Forest and Society
Vol. 9(2): 487-521, December 2025
10.24259/fs.v9i2.43276

REGULAR RESEARCH ARTICLE

The Patchwork Quilt of Global Mangrove Conservation: Mapping the Landscape of International Treaties

Pradip Kumar Sarker [1,*], Md Faisal Abedin Khan [2,3], Fredy Polo Villanueva [1], and Lukas Giessen [1]

AFFILIATIONS

1. Chair of Tropical and International Forestry, Technical University Dresden, Dresden, Germany.
2. Ministry of Science and Technology, Government of the People's Republic of Bangladesh, Bangladesh.
3. Chair Group of Forest and Nature Conservation Policy, Georg-August University, Göttingen, Germany.

* Corresponding authors: psarker@gwdg.de

RECEIVED 2025-02-19
ACCEPTED 2025-06-11

ABSTRACT

Mangroves at the land-sea interface offer invaluable goods and services through their unique ecosystem. Society has responded by developing governance mechanisms to manage these resources sustainably, which is crucial for societal well-being. The global environmental governance landscape is a complex network of treaty-based regimes addressing various ecological challenges. This study aims to examine the treaty-based regimes governing mangrove conservation, systematically mapping and identifying authoritative global mangrove regimes. It analyses the fragmentation scale regarding synergies, conflicts, and neutral relationships between global environmental treaties. Online scoping reviews and content analysis revealed that the Ramsar Convention serves as the legal authority of the global mangrove regime. The study highlights positive interactions and cooperative mechanisms between the mangrove regime and 17 other environmental regimes. Future research should explore how regime secretariats customise policies to make them legally binding and synergise fragmented regimes, emphasising robust inter-regime communication and joint initiatives. Additionally, China's management of the International Mangrove Centre presents a promising research avenue, focusing on the sustainable conservation and use of mangroves.

KEYWORDS

International regime; Regime fragmentation; Global mangrove regime; Regime interaction; Online-scoping method; Synergic fragmentation.

1. INTRODUCTION

Mangroves at the land-sea interface offer invaluable goods and services through their unique ecosystem. However, mangroves are home to 341 threatened species and are vital for biodiversity and climate resilience (Spalding & Leal, 2021). Their global significance is immense, as they function as natural barriers against storm surges and erosion, support diverse marine life, and store large amounts of carbon, which helps mitigate climate change (Lovelock & Reef, 2020; Friess et al., 2019; Hamilton & Casey, 2021). Additionally, mangroves contribute to the livelihoods of millions of people by providing resources such as fish and timber. Meanwhile, according to the Global Mangrove Watch (GMW), the world lost approximately 3% of its mangrove cover between 1996 and 2020, with an estimated annual loss rate of 0.16% (Bunting et al., 2022). This loss is primarily driven by coastal development, aquaculture expansion, and the impacts of climate change, such as sea-level rise and increased storm intensity (Lovelock & Reef, 2020; Worthington & Spalding, 2021). Mangrove deforestation rates remain exceptionally high in Southeast Asia, where countries like Indonesia and Myanmar have seen substantial declines in mangrove areas (Friess et al., 2023).

The unique ecological and socioeconomic significance of mangroves has led to the development of an evolving international regime for their conservation and sustainable management. Regime studies claimed that the number of treaty or non-treaty-based environmental regimes exists and or is growing globally, particularly following "The

United Nations Conference on the Human Environment (UNCHE)" in 1972 (Sarker et al., 2018; Elliot & Breslin, 2011; Haas, 2016; Meyer et al., 1997) and the expectations of actors converge, e.g., tacit, dead-letter, classic/full-blown regimes (details in Levy et al., 1995, p.272; Little, 2014, p.293). The rise of regimes addressing global issues has created a complex governance landscape (Weiss, 1993; Young, 1996). Scholars focus on interactions and interlinkages among these regimes (Young, 2002; Kim, 2004; Oberthür & Gehring, 2006; UNEP, 2019; Pattberg, 2010; Oberthür & Stokke, 2011; Pattberg et al., 2018), specifically, to identify the issue-areas regime, like the Global Mangrove Regime (GMR) within the bazaar of global environmental governance.

With this increasing trend over time, it is sometimes difficult to find the exact issue-specific (non)-legally binding regime[1] in the bazaar of global environmental governance. Because a treaty-based environmental regime provides a formal, legally binding framework for international cooperation, ensuring that member states commit to specific ecological standards and actions by facilitating collective efforts for maintaining accountability and achieving long-term environmental goals effectively (Keohane, 1984; Ivanova, 2021; Kim, 2022; Zelli et al., 2023; Kim & Bosselmann, 2015; Biermann et al., 2015; Young, 2011, 2015, 2016; Mitchell, 2003). Additionally, they help harmonise national policies with global environmental goals, promoting consistency and reducing conflicts between countries' environmental strategies (Keohane & Victor, 2016). On the other hand, regimes can sometimes negatively impact national environmental policies, e.g., by imposing strict guidelines that reduce their flexibility, changes to domestic policies that can result in economic burdens, conflict with existing national policies or priorities, leading to policy incoherence and hindering effective environmental governance, or creating significant implementation gaps (Victor et al., 1998; Keck & Sikkink, 2014; Chichilnisky & Heal, 1994; Underdal, 2010; Nilsson, et al., 2009; Breitmeier, et al., 2011).

However, regime fragmentation is a natural phenomenon influenced by social interests and temporal demands. The United Nations (comprising 193 member states as of 2023, including five permanent members with veto power)[2] is often considered the mother of international regimes and the creator of regime fragmentation as well. Indeed, regime fragmentation is a complex phenomenon with positive and negative consequences. Regimes, as understood, can originate from state or non-state actors, whether formal or informal. It is essential to note that states are the primary members of these regimes. Non-state actors (e.g., INGOs, NGOs, civil societies, and Indigenous communities) play a significant role. Still, they are either part of a state or are operated formally and informally by a state and contribute to the diverse landscape of global environmental governance. In these circumstances, fundamental international conventions like the Ramsar Convention, the CBD, and the UNFCCC contain provisions relevant to mangrove conservation. A focused GMR could streamline these efforts, address transboundary issues, and promote sustainable practices (Hamilton & Friess,

[1] The hard environmental law consists of legally binding agreements that impose enforceable obligations on states and other actors, including treaties, statutes, and regulations, e.g., the UNFCCC, which establishes binding targets for reducing greenhouse gas emissions, and the CBD, which mandates biodiversity protection measures. In contrast, soft environmental law encompasses non-binding agreements, guidelines, and declarations that shape policy and behaviour without legal compulsion, e.g., the Rio Declaration on Environment and Development, which sets out principles for sustainable development and the SDGs, which promote global environmental protection without direct legal obligation (Abbott & Snidal, 2000; Ginsburg & McAdams, 2003; Skjærseth et al., 2006; Boyle, 2019). The 1969 Vienna Convention on the Law of Treaties: "an international agreement concluded between States in written form and governed by international law" in which states express a "consent to be bound" [Articles 2(1)(a) and 11 through 17] (Mitchell, 2024).

[2] See https://www.un.org/securitycouncil/content/current-members: accessed on 25 February 2024

2020; Lee et al., 2022). The fragmented regime landscape, comprising a web of treaties and agreements, presents opportunities for synergy and comprehensive management but also poses challenges related to policy coherence and enforcement (Biermann et al., 2009; Biermann & Kim, 2020; Young, 2011).

Recognising the escalating fragmentation, a United Nations task force recommended stronger cooperation among multilateral environmental institutions in 1998 to enhance synergies and policy coherence (UNGA, 1998). Mapping these frameworks and understanding their interactions (i.e., synergic, conflictive and neutral) is crucial for effective mangrove conservation. However, no study has yet comprehensively examined the issue-specific global mangrove regime within global environmental governance, considering regime features, fragmentation scales, and the interplay of synergies, conflicts, and neutral relationships. Walker et al. (2022) support our argument and stated that while no dedicated international environmental regimes, binding or non-binding, exist for mangrove ecosystems, various global agreements establish commitments that can be applied to their protection.

This study addresses this gap by focusing on two aims:

a) Systematically map and identify the authoritative global mangrove regimes, differentiating between core treaties. This process involves analysing treaty-based regime institutional structure, goals, and interactions, drawing on methodologies from regime institutional analysis and environmental governance literature.
b) Analyse the fragmentation scale of the identified global mangrove regimes by examining synergies, conflicts, and neutral relationships between various global environmental treaties. These aim to understand how these regimes complement or hinder each other's goals.

This study will contribute to a deeper understanding of the complex landscape of global mangrove governance, offering insights into the challenges and opportunities presented by regime fragmentation. This knowledge is essential for formulating effective strategies to conserve and sustainably manage these vital ecosystems amid ongoing environmental pressures.

This study adopted the analytical framework of the international regime and regime fragmentation to address those two aims, which will be detailed in the next section. Notably, this study thoroughly used the terms states, countries, and nations synonymously; seemingly, member states, contracting parties (CPs) and member countries are synonymous.

2. ANALYTICAL FRAMEWORK: INTERNATIONAL REGIME AND REGIME FRAGMENTATION

This study must acknowledge International Relations (IR) theorist Ernst Bernard Haas for his highly inspiring writing on regime study: "Words can hurt you; or, who said what to whom about regimes. The study of regimes maps the ontogeny and the phylogeny of consensual thought about interactions between man, culture, and nature. My purpose is to foster communication, not to provide a true, final theory. Communication uses words and metaphors, and the language for discussing regimes features in many words" (1982: 209- 210).

In the international system, institutions are typically structured around a multilaterally negotiated intergovernmental treaty, supported by a bureaucracy and governed by explicit norms and rules for member states. These institutions primarily engage national governments and embody the conventional approach to global governance, commonly referred to as international regimes (Pattberg et al., 2014). Regimes can vary in formality, ranging from highly formalised agreements with clearly defined expectations to more flexible arrangements that may lack explicit institutional

structures (Little, 2014; Levy et al., 1995; Young, 1980). Typically, regimes are anchored in formal documents such as agreements, conventions, treaties, or charters, serving as "constitutional" contracts (Young, 1980: 350; Levy et al., 1995: 273). In contrast, the Secretariat or bureaucratic apparatus of a regime plays a central role in determining its level of formalisation, executing assigned tasks, and comprising participating members, nominated officials, or an institutional setup established by member states (Koppell, 2010; Hafner-Burton et al., 2008). A regime's key strength is its ability to enhance cooperation among states within a given issue area (Hasenclever et al., 1996). Research identifies distinct global, regional, or bilateral regimes, partially or comprehensively regulating issues (Little, 2014; Biermann et al., 2009). These regimes are established to address specific or multiple issues over time, which can foster conflict resolution and mutually beneficial agreements shaped by member states' diverse interests (Sarker et al., 2024; Koremenos et al., 2001).

The concept of international regimes originates from international relations (IR) scholarship, traditionally dedicated to the broad politics and underlying reasons for (non-)cooperation among member-states. Following the concepts of "regimes matter" by Strange (1982), Haas (1989), and Mitchell (1994), the regime has executed explicit or implicit internationally agreed-upon arrangements in the sovereign states globally. Van Driel et al. (2024) stated that a regime is the byproduct of three elements: *authority*, procedures, and resources, which become institutionalised on an issue through a process that evolves from ad hoc to be more structured and predictable. The popular definition of international regimes in IR is a set of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given issue area (Krasner, 1982). Connectively, the global environmental regime encompasses a complex network of treaties, conventions, and protocols designed to address pressing environmental issues on a global scale, such as climate change, biodiversity loss, and pollution (Biermann et al., 2009; Biermann & Kim, 2020; Young, 2011). Hence, fragmentation occurs within narrowly defined governance structures, where parallel policies and regimes coexist in the same issue area, such as climate governance or plant genetic resource management (McGee & Taplin, 2006; Raustiala & Victor, 2004; van Asselt, 2007; Biermann et al., 2009). Studying governance architecture and fragmentation levels provides valuable insights, while fragmentation is a broader tool for comparing policy areas.[3]

However, amidst the chaos of the burgeoning field of environmental governance, Oran R. Young introduced the concept of regime fragmentation in the research of IR. He emphasised the ever-growing complexity of international regimes and their interactions, which underscored the need for a deeper understanding and analysis of regime fragmentation due to such interactions (1994, 2002). Later, Raustiala and Victor (2004) refined the concept, examining treaty interaction within a specific issue area.

[3] Biermann et al. (2009: 18) interpreted the term "issue area" in a more specific sense than the broader concept of "policy area." Issue areas define the scope of individual regimes, such as the UNFCCC for climate change, whereas governance architectures encompass broader frameworks beyond specific institutions (Pattberg et al., 2014). To highlight this distinction, "policy area" refers to a political system component centred on substantive issues (Burstein, 1991: 328). Policy areas evolve around interconnected problems, with defining issues sharing inherent characteristics that shape their framing and response (ibid). For example, the biodiversity policy area includes issues, e.g., forest management, fisheries, aquaculture, species, trade, ecosystem, habitat, cultural heritage, and desertification. Additionally, many policy areas consist of a diverse mix of international institutions, varying in type (organisations, regimes, norms), constituencies (public and private), scope (bilateral to global), and subject matter (specific fields to broad concerns) (Biermann et al., 2009).

