalized land tenure through land titling (Boutthavong et al., 2016). To reduce illegal land conversion, the governments added GIS-based land information to increase surveillance (Boutthavong et al., 2016; Zhong et al., 2014).

From observing the triggers on land governance change, most of the cases were pressured by external triggers such as changes in socio-economic conditions (Bollens, 1993; Zhong et al., 2014; Varkkey, 2020; Zhang et al., 2021), and biophysical changes (especially land uses) (Ónega-López et al., 2010; Zhong et al., 2014. Few cases were related to changes in the regulation (Varkkey, 2020; Boutthavong et al., 2016). Previous literature on land governance changes argue that external or internal triggers are indispensable for transformation (Andriamihaja et al., 2021). We imply that agencies of change in land governance literature did not emerge until certain triggers destabilized the incumbent land governance instead. External or internal triggers coupled with influential agencies are the cause of transformation in land governance.

4.2. Leverage, agency, and actors in land governance change

The places for interventions (leverage points) vary depending on the intervention's difficulty and their potential impact (Abson et al., 2017; Fischer and Riechers, 2019). There are four places to intervene: parameters, feedback, designs, and intents (Table 3). The parameters have modifiable mechanistic characteristics, such as the number of participants in certain initiatives, the average consumption of transport fuels, or the amount of land the government regulated for communal use (Fischer and Riechers, 2019; Meadows, 1999; Riechers et al., 2021).

Table 3
Relationship between four realms of leverages (Abson et al., 2017), 12 systemic leverage points (Meadows, 1999), and examples for the land governance context.

Leverages (Abson et al., 2017)	Leverage points (Meadows, 1999)	Examples of leverage points for land governance change
Parameters	Constants, parameters, numbers	Average minimum areas for land (re)distribution
	Size of buffer stocks, relative to flows	Lands available to govern
	Structure of material stocks and flows	Method on acquiring new 'empty' lands
Feedback	Length of delays, relative to the rate of system change	Time required for access/use/ interest changes on a particular land
	Strength of negative feedback loops	Frequency of land access/use/ interest report and monitoring, land taxes
	Gain around positive feedback loops	Increase in population, changes in land access/use/interest, land aggregation allowance
Design	Structure of information flows	Information about land ownership (open/limited/proprietary)
	Rules of the system (incentives, constraints)	Land governance that is managed with spatial and environmental awareness, purposeful, and just
	Power to change the system structure or self-organize	The ability of a group of land-owner to establish alternative rules for land (re)distribution
Intent	The goal of the system	Growth-focused land governance, pro-poor land governance
	Paradigm underpinning the system	Social norms and values influencing land access/use/ interest
	Power to transcend the paradigm	Acceptance of alternatives to the existing land governance exist and is doable

Source: adapted from Fischer and Riechers (Fischer and Riechers, 2019).

While it is possible, parameter changes alone rarely kick-start systemic changes (Abson et al., 2017; Meadows, 1999).

Feedback focuses on the internal dynamics of the system to maintain a certain goal. The strength of the negative feedback loop helps keep the system on point. Such as fees and taxes to recapture externalized public costs (Meadows, 1999). A positive feedback loop can drive growth. For example, the growth of meat consumption benefits cattle farming. However, uncontrolled gain around positive feedback loops tends to drive the system to implode and lead to chaos(Meadows, 1999). Over-consumption of meat and the population boom threaten the pasture and can drive deforestation (Skidmore et al., 2021).

Design and intent leverages are categorized as deep leverage points that are more likely to cause systemic changes (Abson et al., 2017; Meadows, 1999). The system's design is made of the structure of information flow, rules of the system, and power characteristics (Dorninger et al., 2020). Changing the design alters the flow of information and power, resulting in a change in governance. For example, changing the regulation to add information such as spatial coordinates, landowners on illegal land clearing, or available lands to the public may lead to how people access, use, and manage land (Boutthavong et al., 2016; Zhong et al., 2014).

