

# Systematic Literature Review: The Evolution of Adaptive Governance and Practice in the Context of the Environmental Crisis

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## ABSTRAK

Tulisan ini bertujuan untuk mengklarifikasi pemahaman tentang evolusi kerangka konseptual tata kelola adaptif, diikuti dengan peninjauan terhadap implementasinya dalam konteks lingkungan. Karena tiga pendekatan diakui penting dalam menavigasi sistem sosio-ekologis yang kompleks, yaitu manajemen adaptif, co-manajemen adaptif, dan tata kelola adaptif. Hal ini dapat menyebabkan kebingungan dan kesalahpahaman dalam konsep dan praktik kajian adaptif. Dalam penelitian ini dilakukan sistematis literatur review dengan menggunakan database Scopus. Penelusuran literatur dilakukan pada Mei 2023 dengan menggunakan kata kunci "Adaptive Governance" sebagai istilah penelusuran. Hasil studi ditemukan bahwa meskipun memiliki tujuan dan filosofi yang sama, setiap pendekatan memiliki fitur dan skala yang berbeda. Tata kelola adaptif muncul sebagai respons terhadap kebutuhan akan solusi holistik untuk mengatasi ketidakpastian dalam kerangka sistem sosio-ekologis yang kompleks. Ini mirip dengan co-manajemen adaptif, meskipun dalam skala dan konteks yang lebih besar. Sedangkan manajemen adaptif merupakan landasan konseptual bagi pendekatan-pendekatan lain.

**Kata kunci:** tata kelola adaptif, manajemen adaptif, co-manajemen adaptif, sistem sosio-ekologis, ketidakpastian

## ABSTRACT

This paper aims to clarify the understanding of the conceptual evolution of the adaptive governance framework, followed by an examination of implementation actions in the environmental setting. Since three approaches are recognized to be essential in navigating complex socio-ecological systems, namely adaptive management, adaptive co-management, and adaptive governance. This might lead to confusion and misunderstandings in adaptive concepts and practice. In this study, a systematic literature review was conducted using the Scopus database. A literature search was conducted in Mei 2023 using the keyword "Adaptive Governance" as the search term. As a result, despite sharing the same purpose and philosophy, each approach's work process has distinct features and scales. Adaptive governance emerges as a response to the need for holistic solutions to overcome uncertainty within the framework of complex socio-ecological systems. This is similar to adaptive co-management, although on a larger scale and context. While adaptive management is the conceptual foundation for other approaches.

**Keywords:** adaptive governance, adaptive management, adaptive co-management, socio-ecological systems, uncertainty

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## 1. INTRODUCTION

Since the rapid changes in the world, the concept of adaptive governance has begun to gain popularity in the professional and academic arenas. This concept has been uniquely developed to handle complex systems while acknowledging the limits of conventional governance approaches (Janssen & van der Voort, 2020). Conventional governance models tend to presuppose stability, properly foresee the future, and that the system can be handled in an

organized and planned manner. In complex systems, however, there is inherent uncertainty, unpredictability, and dynamism, which happens as a result of contributions from environmental changes, interactions between varied system pieces, and the complicated interrelationships between humans and the environment (Sharma-wallace et al., 2018).

Adaptive governance understands that managing complex systems cannot be accomplished by an overly top-down and command-and-control approach.

Instead, by cultivating flexibility, adaptation, and continual learning, this method aims to overcome uncertainty and unpredictability (Cleaver & Whaley, 2018). The process of decision-making and policy execution becomes more flexible to shifting situations and new emerging knowledge. Continuous system monitoring and assessment are used to enhance policies and activities so that the system can modify and adapt to changes. Those involved in managing complex systems can more effectively respond to challenges and unpredictable changes. This approach provides a more dynamic and responsive framework, enabling better management of the uncertainty and dynamics inherent in the system (Olsson et al., 2006).

Adaptive governance originated first as a reaction to the need for holistic environmental governance solutions, particularly in the context of natural resource management. The emphasis in this approach is on management within the context of complex socio-ecological systems (SESs) (Chaffin et al., 2014). Social and ecological systems are interconnected and have an impact on natural resource management. Successful natural resource management necessitates a thorough awareness of the intricacies of human-nature relations. The acknowledgment that social and ecological systems are complex systems with numerous interacting stakeholders, values, and circumstances. As a result, adaptive governance emphasizes the significance of incorporating a wide range of stakeholders in decision-making processes. Collaboration and engagement of stakeholders allow for a greater knowledge of each party's requirements and expectations, allowing the resultant solutions to meet varied interests (Wyborn, 2015).

This approach emerges after Dietz et al. (2003) first used the term and has expanded during the past two decades. Folke (2006) contributed to the theoretical framework's advancement by identifying adaptive governance as an examination of the social aspects of ecosystem management frameworks such as social responsiveness, social capital, and adaptive capacity. Berkes (2017a), on the other hand, attempts to deal with operationalizing adaptive governance by prioritizing and encouraging collaborative learning. Olsson et al. (2006) contributed to exploratory case studies focusing on adaptations within the social realm of the SESs. Several review papers are also appearing that synthesize adaptive governance as a theoretical lens, such as Chaffin et al. (2014), who offer a key theoretical underpinning and characterize adaptive governance. Karpouzoglou (2015) investigates theoretical multiplicity in order to comprehend adaptive governance.

