

## **Predictions from Transitions Theories, Dynamic Capabilities and Real Options Theory on the Role of Governments as Agents of Sustainability.**

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### **ABSTRACT**

In a bid to complement transition research, we brought views from Dynamic Capabilities and Real Options theory. We observed that both Dynamic Capabilities and Real Options theory provide important insights for governments in determining a suitable and successful policy (mix) for sustainability. We performed a qualitative literature analysis to answer our research question “what is the role of governments as agents of sustainability?”. Our findings suggest that these insights could help to fulfil the potential of governments acting as active agents of sustainability transitions. To build integration between these disciplines, we suggest further appreciation on integrating Transition literature with Dynamic Capabilities and Real Options theory.

**Keywords:** Governments, sustainability, dynamic capabilities, real options, transitions

# **1 INTRODUCTION – RESEARCH ON THE ROLE OF GOVERNMENTS**

In 1987, the United Nations World Commission on Environment and Development defined sustainable development as: “[the] development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). Since then, sustainability challenges, such as, climate change and resource depletion have sparked a broad variety of responses within and beyond the academia.

The emergence of the research field of “sustainability transitions” has stemmed from these developments (Markard et al. 2012). Transition literature entails a vested notion that sustainability transitions are inherently political processes (Loorbach et al. 2017). Taking a closer look, sustainability transitions are often explicitly entailed with the purpose to develop policy recommendations towards progressing transitions (de Goyeert et al., 2016). Thus, the extant Transition literature discusses the types of policies that manage, govern and facilitate transitions (Gazheli et al. 2015; Kemp et al. 1998). In addition, traditional policy scholars have also adopted the transition perspective to reflect and evaluate transition policies (Loorbach et al. 2017).

To this end, governing transitions is defined as public decision-making beyond, but also including, the government. In turn, governance is the practice where governments develop policies to interact with a diversity of societal actors (Loorbach 2010) and thus, the discipline typically perceives governments acting as agents of sustainability transitions (Brown et al. 2013; Fischer and Newig 2016). In this chapter, our focus is on the spectrum of political agency. Herewith, we mean that we emphasise the agency of governments and political actors, and leave other societal actors influencing on transitions to lesser attention. We perceive governance primarily as political process, and thus, inherently as political agency.

While transition can be perceived as inherently a political process, the literature stands accused for macro dominance (De Haan and Rotmans 2018; Gazheli et al. 2015). Another critique on Transition literature questions if agency is sufficiently embedded in the discipline (De Haan and Rotmans 2018; Fischer and Newig 2016; Koistinen et al. 2020; Teerikangas et al. 2018). Moreover, Loorbach et al. (2017) argued that realizing the full academic and societal potential, transition literature would require further appreciation on more diverse views from other disciplines.

In a bid to respond to these critiques, we have built this conceptual chapter bearing two objectives in our minds. First, we aim at bringing more appreciation on agency in sustainability transitions by exploring *governance as political agency*. Second, we adopted the alternative perspectives of Dynamic Capabilities and Real Options theory to broaden the scope of the dominant Transition literature perspective beyond the macro-level. While these three perspectives have largely been developed independently from another, we suggest each theory providing insights vis-à-vis the study of governing sustainability transitions.

The first alternative perspective, Dynamic Capabilities, has focused on how governments search for new innovation governing policies, and argues that new capabilities are needed in the public sector to deliver mission-oriented policies (Kattel and Mazzucato 2018). Moreover, Dynamic Capabilities takes an esoteric approach and provide models for organizations to transform their resource base from one stage to the next to gain competitive advantage (Eisenhardt and Martin 2000; Teece et al. 1997).

The second alternative perspective, Real Options theory, predominantly adopted in finance and strategic management literature (Trigeorgis and Reuer 2017), posits an opportunity for sustainability transitions to be developed by having a stronger focus on solutions-oriented work (Miller et al. 2014). Real Options provide a strategic toolset for governments and accounts for

the technological and market uncertainties and irreversibilities that may impact innovative and more sustainable thinking (Avadikyan and Llerena 2010).