The concept of fragmentation was later expanded by contemporary research on regime interlinkages, overlaps, interactions, and interplay (e.g., Zelli & van Asselt, 2013; Brosig, 2011; Oberthür & Gehring, 2006, 2011; Oberthür & Stokke, 2011; Vande Graaf & De Ville, 2013; Betsill et al., 2015). Conversely, scholars set up diversified theoretical foundations and frameworks for assessing the interactions, synergies, conflicts, and neutrality within international environmental governance over time. They offer insights into the complexities of governance arrangements at the global level and the challenges of integrating policies across different actors, sectors, and issue areas. These include regime theory (Keohane & Victor, 2011), transnational environmental governance (Andonova et al., 2014; Biermann et al., 2009), complexity theory (Folke et al., 2010; Walker et al., 2006; Byrne & Callaghan, 2022), institutional theory (Haas, 1992; Young, 2011), network theory (Bodin & Crona, 2009; Betsill & Bulkeley, 2021), policy integration theory (Nilsson & Lundberg, 2010; Pahl-Wostl, 2007), institutional analysis and development framework (Ostrom, 2010; McGinnis, 2011), and global environmental governance (Biermann & Pattberg, 2008, 2012; Young, 2007).

Governance fragmentation introduces a macro-level perspective, enabling the comparison of various types and degrees of fragmentation across different policy areas (see Zelli & van Asselt, 2013). The degrees of fragmentation can be evaluated based on various criteria. In this case, Oberthür & Gehring (2006) proposed that regime interconnections can lead to conflict between the involved regimes, foster synergy, or produce neutral or indeterminate outcomes. According to them, synergy occurs when an interaction supports the target regime's institutional goals, fostering cooperation and mutual benefits, while conflict arises when the interaction contradicts or undermines these goals, causing disruptions and impeding effectiveness. Neutral or indeterminate effects occur when the interaction neither strongly reinforces nor obstructs the regime's pursuit of its goals, resulting in an unclear or insignificant impact (Oberthür & Gehring, 2006: 309). On the other hand, synergistic fragmentation occurs when a core regime includes nearly all countries and establishes effective and detailed principles that regulate policies within distinct yet substantially integrated regime institutional arrangements. Cooperative arises in issue areas characterised by multiple regimes with loosely integrated decision-making procedures, ambiguous relationships between norms and principles, or a core institution that does not encompass all key countries. Conflictive is present when regimes are minimally connected, follow unrelated decision-making procedures, uphold conflicting principles, norms, and rules, and consist of differing memberships or actor coalitions that either accept or actively promote these conflicts (Biermann et al., 2009: 19-20; Biermann & Kim, 2020). Based on this argument, we developed the following assessment criteria (Table 1).

Table 1. The assessment criteria for degree of regime fragmentation (based on Oberthür & Gehring, 2006; Biermann et al., 2009; Biermann & Kim, 2020)

Category	Definition	Key Considerations
Synergy	Occurs when environmental regimes share common goals or address complementary aspects of environmental protection.	Enhances cooperation and reinforces policy goals.
Conflictive	Arises when contradictions or trade-offs exist between the goals and actions of different international regimes.	Can hinder policy effectiveness and create governance challenges.
Neutrality	Exists when the goals and actions of different international regimes neither reinforce nor contradict each other significantly.	Leads to minimal interaction between regimes, maintaining independent goals.

3. METHODOLOGY: ONLINE-BASED SCOPING REVIEWS AND CONTENT ANALYSIS

The most important *first* question is whether the treaty-based global mangrove regime exists. We sorted out several bullet keywords for mangroves based on the scoping review. It is a type of evidence synthesis that aims to identify and map relevant evidence that meets pre-determined inclusion criteria regarding the topic, field, context, concept, or issue under review (Peters et al., 2021). Scoping reviews are increasingly used to respond to complex questions where comparing interventions may be neither relevant nor possible (Lv et al., 2020; Munn et al., 2018). Often, cost, time, and resources are factors in decisions about review type (Shemilt et al., 2014; Khalil et al., 2020). Scoping reviews are useful to clarify key definitions in the literature, such as which treaty-based regime deals with the mangrove or truly relevant terms.

Scholars described "mangrove" as a general term applied to plants which live in muddy, loose, wet soils in tropical tide waters (Davis, 1940), and Chapman (1939, 1940, 1944) described silt, sand, peat, and coral reefs as mangrove habitats. Importantly, Walsh (1974) traced out in the literature of the Ecology of Halophytes that Burtt Davy (1938) proposed many terminologies of mangroves based on vegetation and the nomenclature commonly used today. These include mangrove woodland, mangrove, mangrove swamp, tidal forest, littoral woodland, strand vegetation, beach forest, and dune forest. Connectively, Oxford Dictionary denoted “mangroves” (plural noun) as a tree or shrub that grows in tidal, chiefly tropical, coastal swamps having numerous tangled roots that grow above ground and form dense thickets. This Dictionary furthered that the truly relevant term of mangrove as “wetlands” as land consisting of marshes or swamps, and exampled many synonymous terms, e.g., marsh, marshland, swamp, swampland. Likewise, the National Geography stated that the wetland plants are called hydrophytes, such as mangrove trees, which tolerate brackish water. Mangroves are easy to recognise because of their tall, stilt-like roots, which hold the small trunks and branches of the trees above water. Based on these, this study conclusively considered search bullet keywords: “wetlands”, “mangrove”, “coastal wetlands”, “tidal forest”, “swamp forest”, “strand vegetation”, and “littoral woodland”.

Second, using those scoping keywords, can we identify mangroves or truly relevant multilateral agreements from the International Environmental Agreements (IEAs) collection? Ronald B. Mitchell has already recorded over 1,300 Multilateral Environmental Agreements (MEAs) in their Database Project (https://iea.uoregon.edu/) (Mitchell, 2024) as well as 2182 treaties in the ECOLEX[4] portal (ecolex.org/result/?q=&type=treaty&xdate_min=&xdate_max=). Seemingly, this study found two unique online repositories, such as UN InforMEA[5]

[4] ECOLEX is an information service on environmental law operated jointly by FAO, IUCN and UNEP. The ECOLEX database includes information on treaties, international soft-law and other non-binding policy and technical guidance documents, national legislation, judicial decisions, and law and policy literature. Users have direct access to the abstracts and indexing information about each document, as well as to the full text of most of the information provided.

[5] The facilitation by the United Nations Environment Programme (UNEP) for the “MEA Information and Knowledge Management (IKM) Initiative” (www.informea.org), which brings together 13 Global Multilateral Environmental Agreements to develop harmonised and interoperable information systems in support of knowledge management activities among MEAs for the benefit of Parties and the environment community at large. The InforMEA project provides a web portal to access aggregated data and information harvested from participating MEAs.

(https://www.informea.org/en/node/493128) and Plataforma CIPÓ[6] (plataformacipo.org). These four unique and comprehensive knowledge-based data sources help understand and navigate international multilateral environmental and forest negotiations and related processes from global perspectives. This digital repository helps gather crucial empirical resources, streamline researchers' endeavours, and enhance efficiency (Rahayu et al., 2019). Moreover, internet-based open-source platforms serve as repositories for intellectual outputs, encompassing research findings and educational resources generated by organisations or institutions (Tansley et al., 2003). These platforms augment the visibility and accessibility of such materials (Smith et al., 2003). We use these online repositories only considering the international scope and excluding the regional scope for our empirical data sources.

Third, those keywords were plotted on those two online portals to match our keywords with the listed global treaties' keywords/glossary terms. Based on the remarkably close keyword (s), we have recognised the core global regime of the mangrove. Then, we mapped out by centring the mangrove regime with support from other relevant regimes, considering only the treaty-based regimes (legally binding) with the established Secretariat in order to address this study's first objective.

Fourth, after snapping the core regime, we considered all Global Environmental Treaties and supporting agreements in order to address the second study objective using the established theoretical framework. It offers a comprehensive and nuanced approach to understanding the dynamics of global environmental governance, with a focus on synergy, conflicts, and neutrality among different agreements and actors (detailed in section 2). The developed framework is pivotal for analysing global environmental governance synergies, conflicts, and neutrality. It provides a structured approach to assess how different environmental regimes interact, helping to achieve a comprehensive understanding of their interdependencies and potential overlaps.

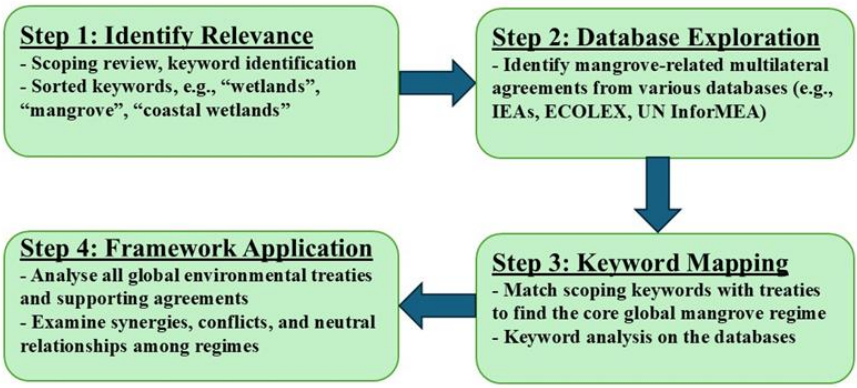

Figure 1. The summarised methodology for this study

Figure 1 shows the methods employed in this study. However, empirically, the study considered the original texts of all the treaties or agreements and supporting protocols for the qualitative content analysis (Brymann, 2001; Friedrichs, 1990). Qualitative content analysis is considered a popular and effective method of data analysis that can expose social and political reality through manifest text and non-manifest context

[6] Database of Global Forest Governance Arrangements: Mapping global and regional governance arrangements on forests and other ecosystems relevant to biodiversity and climate change (https://plataformacipo.org/en/global-forest-governance-arrangements/.

(Neuman, 2014). Moreover, this approach strengthens the empirical basis in the policy research (Kleinschmit, 2012), besides increasing the reliability and validity of data (e.g., Schusser et al., 2012). In this context, Sahide et al. (2018) argued that document analysis could be essential for analysing environmental policy. Therefore, the authors have used this approach to open the understanding of global mangrove governance and policy.

4. RESULTS

4.1 Map and identification of a treaty-based core global mangrove regime

Figure 2 captures 18 global environmental governance initiatives focusing on six main policy areas, which also overlap (this is not our study focus) in those policy areas. Through our established mapping method, the Ramsar Convention (Convention on Wetlands of International Importance, especially as Waterfowl Habitat) holds the core "Global Mangrove Regime (GMR)" out of 18 global environmental governance initiatives (treaties) due to addressing the key issue area "wetlands" and communicating with other regimes through regime policy areas for the betterment of wetlands/mangroves. Notably, Mitchell's IEAs Database[7] captured the highest hit 35 times in 24 paragraphs on this convention out of 68 paragraphs of 24 MEAs (international and regional scope) after plotting the keyword "wetlands".

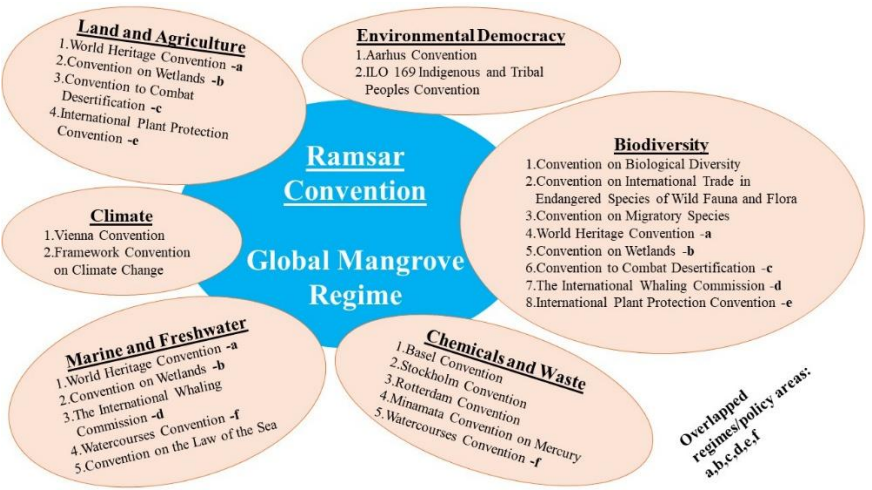

Figure 2. Mapping out the Global Environmental Treaties for finding the Mangrove Regime [Source: Adapted from Annexe 1].

