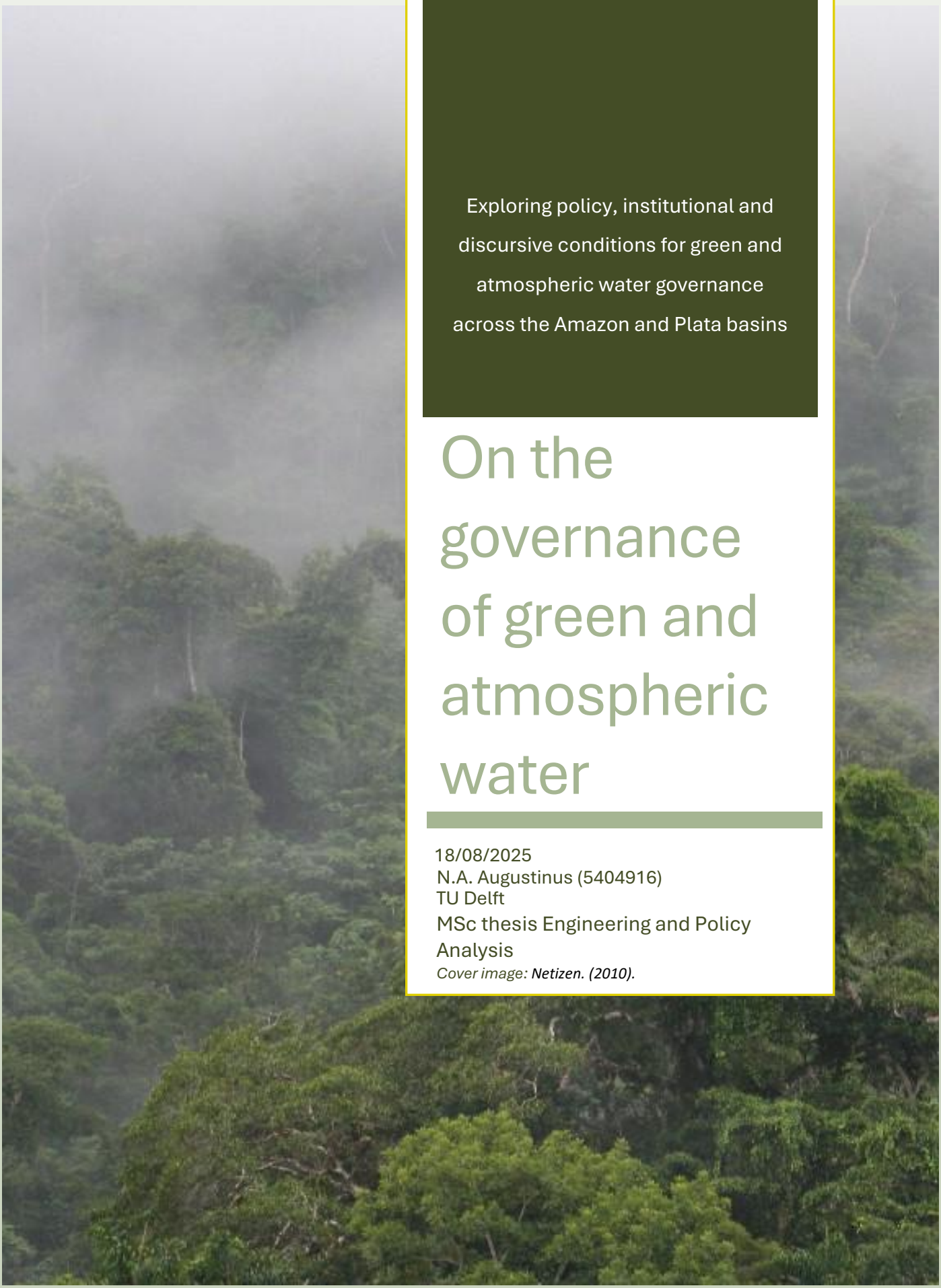

Exploring policy, institutional and discursive conditions for green and atmospheric water governance across the Amazon and Plata basins

On the governance of green and atmospheric water

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Preface

What is there, if there is no rain? Just as regions are connected through rivers over land, they are also dependent on each other through “flying rivers”. While invisible, these currents of moisture in the atmosphere sustain ecosystems and societies far beyond their origin. Yet, as we find ourselves in the Anthropocene, these flying rivers are increasingly altered by human activity, raising pressing questions about their governance.

Over the past six months, I have explored these questions through the lens of one of the world’s largest “sprinklers”: the Amazon rainforest. My research has sought to understand what conditions are necessary for governance of green and atmospheric water in this region, and the role of shared languages and practices in doing so.

This thesis reflects not only an academic pursuit but also a personal learning process. It has been a great learning experience from understanding the dynamics of green and atmospheric water, to getting acquainted to the world of discourses and frames. I hope that the insights offered here contribute in some way to the broader dialogue on how we govern the resources that bind us together, even when they remain unseen. I would like to thank my supervisors Dr. Ir. Lisa Scholten and Prof. Dr. Tamara Metze for your enthusiasm, support and for facilitating this learning process.

Extended abstract

This thesis explores the policy, institutional, and discursive conditions for green and atmospheric water governance in the Amazon region. Just as regions are connected through rivers over land, they are also dependent on each other through “flying rivers”: the atmospheric transport of moisture. Water continuously circulates through the hydrological cycle, partitioning into blue, green, and atmospheric forms. Rainfall infiltrates soils as green water or runs off as blue water, while soil moisture can either percolate to groundwater or return to the atmosphere through transpiration, forming atmospheric water. Terrestrial moisture recycling occurs when evapotranspiration from land surfaces generates precipitation locally or at distant sites. In South America, this process sustains regional rainfall regimes: the Amazon basin contributes between 25–35% of its own rainfall and up to 48–54% of rainfall in the wider region, specifically the La Plata Basin. The process of terrestrial moisture recycling is not isolated. Rather, human activities such as land use influence green and atmospheric water flows and subsequent precipitation patterns. This is problematic and creates new dilemmas, as countries and basins are interdependent on each other and might be impacted by land use decisions elsewhere, affecting water supply for agriculture, drinking water and more.

Despite this, current water and environmental governance frameworks in South America, and globally, focus primarily on visible blue water—rivers, lakes, and aquifers—while neglecting green and atmospheric water. Although the academic literature on green and atmospheric water governance has grown, a critical gap remains regarding case-specific, interdisciplinary, and interpretive research into the policy, institutional, and discursive conditions necessary to guide implementation. Addressing this gap, this thesis applies a multi-method, iterative approach combining actor analysis, social network analysis, and framing analysis to examine four central research questions: (1) Which actors, stakeholders, and formal arrangements currently shape water and environmental governance in the Amazon and La Plata Basins? (2) What dilemmas are likely to emerge for green and atmospheric water governance across and between these basins? (3) How are actors connected to each other, and who are potential policy brokers for advancing governance? (4) How is green and atmospheric water framed within the current discursive landscape?

Regionally, both basins’ member countries cooperate within intergovernmental basin organizations, respectively the Amazon Cooperation Treaty Organization (ACTO) and the Intergovernmental Coordinating Committee of the Countries of the Plata Basin (CIC). The ACTO and CIC can be considered key decision arenas, in which shared agreements and visions by the basin countries are made regarding transboundary water and environmental governance. However, it should be noted that the sovereignty of the countries remains central in these decision arenas, which is reflected in the differences of laws and regulations on the national level. Notably, no institutionally embedded mechanism for cooperation between the basins on (green and atmospheric) water governance was observed.

The Rio Conventions and Sustainable Development Goals are significantly reflected in the basins’ projects related to water governance, primarily in terms of funding and organizational support. Over the years, both ACTO and CIC have formulated strategies for Integrated Water Resources Management (IWRM), which were facilitated through the Global Environment Facility (GEF) together with GEF implementing agencies. Overall, green and atmospheric water is primarily referred to in scientific terms, such as "soil moisture," "precipitation," and "evapotranspiration". This aligns with the general observation of the lack of politicization of green and atmospheric water in current water governance debate and is explained through path dependencies resulting from the hegemony of

sustainable development discourses across water and environmental policy arenas.

Beyond scientific frames, green and atmospheric are found to be framed in climatic, solutionist (technocratic), functional and metaphorical ways using a river as metaphor. Climatic frames are widespread and primarily refer to droughts and floods. The widespread problematization of droughts and floods creates discursive space for green and atmospheric water governance. A climatization of green and atmospheric water could be beneficial given the established recognition of climate change, institutionalized through UNFCCC, and the Paris Agreement. Moreover, an embeddedness within climate change policy would also allow additional funding mechanisms, for example through the GCF. Yet, there are also risks. Climate policy deliberations are volatile which could affect stability for green and atmospheric water governance and a (perceived) distance to climate change could lead to lower levers of public engagement.

A solutionist frame refers to green and atmospheric water in technocratic ways as a means to solve local problems. Within this frame, atmospheric water is referred to as a local, "unconventional" water resource in times of water scarcity. Green water (soil moisture) is referred to in relation to land management techniques, primarily for agriculture. Whereas a solutionist framing allows for the relevance of green and atmospheric water to be highlighted, it risks reestablishing existing blue-water oriented discourses through addressing local blue water scarcity problems.

A functional frame was often observed together with the metaphor of a “flying” river. Such a framing highlights the several uses of green and atmospheric water, for example, for rainfed agriculture. As such, the flying river metaphor shows potential to bridge across different policy arenas and discourses. Yet, upon using the metaphor, one should be considerate to not oversimplify the policy problem of green and atmospheric water governance.

For green and atmospheric water governance to take shape in the Amazon and Plata basins, political readiness, policy entrepreneurship, and cross-sectoral coordination are needed. Global visibility can be enhanced by UN Water, while coalitions like “80x25” and the GCEW can act as policy entrepreneurs using the “flying rivers” metaphor. Regionally, ACTO and CIC should establish inter-program and inter-basin commissions including multi-disciplinary experts, Indigenous and civil society actors, and industry, supported by shared monitoring systems. International funding, such as an extended GEF International Waters mandate, is essential to enable negotiations, policy-making, and effective implementation of transboundary green and atmospheric water governance. The study concludes with several policy implications. First, inter-basin mechanisms should be strengthened, embedding ACTO and CIC into decision-making while exploring inter-basin committees or broader hemispheric forums such as the OAS. Second, organizations like the Science Panel for the Amazon can serve as brokers between competing advocacy coalitions, provided their positioning within governance ecosystems is carefully considered. Third, communicative tools such as the “flying rivers” metaphor may help connect problem streams and broaden political readiness. Finally, deliberate efforts are needed to prevent discursive lock-in by fostering plurality and facilitating deliberative learning across scales and sectors. In this way, green and atmospheric water governance can move from being an underdeveloped policy arena toward becoming an integral part of water and environmental governance in South America and beyond.

This research faces several methodological and analytical limitations. The exploratory and interpretive nature of the work means that the identification of actors, network relations, and discursive patterns

inevitably involves an element of subjectivity. The actor analysis was static, even though actors and their resources evolve dynamically, and data limitations may have produced incomplete assumptions. The framing analysis, conducted through Atlas.ti, risked both missing relevant passages and including false positives, while focusing only on textual sources excluded visual framings and metaphors. Similarly, the social network analysis was limited to publicly available data, omitting informal and undocumented ties. All analyses provide only a static snapshot for 2020–2025, even though discursive and institutional practices evolve continuously. Language barriers, translation issues, and cultural differences may also have shaped findings, particularly when examining actors communicating in Spanish, Portuguese, or Indigenous languages.

Future research should therefore address these limitations by incorporating longitudinal analyses of evolving actor roles and discursive framings, combining textual with visual and oral data. Greater attention should also be paid to informal coalitions and evolving cross-basin relations that may not appear in formal documentation. Beyond the Amazon and La Plata basins, comparative research in other ecological and political contexts could shed light on the transferability of green and atmospheric water governance concepts. Finally, further study is needed on how emerging storylines, such as those of the GCEW, are taken up or resisted by actors and basin stakeholders.
Beyond these directions, a research agenda is suggested to guide further stages of the policy processes. This includes Comparative Cognitive Mapping approaches to understand causes of action and inaction based on actor's system perspectives, alongside the creation of boundary objects to facilitate decision making under diverging interests and incomplete knowledge.

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1. Introduction

1.1. Problem formulation

What is there, if there is no rain? Rain, as a primary source of freshwater, drives societies and supports ecosystems. For example, freshwater is used for drinking water, sanitation and electricity; the water in the soil and the water in the sky that becomes rain is used for agriculture; water is important for regulating natural processes and biodiversity; and rain also has cultural and spiritual values. Consequently, water is pivotal for achieving almost all SDG goals, in relation to hunger, gender equity, health, education, livelihoods, sustainability and ecosystems as well as climate goals.

But where does rain come from? Water continuously moves through the hydrological cycle, in which it partitions between forms of blue, green and atmospheric water (Te Wierik et al., 2019). When rain falls on land, it can either soak into the soil (green water) or run off into rivers, lakes, or other water bodies (blue water), depending on factors such as vegetation cover, soil infiltration capacity and the temporal distribution of rainfall (Falkenmark, 2013; Rockström, 1999; Weiskel et al., 2014; via Te Wierik et al., 2019). When infiltrated in the soil as soil moisture, green water can either return to the atmosphere as a green water flow through plant transpiration and become atmospheric water, or percolate to groundwater (blue water) (Te Wierik et al., 2019). Terrestrial moisture recycling occurs when blue and green water sources evapo(transpi)rate over land surfaces and result in terrestrial precipitation on local or distant locations (Van der Ent et al., 2010).

In South America, terrestrial moisture recycling plays a significant role in sustaining local and regional rainfall regimes. The Amazon basin is the largest river basin in the world and its rainforest represents almost 40 percent of the global tropical forest area (Weng et al., 2018). It is estimated that through evaporation within the basin and transpiration of the Amazon rainforest, the Amazon basin contributes to between 25-35% of the basin's rainfall and up to 48-54% of the regional rainfall (Van Der Ent et al., 2010; Zemp et al., 2014; Weng et al., 2018). As for the La Plata River Basin, South America's second largest river basin, the (southern) Amazon is considered both an indirect and direct source of rainfall, contributing to approximately 20% of mean annual precipitation in the Plata basin (Martinez & Dominguez, 2014).

Terrestrial moisture recycling is not an isolated phenomenon. Rather, human activities such as land use influence green and atmospheric water flows and subsequent precipitation patterns (Te Wierik et al., 2019; Keys et al., 2017; Keys et al., 2019; Ent et al., 2010; O' Conner et al., 2021; Jasechko et al., 2013; Spracklen et al., 2012). As a rule of thumb, an upwind decrease in evaporation leads to a downwind decrease in precipitation (Keys et al., 2017). Consequently, just as regions are dependent on each other through rivers over land, they are also dependent on each other through "flying" rivers (Weng et al., 2018). Also in the Amazon region, a negative relation between deforestation and rainfall patterns within and beyond the basin boundaries is addressed by many studies (e.g. Weng et al., 2018; Weng et al., 2019; O'Connor et al., 2021; Enciso et al., 2022; Mu et al., 2021). For example, within the Amazon Basin, climate modelling and simulation studies estimate a mean annual rainfall reduction of 12% related to deforestation (Spracklen & Garcia-Carreras, 2015; via Te Wierik et al., 2021). Furthermore, in the dry-season, deforestation can contribute significantly to reduced rainfall patterns within the La Plata Basin (Zemp et al., 2017a; Zemp et al., 2017b; via Te Wierik et al., 2021).

Yet, current water and environmental governance frameworks primarily focus on visible, blue water resources such as rivers, lakes and aquifers. Therefore, this thesis sets out to explore conditions for green and atmospheric water governance in the Amazon region.

1.2. Problem Analysis

The absence of (direct) green and atmospheric water governance has several implications (Te Wierik et al., 2019). First, the absence of green and atmospheric water governance hinders a holistic understanding of the globally and regionally available (terrestrial) freshwater resources. Furthermore, in the absence of green and atmospheric water governance, the risk of water grabbing emerges. Third, a lack of green and atmospheric water governance hinders climate change mitigation and adaptation.

1. *The absence of green and atmospheric water governance hinders a holistic understanding of the globally and regionally available (terrestrial) freshwater resources.*

Green and atmospheric water contribute to a significant part of the terrestrial freshwater resources (Te Wierik et al., 2021; Te Wierik et al., 2019). It is estimated that globally, through terrestrial moisture recycling, 40 % of the total rainfall falling over land comes from terrestrial evapo(transpi)ration (Van der Ent et al., 2010). Also in South America, terrestrial moisture recycling is a crucial process, in which the Amazon Basin functions as a terrestrial moisture recycling "hotspot" (Van der Ent et al., 2010; Zemp et al., 2014; Wunderling et al., 2022; Tuinenburg et al., 2020).

Furthermore, blue water availability is not static and continuously moves through the hydrological cycle between different forms of solid, liquid, and vapor (Te Wierik et al., 2019). Consequently, decisions affecting one source of freshwater will ultimately affect other sources of freshwater. Considering the process of terrestrial moisture recycling, regions that show high continental evaporation recycling rates create precipitation dependencies of downwind areas on upwind areas' level of evaporation (Van der Ent et al., 2010). As a result, policies related to evaporation changes in an upwind area, such as deforestation, simultaneously have a multiplier effect on their downwind areas' precipitation patterns (Van der Ent et al., 2010).

In South America, these dependencies are increasingly being recognized in the existing literature. Large scale land use change within the Amazon basin has been linked to decreased precipitation patterns within the basin and beyond its basin borders (see e.g. Keys et al., 2017; Weng et al., 2018; Weng et al., 2019; Zemp et al., 2014; Van der Ent et al., 2010; Wunderling et al., 2022; Tuinenburg et al., 2020). These interdependencies have far-reaching consequences. For example, Argentina, a country largely dependent on rain-fed agriculture, depends on rainfall originating in the Southern Amazon (Martinez & Dominguez, 2014).

2. *In the absence of green and atmospheric water governance, the risk of water grabbing emerges*

Second, in the absence of green and atmospheric water governance, the risk of water grabbing emerges (Te Wierik et al., 2019). Whereas multiple definitions of water grabbing circulate, water grabbing generally refers to situations in which the appropriation of water resources are accompanied by a power imbalance and a disregard of local users and rights (Dell'Angelo et al., 2018). Originally, this concept primarily referred to blue water grabbing. Yet, over the years, modern technologies have emerged which aim to influence green or atmospheric water resources for the purposes of extracting (drinking) water or improving agricultural productivity (Te Wierik et al., 2019). Examples of atmospheric water technologies include fog water collection (Qadir et al., 2018), atmospheric water generators (Kim et al., 2018; via Te Wierik et al., 2019), and cloud

seeding. Whereas these technologies address local water shortages, a downside is that local and distant precipitations patterns might be altered (Te Wierik et al., 2019). Without a clear recognition of green and atmospheric water, the risk emerges that such technology uses exacerbate existing inequalities.

3. *A lack of green and atmospheric water governance hinders climate change mitigation and adaptation.*

In terms of climate change mitigation, green and atmospheric water, as part of the hydrological cycle, play a significant role as they provide major Earth system functions of storage, transport, hydro-ecological regulation, and hydro-climatic regulation (Wang-Erlandsson et al., 2022). For example, cloud development, surface temperatures, temperature differences between land and ocean, and patterns of atmospheric circulation are regulated by moisture content (Wang-Erlandsson et al., 2022). Moreover, green and atmospheric water are important in terrestrial carbon sequestration processes. Soils and vegetation play a large role in the global (terrestrial) carbon cycle and carbon sequestration is widely acknowledged as a climate mitigation pathway (see e.g. Powlson et al., 2011; Lal et al., 2015; Wang-Erlandsson et al., 2022). Increasingly, the role of soil moisture in regulating carbon sequestration and subsequent greenhouse gas emissions is recognized (see e.g. Hao et al., 2025; Green et al., 2019; Zuo et al., 2024 ; Khan et al., 2021). Consequently, a lack of green and atmospheric water governance in these areas could affect climate mitigation.

In terms of climate change adaptation, green and atmospheric water are relevant considering their role in soil management for adaptation practices as well as their relation to unconventional water resources. Aside from its role in climate change mitigation, soil management is also relevant for climate change adaptation (Khan et al., 2021). In adapting to changing climate scenarios, climate smart soil systems and weather proofing soil systems are necessary for the adaptation of agricultural systems to climate change (Khan et al., 2021) as well as for maintenance of the soil's natural sponge function in achieving flood and drought resilience. Soil moisture (green water) is central to soil management and reflects the need for its governance from a climate adaptation perspective.

1.3. Knowledge Gap

Existing literature on green and atmospheric water governance primarily focuses on data collection, modelling and simulation efforts, and potential governance typologies, arrangements, and tools for green and atmospheric water.

A large body of literature discusses the impact of anthropogenic influences on changes in moisture recycling and precipitation patterns (see e.g. Keys et al., 2017; Keys et al., 2019; Van der Ent et al., 2010; Wang et al., 2024; Garcia et al., 2024). Changes in terrestrial moisture recycling affect water resilience in systems of tropical rainforests, drylands and savannas, agriculture (both rain-red and irrigated), river flows, and urban regions (megacities) (Keys et al., 2019). In turn, changes in moisture recycling rates and subsequent precipitation patterns affect social dynamics, creating moisture-recycling social-ecological systems (MRSESs) (Keys & Wang-Erlandsson, 2018). In South America these dynamics are described to be of a telecoupled nature, in which terrestrial moisture recycling, land use change and market-dynamics are coupled on local, regional and even on global scales through virtual water flows (Keys & Wang-Erlandsson, 2018).

Recognizing the importance of green and atmospheric water governance, existing literature already proposes several concepts and tools. The continental evaporation recycling ratio indicates a location's importance in terms of evaporation to sustain precipitation in a downwind target region during a period of time (Van der Ent et al., 2010). The precipitationshed delineates the upwind and downwind regions that are connected through terrestrial moisture recycling (Keys et al., 2012). In other words, a precipitationshed is "a watershed of the sky" (Keys et al., 2017). The Most Influential Precipitationshed (MIP) describes the most important sources of evapotranspiration for a region's precipitation (Weng et al., 2018). Governance typologies of transboundary moisture recycling dynamics range from simple typologies to more complex typologies in which core moisture sources become more difficult to recognize (Keys et al., 2017). Moreover, the literature addresses the potential to integrate moisture recycling into existing mechanisms, such as land and water planning and economic agreements as Payments for Ecosystem Services (PES) (Keys et al., 2017; Te Wierik et al., 2019; Feng et al., 2023).

Various studies have used these concepts to address terrestrial moisture recycling dynamics in, amongst others, the Amazon region (see e.g. Weng et al., 2018; Weng et al., 2019; Keys et al., 2012; Van der Ent et al., 2010; O'Conner et al., 2021; Keys et al., 2017; Enciso et al., 2022; Mu et al., 2021)). Descriptions of moisture recycling dynamics in South America include Brazil acting as a moisture tower to other regions (Keys et al., 2017) as well as cascading moisture recycling patterns in which the Amazon basin is a source of moisture for the Plata basin (see e.g. Zemp et al., 2014; Keys et al., 2017).

Furthermore, there is a growing body of literature which aims to address the green-blue water dynamics within hydrological models. These include innovations on the simulation of blue-green water relations within the hydrological cycle (e.g. Guo et al., 2024), impacts of human activities such as land use on the blue-green hydrological cycle (e.g. Wang et al., 2024; Garcia et al., 2024), studies on governance tools such as Payments for Ecosystem Services (e.g. Feng et al., 2023), and studies considering the effects of uncertainties of climate change on the hydrological cycle (e.g. Shreeshna et al., 2024; Barresi Armoa et al., 2023).

However, while important, these approaches address only the technical dimension of green and atmospheric water governance. Whereas in "simple", well-structured problems such tools might be sufficient to solve problems, more complex, wicked problems require further analysis of social, institutional and normative dimensions (Enserink et al., 2022). The (hidden) interdependencies between actors (e.g. Keys et al., 2017) and the connection of the hydrological cycle to many other domains (Te Wierik et al., 2019) are likely important drivers of (ir)rational behavior of actors in the (geo)diplomatic sphere (Keys et al., 2017) and influencing governance implementation. Additionally, as with other elements of the hydrological cycle, terrestrial moisture recycling is not solely a neutral hydrological concept but brings forward new political arenas for valuation and allocation of freshwater sources. Other catchments areas in the world have already shown that the role and governance of evaporation in or between catchment areas is contested and creating tensions between different groups, such as indigenous people, farmers and government (Jackson and Head, 2021). Consequently, this presents a knowledge gap on what would be policy, institutional and discursive conditions for green and atmospheric water governance with regard to the Amazon Basin and Plata basins in South America.

1.4. Research Objectives

Just as blue water is not confined to national borders, green and atmospheric moisture flows are not confined by basin scale delineations (e.g. Tuinenburg et al., 2020; Van der Ent et al., 2010; Te Wierik et al., 2019). In South America, terrestrial moisture recycling plays a significant role in sustaining local and regional rainfall regimes. This not an isolated phenomenon. Rather, human activities such as land use influence green and atmospheric water flows and subsequent precipitation patterns (Te Wierik et al., 2019; Keys et al., 2017; Keys et al., 2019; Ent et al., 2010; O' Conner et al., 2021; Jasechko et al., 2013; Spracklen et al., 2012). Yet, current water and environmental governance frameworks – in South America and globally- primarily focus on visible, blue water resources such as rivers, lakes and aquifers.

Whereas green and atmospheric water governance is increasingly addressed in academic literature, the preliminary literature review reveals the need for case specific, inter-disciplinary and interpretive research on policy, institutional and discursive conditions of green and atmospheric water governance to guide real-life implementation.

Therefore, the primary objective of this research is to explore what are institutional, policy, and discursive mechanisms shaping the integration of green and atmospheric water governance in the Amazon and La Plata basins.

To achieve this research objective, the following research questions are formulated.

1. What actors, stakeholders and formal arrangements are currently shaping water and environmental governance in the Amazon and La Plata Basins?
2. What dilemmas are likely to emerge for green and atmospheric water governance in and between the Amazon and Plata basins?
3. How are actors connected to each other in the current governance landscape and what are potential policy brokers for green and atmospheric water governance?
4. How is green and atmospheric water framed within the existing discursive space?

The first and second research questions aim to understand green and atmospheric water governance at the actor level. Understanding what actors and stakeholders exist, what their goals are and how they might conflict or converge, and what formal arrangements currently shape water and environmental governance collectively give insight on what would be policy and institutional conditions. The third question moves beyond the actor level towards a network level and contributes to a deeper understanding of institutional conditions for green and atmospheric water governance. Understanding how actors are connected to each other helps to identify what actors emerge as influential brokers of information. Finally, the fourth question aims to explore how green and atmospheric water is framed across discourses to understand discursive conditions for green and atmospheric water governance.

1.5. Societal and scientific relevance

This study is of both societal and scientific relevance. By exploring policy, institutional and discursive conditions for green and atmospheric water governance, this study helps policymakers understand how green and atmospheric water is embedded within the existing landscape and informs actionable strategies for their explicit considerations.

Furthermore, this research extends the existing literature on green and atmospheric water in the following ways. First, this research contributes to existing gaps in the literature on case-specific research on green and atmospheric water governance. Moreover, this research contributes to the existing green and atmospheric water governance literature by adopting a fresh perspective on the discursive implications of hegemonic sustainability discourses and their dynamics with competing storylines on the framing of green and atmospheric water.
Finally, this research can be used as a stepping stone for a) further analysis of governance conditions for terrestrial moisture recycling in the Amazon region; b) provide a basis of comparison to identify future changes in arenas and power dynamics related to green and atmospheric water in the Amazon region; and c) provide a basis of comparison to analyze contextual differences related to power dynamics and terrestrial moisture recycling governance in other hotspot regions, for example, the Congo rainforest.

1.6. Reader's guide

The remainder of this thesis is structured as follows. First, theoretical underpinnings will be offered in chapter 2. Afterwards, chapter 3 details the methodological approaches used to answer the research questions. Next, chapter 4 presents the results of the respective analyses, followed by an in-depth discussion and conclusion on policy, institutional and discursive conditions for green and atmospheric water governance in chapter 5.

2. Theory

2.1. Green and atmospheric water governance as an untamed political problem

This thesis draws upon Enserink et al. (2022) and their approach to decision-making in wicked policy processes. This approach assumes the policy process to be a problem-solving process, which is represented as a policy cycle of agenda setting, decision making, policy implementation and policy impact (Enserink et al., 2022, p. 14). Whereas green and atmospheric water already has a strong academic foundation, it does not hold a prominent place in current policy debates. Only recently, in 2022, the Global Commission on the Economics of Water (GCEW) was commissioned, which in 2024, released its flagship report highlighting a need for green and atmospheric water governance (GCEW, 2024). Therefore, this research assumes green and atmospheric water governance to be positioned as entering the agenda-setting stage in the policy process.

