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Review

Advancing adaptive governance of social-ecological systems through theoretical multiplicity

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ABSTRACT

In recent years there has been rising scientific and policy interest in the adaptive governance of social-ecological systems. A systematic literature review of adaptive governance research during the period 2005–2014, demonstrates a vibrant debate taking place that spans a variety of empirical and theoretical approaches. The particular strength of adaptive governance is that it provides a theoretical lens for research that combines the analyses of novel governance capacities such as adaptive capacity, collaboration, scaling, knowledge and learning. As a way to give greater depth and analytical rigour to future studies over the next decade and beyond, we highlight the added value of theoretical multiplicity (i.e., focusing on the combination of theories to address complex problems). We argue that theoretical multiplicity can encourage stronger synergies between adaptive governance and other theoretical approaches and can help address epistemologically grey areas in adaptive governance scholarship, such as power and politics, inclusion and equity, short term and long term change, the relationship between public policy and adaptive governance.

1. Introduction

In the last decade there has been increasing interest in the governance of complex sustainability issues. Adaptive governance has evolved as an analytical approach for understanding natural resource governance that takes as its foundation the interdependence of social and ecological systems (Dietz et al., 2003; Folke, 2007; Folke et al., 2005). In a world that changes both slowly and abruptly in unpredictable directions, the notion of adaptive governance brings attention to how social-ecological systems can adapt to constantly changing conditions, especially where decisions need to be taken under high uncertainty (Brugnach et al., 2008; Hurlbert and Diaz, 2013). Adaptive governance is in line with the emergence of new modes of governing in which multiple actors are involved, interactions within and across state, private sector and civil society are key and decisions require action across multiple scales and levels (Termeer et al., 2013; Vogler and Jordan, 2003).

The foundations of adaptive governance can be traced back to ecology and conservation science, organisational and governance studies although there is a general lack of consensus in how scholars have advanced adaptive governance. Initially formulated as the adaptive management approach, the theory brought emphasis on integrating ecosystem dynamics with management structures, fostering experimentation in policy design as well as anticipating surprise as a tool for learning (Berkes et al., 2000; Gunderson, 1999; Holling, 1973; Lee, 1999). In this article we follow Boyle et al. (2001: 28) definition of adaptive governance wherein "governance is the process of resolving trade-offs and charting a course for sustainability". Adaptive governance as a theory, further brings attention to actors' involvement in cross-scale interactions, collaborative arrangements with self-organising capabilities that extend beyond government, such as networks and partnerships, required for adaptive governance to be operationalised on a large-scale basis (Folke et al., 2005; Huitema et al., 2009; Olsson et al., 2006). Adaptive governance therefore draws its inspiration from other theoretical lens such as adaptive management and collaborative ecosystem management but it is also distinctive. Its distinctiveness is that it aims to expand the focus from the management of ecosystems towards addressing the complexity of "broader social contexts" within which people make decisions and share power (Dietz et al., 2003; Duit and Galaz, 2008; Folke et al., 2005: 444). Examples include discrete complex decision making arenas, such as water governance (Cosens and

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Williams, 2012), the management of coastal areas and livelihoods (Bunce et al., 2010) and adaptation to climate change and natural hazards (Djalante et al., 2013).

The aim of this paper is to examine adaptive governance as a theory of environmental governance. In particular, we seek to evaluate how adaptive governance as a theoretical lens is applied to real-world problems and explore the potential value of theoretical multiplicity in progressing new understandings of adaptive governance. Theoretical multiplicity can be defined as a meta-paradigmatic approach which recognises the value of exploring areas where theories overlap or can inform each other without undermining the distinctiveness of individual theories (Dewulf et al., 2009; Termeer and Dewulf, 2012). Theoretical multiplicity rests on the notion that, by using a variety of theories, a more nuanced understanding can be attained of 'wicked' societal and sustainability issues. Specifically we argue theoretical multiplicity can be of added value since it can cast new light on how to conceptualise complex issues that are currently epistemologically 'grey areas' of adaptive governance scholarship, for instance issues that pertain to the conceptualisation of power and politics. In this way our paper builds on recent work such as the recent review article on adaptive governance by Chaffin et al. (2014). As Chaffin et al. (2014) argue addressing epistemologically grey areas requires of governance scholars to "develop and refine multiple methods" for characterising adaptive governance. We argue that alongside method development and refinement, the conceptual development of adaptive governance can be advanced through recognising and engaging with theoretical multiplicity.

We draw on systematic review methods as a way to develop conceptual insights on the current state of knowledge in adaptive governance, focusing on the period 2005–2014. Systematic review methods differ from traditional literature reviews in that they can yield a comprehensive assessment of the state of knowledge by applying rigorous, objective and transparent steps and criteria for reaching conclusions from a body of scientific literature (Biesbroek et al., 2013a; Petticrew and Roberts, 2006). Chaffin et al. (2014) also draw upon a literature review to provide an overview and brief chronology of the last decade (2004–2013) of adaptive governance scholarship focusing on key references of existing theoretical and empirical work in the field. However, by drawing upon systematic review methods we attempt to broaden this first attempt at synthesising this literature by elucidating a clear, transparent and easily replicable methodology for selecting and categorising papers that on the one hand reduces researcher bias in the interpretation of the literature while on the other furnishes a detailed account of the types of empirical, methodological and conceptual changes within this emerging field.