However, the concern of "Wetlands" conservation and management came in 1960 from the MAR project composed of three letters, i.e., MARshes, MARecages, and MARismas (Matthews, 1993: 8). On 2 February 1971, 18 countries made history in the Iranian Caspian Sea resort of Ramsar by signing the first global environmental intergovernmental treaty (Matthews, 1993; Tiéga, 2011). Eighteen countries were Belgium, Denmark, Finland, France, the Federal Republic of Germany, India, Iran, Ireland, Jordan, the Netherlands, Pakistan, South Africa, Spain, Sweden, Switzerland, Turkey, the Union of Soviet Socialist Republics and the United Kingdom, and five observer countries were Bulgaria, Greece, Hungary, Italy and Romania (Matthews,

[7] Full Text Search - Advanced | International Environmental Agreements (IEA) Database Project (uoregon.edu) (accessed on 29.02.2024).

1993, p.25). The Ramsar treaty is the oldest modern global intergovernmental environmental agreement to focus on a single ecosystem, which came into force in 1975 (Matthews, 1993; Ramsar, 2022). The Convention's focus is to "conserve, use wisely, restore the wetlands, and recognise and value their benefits by all" (Ramsar, 1971: 1). This achievement was particularly remarkable given that it occurred during the Cold War, a period marked by political tensions and economic rivalries following World War II. Establishing the Ramsar Convention one year before the creation of the United Nations Environment Programme (UNEP) proved the potential for international cooperation in environmental protection (Matthews, 1993; Tiéga, 2011). In February 2024, almost 90 per cent of UN member states from all the world's geographic regions acceded to become "Contracting Parties" (CPs). The number of member countries/CPs is 172, declaring 2,513 Ramsar Sites for a total designated surface of 257,254,185 hectare.[8] Ironically, 309 Ramsar Sites hold mangroves that represent 38,283,548 ha of mangrove coverage globally.[9] This is the iconic achievement so far under the authority of GMR.

Constructively, in 1990, the Ramsar regime addressed the direct term "mangrove" in the classification system for "wetland type" at COP-4 (Conference of the Contracting Parties): intertidal forested wetlands, including mangrove swamps, nipa swamps, and tidal freshwater swamp forests.[10] Then, the mangrove issue was endorsed in the 1997 regime policy by setting operational goal 6.2 (Ramsar, 1997), and the 2003 policy took specific measures on the wise use (regime's 1st pillar) of mangrove ecosystem resources (Ramsar, 2003). In 2019, the United Nations Environment Assembly (UNEA) confirmed that the Ramsar Convention on Wetlands is a relevant policy framework for conserving and managing coastal wetlands, including mangroves and other coastal ecosystems (UNEA, 2019). In 2022, the regime took a milestone decision by adopting the draft resolution on the establishment of the "International Mangrove Centre (IMC)" in the framework of the Ramsar Convention in COP-14 (Ramsar, 2022), which is now operational and hosted by China.[11]

In the highly formalised form, as UNESCO serves as the custodian of the Ramsar Convention's legal documentation, and the Convention is officially registered with the United Nations under Article 102 of the United Nations Charter, this affiliation guarantees the exact recording and acknowledgement of the Convention's agreements.[12] However, the regime's core funding mechanism is based on contributions from CPs. These contributions are based on the UN scale of assessment adjusted to take account of the fact that not all members of the UN are CPs to the Convention.[13] The regime is a collaborative effort involving the COPs, the Standing Committee, and the Secretariat, with guidance from the Scientific and Technical Review Panel (STRP). The International Union for the Conservation of Nature (IUCN) headquarter is honourably hosting the Ramsar Secretariat in Gland, Switzerland. The secretariat consists of 21 staff members from 2023, and the secretary-general is the head of the secretariat, conducting administrative tasks. Significantly, the regime works with a diverse global "network of partners" to meet its goals, which range from

[8] Home page | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (accessed on 29.02.2024).

[9] RIS Search | Ramsar Sites Information Service, (accessed on 29.05.2024).

[10] Microsoft Word - key_rec_4.07e.doc (ramsar.org), (accessed on 29.02.2024).

[11] https://www.ramsar.org/sites/default/files/2024-03/RRI_IMC_2023_24_e.pdf (accessed on 29.02.2024).

[12] Convention on Wetlands of International Importance especially as Waterfowl Habitat. - Legal Affairs (unesco.org) (accessed on 29.02.2024).

[13] The Secretariat | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (accessed on 29.02.2024).

relevant treaty-based global regimes and international organisations to international and national non-governmental organisations and prominent private companies.[14]

Overall, the Ramsar Convention is the legal authority of the global mangrove regime in global environmental governance through the fundamental regime design features, e.g., having the legal framework for member states to designate and manage wetlands of international importance, including mangroves, a multilateral agreement, the membership rules, the design criterion for wetlands as Ramsar Sites, compliances mechanisms (reporting/monitoring), the provision for technical and financial support to the member states, and Secretariat administrative structure (Ramsar, 1971).

4.2 Fragmentation directs synergies, conflicts and neutralities

Figure 2 has already found the core global mangrove regime by filtering the 18 MEAs. Importantly, this regime is fragmented or complex due to its interaction with other relevant environmental regimes and vice versa. However, Table 1 depicts the degree of fragmentation in analysing synergies, conflicts, and neutrality between the regime interaction following our established analytical framework. This study analysed 18 global environmental treaties to determine whether the Ramsar/Mangrove regime (both terms will be used synonymously) interacts synergistically, conflictive, or neutrally by sharing common and key policy goals with other regimes. Table 1 shows that none of the relevant regimes interact in conflicting or neutral behaviour with the Ramsar regime.

In synergic relationships, the goals of the mangrove regime align closely with those of the other regimes, resulting in synergistic interactions. For example, the world heritage and mangrove regimes aim to protect and preserve natural sites of global significance, creating constructive interaction in their efforts. Another example is ILO 169, which focuses on safeguarding the rights of indigenous and tribal peoples, recognising their role as stewards of natural resources, which aligns with the Ramsar regime's goal of conserving wetlands and their biodiversity (Article 2 – Ramsar Convention; Article 1 - ILO 169 Convention). Moreover, a synergy exists between Ramsar and climate change regimes: each preamble recognises the importance of ecological functions and sustainable development. Wetlands are critical in regulating water regimes and supporting biodiversity, which is essential for climate change adaptation and mitigation.

Overall, the table highlights the diverse range of global environmental governance frameworks and illustrates how they interact with or complement the goals of the Ramsar regime in conserving and managing wetland ecosystems.

Table 1. Relationship between the Ramsar Policy and others (based on Annexe 2)

SN	Treaty-based Regimes	Key goal of regime policy	Synergies with Ramsar Policy Goal
The central goal of the Ramsar regime: conservation and wise use of wetlands, recognising their fundamental ecological functions and their economic, cultural, scientific, and recreational value towards achieving sustainable development			
1	World Heritage Convention (WHC)	Cultural and natural heritage protection	Joint reactive monitoring missions to sites covered by both Ramsar and World Heritage Conventions (e.g., Doňana National Park, Ichkeul National Park) promote coordinated conservation efforts.
2	Convention on Biological	Biodiversity conservation,	Joint efforts to promote the conservation and sustainable use of wetland biodiversity,

[14] Partnerships | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (accessed on 29.02.2024).

SN	Treaty-based Regimes	Key goal of regime policy	Synergies with Ramsar Policy Goal
	Diversity (CBD)	sustainable development	aligning with CBD's Aichi Biodiversity Targets and Ramsar's Strategic Plan.
3	Convention on International Trade in Endangered Species (CITES)	Regulating trade in endangered species	Cooperate in regulating international trade to ensure the conservation and sustainable use of wetland species listed under CITES Appendices.
4	Convention on Migratory Species (CMS)	Migratory species conservation	Coordinate to conserve migratory species and their habitats, including wetlands, by implementing joint action plans and initiatives.
5	Vienna Convention	Protect human health and the environment	Collaborate in addressing transboundary environmental issues, including shared wetland ecosystems, through exchanging information and best practices.
6	International Plant Protection Convention (IPPC)	Plant health, safe trade, environmental protection	Collaborate in addressing the threat of invasive species to wetland ecosystems and promoting measures to prevent their introduction and spread.
7	Framework Convention on Climate Change (UNFCCC)	Climate change mitigation, adaptation	Coordinate to promote wetland conservation as a nature-based solution for climate change mitigation and adaptation, aligning with UNFCCC's goals.
8	Convention to Combat Desertification (CCD)	Combat desertification, land restoration	Joint efforts to address land degradation in wetland areas, combat desertification, and promote sustainable land management practices in wetland ecosystems.
9	Convention on the Law of the Sea (CLC)	Whale stock regulation, biodiversity protection	Collaborate in marine conservation efforts to protect wetland habitats and biodiversity, especially in coastal and estuarine areas affected by whaling activities.
10	Watercourses Convention	Ocean governance, marine biodiversity	Coordinate promoting sustainable management and conservation of marine and coastal resources, including wetlands and associated ecosystems.
11	The International Whaling Commission (IWC)	International watercourses management	Collaborate in protecting wetlands and associated watercourses, promoting integrated water resources management, and addressing transboundary water issues.
12	Minamata Convention on Mercury (MCM)	Mercury pollution control	Cooperate in monitoring and mitigating mercury pollution in wetland ecosystems, including contaminated water bodies and sediments, to protect human health and the environment.
13	Basel Convention	Hazardous waste management	Coordinate in managing hazardous wastes and chemicals, including those threatening wetland ecosystems, through adopting environmentally sound management practices.
14	Stockholm Convention	Protects human health and the environment from POPs	Collaborate in reducing and ending the release of persistent organic pollutants (POPs) into wetland environments and promoting measures to protect wetland biodiversity.

SN	Treaty-based Regimes	Key goal of regime policy	Synergies with Ramsar Policy Goal
15	Rotterdam Convention	Informed consent in chemical trade	Cooperate in regulating the international trade of hazardous chemicals and pesticides that may impact wetland ecosystems, ensuring their safe use and handling.
16	Aarhus Convention	Promote environmental Democracy	Joint efforts to enhance public participation, access to information, and environmental decision-making processes related to wetland conservation and management.
17	ILO 169 Indigenous and Tribal Peoples Convention	Indigenous and tribal peoples' rights	Collaborate in recognising and respecting the rights of indigenous peoples to their lands, territories, and resources, including wetland areas of cultural and ecological significance.

5. DISCUSSION

5.1 Core global mangrove regime in the fragmented global governance

The mapping-based analysis suggests that the Ramsar Convention achieved the Global Mangrove Regime's (GMR) crown in the fragmented global environmental governance following the legally binding regime features. These include the convention of common concerns of the issue area[15], formality under Article 102 of the United Nations Charter, membership rules, a well-equipped secretariat, compliance and monitoring mechanisms, and flexibility and adaptiveness in responding to current information and emerging threats. This result supports other eye-catching regimes in the global environmental research arena, such as the United Nations Framework Convention on Climate Change (UNFCCC), which provides an international framework for addressing climate change (UNFCCC, 1992), Convention on Biological Diversity (CBD), which conserve biological diversity, promote sustainable use, and ensure fair sharing of benefits (CBD, 1992), and Convention on International Trade in Endangered Species (CITES), which regulates international trade in endangered species (CITES, 1973). Scholarly, international regimes are systems of principles, norms, rules, and decision-making procedures that govern interactions among states and other actors in specific issue areas (Krasner, 1982; Young, 2007; Abbott & Snidal, 2000; Koremenos et al., 2001; Koremenos, 2016; Henning & Pratt, 2023). Importantly, this mangrove regime has firmly fixed its position globally by establishing the IMC in Shenzhen, China, with the vision of "a world in which Mangroves are conserved, restored, and wisely and sustainably used" and the primary mission: "To establish an open, inclusive, co-built, and mutually beneficial international cooperation mechanism for mangrove and other adjacent coastal blue carbon ecosystems, thereby to promote international cooperation and joint action for mangrove conservation, restoration, and wise and sustainable use."[16]

Our result suggests that the Ramsar Convention is the legal root of the GMR working to improve wetland and mangrove issues through the regime's institutional structure, like the Secretariat. Treaty-based regimes ease cooperation among member

[15] The Convention uses a broad definition of wetlands. It includes mangroves, all lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas and tidal flats, and other coastal areas, coral reefs, and all human-made sites such as fishponds, rice paddies, reservoirs, and salt pans (The Convention on Wetlands and its mission | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (Accessed on 25.02.2024).

[16] IMC_RRI_proposal_final_e.pdf (ramsar.org), (Accessed on 25.02.2024).

states by providing a formal regime administrative structure (e.g., Secretariat) within which states can negotiate, implement, and enforce agreements on common issues (Keohane, 1984). Conversely, the Secretariat, or the regime's international bureaucracy, is the core entity leading formalisation and executing tasks (Koppell, 2010; Hafner-Burton et al., 2008). The Secretariat acts as 'knowledge-brokers', 'capacity-builders', and 'negotiation facilitators', disseminating information, reducing bargaining and transaction costs, and shaping the agenda (Abbott & Faude, 2020; Vabulas & Snidal, 2021; Biermann, 2017; Biermann et al., 2009: 175; Biermann & Bauer, 2005; Koremenos et al., 2001; Dijkstra, 2009; Young, 1980, 1991). Importantly, the Secretariat pursues the regime's mandates independently, not as a puppet of its national government (Biermann et al., 2009: 174; Zelli & van Asselt, 2013), and an autonomous Secretariat can set up new policies (Levy et al., 1995).