Interestingly, the concept of adaptive governance has been broadened and applied in a variety of sectors outside of environmental and natural resource management. This concept is quickly evolving as a result of academic contributions and practical applications in a variety of governance sectors, including health (Janssen & van der Voort, 2020),

disaster management (Djalante et al., 2011), and technology (Wang et al., 2018). To enable the implementation of adaptive governance in various situations, many models, methodologies, and technologies have been developed (Brunner, 2010). Hence, adaptive governance has emerged as the bedrock for adaptable, inclusive, and sustainable techniques and practices. Contributions from researchers and practitioners continue to expand and widen the understanding of adaptive governance, which as a whole provides a beneficial framework for coping with complexity and change across many sectors of governance (Cleaver & Whaley, 2018).

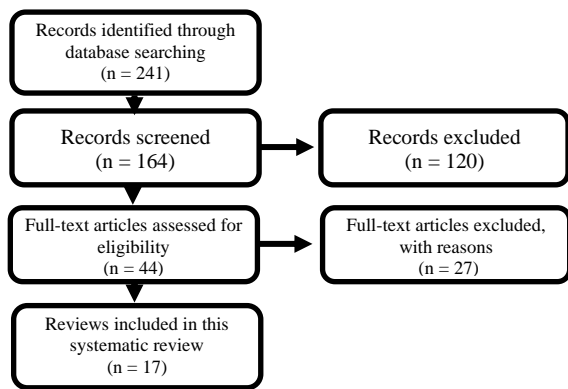
However, since the field of study has rapidly expanded, researchers have designed and examined several structures and processes for managing complex social-ecological systems. Not only did the adaptive governance approach arise from this endeavor, but the other two primary approaches that are often utilized are adaptive management and adaptive co-management. Those terms are frequently used interchangeably, causing misunderstandings and confusion in academic literature. Some scholars may use these terms with the same meaning, while others may differentiate between the two. This might lead to confusion and misunderstandings in comprehending adaptive concepts and practices (Chaffin et al., 2014; Hasselman, 2017).

Lyndal Hasselman (2017) previously conducted a review article to clarify this confusion, but the article was only an attempt to emphasize the ambiguity in definitions, between definitions, and misinterpretations of definitions by identifying aspects that separate the three adaptive concepts. Therefore, this paper contributes to framing adaptive governance as a dynamic and practical rather than a static and conceptual framework. This implies that the study not only specifies the definition or highlights certain features, but also follows its conceptual history and key contributors by offering a portrait of the evolution of adaptive governance practice in the face of the global environmental crisis.

Furthermore, seeking and explaining a better understanding of the complexities of adaptive concept creation and application is critical. This may be accomplished by describing the characteristics of adaptive governance within the framework of a socio-ecological system. This will include a review of adaptive governance theoretical advancements, followed by a more thorough examination of implementation options, which is the aim of this study. A number of questions will be raised in order to achieve the study's objective, such as how the conceptualization evolution of adaptive governance is to confront rapid social-ecological systems change. Furthermore, to study the practical application of adaptive governance, this research raises questions concerning how adaptive governance is used in the context of environmental challenges.

## 2. RESEARCH METHODOLOGY

The method used in this study is a systematic literature review. A systematic literature review is a thorough method of acquiring, assessing, and integrating previous research works on a certain issue. A systematic search for relevant literature is conducted, followed by a critical assessment and synthesis of the findings. In contrast to conventional literature reviews, which may be more narrative or subjective in character, systematic reviews strive to collect and assess all available data on a certain research topic or objective. The aim is to track the evolution and dynamics of research over time and offer a comprehensive overview of all available research on a certain issue mentioned in the study (Grant & Booth, 2009; Pahlevan-Sharif et al., 2019).



**Figure 1.** The Flow Diagram of a Systematic Review Illustrates the Process of Extraction of the Literature

A literature search was performed in May 2023 with the keyword "Adaptive Governance" as the search term. This search was carried out in the Scopus database because it is a comprehensive academic database that encompasses a wide range of scholarly journals. Furthermore, Scopus database is extensively utilized by researchers to conduct systematic literature reviews due to its extensive coverage and indexing of scholarly articles. The search focuses on the title of the articles as the area to be explored and covers the previous two decades, from 2004 to 2023. The time period chosen relates to the initial use of the term "adaptive governance" by Dietz et al. in 2003. Over the last two decades, the concept of adaptive governance has grown in importance in academic research and practice across several disciplines. By utilizing relevant keywords and focusing the search on article titles, this study aims to identify and obtain articles related to the concept of adaptive governance in the Scopus database. Focusing the search on the title of the article can help narrow the scope of the search so that it is more focused on a specific topic.