The paper is organised as follows. Section 2 outlines the methodology of our systematic literature review, the focus for which was scientific peer reviewed articles. Section 3 is a combined results and discussion section which is elaborated in three parts. Section 3.1 describes the literature in terms of article distribution by year, article orientation (i.e., in terms of having a conceptual or case study orientation) their thematic (e.g. focus on water resources) and regional (i.e., developed or developing country focus) emphasis. In Section 3.2, we explore prominent features of adaptive governance as well as adopt a more critical standpoint on how it is applied as a theory. In Section 3.3, we set out the notion of theoretical multiplicity in the context of the adaptive governance scholarship reviewed. In Section 4, we conclude with some overall reflections on how theoretical multiplicity has advanced current understandings of adaptive governance and the added value of the systematic review as a methodological tool.

2. Methodology

2.1. Literature sources

Systematic reviews are increasingly popular in diverse environmental science fields such as water policy (Gallego-Ayala, 2013; Moore et al., 2014), climate adaptation (Biesbroek et al., 2013a; Vink et al., 2013) and food security (Candel, 2014). We have drawn on the methodologies of these studies to enhance the effectiveness of the systematic review used here.

As a first step, the academic literature on adaptive governance was searched using Scopus and Web of Science databases. These databases were chosen because of their coverage across the environmental social and natural sciences. Another methodological consideration that influenced this choice was to prevent either European (Scopus) or American (Web of Science) bias to influence the selection of reviewed articles (Biesbroek et al., 2013a). Our literature survey focused only on electronic journal articles written in English. This means that some studies on adaptive governance published in other languages or in the form of books, book chapters or grey literature were not included. However, similar to other studies that have focused on peer-reviewed journals only, we find that the abundance of material in the field of adaptive governance allow for developing a sample of articles that is representative of current knowledge in the field (Gallego-Ayala, 2013; Moore et al., 2014).

2.2. Selection criteria

In order to zoom in on the conceptual developments in adaptive governance research, we applied a set of selection criteria. First was to restrict the review period to 2005–2014. This ten year interval allowed the systematic review to address phases of emergence, maturity and future trends in adaptive governance scholarship. Given the increasing popularity of adaptive governance, a challenge of this step was to identify those articles that address adaptive governance theory explicitly rather than implicitly. As a first step, a simple search query for "adaptive governance" was developed to perform an initial assessment of the literature in both Scopus and Web of Science databases (see Supplementary material 1). This search resulted in a total of 385 articles. This literature was then sorted by merging together articles from Scopus and Web of Science into one database, enabling duplicates to be excluded. Next, articles were read and evaluated on the basis of a set of inclusion and exclusion criteria, derived from descriptive variables (e.g. language of publication, article type and year) as well as qualitative variables (i.e., article is about adaptive governance not adaptive management) (see Supplementary material 2). The inclusion and exclusion criteria were applied first to article abstract, title and keywords and then to the full papers. This allowed us to narrow our literature sample to the most relevant articles for the study. The final selection yielded 60 articles for this review. Two important reasons why a significant number of articles were eliminated during Step 3 of the process (see also Fig. 1) is because of qualitative as opposed to descriptive variables applied in the inclusion and exclusion criteria. For example, a large number of articles that do not specifically deal with adaptive governance, or only make a passing reference to the concept without dealing with it in depth were eliminated in Step 3. A final reference checking was done to include references that were not identified through our initial search of the databases (see Supplementary material 3). While this was a time-intensive process, it ensured that a rigorous step-by-step analysis of the literature was achieved (see Fig. 1).