The system's intent is about the system's goal, and the background paradigm of the goal is constructed or changed (Abson et al., 2017). As leverage, intents such as goals and paradigms are superior for systemic changes compared to other leverages (Meadows, 1999). Goals in smaller existing systems can be apparent, such as land accumulation or just land distribution. However, some broader systems goals are less obvious and need to be analyzed to understand what the system does. Broader goals include the broader narrative of sustainable transformation or just land governance (Köhler et al., 2019; Meadows, 1999; Singh, 2009). These goals are assumed to be constructed by the existing values behind them. The shared values and ideas within society are about how the world works (Meadows, 1999; Schmidt, 2008). For example, customary norms of land governance may distribute the right of access and use of lands equally among the community members, albeit it can be limited to a certain gender. Such norms can change through colonization. Over time, land governance values social ranks more and creates inequality in land access and use (Doyon et al., 2021). Fig. 4 illustrates the leverage required to make an adjustment or a transformation, fit to concepts from Fig. 1. Shallow leverage points can be enough for shallow adjustment but deep transformation requires accessing deep leverage points (Abson et al., 2017).

In the land governance literature, changes dominated by powerful actors, such as governments, could design and utilize leverage to make changes related to the structure of information flows and rules. For example, the state intervened to address the declining local economic growth and established an intergovernmental structure in the United States' land governance. This intervention changed the authority of land governance at the state and regional levels (Bollens, 1993). The government also changed the rules and governance structure for land inspection in China. They added satellite images to find illegal farmland conversion. The addition of remote sensing imagery increased the type of information that the government could analyze and reduced illegal farmland conversion (Zhong et al., 2014). The government changed the rules and information flow within the country's land governance in Lao PDR through the land titling program. They added land registration to help the land tax system, added GIS as a source of information, and reorganized agricultural land zoning for individual households (Boutthavong et al., 2016).

Transformative actors use leverage differently to dominate the change processes. For example, five farmers' households act as transformative farmers to deal with increasing labor costs and land fragmentation in China. They sensed a problem, conceived a solution, and used their resources to create a land redistribution pilot project. These five farmers' households were "chief decision makers throughout the project." (Zhang et al., 2021). They utilized parameters in the form of incentives as leverage. Farmers who joined the land reallocation project were allowed to access beneficial infrastructure. Those who did not were not allowed. Next, the transformative farmers utilized feedback through pilot project demonstration to ensure that their program was beneficial and provided desired outcomes. Last, the transformative farmers utilized design leverage to self-organize and change the power distribution. They used village cadres as leaders and authoritative figures to resolve land conflicts.

Land governance change literature provided evidence on how leverages change actors' agency. The case of land use trajectories in Myanmar provides detailed pictures of powerful actors utilizing leverage differently than less-powerful actors. Natural Reserve Park (NRP) establishment in Myanmar was meant to establish a Natural Reserve in a Reserved Forest designated area. This action also transformed the overlapping customary land into the buffer zone so that the

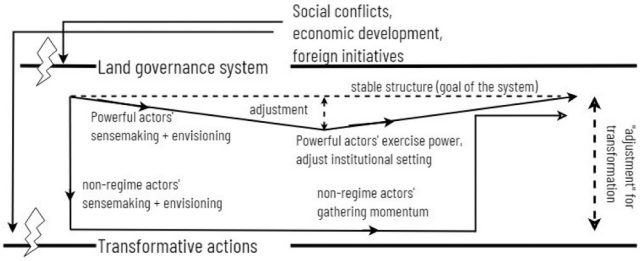

Fig. 4. Illustration of leverage required to make an adjustment vs transformation, fit to concepts from Fig. 1. Thunders represent the landscape shocks. Arrowheads represent agencies enacted by actors. The dashed line represents a stable structure. Dashed lines with arrows represent leverage needed for adjustment or transformation.

locals could retain access to the land (Lundsgaard-Hansen et al., 2018). In one scenario, the government established a Nature Reserve Park (NRP) on top of customary land without prior negotiation and set up NRP rangers' offices around the area. As a result, farmers and local communities in the area refrained from using the land. In this case, the government carried the sensemaking and vision agencies through the NRP program. The government used the design leverage to enforce the rules and power over customary land through NRP rangers' deployment. In addition, an international NGO –collaborating with the government– helped bridge the sensemaking and vision of the government with the local community and established a buffer zone to replace now-protected customary lands. The government also employed design leverage to enforce rules and power over customary land, with additional information flow utilized by government-sponsored NGOs. Both cases resulted in top-down land governance change with slightly different results. The bridging by NGOs resulted in fewer conflicts, a better implementation of their NRP policies, and the local people's access to an alternative land.