The separation amongst these theories of governing transitions is unfortunate for several reasons. First, the importance of common concepts dealing with future uncertainty, and their focus on transformation processes, suggests that important connections exist that may enhance our understanding of governing transitions and its relationship to sustainability. While transitions theorists argue that transformation into a more sustainable state should be treated as a multilevel, multiphase process of structure change in societal systems (Loorbach 2010), real options theorists design strategies that help organizations respond to transitional policy environments (Doh and Pearce 2004). Second, if governments are assumed to be agents of economic and sustainable growth that seek to form dynamic and explorative policies themselves (Karo 2018), the ability to experiment and explore – which is key for a successful entrepreneurial state (Mazzucato 2013) – requires dynamic capabilities that can effectively reconfigure resources (Kattel and Mazzucato 2018; Mazzucato 2018).

Against this background, our chapter seeks to respond to the following research question: *“What is the role of governments as agents of sustainability?”* To answer our research question and meet the objectives set above, we reviewed previous literature from the three literatures to create a basis in understanding Transition literature, Dynamic Capabilities and Real Options theory in relation to governments as agents of sustainability. The qualitative literature analysis (Marshall and Rossman 2014; Miles and Huberman 1994) was conducted in two iterative stages. First, we identify the main concepts and conducted the literature review. Second, we use constructive research to synthesize the findings from the previous literature and to develop integration between the three disciplines.

This chapter defines agency through the lens of sociology. In sociology, agency is often interpreted as the human capability to make free choices and have an impact on one's environment (Giddens 1984). Agency is perceived to involve the possession of power, the “ability to engage in purposeful action” and as “having the capacity to take an action” (Stones 2005; Tourish 2014). However, agency may also be extended to include non-human, non-individual entities (Latour 2005). Thus, the agency of governments can be interpreted to include both the human actors, e.g., legislators, and the non-human entity of a “government”.

The remainder of the chapter proceeds as follows: the next section provides an overview of Transition literature, Dynamic Capabilities and Real Options theory literature as applied to policy decisions involving development of resources and economic performance. This conceptual review provides an explicit statement of the insights, assumptions, and propositions that have been derived from each of these theoretical perspectives. The purpose of this overview is to emphasise the similarities and differences in the assumptions and predictions offered by each theory. The last section discusses opportunities for future research to develop a more robust, integrated conceptualisation of the role of government in sustainability transitions.

## **2 TRANSITION THEORIES, DYNAMIC CAPABILITIES AND REAL OPTIONS THEORY: INSIGHTS, ASSUMPTIONS AND PREDICTIONS**

In this section we identify the main concepts of the literature review. Our results are summarised in Table 1.

## **2.1 Transition literature**

### *2.1.1 Overview*

The growing field of sustainability transitions is developed to address the sustainability challenges that the global system is now encountering (Köhler et al. 2019). The objective of sustainability transitions is to transform societies to greater degree of sustainability. Thus, sustainability transitions are conceptualised as fundamental transformations toward more sustainable modes of production and consumption (Markard et al. 2012).

Transition literature is concerned with understanding environmental problems as inherent in existing socio-technical systems and the stable configurations of institutions, techniques and artefacts, as well as the rules, practices and networks that determine the typical development (Rip and Kemp 1998). Transition literature analyses changes in societal subsystems, such as energy or transport, the focus being on social, technological, and institutional interactions (Loorbach et al. 2017). Transitions are seen to involve a broad range of actors and typically take place over considerable timespans, such as, 50 years and more. While actors are acknowledged, transition literature does not rely on them (De Haan and Rotmans 2018). Taking a closer look, literature stands accused for not addressing actors and agency explicitly (Fischer and Newig 2016) and agency remains often poorly conceptualised in Transition literature (de Haan and Rotmans, 2018). This critique considers also political agency.

The current Transition literature draws from four dominating theories that have been developed simultaneously: (1) Transition Management, (2) Strategic Niche Management, (3) Technological Innovation System and (4) the Multi-level Perspective on Socio-technical Transitions (Köhler et al. 2019; Markard et al. 2012).

### *2.1.2 Primary assumptions*

All the transition frameworks embrace a systemic perspective to capture co-evolutionary complexity and key phenomena such as path-dependency, emergence and non-linear dynamics (Köhler et al. 2019). The vested idea in Transition literature is that the existing system is an outcome of continuous development over many decades and the alignment and co-evolution of the different entities and practices that has led to mutual dependence and resistance to change (Geels 2002). The primary source of stability in these systems is assumed to be the shared rules, norms, expectations and beliefs that guide the behaviour of the different actors within the system (Sorrell 2018).