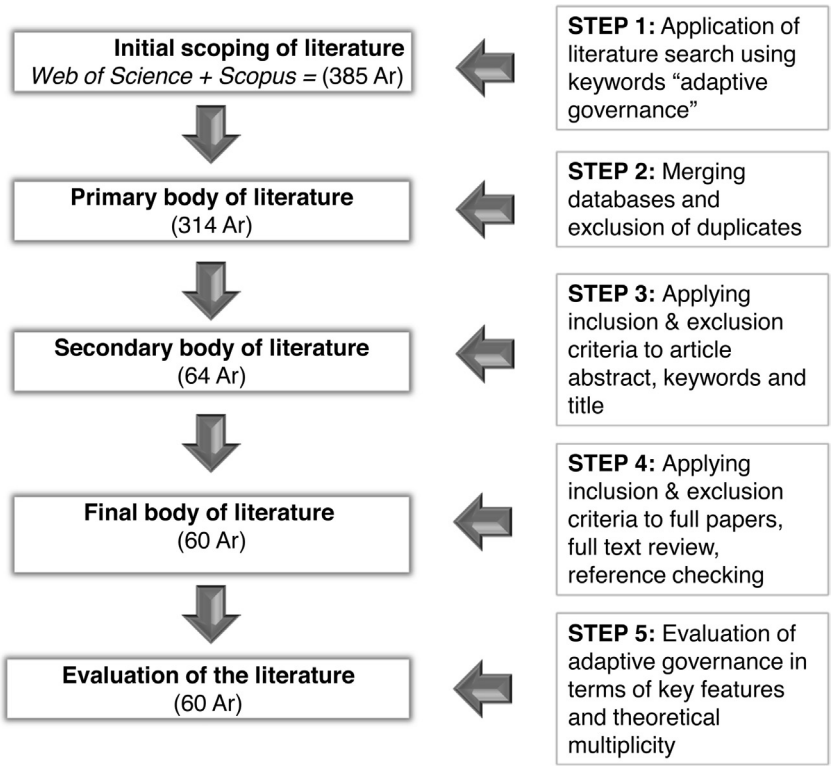

Fig. 1. Step-by-step description of the systematic review process.
Adapted from Biesbroek et al. (2013a).

2.3. Literature classification

Selected articles were assimilated in a data extraction table as part of our literature classification exercise. Each article was classified in terms of author, scientific journal, scale (e.g. international, national, sub-national or local), country (e.g. Canada), method, article orientation (i.e., conceptual or empirical), type of issue (e.g. water resources), regional context (i.e., developed or developing country focus), main argument and key insights and recommendations for future research (see Supplementary material 4). The data extraction table presents the results literally, without interpretation (Candel, 2014) and also ensures that all the summary descriptions of the reviewed articles can be traced to one single document source in an easily accessible manner. This document source was continually referred upon as part of this article's evaluation of the literature, for instance, in terms of the discussion of important trends and thematic scope as part of Section 3.1. Supplementary material 5, provides the full list of references comprising the final body of literature.

2.4. Evaluation of review findings

The last phase of the systematic review was based on our interpretation of the review findings. In this exercise, we develop insights on how the various studies that have been reviewed have advanced the conceptual development of adaptive governance. From our literature survey we find that adaptive governance is elaborated into a range of specific features that may also be viewed as primary analytical constructs of the theory. Such features are highlighted by Munaretto et al. (2014) and include adaptive capacity, collaboration, scaling, knowledge and learning. In Section 3.2, we have evaluated the literature on the basis of these features, with a view towards understanding which aspects of adaptive governance theory are most prominently debated and what features receive less attention or remain entirely outside the preview of adaptive governance scholarship. As part of this exercise, we also draw insights from other domains of scholarship. Most centrally, in Section 3.3, we discuss the added value of reflecting across multiple theoretical approaches (i.e., theoretical multiplicity), as a complementary approach for fostering deeper engagement with concepts from other scientific fields. To bring out this element from the review, we examined the articles assimilated in the data extraction table. We made a note of articles that provide good examples of how other concepts are introduced in characterising adaptive governance. Subsequently, we referred again to the original articles as a way to examine more carefully how these theories were used and in what ways they might have achieved to advance adaptive governance. In revisiting those articles particular attention was placed on the conceptual framework deployed and the main conclusions generated.

3. Results and discussion

3.1. Important trends and thematic scope of the literature

Fig. 2 presents an overview of our systematic review. It shows that the number of studies on adaptive governance has increased significantly since 2005.[1,2] The journal with most articles published on adaptive governance during the census period are *Ecology & Society* (28% of the articles published), this is not so surprising given that a large proportion of foundational references that have defined adaptive governance have been published in this journal (Chaffin et al., 2014). *Environmental Science & Policy* is the second most represented journal, with 13% of total references published. Other journals less strongly

[1] In Fig. 2(a) the fact that fewer publications are observed in 2014 is explained by the inclusion and exclusion criteria used in this article.
[2] This is in line with the evolution of the field observed by Chaffin et al. (2014).