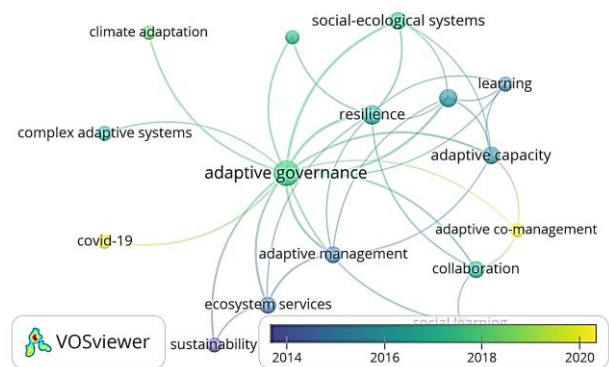
During the early stages of this study, a total of 241 articles were retrieved for inclusion in the assessment. During the assessment process, each article was carefully evaluated using the following criteria: (i) Language and article type limitations: This study limited the inclusion of articles available in English and in the type of journal articles. Thus, 1328

articles that do not meet the language requirements or do not conform to the journal type will be excluded from further evaluation; (ii) Availability of whole papers: Selected articles must be available as full papers. This means that only articles that are fully accessible and not limited to abstracts or summaries are included in the assessment; (iii) Relevance and influence: articles are also assessed based on their relevance and influence on the research questions under study. Articles that meet this criterion must have a high level of citation or be considered as important studies related to the research questions being studied. Finally, by carefully applying these criteria, this study identified 17 articles that met the requirements for inclusion in further analysis.

## 3. RESULTS AND DISCUSSION

### 3.1. Introductory Information and Data Overview

Initial insights into this study were obtained through analysis of the authors' keywords used in the literature examined using the VOSviewer analysis tool. This study uses the co-occurrence technique of keywords, which allows visualization of the relationships between keywords used by authors in their publications. This method can help identify emerging research trends, identify related research areas, and map the intellectual structure within a particular field of study.



**Figure 2.** Co-Occurrence of Author Keywords in This Study using VOSviewer

The results of the analysis show that the concepts of adaptive governance and adaptive co-management emerged as a development of the concept of adaptive management. This indicates that thinking and practice in adaptive management has evolved from a focus on ecosystem management to a greater emphasis on governance aspects and shared involvement in decision making. In the context of this research, adaptation in management does not only involve sustainable management strategies, but also involves a broader institutional and collaborative dimension in managing natural resources.

The study also revealed that Ecology and Society and Environmental Science and Policy were the most prevalent sources of the reviewed literature. Table 1. Below presents data from selected research

publications on adaptive governance for the time period 2004 through 2023.

### 3.2. The Evolution of Adaptive Governance

Based on the investigation of the 17 articles selected in this study, it is possible to conclude that adaptive governance has its analytical basis in the ecological resilience theory of adaptive management. As explained by Gunderson & Light (2006), Adaptive management is an iterative process that involves experimentation, learning, and adjustment. This approach emphasizes the need of confronting uncertainty in managing complex natural resources. (Cosens et al., 2018). Following the progression of this idea, adaptive governance, as defined by Chaffin et al. (2014), is holistic environmental governance

solutions within the framework of complex socio-ecological systems.

In addition, the concept of co-management has influenced the concept of adaptive governance. According to Cleaver and Whaley (2018), adaptive co-management is the approach that highlights collaboration among stakeholders and adaptable decision-making processes. Stakeholder participation is critical in the context of adaptive governance for making better decisions that include local knowledge, different interests, and common understanding. Adaptive governance strives to integrate diverse views and ensure that choices take into consideration the needs and ambitions of all stakeholders through reciprocal interaction and involvement (Chaffin et al., 2014).

**Table 1.** Selected Articles of Study for the Time Period 2004–2023

Author(s)	Scopus Citations	Title	Publication	Study Type
Olsson et al. (2006)	935	Shooting the rapids: Navigating transitions to adaptive governance of social-ecological systems	Ecology and Society	Theoretical and Empirical
Chaffin et al. (2014)	402	A decade of adaptive governance scholarship: Synthesis and future directions	Ecology and Society	Theoretical
Gunderson and Light (2006)	248	Adaptive management and adaptive governance in the Everglades ecosystem	Policy Sciences	Empirical
Termeer et al. (2010)	206	Disentangling scale approaches in governance research: Comparing monocentric, multilevel, and adaptive governance	Ecology and Society	Theoretical
Schultz et al. (2015)	189	Adaptive governance, ecosystem management, and natural capital	Proceedings of the National Academy of Sciences of the United States of America	Empirical
Djalante et al. (2011)	163	Adaptive governance and managing resilience to natural hazards	International Journal of Disaster Risk Science	Theoretical
Rijke et al. (2012)	160	Fit-for-purpose governance: A framework to make adaptive governance operational	Environmental Science and Policy	Theoretical
Janssen and van der Voort (2020)	160	Agile and adaptive governance in crisis response: Lessons from the COVID-19 pandemic	International Journal of Information Management	Theoretical and Empirical
Nelson et al. (2008)	149	Using adaptive governance to rethink the way science supports Australian drought policy	Environmental Science and Policy	Theoretical and Empirical
Bronen and Chapin III (2013)	149	Adaptive governance and institutional strategies for climate-induced community relocations in Alaska	Proceedings of the National Academy of Sciences of the United States of America	Empirical
Chaffin and Gunderson (2016)	137	Emergence, institutionalization and renewal: Rhythms of adaptive governance in complex social-ecological systems	Journal of Environmental Management	Theoretical
Wyborn (2015)	113	Co-productive governance: A relational framework for adaptive governance	Global Environmental Change	Theoretical and Empirical
Karpouzoglou et al. (2016)	110	Advancing adaptive governance of social-ecological systems through theoretical multiplicity	Environmental Science and Policy	Theoretical
Cleaver and Whaley (2018)	83	Understanding process, power, and meaning in adaptive governance: A critical institutional reading	Ecology and Society	Theoretical and Empirical
Brunner (2010)	60	Adaptive governance as a reform strategy	Policy Sciences	Theoretical and Empirical
Cosens et al. (2018)	44	Introduction to the special feature practicing panarchy: Assessing legal flexibility, ecological resilience, and adaptive governance in regional water systems experiencing rapid environmental change	Ecology and Society	Theoretical and Empirical
Hasselman (2017)	40	Adaptive management; adaptive co-management; adaptive governance: what's the difference?	Australasian Journal of Environmental Management	Theoretical