To this end, all the frameworks draw on the concepts of regime and niche. The concept of regime is portrayed as an institutionalised, persistent, path-dependent, and rigid structure that favours stability and allows only incremental advancement (Kemp et al. 1998). In turn, niches are conceptualised as local and dynamic protective spaces that facilitate the development and introduction of radical innovations (Kemp et al. 1998). The objective of Transition literature is to destabilize and reorient existing regimes toward sustainability. Transition literature assumes markets being an outcome of continuous co-evolution and resistance to change, and thus, markets are assumed stable.

Going forward, both the government and market environment are typically seen to represent the current regime and the power structures embedded in the existing system (Geels 2002, 2014). Protection and nurturing of niches in the early stages of a transition are crucial since path-breaking innovations cannot compete within selection environments in the existing socio-technical regime (Kemp et al. 1998; Schot et al. 1994). Examples of such protection include, for example, subsidies and tax incentives. With such protection, the niches are expected to develop and enter broader and more diverse markets, and the need for protection gradually

diminishes as the niche innovations become competitive and begin to contribute to regime shifts (Smith and Raven 2012). Therefore, markets can be assumed as an outcome of bidirectional movement of market and government actors.

As such, according to Fischer and Newig (2016) governance is stated as the leading agent of a transition and thus governments are perceived as the leading actors of the process of governance. Capacities leading to transitions are suggested to be quite different between the local and national levels. Zooming closer, national governance and the actors (e.g. ministries or government agencies) on national governance are assumed capable of managing sustainability transitions due to their actual and perceived power.

### *2.1.3 Main theoretical predictions*

In general, Transition literature highlights the role of governance (e.g. de Gooyert *et al.*, 2016; Fischer and Newig, 2016). Aspects of both the sociotechnical system and sectoral policy regimes need to change structurally to become more sustainable, and policy developments are required to help engender these changes (Kern and Howlett 2009). Taking a closer look, transitions are described as inherently political processes, in the sense that different individuals and groups will disagree about desirable directions of transitions, about appropriate ways to steer such processes and in the sense that transitions potentially lead to winners and losers (Köhler *et al.* 2019).

Thus, governments play an important role in niche (development), while initiatives towards transitions mostly emerge in business communities and civil society. Recently, scholars have moved beyond single policies in initiating transitions. Different policy mixes are stressed important in reacting on traditional market failures, such as, underinvestment in R&D or negative environmental externalities (Kern *et al.* 2019; Kivimaa and Kern 2016). To this end,

Transition literature predicts that the stimulation of innovation and technological change require different types of policy instruments. Second prediction emerging from Transition literature is that governments and policymakers should create and support room for niches and experiments.

## **2.2 The Dynamic Capabilities View**

### *2.2.1 Overview*

The Dynamic Capabilities view is a theoretical perspective which enhances our understanding how organizations change in response to their increasingly turbulent and complex environments. Contrast to other theories of firm change, Dynamic Capabilities fundamental concept is that of capability. Teece (2014), the founder of this view, defines capability as a set of current or potential activities that utilize the organization's productive resources to make and/or deliver services or products. Capability in an organizational context can be further analysed into ordinary and dynamic. An ordinary capability involves the performance of operational, administrative functions so an organisation can 'make its living' (Winter 2003). A dynamic capability on the other hand, is a capability used to extend, modify, change, and/or create ordinary capabilities (Teece and Pisano, 1994). The term 'dynamic' "refers to the shifting character of the environment; certain strategic responses are required when time-to-market and timing is critical, the pace of innovation accelerating, and the nature of future competition and markets difficult to determine" Teece and Pisano, 1994, p. 538).

In the public management domain, Dynamic Capabilities helps governments and public organizations deal with uncertainty and complexity inherent to innovation processes (Piening 2013). Thus, observing the governance and politics of transformations towards sustainability (Patterson et al. 2017), the high turnover rates among elected or appointed executives (McCabe

et al. 2008) as well as personnel instability (Andrews et al. 2016), and a deep routed culture on ad-hoc problem-solving procedures (Gilmore and Krantz 1991), can diminish the ability of governments to implement change underlines the potential value of dynamic capabilities in public sector settings. Elaborate reviews of the Dynamic Capabilities view in public management literature are offered by Piening (2013) and Rosenberg, Hansen and Ferlie, (2016).