Building upon typologies of De Graaf and Hoppe (1989) and Douglas and Wildavsky (1982), Enserink et al. (2022, p. 29) distinguish a typology of tamed and untamed problems based on the degree of social consensus on a problem and the degree of technological uncertainty. Tamed problems (type 1) are those problems for which technical solutions are available and social consensus exists, whereas untamed technical problems (type 2) do have social consensus but lack technological solutions (Enserink et al., 2022). Whereas problems of type 1 and 2 remain relatively overseeable, problem solving becomes more difficult when problems are characterized as type 3 or 4. Untamed political problems (type 3) are those problems with technical solutions but no social consensus, and completely untamed problems (type 4) are those problems without both (evident) technical solutions as well as social consensus (Enserink et al., 2022). Complementary, contested problems are those problems in which no consensus on knowledge and values is present (De Bruijn & Porter, 2004 ; via Enserink et al., 2022).

Referring to these typologies, green and atmospheric water governance is assumed to be an untamed political problem and contested problem. Existing literature already proposes various approaches for green and atmospheric water governance, such as such as the use of precipitationshed delineations (Keys et al., 2012, Weng et al., 2018) or integration into existing land and water governance frameworks (Te Wierik et al., 2019; Te Wierik et al., 2021; Keys et al., 2017). Yet, it is unclear whether there would be social consensus on what approach to take. The Amazon rainforest, as the key ecosystem for terrestrial moisture recycling considered within this research, is already a contested space within current environmental governance deliberations. Consequently, given the relationship between land use and terrestrial moisture recycling, it is assumed that there is no consensus on values among stakeholders yet. Furthermore, given the (pre-)agenda setting stage in which green and atmospheric water governance is assumed to be positioned, it is assumed that consensus on knowledge is not fully achieved. Taken together, green and atmospheric water governance would then be an untamed political and contested problem.

As a response to contested problems, what is considered a suitable problem-solving strategy depends on whether decision-making is authoritarian or networked; whether interests and objectives of actors are aligned; the extent of consensus on knowledge and technological information; and the (perceived) importance of the issue and urgency for agreement to involved stakeholders (De Bruijn & Porter, 2004; Enserink et al., 2022). When a problem is important and urgent, to be decided upon by multiple decision-makers, interests are not fully assigned, and

knowledge is not well-accepted, a suitable strategy is to identify solution spaces (Enserink et al., 2022).

To identify these solution spaces, this thesis adopts three lenses: the actors and arenas related to green and atmospheric water governance, the existing network, and the existing framings and narratives. The underlying theoretical assumptions of these different lenses are described in the following sections of this chapter.

2.2. Actors and arenas

In this research, the assumption is made that decisions on green and atmospheric water governance are to be made in a multi-actor environment in which actors are interdependent (Enserink et al., 2022). Here, an actor is defined as "A social entity, person or organization, able to act on or exert influence on a decision." (Enserink et al., 2022, p. 80). Drawing from garbage can decision-making models (Cohen et al., 1972; via Enserink et al., 2022) and streams decision-making models (Kingdon, 1984/1995; via Enserink et al., 2022) and on the Advocacy Coalition Framework (ACF) (Sabatier, 1988; via Enserink et al., 2022), actor behavior in policy processes can be understood by examining both the structural setting of the decision-making environment (the arena level) and the characteristics of individual actors (the actor level) (Enserink et al., 2022).

Decision arenas are spaces in which strategic decision-making takes place through actor interactions (Hermans & Cunningham, 2018; Enserink et al., 2022). At the arena level, networks and institutions shape conditions for decision-making processes and actor behavior (Hermans & Cunningham, 2018). Furthermore, at the actor level, perceptions, values and resources further explain actor behavior (Enserink et al., 2022). Perceptions reflect actor interpretations of the policy problem (Bots et al., 2000; Scharpf, 1997; via Enserink et al., 2022), whereas values reflect more normative beliefs about what an actor deems (non) desirable (Enserink et al., 2022). Resources reflect actor positions in terms of their ability to influence decision outcomes (Coleman, 1990; Enserink et al., 2022).

Drawing from multiple theoretical lenses, the Advocacy Coalition Framework (ACF) (Sabatier, 1998) assumes advocacy coalitions for a certain policy goal to be formed by actors who share beliefs and together "compete" with other coalitions (Cairney, 2011). ACF considers policy subsystems which are positioned within a wider political system (Cairney, 2011). The policy processes in these subsystems involve a wide variety of actors across different levels of governance and are marked by uncertainties and deliberations on the policy problem (Cairney, 2011, after Sabatier, 1988).

Constraints and resources formed by both stable parameters as well as more dynamic external events influence the policy subsystem (Jenkins-Smith et al., 2018; via Cairney, 2011). Long-term coalition opportunities are shaped by relatively stable processes within the policy subsystem, such as distribution of natural resources, problem attributes, institutional structures and embedded socio-cultural values, whereas external events such as decisions in other policy subsystems create short term opportunities (Cairney, 2011). Within the policy subsystems, coalitions lobby and compete for policy outcomes shaped by the respective coalition's shared beliefs about the nature of the policy problem and the necessary solutions. The extent to which coalitions are able to pursue their policy goals in the policy subsystem is dependent on various factors, among which (formal) authority, mobilizing ability, financial and organizational resources, information (Sabatier & Weible, 2007). Although not always present within policy subsystems, policy brokers mediate between the different coalitions to construct compromises and minimize conflict (Cairney, 2011).

ACF assumes actor's decisions to be formed following bounded rationality, in which individuals are instrumentally rational and thus seek to "use information and other resources to achieve their goals" but reject simple rational choice assumptions of perfect cognition and information that allow individuals to rank their preferences." (Cairney, 2011, p.6). As such, ACF assumes belief systems to explain behavior of individuals and coalitions (Sabatier, 1993; via Cairney, 2011). We speak of (deep) core beliefs when these beliefs are related to an actor's fundamental worldview (Sabatier, 1993). Policy beliefs reflect an individual's empirical and normative position on the policy problem within a subsystem (Jenkins-Smith, 2018; via Cairney, 2011). Contrastingly, secondary beliefs are beliefs more likely to change and are beliefs surrounding the organization of policy goals, such as funding and implementation (Sabatier, 1993; via Cairney, 2011).

2.3. Social Network Theory and Brokerage

Beyond individual actors, this research also considers their network relations as a unit of analysis. Social Network Theory assumes that actor behavior, access to resources, and influence are shaped by their position within the network (Gamper, 2022). Whereas the first lens of actors and arenas is useful to understand what actors are involved, what formal structures potentially shape green and atmospheric water governance, it is also relevant to understand how actors position within the network might contribute to potential brokerage roles.

Formally, brokers are defined as "intermediary links in systems of social, economic, or political relations who facilitate trade or transmission of valued resources that would otherwise be substantially more difficult" (Stovel et al., 2011, p.1). Brokerage is important to facilitate connections between network actors who otherwise would not be connected, especially in situations of information scarcity, complex transactions, or poor institutional development (Stovel et al., 2011). Therefore, it is relevant to understand what brokerage mechanisms exist, what opportunities emerge, and what liabilities exist.

Brokerage varies in structural and nonstructural ways (Stovel et al., 2011). The domains and context in which brokers maneuver can vary and determine the functions of brokers from facilitating trade to establishing new connections (Stovel et al., 2011). Structurally, various brokerage characterizations are described in the literature ranging from a simple "middleman" structure (fig. 2.1.) which is mainly focused on facilitating exchange of goods or information to more complex arrangements of "catalyst" brokerage (fig. 2.2) which is mainly focused on connecting formerly unconnected actors in the network (Stovel et al., 2011).

Fig. 2.1. Middleman broker (source: Stovel et al., 2011).

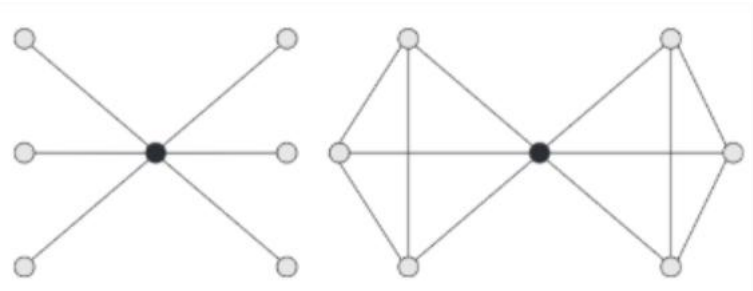

Fig. 2.2. Catalyst brokerage (source: Stovel et al., 2011).

Despite their critical role in establishing network relations and smoothen the movement of goods and information, brokers' positions face inherent structural liabilities due to the relational and informational settings in which brokerage occurs (Stovel et al., 2011). To this end, Stovel et al. (2011) describe three liabilities from a network, social-psychological, and economic perspective to broker positions and consequent potential stabilizing solutions. First, from a network perspective, broker fragility is primarily explained in the literature by the strengths and weaknesses of weak ties (see Granovetter et al., 1973) and, complementarily, balance theory rooted in cognitive dissonance (Stovel et al., 2011). Despite the strength of weak ties as described by Granovetter et al. (1973), Stovel et al. (2011) argue that such weak ties also explain broker fragility using the argument that without reinforcement, bridging ties are likely to weaken over time due to budget constraints.

Moreover, from a balance theory perspective which describes the emergence of an "us vs them" world, Stovel et al. (2011) contend that bridging ties are fragile due to the broker's position between internally aligned groups with externally conflicting interests (Stovel et al., 2011). From a social-psychological perspective, broker fragility might also be attributed to role conflict, in which the different roles that brokers have to occupy bring diverging behavioral expectations (Stovel et al., 2011). Brokers are inherently susceptible to such role conflict given their position between different actors embedded in varying normative and institutional frameworks (Stovel et al., 2011).

Finally, from an economic perspective, broker fragility might also be explained by information asymmetries and commitment problems (Stovel et al., 2011). When a broker mechanism is in such a position to be able to exploit an information advantage, there is a risk of the mechanism losing the trust of involved actors, potentially leading to deterioration or breakdown of the bridging function (Stovel et al., 2011). This highlights the importance of information sharing among actors within and between basin organizations, through a trustworthy brokerage mechanism.

As a remedy to these fragilities, Stovel et al. (2011) refer to stabilization strategies of broker capture or organizational grafting. In cases of broker capture, an integrated structure emerges whereby one of the parties subsumes the broker into its own organizational framework. Within this strategy, the broker assumes the role of an agent aligned with one party's interests, rather than acting as a neutral intermediary (Stovel et al., 2011). Another path to broker stabilization that Stovel et al. (2011) describe is organizational grafting. In organizational grafting, an existing organization with an originally different purpose is used as a "host" organization for the broker position (Stovel et al., 2011). Through the host organization, a stable brokerage position can be established. Moreover, if the host organization holds legitimacy, it can lend credibility to the broker operating under its

umbrella (Stovel et al., 2011), or act as a monitoring mechanism to increase trust in the broker's position (Stovel et al., 2011).

2.4. Frames and discourses

As a third and final lens, this research adopts a Foucauldian discursive lens to understand, beyond actors and networks, how shared languages and concepts frame problem definitions and the range of possible solutions. While the theoretical lenses of ACF and SNA are well-suited for analyzing the various arenas, institutional relationships, dilemmas that arise within and across these arenas, and potential brokerage roles, they do not account for how shared languages and concepts frame problem definitions and the range of possible solutions. Foucault (1980) understands power not as something possessed explicitly by certain actors, but rather as something exercised through established arrangements of language, shared practices and meanings (Christensen, 2023). As such, language plays a significant role in how policy problems and consequent solutions are constructed (Hajer, 1995).

Within this lens, I assume a *dynamic discursive space* (Maciag, 2018) in which discourses and the coalitions they subscribe to, through discursive boundary work, can reframe policy problems and consequent solution spaces (Dodge & Metze, 2024). This is conceptualized in figure 2.3.
In the sections that follow, this conceptual model will be unpacked.

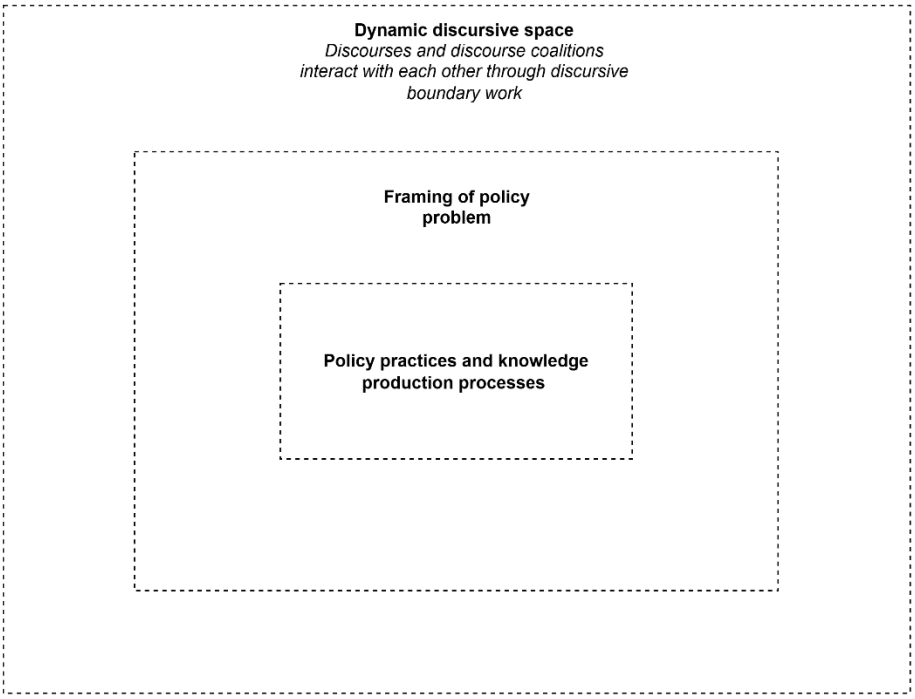

Fig. 2.3. Conceptualization of a discursive approach to framing (own work)

Frames, discourses and discourse coalitions

A frame positions a certain issue or situation in a context in such a way that particular dimensions of the issue or situation are highlighted or dismissed (Van Hulst et al., 2024). As a result, frames can influence the public opinion and policymaking (Entman, 1993;Van Hulst et al., 2024). Following a Foucauldian interpretation of power, a discursive approach to framing assumes that the framing of policy problems emerges through discourses (Dodge & Metze, 2024).

Hajer defines a discourse to be an "*ensemble of ideas, concepts and categories through which meaning is given to phenomena*" (Hajer,1993, p.45). Dryzek (1997) upholds a similar view on discourses and describes discourses to enable "*those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts,' thus legitimizing knowledge and justifying specific policies "* (Dryzek, 1997, p. 8; via Hussein, 2017a). As such, discourse theory considers discourses as the lenses through which policy problems are framed and solution spaces are constructed (Hajer,1993; Hajer, 1995; Dryzek, 1997; via Hussein, 2017a; Van den Brink & Metze, 2009).

Discourse coalitions emerge when actors, despite varying interests and backgrounds, uphold a shared discourse as a set of storylines, respective practices and envisioned solution spaces to problems (Hajer, 1993; Hajer, 1995). Through this lens, Hajer views politics as "a process in which different actors from various backgrounds form specific coalitions around specific story lines. Storylines are the medium through which actors try to impose their view or reality on others, suggest certain social positions and practices, and criticize alternative social arrangements" (Hajer, 1993, p.47).

When adopting discourses as the units of analysis, it also becomes relevant to understand whether they are the status quo (discourse structuration), if they are institutionalized (discourse institutionalization) and whether they are endorsed by respective power elites (discourse legitimization) (Hajer, 1993; Bréthaut et al., 2022). For a discourse coalition to dominate a given arena, Hajer (1993) describes two conditions of structuration and institutionalization. In other words, central actors need to be persuaded by the rhetorics of a new discourse and the institutional practices reflect the dominant discourse (Hajer, 1993, p.48). The combination of a dominant discourse and institutionalized discourse is called a hegemonic discourse (Molle, 2008; Bréthaut et al., 2022).

Dynamic discursive space

It is commonplace for actors to rely on multiple discourse at the same time, especially in the case of complex, wicked problems (Hajer, 1993). Discursive affinity is used to describe the extent to which various separate discursive elements fit together in order to create a coherent storyline (Hajer, 1993). To this end, Maciag (2018) describes the idea of a *discursive space,* which encompasses a representation of knowledge based on discourses and their complex interactions in the world (Maciag, 2018).

Furthermore, discourses and the coalitions which subscribe to them are not static but constantly evolve in what Metze & Dodge refer to as *dynamic discourse coalitions* (Metze & Dodge, 2016). As a result, discourses, and the dynamics between and within discourses and their coalitions can reframe policy problems and consequent solution spaces (Dodge & Metze, 2024). Through discursive

boundary work, actors and coalitions differentiate their storyline from others to gain support for a specific interpretation of a problem (demarcation), or bridge to-and align with other discourses and coalitions (coordination), either within or between coalitions (Metze & Dodge, 2016; Metze, 2010; Metze, 2014). Within a discourse coalition, we speak of discourse coalition confirmation when the coalition is successful in maintaining or redefining its storyline, and consequently, sticks together. On the other hand, discourse coalition disintegration occurs when the storyline within a coalition becomes contested, ultimately dismantling the discourse coalition. Between discourse coalitions, discourse coalition integration occurs when previously distinct coalitions and storylines are brought together through a (new) (re)framing of an issue. Discourse coalition polarization occurs when such (re)framing fails or is not introduced, leaving the issue to remain or even become more (visibly) contested (Metze & Dodge, 2016).

Coordination across coalition and storyline boundaries is often facilitated by shared boundary concepts to allow thinking and deliberations by different coalitions, boundary objects to allow acting when interests diverge or knowledge is incomplete and the right boundary settings (Mollinga, 2010). For example, the boundary concept of ecosystem services brings together various disciplines, and the boundary concepts of IWRM and Sustainable Development have been important in creating shared alliances in policy processes (Mollinga, 2010). Boundary objects can take on various forms ranging from analytical, assessment and participatory approaches (Mollinga, 2010).

3. Methodology

3.1. Overview

The primary objective of this research is to explore what are institutional, policy, and discursive mechanisms shaping the integration of green and atmospheric water governance in the Amazon and La Plata basins. Guiding this research objective are the following research questions.

- What actors, stakeholders and formal arrangements are currently shaping water and environmental governance in the Amazon and La Plata Basins?
- What dilemmas are likely to emerge for green and atmospheric water governance in and between the Amazon and Plata basins?
- How are actors connected to each other in the current governance landscape and what are potential policy brokers for green and atmospheric water governance?
- How is green and atmospheric water framed within the existing discursive space?

To address these research questions, this study employed a multi-method, iterative approach integrating actor analysis, social network analysis and framing analysis. Figures 3.1. and 3.2. present an overview of the methodological approach.

The different methods align with the research questions and the theoretical lenses introduced in the previous chapter. Respectively, actor analysis examines the actor level; social network analysis investigates the network level; and framing analysis focuses on the discourse level. Considering green and atmospheric water governance to be an untamed political and contested problem, this approach acknowledges the multi-dimensional complexity of green and atmospheric water.

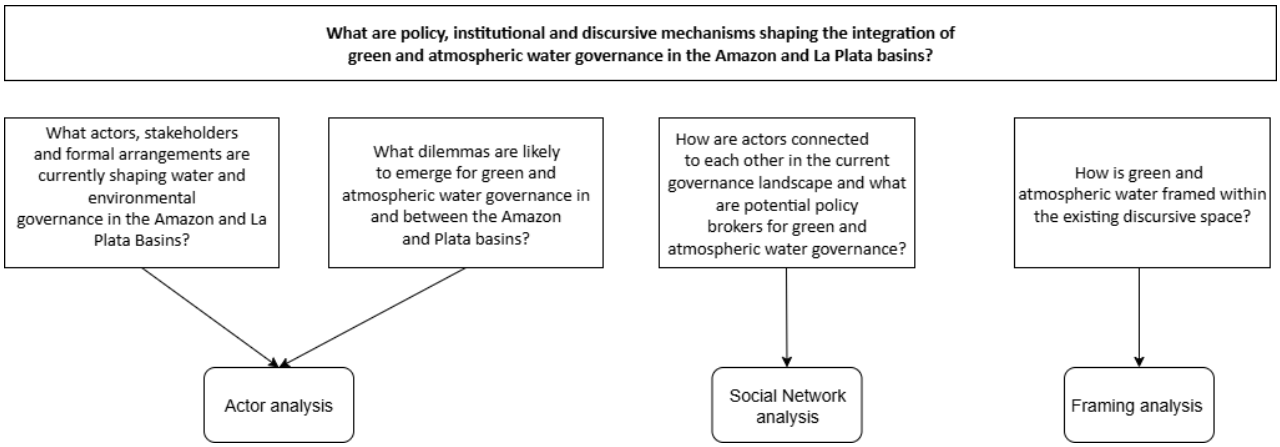

Fig. 3.1. An overview of the methodological approach

The different analysis were conducted in an iterative manner (figure 3.2), meaning that the methods were not conducted separately in a strict order, but were rather influenced by each other following additional insights from the other methods. As a starting point, an initial actor scan was made. The primary data sources used were actor websites, legislative documents, (international) agreements and conventions, and relevant actor documents related to green and atmospheric water. All information used is open-access.

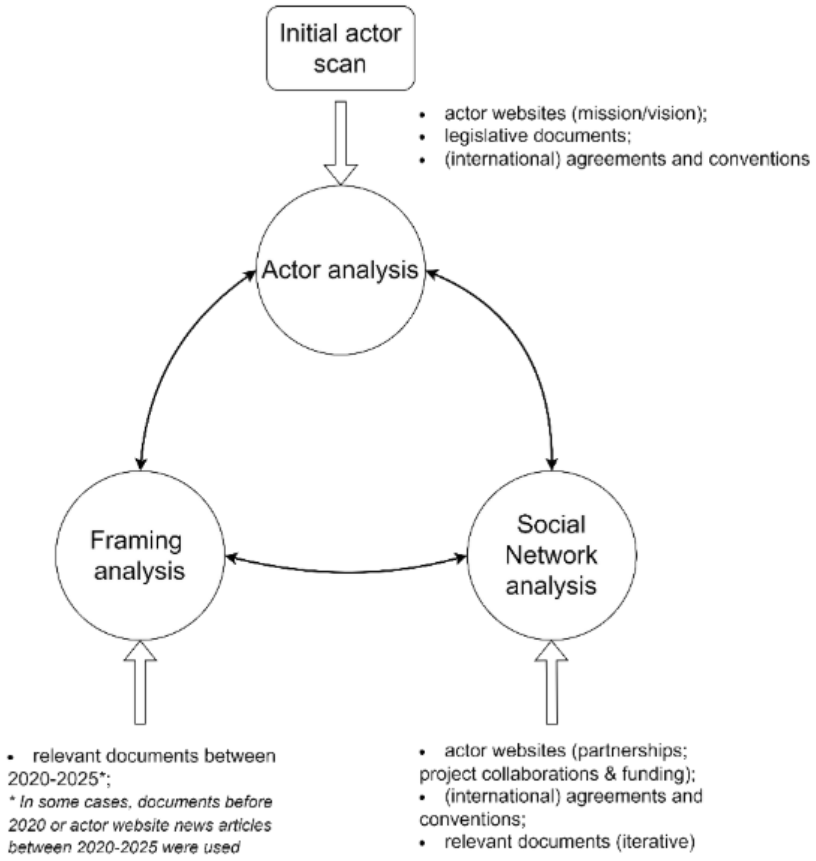

Fig. 3.2. The different analysis and their data inputs. The analysis follow an iterative approach.

First, an actor analysis (Enserink et al., 2022) was conducted to understand what are the key actors, their formal relations legal frameworks and formal arrangements currently shaping water and environmental governance in the Amazon and La Plata Basins. Moreover, actor analysis allowed for a deeper understanding of what dilemmas related to green and atmospheric water governance (are likely to) emerge. The actor analysis comprised of an initial actor and attribute scan, mapping actor resources and broader goals to understand what dilemma's or bridges between actor (groups) exist. Consequently, a formal chart was drawn to understand the institutional landscape shaping current water and environmental governance in the Amazon and La Plata Basins.

Second, a social network analysis (SNA) was conducted to move beyond a narrow focus on formal institutional relationships and to capture the broader structure of connections among actors involved in project collaborations, funding arrangements, and other cooperative engagements.

While informal or personal ties were not considered in this analysis due to limited data availability, SNA facilitates an understanding of how actors are embedded within a network of interdependencies shaped by shared initiatives and resource flows. Given that green and atmospheric water governance spans multiple policy domains, mapping these connections enables the identification of cross-sectoral linkages. This, in turn, highlights the extent to which different policy domains are integrated or siloed. The SNA also supports the identification of key brokers and helps reveal opportunities for improved coordination and policy coherence.

Third, a framing analysis was used to identify the frames on green and atmospheric water used across different policy arenas. The framing analysis followed an interpretive, discursive approach, in which the framing process is positioned within broader discourses (Dodge & Metze, 2024). Notably, this approach assumes discourses rather than the actors behind them to influence the framing processes (Dodge & Metze, 2024). As such, analysis focuses on how issues are framed through discourses. Given that green and atmospheric water is only just beginning to enter the policy domain (at the global level), a discursive approach to framing analysis allows for a deeper understanding of how existing (dominant) discourses within the water governance and environmental governance domains shape (the lack of) framings of green and atmospheric water.

3.2. Actor analysis

The actor analysis consisted of several steps. First, an inventory (long list) of actors and stakeholders was made and considered multiple scales: global, regional, and local. Actors and stakeholders were identified using a combination of imperative, positional, opinion leadership lenses (Enserink et al., 2022). An imperative lens was used to identify those currently involved within water and environmental governance and likely to have an interest considering the dynamics between land use and green and atmospheric water. Furthermore, a positional lens was used to identify those who have explicit positions on green and atmospheric water governance. Finally, a lens considering opinion leadership was used to identify those likely to influence dominant thinking across water and environmental policy arenas. Based on the initial actor scan, power-interest relations were considered to identify relevant actors for further actor analysis.

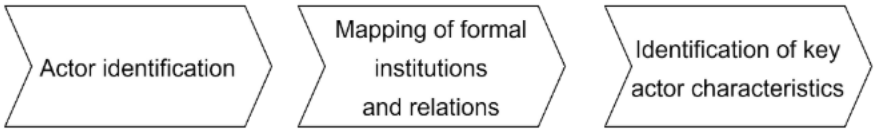

Fig. 3.3. Steps in the actor analysis process. Note that actor analysis itself is an iterative process.

Second, formal institutions and relations were identified and mapped into a formal chart. A formal chart allows for a mapping of the '*formal playing field within which actors interact in a policy process'* (Enserink et al., 2022, p.89). The formal chart has been created using the guidelines provided by Enserink et al. (2022). Data was obtained primarily from the (documents published on) actor's websites and international treaties and agreements.

Last, actor attributes, including resources and objectives (mission and/or vision), were mapped. Here, resources are 'the formal and informal means that are available to the actors to realize their objectives' (Enserink et al., 2022, p.96). Examples of such resources are information, knowledge, manpower, money, and authority power. Objectives were mapped to understand (potential)

problem perceptions related to green and atmospheric water governance. Given that no interviews were conducted, actor's mission and/or vision statements were used as proxies.

3.3. Social Network Analysis

The social network analysis was conducted as follows. First, the most relevant actors based on the actor analysis were taken as a starting point. Next, network relations were systematically registered using the actors webpages and relevant documents from the document analysis. When coming across new actors deemed relevant in the analysis, these actors were included in the network and considered for systematic analysis as well. This was done in a iterative manner.

Defining the network boundary network was challenging, given the cross-cutting nature of water- and environmental related issues in general. Therefore, the assumption of an open network was made. To prevent explosive network growth, actors were only selected if they fit the following criteria:

- the actor's focus area is either global or directed towards South America (e.g. partner organizations solely focused on the African continent were not registered);
- the actor's goal fits within one or more of the identified topical arenas of green water;
- the actor cannot be categorized as an advocacy or highly specialized organization (since many WASH-related actors are present).

Additionally, the choice was made to limit the iterative approach to third-order connections based on the initial number of actors and their identified partners. For example, suppose actor A was part of the initial network construction, and through systematic desk research, actor X was registered as a partner and thus as a node in the network. Next, only actor's X partners were registered, for example actors Y and Z. Subsequently, actors Y and Z were analyzed. However, the nodes Z1 and Z2 were not further investigated.

A tie between two actors is defined to exist if they have any of the following: financial interactions; official partnership and/or membership registrations; project collaboration. For simplicity reasons, ties between two actors were assumed to be binary and undirected. Actor's relations were mapped as edge relations in Microsoft Excel. This was done to allow for systematic registration of actor relations. Gephi, an open-source visualization software for creating and analyzing social network systems was used to depict the full network of actors (see Bastian et al., 2009). In Gephi, duplicate edge relations were reduced to singular edge relations by removing one of two links.