Furthermore, across the 17 materials looked through. In the theoretical and empirical development of the adaptive approaches, many critical domains have been identified, notably flexibility, scope and context, participation, and knowledge integration. Flexibility is the ability to learn from experiences and adjust strategies, it comprises the enhancement of the components of adaptive capacity (Chaffin et al., 2014; Schultz et al., 2015) and transformability (Cosens et al., 2018; Olsson et al., 2006). Knowledge integration is the combination of many types of understanding, including local and scientific knowledge, and it comprises the enhancement of the components of multiplicity (Karpouzoglou et al., 2016; Termeer et al., 2010) and integrating local knowledge (Nelson et al., 2008). Participation is the degree to which diverse stakeholders are involved in decision-making processes, and it comprises the enhancement of the components of multilevel governance (Rijke et al., 2012; Schultz et al., 2015), collaboration (Brunner, 2010; Djalante et al., 2011) and leadership (Olsson et al., 2006). Lastly, scope and context refer to the precise circumstances, situations, and features of a certain situation or setting, such as environmental issues (Cleaver & Whaley, 2018a; Cosens et al., 2018; Olsson et al., 2006), water management (Gunderson & Light, 2006), health (Janssen & van der Voort, 2020), climate change (Bronen & Chapin, 2013), and the reform setting (Brunner, 2010).

The evolution of the three adaptive approaches will be fully discussed below. These adaptive approaches are widely regarded to be critical in the management of socio-ecological systems. Despite having the same aims and ideas, each method places a distinct emphasis on a different aspect of the governing process. As a result, while addressing adaptive governance, it is critical to first comprehend and study the concept of adaptive management since this concept serves as the cornerstone for other concepts and offers a solid framework for an adaptable strategy (Cleaver & Whaley, 2018; Hasselman, 2017).

### **3.2.1. Adaptive Management**

Adaptive management is possibly be traced back to the early 1970s when a group of ecologists and natural resource managers and scientists started working on a novel way to manage complex systems. C.S. Holling, Lance Gunderson, and Carl Walters were among the early pioneers who understood that the older and conventional methods of management were sometimes founded on a false feeling of certainty (Cleaver & Whaley, 2018). Adaptive management arose in reaction to the realization that natural resource management must deal with the uncertainty and complexity of a constantly changing environment (Williams & Brown, 2014). This is an alternative to the conventional top-

down, command and control management strategy. Management choices and actions in the conventional management model were frequently based on static and predictable assumptions about the environment. Holling (1978) suggested that the managers needed to be more flexible in their decision-making, as well as willing to learn from their mistakes (Cleaver & Whaley, 2018).

The purpose of adaptive management is to enhance environmental management, particularly natural resource management, using a "learning by doing" philosophy and an awareness of the uncertainties that exist (Schreiber et al., 2004). "Learning by doing" in this sense refers to the learning process that occurs via engagement with actual-life situations and is responsive to environmental changes. By embracing a "learning by doing", management practitioners may take management activities based on existing understanding while also being open to refining and adjusting their approach as knowledge and experience grow (Williams & Brown, 2014). They involve a continuous cycle of planning, implementation, monitoring, and evaluation. This allows managers to learn from the results of their actions and to make adjustments to their plans as needed. During this process, practitioners continuously examine the outcomes of their activities, uncover new learnings, and use them in subsequent decision-making (Schreiber et al., 2004).

In adaptive management, uncertainty is characterized as the presence of imperfect knowledge, incomplete knowledge, and unpredictability about future events, outcomes, or situations (Hasselman, 2017). Imperfect knowledge occurs when we have limitations in understanding or information we have. Imperfect knowledge may be decreased by doing more in-depth studies, collecting more thorough data, or developing more accurate models. Incomplete knowledge, on the other hand, refers to the requirement to incorporate numerous viewpoints and understandings in order to construct a full understanding of complex systems. However, that unpredictability cannot be fully eliminated due to the oscillations inherent in complex systems and the continual co-evolution of its parts. While research and participation initiatives can help to lessen the uncertainty, the capacity to cope with or adapt to unanticipated developments is still required (Hasselman, 2017).

Moreover, Holling (1986) developed the concept of the adaptive cycle, later known as Panarchy theory, and this become a major aspect of the theoretical underpinning of the adaptive management paradigm (Chaffin & Gunderson, 2016). The adaptive cycle is a concept that is used to describe patterns of stability and instability that occur in a system on an ongoing basis (Williams & Brown, 2014). The adaptive cycle concept

illustrates how natural and societal systems go through four major phases: exploitation, conservation, release, and renewal. During the exploitation phase or exponential change period, the system is constantly developed and improved. The conservation phase is represented by periods of growing stasis and rigidity. However, the release phase or periods of collapse and readjustments emerge when the system is subjected to major disruptions or changes that threaten the system's current stability. The final phase is the renewal or re-organization period that occurs when the system goes through a fundamental shift that generates circumstances for new growth (Folke, 2006).