Dynamic Capabilities offer broadly two primary conceptual insights in the context of public management according to Piening (2013). Although, how organizations adapt to changing conditions is hardly novel to management scholars, how governments process strategic change or why many fail to do so remains a question. In that sense, this perspective delves into the underlying process of organizational change and provides insights on the innovation process itself. Second, the Dynamic Capabilities guide the learning processes that underlie capability building. Capabilities arise in part from learning, from organizational resources, and from organizational histories (Teece, 2014). This enables organizations to accumulate experience with the innovation and establish operational routines for its continuing use (Piening 2011). Taken together, these insights suggest that by gaining insight into the capabilities that are required, governments can develop governing transitions policies by moving away from existing support-and-measure approaches where they find market failures and try to fix them to policies of lead-and-learn, where governments create and shape markets and importantly, learn through social engagements and coordination (Kattel and Mazzucato 2018).

### *2.2.2 Primary assumptions*

There are several assumptions underlying this perspective. As regards the boundary conditions, dynamic capabilities have utility “in environments of rapid technological change” (Teece et

al., 1997, p. 509). Another seminal article challenges this view and argues that dynamic capabilities hold true when markets are moderately dynamic, and stress that in high velocity markets, dynamic capabilities are nothing but “simple, experiential, unstable processes” (Eisenhardt, 2000, p. 1106). These authors describe high-velocity markets as “ones in which market boundaries are blurred, successful business models are unclear, and market players ... are ambiguous and shifting”. Both articles describe a Schumpeterian world where dynamic capabilities become present. Peteraf et al., (2013) offers to reconcile these two contrasting views in their article. The authors conclude that “regardless of the level of market dynamism or the nature of dynamic capabilities, ... may enable ... attain a sustainable competitive advantage in certain conditional cases”.

As regards the role of political agency, dynamic capabilities is not about doing things right, but about doing the right things (Teece, 2014). As such, dynamic capabilities involve a combination of organizational routines and entrepreneurial leadership/management. The Dynamic Capabilities view helps explicate the role political agency plays in a market economy. It assumes that organizations hold the powers in both “identifying and capturing new strategic opportunities, in orchestrating the necessary complementarities and other organizational assets, and in inventing business models and new organizational forms” (Augier and Teece, 2009, p. 410).

### *2.2.3 Main theoretical predictions*

Under Dynamic Capabilities, a recent view emerging from the literature is that new justifications of government intervention are needed that go beyond fixing market failures. The primary prediction suggests that moving towards a more sustainable future can be solved through dynamic public-private partnerships, which until now have been constrained by the

assumption that government was seen only as a fixing markets agent (Katel and Mazzucato, 2018). The Dynamic Capabilities view enacts this narrative of reforming governments in the face of volatile environments. It predicts that governments can build and reconfigure internal resources and competences which are then integrated with other organizations within more partnerships and collaborations (Rosenberg Hansen and Ferlie 2016). This has been supported also empirically, where governmental organisations use Dynamic Capabilities as a strategic approach to pursue continual organizational improvement to achieve new resource configurations, resource creation, and improved effectiveness (Pablo et al. 2007).

The other prediction offered by Dynamic Capabilities, is on understanding the role of public resources. This perspective involves building and orchestrating resources to perform a changing initiative of tasks and activities (Teece, 2014). The resources of strategic interest have been coined by Barney (1991) as those resources that are valuable, rare, inimitable, and non-substitutable (VRIN). In the context of public management, the VRIN criteria argue that resources should be valuable, which is also of relevant focus in public management organizations. However, the criterion that resources need to be rare and inimitable is not a suitable criterion in a governmental setting. The rareness criterion suggests that few other organizations have the resources available. For the inimitable criterion, it is important for the organization to have the resources for itself, to gain advantage over other organizations. However, in governmental organizations the goal is not to control resources that others do not have or cannot get. The goal is to fulfil the organization's mission, and it can do that by sharing resources and letting other organizations (private or public) imitate them through collaboration. Finally, it is also of key importance in governmental organizations that they are organized in relation to structure, control and compensation systems to fully exploit resources (Rosenberg Hansel and Ferlie, 2016).