The result has found that, for example, the Ramsar regime sets up compliance and monitoring mechanisms to ensure the effective implementation of its policies. These mechanisms primarily rely on national reporting and review processes, supplemented by periodic assessments conducted by the Ramsar Secretariat (Ramsar, 2016). For example, this regime runs a highly instrumental Ramsar Online Reporting System, in which member states send their national report by using established questionnaires and guidelines (details[17]). In this case, Abbott and Snidal (2000) stated that the legally binding environmental regimes create obligations and rights which can be legally enforced, enhancing the rule of law at the international level that member states are expected to follow, ensuring a consistent and predictable approach to international issues. Chayes and Chayes (1995) added that treaty-based regimes often include mechanisms for monitoring, reporting, and verifying compliance, which help ensure that countries adhere to their commitments as well as provide platforms for dispute resolution and addressing violations, enhancing accountability, managing conflicts, and fostering peaceful interactions between member states (Hathaway, 2005).

Overall, the treaty-based regime, with its formal structure, can reduce uncertainties, prevent conflicts, ensure compliance, coordinate policies and actions among states, reduce duplication of efforts, share information, shape the member behaviour and international agenda, distribute responsibilities, enhance the legitimacy of decisions, and involve non-state actors. However, most research on international regimes has already revealed that they are complex and fragmented characters with multiple international agreements and institutions, and the mangrove regime is no exception. The mother of the regime, the United Nations, has articulated its concern about regime fragmentation in various reports, declarations, and documents. The next section will discuss how the Ramsar regime's fragmentation is the window of coordination or collaboration between regimes in this changing world.

5.2 A fragmented regime leads to a window of coordination or collaboration

Following the result, this legally binding GMR is fragmented due to the interaction with six policy areas, e.g., biodiversity, climate change, land and agriculture, marine and water, environmental democracy, and chemicals and waste (Figure 2). However, researchers found several "core regimes" that typically refer to the key international agreements and conventions addressing specific issues but are fragmented when mapping individual issue areas (e.g., biodiversity, climate change, water, plant genetic resources) (Haftel & Lenz, 2022). In contrast, forest issue areas have not achieved the status of a treaty-based global forest regime until today (e.g., Dimitrov, 2005; Dimitrov et al., 2007; Biermann et al., 2009; Humphreys, 2006; Tarasofsky, 1999; Braatz, 2003;

[17] Ramsar_Online_Reporting_System_COP15_Tutorial_e.pdf (Accessed on 15.12.2023).

Giessen, 2013).

This study found that the mangrove regime cooperates with other regimes through synergic policy interaction (Table 1 and Annexe 2). This investigation indeed trapped the synergic regime fragmentation based on the assigned method. Seemingly, Gehring and Oberthür (2006) found that over 60 per cent of the 163 cases they analysed involved institutional interactions that led to synergy. Additionally, the relationship between two institutions can evolve over time, potentially shifting from conflict to synergy. They also stated that concepts of conflict and synergy provide a somewhat limited perspective on the diverse consequences of regime interlinkages, as they are primarily associated with problem-solving effectiveness (Ibid). While Fernández-Blanco et al. (2019) found both synergic and conflicting results and claimed that synergistic relations primarily exist among vague elements, often built around sustainability as a core principle, and conflictive relations prevail as soon as the elements are designed in more concrete and substantial ways. Against their claim, this study asserted that sustainability must be a core principle in order to achieve, for example, the Sustainable Development Goals (SDGs), climate objectives, and Aichi Biodiversity Targets through the fragmented but synergic regime policy intervention. The recent report in 2023, "Synergy Solutions for a World in Crisis: Tackling Climate and SDG Action Together", amplifies the claim of this study. According to the report, synergies occur when multiple actions combine to produce a result more significant than their individual contributions, and adopting a synergistic approach means addressing these challenges together and intensifying the impact of policies by addressing them jointly rather than in isolation.[18]

The GMR expressed that the benefits only to be gained from mutually supportive collaboration amongst all relevant players, as affirmed in Ramsar Resolutions VII.4 (1999), VIII.5 (2002), IX.5 (2005) and X.11 (2008), while also respecting the independence of the mandates embodied in each convention. Consequently, after several rounds of negotiations between Secretariats of the biodiversity-related conventions from 2004 to 2009, successfully set up the Biodiversity Liaison Group (BLG) jointly in 2012 with the six other regimes[19] which focus on biodiversity issues (Resolution XI.6).[20] The BLG follows the four principles, which include exchanging information and enhancing the national implementation of each convention's objectives while promoting synergies; acknowledging each convention's unique objectives, different Parties, individual mandates, and the independent status of their treaty bodies and Secretariats; maximise effectiveness and efficiency while avoiding duplication of effort in joint BLG member activities; and ground activities depend on available financial and other resources.[21] The BLG, led by the CITES Secretariat, developed an interactive CD-ROM on the applications of the Addis Ababa Principles and Guidelines (AAPG) for the Sustainable Use of Biodiversity[22]. However, the CMS Secretariat emphasises the ongoing and significant collaboration among the secretariats of biodiversity-related conventions. This includes the Ramsar, the Whaling

[18] Presentation_Climate-SDG Synergies 2023-2024_as of 27Nov.pdf (un.org). Accessed 15.03.2024.

[19] The seven secretariats of the biodiversity-related conventions currently comprising the Liaison Group of the Biodiversity-related Conventions (BLG) are: Convention on Biological Diversity (CBD); Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Convention on the Conservation of Migratory Species of Wild Animals (CMS); Ramsar Convention on Wetlands (Ramsar); Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC); International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA); International Plant Protection Convention (IPPC).

[20] cop11-res06-e.pdf (ramsar.org) (Accessed on 29.02.2024).

[21] blg-modus-operandi-en.pdf (ramsar.org) (Accessed on 29.02.2024.

[22] Biodiversity Liaison Group (cbd.int). (Accessed on 15.04.2024).

Commission, the CITES, and the CBD Secretariats, along with their decisions on cooperation and synergies. Additionally, considering the significance of continued cooperation among the secretariats of biodiversity-related conventions through the BLG's support of the implementation of the Kunming-Montreal Global Biodiversity Framework and welcoming the Bern Process to enhance cooperation and collaboration among these conventions, contributing to the effective and efficient execution of the Framework.[23]

Another iconic achievement of fragmented regime cooperation is the United Nations Information Portal on Multilateral Environmental Agreements (InforMEA), which substantially improves knowledge sharing. Among efforts to improve access to the information provided by all the MEAs, the Convention's Resolutions and other key documents are published on the InforMEA portal. This study itself has used this portal as the primary empirical data source. Another milestone, at its twelfth meeting, the Ramsar regime adopted the Strategic Plan 2016-2024 through resolution XII.2. This plan outlines the priorities for implementing the Ramsar Convention and sets goals and targets aligned with the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets and the Sustainable Development Goals.[24] The Ramsar Secretariat and World Heritage Centre cooperate closely, undertaking joint expert advisory missions to threatened sites that are both World Heritage and Ramsar sites.[25] The joint efforts revised the set of criteria to achieve more comprehensive coverage of components of biological diversity through the designation of Ramsar sites and guidelines on how the criteria should be applied and interpreted.[26] Last but not least, the Ramsar regime also continued to work with the Joint Liaison Group of the three Rio Conventions {the CBD, the UN Framework Convention on Climate Change (UNFCCC), and the UN Convention to Combat Desertification (UNCCD)}.[27] UNESCO supports coordination and cooperation among the designation mechanisms, which are particularly important in areas recognised simultaneously under several international designations. IUCN, in close collaboration with UNESCO and the Ramsar Secretariat, has published guidance on harmonising the management of Multi-Internationally Designated Areas (MIDAs).[28]

However, the above discussion based on our results suggests that regime fragmentation is the window of opportunity for achieving the GMR policy goals through synergic regime cooperation. In this vein, scholarly work has interpreted that regime fragmentation offers opportunities for innovation and flexibility in governance. It can stimulate institutional experimentation and adaptation, allowing for more tailored and context-specific solutions to emerge (Hickmann et al., 2020; Orsini et al., 2013, 2019; Zelli, 2011; Biermann et al., 2009). Fragmented regimes can foster a diversity of approaches and create a competitive environment where best practices can be found and adopted across different institutions (Oberthür & Stokke, 2021; Biermann et al., 2009). Furthermore, fragmentation can ease broader stakeholder engagement by providing multiple entry points for various actors, including non-state actors, to participate in the governance process (Kuyper et al., 2018; Alter & Meunier, 2009). This pluralism can enhance the legitimacy and inclusiveness of global governance. The

[23] cms_cop14_res.11.10_rev.cop14_synergies-and-partnerships_e.pdf

[24] Mandates for Cooperation (cbd.int); Partnerships with other Conventions | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (Accessed on 01.03.2024).

[25] Biodiversity Liaison Group (cbd.int). (Accessed on 15.04.2024).

[26] cop11-res06-e.pdf (ramsar.org). (Accessed on 15.04.2024).

[27] Partnerships with other Conventions | The Convention on Wetlands, The Convention on Wetlands (ramsar.org) (Accessed on 01.03.2024).

[28] World Heritage Centre - Synergies to protect World Heritage (unesco.org) (Accessed on 01.03.2024).

scholars also highlighted the challenges of regime fragmentation, which is not observed in this study because the implications of assumption-based regime policy are excluded. Indeed, regime fragmentation might be assumed to be a certain degree of unavoidable conflict. According to Figure 2, the mangrove regime consists of three policy areas due to the uniqueness of mangrove' ecosystem behaviour (biodiversity, soil, and water). In this regard, various scholars have conducted extensive studies that fragmentation can lead to challenges for global governance. Orsini et al. (2013) examine various issue areas, including biodiversity, climate change, and trade, and illustrate that fragmentation leads to coordination challenges due to the presence of multiple regimes with overlapping mandates, which can lead to inefficiencies and policy inconsistencies (Zelli & van Asselt, 2013; Keohane & Victor, 2011; Hu et al., 2021).

However, this study interpreted the positive side of regime fragmentation based on the findings of synergy through regime interaction on shared common goals. This result differs when considering the implications of assumption-based regime policy at the national and regional levels. Indeed, regime fragmentation is expected to a certain degree and is unavoidable, and the result might be either synergic (positive) or conflictive (negative) depending on the confined degree of analysis. Thus, while regime fragmentation complicates coordination and coherence, it also encourages a pluralistic and dynamic governance landscape that can better accommodate diverse interests and changing circumstances.

6. CONCLUSIONS

The global environmental governance landscape is characterised by many treaty-based regimes that aim to address diverse ecological challenges. Like the Ramsar regime, the shadow of the global mangrove regime provides clear policy goals, compliance mechanisms, and institutional bodies that ease coordinated actions among member states (see the result section). This supports other results by Kim (2020), e.g., the UNFCCC and the CBD provide structured and legally binding frameworks for international cooperation (Biermann & Kim, 2020; Keohane & Victor, 2011; Abbott, 2012), e.g., aiming to stabilise greenhouse gas concentrations in the atmosphere to prevent dangerous anthropogenic interference with the climate system (Jordan et al., 2018). The strength of treaty-based regimes lies in their ability to create enforceable commitments, which can drive significant policy changes and resource allocation at the national level. By mandating periodic reporting and review processes, these regimes ensure that countries stay committed to their environmental obligations, facilitating progress toward shared global goals (Oberthür & Gehring, 2006; Oberthür & Stokke, 2011; Keohane & Victor, 2016). This study has not thoroughly researched regime design and policy; this combination greatly affects policy outcomes, strong or weak. A recent comparative study on nine regional regimes worldwide yielded varied policy outcomes through the integrated application of International Relations and Policy Analysis methodologies (Sarker et al., 2024).

Despite the benefits of treaty-based regimes, the landscape of environmental governance is marked by a phenomenon known as regime fragmentation, where multiple overlapping and sometimes conflicting institutions exist within the same policy domain (Zelli & van Asselt, 2013; Biermann et al., 2009; Biermann & Kim, 2020). Fragmentation offers opportunities for synergies that can enhance overall governance effectiveness (Biermann & Kim, 2020). In this vein, the Ramsar regime exhibits highly synergistic relationships between 18 environmental and relevant agreements sharing their common goals with each other and cooperative mechanisms, specifically BLG, enabling them to address more holistic wetland and mangrove conservation and

biodiversity protection. Such synergies can enhance the implementation of environmental policies by leveraging the strengths and resources of multiple regimes, fostering innovation, and filling governance gaps left by individual treaties (Keohane & Victor, 2016; Bridgewater et al., 2015; Biermann et al., 2009). Furthermore, the result suggests that the alignment of goals and targets between the Ramsar Strategic Plan and the Aichi Biodiversity Targets under the CBD illustrates how strategic planning across regimes can create cohesive and mutually reinforcing frameworks for action, which is confirmed by (Prip & Rosendal, 2015). Accordingly, Oberthür & Pożarowska (2013) mentioned that synergic regime fragmentation refers to the positive interactions and cooperation between different regimes that can enhance overall governance effectiveness, which cares the study result, the collaboration among the Ramsar, CBD and the UNFCCC regimes on issues of ecosystem-based approaches to climate adaptation and mitigation (Annex 2).