According to Panarchy theory, the adaptive cycle as a heuristic analytical tool may be implemented at several scales, ranging from the local to the global. This concept emphasizes the dynamic relationships between various systems and their interactions across time. Smaller systems have a shorter time scale in Panarchy theory, whereas bigger systems have a longer time scale. Utilizing this theoretical basis the adaptive management technique obtains a better knowledge of system dynamics, allowing for more flexible and responsive decision making. Adaptive management may tolerate uncertainty and begin solutions that are more flexible and sustainable in managing complex natural resources and the environment by utilizing the concept of adaptive cycles or Panarchy theory (Folke, 2006).

Adaptive management provides two distinct decision-making techniques, active adaptive management and passive adaptive management, with the goal of minimizing uncertainty (Williams, 2011). In active adaptive management, knowledge is regarded as absolute, but uncertainty is regarded as something to be eliminated. This strategy is predicated on the concept that expanding our knowledge and understanding of the system under management will lower uncertainty. To eliminate uncertainties caused by limited or wrong information, research activities, extensive data collecting, and the construction of reliable models are utilized in this context. Passive adaptive management, on the other hand, takes a more responsive approach to uncertainty. Because of the oscillations inherent in complex systems, this approach realizes that uncertainty cannot be totally removed. As a result, efforts are concentrated on responding to uncertainty and adapting to unexpected developments. This strategy entails constant system monitoring, learning from experience, and modifying plans and actions in response to changes as they occur (Hasselman, 2017; Williams, 2011). Table 2. summarizes the vital distinctions of active and passive adaptive management.

In the beginning of the evolution of adaptive management process, the primary participants were managers and scientists from diverse fields. They have a vital role in the research and development as well as

execution of adaptive management strategies. One of the first initiatives they took was to develop models of ecological systems to aid in the identification of information and understanding gaps in ecology. They may use this model to study the intricate relationships between ecological components and identify areas that require further research and understanding. Following that, the key players in this process collaborate to define clear natural resource management objectives. This objective is to strike a balance between the use of natural resources and environmental sustainability. Ecological system models are quite useful in this context for assessing the impact of various management scenarios. Stakeholders may assess the possible consequences of each management style by comparing these scenarios and selecting the one that best suits the stated management objectives (Chaffin et al., 2014; Hasselman, 2017).

**Table 2.** The Distinctions of Active and Passive Adaptive Management

Characteristic	Active Adaptive Management	Passive Adaptive Management
Emphasis	Experimentation To test hypotheses about how the system will respond to management interventions	Monitoring To improve management outcomes by making adjustments to management plans as needed
Goal	Controlled experiments, management interventions in different areas	Monitoring the system, collecting data, and using this data to identify areas where management interventions may be needed
Methods		

However, adaptive management under this concept prioritizes the ecological components of a system while underestimating the social processes that are embedded in complex environmental problems (Chaffin et al., 2014). Cultural viewpoints, societal values, conflicts of interest, and other social factors are critical components in the context of complicated environmental concerns (Sharma-wallace et al., 2018; Williams & Brown, 2014). Furthermore, environmental and natural resource challenges frequently include a wide range of stakeholders, including local communities, indigenous peoples' groups, non-governmental organizations, and the commercial sector (Termeer et al., 2010). As a result, adaptive management has been criticized for its lack of legitimacy and for failing to represent a diverse range of interests. Therefore, new innovations in the conceptual framework of complex nature of social and ecological systems are required to supplement the limitations of adaptive management, particularly in the increased engagement of many stakeholders in decision-making.

### **3.2.2. Adaptive Co-Management**

Adaptive co-management is one of the innovations with the aim of increasing the engagement of many stakeholders in decision-making in the conceptual framework of the complex nature of social and ecological systems. The principles of adaptive management, cooperative management dan collaborative management are combined in adaptive co-management (Olsson et al., 2004). The term "co-management" refers to the deliberate engagement and collaboration of diverse organizations having an interest in resource management in the context of adaptive co-management. Government, local communities, indigenous groups, scientists, and the corporate sector are all included. In practice, adaptive co-management enables stakeholders to actively participate in decision-making and management action execution. Adaptive co-management tries to manage resources in a sustainable manner by incorporating numerous organizations and stakeholders. This approach acknowledges that sustainable resource management necessitates collaboration among many stakeholders with varying knowledge, interests, and experience. Adaptive co-management tries to establish a balance between ecological sustainability, social fairness, and economic interests through continuous experimentation, monitoring, and discussion (Hasselman, 2017).

According to Plummer et al., (2007, 2012), the term "adaptive co-management" was coined in 1997 by the Center for International Forestry Research (CIFOR). CIFOR is a research agency focused on natural resource management policy and practice. This concept refers to a management style that emphasizes the need to involve and actively participating with diverse stakeholders in adaptive decision-making processes. CIFOR highlights the importance of the social aspect of resource management, which should not be underestimated (Plummer et al., 2007, 2012). This strategy is a natural resource management innovation that prioritizes cooperation, learning, and adaptive decision-making. Its purpose is to empower resource users and managers in small-scale resource experimentation, monitoring, debate, and responsive management (Hasselman, 2017).