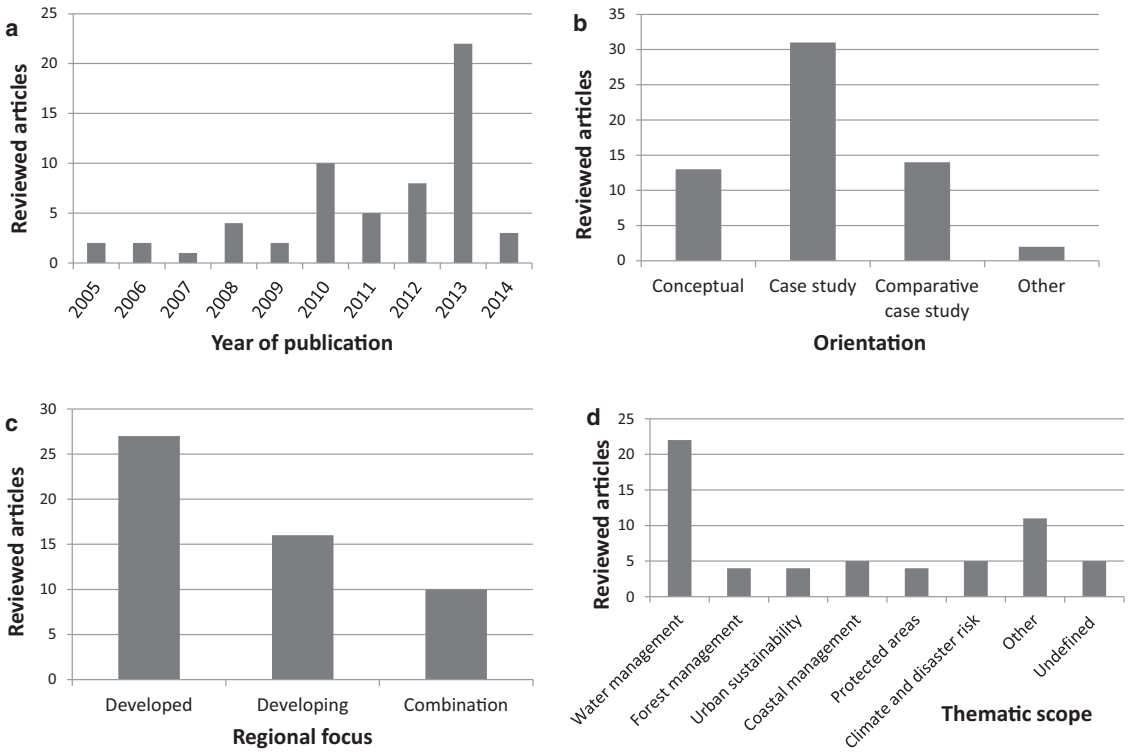

Fig. 2. Distribution of papers by year for the time period 2005–2014 (a). Distribution of reviewed articles by orientation (b), regional focus (c), thematic scope (d).

represented include *Global Environmental Change, Regional Environmental Change, Land Use Policy* and *Policy Sciences*.

Articles that have a conceptual orientation are primarily focused on the advancement of adaptive governance as a theory. Such studies develop theoretical insights on specific adaptive governance prescriptions such as polycentricity, participation and experimentation (Huitema et al., 2009). Articles that have a case study orientation include those adopting insights from adaptive governance and subsequently applying these insights to real-world case studies. Working from the principle that adaptive governance can result in better management of social-ecological systems, case-driven articles have sought to determine specific conditionalities for this to become realised. A comparative case study approach was used for instance to compare insights on adaptive governance between countries (Hurlbert and Diaz, 2013), within countries (Rijke et al., 2013) or at different scales (Olsson et al., 2006). 'Other' articles did not fall in these categories. These included Clark and Clarke's (2011)'s examination of the role of bridging organisations based on a national survey of management practices for English protected landscapes and the article by (Munaretto et al., 2014) that focused on participatory multicriteria methods for the study of adaptive governance.

For articles across all categories, the methodological choices have primarily drawn from qualitative styles of enquiry more commonly associated with the environmental social sciences, including literature reviews, interviews and participant observation. The use of literature reviews has been very common although these reviews where mostly conducted using traditional literature reviews methods as opposed to systematic approaches (Petticrew and Roberts, 2006). More recently some scholars have aimed to develop participatory styles of engagement that allow for more in-depth engagement with community groups. For instance, McDougall et al. (2013a) elaborates a methodology described as participatory wealth ranking, Fridman and Lenters (2013) use participatory action research, while Hurlbert and Diaz (2013) develop a community vulnerability assessment.

Article distribution by region indicates that the majority of studies are focused in developed countries, while there are less articles focusing on developing economies. Specifically articles from developed countries, are strongly represented by the United States (8 articles), Australia (9 articles) and Canada (6 publications). Publications from developing countries have emerged more recently in the literature. For example, 8 publications with a developing country focus where published in 2013. The majority of studies have evaluated the adaptive governance concept in the area of water management. Particularly prominent thematic areas on water included for instance, trans-boundary water resources governance (Akamani and Wilson, 2011), management of river basins (Foerster, 2011; Mandarano and Mason, 2013), groundwater and ecosystem services (Knüppe and Pahl-Wostl, 2013) and integrated water resource management (IWRM) (Herrfahrdt-Pähle, 2013; Rouillard et al., 2013). This preponderance towards water related issues is to some extent counterintuitive considering wider relevance of the concept for environmental governance (Dietz et al., 2003; Folke, 2007). A reason for this might be that one of the prominent factors social-ecological systems need to adapt to is climate change and water management is a key area for climate change adaptation.