However, design and intent leverage do not always generate changes. The single case where changes are not observed (Biitir and Nara, 2016; Cenamo and Carrero, 2012) suggests a few key aspects of land governance change. First, while from the agency perspective, actors (or agents of change) can be anyone (Andriamihaja et al., 2021; Moore et al., 2014), it is important to understand the actors' alignments, whether they are niche or incumbent actors. Incumbents may prolong pre-existing power imbalances, co-opt the triggers, and prevent transformation (Ansoms et al., 2014). Second, agencies and leverages are interrelated. Failure to gather momentum in mutual agreements, align interests, or commitments among key actors leads to inefficient utilization of design leverage. This inefficiency can change some key actors into a barrier to change instead. In Ghana's case of land governance, the growing mistrust among tendamba (land-owning families) prevented land governance change (Biitir and Nara, 2016). In the case of Southern Amazonas, a 'lack of commitment from public institutions' might have prevented the transformation (Cenamo and Carrero, 2012).

5. Linking triggers, actors, agency, and leverages

Literature in land governance change argues that linking can lead to transformative action. Linking actors with different resources and aims (such as economic, sustainable, or social) can change actors' aims while allowing other actors to access resources. Such as the link between resourceful (network and physical), economic actors, to sustainable actors (Andriamihaja et al., 2021; Lundsgaard-Hansen et al., 2018). Connecting NGOs and local communities with governments can influence governments to shift their aims from economic to more sustainable. However, this argument assumes that actors with different aims can influence change regardless of power. Our observation from land governance change literature shows that actors' influence in the governance transformation varies depending on who takes advantage of the triggers (i.e., enacting agency on the triggers through leverages). When incumbents take advantage of the triggers through their agency, they influence the transformation direction (Ansoms et al., 2014; Varkkey, 2020). In case of bottom-up changes (Zhang et al., 2021; Lundsgaard-Hansen et al., 2018), emergent actors (farmers and landowners) gather momentum to support their pilot project, a work of their vision, offering a new land governance mechanism in the face of triggers. In both cases, we saw networks between less resourceful actors with non-economic aims and resourceful actors with economic aims. The difference lies in who acted on the leverages. Analyzing actors, agencies, and leverages can provide contextual factors missing from the previous literature.

Our analysis offer two insights. First, powerful actors can influence the direction of land governance change. The change in land governance started through triggers and was responded to by actors through some agency against leverages. The leverages, especially deep leverages, are relevant to 'specific structures' in land governance change mentioned in the STS and SES literature (Geels, 2006; Olsson et al., 2006). Second, agency and leverage need to be seen as interrelated to influence the transformation trajectory in land governance. The cases where transformations are not observed showed that any actors are capable of sensemaking or envisioning.

However, only a few actors can enact such agencies and influence change. Leverage was important in influencing change. Powerful actors such as the government require fewer agencies who are able and can be quick to utilize shallow or deep leverages. There is a risk that their agencies are favoring the incumbent and resulting in unobserved transformation.

5.1. *Analytical framework for land governance: a morphogenetic cycle of deliberate governance change*

In analyzing changes in land governance trajectory, the STS and SES transformation literature have provided many insights. Change may begin with one or multiple triggers that result in instabilities and problems that structurally influence actors. These actors then respond with their agency by making sense of the problem and preparing potential innovations as solutions. These potential solutions are then reproduced or transformed, creating a new structure through leverages before they are institutionalized. This cycle is conceptualized as a morphogenetic cycle (Fig. 1).