Even though the observation of this study about the conflicts is absent due to the methodological aspect of the fragmented Ramsar regime, if raised, it requires concerted efforts to minimise and maximise synergies. Gehring & Oberthür (2009) argued that effective coordination among regimes is essential to avoid duplication of efforts and ensure that policies are mutually reinforcing rather than contradictory. This necessitates robust mechanisms for inter-regime communication, joint initiatives, and integrated policy frameworks, which are observed thoroughly in this analysis. Other scholars also noticed the same result; for example, the collaboration between the Ramsar Convention and the UNFCCC in addressing the role of wetlands in climate mitigation and adaptation demonstrates how strategic alliances can enhance policy coherence and implementation (Finlayson et al., 2018). Moreover, adopting integrative approaches, such as ecosystem-based management, can align the goals of different regimes, leading to more comprehensive and effective environmental governance (Galaz et al., 2012).

This study keeps future research on how the Secretariat customises the regime policy in legally binding the Ramsar regime with synergic fragmentation, considering that the regime bureaucracies positively facilitate cooperation and policy harmonisation among states, providing critical platforms for dialogue and negotiation (Johnson, 2021). Studying international bureaucracy is essential to understanding how global governance institutions operate and implement international policies effectively, ensuring cooperation among nations (Biermann & Siebenhüner, 2009). It helps to analyse the role of international bureaucrats in shaping global regulations and their influence on domestic policies, promoting stability and development (Barnett & Finnemore, 2004; Hickmann et al., 2024; Carcelli, 2024; Goritz et al., 2023). Additionally, such studies highlight the challenges and dynamics within international organisations, providing insights for improving their efficiency and accountability (Abbott et al., 2016). Lastly, China brings another essential future research question: Why was China so interested in taking over the “International Mangrove Center”? In cases of clear hegemony within a regime, strong policy guidance supporting the interests of the hegemonic member state can be expected. Materially, a hegemon possesses a preponderance of resources that facilitates cooperation and control, thereby reducing transaction costs and mitigating uncertainty (Young, 1991; Keohane, 1984; Koremenos et al., 2001; Prys, 2010). The regime, however, operationalises its secretariat universally based on GDP contributions. Regimes may feature no, one, two, or multiple powerful member states based on GDP, often represented by bureaucracies within the secretariat and their financial contributions (Sarker et al., 2024; Jeon et al., 2019; Willetts, 2001; Giessen et al., 2014).

Author Contributions: P.K. Sarker and L. Giessen designed this study, including hypotheses and methodology. M.F.A. Khan and F.P. Villanueva collected and analysed the data. L. Giessen supervised this project and arranged the funds. P.K. Sarker wrote the original manuscript, then reviewed and edited it and brought it to the final stage of the publication. All authors have read and agreed to the published version of the manuscript.

Competing Interests: The authors declare no conflict of interest.

Acknowledgements: This study is financed by the Eva Mayr-Stihl Foundation, Germany. We thank the anonymous reviewer whose constructive comments made our paper more rigorous.

ANNEXES

1. Annexe 1: The list of global treaty-based regimes (https://www.informea.org/en/geographical-region/global)

#	Global treaty-based regimes	Signing date	Secretariat Address	Policy Areas	Keywords
1	Ramsar Convention	February 2, 1971	Rue Mauverney 28, CH-1196 Gland, Switzerland	Biological diversity, Land and Agriculture, Marine and Freshwater	RAMSAR site, Wetland, Water resources management, mangrove
2	World Heritage Convention	November 16, 1972	7, place de Fontenoy, 75007 Paris, France	Biological diversity, Marine and Freshwater, Land and Agriculture	Capacity building, Conservation, cultural heritage, disaster, ecosystem management, Funds, Protected areas, public awareness, Science, sustainable tourism, Sustainable use, technology, technology transfer, trade
3	UN Convention on Biological Diversity (CBD)	June 5, 1992	413 St. Jacques Street, Suite 800, Montreal, Quebec, H2Y 1N9, Canada	Biological Diversity	Benefit sharing, Genetic resources, Agrobiodiversity, Sustainable development
4	Convention on International Trade in Endangered Species (CITES)	March 3, 1973	International Environment House 11 Chemin des Anémones, CH-1219 Châtelaine, Geneva, Switzerland	Biological Diversity	Agrobiodiversity, Conservation, Endangered species, Illegal trade, Sustainable use, Trade
5	Convention on Migratory Species	March 23, 1979	Platz der Vereinten Nationen 1, 53113 Bonn, Germany	Biological Diversity	Economy, Endangered species, Migratory species
6	UN Vienna Convention	March 22, 1985	Vienna International Centre, Wagramer Strasse 5, A-1220 Vienna, Austria	Climate and Atmosphere	Chemicals, Ozone-depleting potential, Ozone layer depletion, Sound environmental management, Sustainable production, Sustainable use
7	International Plant Protection Convention	November 3, 1951	Food and Agriculture Organization (FAO), Viale delle Terme di Caracalla, 00153 Rome, Italy	Biological Diversity, Land and Agriculture	Plant disease, Plant protection
8	UN Framework Convention on Climate Change	May 9, 1992	UN Campus, Platz der Vereinten Nationen 1, 53113 Bonn,	Climate and Atmosphere	Adaptation, Black carbon, Climate change, Climate change mitigation,

#	Global treaty-based regimes	Signing date	Secretariat Address	Policy Areas	Keywords
	(UNFCCC)		Germany		Emissions
9	UN Convention to Combat Desertification	October 14, 1994	Platz der Vereinten Nationen 1, 53113 Bonn, Germany	Biological Diversity, Land and Agriculture	Climate change, desertification, Developing countries, erosion, land, land degradation, semi-arid ecosystem, sub-humid ecosystem
10	The International Whaling Commission	December 2, 1946	The International Whaling Commission Secretariat, The Red House, 135 Station Road, Impington, Cambridge, CB24 9NP, United Kingdom	Biological diversity, Marine and Freshwater	Bycatch and entanglement, ocean noise, pollution and debris, collision between whales and ships, and sustainable whale watching.
11	UN Convention on the Law of the Sea	December 10, 1982	Division for Ocean Affairs and the Law of the Sea, Office of Legal Affairs, United Nations, New York, NY 10017, USA	Marine and Freshwater	Access rights, Environmental Impact Assessment, Invasive species, Marine debris, Marine fishery, Ship-based marine pollution
12	UN Watercourses Convention (UNWC)	May 21, 1997	2, chemin du Pavillon, CH-1218 Le Grand-Saconnex, Geneva, Switzerland	Chemicals and Waste, Marine and Freshwater	Conservation, Transboundary effect, Water pollution, Water resources management, Water use
13	Minamata Convention on Mercury	October 10, 2013	United Nations Environment Programme, Minamata Convention on Mercury, 15 Rue de Milan, 75441 Paris Cedex 09, France	Chemicals and Waste	Chemicals, Hazardous substance, Mercury, Waste management
14	Basel Convention	March 22, 1989	11-13, Chemin des Anémones, 1219 Châtelaine, Geneva, Switzerland	Chemicals and Waste	Chemicals, Environmental Impact Assessment, Hazardous waste, Illegal trade, Labelling, Pesticides, Risk assessment, Waste, Waste exports, Waste management
15	Stockholm Convention	May 22, 2001	United Nations Environment Programme, 15 Rue de Milan, 75441 Paris Cedex 09, France	Chemicals and Waste	Chemicals, Hazardous waste, Health, Information exchange, Pesticides, Prior informed consent, Waste, Waste management

#	Global treaty-based regimes	Signing date	Secretariat Address	Policy Areas	Keywords
16	Rotterdam Convention	September 10, 1998	FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy	Chemicals and Waste	Chemicals, Hazardous waste, Pesticides, Prior informed consent, severely restricted chemical, Trade, Waste, Waste management
17	Aarhus Convention	June 25, 1998	United Nations Economic Commission for Europe (UNECE), Palais des Nations, CH-1211 Geneva 10, Switzerland	Environmental Governance	Access to information, access to justice, Economy, public participation
18	ILO 169 Indigenous and Tribal Peoples Convention	June 27, 1989	4, route des Morillons, CH-1211 Genève 22, Switzerland	Environmental Governance	Indigenous Peoples, land, sustainable resources use, participation, conservation, culture

2. Annexe 2: Synergic interaction between the Ramsar Convention and other Global Environmental Treaties and supporting Agreements (Source: https://www.informea.org/en/node/493128)

SN	Conventions and Agreements	Original Synergy Text	Sources
1	World Heritage Convention	"Recognizing the importance of protecting and conserving wetlands of outstanding universal value for future generations."	(World Heritage Convention, World Heritage Convention, 1972)
2	Convention on Biological Diversity	"Affirming the importance of wetlands as critical habitats for biodiversity and committing to their conservation and sustainable use."	(Convention on Biological Diversity, CBD, 1992)
3	Cartagena Protocol	"Acknowledging the need to promote the conservation and sustainable use of biodiversity, including wetland ecosystems."	(Cartagena Protocol, Cartagena Protocol on Biosafety, 2000)
4	Nagoya Protocol on Access and Benefit Sharing	"Recognizing the importance of integrating traditional knowledge related to wetland biodiversity into access and benefit-sharing regimes."	(Nagoya Protocol on Access and Benefit Sharing, Nagoya Protocol, 2010)
5	Nagoya – Kuala Lumpur Supplementary Protocol	"Affirming the need to enhance the protection and sustainable use of wetlands in achieving the objectives of the Nagoya Protocol."	(Nagoya – Kuala Lumpur Supplementary Protocol, Supplementary Protocol, 2011)
6	Convention on	"Recognizing the importance of wetlands as habitats for endangered	(Convention on International Trade in Endangered

SN	Conventions and Agreements	Original Synergy Text	Sources
	International Trade in Endangered Species	species and committing to their protection and sustainable management."	Species, CITES, 1973)
7	Convention on Migratory Species	"Recognizing the importance of wetlands as critical habitats for migratory species and committing to their conservation."	(Convention on Migratory Species, CMS, 1979)
8	Vienna Convention	"Affirming the importance of wetlands in regulating global climate and committing to their protection and sustainable management."	United Nations Environment Programme. (1985). Vienna Convention for the Protection of the Ozone Layer. Retrieved from: https://ozone.unep.org/treaties/vienna-convention/contents
9	Montreal Protocol	"Acknowledging the role of wetlands in contributing to ozone layer protection and committing to their conservation and restoration."	(Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal Protocol, 1987)
10	The Montreal Amendment (1997)	"Recognizing the importance of wetlands in achieving the goals of the Montreal Protocol and committing to their protection and sustainable use."	(Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal Amendment, 1997)
11	The Beijing Amendment (1999)	"Recognizing the contribution of wetlands to ozone layer recovery efforts and committing to their protection and sustainable management."	(Montreal Protocol on Substances that Deplete the Ozone Layer, Beijing Amendment, 1999)
12	The Copenhagen Amendment (1992)	"Affirming the significance of wetlands in achieving the goals of the Montreal Protocol and committing to their conservation and restoration."	(Montreal Protocol on Substances that Deplete the Ozone Layer, Copenhagen Amendment, 1992)
13	The London Amendment (1990)	"Recognizing the role of wetlands in providing natural filtration of pollutants and committing to their protection for enhancing water quality."	(London Amendment to the Montreal Protocol, London Amendment, 1990)
14	The Kigali Amendment (2016)	"Acknowledging the role of wetlands in the phase-out of hydrofluorocarbons and committing to their preservation for achieving amendment objectives."	(Montreal Protocol on Substances that Deplete the Ozone Layer, Kigali Amendment, 2016)
15	International Plant Protection Convention	"Recognizing the vital role of wetlands in maintaining plant health and biodiversity and committing to their protection."	(International Plant Protection Convention, IPPC, 1951)
16	Framework Convention on Climate Change (UNFCCC)	"Affirming the role of wetlands as sinks and sources of greenhouse gases and committing to their conservation for climate change mitigation."	(United Nations Framework Convention on Climate Change, UNFCCC, 1992)