3.2. Prominent features of adaptive governance theory

Table 1 presents the distribution of articles in terms of their emphasis across a range of specific features. From Table 1, it may be inferred that the major thrust of the literature is on adaptive capacity development (40% of the reviewed articles), where an overarching emphasis is placed on how to build adaptive capacity into existing governance systems (Akamani and Wilson, 2011). In these papers, adaptive governance is put forward as a theory for enabling society to adapt to change and surprise while emphasising the ecological arguments in favour of this approach (i.e., social-ecological system capacity to remain within desired states) (Folke et al., 2005). This has also brought attention to how flexibility can

Table 1
Distribution of articles by adaptive governance feature, adapted from Munaretto et al. (2014).

Adaptive governance feature	Description	Number of reviewed articles	%Total
Adaptive capacity	Focus on governance capacity to adapt to change and self-organise	24	40%
Collaboration	Networks and partnerships; collective search for solutions to societal problems	16	27%
Knowledge and learning	Indigenous and scientific knowledge integration; learning by doing; policy and management as experiments	12	20%
Scaling	Polycentric organisation of authorities; mixed hierarchies; matching ecosystem management with the appropriate governance scale	8	13%
		60	100%

become part of governance arrangements as part of dealing better with increased uncertainty and changing ecological baseline conditions (Clarvis et al., 2013; Hill Clarvis et al., 2013). An aspirational approach to governance is followed, whereby decision making and decision taking are viewed as the exercise of implementing multiple technical, social and organisational adaptation options. The emphasis on adaptive capacity for understanding potentially appropriate societal response pathways to change and uncertainty in a given context is a major strength of the theory.

Other prominent features of adaptive governance that can also be perceived as building blocks of the theory include, collaboration, which is identified in 27% of articles reviewed and has a particular emphasis on networks and partnerships (Ernstson et al., 2010; Hahn, 2011), as well as responsibility sharing (Elbakidze et al., 2010; Green et al., 2013). Knowledge and learning are prominent features of adaptive governance that have been followed through in 20% of the articles. For example, studies by Bruckmeier (2014) and Knüppe and Pahl-Wostl (2013) highlight that adaptive governance as a framing concept should address more explicitly processes of learning between actors operating at different levels of governance and within different arenas of policy and management. Other recent work by Evans et al. (2011) specifically brings attention to how knowledge integration may play out differently in developing country contexts, drawing on the particular example of small-scale fisheries in Southern Kenya. Scaling has a prominent role in 13% of the articles, particularly in terms of fostering polycentricity in governance structures and matching ecosystem management with the appropriate governance scale (Herrfahrdt-Pähle, 2013).

By adopting a more critical perspective, we then might further ask, what aspects of governance remain less understood as a result of the literature's current emphasis? In the literature surveyed we find that adaptive governance is often underpinned by explicitly normative considerations about the function of governance whereby characteristics of 'good governance' are often closely aligned with the maintenance of social-ecological resilience (Ratner et al., 2013). For some scholars, there is a need for adaptive governance to be more critical, whereby understanding how 'things are' is more balanced with understanding how things 'ought to be' (Ratner et al., 2013). Adaptive governance further lacks explicit emphasis on repeated patterns of governance failure and questions that relate to 'why governance continues to fail' (Biesbroek et al., 2013b; Boyd et al., 2014). This is partly because at times adaptive governance runs the risk of being interpreted narrowly as the practice of selecting the best choice of options to adapt to predictable and unexpected consequences (Biesbroek et al., 2013b). It is less clear whether adaptive governance can be used to develop more complete understandings of unequal power relations underpinning governance structures (Clark and Clarke, 2011; Ernstson et al., 2010). This concern is also consistent with Hurlbert and Diaz (2013) who have compared adaptive capacities of water governance regimes in the South Saskatchewan River Basin (SSRB) of western Canada and the Elqui River Basin (EB) in Chile. According to their study, limitations in the operationalisation of adaptive water governance is related to the existence of a neoliberal water legal framework that defines water as a market commodity (Hurlbert and Diaz, 2013). This has consequences that can be overlooked if adaptive governance is applied uncritically to particular resource management problems. In the study of Hurlbert and Diaz (2013) it is highlighted for example that adaptive capacity may become concentrated in a small number of large water users (such as large scale farmers in agro-industry) who have easier access to water rights.

These problems represent some of the difficulties associated with the normative roles of adaptive governance. An increasing number of studies demonstrate challenges with the theory particularly when it comes to exploring questions associated with operationalising adaptive governance (Clark and Semmahasak, 2013). Lack of policy clarity and political will, as well as difficulties in coordinating institutions have been discussed as major obstacles for operationalisation of adaptive governance (Schmidt et al., 2013). There is less emphasis still on questions that concern who is doing the governing and through what procedures? Adaptive governance has emerged and subsequently matured as a theoretical framework to understand the governance of social-ecological systems more holistically, to either increase resistance to undesirable change or facilitate the ability to transform a system to a more desirable state (Chaffin et al., 2014). But this inherently normative aspect of adaptive governance may obscure the fact that a coherent goal for future regime transformation may be far from unproblematic and that there are likely to be multiple ways of judging and evaluating the governance of multi-scale problems (Smith et al., 2005). This is not solely an adaptive governance problem, it is inherent of deliberation and scholarly advancement across a range of governance theories. For example, while monocentric governance theories emphasise 'effectiveness', the 'resilience' norm dominates adaptive governance (Termeer et al., 2010). Explicitly recognising and exploring the normative aspects of adaptive governance and related concepts like resilience could be a fruitful way forward (Wiering et al., 2015). For example, defining whose resilience needs to be strengthened can involve quite a consequential choice in terms of where the responsibility for adapting is assigned, e.g. to public authorities or individual citizens.