## **2.3 Real Options theory**

### *2.3.1 Overview*

Real options theory has emerged as vitally important both for investment decisions and for strategy formulation. It suggests that decisions are guided by the strategic exploitation of flexibilities and irreversibilities proper to the sequential logic of an investment (McGrath 1997). While the technical details of option analysis are complex and not often employed in practice, the underlying principles are intuitive (Grant 2016). The term real option refers to the ‘right, but not an obligation, to take some future specified action at a specified cost’ (Trigeorgis and Reuer 2017, p. 43). Broadly speaking, two streams of literature leverage real options theory. The real options ‘valuation’ approach, developed in economics and finance, formally assigns a value to the flexibility inherent in waiting for prospective uncertainty to be resolved (e.g. Locatelli, Invernizzi, and Mancini, 2016). This approach deploys mathematical or simulation models to enable better decision-making. Conversely, the real options reasoning approach applies verbal theorising without the use of analytical modelling to consider the value of flexibility (e.g. Krystallis, Locatelli and Murtagh, 2020).

In terms of strategy formulation, real options theory offers two types of real options. Growth options allow governmental organizations to make incremental investments in several future opportunities without the need to commit to them. Flexibility options relate to the design of policies that permit adaptation as circumstances undergo change. In a UK government guidance document, the relevance of the real options theory is acknowledged. It recognises the need on adaptation for climate change and recommends flexible investment (HM Treasury 2009). Both types of options can co-exist.

Two key insights underlie the application of real options theory according to Trigeorgis (2017). The first one is the trade-off between commitment and flexibility. This insight reflects on the importance of ‘staging’ choices (Hambrick and Fredrickson 2001). For example, options thinking embedded in governing transitions enables governmental organisations from committing completely to a policy. Instead, by introducing decision points at various stage gates, they have the option to delay, modify, scale up, or abandon the policy. The second insight is between competition and cooperation. This insight lies at the heart of competitive strategies and organization’s interactions with others and relates to strategic choices concerning whether it is better for organizations to pursue independent, competing R&D activities or whether they should cooperate via joint research ventures (Smit and Trigeorgis 2012).

### *2.3.2 Primary assumptions*

Two primary assumptions guide the real options perspective. First, regarding the boundary conditions, real options assume organizations are better off cooperating than competing when markets are uncertain and dynamic (Trigeorgis, 2017). In transitional policy environments, corporations affected by governing transitions policies can use options thinking strategies to effectively respond to uncertain and unstable market environments (Doh and Pearce 2004).

As regards the role of political agency, real options theory assumes governments as organizations and civil servants as individuals working in these organizations are able to make implicit and explicit claims about future follow-on opportunities (Leiblein 2003). This assumption assumes that through real options valuation we could estimate what the project or initiative would be worth if it was traded in the free market. However, governmental projects and policy initiatives are not traded in any economic market. Despite that, market-like

behaviour can be adopted for those involved in the evaluation of the project. The NASA technology assessment which used real options valuation is an example (Shishko et al. 2004).

### *2.3.3 Main theoretical predictions*

Kim et al, (2017) proposed that a governing transition policy environment creates unique opportunities for corporations to exercise options thinking and undertake beneficial entrepreneurial initiatives so they can harness policy changes to their advantage. This prediction suggests that governments are facing continuous pressure to redefine their role in both social and economic aspects. This pressure takes the form of privatization, deregulation, and market liberalization (Kim et al. 2017).

The second prediction through which the theory informs political agency towards sustainability transitions, is that governments can avoid risks and investment lock-ins. For example, Avadikyan and Llerena, (2010) suggest governments in the context of hybrid vehicles, could combine short-term and long-term technology policies and avoid technological lock-ins by using a compound options strategy – an option to receive another option as the underlying - to contribute to the transition towards zero emission. Similarly, the Indonesian government made use of a compound options strategy to inform their decision making regarding the investment towards a hydropower project (Kim et al. 2017).

‘INSERT TABLE 1 HERE’

### **3 FUTURE RESEARCH AVENUES**

The purpose of this section is to assess the similarities and differences of the examined disciplines, build possible integration between the fields and highlight opportunities for future research to link the Transition literature, Dynamic Capabilities and Real Options regarding the role of governments, both empirically and conceptually. To this end, our implications are three-fold. First, we pay attention to the market assumptions in the three different disciplines. Second, we draw attention to the dependencies among various actors. Third, we stress the perception on micro- and macro-levels of governance and approaches to change.