After representing the network in Gephi, the following analytical approach has been applied. First, centrality metrics were calculated and extracted from Gephi. These include degree, betweenness, closeness, and eigenvector centrality. A brief description of these indicators is provided below, for a more detailed overview see Peng et al. (2022). First, degree centrality is computed by counting the number of links that an actor has with other actors. Betweenness centrality allows to identify those actors that mediate between other groups in order to identify actors with brokerage roles. It counts the times a node acts as a mediator along the shortest path of two other nodes (Peng et al., 2022). Closeness centrality is used to identify those actors which are efficient in spreading information through the network, by computing the average distance from one vertex to the other vertices in a network (Peng et al., 2022). In addition to closeness centrality, eigenvector centrality is also used to

measure the influence of one actor on the other actors in the network (Peng et al., 2022). Additionally, network modularity was calculated to assess the extent to which actors interact within their own level of governance (global, regional, and local). For this, a Chi-square test was carried out to test whether a relationship exists between the modularity cluster assigned to actors and their respective scale levels. For this, IBM SPSS 29.0 (IBM, 2023) was used as the dedicated software package for statistical analyses.

The degree, closeness, betweenness and eigenvector centrality, as well as the network modularity metrics allow for a validation and extension of earlier formal analysis. Furthermore, the betweenness centrality metric allows for identification of potential brokerage roles and institutional conditions for the implication of green and atmospheric water governance. Collectively, the network metrics allow to identify key characteristics of the network as well as crucial links between actors in the debate on green and atmospheric water in the Amazon and La Plata basin.

3.4. Framing Analysis

For the purpose of answering the last research question, a framing analysis was conducted. The framing analysis followed an interpretive, discursive approach, in which the framing process is positioned within broader discourses (Dodge & Metze, 2024). The framing analysis consisted of several steps, which are visualized within figure 3.4.

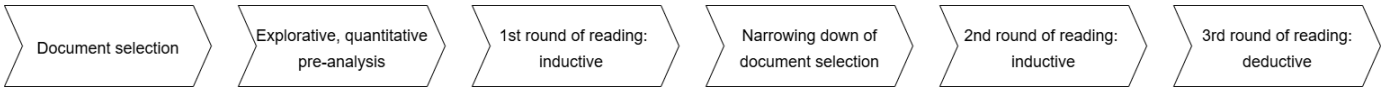

Fig. 3.4. Steps in the discourse analysis process.

First, building upon insights from the actor and social network analyses, a wide variety of relevant documents and/or webpages were selected. Document selection was guided by predefined criteria and documents were roughly scanned to determine relevance. Next, an explorative, quantitative analysis was conducted as a means to get a broad feeling for what referrals to green and atmospheric water were present in the documents and / or webpages selected. Third, the documents and/or webpages were closely read with special attention to storylines and discursive elements, as well as frames of green and atmospheric water. Whilst reading the materials, it was observed how some documents were more relevant than others in terms of being exemplary for storylines and frames of green and atmospheric water. Therefore, for scoping purposes, as a fourth step, the initial document and/ or webpage selection was narrowed down to include key documents exemplary of existing discourses and storylines. Next, these documents were read again with special attention to storylines and discursive elements and dynamics, as well as frames of green and atmospheric water. Frames of green and atmospheric water were derived inductively.
This second round of reading, due to the reduced volume, allowed for a deeper understanding of the main storylines and frames shaping green and atmospheric water. Where deemed necessary, the inductively derived fames of green and atmospheric water during the first round were revisited. Finally, a third round of reading was conducted, in which the frame themes identified inductively were applied deductively.

In the following sections, the individual steps within the framing analysis are discussed in more detail.

3.4.1. Document selection

Actors' key documents related to green water and/or water governance were selected within the period 2020-2025. This period was chosen following an initial exploration and scoping of green and atmospheric water governance as a policy problem. During this exploration, it became clear that green and atmospheric water as a policy problem was introduced only recently (2024) by GCEW. Consequently, a period of 5 years was deemed appropriate to capture possible early mentions of green and atmospheric water whilst keeping the workload attainable.

Documents were searched on actor/stakeholder websites resulting from the initial actor and stakeholder scan. Considering that a dynamic discursive approach to framing analysis allows for an exploration of storylines beyond those that are dominant or institutionalized, both actors that were regarded as having formal power based on the formal chart, as well as relevant stakeholder representatives were included in the analysis.

As for the water policy arena, the focus was on both the Amazon as well as the Plata basin. As for the environmental policy arena, the choice was made to narrow the focus of analysis on environmental policy debates surrounding the Amazon rainforest. This choice was made for scoping purposes and is justified considering the region's importance for terrestrial moisture recycling within and beyond the basin.

Key actors on the global level that were included are UN-Water, GCEW, GEF, and GCF. On the regional level, these are ACTO, CIC, and OAS. Furthermore, several UN programs or agencies were included to better understand nuances in different substantive themes, including UNEP, UNDP, FAO, and WMO. Moreover, to understand what other perspectives and storylines exist by those not in formal power, the choice was made to include stakeholder representations of the agricultural industry, mining industry and Indigenous People's advocacy groups, and environmental / climate change advocacy groups. These representations were mostly selected on the regional and local level (Brazil) to better understand green and atmospheric water in the context of the Amazon. For those organizations who focus on many different policy themes beyond water governance, only documents related to the respective "freshwater" themes were selected.

To ensure systematic document selection, actors' websites were searched on green and atmospheric water, as well as related terms. These are "green water", "soil moisture", "precipitation", "rainfall", "aerial river", "river of the sky", "watershed of the sky", "freshwater", "drought", and "flood". These keywords were used to allow a broad range of documents to be considered for the explorative, quantitative pre-analysis. Considering the novelty of green and atmospheric water governance in policy deliberations, these terms were included to also capture documents that did not explicitly consider green and atmospheric water.

Documents resulting from the search were selected using the criteria shown in table 3.1. For some actors, however, exceptions regarding this time period were made. A limited set of documents between 2020 and 2025 were retrieved for ACTO and CIC. In these cases, documents from the period before 2020 were selected. To compensate, news articles related to (green) water governance were selected from these actors' news sites in the period 2020-2025 as well. Moreover, in some cases, actor/stakeholder websites were not accessible in English language. In these cases,

the keywords were searched in the respective languages (mostly, Portuguese and Spanish), using Google translate. For those websites, the search results were translated to English using Google translate.

Table 3.1. Selection criteria for document analysis.

Criterium	Explanation
Relevant time period	The document was published between 2020-2025
Topical relevance	The document is relevant to green and atmospheric water governance in terms of referring to freshwater or to related policy themes surrounding land use
Public access	The document is publicly accessible
Language	The document / source is accessible in English, or is translatable to English

3.4.2. Quantitative analysis

Ater selecting documents for all actors deemed suitable for the framing and discourse analysis, those paragraphs within the documents in which the above-described keywords were mentioned, were extracted. The software package Atlas.ti was used to retrieve these paragraphs i.e. quotations. In total, this first search resulted in 25,000 quotations. These results were extracted from Atlas.ti and used for an initial quantitative exploration.

An exploratory analysis was conducted to explore the relative term frequency of general water related terms (drought, rain, flood, rainfall, water cycle, hydrological cycle, freshwater) , green and atmospheric water related terms (green water, soil moisture, precipitation, evaporation, evapotranspiration, flying river, aerial river, watershed of the sky, precipitationshed, green and blue water) based on the textual data of the 25,000 quotations using Python (version 3.12.5). The resulting distributions were visualized through the use of histogram plots and heatmaps, ultimately to provide an overview of the use of specific terms related to green water governance by actors. Visualizations have been made using the bar plot and heatmap feature of Python package Seaborn (version 0.13.2).

3.4.3. Qualitative framing analysis

The documents and/or webpages were closely read with special attention to storylines and discursive elements, as well as frames of green and atmospheric water. Additionally, passages that contained green and atmospheric water or related terms were searched in Atlas.ti to ensure these passages were not accidentally overlooked. Given the widespread use of the terms “freshwater”, “droughts”, and “floods” observed during the quantitative analysis, the choice was made to narrow down the search term to only contain “green water”, “soil moisture”, “precipitation”, “rainfall”, “aerial river”, “river of the sky”, “watershed of the sky”. Ultimately, this reduced the number of quotations to 2,500. These results were used for further qualitative analysis of green and atmospheric water framings. Whilst reading the materials, it was observed how some documents were more relevant than others in terms of being exemplary for storylines and frames of green and atmospheric water.

Therefore, for scoping purposes, as a fourth step, the initial document and/ or webpage selection was narrowed down to include key documents exemplary of existing discourses and storylines, and subsequent frames of green and atmospheric water. Appendix A provides an overview of the set of documents included within the analysis. The colored documents were included for qualitative analysis.

Next, these documents were read again with special attention to storylines and discursive elements and dynamics, as well as frames of green and atmospheric water. Frames of green and atmospheric water were derived inductively. This second round of reading, due to the reduced volume, allowed for a deeper understanding of the main storylines and frames shaping green and atmospheric water. Where deemed necessary, the inductively derived fames of green and atmospheric water during the first round were revisited. Finally, a third round of reading was conducted, in which the frame themes identified inductively were applied deductively. Table 3.2. provides an overview of the various water discourses identified. These were derived inductively and informed by reading additional literature on water discourses (Salamé et al., 2021). Table 3.3. provides an overview of the (simplified) environmental discourses identified. Table 3.4. provides an overview of the frames of green and atmospheric water identified.

Table 3.2 Water discourses

Discourse	Description	Example
Water as an economic good	This code refers to passages that use discursive elements of the "water as an economic good" discourse. This discourse is characterized by its vision of water as an economic resource and the presentation of an economic/market-oriented solution space for water governance, focused on optimalisation of resources. The discourse can be recognized by the use of terms such as common good, growth, pricing, allocate, externalities, market, incentive, revenue, subsidy, investment, and value.	"*We must price water properly to incentivise its conservation, particularly by the largest users. Today's massive subsidies that contribute to water's overuse in many sectors and environmental degradation should be redirected towards water-saving solutions, protecting and restoring freshwater ecosystems, and ensuring access to clean water for vulnerable communities."* (GCEW, 2024, p.22)
Water and sustainability	This code refers to passages that use discursive elements of the "water and sustainability" discourse. This discourse is characterized by its vision of water in relation to sustainable development as an and presents a technocratic-scientific solution space. To recognize this discourse, look for terms referring to concept, sustainable development goals (SDG's), Integrated Water Management, water security	*"Implementing transboundary Integrated Water Resources Management (IWRM) in the Amazon Basin poses countless challenges associated with the region's socioeconomic development, as well as anthropogenic and climate impacts. The basin forms a single hydrologic system that crosses the national borders of eight countries—Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela, all of which consider it necessary to have a regional IWRM framework to meet the needs of the population and for sustainable development in the Amazon Region."* (ACTO, 2018, p.15)
Right to water	This code refers to passages that use discursive elements of the "water as a human right" discourse. This discourse is characterized by its vision of (clean, drinking) water as a human right.	*"Beyond the economic, socio-cultural, and political interests behind water management still is one critical facet, the human interest. Water management extends beyond the promotion of the IWRM and water culture to prevent conflicts, avoid ecological disturbances, boosting sustainability of ecosystem services and promoting water security. The central issue today, above all else, is to recognize that water is a human*

		right7 ; the viability of this application of human rights is greatly determined by the quality water governance in the Member States." (OAS, 2018, p.24)
Water in Nexus Considerations	This code refers to passages that use discursive elements of the "water in nexus considerations" discourse. This discourse is characterized by its vision of water in relation to food, and/or energy, and/or ecosystems/climate. The discourse can be recognized by terms such as "nexus" or by referrals to water tenure.	*"A key aspect of the further definition of water tenure therefore requires careful assessment and understanding of the various ways in which the Land/Water Nexus shapes the recognition and protection of water tenure, as well as the opportunities the nexus poses for more integrated and sustainable approaches to terrestrial and aquatic resource management and development."* (FAO, 2020, p.26)
Water Diplomacy	This code refers to passages that use discursive elements of the "water diplomacy" discourse. This discourse is characterized by its vision of water in relation to diplomacy. It is often used in the transboundary context and highlights the need for cooperation and agreements. The discourse can be recognized by terms such as peace, conflict, cooperation, dialogue, diplomacy, coordination, pact, agreement, negotiate, treaty, geopolitical, convention.	*"International water law has developed principles and norms that provide the basis for transboundary water cooperation, which can also help solve disputes and contribute to regional stability.* *'Water diplomacy' seeks to facilitate the political processes and practices aimed at preventing, mitigating and resolving disputes over transboundary water resources, and the development of joint water governance arrangements by applying foreign policy means at different tracks and levels. It can involve actors other than traditional state actors, including civil society organizations or academic networks."* (United Nations, 2024, p.5)
Water valuation	This code refers to passages that use discursive elements of the "water valuation" discourse. This discourse is characterized by	*"There is enough water for all provided we use and manage it efficiently. But we don't. We invest too little, and ineffectively. We use too much water, creating scarcities. Quality is suffering and so is the environment.*

	its vision of water in a broader valuation context, beyond economic valuation.	*The value we place on water varies, depending upon who is using it, and why. Value can be a guide to what our goals should be, what actions are needed, and where we should invest. Many of our problems arise because we don't value water highly enough; all too often water is not valued at all."* (United Nations, 2021, p. vii)
Hydrological cycle as a global common good (GCEW)	This code refers to passages that use discursive elements of the "Hydrological cycle as a global common good (GCEW)" discourse. This discourse is characterized by its vision of governing the full hydrological cycle as a global common good. Within this discourse, green and atmospheric water are explicitly addressed.	*"One that recognises the hydrological cycle as a global common good, understanding that it connects countries and regions through both the water that we see and atmospheric moisture flows; that it is deeply interconnected with climate change and the loss of biodiversity with each rebounding on the other; and that impacts virtually all the SDGs"* (GCEW, 2024, p.35)

Table 3.3 Environmental discourses

Discourse	Description	Example
Sustainable development	This code refers to passages in which climate variability or climate change is used in relation to (sustainable) development. The narrative is used to advocate for (sustainable) development that accounts for climate effects which might hinder development.	"*The various forces that affect the Amazon are exacerbated by the pressure of climate variability, especially in the form of intense floods and droughts."* (ACTO, 2018, p.54)
Planetary boundaries and tipping points	This code is used to refer to passages in which climate variability or climate change is used in relation to (sustainable) development. The narrative is used to advocate for (sustainable) development that accounts for climate effects which might hinder development.	*"Notwithstanding, the Amazon and its inhabitants have been historically threatened by a resource-based development model with a monetary-centric vision that causes ecosystem destruction while maintaining inequalities and violence. This model has been associated with a tremendous loss of intact, diverse forests and degradation of terrestrial and aquatic ecosystems by deforestation, non-natural fires, logging, natural resources exploitation, and pollution. Together with global climate change, these activities are pushing the Amazon towards a tipping point beyond which lies irreversible loss of the rainforest and its biodiversity, severely compromising human well-being. Halting deforestation and ecosystem degradation and finding alternative pathways towards the sustainable development for the Amazon are a priority under this critical scenario."* (Science Panel for the Amazon, 2021, p.vii)
Indigenous Environmental Justice	This code is used to refer to passages in which the need for Indigenous (land) rights are highlighted. The narrative is used to advocate for Indigenous (land) rights and often uses referrals to destructive extractive industries or highlights the role of Indigenous peoples as stewards of nature conservation. The narrative often goes accompanied by the goal of free, prior and informed consent.	*"Up until now, global policies have ignored the role our worldview and culture play in conserving nature and biodiversity. By making our efforts invisible, the States and the international financial system do not take our territories into account. This set of data that we offer to political decision makers shows that indigenous territories are as efficient, or even more, than protected areas. In exchange, the extractive industries arrive in our territories with "legal" concessions granted by the States themselves without our free, prior and informed consent. In the process we are silenced by omission and violence."* (COICA general coordinator Gregorio Mirabal in Amazonia against the Clock:A

		Regional Assessment on Where and How to Protect 80% by 2025 (Quintanilla et al., 2022,p.5))
Sectoral Developmentalism	This code is used to refer to passages in which an industry-oriented storyline focusing on agricultural importance is used. The storyline is used to highlight the importance of the agricultural industry for economic development and food security.	*"While water conservation is a global issue, it requires a local approach – and that drives us to focus our efforts on the supply chains and regions where it's needed most. Together, we are driving positive changes in water usage in our operations, in the communities where we live and work, and in the supply chains where our farmers grow the food that feeds the world."* (Cargill, 2025c)
	This code is used to refer to passages in which an industry-oriented storyline focusing on the importance of extractive industries like mining is used. The narrative is used to highlight the importance of extractive industries like mining for economic development and a clean energy transition.	*"The mining sector is one of the oldest and most fundamental in the global economy. It is responsible for extracting essential raw materials for energy production, the manufacture of technological products and the construction of infrastructure. Mining not only supplies key industries, electronics and automotive, but also plays a vital role in the production of inputs for agriculture and the energy transition, such as critical and strategic minerals (CSMs) used in batteries and renewable technologies."* (IBRAM, 2024 , p.12)

Table 3.4. Code table, frames of green and atmospheric water

Theme	Code	Definitions	Example
Frame: scientific descriptions	Green and atmospheric water terms-static	This code refers to passages that use green and atmospheric water in a descriptive and scientific way. These descriptions use terms of soil moisture, precipitation, and evapotranspiration. Most of the time, these descriptions are accompanied by tables or graphs, but they can also be accompanied by maps or no additional figures. The descriptions show green and atmospheric water in a "static" way: for example, the amounts of evapotranspiration and precipitation are described apart from each other, but these descriptions do not capture the dynamics between these two components. The tone of these descriptions is neutral, but the descriptions themselves can be embedded within certain narratives to act as an argument for a statement.	*"Precipitation levels range from 200 mm per year in the Andes to over 6,000 mm per year in some areas of the Amazon lowlands.* *Seasonal rainfall variations are caused by movements in the intertropical convergence zone, with maximum precipitation levels occurring from March to June in the northern hemisphere and December to March in the southern hemisphere."* (ACTO, 2018, p.19)
	Green and atmospheric water terms-dynamic	This code refers to passages that use green and atmospheric water in a descriptive and scientific way. The descriptions show green and atmospheric water in a "dynamic" way by acknowledging the dynamic interactions between processes of green and atmospheric water such as evapotranspiration and precipitation. Terms such as "atmospheric moisture flows" are used. Most of the time, these descriptions are accompanied by maps. The tone of these descriptions is neutral, but the descriptions themselves can be embedded within certain narratives to act as an argument for a statement.	"*The subcontinental moisture flow dynamics are well illustrated with the case of Brazil, which receives moisture from across the Atlantic Ocean, recycles this rainfall through the Amazon rainforest, which evapotranspires and sends moisture downwind to its neighbouring countries."* (GCEW, 2024, p. 62)
Frame: functions of green and	Global and/or regional climate modulator	This code refers to passages in which green and/or atmospheric water is referred to in a way that highlights the function of green and/or atmospheric water as a global and/or regional climate modulator.	*"The Amazon accounts for more than half of the tropical rainforest in the world, which together with intense evaporation and absorption of carbon dioxide from the atmosphere make the region a global climate modulator."*

atmospheric water			(ACTO, p. 19)
	The Amazon as a contributor to (downwind) rainfall	This code refers to passages in which green and/or atmospheric water is referred to in a way that highlights the function of green and/or atmospheric water as a contributor to (downwind) rainfall.	*"The Amazon region is also an important source of moisture for several regions of South America, such as providing moisture and rainfall to glaciers in the Andes, paramos, major cities, and the La Plata River Basin (Marengo et al. 2004, Arraut et al. 2012; Zemp et al., 2014; Drumond et al., 2014; Poveda et al., 2014; Gimeno et al. 2019)."* (Science Panel for the Amazon, 2021, p.7.14)
	Rainfall as a source for drinking water	This code refers to passages in which rainfall is referred to in a way that highlights its contributions to facilitating drinking water	*"Approximately 25-50% of the total annual rainfall observed in the tropical Andes originates from Amazon tree transpiration. Part of the produced moisture reaching east of the Andes — 10 to 23 billion liters per day — is transported southward by winds flowing in low altitudes, known as "aerial rivers", reaching as far as Argentina and supplying water to other major river basins on the continent, thus supporting agriculture and providing drinking water."* (Science Panel for the Amazon, 2024, p.6)
	Green and atmospheric water as a source for agriculture	This code refers to passages in which rainfall and/or soil moisture is referred to in a way that highlights its contributions to facilitating (rainfed) agriculture.	*"This phenomenon, studied by Brazilian scientist Antonio Nobre, occurs when clouds over the Amazon are blown to other parts of the continent, maintaining a water cycle that is vital for agriculture."*(United Nations Development Programme, 2022)
	Rainfall as a source for blue water	This code refers to passages in which rainfall is referred to in a way that highlights its contributions to maintaining blue water reserves, such as river water levels and aquifer recharge. This code is also applied when this function can be derived from the passage but is not explicitly mentioned. For example, when the	*"Moreover, rainfall infiltrates the ground and contributes to the formation of large aquifers like the Alter do Chão-Içá system, with a recharge amount estimated to be at least 236,400 and 350,000 m3.yr-1 4, 37."* (Science Panel for the Amazon, 2024, p.6)

		link between a lack of rain and lower river levels is mentioned.	
	Rainfall as a source for energy	This code refers to passages in which rainfall is referred to in a way that highlights its contributions to sustaining hydro-energy. This code is also applied when this function can be derived from the passage but is not explicitly mentioned. For example, when the link between a lack of rain and lower water storage for hydro-energy is mentioned.	*"The reduction in precipitation and flow in the upper basins directly affects hydroelectric production, considering that 60 percent of the country's hydroelectric generation is concentrated in southeastern Brazil and, in turn, that a large portion of the flows that feed hydroelectric uses in the international stretches originate in the upper basins."* (CIC, 2016, p.135)
	Cultural / spiritual functions of rainfall	This code refers to passages in which rainfall is referred to in a way that highlights its cultural and/or spiritual values.	*"Minister of Indigenous Peoples Sonia Guajajara explained some of the struggles faced by indigenous people. 'This alters their whole lifestyle. … And this also affects culture, because many of the rituals are carried out in the water - and, with streams, rivers and creeks all drying up, this hits them hard," she said. "We are here, as part of this delegation, to reaffirm our commitment: that we will continue working together to combat this drought,' she stressed."* (Planalto, 2024)
Frame: effects of droughts and floods	Droughts and floods	This code refers to passages in which (the effects of) droughts and floods are mentioned.	*"In spite of its richness, it is one of the most socially and economically affected basins by cyclic flooding and persistent drought periods. The relationship between hydrology, changes in land use and the uncertainties with respect to the future climate poses a number of challenges to reduce the vulnerability to natural disasters and address environmental management and the needs of the economically marginalised people."* (CIC, 2016, p.13)
Frame: solutionist/ technocratic	As a solution to (drinking) water scarcity	This code refers to passages in which green and atmospheric water-related innovations are mentioned in a solutionist way to (drinking) water scarcity problems. Examples include referrals to rainwater harvesting, cloud	"*One of the simplest and cheapest ways to provide safe water is to use rainwater. This strategic action has the purpose providing drinking water through rainwater harvesting systems (6,7) that are simple to install, cheap to*

		seedling.	*build and maintain, and easy to replicate in different regions of the Amazon."* (ACTO, 2018, p.158) *"The earth's atmosphere contains about 13,000 km³ of water in a vapor phase, the source of which is evaporation from the surface of the oceans, seas, and soil moisture and transpiration from plants. These water vapor reserves are continuously updated due to the circulation of evaporation-condensation and precipitation, making annually 8-9 hydrological cycles, each lasting about 40-45 days (Bengtsson, 2010). Thus, the amount of water vapor present in the atmosphere is an inexhaustible freshwater source and opportunity for rain enhancement."* (UN-Water, 2020, p.14)
	As a solution to improve agricultural efficiency	This code refers to passages in which green and atmospheric water-related innovations are mentioned in a solutionist way to improve agricultural processes, and/or reduce reliance on irrigation, and/or mitigate water scarcity problems. Examples include referrals to rainwater harvesting, cloud seedling, and soil moisture retention techniques.	*"The use of rainwater harvesting systems should be enhanced to bolster the resilience of rain-fed agriculture, which accounts for 80% of the total cropland and more than half of the world's food production (FAO, 2020)."* (GCEW, 2024, p.118)
Metaphors of green and atmospheric water	River metaphors	This code refers to passages in which green and atmospheric water is mentioned through a river metaphor.	*"The Wampís Nation's forests cover more than 1.3 million hectares within Peru, but through the flying rivers, they supply water for three countries. This phenomenon, studied by Brazilian scientist Antonio Nobre, occurs when clouds over the Amazon are blown to other parts of the continent, maintaining a water cycle that is vital for agriculture."* (United Nations Development Programme, 2022)

3.5. Validity considerations and researcher positionality

The exploratory and interpretive nature of this research means that the identification and analysis of relevant actors, network relations and discursive patterns inevitably involve an element of subjectivity. The following section reflects my positionality in regard to the research topic and outlines potential selection and cognitive biases and the steps taken to mitigate their influence.

Positionality

My own positionality may have shaped the framing of research questions, the interpretation of policy narratives, and the weighting of certain discursive elements over others. I am a Western female student working within a university environment in which I feel comfortable and supported. My institutional background and academic training shape the way I frame questions and interpret findings, situating me within particular scholarly traditions.

Whereas during the research process, I have been actively aware of my positionality and cognitive biases, a similar analysis conducted by a different person with a different lived reality can result in different outcomes, conclusions drawn and suggested policy implications.

Cognitive biases

Cognitive bias refers to research bias introduced through systematic pre-existing beliefs or expectations that shape data collection, interpretation and conclusions (Nikolopoulou, 2025a). During the research, I have been aware of potential confirmation and observers biases.

Confirmation bias is a cognitive bias in which we are inclined to look for evidence which supports our hypothesis and beliefs (Nikolopoulou, 2025b). Throughout the research process, I sought to mitigate this bias by revisiting sources multiple times and analysing discourses, storylines, and frames from different angles. By actively reflecting on my positionality, I was able to critically assess how my own perspectives shaped the interpretation of information.

Observer bias is a cognitive bias in which what is observed by the researcher is affected through the researcher's positionality and expectations or assumptions (Bhandari, 2023). To reduce this risk, I first engaged with the documents without prior engagement or predefined categories, and then applied a combined inductive–deductive approach.

Selection biases

Selection bias refers to research bias introduced through the data attributes included (selected) (Nikolopoulou, 2023). Whereas various types of selection bias exist, this study primarily risks undercoverage bias. Undercoverage bias refers to selection bias resulting from data sources being inadequately represented within the sample (Nikolopoulou, 2023). Within the present study, undercoverage bias might emerge as certain actor (groups) might use different mediums through which they express their perspectives on topics.

To summarize, this study employed a multi-method, iterative approach integrating actor analysis, social network analysis and framing analysis. The methodological approach adopted in this study addresses a notable gap in the current literature on green and atmospheric water governance. Existing literature has predominantly addressed green and atmospheric water governance through hydrological perspectives. While such approaches yield important insights into ecological processes, they often overlook the case-specific political and institutional conditions that shape governance in practice. The different methods focus on different levels of analysis, respectively the actor level, the

network level, and the discourse level. This design enables a more nuanced understanding of governance dynamics by capturing the interplay between institutional structures, relational patterns, and meaning-making processes.

In the chapter that follows, the results of the different analyses are reported in subsequent order of actor analysis, social network analysis and framing analysis.

4. Results

4.1. Formal chart and actor analysis

Appendix B shows the actor and stakeholder table based on data collection of actor websites and policy documents. The table shows actor's mission and/or vision statements and primary resources. The formal chart of the current institutional landscape related to green and atmospheric water governance is shown in Figure 4.1 This chart is simplified to highlight the most important institutional structures. Overall, the global level, state level, and basin (regional) level are depicted. The light blue pane on the global level demarcates the UN System. Some arrows are specified to highlight agreements, memoranda of understandings, or specific roles. Connections between actors which are not specified depict partnership relationships. Given that green and atmospheric water governance is not explicitly institutionalized in the current landscape, the formal chart shows the current institutional landscape in relation to water governance. Note that other topical arenas are also reflected in this formal chart, such as climate change and the environment (UNFCCC, UNCCD, UNCBD, RAMSAR) and human rights (UNDRIP), partly because of the role water already holds in these conventions as well as the relation between green and atmospheric water and these arenas as described earlier.

The Amazon and Plata basins, as the two major basins considered in this research, each have a complex water and environmental governance regimes. A wide variety of state actors, intergovernmental organizations, non-governmental, non-profit organizations operating at global, regional, and local levels and spanning different topical area's related to green and atmospheric water. Both basins' member countries cooperate within intergovernmental basin organizations, respectively the Amazon Cooperation Treaty Organization (ACTO) and the Intergovernmental Coordinating Committee of the Countries of the Plata Basin (CIC), which were negotiated with the support of amongst others, the Organization of American States (OAS), the Inter-American Development Bank, and the United Nations Economic Commission for Latin America and the Caribbean (Villar et al., 2023).