3.3. Adaptive governance and theoretical multiplicity

In Section 3.2 we have highlighted some of the unresolved challenges and tensions in the conceptualisation of complex sustainability issues that adaptive governance as a governance theory struggles with. In this section, we discuss an alternative and more productive approach to engage with these challenges and tensions which rests upon a multi-, or pluralist perspective that enhances engagement and utilisation of insights from different angles, alongside insights gained from adaptive governance scholarship (Biesbroek et al., 2013b). Theoretical multiplicity is not a plea for absorbing all kinds of concepts into adaptive governance theorising, so as to create a 'theory of everything' – the

extensive account of concepts discussed in Folke's et al. (2005) landmark article about adaptive governance illustrates this tendency to some extent. In the realm of governance theories, adaptive governance has convincingly brought new issues to our attention, such as non-linear change, scale and polycentricity, irreducible uncertainties and experimentation. Furthering governance knowledge on these distinctive aspects does not benefit from adding a long list of concepts borrowed from other approaches. By contrast what we are proposing is deepening reflexive engagement with different concepts as a way to address specific conceptual or empirical dilemmas. This type of engagement is recognised by researchers in fields, such as climate adaptation research as well as social-ecological system research but it is yet not the norm in adaptive governance scholarship (Fischer et al., 2015; Pereira et al., 2015; Preston et al., 2015; West et al., 2014).

In our literature review we have identified study examples whereby this exercise of exploring the zones between adaptive governance theory and theoretical insights gained from other approaches is already ongoing (see also Table 2). Rijke et al. (2013) use a comparative city-case study analysis in Australia, to understand governance reform to enable adaptive and resilient urban water resource management. The authors combine insights from transitions (Rotmans et al., 2001) and adaptive governance to understand water reform processes. They argue that adaptive governance and transition governance complement each other in identifying the value of hybrid multi-level governance approaches. More specifically the fruitful complementarities work at the intersection of each of the theories' respective strengths and weaknesses. Thus whereas "adaptive governance focuses on the ability to maintain system functions under changing conditions", "transition governance focuses on the ability to steer structural system change" (Rijke et al., 2013: 64). Both theoretical approaches have merit and distinctive but complementary strengths, but arguably it would not make much sense to try to incorporate the whole conceptual apparatus of transition theory into adaptive governance, or vice versa. In a different study by Rijke et al. (2012) on developing resilient governance systems to manage environmental assets to support long-term societal development, the authors propose a 'fit-for-purpose' governance for overcoming barriers related to adaptive governance operationalisation. Fit-for-purpose governance aims at 'good enough governance' which may be more important for policy makers to navigate short-term change, while adaptive governance works to complement support for decision-makers to navigate long term change (Rijke et al., 2012). Schmidt et al. (2013: 315) argue that in some cases such as in the context of coastal governance in Portugal, characterised by "complex and persistent economic, social and climatic turbulence", the governance model needs to become more progressive as well as more radical than what transition or adaptive governance theory suggest. Based on their notion of progressive change, they develop a framework that continues to place emphasis on important features of adaptive governance, such as social learning, but highlight further the role of proactive preparedness, the importance of cooperative science, strong political will and social justice.

'Complementary' theories in Table 2 have been particularly useful to address systemic problems of catalysing adaptive governance that relate to power and politics or the marginalisation of minority cultures and worldviews (Chaffin et al., 2014). Boyd et al. (2014) adopts a novel approach that links the 'environmentalities' theoretical lens (Agrawal, 2005) – where the analysis of power relations is centrally placed – with social learning processes underpinning urban climate adaptation practices in Maputo, Mozambique. This was particularly useful for strengthening the theoretical relevance of adaptive governance in Global South contexts, through drawing attention to the role of power in shaping relationships between technologies of government and peoples' environmental identities. The environmentalities theoretical lens further enriches adaptive governance by revealing the complex set of relations that citizens have with the state and the processes underpinning the routine exclusion of marginalised city actors from shaping visions for the city (Boyd et al., 2014). McDougall et al. (2013b) who draw on six years of research in Nepal turn their attention to the role of engagement in governance. Engagement in this context is understood as people's efforts "to express their views and exercise their rights, including challenging dominant power" as well as "taking leadership roles" (McDougall et al., 2013b: 3). The authors further introduce the term adaptive (collaborative) governance as part of their own understanding of how adaptive governance theory can be expanded, adding with this term particular emphasis on inclusion, equity and strategic collaboration as integral elements of adaptive governance. An adaptive collaborative governance analytical frame further introduces the notion that power, incentives, and capacity gaps in natural resource governance can create fundamental barriers to effective engagement of marginalised individuals and groups, in this case Nepalese *Dalit* women that tend to be marginalised from forest governance (McDougall et al., 2013b).