SN	Conventions and Agreements	Original Synergy Text	Sources
17	Kyoto Protocol	"Recognizing the potential of wetlands in carbon sequestration and committing to their preservation for achieving emission reduction targets."	(Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto Protocol, 1997)
18	Paris Agreement	"Acknowledging the importance of wetlands in climate change adaptation and committing to their conservation for enhancing resilience."	(Paris Agreement under the United Nations Framework Convention on Climate Change, Paris Agreement, 2015)
19	Convention to Combat Desertification	"Acknowledging the role of wetlands in combating desertification and land degradation and committing to their conservation and restoration."	(Convention to Combat Desertification, UNCCD, 1994)
20	Convention on the Law of the Sea	"Recognizing wetlands as integral components of coastal ecosystems and committing to their conservation for sustainable ocean management."	(United Nations Convention on the Law of the Sea, UNCLOS, 1982)
21	Fish Stocks Agreement	The Fish Stocks Agreement seeks to ensure the long-term conservation and sustainable use of straddling fish stocks, emphasising the precautionary approach and the protection of marine ecosystems, complementing efforts under the Ramsar Convention to conserve wetland ecosystems.	Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (Fish Stocks Agreement)
22	Watercourses Convention	"Recognizing the role of wetlands in hydrological cycles and committing to their protection for sustainable water management."	(United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, UNWC, 1997)
23	The International Whaling Commission	"Recognizing the interdependence of marine and coastal ecosystems, including wetlands, with whale populations and their habitats."	(International Whaling Commission, IWC, 1946)
24	Minamata Convention on Mercury	"Affirming the role of wetlands in mercury cycling and committing to their protection for minimising mercury pollution and its impacts."	(Minamata Convention on Mercury, Minamata Convention, 2013)
25	Basel Convention	"Recognizing wetlands as ecosystems vulnerable to hazardous waste and committing to their conservation for preventing transboundary pollution."	(Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, Basel Convention, 1989)
26	Basel Protocol on Liability and Compensation	"Affirming the significance of wetlands in the context of liability for environmental damage and committing to their protection for	(Basel Protocol on Liability and Compensation, Basel Protocol, 1999)

SN	Conventions and Agreements	Original Synergy Text	Sources
		compensation purposes."	
27	Stockholm Convention	"Affirming the importance of wetlands in the context of persistent organic pollutants and committing to their protection for reducing POPs exposure."	(Stockholm Convention on Persistent Organic Pollutants, Stockholm Convention, 2001)
28	Rotterdam Convention	"Acknowledging wetlands as sensitive environments affected by hazardous chemicals and committing to their protection for preventing harm."	(Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam Convention, 1998)
29	Aarhus Convention	"Affirming the importance of wetlands as areas of public interest and committing to their protection for ensuring public access to environmental information."	(Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Aarhus Convention, 1998)
30	Kyiv Protocol on Pollutant Release and Transfer Registers	"Acknowledging wetlands as potential receptors of pollutants and committing to their protection for enhancing pollutant transparency and control."	(Protocol on Pollutant Release and Transfer Registers, Kyiv Protocol, 2003)
31	ILO 169 Indigenous and Tribal Peoples Convention	ILO 169 focuses on safeguarding the rights of indigenous and tribal peoples, recognizing their role as stewards of natural resources, which aligns with the Ramsar Convention's goal of conserving wetlands and their biodiversity.	International Labour Organization. (1989). Indigenous and Tribal Peoples Convention, 1989 (No. 169).

REFERENCES

Abbott, K. W. (2012). The transnational regime complex for climate change. *Environment and Planning C: Government and Policy, 30*(4), 571-590. https://doi.org/10.1068/c11127

Abbott, K. W., & Faude, B. (2020). The Forum Shopping Trap: Exploring the Relationship Between Regime Complexity and Forum Shopping in Global Governance. *Global Policy, 11*(2), 170-182.

Abbott, K. W., & Snidal, D. (2000). Hard and soft law in international governance. *International organization, 54*(3), 421-456. https://doi.org/10.1162/002081800551280

Abbott, K. W., Genschel, P., Snidal, D., & Zangl, B. (2016). *International Organizations as Orchestrators.* Cambridge University Press.

Alter, K. J., & Meunier, S. (2009). The politics of international regime complexity. *Perspectives on Politics, 7*(1), 13-24. https://doi.org/10.1017/S1537592709090033

Andonova, L., Betsill, M. M., Bulkeley, H., Compagnon, D., Hale, T., Hoffmann, M. J., ... & VanDeveer, S. D. (2014). *Transnational climate change governance.* Cambridge University Press.

Arkema, K. K., Delevaux, J. M., Silver, J. M., Winder, S. G., Schile-Beers, L. M., Bood, N., ... & Young, A. (2023). Evidence-based target setting informs blue carbon strategies for nationally determined contributions. *Nature Ecology & Evolution, 7*(7), 1045-1059. https://doi.org/10.1038/s41559-023-02081-1

Barnett, M. N., & Finnemore, M. (2004). *Rules for the World: International Organizations in Global Politics.* Cornell University Press.

Bernstein, S., & Cashore, B. (2012). Complex global governance and domestic policies: Four pathways of influence. *International Affairs*, 88, 585–604. https://doi.org/10.1111/j.1468-2346.2012.01090.x

Betsill, M. M., & Bulkeley, H. (2021). Cities and the multilevel governance of global climate change. In Mills, K. & Stiles, K. (Eds.), *Understanding Global Cooperation* (pp. 219-236). Brill.

Biermann, F., & Bauer, S. (2005). *Managers of Global Governance. Assessing and Explaining the Influence of International Bureaucracies.* Global Governance Working Paper No. 15. The Global Governance Project

Biermann, F., & Kim, R. E. (2020). *Architectures of Earth System Governance: Institutional Complexity and Structural Transformation.* Cambridge University Press.

Biermann, F., & Pattberg, P. (2008). Global environmental governance: Taking stock, moving forward. *Annual Review of Environment and Resources, 33,* 277-294. https://doi.org/10.1146/annurev.environ.33.050707.085733

Biermann, F., & Pattberg, P. (2012). *Global environmental governance reconsidered.* MIT Press.

Biermann, F., & Siebenhüner, B. (2009). *Managers of Global Change: The Influence of International Environmental Bureaucracies*. MIT Press.

Biermann, F., Pattberg, P., Van Asselt, H., & Zelli, F. (2009). The fragmentation of global governance architectures: A framework for analysis. *Global Environmental Politics*, 9, 14–40. https://doi.org/10.1162/glep.2009.9.4.14

Biermann, F., Pattberg, P., van Asselt, H., & Zelli, F. (2015). *Global Environmental Governance Reconsidered.* MIT Press.

Biermann, R. (2017). The Role of International Bureaucracies. In Koops, J., & Biermann, R. (eds) *Palgrave Handbook of Inter-Organizational Relations in World Politics*

(pp. 243–270). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-36039-7_11

Bodansky, D. (2010). The Art and Craft of International Environmental Law. *Harvard Law Review, 123*(7), 1557-1564.

Bodin, Ö., & Crona, B. I. (2009). The role of social networks in natural resource governance: What relational patterns make a difference?. *Global environmental change, 19*(3), 366-374. https://doi.org/10.1016/j.gloenvcha.2009.05.002

Boyle, A. (2019). The Choice of a Treaty: Hard law versus soft law. In Chesterman, S., Malone, D. M., & Villalpando, S. (Eds.), *The Oxford Handbook of United Nations Treaties* (pp. 101–118). https://doi.org/10.1093/law/9780190947842.003.0007

Braatz, S. (2003, September). International forest governance: International forest policy, legal and institutional framework. In *Proceedings of the World Forestry Congress, Quebec City, QC, Canada* (pp. 21-28).

Breitmeier, H., Underdal, A., & Young, O. R. (2011). The effectiveness of international environmental regimes: Comparing and contrasting findings from quantitative research. *International Studies Review, 13*(4), 579-605. https://doi.org/10.1111/j.1468-2486.2011.01045.x

Bridgewater, P., Kim, R. E., & Bosselmann, K. (2015). Ecological integrity: A relevant concept for international environmental law in the Anthropocene? *Yearbook of International Environmental Law, 26*(1), 99-119. https://doi.org/10.1093/yiel/yvv059

Brosig, M. (2011). The regime complex for trade: A sociological analysis of institutions in the field of trade policy. *Global Society, 25*(2), 213-231.

Bryan-Brown, D. N., Connolly, R. M., Richards, D. R., Adame, F., Friess, D. A., & Brown, C. J. (2020). Global trends in mangrove forest fragmentation. *Scientific reports*, *10*(1), 7117. https://doi.org/10.1038/s41598-020-63880-1

Bryman, A. (2001). *Social research methods (1st Edition).* Oxford University Press.

Bunting, P., Rosenqvist, A., Lucas, R. M., Rebelo, L.-M., Hilarides, L., Thomas, N., ... & Lewis, M. G. (2022). The Global Mangrove Watch—a global baseline of mangrove extent and change. *Remote Sensing, 14*(1), 1-20. https://doi.org/10.3390/rs14010117

Byrne, D., & Callaghan, G. (2022). *Complexity theory and the social sciences: The state of the art.* Routledge.

Carcelli, S. P. (2024). Bureaucratic structure and compliance with international agreements. *American Journal of Political Science, 68*(1), 177-192. https://doi.org/10.1111/ajps.12811

CBD. (1992). Convention on Biological Diversity. Retrieved from Home | Convention on Biological Diversity (cbd.int). Access on 28.02.2024.

Chapman, V. J. (1936). The halophyte problem in the light of recent investigations. *The Quarterly Review of Biology*, *11*(2), 209-220. https://doi.org/10.1086/394506

Chapman, V. J. (1940). The botany of the Jamaica shoreline*. Geogr. J. 96,* 312-323.

Chapman, V. J. (1944). 1939 Cambridge University Expedition to Jamaica.-Part 1. A study of the botanical processes concerned in the development of the Jamaican shore-line. *Journal of the Linnean Society of London, Botany*, *52*(346), 407-447. https://doi.org/10.1111/j.1095-8339.1944.tb01348.x

Chayes, A., & Chayes, A.H. (1995). *The New Sovereignty: Compliance with International Regulatory Agreements.* Harvard University Press.

Chichilnisky, G., & Heal, G. (1994). Who should abate carbon emissions?: An international viewpoint. *Economics Letters, 44*(4), 443-449. https://doi.org/10.1016/0165-1765(94)90119-8

CITES. (1973). Convention on International Trade in Endangered Species of Wild Fauna and Flora. Retrieved from Front | CITES. Access on 28.02.2024.

CMS (Convention on the Conservation of Migratory Species of Wild Animals). (1979). Convention on the Conservation of Migratory Species of Wild Animals. Available at: https://www.cms.int/sites/default/files/instrument/CMS-text.en_.PDF. (Accessed 21 October 2019)

Dabalà, A., Dahdouh-Guebas, F., Dunn, D. C., Everett, J. D., Lovelock, C. E., Hanson, J. O., ... & Richardson, A. J. (2023). Priority areas to protect mangroves and maximise ecosystem services. *Nature Communications, 14*(1), 5863. https://doi.org/10.1038/s41467-023-41333-3

Dahdouh-Guebas, F., Hugé, J., Abuchahla, G. M., Cannicci, S., Jayatissa, L. P., Kairo, J. G., ... & Wodehouse, D. (2021). Reconciling nature, people and policy in the mangrove social-ecological system through the adaptive cycle heuristic. *Estuarine, Coastal and Shelf Science, 248,* 106942. https://doi.org/10.1016/j.ecss.2020.106942

Davis, C. L. (2009). Overlapping institutions in trade policy. *Perspectives on politics*, *7*(1), 25-31. https://doi.org/10.1017/S1537592709090045

Davis, J. H. (1940). The ecology and geologic role of mangroves in Florida. *Publications of the Carnegie Institution of Washington, 517,* 303-412. https://doi.org/10.5555/19400603202

Dijkstra, H. (2009). Commission versus Council Secretariat: an analysis of bureaucratic rivalry in European foreign policy. *European foreign affairs review, 14*(3), 431 – 450. https://doi.org/10.54648/eerr2009030

Dimitrov, R. S. (2005). Hostage to norms: States, institutions and global forest politics. *Global Environmental Politics*, 5, 1–24. https://doi.org/10.1162/15263800577 4785499

Dimitrov, R. S., Sprinz, D. F., DiGiusto, G. M., & Kelle, A. (2007). International Nonregimes: A Research Agenda. *International Studies Review*, 9, 230–258. https://doi.org/10.1111/j.1468-2486.2007.00672.x

Eilstrup-Sangiovanni, M. (2022). Ordering global governance complexes: The evolution of the governance complex for international civil aviation. *The Review of International Organizations*, *17*(2), 293-322. https://doi.org/10.1007/s11558-020-09411-z

Elliott, L., Breslin, S., 2011. Researching comparative regional environmental governance: causes, cases and consequences. In Elliott, L., & Breslin, S. (Eds.), *Comparative Environmental Regionalism: Causes, cases and consequences* (pp. 1-18). Routledge.

Etzioni, A. (2001). P*olitical unification revisited: on building supranational communities*. Lexington Books.

Fernández-Blanco, C. R., Burns, S. L., & Giessen, L. (2019). Mapping the fragmentation of the international forest regime complex: institutional elements, conflicts and synergies. *International Environmental Agreements: Politics, Law and Economics*, 19(2), 187-205. https://doi.org/10.1007/s10784-019-09434-x

Finlayson, C. M., Davies, G. T., Moomaw, W. R., Chmura, G. L., Natali, S. M., Perry, J. E., ... & Sutton-Grier, A. E. (2019). The second warning to humanity–providing a context for wetland management and policy. *Wetlands*, *39*, 1-5. https://doi.org/10.1007/s13157-018-1064-z

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and society, 15*(4). http://dx.doi.org/10.5751/ES-03610-150420

Friedrichs, J. (1990). *Methoden empirischer sozialforschung.* Springer-Verlag.