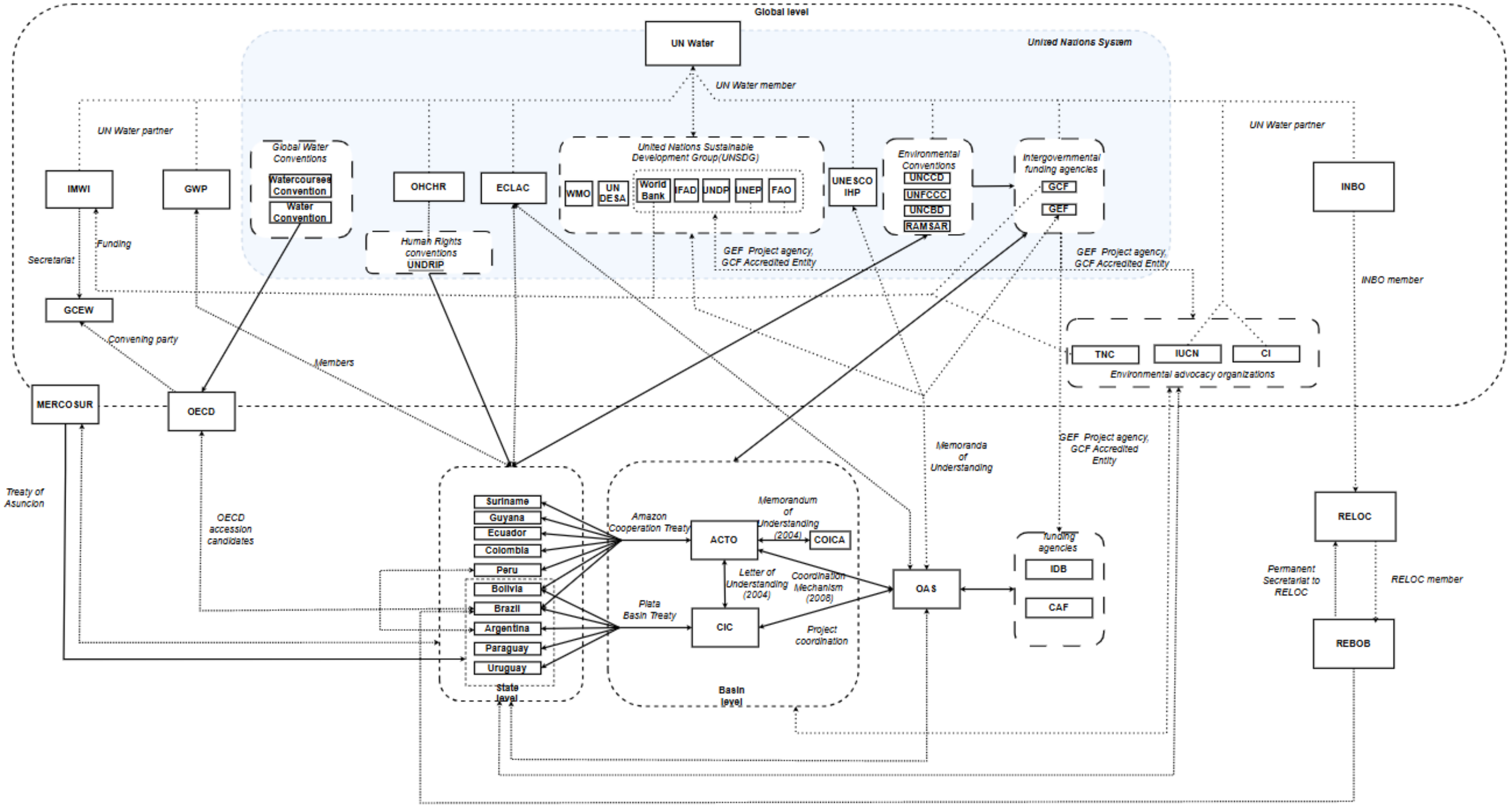

Fig. 4.1. Formal chart (own work).

4.1.1. Regional level

Coordinating Committee of the Countries of the Plata Basin

The Coordinating Committee of the Countries of the Plata Basin (CIC) was established in 1967 as part of the La Plata River Basin (LPRB) governance system, following a need for cooperation on natural resources (primarily waters) uses between riparian states (Villar et al., 2023). CIC is an intergovernmental organization and consists of the five Plata Basin countries: Brazil, Argentina, Bolivia, Paraguay and Uruguay (CIC, 2025a). Notably, Brazil and Bolivia are members to both the CIC and ACTO. The organization builds upon the Plata Basin Treaty (CIC, 1969), with the objective "t*o strengthen the institutionalization of the La Plata Basin system and to combine efforts to promote the harmonious development and physical integration of the region and its areas of direct and significant influence."* (CIC, 1969). The organization coordinates across six areas of work: transportation; water resources and other natural resources; economic cooperation; social sectors; public services; and institutional affairs (CIC, 2025b). The Financial Fund for the Development of the La Plata Basin (FONPLATA) was created in 1974 as a multilateral development bank to support programs, projects, research among CIC member countries, among which also transboundary water-related projects (Villar et al., 2023).

In 2016, CIC members agreed upon a basin-wide Strategic Action Program (SAP) for Integrated Water Resources Management in the Plata Basin (CIC, 2016). The SAP was made within the CIC-OAS-GEF – UNEP Framework Programme for the sustainable management of the water resources for the La Plata Basin, with respect to the effects of variability and climate change, and builds upon a shared vision of Plata Basin Countries and a Regional Transboundary Diagnostic Analysis (TDA). The regional strategy builds upon the following response lines: Information Management; Planning, Management, and Sustainable Use of Water Resources Environmental Protection/Rehabilitation; Education, Communication, and Public Participation; Research and Techno logical Development; and Institutional Strengthening (CIC, 2016).

The CIC also facilitates the Plata Basin Decision Support System (SSTD-CdP), which provides real-time information from monitoring stations across the basin and provides forecasts (CIC, n.d.). The SSTD-CdP builds upon data from the WHOS-Plata system, which provides hydrometeorological data in the La Plata river basin (under development) (WMO, n.d.).

Amazon Cooperation Treaty Organization

A significantly younger organization, the Amazon Cooperation Treaty Organization (ACTO) was established in 1995 and consists of the eight Amazonian countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela (ACTO, 2025a). The organization is built upon the Amazon Cooperation Treaty (1978), and aims to "*be a permanent cooperation, exchange and information forum guided by the principle of reducing regional asymmetries among the Member Countries through its actions, cooperating in national processes for socioeconomic progress and enabling a gradual incorporation of these vast territories into the national economies, promoting regional cooperation actions to improve the quality of life of Amazonian inhabitants, and working under the principle of sustainable development and sustainable livelihoods in harmony with nature and the environment and considering the internal laws of the Member Countries.*" (ACTO, 2025a).

In 2018, ACTO members also agreed upon a basin-wide Strategic Action Program for Integrated Water Resources Management in the Amazon Basin (ACTO, 2018). The SAP was made within the ACTO- GEF – UN Environment Amazon Project - Water Resources and Climate Change and builds upon a shared vision of Amazon Basin Countries and a Regional Transboundary Diagnostic Analysis (TDA). The regional strategy builds upon three response lines: strengthening IWRM; institutional adaptation to climate change and variability; and knowledge management (ACTO, 2018). Key

strategic actions among these response lines include, amongst others: implementing a regional water quality monitoring system; action program to respond to the impacts of current land occupation and land-use on water resources in the Amazon Basin; creating a regional hydrometeorological monitoring network; increasing scientific knowledge about water resources and relevant topics; establishing rainwater harvesting systems (RHS) to provide safe drinking water to isolated riverside communities of the Amazon Basin. The SAP is currently implemented through the Amazon Basin Project. Currently, the Strategic Action Program is implemented through the Amazon Basin Project.

In 2023, ACTO member countries agreed upon the Belém Declaration, which articulates joint commitments of the member countries on themes of amongst others, monitoring and cooperation in water resources management; protection of forests, Amazonian coastal areas, vulnerable ecosystems and biodiversity; food and nutrition security and sovereignty; economy for sustainable development; and police, judicial and intelligence cooperation in the fight against illicit activities, including environmental crimes (ACTO, 2023a). Formalized within the Belém Declaration, the Amazon Network of Water Authorities (ANWA) brings together national water authorities of ACTO member countries and aims to promote and coordinate IWRM of Amazonian waters (ACTO, 2023b;. ANWA's 2024-2026 work plan (ANWA & ACTO, 2024) describes four focus areas of technical training, implementation of common monitoring protocols, the establishment of a permanent regional coordination mechanism for IWRM within ACTO and securing international funding (ANWA, 2024c). Currently, ACTO and WMO are working towards a memorandum of understanding focused on information exchange, specifically related to integration between WMO's Hydrological Observing System (WHOS) and the Amazon Regional Observatory (ARO) (ACTO, 2023c).

The institutional frameworks for current (blue) water resources management in Amazon and Plata Basin countries are primarily established through their national constitutions (ACTO, 2018, p75; CIC, 2016). Overall, water is considered a multi-purpose, state-owned, public good, and some countries such as Bolivia highlight the right to “mother nature”. Furthermore, most countries have enacted specific water laws and use the watershed as the core management unit, primarily drawing upon integrated and ecosystem-based water management approaches. Legal and institutional arrangements differ across the countries, reflecting diverse governance models, administrative capacities, and levels of decentralization. A high-level overview is provided in Appendix C.

Framework Agreement for Cooperation between the ACTO and CIC

ACTO and CIC uphold a Framework Agreement for Cooperation between the ACTO and the CIC-Plata, which was first initiated in 2002 and re-established in 2021 (CIC, 2021 ; ACTO, 2021). The framework agreement is organized around the following areas of mutual interest: exchange of experiences and lessons learned on the Strategic Action Programs (SAPs); exchange of knowledge; training and technical assistance; and studies to deepen understanding of the hydroclimatic interdependence between the basins (CIC, 2021, p.2). Yet, no formal agreements on shared water resources management considering hydroclimatic interdependence between the basins were found during this research.

OAS

The Organization of the American States (OAS) is the America’s political forum, bringing together all 31 independent states of the Americas, and works along four pillars of democracy, human rights, security and development (OAS, n.d-a). Whereas OAS holds no formal power, it is considered as an important actor in the arena of regional cooperation given its position in the network, its ambitions to foster political dialogue (OAS, n.d-a)., and its functioning as a regional executing agency of IWRM-related projects in collaboration with global actors as UNEP, UNESCO, the World Bank and GEF (OAS,

n.d.-b). The Organization has brought forward several Inter-American Conventions, yet none of these are about water- or environment related matters. However, over the years, the Summits of the Americas have brought forward several water-related mandates and initiatives (OAS, n.d-c). These are mostly related to the implementation and promotion of Integrated Water Resources Management, where watersheds and river basins are considered the relevant planning units (OAS, n.d.-c). The OAS's Water Section (Department of Sustainable Development) actively promotes Water Diplomacy as a means to strengthen its Member States's capacity for IWRM and general water governance (OAS, 2025e). For example, in 2018, the Organization published a flagship report on "50 Years of Water Diplomacy in the Americas" (OAS, 2018). Over the years, the organization has transitioned its water resources approach from the emphasis on the economic, political, and social dimensions of water towards the recognition of water access as an essential human right (OAS, 2018, p.25).

Development banks

The Inter-American Development Bank (IDB) and the Development Bank of Latin America and the Carribean (CAF) operate at the regional level as primary funding mechanisms and as accredited GEF and GCF agencies. The organizations are involved in various projects, both water- and non-water related, in the Amazon and Plata basins.

Science Panel for the Amazon

Convened by the United Nations Sustainable Development Solutions Network (SDSN), the Science Panel for the Amazon (SPA) panel is referred to as "the world's first regional high-level science initiative dedicated to the Amazon" (SPA, n.d.) The SPA aims to integrate Indigenous and Local Knowledge (ILK) with scientific (Western) knowledge about the Amazon with a mission to accelerate sustainable and equitable development within the Amazon (SPA, n.d.). With its regional scientific focus on the Amazon, the SPA occupies a structurally significant position that enables it to connect scientific knowledge with policy and advocacy efforts.

Environmental advocacy organizations

There are many environmental advocacy organizations on various levels who advocate in favor of nature conservation. It is out of the scope of this study to list them all. However, globally visible organizations include The Nature Conservancy (TNC), Conservation International (CI), and the International Union for the Conservation of Nature (IUCN).

The IUCN is an intergovernmental organization organized as a global environmental network and brings together over 1400 member organizations, including governments, NGO's, academic organizations and Indigenous Peoples organizations (IUCN, 2025a). Its working themes include biodiversity; business and finance; climate change; freshwater and water security; governance; nature based solutions; ocean and coasts; and protected areas and land use (IUCN, 2025a). Within the theme of freshwater and water security, the IUCN focuses on topics of sustainable food and agriculture systems; fisheries and aquaculture; freshwater species; livelihoods and sustainable use; plastic and other pollution; and transboundary water governance and diplomacy (IUCN, 2025b). Ultimately, within this theme, their goal is "to provide everyone with fair access to clean water, and to protect the freshwater ecosystems on which humanity depends" (IUCN, 2025b). Within the theme of protected areas and land use, the IUCN focuses, amongst others, on topics of sustainable food and agriculture systems, drylands and land degradation, effective protected areas, forests, livelihoods and sustainable use (IUCN, 2025g).

Aside from the several themes and topics, the IUCN has also established seven expert commissions, respectively, on education and communication; ecosystem management; environmental, economic, and social policy; species survival; environmental law; protected areas; and climate crisis (IUCN, 2025c). These commissions work to, among others, conduct research, provide advice, and develop activities within their topical fields (IUCN, 2025c). Given the IUCN's global presence and large membership, alongside its various topical expertise and commissions, this makes the IUCN a relevant environmental advocacy organization. Moreover, IUCN is a project agency of GEF and an Accredited Entity of the Green Climate Fund (IUCN, 2025d). In South America, IUCN has been and currently is active in various projects in the Amazon region, amongst others, the Amazonia 2.0 project (2016-2023) (IUCN, 2025e), the Green List project (2019-2023) (IUCN, 2025f).

Conservation International (CI) is a global nonprofit organization with the mission to "empower societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity." (CI, 2025a). Working alongside three priorities- stabilizing the climate by protecting and restoring nature, ocean protection, and nature positive economies- CI partners with governments, Indigenous peoples, local communities, companies and civil society (CI, 2025a). Similarly to IUCN, CI is an accredited Project Agency of GEF and an Accredited Entity of GCF (CI, 2025b). In South America, CI has been and currently is active in various projects in the Amazon region, for example, in the Amazon Sustainable Landscapes (ASL) project (CI, 2025c).

Focused on three priorities of Climate Change; Ocean, Land & Fresh Water; and Food and Water, the Nature Conservancy is a global environmental nonprofit organization with the mission "*To conserve the lands and waters on which all life depends*". (TNC, 2025). The Nature Conservancy is a non-profit organization rooted in the U.S. but currently operating in more than 70 countries (TNC, 2025). Whereas the Nature Conservancy does not explicitly bring together governments and organizations as the IUCN does, it is still considered a relevant actor given its global presence and its topical focuses.

Indigenous organizations and coalitions

Several Indigenous Peoples organizations operate within environmental and land use policy arenas on the Amazon. Regionally, the Coordinating Organization of the Indigenous Peoples of the Amazon (COICA) is comprised of national Indigenous People's organizations of each Amazon Basin country. The organization aims "*to coordinate the efforts and ideals of Amazonian Indigenous peoples to promote, defend, and exercise the rights of indigenous peoples and territories in the Amazon basin*" (COICA, n.d.). ACTO and COICA uphold a Memorandum of Understanding (International Waters Governance, n.d.).

Notably, in 2021, the "80x25" coalition was initiated by COICA with the aim of establishing permanent protection of 80% of the Amazon rainforest by 2025 (Amazonia80x25, 2025a). Since then, it has acquired the support of many environmental advocacy organizations, including the International Union for the Conservation of Nature, the Nature Conservancy, Conservation International, and human rights organizations. Recently, the Science Panel for the Amazon also expressed its support in favor of the movement (Amazonia80x25, 2025b).

Industry

In both the Amazon and Plata basins, (rainfed) agriculture, mining and oil extraction are key economic activities, all of which are closely linked to land-use policies. This makes industry (related) organizations important to consider. Generally speaking, the primary goal of these actors is making turnover. Cargill is also one of the largest companies in the food industry in Brazil, with around

11,000 employees (Cargill, 2025a). Second, Bayer is also represented throughout Brazil, with around 26 departments (Bayer, 2025). Lastly, ADM works in South America as well, with around 4,500 employees. ADM is not only present in Brazil, but also in Argentina, Chile, Mexico, Paraguay, Peru and Uruguay (ADM, 2025).

The industry stakeholders have strong lobbying power. For example, in Brazil, The Parliamentary Front for Agriculture (FPA) is a political coalition within the Brazilian Congress comprised of multiple parties that together lobby for the interests of the agricultural sector (FPA, 2025). Moreover, the Brazilian Agriculture and Livestock Confederation (CNA) defends the agricultural sector's rights and interests from a perspective of economic and social development (CNA, 2021) and operates in international arenas of the World Trade Organization as well as the Latin American Water Forum.

4.1.2. UN System

The UN System is strongly represented within water and environmental governance of the Amazon and Plata Basins. The UN System is characterized by its high fragmentation of responsibilities and capabilities across organizations (e.g. FAO, WMO), programs (e.g. UNDP, UNEP, UNESCO-IHP) and funds (e.g. GCF, IFAD) (Baumgartner & Pahl-Wohl, 2013). In terms of global conventions, all ACTO and CIC member countries have ratified several global environmental conventions, including the Rio conventions (UNFCCC, UNCCD, UNCBD) and the RAMSAR convention. Notably, none of the ACTO and CIC member countries have ratified global water conventions, exceptions made to Paraguay and Venezuéla having signed the Watercourses Conventions (not approved, accepted, accessioned or ratified) (United Nations Treaty Collection, 2025).

Rio Conventions

The UNFCCC (1994) provides a general framework for intergovernmental cooperation with regard to climate change (UNFCCC, 2025). Specifically, the Convention focuses on stabilizing greenhouse gas concentrations to "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." (UNFCCC, 2025). Within the Convention, industrialized countries (Annex I countries, belonging to the OECD and 12 countries with economies in transition), are expected to provide financial support (initially coordinated by GEF, and later also by GCF) for action on climate change in developing countries (UNFCCC, 2025). UNFCCC is the parent treaty of the 2015 Paris Agreement and the Kyoto Protocol.

Yet, within the international climate change regime, it is observed that water is mentioned in a limited way (Mvogo, 2024). In the original FCCC convention, it is primarily discussed as a means for adaptation to climate change impacts: "Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods" (UNFCCC, 1992, p.5). Within the Kyoto Protocol (UNFCCC 1998), water mentioned was limited to wastewater (as a source of greenhouse gas) and it is not mentioned within the Paris Agreement (Mvogo, 2024).

The UNCCD addresses desertification and the effects of drought, and aims for Land Degradation Neutrality (LDN) (UNCBD, 2025a, 2025b). The Conference of the Parties (COP) is the Convention's main decision-making body and is mandated to review and recommend on parties' LDN commitments, as well as making amendments or adopting new annexes to the Convention (UNCBD,

2025c). Upon inspecting this Convention from the perspective of green and atmospheric water governance in the Amazon region, two observations are made.
A first observation is that, whereas the Convention recognizes that "*desertification is caused by complex interactions among physical, biological, political, social, cultural and economic factors*" (p.2), its objectives are mostly focused on "combating desertification" and "mitigating the effects of drought". In this sense, based on my personal interpretation, the Convention does not seem to account for long-range teleconnections as characterized by the governance challenge of green and atmospheric water governance. This is also reflected in the problem definition of drought as "*the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems*" (Article 1, p. 4). Notably, this definition does not consider the sources of precipitation. Similarly, cloud-seeding techniques are mentioned as a means to enhance the availability of water resources (p.13), but the tradeoffs in relation to green and atmospheric water governance are not listed. Yet, the Convention does affirm that in accordance with the Rio Declaration on Environment and Development, "*States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction*" (p.3). However, it remains unclear whether this would also include the teleconnections as defined by through atmospheric moisture flows.
A second observation is that the Convention adopts a specific regional focus of Africa: "The objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, …" (UNCCD, 2022, Article 2, p.5).

The UNCBD is relevant to green and atmospheric water governance given its recognition of the importance of ecosystem conservation (UNCBD, 2011 p.2). Notably, water is not mentioned in the Convention text.

Global Environment Facility and Green Climate Fund
The Global Environment Facility (GEF) is the designated funding mechanism of the Rio Conventions (GEF, 2025a), GEF's work spans a wide variety of topics, including the Amazon; International Waters (IW); Agriculture, Forestry and Other Land Uses; Food Security; Forests; Freshwater; Indigenous Peoples; Land Degradation; River Basin Institutions; Safeguarding the Global Commons; and Sustainable Forest and Land Management (GEF, 2025b).

Through its International Waters (IW) focal area, GEF is the primary funding organization of transboundary water governance projects within ACTO and CIC. The International Waters focal area aims to facilitate collaboration across transboundary waters through "*sustainable, integrated management of water resources*" (GEF, 2025c) Notably, its mandate is structured specifically around blue water. International waters are defined to include transboundary surface waters and groundwater basins (GEF, 2020; GEF, 2025c). GEF support is step-wise and comprises of a Transboundary Diagnostic Analysis (TDA) and a Strategic Action Program (SAP) (GEF, 2025c). A TDA is a common and participatory fact finding process to guide identification of transboundary problems and their causal chains in shared water bodies (GEF, 2025c; GEF, 2020).

Furthermore, in 2015, the GEF established the Amazon Sustainable Landscapes Program (ASL), of which the third phase (ASL3) runs until 2030 and spans all eight basin countries (GEF, 2025d). The objective of the ASL Program is to "*preserve and restore where needed the integrity and functioning of the Amazon bio through an integrated and inclusive approach"* (GEF, 2025d). Interventions within

the program include "*management and financial sustainability of protected areas; strengthening sustainable forest management; reducing carbon emissions from deforestation; and incorporating biodiversity management principles (both conservation and sustainable use) into selected sectors that are drivers of deforestation (i.e., agriculture, extractive industries, and infrastructure) through policies, sectoral agreements, and/or instruments that engage private sector actors."* (GEF, 2025d).

GEF agencies are organizations which act as project initiators and managers in the various regions in which GEF operates. Relevant GEF agencies in the scope of this research are: the World Bank Group (WBG), UNEP, UNDP, FAO, International Fund for Agricultural Development (IFAD), Inter-American Development Bank (IDB), Development Bank of Latin America (CAF), Conservation International (CI), International Union for the Conservation of Nature (IUCN), and Brazilian Biodiversity Fund (FUNBIO) (GEF, 2025b).

Aside from GEF, the UN-mandated Green Climate Fund (GCF) is active as a part of the Paris Agreement and the world's largest climate fund (GCF, 2025a). The fund's operations revolve around climate adaptation and mitigation, focused on eight result areas of 1) Health, food, and water security; 2) Livelihoods of people and communities; 3) Energy generation and access; 5)Transport; 5) Infrastructure and built environment; 6) Ecosystems and ecosystem services; 7) Buildings, cities, industries and appliances; and 8) Forests and land use (GCF, 2025b).

United Nations Sustainable Development Group

The United Nations Sustainable Development Group guides, supports, tracks and oversees development operations across UN Member States' countries and territories (UNSDG, 2025). The UNSDG comprises of, amongst others, FAO, IFAD, ILO, OHCHR, UN DESA, UN ECLAC, UNDP, UNEP, UNESCO, WMO.

Notably, the Sustainable Development Goals (SDGs) do not explicitly consider green and atmospheric water. SDG 6 aims to "e*nsure availability and sustainable management of water and sanitation for all".* (SDG 6). Its sub targets primarily focus on water, sanitation and hygiene (WASH) goals (targets 6.1; 6.2; 6.3; 6.7; 6.8), in which green and atmospheric water are not addressed. Targets 6.4; 6.5; and 6.6 address water management targets. Target 6.4 focuses on increasing water-use efficiency and ensure freshwater supplies. Notably, green and atmospheric water are not explicitly considered in indicator calculations on water stress, according to the latest SDG metadeta report (United Nations Statistics Division, 2024). Target 6.5 focuses on implementing IWRM. Target 6.6 addresses changes in water-related ecosystems. Whereas in this target, the role of water-related ecosystems such as forests in providing water-related ecosystem services are recognized, its sub-indicators focus on river flow dynamics, permanent surface water extent dynamics, reservoir extent dynamics, water quality of large lakes, inland wetland extent and mangrove area changes (United Nations Environment Programme, 2024).

UN Water

In 2003, UN Water was established to act as a "coordinating mechanism" for the United Nations' work on water and sanitation (UN Water, 2025). Notably, its orientation is primarily directed to blue water, aligned with SDG 6 and other water-related SDGs.

Its core tasks revolve around "*informing policy processes and addressing emerging issues, supporting monitoring and reporting on water and sanitation, and building knowledge and inspiring people to take action*" (UN Water, 2025). Within its mandate, UN Water plays a central role in sparking freshwater debates through recurring global events and publications. World Water Day focuses attention on specific themes each year. The World Water Development Reports (WWDR) are launched on the same day.

Aside from connecting the large body of UN agencies and programs working on water-related issues, the organization connects to a wide range of non-UN organizations and institutions as partners, such as the Global Water Partnership (GWP), the International Network of Basin Organizations (INBO) and several environmental advocacy organizations.

Food and Agriculture Organization (FAO)
Furthermore, the United Nations Food and Agriculture Organization (FAO) are actively involved in both basins, focusing on food security and rural development. A specialized agency of the UN, the FAO's mission is "to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives." (FAO, 2025a). Given the feedbacks between land use and terrestrial moisture recycling, and considering FAO's global presence and authority as a specialized UN agency, this makes the FAO a key player within the food and agriculture arena related to green and atmospheric water governance.

World Meteorological Organization (WMO)
As the UN System's authority on the Earth's system processes (WMO, 2025), the WMO is considered a key player for green and atmospheric water governance. WMO operates within the field of meteorology, operational hydrology and geophysical sciences, in which it regulates and facilitates data, standards and policies and advances collaboration between National Meteorological and Hydrological Services (NMHs) (WMO, 2025). Moreover, WMO contributes to the implementation of UNFCCC and other environmental conventions as well as providing advice to governments (WMO, 2025). WMO is also a member of UN Water. WMO and CIC already have operational collaborations on this area. The WHOS-Plata system provides hydrometeorological data in the La Plata river basin (under development) (WMO, n.d.). Currently, ACTO and WMO are working towards a memorandum of understanding focused on information exchange, specifically related to integration between WMO's Hydrological Observing System (WHOS) and the Amazon Regional Observatory (ARO) (ACTO, 2023).

4.1.3. The Global Commission on the Economics of Water
To this point, the complex landscape of water and environmental governance has been described. Notably, none of these actors analysed holds explicit positions on green and atmospheric water. Within global water and environmental policy arenas however, the Global Commission on the Economics of Water (GCEW) is observed as a policy entrepreneur for the explicit governance of green and atmospheric water flows. Convened in 2022 by the Government of the Netherlands and the OECD, the Global Commission on the Economics of Water (GCEW) aim is to redefine the way water is valued and governed, taking a stable hydrological cycle – a global common good – as a starting point. In 2024, the Commission's initial two year's mandate was concluded with a final report 'The Economics of Water: Valuing the Hydrological Cycle as a Global Common Good' (GCEW, 2024a). The report adopts an economic perspective and builds on Stern Review on the Economics of Climate Change and Dasgupta Review on the Economics of Biodiversity (GCEW, 2024a).

Drawing on fields of Earth System Science, resource economics, and Water System Justice, the report (and the Commission's) key conclusions and messages are nine-fold (GCEW, 2024a). First, the report recommends the hydrological cycle be governed as a global common good in which the interdependence between blue and green water is central. Second, the report recommends a minimal requirement of water for a dignified life. Third, the Commission argues for a water pricing mechanism which reflects its scarcity and includes the value of green water. Consequently, the authors argue that water markets should be (actively) shaped to include the entire water cycle and

adopt a long-term socioeconomic perspective. Moreover, the report advocates for symbiotics partnerships centered around five missions of 1)food systems, 2)conservation and restoration of natural habitats for green water, 3)circular water economy, 4)low water intensity, AI-rich clean energy and 5) supply of potable water and sanitation, whilst focusing on “efficient, equitable and environmentally sustainable use of water from the start” (GCEW, 2024a, p.211). Increasing the quantity, quality and reliability of financing and data availability are also core recommendations of the report, with the Commission arguing for “Just Water Partnerships” involving Development Finance Institutions (DFIs). Finally, the report concludes with the recommendation that water should be recognized as an organizing principle, with the ultimate ambition of a “Global Water Pact”.