Contributions from diverse scholars and practitioners in this subject are being made to the development of adaptive co-management. Derek Armitage (2007), Fikret Berkes (1999) and Ryan Plummer (2009) are the prominent contributors who have helped to improve knowledge of this approach. Armitage has published extensively on the importance of institutions and governance structures in facilitating adaptive co-management initiatives. It investigates how regulatory agencies and processes might foster collaborative and participative interactions among

resource management stakeholders (Armitage, 2007). Berkes has also made substantial contributions to the understanding of socio-ecological systems and the importance of local knowledge and institutions in adaptive co-management. He realized that people are not just a component of the environment, but its managers as well. Berkes highlights the necessity of understanding and applying local environmental knowledge in decision-making. He also emphasized the need for local institutions in managing resource access and usage in a fair and sustainable way. Berkes contends that local knowledge and institutions may be valuable resources in the pursuit of adaptive and sustainable co-management (Berkes, 2017b).

Ryan Plummer then made significant developments to the evolution of adaptive co-management. He is a well-known academic and researcher who has made important contributions to the subject. Plummer's research focuses on the integration of social and ecological systems in resource management, as well as the implementation of ideas of adaptive co-management. Plummer's research highlights the significance of adaptive capacity, learning processes, and collaborative governance in the management of social-ecological systems. His work has aided in the advancement of knowledge and the use of adaptive co-management techniques in a variety of scenarios (Plummer, 2009).

### **3.2.3. Adaptive Governance**

Adaptive governance has gained prominence in academic study and practice across numerous disciplines during the last two decades. This approach emerges after Dietz et al. first used the term in an article published in the scientific journal "Science" in 2003. Adaptive governance, according to them, is an approach to understand and governance the complexity of interactions between the human system and the ecological system, particularly in the face of great uncertainty (Chaffin et al., 2014). This implies that the approach asserts that the environment of land and sea must be studied and treated as a complex nature of socio-ecological systems, rather than just ecosystems alone (Schultz et al., 2015).

Many initial empirical and theoretical contributions resulting from the adaptive co-management framework have been made in the development of the conceptual framework for adaptive governance. The evolution of adaptive governance, as well as adaptive co-management, first focused on developing, operationalizing, and scaling adaptive management ideas. Thus, although the terms adaptive co-management and adaptive governance differ in terms, the two approaches are frequently used interchangeably in natural resource management literature and practice. This demonstrates that both

concepts are connected and that the approaches to adaptive and sustainable natural resource management are interrelated (Hasselman, 2017; Nelson et al., 2008).

In order to distinguish between the two concepts discussed above, Brunner (2010) offers adaptive governance as a reform model that extends beyond environmental and natural resource issues. Furthermore, he noted that adaptive governance may be used in a variety of contexts, including public governance, health care governance, national security, development aid, and information technology governance (Brunner, 2010). In this regard, adaptive governance, distinct from adaptive co-management, is not restricted to the natural resource domain but may also be applied to a variety of other disciplines. The fields and sectors may take a more adapted approach, learn from experience, and innovate to deal with complex and changing difficulties by adopting this larger concept of adaptive governance. This will aid in the development of governance systems that are more responsive, responsive, and sustainable in a variety of circumstances (Clever & Whaley, 2018).

In addition, according to Hasselman's (2017) perspective, the recent definition of adaptive governance has centered on one aspect of the triangle of politics, polity, and policy. According to him, the adaptive governance of politics strives to combine research, policy, and decision-making into a holistic system. In the view of Hasselman, a political process is urgent to incorporate multiple stakeholders and takes into account power dynamics and the bargaining of interests between them. Knowledge integration in decision-making is also an important part of adaptive governance. Furthermore, the definition of polity highlights the necessity of collaborative institutional structures. This means that decision-making under adaptive governance must entail the participation and collaboration of a wide range of stakeholders, including the government, communities, the corporate sector, and indigenous peoples' organisations. Good institutions are meant to help all stakeholders coordinate, communicate, and collaborate (Hasselman, 2017).

Moreover, the policy-based interpretation contends that in the context of adaptive governance, prescriptive and technically specialized regulations might inhibit change and innovation. Policies under adaptive governance must be more sensitive to environmental changes and adaptable to complex socio-ecological interactions. The policy-based concept highlights the significance of adaptation and flexibility in dealing with change. Thus, Hasselman's viewpoint emphasizes the significance of including political, institutional, and policy components in the adaptive governance approach. This underlines the need to involve stakeholders, considering power dynamics and negotiations, and developing policies and institutions

that promote adaptability, creativity, and responsiveness in natural resource and environmental management (Hasselman, 2017).