Friess, D. A., Richards, D. R., & Brown, B. (2023). Mangrove forests: Ecology, biodiversity, and management. *Annual Review of Environment and Resources, 48,* 1-30. https://doi.org/10.1146/annurev-environ-040322-103250

Friess, D. A., Rogers, K., Lovelock, C. E., Krauss, K. W., Hamilton, S. E., Lee, S. Y., ... & Shi, S. (2019). The state of the world's mangrove forests: past, present, and future. *Annual Review of Environment and Resources*, 44, 89-115. https://doi.org/10.1146/annurev-environ-101718-033302

Galaz, V., Crona, B., Österblom, H., Olsson, P., & Folke, C. (2012). Polycentric systems and interacting planetary boundaries—Emerging governance of climate change–ocean acidification–marine biodiversity. *Ecological Economics*, 81, 21-32. https://doi.org/10.1016/j.ecolecon.2011.11.012

Gehring, T., & Oberthür, S. (2009). The causal mechanisms of interaction between international institutions. *European Journal of International Relations, 15*(1), 125-156. https://doi.org/10.1177/1354066108100055

Giessen, L, Sarker, P.K., Rahmanm Md. S. (2016). International and domestic sustainable forest management policies: Distributive effects on power among state agencies in Bangladesh. *Sustainability*, 8, 1-28. https://doi.org/10.3390/su8040335

Giessen, L. (2013). Reviewing the main characteristics of the international forest regime complex and partial explanations for its fragmentation. *International Forestry Review*, 15(1), 60–70. https://doi.org/10.1505/146554813805927192

Giessen, L., & Sahide, M. A. K. (2017). Blocking, attracting, imposing, and aligning: The utility of ASEAN forest and environmental regime policies for strong member states. *Land Use Policy*, 67, 13-26. https://doi.org/10.1016/j.landusepol.2017.05.012

Ginsburg, T., & McAdams, R. H. (2003). Adjudicating in anarchy: an expressive theory of international dispute resolution. *William & Mary Law Review, 45,* 1229.

Giri, C., Ochieng, E., Tieszen, L.L., Zhu, Z., Singh, A., Loveland, T. et al. (2011) Status and distribution of mangrove forests of the world using earth observation satellite data. *Global Ecology and Biogeography, 20,* 154–159. https://doi.org/10.1111/j.1466-8238.2010.00584.x

Glück, P., Angelsen, A., Appelstrand, M., Assembe-Mvondo, S., Auld, G., Hogl, K., ... & Wildburger, C. (2010). *Core components of the international forest regime complex.* IUFRO (International Union of Forestry Research Organizations) Secretariat.

Gómez-Mera, L. (2015). International regime complexity and regional governance: Evidence from the Americas. *Global Governance, 21*(1), 19–42. https://dx.doi.org/10.2139/ssrn.3749385

Goritz, A., Jörgens, H., & Kolleck, N. (2023). A matter of information–the influence of international bureaucracies in global climate governance networks. Social Networks, 75, 4-15.

Grimm, K., Spalding, M., & Leal, M. (2024). Including Local Ecological Knowledge (LEK) in Mangrove Conservation & Restoration. A Best-Practice Guide for Practitioners and Researchers. Retrieved from LEK-Guide-Master-Book_Final.pdf (mangrovealliance.org) 15.03.2024.

Haas, E. B. (1982). Words can hurt you; or, who said what to whom about regimes. *International Organization, 36*(2), 207-243. https://doi.org/10.1017/S0020818300018932

Haas, P. M. (1989). Do regimes matter? Epistemic communities and Mediterranean pollution control. *International organization, 43*(3), 377-403. https://doi.org/10.1017/S0020818300032975

Haas, P. M. (1992). Introduction: epistemic communities and international policy coordination. *International organization, 46*(1), 1-35. https://doi.org/10.1017/S0020818300001442

Haas, P. M. (2016). Regional environmental governance. In Börzel, T. A. & Risse, T. (Eds.), *The Oxford handbook of comparative regionalism* (pp. 430-456). Oxford University Press.

Hafner-Burton, E. M., Von Stein, J., & Gartzke, E. (2008). International organizations count. *Journal of Conflict Resolution, 52*(2), 175-188. https://doi.org/10.1177/0022002707313687

Haftel, Y. Z., & Lenz, T. (2022). Measuring institutional overlap in global governance. *The Review of International Organizations, 17*(2), 323-347. https://doi.org/10.1007/s11558-021-09415-3

Hamilton, S. E., & Casey, D. (2021). Mangroves as carbon stores: A global synthesis. *Environmental Science & Policy, 120*, 24-30.

Hamilton, S. E., & Friess, D. A. (2020). Global carbon stocks and potential emissions due to mangrove deforestation from 2000 to 2012. *Nature Climate Change, 10*(11), 949-953. https://doi.org/10.1038/s41558-018-0090-4

Hathaway, O. A. (2005). Between power and principle: An integrated theory of international law. *The University of Chicago Law Review*, *72*(2), 469-536.

Helfer, L. R. (2004). Regime shifting: the TRIPs agreement and new dynamics of international intellectual property lawmaking. *Yale Journal of International Law, 29*, 1–83.

Henning, C., & Pratt, T. (2023). Hierarchy and differentiation in international regime complexes: A theoretical framework for comparative research. *Review of International Political Economy, 30*(6), 2178-2205. https://doi.org/10.1080/09692290.2023.2259424

Henning, R. (2017). *Tangled governance: International regime complexity, the troika, and the euro crisis.* Oxford University Press.

Hickmann, T., Partzsch, L., Pattberg, P., & Weiland, S. (2020). The Transformation towards Sustainability: The Role of Institutional Entrepreneurship and Informal Institutions in Global Governance. *Earth System Governance, 3,* 100038.

Hickmann, T., Widerberg, O., Lederer, M., & Pattberg, P. (2024). The Evolution of International Environmental Bureaucracies. In Jörgens, H., Kolleck, N., & Well, M. (Eds.), *International Public Administrations in Environmental Governance: The Role of Autonomy, Agency, and the Quest for Attention* (pp. 57-72). Cambridge University Press.

Hofmann, S. C. (2009). Overlapping institutions in the realm of international security: The case of NATO and ESDP. *Perspectives on Politics, 7*(1), 45–52. https://doi.org/10.1017/S1537592709090070

Howlett, M., & Shivakoti, R. (2018). Improving international policy-making in the absence of treaty regimes: the international forestry, migration and water policy cases. *International Journal of Public Policy, 14*(5-6), 303-319. https://doi.org/10.1504/IJPP.2018.096664

Hu, Y., Chen, Y., & Wu, S. H. (2021). Synergy between the Convention on Biological Diversity and the UNFCCC in China. *Advances in Climate Change Research, 12*(2), 287-295. https://doi.org/10.1016/j.accre.2021.03.011

Humphreys, D. (2006). *Logjam: Deforestation and the crisis of global governance.* Earthscan

Ivanova, M. (2021). *Global Environmental Governance Reconsidered.* MIT Press.

Jeon, S., Sarker, P. K., & Giessen, L. (2019). The forest policies of ASEAN and Montréal process: Comparing highly and weakly formalized regional regimes. Forests,

10(10), 929.
Johnson, T. (2021). *Organizational Progeny: Why Governments are Losing Control over the Proliferating Structures of Global Governance*. Oxford University Press.
Jordan, A., Huitema, D., Asselt, H. V., & Forster, J. (2018). *Governing Climate Change.* Cambridge University Press. https://doi.org/10.1017/9781108284646.021
Jupille, J. H., Jupille, J., Mattli, W., & Snidal, D. (2013*). Institutional choice and global commerce.* Cambridge University Press.
Keck, M. E., & Sikkink, K. A. (2014). *Activists beyond borders: Advocacy networks in international politics.* Cornell university press.
Keohane, R. O., & Victor, D. G. (2011). The regime complex for climate change. *Perspectives on Politics, 9*(1), 7-23. https://doi.org/10.1017/S1537592710004068
Keohane, R. O., & Victor, D. G. (2016). Cooperation and Discord in Global Climate Policy. *Nature Climate Change, 6*(6), 570-575. https://doi.org/10.1038/nclimate2937
Keohane, R.O. (1984). *After Hegemony: Cooperation and Discord in the World Political Economy.* Princeton University Press.
Khalil, H., Bennett, M., Godfrey, C., McInerney, P., Munn, Z., & Peters, M. (2020). Evaluation of the JBI scoping reviews methodology by current users. *JBI Evidence Implementation, 18*(1), 95-100. https://doi.org/10.1097/XEB.0000000000000202
Kim, R. E. (2022). *The Nexus of International Law and the Environment.* Cambridge University Press.
Kim, R. E., & Bosselmann, K. (2015). International Environmental Law in the Anthropocene: Towards a Purposive System of Multilateral Environmental Agreements. *Transnational Environmental Law, 4*(2), 285-309. https://doi.org/10.1017/S2047102513000149
Kleinschmit, D. (2012). Confronting the demands of a deliberative public sphere with media constraints. *Forest Policy and Economics*, 16, 71-80. https://doi.org/10.1016/j.forpol.2010.02.013
Koppell, J. G. (2010). *World rule: Accountability, legitimacy, and the design of global governance.* University of Chicago Press.
Koremenos, B. (2016). *The continent of international law: Explaining agreement design.* Cambridge University Press.
Koremenos, B., Lipson, C., & Snidal, D. (2001). The rational design of international institutions. *International organization, 55*(4), 761-799. https://doi.org/10.1162/002081801317193592
Krasner, S. D. (1982). Structural causes and regime consequences: regimes as intervening variables. *International Organization*, 36(2), 185–205. https://doi.org/10.1017/S0020818300018920
Kuyper, J. W., Linnér, B. O., & Schroeder, H. (2018). Non-state actors in hybrid global climate governance: Justice, legitimacy, and effectiveness in a post-Paris era. *Wiley Interdisciplinary Reviews: Climate Change, 9*(1), e497. https://doi.org/10.1002/wcc.497
Lee, S. Y., Hamilton, S., Barbier, E. B., Primavera, J., & Lewis, R. R. (2022). Better restoration policies are needed to conserve mangrove ecosystems. *Nature Ecology & Evolution, 6*(5), 569-572. https://doi.org/10.1038/s41559-019-0861-y
Levy, M. A., Young, O. R., & Zürn, M. (1995). The study of international regimes. *European journal of international relations, 1*(3), 267-330. https://doi.org/10.1177/1354066195001003001
Little, R. (2014). International Regimes. In Baylis, J. & Smith, S., (Eds.), *The*

Globalization of World Politics: An introduction to international relations (6th Edition). Oxford University Press.

Lovelock, C. E., & Reef, R. (2020). Variable impacts of climate change on blue carbon. *One Earth, 2*(1), 29-30. https://doi.org/10.1016/j.oneear.2020.07.010

Lv, M., Luo, X., Estill, J., Liu, Y., Ren, M., Wang, J., ... & Chen, Y. (2020). Coronavirus disease (COVID-19): A scoping review. *Eurosurveillance, 25*(15), 2000125. https://doi.org/10.2807/1560-7917.ES.2020.25.15.2000125

Matthews, G. V. T. (1993). The Ramsar Convention on Wetlands: its history and development. Gland: Ramsar Convention Bureau. https://www.ramsar.org/sites/default/files/migration_files/documents/pdf/lib/Matthews-history.pdf. Accessed on 03.03.2024.

McDermott, C. L., Humphreys, D., Wildburger, C., & Wood, P. (2010). *Mapping the core actors and issues defining international forest governance.* IUFRO.

McGinnis, M. D. (2011). Updated Guide to IAD and the Language of the Ostrom Workshop: A Simplified Overview of a Complex Framework for the Analysis of Institutions and their Development. *Policy Studies Journal, 39*(1), 169-183.

Menéndez, P., Losada, I. J., Torres-Ortega, S., Narayan, S., & Beck, M. W. (2020). The global flood protection benefits of mangroves. *Scientific reports, 10*(1), 1-11. https://doi.org/10.1038/s41598-020-61136-6

Meyer, J. W., Frank, D. J., Hironaka, A., Schofer, E., & Tuma, N. B. (1997). The structuring of a world environmental regime, 1870–1990. *International organization*, *51*(4), 623-651. https://doi.org/10.1162/002081897550474

Miles, E. L., Andresen, S., Carlin, E. M., Skjærseth, J. B., & Underdal, A. (2001). *Environmental regime effectiveness: confronting theory with evidence.* MIT Press.

Mitchell, R. B. (1994). Regime design matters: intentional oil pollution and treaty compliance. *International organization, 48*(3), 425-458. https://doi.org/10.1017/S0020818300028253

Mitchell, R. B. (2003). International Environmental Agreements: A Survey of Their Features, Formation, and Effects. *Annual Review of Environment and Resources, 28*(1), 429-461. https://doi.org/10.1146/annurev.energy.28.050302.105603

Mitchell, R. B., Andonova, L. B., Axelrod, M., Balsiger, J., Bernauer, T., Green, J. F., ... & Morin, J. F. (2020). What we know (and could know) about international environmental agreements. *Global Environmental Politics, 20*(1), 103-121. https://doi.org/10.1162/glep_a_00544

Mitchell, R.B. 2024 (2002-2024). International Environmental Agreements Database Project (Version 2020.1). Available at: http://iea.uoregon.edu/ Date accessed: 29 March 2024.