By integrating insights from the SES with land governance literature, we present evidence of land governance change and identify four strategic aspects (Table 4) for deliberate governance change: 'when' (triggers), 'who' (actors), 'where' (leverage points), and 'how' (agency). In addition, considering the similarities between the STS and SES conceptual framework and the trajectories of land governance transformations, we present an analytical framework (Fig. 5). This analytical

Table 4
Factors influencing deliberate change in governance transformation during release and reorganization.

Deliberate change prerequisites	Description	Key literature
Triggers External or internal	Potential turning points, providing opportunities to be captured or responded to by other actors	Walker et al. (2004),Moore et al. (2014)
Actors Various levels of governments, local community leaders, or international organizations	Individuals or collectives with sustainability aims, access to rich and diverse resources, and a central position in the network	Walker et al. (2004), Andriamihaja et al. (2021)
Agencies Response to triggers from capable actors. Agencies are conscious actions with a certain intended goal, that is to intervene leverage points	Prepare for change through sensemaking (reinterpreting current problems), envisioning (providing alternative solutions), and gathering momentum (making coalitions). Actors with aligned agency elements tend to coexist and increase their influence on land governance	Westley et al. (2013), (2011),Moore et al. (2014), Lundsgaard-Hansen et al. (2018)
Leverages Interventions or leverage points to influence the behavior of a system	The 'place' of interventions varies between shallow to deep, consecutively: parameters, feedback, designs, and intents	Abson et al. (2017), Dorninger et al. (2020)

Source: Authors

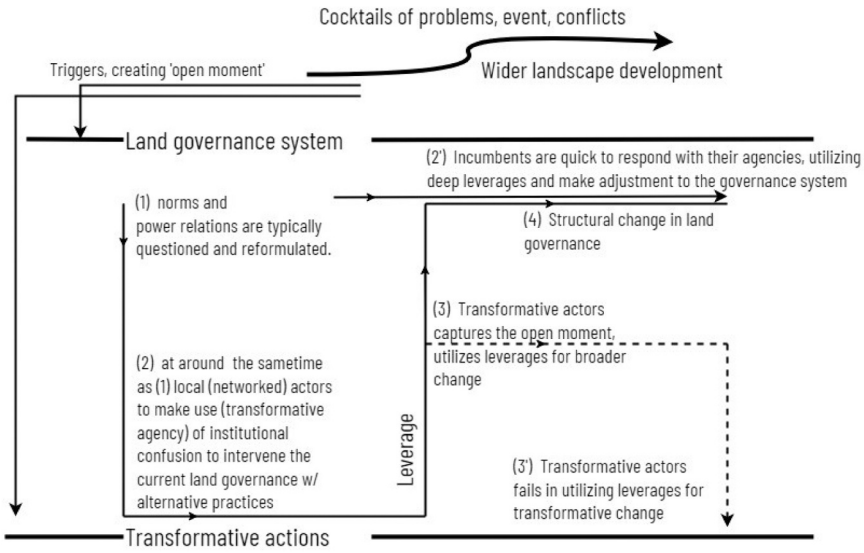

Fig. 5. Analytical framework on deliberate change in land governance transformation. Dashed arrows denote a failed trajectory due to some unmet factors. Numbers represent step-wise trajectories, following triggers created by landscape changes. Accented numbers (e.g., 2′ or 3′) represent alternative pathways depending on the dynamics of actors' agencies.

framework emphasizes the transformative pathway in land governance as a way out of path dependency. Combining strategic aspects in Table 4 and the transformative pathway, we highlight the different strategic aspects that actors can use to influence change.

We present a novel analytical framework (Fig. 5) that draws on insights from STS, SES, and literature on land governance change to identify 'when', 'where', and 'how' deliberate change can influence land use governance. Gradual changes in social and economic development often lead to turning points and social conflicts, which we refer to as 'open moments' (Ansoms et al., 2014. During these moments, established institutional arrangements or societal opinions about land governance are questioned, presenting opportunities for transformative actors as well as powerful incumbents such as government actors to respond.