4.2. Social network Analysis

1. *Degree centrality*

Figure 4.3.1. shows the degree centrality of the actors considered within the network, scaled by node size. UN-Water has the highest overall degree centrality. On the regional level, OAS shows a high degree centrality, followed by ACTO and CIC. Another observation is the relatively high degree centrality of GEF, which is expected considering its large funding role worldwide and specifically with ACTO and CIC. Furthermore, Group Earth Observation (GEO) shows a high degree centrality. GEO is an intergovernmental monitoring programme hosted by WMO, which aims to co-produce “Earth intelligence” to inform decision-making across societal and environmental challenges (GEO,2025). Interestingly, the Global Water Partnership (GWP) does not appear to have a large degree centrality within this network. Notably, advocacy groups show lower degree centralities as well.

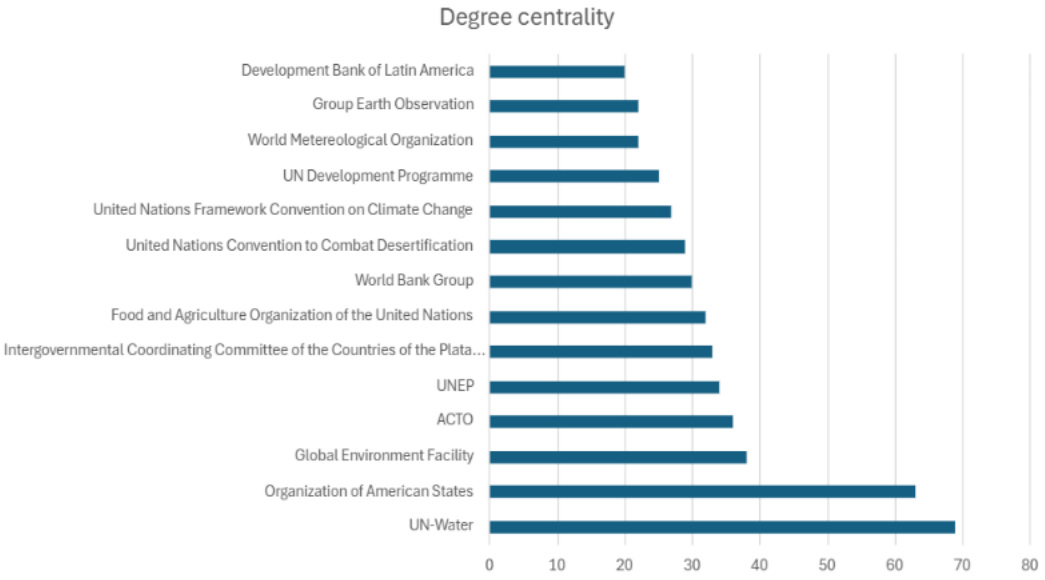

Fig. 4.2 Degree centrality of the first 15 actors with the highest (normalized) score.

2. *Betweenness centrality*

Figure 4.3. shows the betweenness centrality of the first 15 actors in the network with the highest betweenness centrality. Overall, UN-Water shows the highest betweenness centrality in the

network, followed by UNDP, the Organization of American States (OAS), and the General Coordinator of the Indigenous Organization of the Brazilian Amazon (COIAB). Additionally, the majority of organizations in the top 15 are (specialized) UN agencies, Programmes, or Conventions (UNFCCC, UNCCD).

UN-Water high betweenness centrality aligns with its formal mandate of a coordinating mechanism of the water-related UN agencies. This highlights the brokerage potential of UN-Water with regard to green and atmospheric water governance. Following UN-Water, though positioned significantly lower, are the OAS, COIAB, APIB, SPA, UNFCCC, WMO UNDP, GEF, and UNEP. This suggests a potential brokerage role for the OAS on the regional level, which would also be in line with its mandate. Unexpectedly, the Global Environment Facility scores relatively low when considering its role as a major funding source for Amazon related projects. A possible explanation is the limited reporting of funding activities other than water-related projects in the Amazon, which might have resulted in an underrepresentation of its role in the network. Interestingly, the COIAB also shows a relatively high betweenness centrality. The organization is the umbrella organization for the Brazilian Amazon Indigenous People's organizations, and the organization is highly active on the regional and international level.

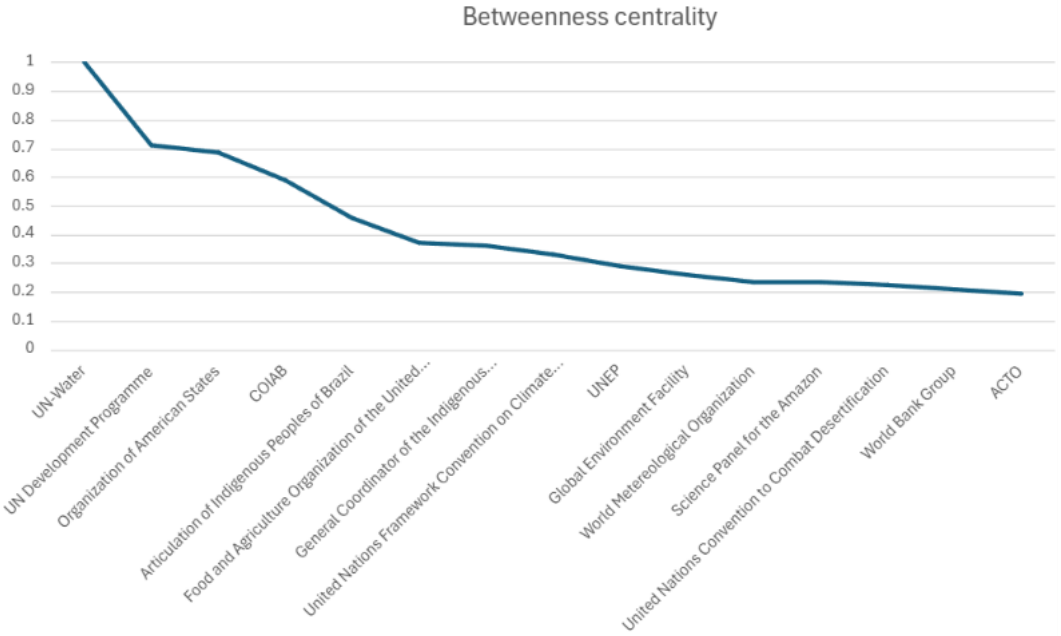

Fig. 4.3. Betweenness centrality of the first 15 actors with the highest (normalized) score.

3. *Closeness centrality*

Figure 4.3.3. shows the top 15 ranked actors' closeness centrality measures. UN-Water shows the highest closeness centrality in the network, followed by the UNDP, and the World Bank Group. Notably, Global Environment Facility scores significantly higher compared to the betweenness centrality measures. This implies that GEF does not necessarily hold a central coordinating / information role but rather has close links to parties that have. This is in line with GEF's mandate and

governance structure, considering it is the primary funding mechanism of the Rio Conventions (UNFCCC, UNCCD, UNCBD) and its implementing agencies such as IDB, CI, IUCN, and others.

Another observation is that, compared to the betweenness centrality, different actors emerge in the top 15, such as the Stockholm Waters Institute (SIWI), Conservation International, and the Transboundary Water Cooperation Coalition. Conservation International is an international advocacy organization that operates on the global level, functioning as a GEF and GCF implementing agency. The relatively high closeness centrality for this actor indicates its potential as a broker between the different scales within the network.

The Transboundary Water Cooperation Coalition is a multi-stakeholder coalition launched in December 2022 and aims to "inspire and foster equitable and sustainable cooperation on transboundary waters and provide support through its members"(UNECE, n.d.). The Coalition currently comprises of state actors (Chile, Dominican Republic, Estonia, Finland, France, Germany, Hungary, Iraq, Kazakhstan, Morocco, Namibia, The Netherlands, Panama, Senegal, Slovenia, Switzerland, Uganda; European Union); UN-system related agencies (ESCWA, GEF, IDB, UNCDF, UNDP, UNECE, UNEP, UNESCO, World Bank), research institutes (IHE Delft, CeReGAS, IGRAC), and Geneva Water Hub, GWP, INBO, IUCN, SIWI, and OAS. (UNECE, 2023). Notably, ACTO and CIC are not part of this coalition, whereas OAS and GWP are. Given the fact that the countries making up the ACTO and CIC are indeed members of both OAS and GWP, this implies that ACTO and CIC are "two handshakes away" from this coalition. Another observation is the inclusion of groundwater-related (research) institutes. Given that this water resource was first an "invisible" water resource, this might introduce possibilities for the recognition of the "invisible" green water resources.

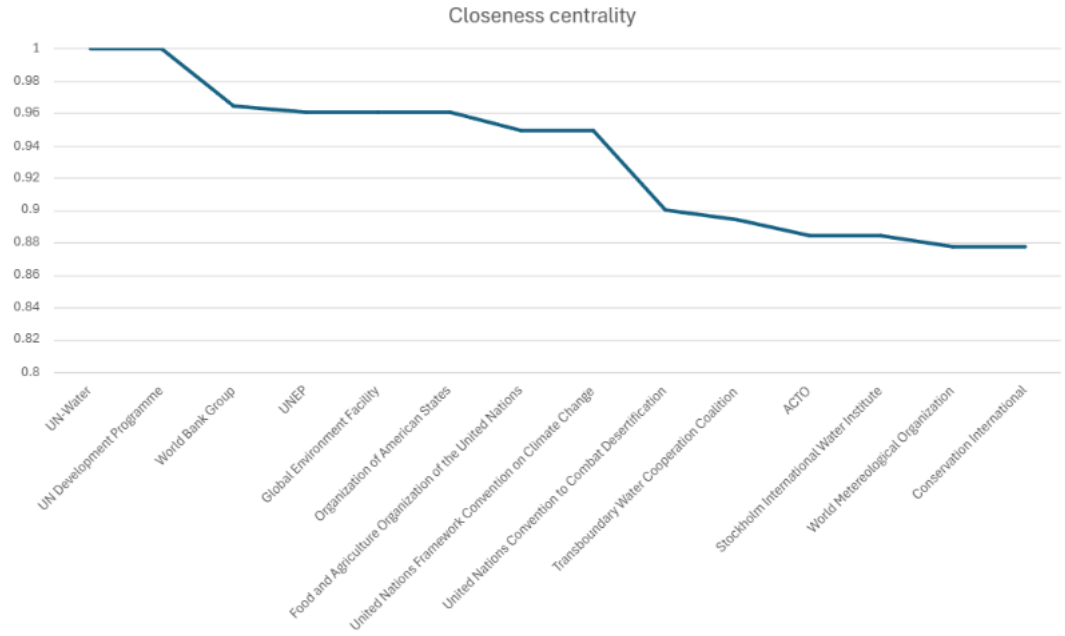

Fig. 4.4. Closeness centrality of the first 15 actors with the highest (normalized) score.

4. ***Eigenvector centrality***

Figure 4.3.4. shows the top 15 ranked actors' eigenvector centrality measures. An observation is that within this ranking, primarily UN System organizations operating on the global level and intergovernmental organizations on the regional level emerge. Global, regional and local advocacy organizations do not emerge in the top 15. OAS shows the highest eigenvector centrality in the network, followed by the UN-Water, and GEF. The large eigenvector centrality of OAS highlights its regional positioning. Notably, CIC and ACTO also show relatively high eigenvector centrality measures. This is in line with the "two handshakes away" observation made earlier when considering closeness centrality measures.

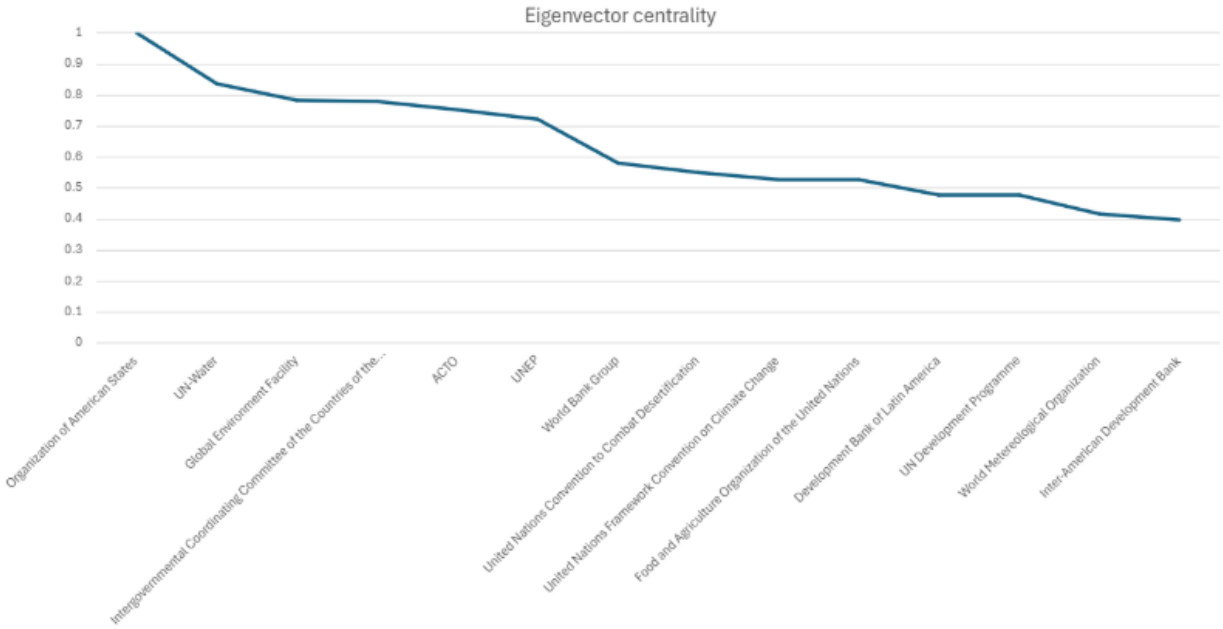

Fig. 4.5. Eigenvector centrality of the first 15 actors with the highest (normalized) score.

5. *Modularity*

To assess the extent to which actors collaborate on specific governance levels (global, regional, local), a Chi-square test has been conducted to compare the relationship between the modularity cluster and governance level of actors. The hypotheses of this test are formulated as:

- H0: no significant relation between modularity cluster and governance level of actors
- H1: significant relation between modularity cluster and governance level of actors

In the case that the Chi-square test statistic is significant, it is necessary to reject the null hypothesis (H0) and accept the alternative hypothesis (H1). In this respect, we can conclude that actors indeed collaborate within their global, regional, or local communities.

Table 4.3.1 presents the cross tabulation of modularity cluster and governance scale. Notably, a large share of global-level actors are allocated to cluster 2, whereas regional actors are fragmentally

allocated to clusters 1, 2 and 4. Interestingly, a large share of local-level actors have been allocated to clusters 1 and 4, while some small communities (e.g. clusters) with a single local-level actor exist as well (clusters 5-9). The Chi-square test statistic reaches statistical significance, as presented in Table 4.3.2, underscoring that modularity significantly links to governance scale. In other words, the communities that are formed in the network can be categorised as either global, regional, or local. In addition, the links between these communities are relatively scarce, as is indicated by the modularity of the network (equals 0.364).

Table 4.1. Cross tabulation of modularity cluster and governance scale.

Modularity cluster	Local	Regional	Global	Total
1	8.8%	6.4%	4.8%	20.0%
2	2.4%	7.2%	40.0%	49.6%
3	0.0%	0.8%	4.8%	5.6%
4	8.0%	6.4%	4.8%	19.2%
5	0.8%	0.0%	0.0%	0.8%
6	0.8%	0.0%	0.0%	0.8%
7	0.8%	0.0%	0.0%	0.8%
8	0.8%	0.0%	0.0%	0.8%
9	0.8%	0.0%	0.0%	0.8%
10	0.0%	0.0%	0.8%	0.8%
11	0.0%	0.0%	0.8%	0.8%
Total	23.2%	20.8%	56.0%	100.0%

Table 4.2. Chi-square test results.

	Value
Chi-square value	58.11
Degrees of freedom	20
P-value	< 0.001

4.3. Framing Analysis

4.3.1. Exploratory, quantitative analysis

Figure 4.7 shows an overview of the green and atmospheric water frequency distribution across actors. More specifically, Figure 4.6 presents the frequency distributions of keywords 'green water', 'soil moisture', 'precipitation', 'rainfall', 'evaporation', 'evapotranspiration', 'flying river', 'aerial river', 'watershed of the sky', 'precipitationshed', 'evaporationshed' across actors.
At the global level, mentions of green and atmospheric water are most prevalent among UN Water, GCEW, FAO, WMO. At the regional level, CIC shows the highest normalized frequency, followed by the Science Panel for the Amazon, ACTO, CIC, IDB, CAF, and lastly OAS.

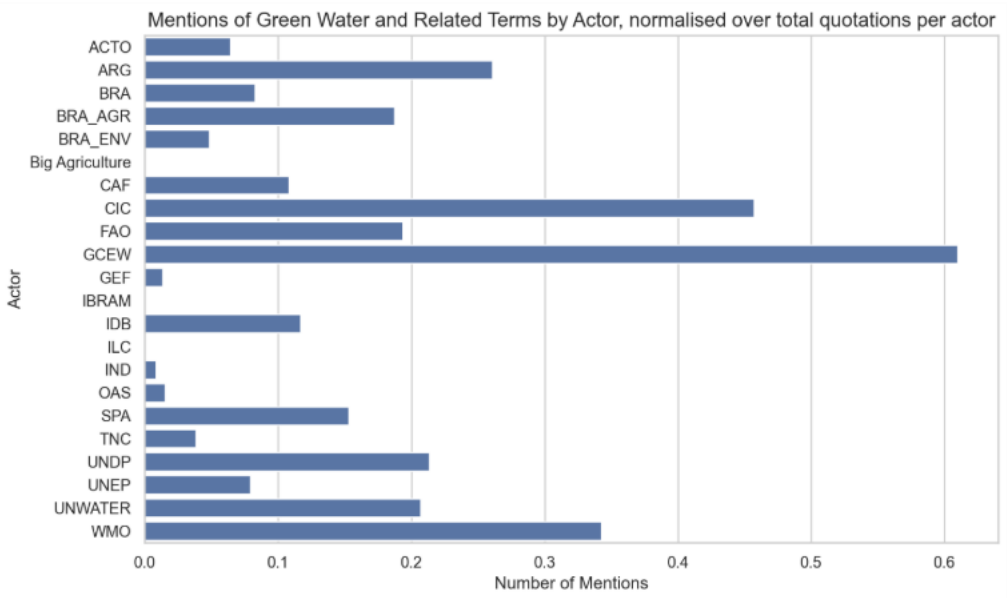

Fig. 4.6. Green water, normalized over total quotations per actor

Figure 4.7 shows the relative usage of green water terms across actors, normalized over the total amount of quotations per actor. The term "green water" itself is primarily used by GCEW. Notably, the *physical processes* which describe green and atmospheric water transformations- evapo(transpi)ration and precipitation- are relatively used the most by the various actors, with especially precipitation being widely used. The term soil moisture is also used across a variety of actors, with WMO and the Brazilian Agriculture Actor group (CNA) among the highest uses. Interestingly, bare for their low proportions, metaphors such as "flying river" and "aerial river" also emerge, with the term "flying river" found across UNDP, CAF, and Brazilian environmental organizations, and the term "aerial river" mentioned by the SPA.

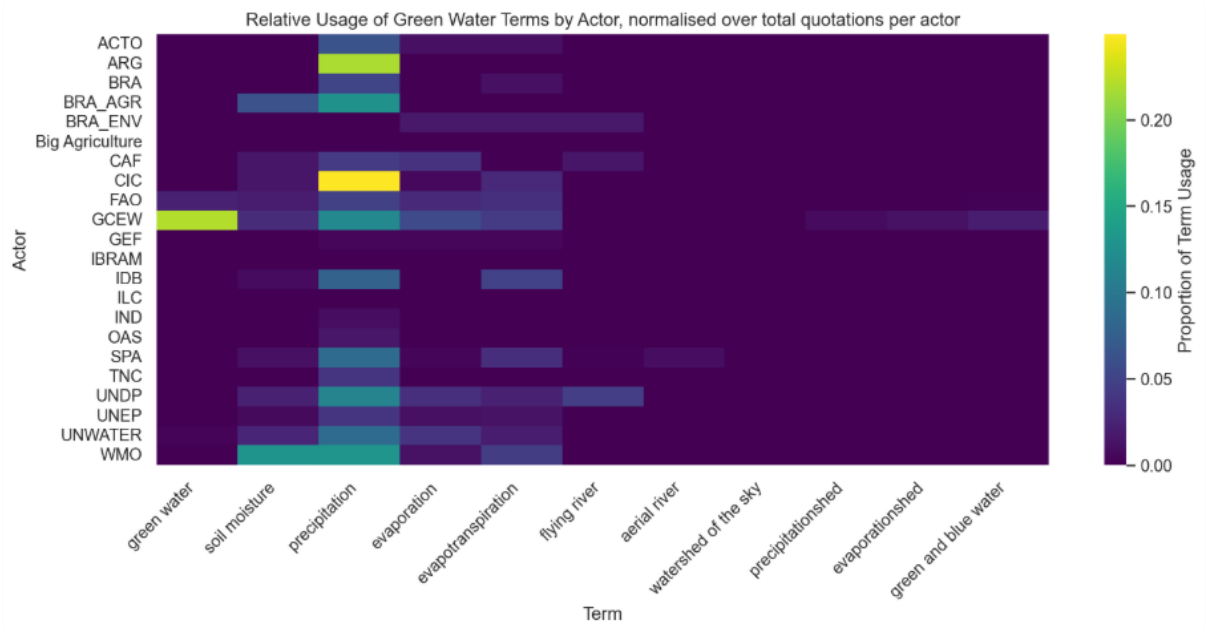

Fig. 4.7. Relative usage of green water terms by actor, normalized over total quotations per actor

Figure 4.8 illustrates the relative usage of water-related terms, normalized by the total quotations per actor. Notably, actors who frequently reference freshwater tend to use water cycle–related terms less often. This could suggest a disconnect between how freshwater is discussed in relation to the broader hydrological cycle and its connection to rainfall.

Fig. 4.8. Relative usage of water-related terms by actor, normalized over total quotations per actor

Overall, the normalized frequency and relative usage of green and atmospheric water related terms observed across actors is expected, considering the organizations' mandates and positions on green and atmospheric water. Respectively, the GCEW as a policy entrepreneur of green and atmospheric water governance is expected to use green water more often than other actors who have not

formally positioned themselves across green and atmospheric water governance.

4.3.2. Water governance discourses and framings of green and atmospheric water

Global governance arena

In the global water governance arena, it is observed how existing, blue water oriented, discourses united within UN Water are challenged by a new storyline focused on the hydrological cycle as a whole, introduced by the Global Commission on the Economics of Water. In the first, green and atmospheric water are absent or at least underrepresented, in the latter, green and atmospheric water are actively highlighted and central to the core storyline. In the sections below, I first present my observations with regard to existing water discourses. I do so through exploring the themes of the United Nations World Water Development reports. Next, I explore GCEW's discourse as in its 2024 flagship report.

Blue water discourses and frames of green and atmospheric water

UN Water plays a central role in sparking freshwater debates through recurring global events and publications. It is observed how on World Water Day, many actors on different levels give attention to that year's theme. Furthermore, other global annual events such as World Water Week (organized by the Stockholm International Water Institute) are often also aligned with the theme of World Water Day.

World Water Day focuses attention on specific themes each year. The World Water Development Reports (WWDR) are launched on the same day. Table 4.3 shows an overview of the WWDR reports and their themes from 2020-2025. Notably, green and atmospheric water have not been a central theme.

Table 4.3 *Themes of United Nations World Water Development reports in the period 2020-2025*

2020	2021	2022	2023	2024	2025
Water and Climate Change	Valuing Water	Groundwater: making the invisible visible	Partnerships and cooperation for water	Water for prosperity and peace	Mountains and Glaciers Water Towers

Over the years, various discourses have been highlighted through the thematic United Nations World Water Development Reports. For example, the 2021 WWDR report highlighted a Water Valuation discourse, whereas the 2023 and 2024 emphasize Water Diplomacy discourses. Overall, water and sustainability is an overarching theme. The WWDR reports are primarily oriented on water and sanitation goals related to SDG 6, as well as other water-related SDGs (UN Water, n.d.).

When exploring the individual themes of the World Water Development Reports, limited referrals to green and atmospheric water are observed. In those cases where green and atmospheric water are referred to, a solutionist framing is observed, embedded in technocratic language. These are further unpacked in the following sections.

As for atmospheric water, the WWDR 2020 report on Water and Climate Change frames atmospheric water as an “unconventional water resource” (United Nations, 2020, p.53), which is

further highlighted in UN Water's analytical brief on Unconventional Water Resources published in same year (UN-Water, 2020) . Embedded within scientific/technical language, green and atmospheric water is referred to in a "solutionist" way, in order to address local water scarcity challenges. Atmospheric water is an "inexhaustible" source to be "tapped", "captured", and "harvested" through technological innovations. Interestingly, evaporation is viewed as a loss rather than a source of rainfall elsewhere:

"There is a multitude of unconventional water resources that can be tapped. Sources of unconventional water resources range from Earth's seabed to its upper atmosphere, and capturing them requires a diverse range of technological interventions and innovations. Harvesting water from the air consists of rain enhancement through cloud seeding and collection of water from fog, while capturing water on the ground addresses micro-scale capture of rainwater where it would otherwise evaporate; all these techniques address local water shortages" (UN-Water, 2020: UN-Water Analytical Brief on Unconventional Water Resources, p.5).

[...]

"The earth's atmosphere contains about 13,000 km³ of water in a vapor phase, the source of which is evaporation from the surface of the oceans, seas, and soil moisture and transpiration from plants. These water vapor reserves are continuously updated due to the circulation of evaporation-condensation and precipitation, making annually 8-9 hydrological cycles, each lasting about 40-45 days (Bengtsson, 2010). Thus, the amount of water vapor present in the atmosphere is an inexhaustible freshwater source and opportunity for rain enhancement." (UN-Water, 2020: UN-Water Analytical Brief on Unconventional Water Resources, p.14).

Green water is referred to more often than atmospheric water, yet it remains absent as a central theme. In these cases, it is observed how green water is referred to as soil moisture and its role in rainfed agriculture (UNESCO, 2021, p24.; UNESCO, 2024,p.38). Overall, these often occur together with (technocratic) recommendations to improve local water conservation, as well as to improve efficiency in production processes:

"Although 70–80% of cropland is not irrigated (FAO, n.d.b), investments in rainfed agriculture are underway and there is scope to improve rainwater retention in order to shift from non-productive water loss (evaporation and runoff) to productive water uptake (transpiration) by crops. Additional and complementary actions supporting the conservation of water in soils include efficient water use and water scarcity management; tech-enabled irrigation systems; and runoff and rainwater collection and storage systems (Ghosh et al., 2022, p. 40)." (UNESCO, 2024, p.38).

Interestingly, one instance is observed in which effects of land use on water consumption and distant effects of evapotranspiration on rainfall elsewhere are brought to attention:

"In rainfed systems, withdrawals (soil moisture/rainfall) are not usually considered part of water 'abstraction/withdrawal' in use calculations. But land use in rainfed farming can decrease local surface and groundwater storage and flows, and therefore has a 'consumption' element. On the other hand, it can also increase local water storage and flows, in which case water availability is augmented. As a final example, in both rainfed and irrigated systems most consider the water

evapotranspired by crops as water actually 'consumed', but in both cases this will return again somewhere else as rainfall – so is it 'consumed' or 'recycled'?" (UNESCO, 2021, p.24).

1.2. Exploring GCEW's storyline

The establishment of the Global Commission on the Economics of Water in 2022 brings forward a new storyline grounded in economic water governance discourse, yet bridging to other water- and environmental governance related discourses. Consequently, this discourse is termed as the "*hydrological cycle as a global common good"*, named after the title of the GCEW's flagship publication in 2024.

As a policy entrepreneur in the global water governance arena, the GCEW introduces an alternative storyline which frames the hydrological cycle as a global common good. Originally commissioned by the OECD and the Dutch government, the commission is comprised of representatives of key policy and academic institutions on the global policy level (see appendix B). This suggests a potential legitimization of the storyline.

In short, the core storyline urges for a change in understanding and governance of water to address global challenges of water security, food security, biodiversity decline, climate change, and sustainable development. Using a framing of "*the world facing a* growing *water disaster"*, the storyline expresses a sense of urgency, in which "*for the first time in human history, the hydrological cycle is out of balance, undermining an equitable and sustainable future for all."* (GCEW, 2024, p.11).