The essential features of adaptive governance, according to Karpouzoglou et al. (2016), stress the significance of collaboration, knowledge and learning, adaptive capability, and polycentrism or multiplicity in the governance of complex socio-ecological systems. Firstly, is collaboration. This requires the collaboration and active engagement of a wide range of stakeholders, including the government, communities, the commercial sector, and indigenous peoples' organizations. Collaboration allows for the integration of diverse viewpoints, information, and interests in decision-making and management action execution. Furthermore, collaboration is crucial since it allows for the exchange of wisdom and viewpoints, as well as the development of trust and cooperation among stakeholders. This is significant because social-ecological systems are complex and dynamic, with continually changing problems. Collaboration may help stakeholders gain a better understanding of the system they are managing and establish more effective management methods (Karpouzoglou et al., 2016; Sharma-wallace et al., 2018).

**Table 3.** The Features of Adaptive Governance, Adapted from Karpouzoglou et al. (2016)

Features	Description	Goal
Polycentrism or Multiplicity	A diversified governance structure in which decision-making authority is spread across many institutional scales and among a broad network of participants. Related to communicative planning and deliberative democracy theory as strategies for intercommunication and multilateral decision-making among diverse players on social issues.	Supports cross-institutional learning, trust and communication and consequently facilitates resource sharing, collective problem solving and innovation.
Collaboration	Indigenous and scientific knowledge integration; learning by doing; policy and management as experiments. The ability of individuals, communities, organizations, or systems to respond uncertainty.	Collaboration approaches are frequently oriented toward consensus decision-making.
Knowledge and learning		Allowing for the co-creation of new kinds of knowledge, which will eventually result in changes to practice. Strengthens governance capacity to adapt to change and self-organise.
Adaptive capacity		



The next feature is adaptive governance which relies heavily on knowledge and learning. This entails identifying many types of information, such as scientific, local, and traditional knowledge. Continuous learning from experience and experimentation is the cornerstone for managerial improvement and adaptability. The use of appropriate and up-to-date information is critical in dealing with uncertainties and changes in socio-ecological systems. Since adaptive governance is a learning-by-doing process. Adaptive governance is successful because it allows stakeholders to modify their management techniques as they learn more about the system under control. This is significant because social-ecological systems are always changing, as are the difficulties that these systems face. Stakeholders may benefit from knowledge and learning to remain ahead of the curve and establish more effective management techniques (Karpouzoglou et al., 2016; Wyborn, 2015).

Another crucial aspect of adaptive governance is adaptive capability. The ability of individuals, communities, and systems to adjust to change and uncertainty is referred to as adaptive capacity. This includes the ability to adapt behaviors, policies, and institutions to changing socio-ecological conditions and developing issues. Adaptive capability is vital for adaptive governance because it enables stakeholders to modify their management techniques as the system under-managed evolves. This is significant because social-ecological systems are dynamic and unpredictable, and the issues they face are ever-changing. Stakeholders with adaptive capacity can better respond to change and build more effective management plans (Bronen & Chapin, 2013; Karpouzoglou et al., 2016).

Finally, is polycentrism or multiplicity. It emphasizes the need to have many decision centers that are interconnected and collaborate in management. Polycentrism provides for more involvement and participation, as well as various levels of decision-making that reflect the complexity and diversity of socio-ecological systems. This feature is essential for adaptive governance since it enables the engagement of a diverse range of stakeholders and helps to avoid decision-making from being captured by a single group or actor. This is significant because social-ecological systems are complex and include several stakeholders. Polycentrism or plurality can assist in guaranteeing that all stakeholders have a voice in system management and that the system is not controlled in the interests of a single group or actor (Karpouzoglou et al., 2016; Rijke et al., 2012; Termeer et al., 2010).

These four essential features are all interrelated. For example, collaboration can help to facilitate knowledge and learning, and adaptive capacity can help to ensure that polycentrism or multiplicity is effective. Together,

these four features highlight the importance of a holistic approach to the management of complex social-ecological systems.

### **3.3. The Global North Practice: The Everglades**

The Everglades are case examples from the global north that show it was feasible to reform the governance for better crisis response (Olsson et al., 2006). The Everglades, which are located in south Florida, are a unique and complex environment of international significance. The Everglades are a vital ecosystem for the United States and thus are the primary focus of regional restoration efforts. The success of the Everglades restoration has had a profound influence on communities in Florida as well as the United States (Gunderson & Light, 2006).

The availability of drinking water is one of the main advantages supplied by the Everglades (Gunderson & Light, 2006). These ecosystems serve as natural water filters, supplying a critical source of clean water to millions of people in the region. Furthermore, the Everglades help to safeguard the neighborhood from flood catastrophes. The Everglades reduce the risk of floods and protect the surrounding region by effectively absorbing and storing water. Aside from these advantages, the natural setting of the Everglades promotes a wide range of plant and animal life. This ecosystem is home to numerous rare and endangered species, as well as indigenous vegetation and animals. The existence of the Everglades is critical to the preservation of valuable biodiversity and ecosystems. Therefore, the Everglades is a top priority in regional restoration efforts. It is envisaged that effective restoration and management would restore the function of damaged ecosystems and assure the continuance of the substantial advantages offered by the Everglades for both local populations and the state (Gunderson & Light, 2006; Olsson et al., 2006).

The Everglades ecosystem is facing multiple challenges as a result of human activities such as water management, urban growth, and practices related to agriculture (Chaffin et al., 2014; Djalante et al., 2011). Among the problem areas that occur is water quality degradation: Because the Everglades is a slow-moving grassland river, it is extremely vulnerable to changes in water quality. Agricultural runoff, urban pollution, and climate change have all harmed the Everglades. Habitat loss: Because of construction, farming, and water management methods, the Everglades have lost a large quantity of habitat. This has resulted in the extinction of numerous plant and animal species. Invasion of non-native species: The Everglades have been invaded by a variety of non-native species, including pythons, lionfish, and slugs. This species poses a hazard to vegetation and animals (Gunderson & Light, 2006; Olsson et al., 2006).