#### **3.1 Responses to different levels of market dynamism**

One shortcoming that emerged from the literature review is that Transition literature does not account for market dynamism. Transition literature assumes that markets are stable, and governments play a more subtle role since transitions mostly depend on business communities and on civil society (Smith and Stirling 2010). Thus, Fischer and Newig (2016) argued that governments strongly depend on the market. Hence, as illustrated in the review, this approach equips governments with a rather *passive* response as regards market dynamism. This shortfall can be mitigated by leveraging the Dynamic Capabilities and Real Options to consider market dynamism and governance. Dynamic capabilities equip governments with the capabilities to undergo continuous adaptations to sustain their position. In that sense, the review results suggest that the response is indeed *reactive* due to market dynamism. Through the lens of Dynamic Capabilities, governments can successfully adapt their governance by reactively developing dynamic capabilities at the organization level to change and adapt their internal resources and operating capabilities. Lastly, by employing Real Options logic, governments are better equipped in the face of increased uncertainty. The options logic encourages

governments to experiment and adopt a *proactive* exploration of uncertainty. For example, governments can employ compound options in their governance approach to revolutionise their thinking. The above responses to market dynamism are summarised in Figure 1. Responses to market dynamism.

‘INSERT FIG 1 HERE’

### **3.2 Dependencies on other institutions and resources**

The dependencies between institutions from different actor typologies and the role of government deserve more attention, considering governments are seldom considered to act independent from other systems and actors. While Transition literature suggests that governments are the leading agents of transitions, the literature also suggests governments depend on the market for jobs, tax income and new technologies (Fischer and Newig 2016). This notion supports our finding that governments have a more *passive* role as regards sustainability transitions. However, Transition literature is quite advanced regarding different ‘buckets’ of actor typologies, and there is great potential how the views of Dynamic Capabilities and Real Options can further advance our understanding on how various actors interact. For example, Transition literature such as the MLP (Geels 2002) provide an elaborate view of the different roles of various institutions e.g. niche actors (e.g. start-ups) can create new markets, whereas regime actors (e.g. government) can provide changes in policy to favour those markets. In this set up, Dynamic Capabilities can offer the comprehensive tools for

governments to build and reconfigure their internal resources and competences which can then be integrated with other organizations (e.g. niche actors) establishing more partnerships and collaborations (Kattel and Mazzucato 2018). Real Options then can offer insights as to when such collaborations and partnerships are beneficial, by evaluating the social and economic aspects surrounding them. This comprehensive valuation provides insights to inform government decisions about the future and informs governments which options (i.e. strategies) will be more favourable to establish (e.g. privatization, deregulation, and market liberalization).

### **3.3 Levels of analysis in governing sustainability**

Based on our review, we observe that the three research fields have at least two different levels of analysis. First, we note that the three fields operate on *different levels of the society*. Echoing the introduction of this chapter, research on sustainability transitions is inherently interested in societal changes to sustainability. To this end, Transition literature emphasises the macro-level of the society. We noted that the underpinnings of Dynamic Capabilities and Real Options theory differ from the Transition literature. As the Dynamic Capabilities view embraces the capabilities how organisations react and adapt in unpredictable environments, the field of study can be seen to revolve around the meso-level of the society. In the Dynamic Capabilities view, the meso-level is depicted through the organisational level. In turn, Real Options theory can be perceived as representing the micro-level of the society. Traditional Real Options literature studies strategy formulation and modelling, in which the focus is on the macro-level. Contemporary research on Real Options, however, emphasises the role of decision makers via implications of bounded rationality, information imperfection, behavioural biases and cognitive limitations, and managerial incentives (Trigeorgis, 2017). Thus, the extant Real Options theory is seen to depict the micro-level.