Highlighted in this storyline is the importance of considering the entire hydrological cycle, through underpinning how it "*connects countries and regions through both the water that we see and atmospheric moisture flows; that it is deeply interconnected with climate change and the loss of biodiversity with each rebounding on the other; and that it impacts on virtually all the SDGs."* (GCEW, 2024, p.11).

Notably, the storyline explicitly makes visible green and atmospheric water, as being a *critical but overlooked freshwater resource* (GCEW, 2024, p.11).
It is observed how the importance of green and atmospheric water is highlighted through scientific, functional and climatic frames.
Green water as soil moisture is framed as *"crucial to sustaining the natural systems that absorb more than a quarter of the carbon dioxide emitted from fossil-fuel combustion*." (GCEW, 2024, p. 13). Moreover, using concepts such as *terrestrial moisture recycling, evaporationshed* and *precipitationshed* drawn from academia, the *atmospheric moisture flows* are framed as *"transboundary resources, carrying water from one country to another, even across continents and oceans" (*GCEW, 2024, *p.62).* Given these scales, the atmospheric water flows are explicitly distinguished from blue water resources, stating that these flows follow "*patterns that shift with the prevailing winds and rarely match the geographical complexity of surface water and aquifer basins*" (GCEW, 2024, p.37).

In explicitly considering green and atmospheric water, the storyline also makes visible the relation between land use change and precipitation, stating that "*Land-use change significantly influences precipitation patterns across regions (Keys et al., 2019). About 40-60% of rainfall over land originates from land-based evapotranspiration – known as terrestrial moisture recycling (TMR) – much of which comes from forests, cropland, and large water bodies (De Petrillo et al., 2024). This creates a complex, global web of influence between land use and rainfall*." (GCEW, 2024, p.85).

It is through this link that the storyline bridges to other discursive elements of food security, climate change, droughts and desertification, and biodiversity loss. One exemplary example of this bridging to climate change, desertification and biodiversity can be found on page 38 of the GCEW 2024 report: "*when green water is mismanaged and lost through deforestation and unsustainable land use, future precipitation is impacted and carbon storage is reduced in the soil and vegetation. Beyond climate change, the water crisis is deeply intertwined with biodiversity loss and desertification, both recognised as systemic and global issues" (*GCEW, 2024, p.38).

Moreover, the storyline brings to attention feedback loops of land use and droughts: "*Droughts and floods exacerbate soil erosion and land degradation, which can create vicious cycles – ever-less-fertile soil that cannot support vegetation or absorb rainfall, more green water lost, and more land cleared to grow crops – inflicting damage on communities and all life. It follows that water should play a much more prominent role in national strategies to mitigate climate change and biodiversity loss*." (GCEW, 2024, p.38).

Acknowledging the feedback loops between land use and green and atmospheric water flows, the storyline also bridges to the topical arena of agriculture and food security: "*Changes in land use over the last half century have had the largest negative impact on freshwater ecosystems. Agricultural expansion in particular has been the main driver of deforestation, altering green water's key role in the hydrological cycle, hence impacting rainfall patterns, lowering agricultural yields and threatening food security itself, particularly as 80% of the total cropland and more than half of the world's food production is rainfed*."(GCEW, 2024, p.17).

Bridging to the Indigenous rights discourse was also observed, in which Indigenous Peoples are framed as being on the "*frontlines of water conservation*", stating that "*policymaking must become more collaborative, accountable, and inclusive of all voices, especially those of youth, women, marginalised communities, and the Indigenous Peo*ple […]." (GCEW, 2024, p.16).

Following from the argument that "*priority should be given to protecting and restoring those areas that can best contribute to a stable water cycle*," the case is made for engagement with and support of Indigenous people as "*stewards of a quarter of the planet's land and about 40% of remaining natural lands worldwide*" (GCEW, 2024, p.17). These connections are deepened through a call for epistemic justice, which entails "*recognising, incorporating and sharing diverse sources of knowledge about water, including scholars from the Global South, Indigenous groups and peoples with different knowledge about water*" (GCEW, 2024, p.110). As such, Indigenous Peoples are positioned not only as stakeholders, but as "*rightsholders who bring unique knowledge and perspectives on water*," and whose "*epistemic knowledge and agency*" are essential to "*address water-related issues and to be faithful to the principle of recognition justice*" (GCEW, 2024, p.198).

As its 2024 flagship report's title also suggests, it is observed that the GCEW operates primarily from an economic policy discourse, in which the hydrological cycle is presented as a global common good and in need of a "*new economics of water"* (GCEW, 2024, p.6).

The storyline upholds an economic perspective in which the costs of inaction are described:

"*The human and economic costs of inaction will be substantial. Globally, total water stored on and beneath the Earth's surface is unstable and declining across areas where populations and economic activity are concentrated, and crops are grown. […] If rainfall that originates from deforestation hotspots were to disappear, growth rates in Africa and South America could drop significantly – by 0.5 and 0.7 percentage points, respectively. […] If current trends persist, extreme water storage declines could make irrigation unfeasible, leading to a 23% reduction in global cereal production. […] The combined effects of changing precipitation patterns and rising temperatures due to climate*

change, together with declining total water storage and lack of access to clean water and sanitation imply that high-income countries could see their GDPs shrink by 8% by 2050 on average, while lower-income countries could face even steeper declines of between 10% and 15%. Disruptions of the hydrological cycle therefore have major global economic impacts." (GCEW, 2024, p.14).

As such, the core solutionspace which is presented in the storyline primarily draws on economic instruments. Consequently, in line with economic policy discourse, the narrative states that it is needed that "*prices, subsidies, and other incentives are brought together to ensure that water is used more efficiently in every sector, more equitably in every population, and more sustainably.*" (GCEW, 2024, p.6). Ultimately, the goal is to reshape economies to "*allocate and use water properly from the start and avoid having to fix problems after they occur."*(GCEW, 2024, p.6).

Notably, whilst drawing upon economic policy discourse, the storyline actively includes elements of equity and sustainability. The commission calls for integretation of the three E's – effiency, equity, environmental sustainabilty- instead of these aspects being perceived as zero-sum games: "*At its heart is the recognition of the connection between environmental sustainability, social equity, and economic efficiency. Historically, these "Three 'Es'" (3Es) have been pitted against each other. The GCEW envisions the 3Es as interdependent, equally important, and best implemented together through a more robust economics."* (GCEW, 2024, p.14).

Regional water governance arena

In the regional water governance arena, these dynamics are not observed yet. A water and sustainability disourse is hegemonic. Integrated Water Resources Management (IWRM), as a subtarget of SDG 6 "*to ensure availability and sustainable management of water and sanitation for all",* is a core policy goal among both ACTO and CIC. The policy processes through which the Strategic Action Plans for IWRM in the basins have emerged are shaped through conditions of the Global Environmental Facility (GEF), which is the primary funding mechanism for the Rio Conventions.

Notably, the general dominance of a sustainable development discourse emphasizes the symbiosis of environmental considerations with regional economic development and brings forward a technocratic focus. This is also reflected in ACTO's water governance motivations guiding the development of the Strategic Action Program (p.14) : sustainable water use is promoted as a "*strategic resource for the Amazon countries"* and countries' technical capacity should be strengthened for IWRM. Climate variability is an (external) threat to which people have to adapt (ACTO, 2018, p.14).

Green and atmospheric water is largely absent from this discourse. In those cases where proxies of green and atmospheric water are present, they are primarily framed in a neutral, scientific way. For example, both ACTO and CIC describe climatic patterns (including precipitation patterns) of the Amazon and Plata basins as a means of context setting with regard to climate variability for IWRM of blue water resources of the basins:

"*A spatial-temporal variability analysis of precipitation highlights the important role played by land relief and exposure to the season's dominant winds. In the northeast of the Amazon Basin, variability during the rainy season (December-May) follows a decennial pattern. Rainfall increased in the 1970s, followed by a decrease, and has increased again since the 1990s. The opposite took place in the southern part of the Amazon Basin. ... Interannual pluviometric variability is greater in the eastern Amazon Basin, due to reduced rainfall during El Niño years. This variability is weaker towards the*

west, and it is stronger in the northwest of the Bolivian plateau and the Andean region of the Amazon Basin." (ACTO, 2018, p.55).

Notably, the CIC does address the impacts of land use change on precipitation levels, but does not explicitly link this to the Amazon region:

"Deforestation and changes in soil use as a result of human activity in the Basin have rapidly increased over the last 60 years and there is evidence that these anthropic actions modify the thermodynamic characteristics of the lower atmosphere. These changes are the result of complex interactions between the atmosphere, hydrology, vegetation, and the management of water and soil resources. Among the changes detected are the increments of precipitation and river water levels, in addition to modifications in surface level atmospheric circulation and in the extreme temperatures that can be Figure 2.1.1.3 associated with climate change. Existing evidence suggests that changes in soil use could have contributed to increasing the average water level of the Paraná River since 1970." (CIC, 2016, p.118)

Furthermore, a noteworthy observation relates to the positioning of climate change and variability. Both ACTO and CIC highlight droughts and floods as climate change impacts. For example, ACTO describes how drougths and floods are excacerbated through climate variability:

"Most of the Amazon Basin is covered by tropical rainforest that produces intense evapotranspiration with high precipitation levels and heat release, which influence the regional and global climate. The various forces that affect the Amazon are exacerbated by the pressure of climate variability, especially in the form of intense floods and droughts." (ACTO, 2018, p.54)

Moreover, in some cases, these effects are linked to development goals, adopting a functional framing. For example, in CIC's Transboundary Diagnostic Analysis, the effects of reductions in precipitation for hydroelectric production are mentioned:

"The reduction in precipitation and flow in the upper basins directly affects hydroelectric production, considering that 60 percent of the country's hydroelectric generation is concentrated in southeastern Brazil and, in turn, that a large portion of the flows that feed hydroelectric uses in the international stretches originate in the upper basins." (CIC, Transboundary Diagnostic Analysis, 2016, p.135)

One instance in which atmospheric water is framed in a solutionist way is observed. Within its Strategic Action Program, ACTO points to rainwater harvesting systems as a means of of water supply in isolated or polluted areas in the Amazon Basin (ACTO, 2018, p.157).

"*One of the simplest and cheapest ways to provide safe water is to use rainwater. This strategic action has the purpose providing drinking water through rainwater harvesting systems (6,7) that are simple to install, cheap to build and maintain, and easy to replicate in different regions of the Amazon."* (ACTO, Strategic Action Program, 2018, p.157)

Such a framing corresponds with the use of a solutionist framing identified earlier in hegemonic sustainability discourse at the global level.

4.3.2. Environmental governance

Interestingly, within the environmental governance arena, it is observed how green and atmospheric water are more explicitly part of deliberations about land use in the Amazon basin. As within the water governance arena, references to green and atmospheric water are primarily embedded in scientific language. Yet, notably, green and atmospheric water are more often linked to the Amazon rainforest through functional and metaphorical frames.

The deliberations and discourses on land use and environmental governance within the Amazon Basin are a field of study on its own, and it out of scope of this study to thoroughly unpack the various complexities and nuances between discourses and their storylines. For simplicity reasons, and to maintain a focus on green and atmospheric water, a gross distinction is made between three main discourses observed: a (status quo) "sustainable development" discourse, a "environmentalist" discourse, and a "indigenous rights" discourse.

Sustainable development discourse
As also observed within the water policy arena, it is observed how a sustainable development discourse is hegemonic. This discourse, as within the water governance arena, places more emphasis on development in combination with nature conservation efforts and is observed to be subscribed to by the UN System, ACTO, financial institutions, and agriculture and industry actors.

In line with observations made on the sustainable development discourse in the water policy arena, many climate change related referrals are observed, to which green and atmospheric water is implicitly connected. Interestingly, compared to the sustainable development discourse observed within the water policy arena, green and atmospheric water in are more often observed to be explicitly used. Furthermore, an interesting observation is that across actors subscribing to a sustainable development storyline, different types of frames are observed. More specifically, a distinction is made between UN System related actors, ACTO and state actors, and sectoral actors.

Among UN System related actors, it is observed how beyond scientific framings, green and atmospheric water are also actively framed in relation to the importance of the Amazon rainforest, using (a combination of) climatic, functional and metaphorical frames. In 2019, for example, the FAO emphasized the role of forests in atmospheric water transport through its Forest and Water Program:

> "*With forests contributing to water availability not just downstream, but also downwind through these 'flying rivers', the role of forests in supplying water takes up a new dimension – and with this, so should the management of forests to secure the provision of water. Droughts experienced in the South of Brazil in recent years have in fact been linked to the deforestation and conversion of the Amazon resulting in the reduction in rainfall brought by the 'flying rivers'*." (FAO, 2019)

Here, a metaphor of a "flying" river (metaphorical framing) is used to highlight the role of forests in water supply (functional framing) and links it to climatic implications in the form of droughts (climatic framing).

Another example can be found in a UNDP story about flying rivers. The excerpt below shows how the flying river metaphor is explicitly linked to potential uses (functional framing), including agriculture and water consumption:

> *"This phenomenon, studied by Brazilian scientist Antonio Nobre, occurs when clouds over the Amazon are blown to other parts of the continent, maintaining a water cycle that is vital for*

agriculture. [...] Protecting the flying rivers safeguards water for consumption, for agriculture, and for maintaining life in areas that would otherwise experience desertification." (UNDP, 2022).

The functional framing of green and atmospheric water especially comes forward in the storyline adopted by the Science Panel for the Amazon, which is sponsored by the United Nations Sustainable Development Solutions Network (SDSN). In their flagship report, several functional framings are observed, including a climatic framing in line with the one adopted by ACTO but also more explicit framings highlighting the role of (Amazonian) green and atmospheric water in sustaining rainfall elsewhere, and consequent agriculture and drinking water:

"The Amazon region is also an important source of moisture for several regions of South America, such as providing moisture and rainfall to glaciers in the Andes, paramos, major cities, and the La Plata River Basin (Marengo et al. 2004, Arraut et al. 2012; Zemp et al., 2014; Drumond et al., 2014; Poveda et al., 2014; Gimeno et al. 2019). Over the La Plata River Basin, and possibly over the Pantanal (wetlands in Brazil) and Andean regions, the Amazon is the second-highest continental contributor to annual mean precipitation (Martinez and Dominguez, 2014), with local recycling over the La Plata Basin being the main source. This water vapor transport happens in relatively narrow spaces of the atmosphere nicknamed "aerial rivers" (Box 7.1)." (Science Panel for the Amazon, 2021, p.7.14).

"Approximately 25-50% of the total annual rainfall observed in the tropical Andes originates from Amazon tree transpiration. Part of the produced moisture reaching east of the Andes — 10 to 23 billion liters per day — is transported southward by winds flowing in low altitudes, known as "aerial rivers", reaching as far as Argentina and supplying water to other major river basins on the continent, thus supporting agriculture and providing drinking water."
(Science Panel for the Amazon, 2024, p.6)

Notably, whereas not situated around environmental governance deliberations in the Amazon basin, a similar functional framing (though not metaphorical framing) is observed at the CIC. In CIC's Transboundary Diagnostic Analysis, the effects of reductions in precipitation for hydroelectric production are mentioned:

"The reduction in precipitation and flow in the upper basins directly affects hydroelectric production, considering that 60 percent of the country's hydroelectric generation is concentrated in southeastern Brazil and, in turn, that a large portion of the flows that feed hydroelectric uses in the international stretches originate in the upper basins." (CIC, Transboundary Diagnostic Analysis, 2016, p.135)

A notable difference to these framings is observed among sector-oriented narratives. The (combined) metaphorical, functional and climatic framing of green and atmospheric water across UN System related actors primarily highlights beyond-local effects. Contrastingly, sectoral narratives primarily frame green and atmospheric water in a local context, as a response to climatic threats.

Agricultural narratives, in deliberations surrounding land use, frame the necessity of agriculture in terms of economic development and its contribution in addressing food security. Water, in general, is framed as "*essential for people and agriculture"* (Cargill, 2025c), and being important *"not only for life but also for their energy- and water-intensive operations for food systems and supply chain continuity"* (Bayer, 2025b). Interestingly, green and atmospheric water are (implicitly) framed as both a problem and solution. Climate change, especially in the form of floods

and droughts, is presented as a growing risk. "*Water scarcity is becoming a bigger problem worldwide*," Cargill states, pointing to the shrinking share of usable freshwater and its impact on agricultural productivity (Cargill, 2025b). At the same time, the role of soil moisture (green water) is recognized and framed in a (technocratic) solutionist way. Innovations in regenerative agriculture (e.g., cover crops, reduced tillage) which increase soil moisture retention are promoted as a means to "*maximize water use efficiency"* and improve conditions in "*water stressed areas"* (ADM, 2023a; Cargill, 2025b).

Clean energy oriented storylines within the sustainable development coalition refer to a less extent to green and atmospheric water. Mining is portrayed not as an environmental threat, but as a strategic enabler of low-carbon futures:

"Today, the greatest and most immediate threat to the future of humanity is, without a doubt, the climate crisis, which affects populations and economies all over the world. In order to fight climate change, the Paris Agreement established targets for reducing greenhouse gas emissions, requiring all countries to engage in a process of decarbonizing their economies, including a process of changing the energy matrix. […]. Climate, decarbonization, energy and mining are elements of the same equation. Tackling the climate emergency and seeking to comply with the Paris Agreement involve, among other things, expanding the extraction and use of mineral resources. Mining institutions and professionals have highlighted the importance of the sector in achieving the established global goals" (IBRAM, 2024, p.21).

Within this narrative, green and atmospheric water is observed to be less explicit as in the *agriculture* narrative, which actively mentions soil moisture. Nevertheless, from a green and atmospheric water perspective, several framings indirectly engage with these concepts. First, droughts and water scarcity are named as key climate risks to mining operations (IBRAM, 2024, p.21). Moreover, the polluting role of the mining industry is mentioned by both ACTO and CIC, in which ACTO also suggests rainwater harvesting techniques as solutions for distant communities as a "clean water" alternative. In this way, green and atmospheric water is indirectly linked to the mining industry.

Environmentalist discourse

Another broad discourse category observed to be present in environmental governance deliberations surrounding the Amazon is what I call an "environmentalist / tipping point" discourse. In short, the core storyline in this discourse argues for a complete and urgent halt to deforestation within the Amazon rainforest. Often, the threat of the Amazon reaching a "tipping point" is used to stress the urgency for anti-deforestation policies. The discourse is primarily found across environmental and climate advocacy groups.

Green and atmospheric water are mostly referred to in relation to the tipping point. Interestingly, similar functional and metaphorical framings are observed to be used compared to the sustainable development discourse (UN- system). Yet, a notable difference lies in the sense of urgency and emphasis on conservation and reforestation rather than sustainable development.

For example, on its website, Conservation International describes how the water cycle is under threat due to deforestation and pushes the rainforest to a tipping point:

"For millennia, the Amazon rainforest has thrived on an endless cycle of rainfall supported by billions of trees recycling water back into the atmosphere. But as more trees are cleared, the forest is losing

its ability to retain moisture. If this cycle of destruction continues, the rainforest will be pushed to an ecological tipping point — gradually turning into a dry savanna. Experts warn that could set off catastrophic consequences, including the loss of Indigenous cultures and Amazonian livelihoods, and a massive decline of biodiversity. We are in a race against time, and a rapidly changing climate, to sustain the forests of Amazonia, so that they can continue to sustain us all." (Conservation International, n.d.)

Furthermore, the Nature Conservancy adopts a metaphorical framing of a "giant river in the sky" to emphasize various functions of green and atmospheric water:

"Natural cycles are being altered, tipping a delicate balance that affects local, regional and even global levels and getting closer and closer to a point of no return. […]
Here's how things should run: The humidity comes from the Atlantic Ocean. Once it reaches the forest, it rains. The roots of trees and plants absorb water, which sticks to the surface of the leaves. Then the trees generate more moisture, and the water that fell as rain returns back to the atmosphere. It rains again, the roots absorb the water, and again it evaporates. Aptly named, the rainforest produces at least half of its own rain. And that's how, as author Craig Welch put it, a "giant river in the sky" forms. The resulting precipitation supplies water to nearly every country on the continent—that is, a region that generates 70 percent of South America's GDP, according to The Nature Conservancy (TNC). [...] "In addition to the large amount of water the rainforest produces, the Amazon influences the circulation of air masses, affecting rain patterns not only here in South, but also in North America. Many places in the world depend heavily on these rain patterns. When trees are cut down, fundamental ecosystem services such as the regulation of the water cycle are lost—directly affecting the water supply for millions of people." (TNC, 2020).

Indigenous rights discourse

Moreover, an indigenous rights discourse is observed. This discourse also challenges traditional economic and sectoral discourses and urges for Indigenous rights, knowledge systems, and territorial governance to be properly recognized. This narrative is primarily observed at the Indigenous People's organizations analyzed (COICA, APIB).

The storyline describes how state-granted concessions to extractive industries (e.g., oil, beef, soy, mining) threaten Indigenous territories, often without free, prior, and informed consent. These concessions pollute rivers, erode land, and compromise water quality: *"The exploration, drilling, extraction, transportation, and even refining and consumption of fossil fuels cause environmental devastation, violence, and local impoverishment. In all phases, there is deforestation and degradation of ecosystems, contamination of water bodies, acid rain resulting from the burning of associated petroleum gas, unbearable noise, and pollution. These facts extend to the natural networks of water and air circulation, as explained by the Arayara Institute." (APIB,* 2023)

On the regional/local level (Brazil), narratives are structured around the Marco Temporal policy debate. The Marco Temporal (Time-Frame) thesis is the legal idea in Brazil that Indigenous land claims are valid only for territories Indigenous peoples were physically occupying (or had an active legal dispute over) on October 5, 1988, the date the current Brazilian Constitution was enacted (Ramalho, 2025). It's contested because critics argue the thesis imposes an arbitrary cutoff that undermines Indigenous peoples' ancestral and constitutional rights, whereas supporters argue that a

clear time delineation prevents legal uncertainty for industry stakeholders (Mongabay, 2023). In 2023, Brazil's Supreme court voted against the proposal (Mongabay, 2023).

80x25 coalition

Interestingly, the actors within the "environmentalist/ tipping point" and "indigenous rights" coalition have also formed a discourse coalition together, united within the "80x25" movement. The movement was initiated in 2021 by COICA with the aim of establishing permanent protection of 80% of the Amazon rainforest by 2025 (Amazonia80x25, 2025a). Since then, it has acquired the support of many environmental advocacy organizations, including the International Union for the Conservation of Nature, the Nature Conservancy, Conservation International, and human rights organizations. Notably, recently, the Science Panel for the Amazon also expressed its support in favor of the movement (Amazonia80x25, 2025b).

The "80x25" discourse coalition challenges the existing land use policies in the Amazon basin. The discourse coalition integrates storylines of Indigenous rights and environmentalist discourses. Consequently, the "80x25" storyline highlights the critical role of Indigenous peoples and their territories in the protection of the Amazon rainforest, whilst drawing upon a sense of urgency for conservation and reforestation efforts amidst a luring tipping point:

"the Amazonia is crossing a dangerous tipping point: if deforestation and degradation continues at the current pace, the Amazonia will die as we know it today and will rapidly change from a tropical rainforest into a savannah, releasing enough carbon emissions to wreck our planet's climate stability, and undermining international efforts to keep us under 1.5ºC temperature rise. [...] We cannot afford to lose another hectare of forest. We know that intact ecosystems and low degradation areas represent 74% of the Amazon and that we can still restore 6% to achieve the protection of 80% of the region and avert the tipping point. This goal is not ambitious, but rather the minimum we need for this mega-ecosystem to survive." (Quintanilla et al. , 2022, p.4-5)

[…]

"*The loss of Amazonian ecosystems impacts the planet and all forms of life and, in an inverse relationship, climate change affects the ways of life of indigenous peoples, their cultural and linguistic diversity, health and food security , and threatens to make up to 1 million species extinct. Expanding indigenous rights and territories is a global imperative that can mitigate the climate and biodiversity crisis as 80% of the world's remaining biodiversity is on Indigenous homelands"* (Quintanilla et al. , 2022, p.8)

Notably, whereas green and atmospheric water was observed to be explicitly framed within the environmentalist discourse, such explicit framings were not observed within the integrated storyline of the "80x25" storyline. Yet, a symbolic reframing of the Amazon is observed: in which the Amazon is reframed as no longer the "*lungs of the world*" it is described as the "*heart of planet Earth*" (Quintanilla et al. , 2022, p.4)

5. Discussion

This study aimed to explore the policy, institutional and discursive conditions for green and atmospheric water governance within the Amazon and Plata basins in South America. In South America, through green and atmospheric water, terrestrial moisture recycling plays a significant role in sustaining local and regional rainfall regimes, within and beyond established basin delineations. Yet, current water and environmental governance frameworks – in South America and globally- primarily focus on visible, blue water resources such as rivers, lakes and aquifers.

For the purpose of identifying policy, institutional and discursive conditions, the following questions have been explored using an iterative, multi-method approach combining actor analysis, social network analysis and framing analysis:

- What actors, stakeholders and formal arrangements are currently shaping water and environmental governance in the Amazon and La Plata Basins?
- How are actors connected to each other in the current governance landscape and what are potential policy brokers for green and atmospheric water governance?
- How is green and atmospheric water framed within the existing discursive space?

These research questions will be shortly revisited, followed by a broader discussion on policy, institutional and discursive conditions.

5.1. Actors, arenas and dilemmas for green and atmospheric water governance in South America

What actors, stakeholders and formal arrangements are currently shaping water and environmental governance in the Amazon and La Plata Basins?

The Amazon and Plata basins, as the two major basins considered in this research, each have complex water and environmental governance regimes, characterized by a wide variety of state actors, intergovernmental organizations, non-governmental, non-profit organizations operating at global, regional, and local levels.

Regionally, both basins' member countries cooperate within intergovernmental basin organizations, respectively the Amazon Cooperation Treaty Organization (ACTO) and the Intergovernmental Coordinating Committee of the Countries of the Plata Basin (CIC). The ACTO and CIC can be considered key decision arenas, in which shared agreements and visions by the basin countries are made regarding transboundary water and environmental governance. However, it should be noted that the sovereignty of the countries remains central in these decision arenas, which is reflected in the differences of laws and regulations on the national level. Consequently, the institutional frameworks for current (blue) water resources management in Amazon and Plata Basin countries are primarily established through their national constitutions (ACTO, 2018, p75; CIC, 2016). Overall, water is considered a multi-purpose, state-owned, public good, and some countries such as Bolivia highlight the right to "mother nature". Legal and institutional arrangements differ across the countries, reflecting diverse governance models, administrative capacities, and levels of decentralization.

Whereas ACTO and CIC uphold a Framework Agreement for Cooperation between the ACTO and the

CIC-Plata, which was first initiated in 2002 and re-established in 2021 (CIC, 2021 ; ACTO, 2021), formal agreements on shared water resources management are lacking.

The Rio Conventions and Sustainable Development Goals are significantly reflected in the basins' projects related to water governance, primarily in terms of funding and organizational support. Over the years, both ACTO and CIC have formulated strategies for Integrated Water Resources Management (IWRM), which were facilitated through the Global Environment Facility (GEF) together with GEF implementing agencies World Bank Group (WBG), UNEP, UNDP, FAO, International Fund for Agricultural Development (IFAD), Inter-American Development Bank (IDB), Development Bank of Latin America (CAF), Conservation International (CI), International Union for the Conservation of Nature (IUCN), and Brazilian Biodiversity Fund (FUNBIO) (GEF, 2025b).

Countries within the Amazon and Plata basins have notably refrained from ratifying the principal global water conventions. While the historical origin of one such convention as a European agreement may have limited its early resonance in South America, the continued absence of ratification may also reflect a reluctance to formalize international commitments over water governance. Given water's strategic value and potential for geopolitical contention, this reluctance could indicate underlying political considerations beyond purely legal or institutional factors.

As a coordinating institution with regard to water-related sustainable development goals, UN-Water appears as a key actor in the global water governance landscape. Through global events such as World Water Day, Outside of the UN System, the GCEW might be regarded as a policy entrepreneur. The GCEW actively contests existing water discourses by arguing for viewing the hydrological cycle as a global common good and highlights the role of green and atmospheric water. The GCEW is not directly connected to UN Water, but implicitly through IMWI's secretariat. Currently, the GCEW activities do not seem to reach the regional scale, and diffusion to this region still needs to occur.

What dilemmas are likely to emerge for green and atmospheric water governance in and between the Amazon and Plata basins?

Beyond water governance, green and atmospheric water governance relates to substantive governance themes including climate and environment; food and agriculture; mining and energy; indigenous and land rights; and international trade. In both basins, core economic activities among state actors are (rainfed) agriculture, mining and oil extraction, and hydropower generation. These activities are dependent on stable rainfall regimes, and their expansion often comes at the expense of forest cover, directly influencing the hydrological cycles they depend upon. This creates interdependencies between countries within the basins as well as between the basins themselves, where decisions made in one political or economic context may have cascading ecological effects across national boundaries. Furthermore, as the Amazon and Plata basins are major sources of globally traded commodities, green and atmospheric water also adds a global (trade) dimension. At the same time, the Amazon rainforest is subject to disputes on territorial rights between Indigenous peoples, Afro-Descendants, local communities, and industrial actors.