To address these challenges and protect the Everglades' long-term viability, adaptive management and adaptive governance have emerged as potential approaches. The enactment of the Everglades Restoration Act in 2000 was a crucial driver of this transition (Cosens et al., 2018). The Comprehensive Everglades Restoration strategy (CERP) was established by this act as a long-term strategy to restore the Everglades. The CERP is a complicated and costly project, but it is critical for the long-term health of the environment. This measure allowed up to \$7.8 billion in rehabilitation funds. The statute expressly specified that adaptive management will be employed to achieve restoration objectives (Gunderson & Light, 2006).

However, according to Olsson et al. (2006), in the Everglades case study, the successful transformation to adaptive governance did not just occur spontaneously but was often preceded by the development of informal networks. These informal networks have an important role in facilitating the exchange of relevant information, identifying gaps in knowledge, and creating connections between different stakeholders. One of the important aspects of this informal network is its independence from regulation and implementation which often occurs within formal frameworks. In a context where formal networks and conventional planning processes are often hampered by rigid regulations and slow bureaucracy, informal networks are emerging as an alternative means of bridging gaps and driving needed changes in ecosystem management (Olsson et al., 2006).

Through this informal network, stakeholders can explore opportunities and more flexible solutions to solve resource problems. They can design and test innovative alternative policies, as well as create mechanisms that promote social learning and adaptation in ecosystem management. In a more open and collaborative environment, informal networks can create opportunities to integrate diverse knowledge and experiences, thereby strengthening the knowledge base and improving management effectiveness. In the context of the Everglades, the development of informal networks is important in facilitating the transformation towards more effective adaptive governance. By connecting diverse stakeholders and building collective capacity, informal networks can help create an environment in which more responsive decisions can be made, innovative solutions can be tested, and learning can be integrated into sustainable management practices (Olsson et al., 2006).

Effective leadership is another important aspect impacting the success of the transition to adaptive governance (Rijke et al., 2012). Art Marshall was a successful leader in coordinating restoration activities in the setting of the Everglades. Its success is based on its capacity to comprehend and express a diverse range of technical, social, and political viewpoints on current

resource concerns in the Everglades. Art Marshall is crucial in combining comprehensive understanding and successfully speaking in numerous places of interest. One of the most important components of this integration was networking with relevant groups, including informal groups. He was able to establish strong ties with these organizations and encourage healthy conversation through his interactions with them. Art Marshall's leadership demonstrates the need to integrate multiple viewpoints and involve key groups, including informal groups, in the implementation of adaptive governance. Strong leadership and the capacity to create mutually beneficial partnerships with many stakeholder groups are critical in the context of the Everglades for sustainable transformation and adaptive management (Olsson et al., 2006).

However, the transformation of governance in the Everglades is indeed a success story, but it is important to acknowledge that the process is ongoing and there are still challenges that need to be overcome. The restoration of the Everglades involves addressing a range of complex issues, such as water management, habitat restoration, and the integration of scientific research and monitoring. These challenges require innovative approaches and the collaboration of various stakeholders to find practical and sustainable solutions. The success achieved so far in the transformation of governance can be attributed to the power of adaptive governance. The Everglades restoration efforts have brought together diverse stakeholders, including government agencies, scientists, environmental organizations, indigenous communities, and local residents. This adaptive governance approach has fostered a shared understanding of the importance of social-ecological systems-based restoration and the need for collective action.

#### 4. CONCLUSION

There are significant distinctions between adaptive management and adaptive governance in the scopes, scales, participants, and emphasis of the governance that is carried out, as identified in the literature. Adaptive management, in general, refers to an approach that focuses on managing natural resources and the environment by adopting strategies that are responsive to change and uncertainty. The main objective is to adapt to environmental change and uncertainty through a continual and iterative interaction between management actions and environmental change.

On the other hand, adaptive governance is a broader approach and involves different elements of governance, such as institutions, public participation and inclusive decision-making processes. Adaptive governance includes regulatory aspects that are more comprehensive and pay attention to the social,

economic and political context in managing socio-ecological systems. There is also a distinction between adaptive co-management and adaptive governance. The importance of cooperation, participation, and involvement of diverse stakeholders in the decision-making process and policy execution is emphasized by adaptive co-management. This term is frequently used in the context of natural resource management, which involves a variety of actors and community groups. Meanwhile, adaptive governance includes principles and approaches that can be applied in various contexts, not limited to natural resource management. This concept recognizes that adaptive governance can be applied in various fields, such as urban planning, climate change policy, or disaster management.

In order to understand and apply these concepts effectively, it is important to understand the differences and characteristics of each. This helps us to see the role and practical implications of adaptive governance approaches in different contexts and opens opportunities for collaboration between diverse stakeholders in order to achieve broader sustainability goals. Therefore, the conception of adaptive governance as a whole is continually evolving, with the objective of incorporating all of the characteristics within the framework of the complexity of social-ecological systems.

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