Second, we observe that the three disciplines entail *different approaches to change*. We note that the three fields perceive governments acting in bidirectional movement with the business environment. Yet, their views on the role of government are contrasting. While the Transition literature highlights the role of governance and governments as the most powerful actors of sustainability transitions, the change approach is managed top-down. Thus, governments may act as *gatekeepers* for sustainability transitions as the dynamics between other social environments is often rather passive. Zooming closer, Transition literature uses governance as the unit of analysis in exploring changes to sustainability. Instead, in Dynamic Capabilities, governments are seen to stabilize volatile markets. Taking a closer look, the Dynamic Capabilities view may help governments to deal with uncertain and (semi)dynamic market environments as well. Therefore, Dynamic Capabilities can be understood as a mix of top-down and bottom-up change approaches. In Real Options theory, governments are seen to *create opportunities* for organisations to harness policy changes to their advantage. In other words, Real Options helps market actors through a bottom-up approach and thus our assessment concludes that governments may act as *gamechangers*, setting long-term plans and contingencies by laying options that enable strategic flexibility. Both contrasting levels of analysis are illustrated in Figure 2.

‘INSERT FIG 2 HERE’

Finally, we observe that successful political agency calls for various forms of collaboration. This notion is emphasised in all three literatures. First, Transition literature draws attention to the fact that transitions need policy mixes that are formed via networks of governments and other societal actors. Second, Dynamic Capabilities highlight the role of public-private

partnerships in collaboration with governments. Third, Real Options theory stresses the balance between cooperation and competition. Thus, our findings imply that successful political agency requires not only policy mixes but also public-private partnerships and optimised cooperation with possible competitors.

#### **4 CONCLUSION**

In this chapter, we consider three theoretical perspectives used to understand governance, specifically, the role of governments towards sustainability transitions. We consider a well-established dominant perspective (Transition literature) and newer but increasingly common alternative perspectives (Dynamic Capabilities and Real Options). Certainly, the dominant perspective to explaining governing transitions is an important view for sustainability and the role of governments. We highlight certain shortcomings were the dominant perspective can be infused by the two alternative perspectives. As empirical research exists which independently supports each of these perspectives, future research will require a coherent and systematic approach that rigorously tests potential integrations between these theories of governing transitions.

We argue that despite these contrasting views, a thorough understanding on diversity embedded in different fields of research and stronger incorporation of different levels of society and approaches to change would ultimately enrich the entire process of governing sustainability. Thus, we call for more adventurous research openings to broaden the view on governments as agents of sustainability.

Bearing this in mind, we observe that especially Real Options theory could serve as beneficial approach in creating successful transition policies for governments. The Real Options theory bears a notion that it is possible to provide a most optimal choice for strategy building.

Arguably, Real Options approaches are still an infrequently exploited means in building sustainability strategies for governments. As Real Options theory may help governments to avoid unnecessary risks and investment lock-ins, we suggest that Real Options theory could be applied more broadly in governing sustainability. To this end, we propose Real Options theory as an important non-human agent for governing sustainability transitions.

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Table 1: Summary results of literature survey

	<b>Transition literature</b>	<b>Dynamic Capabilities</b>	<b>Real Options Theory</b>
<b>Insights</b>	Analyses changes in societal subsystems, such as transport, the focus being on social, technological, and institutional interactions.  Transitions emerge through interaction between various actors.	Process of organizational change and insight on the innovation process.  Dynamic capabilities guide the learning processes that trigger capability building.	Trade-off between commitment and flexibility.  Trade-off between competition and cooperation.
<b>Assumptions</b>	<i>Market:</i> Governments play an important role in niche development. Initiatives towards transitions mostly emerge in business environment. Markets assumed stable and portraying the current regime.  <i>Political agency:</i> Governance the leading agent of a transition.	<i>Market:</i> Regardless of market dynamism, DCs enable governments to attain sustainable competitive advantage.  <i>Political agency:</i> Governments identify new strategic opportunities, orchestrate organizational assets and invent new business models.	<i>Market:</i> Governments are better off cooperating than competing when markets are uncertain and dynamic.  <i>Political agency:</i> Governments as organizations and civil servants as individuals are able to make implicit and explicit claims about future follow-on opportunities.
<b>Predictions</b>	The stimulation of innovation and technological change require different types of policy instruments.	Governments can build and reconfigure internal resources and competences which are then integrated with other organizations	Governments are facing continuous pressure to redefine their role in both social and economic aspects. This pressure takes the form

Governments should create and support niches and experiments. within more partnerships and collaborations. of privatization, deregulation, and market liberalization.

On understanding the role of public resources. Governments share resources and letting other organizations (public or private) imitate them through collaboration. Governments by adopting options strategy can avoid risks and investment lock-ins.