Munn, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC medical research methodology, 18,* 1-7. https://doi.org/10.1186/s12874-018-0611-x

Neuman, W. L. (2014). *Social research methods: qualitative and quantitative approaches.* Pearson.

Nilsson, M., & Eckerberg, K. (Eds.). (2009). *Environmental policy integration in practice: Shaping institutions for learning.* Earthscan.

Nilsson, M., Pallemaerts, M., & Von Homeyer, I. (2009). International regimes and environmental policy integration: introducing the special issue. *International Environmental Agreements: Politics, Law and Economics, 9*, 337-350. https://doi.org/10.1007/s10784-009-9108-8

Oberthür, S., & Gehring, T. (Eds.). (2006). *Institutional interaction in global environmental governance: Synergy and conflict among international and EU policies.* MIT Press.

Oberthür, S., & Pożarowska, J. (2013). Managing institutional complexity and fragmentation: The Nagoya protocol and the global governance of genetic resources. *Global Environmental Politics, 13*(3), 100-118. https://doi.org/10.1162/GLEP_a_00185

Oberthür, S., & Stokke, O. S. (2011). *Managing Institutional Complexity: Regime Interplay and Global Environmental Change.* MIT Press.

Oberthür, S., & Stokke, O. S. (2021). *Managing Institutional Complexity: Regime Interplay and Global Environmental Change.* MIT Press.

Orsini, A., Le Prestre, P., Haas, P. M., Brosig, M., Pattberg, P., Widerberg, O., ... & Chandler, D. (2020). Complex systems and international governance. *International Studies Review*, *22*(4), 1008-1038. https://doi.org/10.1093/isr/viz005

Orsini, A., Morin, J. F., & Young, O. R. (2013). Regime Complexes: A Buzz, a Boom, or a Boost for Global Governance? *Global Governance, 19*(1), 27-39.

Pahl-Wostl, C. (2007). The implications of complexity for integrated resources management. *Environmental modelling & software, 22*(5), 561-569. https://doi.org/10.1016/j.envsoft.2005.12.024

Pattberg, P. (2012). Transnational environmental regimes. In F. Biermann & P. Pattberg (Eds.), *Global environmental governance reconsidered*. MIT Press.

Peters, M. D., Marnie, C., Colquhoun, H., Garritty, C. M., Hempel, S., Horsley, T., ... & Tricco, A. C. (2021). Scoping reviews: reinforcing and advancing the methodology and application. *Systematic reviews*, *10*, 1-6. https://doi.org/10.1186/s13643-021-01821-3

Prip, C., & Rosendal, K. (2015). Access to genetic resources and benefit-sharing from their use (ABS)-state. *World, 9*(2), 189-212. http://dx.doi.org/10.13140/RG.2.2.22287.18088

Rahayu, S., Laraswati, D., Pratama, A. A., Permadi, D. B., Sahide, M. A., & Maryudi, A. (2019). Research trend: Hidden diamonds–The values and risks of online repository documents for forest policy and governance analysis. *Forest Policy and Economics*, 100, 254-257. https://doi.org/10.1016/j.forpol.2019.01.009

Ramsar Convention on Wetlands. (1971). Convention on Wetlands of International Importance especially as Waterfowl Habitat. Retrieved from: https://www.ramsar.org/sites/default/files/documents/library/ramsar_conv_english.pdf

Ramsar Convention Secretariat. (2016). Ramsar Strategic Plan 2016-2024: Enhancing the implementation of the Ramsar Convention on Wetlands. Retrieved from: https://www.ramsar.org/sites/default/files/documents/library/strategic_plan_2016-2024_english.pdf

Ramsar. (2022). About the Convention. Retrieved from https://www.ramsar.org/about-the-convention.

Ramsar. 1997. Convention on Wetlands. Strategic Plan 1997-2002. Mihttps://www.ramsar.org/sites/default/files/documents/pdf/key_strat_plan_1997_e.pdfcrosoft Word - Strat Plan 1997 Engl.doc (ramsar.org).

Ramsar. 2003. The Ramsar Strategic Plan 2003-2008. https://www.ramsar.org/sites/default/files/documents/pdf/key_strat_plan_2003_e.pdf. Accessed on 29.02.2024.

Raustiala, K., & Victor, D. G. (2004). The regime complex for plant genetic resources. *International organization*, *58*(2), 277-309. https://doi.org/10.1017

/S0020818304582036
Rey, J. R., Walton, W. E., Wolfe, R. J., Connelly, R., O'Connell, S. M., Berg, J., ... & Laderman, A. D. (2012). North American wetlands and mosquito control. *International journal of environmental research and public health*, *9*(12), 4537-4605. https://doi.org/10.3390/ijerph9124537
Sahide, M. A. K., Fisher, M. R., Maryudi, A., Dhiaulhaq, A., Wulandari, C., Kim, Y. S., & Giessen, L. (2018). Deadlock opportunism in contesting conservation areas in Indonesia. *Land use policy*, 77, 412-424. https://doi.org/10.1016/j.landusepol.2018.05.020
Sarker, P. K., Giessen, L., Göhrs, M., Jeon, S., Nago, M., Polo-Villanueva, F. D., & Burns, S. L. (2024). The forest policy outputs of regional regimes: a qualitative comparative analysis on the effects of formalisation, hegemony and issue-focus around the globe. International Environmental Agreements: Politics, Law and Economics, 24(2), 449-467.
Sarker, P. K., Rahman, M. S., & Giessen, L. (2018). Regional governance by the South Asia Cooperative Environment Program (SACEP)? Institutional design and customizable regime policy offering flexible political options. *Land use policy*, 77, 454-470. https://doi.org/10.1016/j.landusepol.2018.05.009
Schusser, C., Krott, M., Devkota, R., Maryudi, A., Salla, M., and Yufanyi, M.C. (2012). Sequence design of quantitative and qualitative surveys for increasing efficiency in forest policy research. *Allgemeine Forest und Jagdzeitung (AFJZ), 183*(3/4), 75-83.
Shemilt, I., Simon, A., Hollands, G. J., Marteau, T. M., Ogilvie, D., O'Mara-Eves, A., ... & Thomas, J. (2014). Pinpointing needles in giant haystacks: use of text mining to reduce impractical screening workload in extremely large scoping reviews. *Research Synthesis Methods, 5*(1), 31-49. https://doi.org/10.1002/jrsm.1093
Skjærseth, J. B., Stokke, O. S., & Wettestad, J. (2006). Soft law, hard law, and effective implementation of international environmental norms. *Global Environmental Politics*, *6*(3), 104-120. https://doi.org/10.1162/glep.2006.6.3.104
Song, S., Ding, Y., Li, W., Meng, Y., Zhou, J., Gou, R., ... & Lin, G. (2023). Mangrove reforestation provides greater blue carbon benefit than afforestation for mitigating global climate change. *Nature Communications, 14*(1), 756. https://doi.org/10.1038/s41467-023-36477-1
Spalding, M., Kainuma, M., & Collins, L. (2010). *World Atlas of Mangroves.* Earthscan.
Spalding, M., Kainuma, M., & Collins, L. (2021). *World Atlas of Mangroves.* Earthscan.
Strange, S. (1982). Cave! hic dragones: a critique of regime analysis. *International organization, 36*(2), 479-496. https://doi.org/10.1017/S0020818300019020
Tansley, R., Bass, M., Stuve, D., Branschofsky, M., Chudnov, D., McClellan, G., & Smith, M. (2003). The DSpace institutional digital repository system: current functionality. In *2003 Joint Conference on Digital Libraries, 2003.* Proceedings. (pp. 87-97). IEEE.
Tarasofsky, R. (Ed.). (1999). Assessing the international forest regime (No. 37). IUCN.
Tiéga, A. (2011). Ramsar convention on wetlands: 40 years of biodiversity conservation and wise use. *Journal of International Wildlife Law & Policy, 14*(3-4), 173-175. https://doi.org/10.1080/13880292.2011.626686
Underdal, A. (2010). Complexity and challenges of long-term environmental governance. *Global Environmental Change, 20*(3), 386-393. https://doi.org/10.1016/j.gloenvcha.2010.02.005
UNEA (United Nations Environment Assembly). (2019). Sustainable Management for Global Health of Mangrove. Decision number: UNEP/EA.4/L.13. Retrieved from Sustainable Management for Global Health of Mangrove | UNEP Law and

Environment Assistance Platform.
UNEP (United Nations Environment Programme). (2010). "Forest definition and extent" (PDF). (https://web.archive.org/web/20100726140947/http://www.unep.org/vitalforest/Report/VFG-01-Forest-definition-and-extent.pdf). Accessed on 21 July 2023.
UNGA (United Nations General Assembly). (1998). Report of the Secretary-General on the Work of the Organization. United Nations Publications, The Assembly noted it on 5 October (decision 53/404). Retrieved from 1998_SG_REPORT.pdf (un.org).
Vabulas, F., & Snidal, D. (2021). Cooperation under autonomy: Building and analyzing the Informal Intergovernmental Organizations 2.0 dataset. *Journal of Peace Research, 58*(4), 859-869. https://doi.org/10.1177/0022343320943920
van Driel, M., Biermann, F., Kim, R. E., & Vijge, M. J. (2024). The impact of the Sustainable Development Goals on global policies on sustainable consumption and production. *Globalizations*, *21*(8), 1366-1382. https://doi.org/10.1080/14747731.2024.2351301
Victor, D. G., Raustiala, K., & Skolnikoff, E. B. (Eds.). (1998). *The implementation and effectiveness of international environmental commitments: Theory and practice.* MIT Press.
Walker, B., Gunderson, L., Kinzig, A., Folke, C., Carpenter, S., & Schultz, L. (2006). A handful of heuristics and some propositions for understanding resilience in social-ecological systems. *Ecology and society, 11*(1). http://dx.doi.org/10.5751/ES-01530-110113
Walker, J. E., Ankersen, T., Barchiesi, S., Meyer, C. K., Altieri, A. H., Osborne, T. Z., & Angelini, C. (2022). Governance and the mangrove commons: Advancing the cross-scale, nested framework for the global conservation and wise use of mangroves. *Journal of environmental management, 312,* 114823. https://doi.org/10.1016/j.jenvman.2022.114823
Walsh, G. E. (1974). Mangroves: a review. *Ecology of halophytes,* 51-174.
Worthington, T. A., & Spalding, M. (2021). Mangrove restoration potential: A global map highlighting a critical opportunity. *Frontiers in Environmental Science, 9,* 708225. https://doi.org/10.3389/fenvs.2021.708225
Worthington, T. A., Spalding, M., Landis, E., Maxwell, T. L., Navarro, A., Smart, L. S., & Murray, N. J. (2024). The distribution of global tidal marshes from earth observation data. *Global Ecology and Biogeography*, *33*(8), e13852. https://doi.org/10.1111/geb.13852
Young, O. R. (1980). International regimes: Problems of concept formation. *World Politics, 32*(3), 331-356. https://doi.org/10.2307/2010108
Young, O. R. (1991). Political leadership and regime formation: on the development of institutions in international society. *International organization*, *45*(3), 281-308. https://doi.org/10.1017/S0020818300033117
Young, O. R. (1994). *International governance: Protecting the environment in a stateless society.* Cornell University Press.
Young, O. R. (1999). *Governance in World Affairs.* Cornell University Press.
Young, O. R. (2002). *The institutional dimensions of environmental change: fit, interplay, and scale.* MIT Press.
Young, O. R. (2008). The architecture of global environmental governance: bringing science to bear on policy. *Global Environmental Politics*, *8*(1), 14-32. https://doi.org/10.1162/glep.2008.8.1.14
Young, O. R. (2011). Effectiveness of international environmental regimes: Existing knowledge, cutting-edge themes, and research strategies. *Proceedings of the*

National Academy of Sciences, *108*(50), 19853-19860. https://doi.org/10.1073/pnas.1111690108

Young, O. R. (2015). *Politics of force: Bargaining during international crises.* Princeton University Press.

Young, O. R. (2016). *Governing Complex Systems: Social Capital for the Anthropocene.* MIT Press.

Yousefi, M., & Naderloo, R. (2022). Global habitat suitability modeling reveals insufficient habitat protection for mangrove crabs. *Scientific Reports, 12*(1), 21713. https://doi.org/10.1038/s41598-022-26226-7

Zelli, F. (2011). The fragmentation of the global climate governance architecture. *Wiley Interdisciplinary Reviews: Climate Change, 2*(2), 255-270. https://doi.org/10.1002/wcc.104

Zelli, F., & Van Asselt, H. (2013). Introduction: The institutional fragmentation of global environmental governance: Causes, consequences, and responses. *Global environmental politics, 13*(3), 1-13. https://doi.org/10.1162/GLEP_a_00180

Zelli, F., Gupta, A., & van Asselt, H. (2023). *The Global Climate Regime and Transnational Governance.* Edward Elgar Publishing.