Consequently, green and atmospheric water governance is not only positioned between existing dilemmas and deliberations on environmental governance of the Amazon basin, it also brings to light new dilemmas in which trade-offs between decisions within one basin affect the other. These dilemmas challenge conventional governance frameworks that have historically treated river basins

as discrete management units. revealing the need for approaches that acknowledge the interconnected, atmospheric dimension of water systems.

5.2. Network relations and policy brokers

How are actors connected to each other in the current governance landscape and what are potential policy brokers for green and atmospheric water governance?

The social network analysis shows a disconnect between the global, regional, and local scales. Potential brokers emerging from the social network analysis are UN-Water, UNDP, the Organization of American States (OAS), the General Coordinator of the Indigenous Organisation of the Brazilian Amazon (COIAB), the Science Panel for the Amazon (SPA), and UN agencies, programmes and Conventions (UNCCD, UNFCCC).

UN-Water high betweenness centrality aligns with its formal mandate of a coordinating mechanism of the water-related UN agencies. This highlights the brokerage potential of UN-Water with regard to green and atmospheric water governance. UN- Water's institutional structure represents its strengths and weaknesses at the same time. On the one hand, giving its coordinating mandate and its embeddedness within the UN System, the organization has to account for deliberations and the need to reach compromises among member organizations and their underlying member states: "UN–Water cannot unilaterally address controversial issues; instead, it has to embrace the whole political and scientific complexity of global water challenges, find solutions that are acceptable to all of its member organizations, and ultimately ones that are acceptable to all member states" (Baumgartner & Pahl-Wohl, 2013).

Yet, on the other hand, as a coordinating mechanism, the UN-Water lacks formal decision-making power and only implicitly influences existing discourses on global water governance (Baumgartner & Pahl-Wohl, 2013). As a result, in the past, the organization's role in global water governance has been described as more of a procedural one, but limited in its effect on bringing forward new institutional development and financial resources (Baumgartner & Pahl-Wohl, 2013). This raises concern in the context of green and atmospheric water governance, which challenges dominant water discourses. Without the involvement of policy entrepreneurs, there is a risk that existing narratives, which tend to overlook green water, will continue to be reinforced.

Recently, the appointment of the UN's first Special Envoy on Water can be viewed as some progress in this regard and reflects the increased political prioritization of water issues. Working with UN-Water, the Special Envoy's mandate is to take "a global lead on water in the run up to various global water processes, particularly the 2026 UN Water Conference." (UN Water, 2024). The appointment of a Special Envoy on Water fits to a broader pattern within the diplomatic landscape, in which special envoys are increasingly appointed by both state and non-state actors to express their interest and commitment to certain short-term situations or even long-term thematic and horizontal issues (Morini, 2018). In general, the value-added of special envoys is their flexibility, in which they can bridge the tensions between change and continuity in complex systems (Morini, 2018). Yet, it is important to understand that their responsibilities are often tailored to the perspectives and preferences of their sending organisations (Morini, 2018), which in this case, is the UN Secretary-General, following up on the outcomes of the UN 2023 Water Conference. As with UN-Water, this means that the role of the Special Envoy on Water within the global green and atmospheric water

governance arena depends on the level of flexibility the special envoy has to act as a boundary spanner to this field rather than a coordinator or manager of existing efforts within the dominant (blue) water and sanitation discourses.

Another potential brokerage role emerges for OAS. This would also be in line with its mandate, being a regional forum for political discussion and decision-making in the Americas (OAS, n.d.).

Interestingly, COIAB also emerges as a potential broker. The organization is the umbrella organization for the Brazilian Amazon Indigenous People's organizations, and the organization is highly active on the regional (as part of COICA) and international level. For example, COIAB partners with several environmental organizations on the global level (the Nature Conservancy, IUCN, CI, WWF) as well as UN System through UNDP (COIAB, 2025b).

Another potential broker emerging on the regional level is the Science Panel for the Amazon (SPA). Convened by the United Nations Sustainable Development Solutions Network (SDSN), the panel is referred to as "the world's first regional high-level science initiative dedicated to the Amazon" (SPA, n.d.) The SPA aims to integrate Indigenous and Local Knowledge (ILK) with scientific (Western) knowledge about the Amazon with a mission to accelerate sustainable and equitable development within the Amazon (SPA, n.d.). With its regional scientific focus on the Amazon, the SPA occupies a structurally significant position that enables it to connect scientific knowledge with policy and advocacy efforts.

Despite their critical role in establishing network relations and smoothen the movement of goods and information, brokers' positions face inherent structural liabilities due to the relational and informational settings in which brokerage occurs (Stovel et al., 2011; see chapter 2). To this end, Stovel et al. (2011) describe three liabilities from a network, social-psychological, and economic perspective to broker positions and consequent potential stabilizing solutions. First, from a network perspective, broker fragility is primarily explained in the literature by the strengths and weaknesses of weak ties (see Granovetter et al., 1973) and, complementarily, balance theory rooted in cognitive dissonance (Stovel et al., 2011). Despite the strength of weak ties as described by Granovetter et al. (1973), Stovel et al. (2011) argue that such weak ties also explain broker fragility using the argument that without reinforcement, bridging ties are likely to weaken over time due to budget constraints.

Moreover, from a balance theory perspective which describes the emergence of an "us vs them" world, Stovel et al. (2011) contend that bridging ties are fragile due to the broker's position between internally aligned groups with externally conflicting interests (Stovel et al., 2011). From this perspective, in the context of green and atmospheric water governance, it could be possible that the potential broker positions of the SPA between (large scale) agriculture or extractive industries like mining and Indigenous People groups advocating for land rights might be fragile.

From a social-psychological perspective, broker fragility might also be attributed to role conflict, in which the different roles that brokers have to occupy bring diverging behavioral expectations (Stovel et al., 2011). Brokers are inherently susceptible to such role conflict given their position between different actors embedded in varying normative and institutional frameworks (Stovel et al., 2011). In the context of green and atmospheric water governance, role conflict may arise for an organization like COIAB, which represents Indigenous Peoples in the Amazon region. If COIAB were to assume a

brokerage role between Indigenous communities and non-Indigenous organizations such as governmental agencies, NGOs, or scientific institutions, it could face conflicting expectations. On one hand, COIAB is accountable to Indigenous communities, whose values, norms, and governance systems are deeply rooted in traditional knowledge and sovereignty. On the other hand, engaging with non-Indigenous institutions requires bridging to other normative and institutional frameworks.

Finally, from an economic perspective, broker fragility might also be explained by information asymmetries and commitment problems (Stovel et al., 2011). When a broker mechanism is in such a position to be able to exploit an information advantage, there is a risk of the mechanism losing the trust of involved actors, potentially leading to deterioration or breakdown of the bridging function (Stovel et al., 2011). This highlights the importance of information sharing among actors within and between basin organizations, through a trustworthy brokerage mechanism. On the regional level, the OAS might consider such a brokerage role. However, considering OAS's current position as a regional forum for political discussion and decision-making, caution is needed to prevent data collection and sharing efforts to vary along with political fluctuations.

As a remedy to these fragilities, Stovel et al. (2011) refer to stabilization strategies of broker capture or organizational grafting. In cases of broker capture, an integrated structure emerges whereby one of the parties subsumes the broker into its own organizational framework. Within this strategy, the broker assumes the role of an agent aligned with one party's interests, rather than acting as a neutral intermediary (Stovel et al., 2011). Another path to broker stabilization that Stovel et al. (2011) describe is organizational grafting. In organizational grafting, an existing organization with an originally different purpose is used as a "host" organization for the broker position (Stovel et al., 2011). Through the host organization, a stable brokerage position can be established. Moreover, if the host organization holds legitimacy, it can lend credibility to the broker operating under its umbrella (Stovel et al., 2011), or act as a monitoring mechanism to increase trust in the broker's position (Stovel et al., 2011).

Operating under the umbrella of the United Nations Sustainable Development Solutions Network, the SPA already seems to be partially organizationally grafted. While the Science Panel for the Amazon (SPA) benefits from its association with the United Nations Sustainable Development Solutions Network (SDSN), its affiliation also raises concerns. By being nested within the SDSN, the SPA risks being overly aligned with global sustainability agendas. This positioning could also undermine the SPA's capacity to act as a neutral convener across competing land and water governance regimes in the Amazon. From this perspective, the current grafting of SPA into SDSN should not be uncritically solidified. Instead, it should be reconfigured to embed the SPA more firmly within regional governance ecosystems while maintaining international linkages.

5.3. Green and atmospheric water frames across discourses and coalitions

How is green and atmospheric water framed within the existing discursive space?

Overall, green and atmospheric water is primarily referred to in scientific terms, such as "soil moisture," "precipitation," and "evapotranspiration". This aligns with the general observation of the lack of politicization of green and atmospheric water in current water governance debate (Te Wierik, 2021). Beyond scientific frames, green and atmospheric are found to be framed in climatic, solutionist (technocratic), functional ways and metaphorical ways using a river as metaphor.

Existing frames of green and atmospheric water are shaped by a *dynamic discursive space* (chapter 2) consisting of water and environmental governance discourses, their coalitions and interactions. The dynamic discursive space for green and atmospheric water in the Amazon and Plata basins as interpreted following the discursive framing analysis is visualized in figure 5.1.

The discursive space highlights several discourses observed across water and environmental governance arenas. A sustainable development discourse is hegemonic across both water governance and environmental governance themes in the Amazon and Plata basins. The Sustainable Development Goals (SDG's) and Rio Conventions are widely referred to in policy documents on both water governance and environmental governance in the Amazon and Plata basins.

In the sections that follow, I will discuss the implications of the observed hegemonies and dynamics within the discursive space on the (re)framing of green and atmospheric water. For clarity purposes, the discussion first considers the dynamic discursive space across the water policy arena and then continues to do the same for the environmental policy arena.

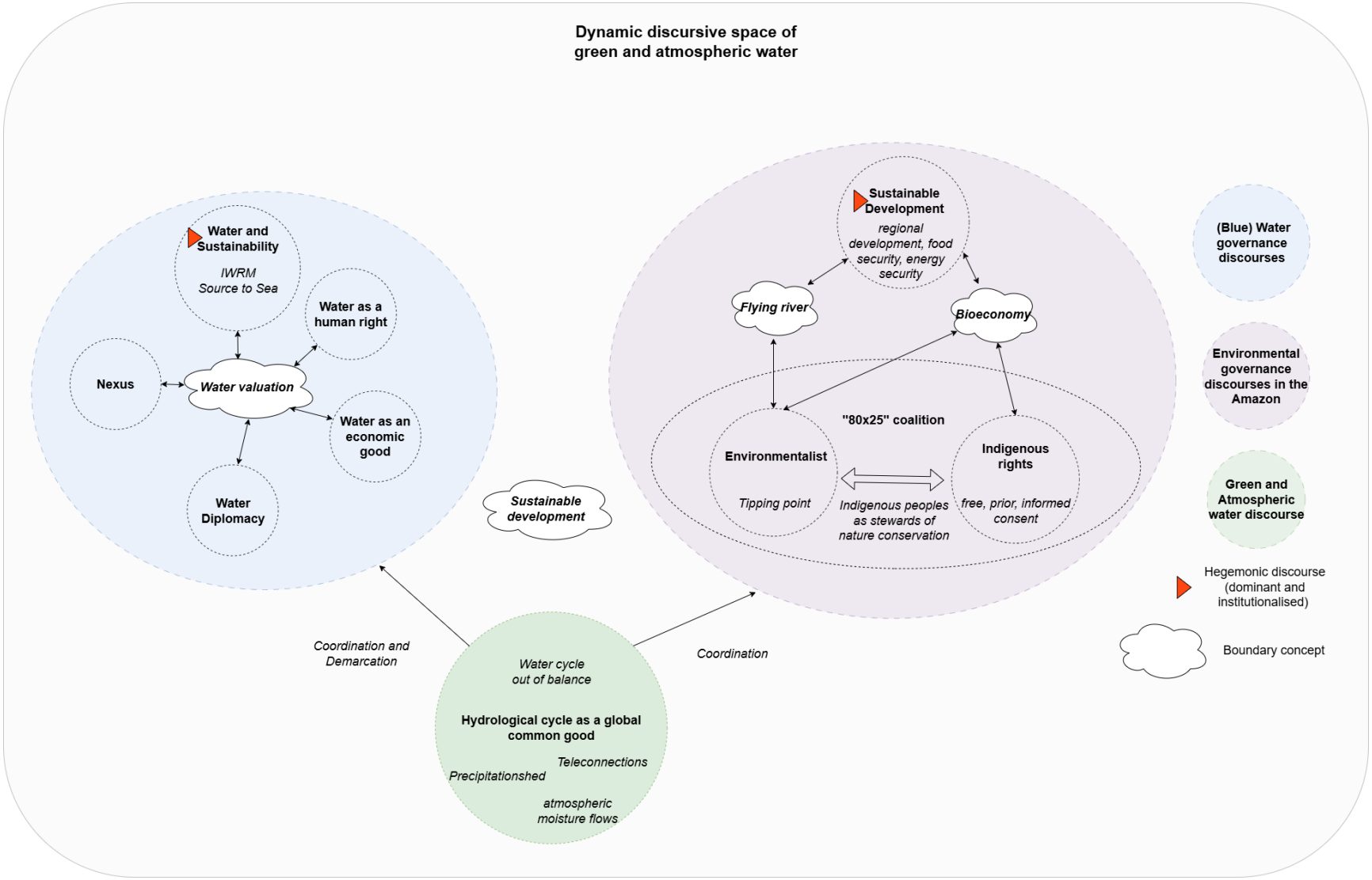

Figure 5.1 Dynamic discursive space of water and environmental policy discourses shaping green and atmospheric water frames (own work)

5.3.1. Dynamic discursive space within the water policy arena

The water governance landscape is shaped by many discourses. This is especially true within UN-Water. Nevertheless, the water and sustainability discourse is considered hegemonic considering the strong orientation of the sustainable development goals and widespread use of concepts including Integrated Water Resources Management (IWRM), and water security. Even more so at the regional level, a water and sustainability discourse remains hegemonic. ACTO and CIC, and their member countries, draw heavily upon IWRM and sustainable development goals amidst water security. Green and atmospheric water are primarily absent, depoliticalized or framed in a solutionist/technocratic way.

In the global water governance arena, it is observed how the existing, blue water oriented, discourses united within UN Water are challenged by a legitimized storyline introduced by the Global Commission on the Economics of Water (GCEW). In the first, green and atmospheric water are absent or at least underrepresented, in the latter, green and atmospheric water are actively highlighted and central to the core storyline. In the regional water governance arena, these dynamics are not observed.

Water and Sustainability

Considering the formal governance landscapes within both basins, this is expected. The Global Environment Facility (GEF), as the primary financial mechanism for the Rio Conventions and closely aligned to the sustainable development goals, plays a defining role in shaping transboundary water governance in the Amazon and Plata basins. Through its International Waters focal area, the GEF has been and still is involved in both basins' projects on integrated water resource management. By design, the Transboundary Diagnostic Analyses and Strategic Action Plans through which these projects were negotiated, consider the basin level, in line with integrated water resources management. Furthermore, within GEFs *international waters'* focal area, international waters are explicitly defined to focus on surface waters and aquifers only. As a result, green and atmospheric water are left out from the beginning.

The hegemony of IWRM on the regional level has significant implications for water governance in general and for green and atmospheric water governance. First, the established focus on basin-level management hinders inter-basin governance of green and atmospheric water. Moreover, existing literature describes several critiques on IWRM, among which the most prominent critique is its technocratic view which reduces public participation (Gerlak, 2015). Especially in green and atmospheric water governance which aside from the plurality of values already assigned to water in general also bridges to policy deliberations on land use, such a limited view of public participation is detrimental to successful governance efforts.

In those cases where green and atmospheric water are addressed, a solutionist / technocratic frame is observed. Atmospheric water is referred to as a local, "unconventional" water resource in times of water scarcity. Green water (soil moisture) is referred to in relation to land management techniques, primarily for agriculture. Whereas a solutionist framing allows for the relevance of green and atmospheric water to be highlighted, there are also risks to this framing. First, this framing tends to position governance of green and atmospheric water as a solution to blue water issues, rather than recognizing it as a distinct governance imperative linked to the broader hydrological cycle.

Consequently, such a solutionist framing might impede systemic governance of green and atmospheric water addressing root causes of scarcity in the first place. Furthermore, the risk exists that when framing green and atmospheric water as solution to scarcity problems, not all stakeholders and actors will view green and atmospheric water governance as a necessity. For example, when "times are good", or when states do not experience frequent droughts, the perceived relevance of green and atmospheric water might go unnoticed through this framing.

Interestingly, climate change and its effects in the form of droughts and floods are observed to be a central theme across water and environmental discourses. This fits within broader observations in the existing literature on the climatization of environmental discourse (Pülzl et al., 2024). Whereas green and atmospheric water are often not directly referred to, the widespread problematization of droughts and floods creates discursive space for green and atmospheric water governance. A climatization of green and atmospheric water could be beneficial given the established recognition of climate change, institutionalized through UNFCCC, and the Paris Agreement. Moreover, an embeddedness within climate change policy would also allow additional funding mechanisms, for example through the GCF. Yet, there are also risks associated with the climatization of green and atmospheric water governance. A first risk is that the global-to-local characterization of the climate debate might distance itself from local green and atmospheric water effects. Consequently, as with the climate debate, a spatial and psychological distance could lead to lower levels of public engagement and political will at the local level. Furthermore, despite the discursive affinity of green and atmospheric water with the climate change arena, the risk exists that green and atmospheric water governance becomes dependent on climate policy and its subsequent volatile shifts in policy decisions and preparedness to act. For example, in late 2024, the president of Argentina reconsidered the global climate agreement (New York Times, 2024). A third risk relates to how a climatization of green and atmospheric water governance might result in biased policy options only regarding the "atmospheric" part of green and atmospheric water governance.

The hydrological cycle as a global common good

In the global water governance arena, it is observed how the existing, blue water oriented, discourses united within UN Water are challenged by a legitimized storyline introduced by the Global Commission on the Economics of Water (GCEW). In the first, green and atmospheric water are absent or at least underrepresented, in the latter, green and atmospheric water are actively highlighted and central to the core storyline. In the regional water governance arena, these dynamics are not observed.

In short, the core storyline urges for a change in understanding and governance of water to address global challenges of water security, food security, biodiversity decline, climate change, and sustainable development. Using a framing of "*the world facing a* growing *water disaster"*, the storyline expresses a sense of urgency, in which "*for the first time in human history, the hydrological cycle is out of balance, undermining an equitable and sustainable future for all."* (GCEW, 2024, p.11). Highlighted in this storyline is the importance of considering the entire hydrological cycle, through underpinning how it "*connects countries and regions through both the water that we see and atmospheric moisture flows; that it is deeply interconnected with climate change and the loss of biodiversity with each rebounding on the other; and that it impacts on virtually all the SDGs."* (GCEW, 2024, p.11).

Notably, the storyline explicitly makes visible green and atmospheric water, as being a *critical but*

overlooked freshwater resource (GCEW, 2024, p.11). It is observed how the importance of green and atmospheric water is highlighted through scientific, functional and climatic frames. Green water as soil moisture is framed as *"crucial to sustaining the natural systems that absorb more than a quarter of the carbon dioxide emitted from fossil-fuel combustion*." (GCEW, 2024, p. 13). Moreover, using concepts such as *terrestrial moisture recycling, evaporationshed* and *precipitationshed* drawn from academia, the *atmospheric moisture flows* are framed as *"transboundary resources, carrying water from one country to another, even across continents and oceans" (*GCEW, 2024, *p.62).* Given these scales, the atmospheric water flows are explicitly distinguished from blue water resources, stating that these flows follow "*patterns that shift with the prevailing winds and rarely match the geographical complexity of surface water and aquifer basins*" (GCEW, 2024, p.37).

Discursive conditions for green and atmospheric water governance within the water policy arena

The GCEW's storyline shows high discursive affinity (Hajer, 1993; see chapter 2) and from a dynamic discourse coalition perspective (Metze & Dodge, 2016; see chapter 2), the GCEW coordinates its storyline across the various blue water *and* environmental water discourses. GCEW's storyline addresses the interconnected challenges of climate change, biodiversity conservation, and water, energy, and food security. While it draws heavily on technocratic-economic policy discourse, it also integrates elements from rights-based approaches and diplomacy. Moreover, its storyline considers Earth-system discourse by considering planetary boundaries for green and atmospheric water.

Yet, at the same time, the GCEW clearly demarcates its storyline as it differentiates from existing blue water-oriented storylines by considering the hydrological cycle as a whole and moving beyond traditional basin delineations. Consequently, GCEW's storyline facilitates a reframing of green and atmospheric water from a primarily invisible, depoliticized, scientific and solutionist framing to a more visible, functional framing. Such a reframing has several implications for green and atmospheric water governance. First, by making green and atmospheric water governance visible in the first place, drawing on concepts of the precipitationshed and atmospheric moisture flows, green and atmospheric water become more tacit. To this end, concepts such as the precipitationshed might function as an analytical boundary object (Molle, 2008). As the precipitationshed shows many similarities to the traditional watershed, this might contribute to a broader legitimatization of the global hydrological cycle discourse. Furthermore, a functional framing of green and atmospheric water creates opportunities for making visible tradeoffs across dilemmas on land use decisions.

However, drawing on discursive dynamics literature, several reservations and risks related to discursive lock-in and bias are in place.

First, whereas the bridging elements to existing discourses allow for the GCEW narrative to be attractive to existing discursive practices, the risk exists that the narrative converges to be only a marginally different narrative. This is described by Simoens et al. (2023) as co-optation. As such, by aligning with dominant economic-technocratic ideas, the risk emerges that only incremental change is put forward (Simoens et al., 2023).

Moreover, referring to what Simoens et al. (2023) describe as discursive lock-in due to incumbents' strong discursive agency, the GCEW storyline origins and institutional backing in the Global North risk reproducing North-South oppositions. This is particularly significant given that historical climate policymaking has largely been driven by Global North interests and priorities, often sidelining the perspectives and needs of the Global South. As a result, the origins of the GCEW in the global North risks perpetuating power imbalances in global green and atmospheric water

governance.

Furthermore, acknowledging existing power dynamics and polarized discourse networks in the policy arenas of land use on the regional level, there is a risk of powerful decisionmakers to gather at the technocratic-economic side of the emerging discourse network (Starke et al., 2023). Consequently, in the absence of alternative discourse coalitions which explicitly address green and atmospheric water, the risk of policymakers facing a bias in regarded policy solutions emerges (Starke et al., 2023).

Following these risks, further politization (Starke et al., 2023) of green and atmospheric water governance on all levels is necessary to prevent discursive lock-in of the GCEW narrative. To this end, Simoens et al. (2023) describe several pathways, of which one is cross-sectoral discursive change. This pathway encompasses deliberative learning processes between socio-technical systems (Simoens et al., 2023; Buschmann & Oels., 2019). In the context of green and atmospheric water governance, this is particularly relevant due to the highly interconnected nature of the involved socio-technical systems. Furthermore, to prevent the GCEW storyline becoming one-sided in its presented solution space, it is critical that the hydrological commons storyline consciously cultivates plurality beyond stakeholder inclusiveness (Starke et al., 2023).

5.3.2. Dynamic discursive space of Amazonian environmental policy arena and implications for green and atmospheric water

Considering the strong relationships between land use and terrestrial moisture recycling processes in the Amazon, the dynamic discursive space related to the environmental and land use policy arena in the Amazon is relevant to consider when understanding frames of green and atmospheric water. A (hegemonic) sustainable development discourse, environmentalist discourse and Indigenous rights discourse and their dynamics within and between discourses affect (re)framing of green and atmospheric water.

In line with observations made on the sustainable development discourse in the water policy arena, many climate change related referrals are observed, to which green and atmospheric water is implicitly connected.

Sustainable development

As also observed within the water policy arena, a sustainable development discourse is hegemonic. This discourse, as within the water governance arena, generally places more emphasis on development in combination with nature conservation efforts. In the water policy arena, the hegemony of a sustainable development discourse shapes green and atmospheric water frames mainly through IWRM and water security goals. In the environmental policy arena, it does so through environmental and land-use policies. The influence of (traditional) sustainable development discourse on land use policies in the Amazon region is widely described in existing literature, and has historically enabled actors to justify regional development initiatives over the cost of deforestation (see e.g. Pokorny et al., 2021). Existing literature has already called for the opening up of the sustainable development discourse. Green and atmospheric water might facilitate this process through functional and metaphorical frames.

Indeed, among UN-system actors at the global level as well as the Science Panel for the Amazon, the use of functional and metaphorical frames of green and atmospheric water is observed to highlight the importance of the Amazon rainforest in a beyond-local and regional way. The metaphor of a

"flying" river is used to highlight the role of forests in water supply related to SDG goals and argue in favor of forest management.

Yet, the use of such framings remains limited to those actors. Traditional sectoral storylines primarily refer to green and atmospheric water in a technocratic, solutionist frame as a local response to climatic challenges. For example, within the agricultural storyline in which agriculture is positioned as critical for food security and economic development and threatened by climate change impacts, Innovations in regenerative agriculture (e.g., cover crops, reduced tillage) which increase soil moisture retention are promoted as a means to "*maximize water use efficiency"* and improve conditions in "*water stressed areas"* (ADM, 2023a; Cargill, 2025b).

Tipping points, Indigenous rights, and discursive dynamics

A environmentalist / tipping point discourse and indigenous rights discourse compete with the dominant sustainable development discourse.

The core storyline within the environmentalist / tipping point discourse argues for a complete and urgent halt to deforestation within the Amazon rainforest. Often, the threat of the Amazon reaching a "tipping point" is used to stress the urgency for anti-deforestation policies. Green and atmospheric water are mostly referred to in relation to the tipping point. Interestingly, similar functional and metaphorical framings are observed to be used compared to the sustainable development discourse (UN- system). Yet, a notable difference lies in the sense of urgency and emphasis on conservation and reforestation rather than sustainable development.

The indigenous rights discourse observed also challenges traditional economic and sectoral discourses and urges for the recognition of Indigenous rights, knowledge systems, and territories. This discourse is primarily observed at the Indigenous People's organizations analyzed (COICA, APIB). The storyline describes how state-granted concessions to extractive industries (e.g., oil, beef, soy, mining) threaten Indigenous territories, often without free, prior, and informed consent.

Notably, a discourse coalition under the movement of "Amazonia 80x25" is observed, consisting of Indigenous organizations, environmental advocacy organizations and academia. Within this coalition, environmentalist and Indigenous rights storylines have been integrated into a new storyline. This storyline underscores the urgency of the Amazon being in the midst of a tipping point and highlights the role of Indigenous peoples and territories as Indigenous stewards of nature conservation.

From a dynamic discourse coalition perspective (Metze & Dodge, 2016; see chapter 2), the emergence of this discourse in 2021 might be understood as the coordinating efforts of COICA, through discursive boundary work using the tipping point as an analytical boundary object, which has resulted in the integration of the two storylines. The success of the coalition confirms the perspectives obtained from the network analysis, in which COICA is suggested as a possible broker. This underscores the added value of the multi-disciplinary, multi-method approach adopted in this research.

Discursive conditions for green and atmospheric water governance within the environmental policy arena

Yet, whereas green and atmospheric water was observed to be explicitly framed within the environmentalist discourse, such explicit framings were not observed within the integrated storyline of the "80x25" movement (as it was observed within the 2021 flagship report). It seems to be the case that, during the integration process of both storylines, only those elements that facilitated the coalition-building (respectively, tipping point on the one hand and the indigenous rights on the other), have survived the integration. For green and atmospheric water to remain its discursive traction within the environmental policy arena, discursive lock-in (Simoens et al., 2023) of the "80x25" storyline should be prevented by actively opening up and differentiating the storyline to create variations in which green and atmospheric water are highlighted.

In using such variations, this might also facilitate coordination efforts towards the traditional sustainable development storylines. As the "flying" river metaphor is observed across both sustainable development and environmentalist storylines, it might serve as a boundary concept in depolarizing existing deliberations on land use policy within the Amazon.

Moreover, the metaphor lends itself to not only be used as a boundary concept within the Amazon Basin, but also beyond basin borders. This is already happening. For example, at the 2023 Summit of the Three Basins, the metaphor of "rivers in the sky" was extended symbolically to describe global cooperation:

> "*Carlos Nobre's research in the Amazon talks about rivers in the sky... The South-South cooperation you are building is also creating rivers in the sky: rivers that carry hope, not water—across basins, across nations and across continents.*" (UNEP, 2023; speech delivered by Inger Andersen at the Summit of the Three Basins).

To this end, the OAS could leverage its broker position to facilitate coordination on green and atmospheric water between the Amazon and Plata basins.