Two of the articles reviewed work with complementary theories that support a better conceptualisation of the relationship between public policy and adaptive governance. Rouillard et al. (2013) draw insights from public policy integration theory to understand how policy integration can be achieved while maintaining a level of adaptability in social-ecological systems. The research is based on recent policy experiences in Scotland to improve flood management. Policy integration theory has brought particularly valuable insights on how deeper actor collaboration can take place in the context of national policy processes and through formal procedures. This is a useful complementary lens to adaptive governance, given that the theory often places greater emphasis on the use of informal and voluntary channels of collaboration (Rouillard et al., 2013). Meek et al. (2011) departing from an adaptive governance theoretical lens, explore the

Table 2
Articles on adaptive governance that make links with complementary theories.

Complementary theory	Orientation	Example article
Environmentalities	Understanding the role of power in state citizen interactions	Boyd et al. (2014)
Engagement in governance	Participation of marginalised actors in governance processes	McDougall et al. (2013b)
Transitions	Transformative change	Rijke et al. (2013)
Fit-for-purpose governance	Operationalisation of adaptive governance	Rijke et al. (2012)
Progressive adaptation	Enabling progressive change	Schmidt et al. (2013)
Policy integration	Synergies across policies	Rouillard et al. (2013)
Policy framing	Understanding problem frames	Meek et al. (2011)
Ladder of partnerships	Partnership formation	Morrison and FitzGibbon (2014)
Co-production	Interaction between different forms of knowledge	Wyborn (2015)
Legitimacy	Role of legitimacy in governance	Cosens and Williams (2012)

performance of marine mammal governance regimes in three Northern regions (Alaska, Nunavut, and Finland). They argue that because adaptive governance is a scale sensitive theory, it is of particular relevance to marine mammal governance since it places attention to the opportunities for institutional learning and actor interaction across multiple governance levels. However, they extend the conceptualisation of scale by illustrating how it can also affect the framing of policy problems. On the basis of a policy framing theoretical lens, they find that framing of marine policy regimes (and the very different interests involved in human-marine wildlife interactions), affects both the effectiveness of cross-scale interactions and the ability of local actors to self-organise (Meek et al., 2011).

In one of the articles reviewed theoretical multiplicity was leveraged to bring new insights into the analysis of partnerships as part of adaptive governance theory. Morrison and FitzGibbon (2014) are interested in the role of partnership formation in the context of the Ontario Environmental Farm Plan (OEFP). The article finds that while adaptive governance helps reposition the evolution of partnerships as non-linear and dynamic, as a theory, it lacks sufficient emphasis on how partnerships evolve over long time spans.[3] To address this challenge, they draw insights from Glasbergen's (2011) 'Ladder of Partnerships', since as a theory it helps trace more systematically partnership formation in the OEFP and to better understand how actors restructure and build new social relationships over a longer time period. The Ladder of Partnerships complements the understanding of partnerships in adaptive governance theory by making better links between "interpersonal and inter-agency work" and "the possibility of long-term shifts in the political order" (Morrison and FitzGibbon, 2014: 384).

In two of the articles, drawing insights from theories more widely used in legal and political science scholarship has also helped build upon adaptive governance theory in a constructive way. Carina Wyborn (2015)[4] drawing insights from political science brings attention to the concept of co-production[5] (cf. Jasanoff, 2004), which focuses attention on the interplay between knowledge-making and decision-making. The article unites adaptive governance and co-production theory by introducing a new conceptual framing titled 'co-productive governance'. In this new conceptual framing, attention is brought to the dynamic interplay between "context, knowledge, process, and vision of governance" drawing on two cases that relate to connectivity conservation in North America and Australia (Wyborn, 2015: 57). Cosens and Williams (2012) turn to legal scholarship and specifically the concept of legitimacy to explain why certain aspects of governance are necessary if flexible, experimental governance approaches such as adaptive governance are to gain wider public acceptance. Exploring the relationship between adaptive governance theory and legitimacy theory becomes particularly important for understanding how adaptive governance might more effectively become embedded in existing public administrative processes and laws (Cosens and Williams, 2012). Certainly there are risks in combining different theories and perspectives, such as limitations in the interpretation of results (Biesbroek et al., 2013b). However in the example studies discussed here, theoretical multiplicity overall yielded positive effects, such as providing a complementary theoretical lens in contexts where insights on change processes from adaptive governance theorists are traditionally lacking (i.e., contexts whereby actors experience processes of inequity, social injustice or exclusion).