5.1.1. 'When' the triggers should be captured

The 'when' aspect of deliberate land governance change as Triggers. 'When' is relevant to the emergence of an open moment where power relations and norms are challenged and reformulated. Transformative actors seize this opportunity to introduce alternative sensemaking and envision alternative practices to gain momentum for their movement. However, literature on land governance and systemic transformation provides limited insights on when an open moment will arise. Triggers can be difficult to predict, particularly when broader exogenous changes occur gradually over time (Geels et al., 2017). To adapt to emerging triggers, transformative actors build alternative practices through transformative agencies and adjust their strategies accordingly (Järnberg et al., 2018). When the time comes, they utilize their gathering momentum to leverage the intended transformative actions.

Timing is crucial in leading to successful transformation. Our study found that powerful actors have a greater chance of capturing triggers compared to transformative actors. However, some transformative actors can predict the emergence of an open moment with the help of external actors such as international NGOs. Together, they utilize their transformative agencies to build up power and leverage transformative actions.

5.1.2. 'Where' should the intervention is targeted

Leverage points, or places where sustainable transformation intervention can be initiated, have been identified in the literature (Abson et al., 2017; Meadows, 1999). However, only deep leverage points are capable of bringing about substantial change. In the context of land governance, 'where' in Fig. 5 refers to the straight line connecting the trajectory (2), (3), and (4) as a transformative pathway. Both incumbent actors and transformative actors have the opportunity to target leverage points in land governance. However, the key factor that distinguishes them is the speed with which they understand and utilize the trigger ('when') and their power (if any). Government actors, as incumbents, are inherently more powerful than potential transformative actors, such as farmers and landowners. As a result, transformative actors must be strategic in anticipating broader changes and gathering momentum before they can utilize the leverage points. Failure in utilizing the leverages for transformative change risks wasting the open moment, and missing the opportunity for change.

5.1.3. 'How' actors access triggers and leverages

Agency refers to the conscious actions of actors in response to triggers, whether they are transformative or incumbents. These actions aim to intervene in leverage points. While Fig. 5 does not depict how actors access triggers and leverage points, the literature suggests that both incumbent and transformative actors can engage in sensemaking, envisioning, and gathering momentum to act on 'when' and 'where'. The 'how' also determines the time needed for actors to become powerful enough to drive transformation. Inherently powerful actors, such as incumbents, may be able to skip the process of gathering momentum and steering the change according to their sensemaking and envisioning. However, transformative actors require a stepwise build-up of agency, accessing all agencies before reaching deep leverages and driving transformation. The slow build-up increases the risk of the leverage point being co-opted by more powerful actors to prevent the transformation from happening.

Our analytical framework for studying transformation in land governance suggests that different actors play varying roles at different phases of the process. For instance, transformative actors can innovate alternative practices regardless of who generates ideas, but some actors' sensemaking may be more crucial than others. Envisioning, such as creating pilot projects or new institutions for land documentation, can help visualize these alternative practices. However, conflicts may arise during the envisioning process, and powerful actors may influence the implementation of these practices. These insights are supported by existing literature (Moore et al., 2014; Scobie et al., 2020; Zhang et al., 2021; Biitir and Nara, 2016; Zhong et al., 2014).

Gathering momentum works well, especially when a shared identity can be formed or gathered, such as aims for lands related activities (Andriamihaja et al., 2021; Moore et al., 2014). However, the process might not be free of conflicts. Hence, gathering momentum agencies are often found in meetings, spreading information, and conflict resolution mechanisms (Lundsgaard-Hansen et al., 2018; Varkkey, 2020; Zhang et al., 2021).

Powerful actors can utilize leverage. Leverages vary from shallow to deep depending on their difficulty and potential impact (Abson et al., 2017). Deep leverages are the 'specific structures' (Geels, 2006) in land governance changes that are vital for change. Incumbent actors may be better equipped to respond to deep leverages. Transformative actors must gather the power to influence deep leverages in response to the triggers. Therefore, the use of leverage by emerging (transformative) actors can fail if it is prolonged, resulting in a postponed transformation.