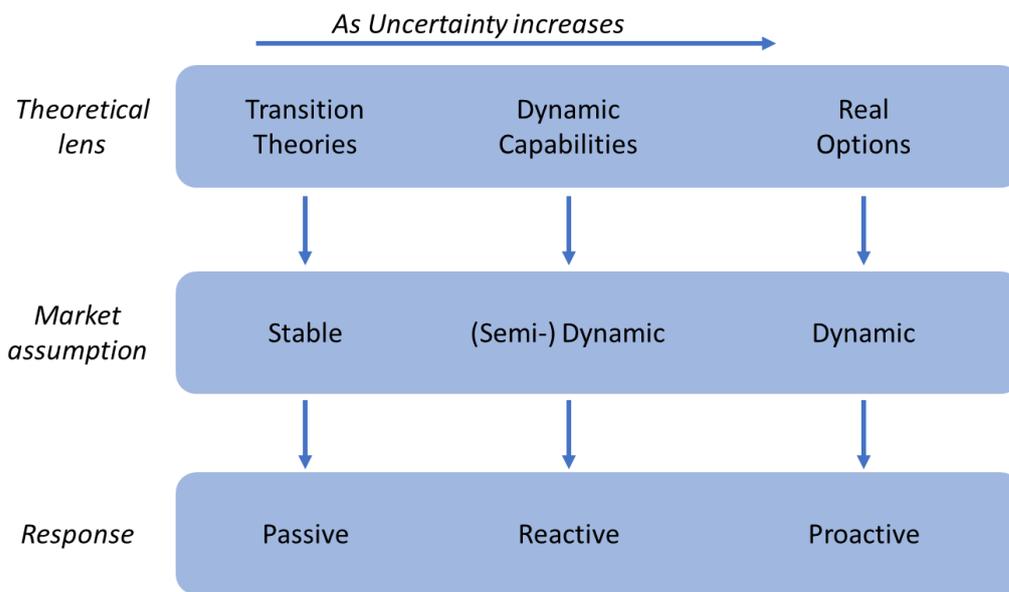


Figure 1. Responses to market dynamism

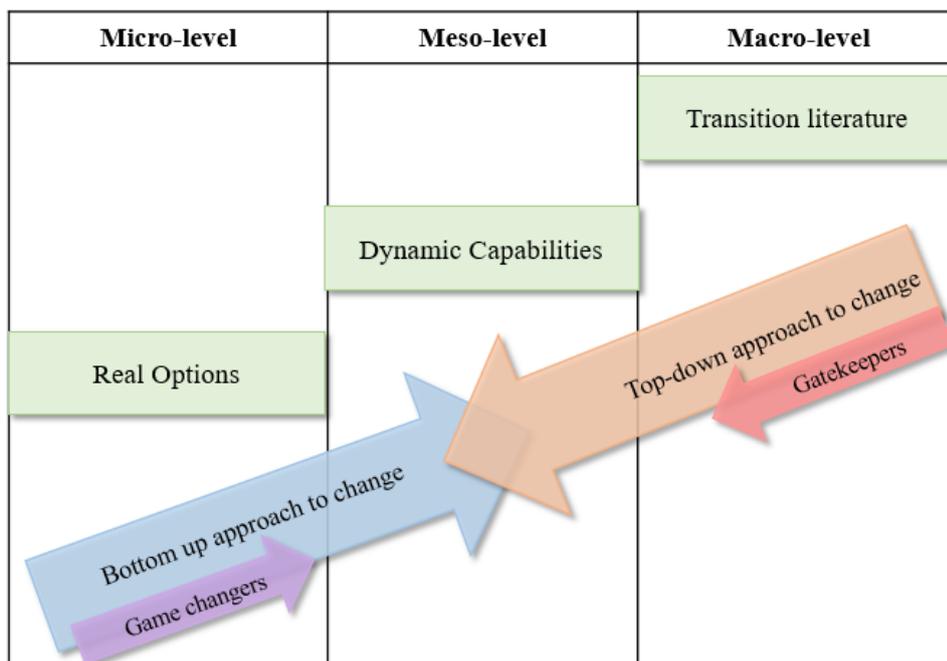


Figure 2. Different levels of analysis and approaches to change

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