4. Conclusion

This study has presented a literature review of adaptive governance, focusing on articles published during 2005–2014. Our review confirms that adaptive governance as a theory continues to hold wide appeal conceptually. Evidently, it shares characteristics with so-called 'magic concepts' that are designed to cover very large domains and which have multiple, overlapping or conflicting definitions, as well as global marketability (Swart et al., 2014: 5). This presents both opportunities as well as limitations for researchers. We find that there are still few alternative governance theories to draw upon that can handle processes of change characterised by nonlinear dynamics, threshold effects, cascades and limited predictability (Duit and Galaz, 2008). At the same time, it is a concept that is often neither very precise nor necessarily stable and does not provide clear guidance on follow-up action (Clark and Clarke, 2011; Rijke et al., 2012; Swart et al., 2014). Using a systematic literature review has been a useful methodological tool of this study, since it has been able to support both a critical as well as nuanced view of how the theory is evolving.

From the evaluation of the literature in terms of key characteristics such as thematic scope, article orientation and regional emphasis we can draw some important conclusions. In terms of thematic scope, we find that water management related topics tend to be over-represented in the literature. In contrast, we find that while there is an increasing emphasis on topics such as coastal management, urban sustainability and food security, these are still topics that are far less represented in the literature. Furthermore, the majority of articles on adaptive governance have been carried out in developed countries, with the large majority of those articles focusing on either the United States or Canada. There are critical theoretical research areas that are most relevant to social-ecological dynamics and governance in developing economies that are less represented in the literature. Thus, there is considerable scope for taking theoretically and conceptually developed work on adaptive governance in the Global North and evaluating the extent to which it can be applied in the context of the Global South. One particularly important research opportunity that is still a grey area in adaptive governance scholarship, is how to go beyond 'just managing' vicious cycles of poverty, social exclusion and environmental harm in the Global South towards recognising the need for governance flexibility, creativity and innovation (Seeliger and Turok, 2014). Lastly, a positive development in the literature is the significant number of articles that apply insights from adaptive governance to real-world case studies. However, there is still scope to bridge the gap between the current dominant 'soft' qualitative adaptive governance paradigm with more structured quantitative approaches as part of addressing the full range of social-ecological governance complexities (Munaretto et al., 2014).

We find that innovative foci of adaptive governance scholarship are represented by articles that develop links with other theories and approaches. Underpinned by an openness to theoretical multiplicity, some of the more recent studies have balanced their analysis of adaptive governance with other concepts as part of addressing real world problems or proposing interventions. Combining theories has demonstrated a better and more reflexive evaluation of important governance features such as power and politics, inclusion and equity, short term and long term change, the relationship between public policy and adaptive governance. This type of engagement is further creating space for deeper exploration of assumptions and underlying views associated with

[3] The Ontario Environmental Farm Plan (OEFP) is a programme that spans over a 20 year period.

[4] Our systematic review spans the period 2005–2014 but still we decided to include this publication from 2015 because of its added value in illustrating some important trends with regards to theoretical multiplicity.

[5] Co-production is also widely recognised as an analytical lens in science and technology studies (STS).

different views of governance and governance responses to complex social-ecological problems (Termeer et al., 2010). Our review article supports that multi-perspectival approaches might therefore enable conceptual and knowledge gaps to be addressed through reference to other theories but without trying to integrate every theory under one paradigm. As Cosens and Williams (2012) highlight, adaptive governance "is only one of many approaches that a system of governance might use to implement its policies".

It is important to consider instances whereby theoretical perspectives can become synergistically applied and become further evaluated with detailed empirical research but in a way that does not undermine the value or distinctiveness of individual theories (Boyd et al., 2014; McDougall et al., 2013b; Wyborn, 2015). As discussed in Section 3.2, the emphasis on adaptive capacity for understanding societal response pathways to change and uncertainty is arguably a distinct and widely accepted strength of adaptive governance theory. Theoretical multiplicity can further support a more balanced emphasis across a wider range of governance features to ensure both a more critical and pragmatic approach to adaptive governance research and operationalisation (Dewulf et al., 2009; Schweizer, 1998). We believe that theoretical multiplicity can in the long run expand the relevance of adaptive governance in social-ecological systems research and contribute to a more robust theory that can be used to address a greater variety of governance contexts.

Adaptive governance as a theory of environmental governance is likely to continue to attract academic, policy and public interest. Using a systematic literature review has enabled this study to develop an objective and robust assessment of this emerging field of scholarship while tracing some of the implications of current work for future research on the subject. Given that this review has not included books, theses and grey literature within its scope, we find that further systematic literature reviews in this field can also focus on these sources of literature. This would allow for instance a better assessment of how the concept travels in policy and decision making arenas and the particular influence of the concept on environmental discourses (Hajer, 1995). Additionally, further systematic review studies may concentrate on specific features of adaptive governance to better understand the relative importance and interplay across different features and the extent and scale to which theoretical multiplicity enacts or shapes the further evolution of adaptive governance scholarship.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.envsci.2015.11.011.

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