6. Conclusion

In this article, we addressed three research questions. How did land governance start to change, who or what was responsible, and who took advantage of it? Our review of the literature on land governance revealed that most changes in land governance began with triggers, such as social conflicts and economic development, that resulted in crises. During these crises, actors engaged in sensemaking and envisioning, and then took advantage of the leverages to bring about change. We found that both transformative and incumbent actors could utilize leverages to make changes related to the structure of information flows and rules, but they differed in the steps they must take to do so.

To tackle path dependency in land governance, policymakers and practitioners should focus on promoting bottom-up relations among stakeholders through community meetings and increased participation. To improve innovation through sensemaking and envisioning, local communities should be empowered to take ownership of the land governance process. Some examples include providing local community with capacity building programs and institutional reforms that support decentralization and participatory decision-making processes. Policymakers and practitioners should also engage with a wide range of stakeholders to promote legitimacy and adoption of proposed new land governance mechanisms. By targeting these deep leverages, such as design and intent, local movements could lead to systemic transformation.

Unlike previous studies, our analysis of land governance transformation considered four strategic aspects: triggers, actors, leverage points, and agency. We found that the transformative agents and agency in land governance emerged only when certain triggers destabilized the incumbent land governance. Our analytical framework allowed us to analyze the possible failure transformation points by considering the interrelation between agencies and leverages. Not all actors had access to leverage or can exercise agency. By utilizing the four strategic aspects while focusing on the interplay of actors, we could better understand why certain actors fail in making change.

We went through articles with observed governance change and unobserved governance change. In those cases, there were variety of agencies and leverages where land governance changes occurred. In understanding these cases, it is insufficient to analyze why changes did not happen only by observing the network allowing transformative action, actors, and their aim or agency. Instead, all factors must be combined and analyzed as a whole picture. Departing from land governance as 'the politics of who gets what rights and access to which land, for how long and for what purposes, and of who gets to decide' (Borras et al., 2013), it is important to link all four strategic aspects of actors, agencies, and leverages while acknowledging triggers (Fig. 1). Considering land systems are increasingly affected by changes outside the immediate environment (Verburg et al., 2015), analyzing land governance through the four strategic aspects allows us to understand why land governance changes one way and not another.

However, we still lack an understanding of why certain governance models are preferred over others. Our analysis suggests that the answer may lie in the timing of when actors can leverage their power to make or prevent change, particularly considering the greater effort required for transformative actors to do so compared to incumbent actors. It is important to note, that this article did not directly address how land governance transformation could improve the functions of land governance, nor did it examine cases where agencies from emerging and incumbent actors were explicitly explored and discussed. To advance this research area, future studies could explore the regime and agency of transformative actors, focusing on the challenges they faced. Our analysis also highlighted the potential risks of delay in building up power by emergent actors, which might miss the opportunity for change. Thus, future studies could explore the use of Strategic Niche Management (Rotmans and Loorbach, 2010) or 'safe spaces' (Falayi et al., 2020; Pereira et al., 2015) to increase the interaction among actors, accelerate agency buildup, and address power imbalances.

Our analysis was descriptive in nature, aiming to synthesize a textual narrative. While we saw the textual narrative of governance change in the peer-reviewed articles and book chapters, there are aspects that worth further exploration. Future research can benefit from searching outside the peer-reviewed article and include empirical cases. For example, the Land Governance Program Map & Database houses 853 cases, with 776 completed cases. Using the database of completed cases may further elaborate our framework with details of which leverage points led to successful land governance transformation.

Additionally, we did not consider the five core themes of the Land Governance Assessment Framework (LGAF) (Deininger et al., 2012. Future research may further elaborate our framework (Fig. 5) with empirical cases from each core theme of the LGAF to see different dynamics of different themes. Reports published by Millennium Challenge Corporation (MCC) or US-AID may provide detailed dynamics on how local actors make use of transformative agency to intervene in the dominant governance practice.

CRediT authorship contribution statement

Faris Salman: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. **Akihisa Mori:** Supervision, Writing - review & editing.

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.

Data Availability

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

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.landusepol.2023.106920.

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