Furthermore, storyline differentiation to include green and atmospheric water would also strengthen the durability of the 80x25 discourse beyond its initial goal of protecting 80% of the Amazon. What happens once that goal is reached and the immediate tipping-point threat subsides? By incorporating green and atmospheric water into beyond–tipping point narratives, the storyline can anchor a longer-term vision in which water supply remains a constant necessity, regardless of whether the tipping point has been averted.

Beyond the discursive potential of the flying river metaphor to function as a boundary concept across discourses, the metaphor might even develop in what Hajer (2006) describes as an emblematic issue. Referring to Burke (1969) and Lakoff & Johnson (1980), Hajer (2006) underlines the role of metaphors in discourse analysis. In his famous exploration of acid rain, Hajer (2006) describes how the metaphor of acid rain influenced the policy processes and solution spaces within environmental governance. The flying river metaphor shows similar potential in serving a

transforming role in the broader discussion on Earth System governance. Nevertheless, current use of the metaphor is still in its infancy and future research should explore the actual influence of the flying river metaphor on policy processes.

There are also risks to the use of the flying river metaphor. Above all, terrestrial moisture recycling is a complex, dynamic process influenced by many variables and subject to deep uncertainty. A framing of atmospheric moisture flows as rivers would oversimplify these processes. Consequently, such a frame might give a false impression that these flying rivers are easily managed. Furthermore, the referral to rivers implies a tangible, bounded resource that can be allocated, owned or captured. This might spark inappropriate regulatory or market-based approaches that don't match the physical reality.

5.4. Policy, institutional and discursive conditions for green and atmospheric water governance in South America

Adopting a green and atmospheric water governance perspective brings to light existing and new policy arenas between moisture sources and sinks respectively on the intra-state level (within countries, such as Brazil), intra-basin level (within the Amazon basin), inter-basin / inter-state level (between the Amazon and Plata basins), and global level.

Policy conditions

Across all arenas, the policy debate surrounding green and atmospheric water governance is still underdeveloped. Drawing upon Kingdon's (1984/1995) multiple streams interpretation of the policy process, a window of opportunity for policymaking emerges when a problem stream, solution stream, and political stream meet each other.

Within the global water governance arena, it is observed how the Global Commission on the Economics of Water (GCEW) acts as a policy entrepreneur for the explicit governance of green and atmospheric water flows. Convened in 2022 by the Government of the Netherlands and the OECD, the Global Commission on the Economics of Water (GCEW) aim is to redefine the way water is valued and governed, taking a stable hydrological cycle – a global common good – as a starting point. In 2024, the Commission's initial two year's mandate was concluded with a final report 'The Economics of Water: Valuing the Hydrological Cycle as a Global Common Good' (GCEW, 2024a). The report adopts an economic perspective and builds on Stern Review on the Economics of Climate Change and Dasgupta Review on the Economics of Biodiversity (GCEW, 2024a).

However, such a policy entrepreneur has not been observed within regional arenas. This creates room for actors to steer the policy making process on the regional level towards their desired solution space. For example, the 80x25 coalition might present green and atmospheric water governance as a problem, together with a solution in the form of Indigenous land rights. Yet, the current political landscape should align to open up the debate on green and atmospheric water governance. The recent introduction of green and atmospheric water governance by the GCEW on the global level might contribute to political readiness on the regional level, under the condition that it distances itself enough from the global North. Furthermore, the recent climate shocks across South America might serve as an external shock to increase political readiness.

Whereas on the intra-state level and intra-basin level, decision arenas are already institutionally embedded, this is less the case on the inter-basin level. ACTO and CIC do uphold a Framework Agreement for Cooperation, but no formal decision and information sharing space exists. Therefore, for green and atmospheric water governance between the basins, an institutionally grounded

decision arena is necessary. This could be done in the form of an inter-basin committee, or in a broader arena such as the OAS.

Once a window of opportunity has been created, for the policy process to be successful, a policy broker is needed to mediate between the different advocacy coalitions, drawing upon the Advocacy Coalition Framework (ACF). Within the inter-basin arena of Amazon basin, this role might be attributed to the Science Panel for the Amazon. Within the intra-basin arena of the Amazon and Plata basins, this role might be attributed to the OAS.

Institutional conditions
At the intra-basin level, both basins' member countries cooperate within intergovernmental basin organizations, respectively the Amazon Cooperation Treaty Organization (ACTO) and the Intergovernmental Coordinating Committee of the Countries of the Plata Basin (CIC).
Yet, institutional frameworks for current (blue) water resources management in Amazon and Plata Basin countries are primarily established through their national constitutions (ACTO, 2018, p75; CIC, 2016). This means that at the *intra-state* level, countries institutional arrangements should be in place which facilitate deliberations and decision-making on green and atmospheric water governance. In the case of Brazil, as a country with high terrestrial moisture recycling rates, its National Water Resources Council (CNRH) could function as such a space. The CNRH is a consultative and deliberative body with the mandate to, among others, formulate the National Water Resources Policy and promote the articulation of water resources planning within different governance scales (Planalto Brazil, 2024). As mandated in the decree of 2024, the Plenary session includes representatives of the various Ministries, the state and district water resources councils, representatives from water resource user sectors, and representatives from civil society organizations related to water resources (Planalto Brazil, 2024).

Furthermore, in the absence of formal water and environmental governance arrangements , this highlights the need for trust among states. Institutionally, this trust can be facilitated through boundary concepts, objects and organisations. In the Amazon basin, the Science Panel for the Amazon is a possible boundary organization. Positioned as the "knowledge bank" for the Amazon and combining both Western and Traditional / Indigenous knowledge practices, the SPA connects various coalitions. The flying river metaphor might serve as a boundary concept. Furthermore, the WMO could play a facilitating role in creating shared boundary objects between the Amazon and Plata basins, through shared data collection and mapping of atmospheric moisture flows.

Discursive conditions
Policy makers, practitioners and scholars should be aware of path dependencies resulting from dominant discourses and practices such as Integrated Water Resources Management, which only consider blue water as their resource base. Further politization (Starke et al., 2023) of green and atmospheric water governance on all levels is necessary to prevent discursive lock-in of the GCEW narrative. To this end, Simoens et al. (2023) describe several pathways, of which one is cross-sectoral discursive change. This pathway encompasses deliberative learning processes between socio-technical systems (Simoens et al., 2023; Buschmann & Oels., 2019). In the context of green and atmospheric water governance, this is particularly relevant due to the highly interconnected nature of the involved socio-technical systems. Furthermore, to prevent the GCEW storyline becoming one-sided in its presented solution space, it is critical that the hydrological commons storyline consciously cultivates plurality beyond stakeholder inclusiveness (Starke et al., 2023).

For green and atmospheric water to remain its discursive traction within the environmental policy

arena, discursive lock-in (Simoens et al., 2023) of the “80x25” storyline should be prevented by actively opening up and differentiating the storyline to create variations in which green and atmospheric water are highlighted.

In using such variations, this might also facilitate coordination efforts towards the traditional sustainable development storylines. As the “flying” river metaphor is observed across both sustainable development and environmentalist storylines, it might serve as a boundary concept in depolarizing existing deliberations on land use policy within the Amazon. Yet, there are also risks to its use and one should be cautious to remain from oversimplifying terrestrial moisture recycling processes. Furthermore, the widespread problematization of droughts and floods creates discursive space for green and atmospheric water governance. A climatization of green and atmospheric water could be beneficial given the established recognition of climate change, institutionalized through UNFCCC, and the Paris Agreement. Moreover, an embeddedness within climate change policy would also allow additional funding mechanisms, for example through the GCF. Yet, there are also risks. Climate policy deliberations are volatile which could affect stability for green and atmospheric water governance and a (perceived) distance to climate change could lead to lower levers of public engagement.

5.5. Positioning within existing literature

This research confirms existing literature on green and atmospheric water and environmental governance in South America. The notable absence of green and atmospheric water across water and environmental policy arenas in South America confirms existing literature (e.g. Te Wierik et al., 2021; Te Wierik et al., 2019; Keys et al., 2017). The overall multiplicity of discourses observed within water policy arenas is widely acknowledged within existing literature (e.g. Salamé et al., 2021; Gerlak, 2015) . Given the complex and wicked characteristics of water and environmental governance, such policy domains are never shaped by a single narrative or discourse, and the rise of one discourse invites new deliberations, often characterized by a gradual and incomplete process (Gerlak, 2015). The hegemony of the sustainable development goals across water and environmental policy arenas are also in line with earlier observations on the hegemony of IWRM within water governance (see e.g. Salamé et al., 2021; Mukhtarov & Cherp, 2014) and the influence of (traditional) sustainable development discourse on land use policies in the Amazon region (see e.g. Pokorny et al., 2021). Notably, existing literature also reports the emergence of the Source to Sea (S2S) approach (see e.g. Michels-Brito et al., 2023; Weinberg et al., 2021; Kroepsch et al., 2021). Whereas this concept was indeed observed at key global level actors, such as the Global Environment Facility, this observation was not evident at the regional level. A possible reason for this absence might be the slightly outdated policy documents examined. Further research could explore how the evolving concept of a S2S approach affects green and atmospheric water frames.

Furthermore, this research extends the existing literature on green and atmospheric water in the following ways. First, this research contributes to existing gaps in the literature on case-specific research on green and atmospheric water governance. Moreover, this research contributes to the existing green and atmospheric water governance literature by adopting a fresh perspective on the discursive implications of hegemonic sustainability discourses and their dynamics with competing storylines on the framing of green and atmospheric water.

In a broader sense, this research also contributes to the existing body of literature on global water and environmental governance discourses by unpacking the emerging storyline introduced by the Global Commission on the Economics of Water (GCEW). Additionally, through adopting a dynamic discourse coalition approach (Metze & Dodge, 2016), this research contributes to the existing body of literature on environmental governance discourses in the Amazon region by observing the emergence of the "80x25" discourse coalition through integration of environmentalist and Indigenous rights storylines.

5.6. Policy implications

The findings of this thesis have several policy implications.
First, further politicization of green and atmospheric water governance is necessary at all levels to prevent discursive lock-in around the storyline presented of the Global Commission on the Economics of Water (GCEW). To this end, the GCEW is encouraged to design deliberative learning processes that enable exchange between different arenas.

For green and atmospheric water governance to take shape in the Amazon Basin, increased political readiness and a policy entrepreneur is necessary. To increase political readiness, visibility of green and atmospheric water as a policy problem should become more visible at the global level. UN Water could facilitate this by positioning green and atmospheric water as a central theme for World Water Day and its related World Water Development Reports, alongside thematic analytical policy briefs. Moreover, it is recommended that the GCEW engages with the "80x25" coalition as a potential policy entrepreneur. The coalition is supported by the COICA, environmental advocacy organizations such as the International Union for the Conservation of Nature (IUCN), Conservation International (CI), the Nature Conservancy (TNC), as well as the Science Panel for the Amazon (SPA). The "80x25" coalition, or any other policy entrepreneur, could make use the "flying rivers" metaphor to connect multiple problem streams and raise awareness of atmospheric water's significance across sectors. Furthermore, the Science Panel for the Amazon (SPA) could act as a policy and information broker between competing advocacy coalitions.

Furthermore, it is recommended that ACTO creates an inter-program commission on green and atmospheric water flows, in which its Forest Program and Strategic Action Plan for Integrated Water Resources Management are revisited to account for green and atmospheric water flows. The Belém Declaration might serve as an entry point for this, considering that it reestablishes basin countries' willingness to cooperate on a new common agenda in the Amazon.

For green and atmospheric water governance to take shape between the Amazon and Plata basins, ACTO and CIC should first negotiate inter-basin agreements. To this end, an inter-basin commission should be established to facilitate deliberative learning processes on green and atmospheric water. The commission should include ACTO and CIC representatives (member states) related to water and environmental (land use) policy, alongside knowledge institutions from multiple disciplines (including, amongst others, complex system sciences; hydrology; social sciences; law; and economics). It should also involve representatives of environmental advocacy organizations, Indigenous peoples and traditional community organizations, as well as industry representatives (agriculture, extractive industries, hydro-energy). Furthermore, ACTO, CIC, and the WMO are encouraged to implement a shared monitoring and information system on green and atmospheric

water flows. The Organization of American States (OAS) could play a facilitating role in these processes.

At present, no international funding mechanisms exist to support such negotiations and subsequent policy-making. Therefore, it is recommended that the Global Environment Facility (GEF) extend the mandate of its International Waters (IW) focal area to include green and atmospheric water flows as transboundary water resources.

5.7. Research limitations and future research recommendations

5.7.1. Research limitations

First and foremost, the exploratory and interpretive nature of this research means that the identification and analysis of relevant actors, network relations, and discursive patterns inevitably involve an element of subjectivity. While I have been actively aware of potential cognitive biases throughout the process, a similar analysis conducted by a different researcher with a different lived reality might yield different outcomes, conclusions, and policy implications.

Furthermore, the analysis presents only a static snapshot of actors, their objectives, resources, network relations, discourses and frames of green and atmospheric water. In reality, these elements change over time (see e.g. Enserink et al., 2022). The results presented here may therefore not hold in the future. Moreover, because the analysis does not capture long-term dynamics, it misses a nuanced understanding of when, why, and how changes occur. Such an analysis would be useful to anticipate and deal with future situations.

Third, it is unfortunate that this research did not include interview inputs. Without interviews, informal perspectives, framings, and lived experiences of key stakeholders could not be captured. This limits the ability to validate interpretations drawn from textual data. Including interviews in future research would add depth and strengthen the analysis by providing insights into how actors perceive and negotiate green and atmospheric water governance in practice.

The social network analysis was based on publicly available textual data, such as policy documents and actor websites. This approach likely excluded informal relations and ad hoc coalitions that are not documented online. The analysis was also open-boundary, which allowed for a broader perspective but introduced the risk of omitting relevant actors or including peripheral ones, potentially misrepresenting the network structure (see e.g. Enserink et al., 2022). At the same time, this reflects the fragmented and cross-sectoral nature of green and atmospheric water governance.

The framing analysis consisted of a quantitative analysis and a qualitative analysis, following a discursive approach. As for the quantitative analysis, the search strategy in Atlas.ti presents some limitations. By only considering those paragraphs in which freshwater was used, frames of green and atmospheric water beyond the policy theme of freshwater were not necessarily included. Moreover, standardized search terms may not have captured implicit or nuanced framings, particularly among actors communicating in culturally specific or coded ways. Future research could apply topic modelling to uncover implicit and nuanced framings of green and atmospheric water that may not surface through predefined search terms. This approach would allow the analysis to move beyond freshwater-related contexts and reveal culturally specific or coded ways in which actors communicate about water.

The qualitative framing analysis in this research primarily adopted a discourse approach. Yet, there are many different approaches to framing which adopt different lenses (Dodge & Metze, 2024). For example, a contestation approach to framing takes the competition between actors in a policy contest as a lens for what frames are used and how they influence policy stasis(Dodge & Metze, 2024). Adopting such a lens would have yielded other insights. Future research could usefully adopt different approaches to framing analysis, either individually or combined, to explore different dimensions and create a more comprehensive understanding of green and atmospheric water frames.

Moreover, the framing analysis only relied on written text and did not evaluate the use of visual content such as images or infographics. Yet, visualizations and the processes through which they emerge are recognized to be powerful in shaping science-policy-society interactions (see e.g. Van Beek et al., 2020). Including such visualizations might have resulted in different interpretations. This would be a fruitful area for further work.

5.7.2. Future research directions

While the present study provides valuable insights into the presence and framing of green and atmospheric water in the context of water and environmental policy arenas within South America, further research is needed to address the notable limitations discussed earlier. Future research should incorporate other data sources including interviews and visual content. Moreover, longitudinal research is needed to facilitate a better understanding as to how the discursive framings of green and atmospheric water have changed over time. Future research could usefully adopt different approaches to framing analysis, either individually or combined, to explore different dimensions and create a more comprehensive understanding of green and atmospheric water frames.

The frames of green and atmospheric water studied in this research were primarily situated within the context of the Amazon rainforest. Yet, an increasing body of research recognises the importance of terrestrial moisture recycling processes and land use dynamics within other ecological contexts such as wetlands and semi-arid regions. An interesting future research direction would be to identify and compare frames of green and atmospheric water across different ecological contexts. Similarly, future research could analyse frames of green and atmospheric water across different socio-economic contexts.

Beyond these directions, I suggest the following research agenda to guide future stages of the policy process. First, more work is needed to understand how storylines such as the GCEW's are endorsed or contested by regional and local actors and stakeholders. Moreover, a relevant research direction in this regard would be it would be to understand how actor's system perceptions contribute to their understandings and positions of green and atmospheric water. Comparative Cognitive Mapping (CCM) allows for systematic comparison of actor's cognitive maps and can reveal different perspectives on complex problems to explain reasons for action and inaction (Cunningham & Hermans, 2018).

Furthermore, an interesting future research alley would be to develop boundary objects for green and atmospheric water governance to facilitate acting under diverging interests and incomplete knowledge (Molle, 2008). One possible direction in this regard is to model the different arenas identified in this research as moisture-recycling social-ecological systems (MRSESs) (Keys & Wang-

Erlandsson, 2018). Consequently, a rival problem framing approach (Quinn et al., 2017) could be used to make visible the trade-offs of land use policies with regard to green and atmospheric water flows. Such an approach would not only enhance dialogue across competing perspectives but also provide decision-makers with a more plural and transparent basis for policy deliberation. The different frames identified in this study could serve as an entry point for the construction of such rival problem frames.

Another possible direction for creating boundary objects is found in adopting a participatory multi-modelling approach. Participatory multi-modelling, as a participatory boundary object itself, facilitates social learning and dialogue (Cuppen et al., 2020). Earlier studies have shown the value of such an approach in creating a boundary object ecology (Cuppen et al., 2020). A boundary object ecology connects multiple (co-evolving) boundary objects which connect different social worlds (Cuppen et al., 2020). Especially for green and atmospheric water governance, such an approach could be useful in connecting the many different disciplines and social domains to which green and atmospheric water relate.

5.8. Conclusions

To conclude, this thesis explored the policy, institutional, and discursive conditions for green and atmospheric water governance in the Amazon and Plata basins. It demonstrates that understanding terrestrial moisture recycling and its role in sustaining rainfall requires multi-disciplinary research beyond technical governance dimensions. Framing green and atmospheric water as a policy problem creates cross-sectoral arenas at intra-state, intra-basin, inter-basin, and global levels. Amidst diverging interests and discursive backgrounds, green and atmospheric water might contribute to introducing new pathways for cooperation.

References

Acosta, P., Hurtado, J.D.A., Bonnel, H., & Bracklo, A. (2024). Blue and green water: why they affect us all. Polytechnique Insights. https://www.polytechnique-insights.com/en/columns/planet/blue-and-green-water-why-both-are-important-to-achieve-a-global-water-pact/

ADM. (2023). *Scaling Impact: 2023 Corporate Sustainability Report.* ADM. Retrieved from https://www.adm.com/globalassets/sustainability/sustainability-reports/final_archer-daniels-midland-adm_2023-corporate-sustainability-report_51424.pdf

ADM. (2025). ADM South America. ADM. Retrieved from https://www.adm.com/en-us/about-adm/locations/south-america/

Agência Nacional de Águas e Saneamento Básico (ANA). (2025a). *National Water and Sanitation Agency*. Government of Brazil. Retrieved from https://www.gov.br/ana/en

Amazon Cooperation Treaty Organization (ACTO). (2018). *Strategic Action Program: Regional Strategy for Integrated Water Resources Management in the Amazon Basin.* ACTO. Retrieved from https://otca.org/en/wp-content/uploads/2021/01/Strategic-Action-Program-SAP.pdf

Amazon Cooperation Treaty Organization (ACTO). (2021). *Framework Agreement between ACTO and CIC-Plata will allow strategic actions for the management of water resources in the Plata and Amazon Basins.* ACTO. Retrieved from https://otca.org/en/framework-agreement-between-acto-and-cic-plata-will-allow-strategic-actions-for-the-management-of-water-resources-in-the-plata-and-amazon-basins/

Amazon Cooperation Treaty Organization (ACTO). (2023a). *Belém Declaration.* ACTO. Retrieved from https://otca.org/en/wp-content/uploads/2023/10/Declaration-of-Belem.pdf

Amazon Cooperation Treaty Organization (ACTO). (2023b). A*mazon Network of Water Authorities (ANWA).* ACTO. Retrieved from https://otca.org/en/wp-content/uploads/2023/10/Declaration-of-Belem.pdf

Amazon Cooperation Treaty Organization (ACTO). *ACTO and the World Meteorological Organization (WMO) explore cooperation opportunities to strengthen the integrated monitoring of the Amazon's water resources.* (2023c). Retrieved from https://otca.org/en/acto-and-the-world-meteorological-organization-wmo-explore-cooperation-opportunities-to-strengthen-the-integrated-monitoring-of-the-amazons-water-resources/

ANWA., Amazon Cooperation Treaty Organization (ACTO). (2024). *Work Plan of the Amazon Network of Water Authorities (ANWA). Retrieved from* https://aguasamazonicas.otca.org/wp-content/uploads/2025/06/ANWA-Work-Plan.pdf

Amazon Cooperation Treaty Organization (ACTO). (2025a). *About us.* OTCA. Retrieved from https://otca.org/en/about-us/

Amazon Cooperation Treaty Organization (ACTO). (2025b). *Amazon Network of Water Authorities (ANWA).* OTCA. Retrieved from https://aguasamazonicas.otca.org/rada/?lang=en

Amazonia80x25. (2025a). *About*. Amazonia80x2025-2030. Retrieved from https://amazonia80x2025-2030.earth/about/

Amazonia80x25. (2025b). *COICA and the Science Panel for the Amazon join forces to promote the protection and restoration of at least 80% of Amazonia as a measure to avoid a tipping point.* Amazonia80x2025-2030. Retrieved from https://amazonia80x2025-2030.earth/coica-and-the-science-panel-for-the-amazon-join-forces-to-promote-the-protection-and-restoration-of-at-least-80-of-amazonia-as-a-measure-to-avoid-a-tipping-point/

Arnold, J. G., Moriasi, D. N., Gassman, P. W., Abbaspour, K. C., White, M. J., Srinivasan, R., Santhi, C., Harmel, R.D., Van Griensven, A., Van Liew, M.W., Kannan, N., & Jha, M. K. (2012). SWAT: Model use, calibration, and validation. *Transactions of the ASABE*, *55*(4), 1491-1508. https://doi.org/10.13031/2013.42256

Articulation of Indigenous Peoples of Brazil (APIB). (2023). *COP28: Apib cobra demarcação como principal compromisso climático e denuncia os riscos de exploração de petróleo em Terras Indígenas.* APIB. Retrieved from https://apiboficial.org/2023/12/20/cop28-apib-cobra-demarcacao-como-principal-compromisso-climatico-e-denuncia-os-riscos-de-exploracao-de-petroleo-em-terras-indigenas/

Articulation of Indigenous Peoples of Brazil (APIB). (2025a). *The Articulation of Indigenous Peoples of Brazil (APIB) is an instance of agglutination and national reference of the indigenous movement in Brazil.* APIB. Retrieved from https://apiboficial.org/sobre/?lang=en

Articulation of Indigenous Peoples of Brazil (APIB). (2025b). *No Marco Temporal.* APIB. Retrieved from https://apiboficial.org/marco-temporal/?lang=en

Articulation of Indigenous Peoples of Brazil (APIB). (2025c). *APIB launches Indigenous NDC and International Commission for COP-30.* APIB. Retrieved from https://apiboficial.org/2025/04/10/apib-launches-indigenous-ndc-and-international-commission-for-cop-30/?lang=en

Barresi Armoa, O. L., Sauvage, S., Houska, T., Bieger, K., Schürz, C., & Sánchez Pérez, J. M. (2023). Representation of Hydrological Components under a Changing Climate—A Case Study of the Uruguay River Basin Using the New Version of the Soil and Water Assessment Tool Model (SWAT+). *Water*, *15*(14), 2604. https://doi.org/10.3390/w15142604

Baumgartner, T., & Pahl-Wostl, C. (2013). UN–Water and its role in global water governance. *Ecology and Society*, *18*(3). https://www.jstor.org/stable/26269338

Bayer. (2025a). Bayer Brazil. Bayer. Retrieved from https://www.bayer.com.br/pt/unidades-brasil

Bayer. (2025b). *Water Security Builds Our Resilience to Climate Change.* Bayer. https://www.bayer.com/en/sustainability/water-stewardship

Bhandari, P. (2023, March 13). *Observer Bias | Definition, Examples, Prevention.* Scribbr. Retrieved August 12, 2025, from https://www.scribbr.com/research-bias/observer-bias/

Bogardi, J. J., Gupta, J., Nandalal, K. W., Salamé, L., van Nooijen, R. R., Kumar, N., Tingsanchali, T., Bhaduri, A., Kolechkina, A.G., & Kolechkina, A. G. (Eds.). (2021). *Handbook of water resources management: Discourses, concepts and examples*. Dordrecht: Springer.

Bots, P. W. G., van Twist, M. J. W. & van Duin, J. H. R. (2000). Automatic Pattern Detection in Stakeholder Networks. In J. F. Nunamaker & R. H. Sprague (Eds.), Proceedings HICSS-33. Los Alamitos: IEEE Press.

Bréthaut, C., Ezbakhe, F., McCracken, M., Wolf, A., & Dalton, J. (2022). Exploring discursive hydropolitics: A conceptual framework and research agenda. *International journal of water resources development*, *38*(3), 464-479. https://doi.org/10.1080/07900627.2021.1944845

Buschmann, P., & Oels, A. (2019). The overlooked role of discourse in breaking carbon lock-in: The case of the German energy transition. Wiley Interdisciplinary Reviews: Climate Change, 10(3), e574.

Burke, K. (1969). *A grammar of motives*. Prentice Hill.

Cairney, P. (2011). The Advocacy Coalition Framework (Chapter 10 of Understanding Public Policy: Theories and Issues).

Cambridge Dictionary. (n.d.). Metaphor. In Cambridge Dictionary. Retrieved from https://dictionary.cambridge.org/dictionary/english/metaphor

Cargill. (2025a). *About Cargill*. Cargill. Retrieved from https://www.cargill.com.br/en/about-cargill

Cargill. (2025b). *6 facts you should know about water use in agriculture.* Cargill. Retrieved from https://www.cargill.com/story/agriculture-water-use

Cargill. (2025c). *Water.* Cargill. Retrieved from https://www.cargill.com/sustainability/priorities/water

Christensen, G. (2023). Three concepts of power: Foucault, Bourdieu, and Habermas. *Power and Education*, *16*(2), 182-195. https://doi.org/10.1177/17577438231187129 (Original work published 2024)

CIC. (1969). *El Tratado de la Cuenca del Plata.* CIC. Retrieved from https://cicplata.org/wp-content/uploads/2016/12/tratado-de-la-cuenca-del-plata.pdf

CIC. (2021). *Framework Agreement for Cooperation between the Amazon Cooperation Treaty Organization (ACTO) and the Intergovernmentat Coordlnating Committee of the La Plata Basin Countries (CIC-Plata).* CIC. Retrieved from https://cicplata.org/wp-content/uploads/2021/12/EN_MoU-ACTO-CIC-Plata_signed13122021.pdf

CIC. (2025a). *Sistema de la Cuenca del Plata.* CIC. Retrieved from https://cicplata.org/es/sistema-de-la-cuenca-del-plata/

CIC. (2025b). *Areas de trabajo*. CIC. Retrieved from https://cicplata.org/es/areas-de-trabajo/

CIC. (n.d.). CIC. *Decision-Making Support System for the Plata Basin.* Retrieved from https://cicplata.org/es/sistema-soporte-para-la-toma-de-decisiones-de-la-cuenca-del-plata/

Climate Alliance. (2025). *Indigenous Partners.* Climate Alliance. Retrieved from https://www.climatealliance.org/indigenous-partners/coica.html

CNA Brasil. (2021). *The CNA system.* CNA. Retrieved from https://www.cnabrasil.org.br/cna/institucional-cna

CNA Brasil. (2025a). *The environment.* CNA. Retrieved from https://www.cnabrasil.org.br/areas-de-atuacao/meio-ambiente

CNA Brasil. (2025b). *Irrigation.* CNA. Retrieved from https://www.cnabrasil.org.br/areas-de-atuacao/irrigacao

CNA Brasil. (2025c). *International Relations.* CNA. Retrieved from https://www.cnabrasil.org.br/areas-de-atuacao/relacoes-internacionais

Cohen, M. D., March, J. G. & Olsen, J. P. (1972). A Garbage Can Model of Organizational Choice. Administrative Science Quarterly, 17(1), 1-25. https://doi.org/10.2307/2392088.

Coleman, J. S. (1990). Foundations of Social Theory. Cambridge: Harvard University Press.

Conservation International (CI). n.d.). *Amazonia*. Retrieved from https://www.conservation.org/places/amazonia

Conservation International (CI). (2025a). *About*. Conservation. Retrieved from https://www.conservation.org/about

Conservation International (CI). (2025b). *Working with governments*. Conservation. Retrieved from https://www.conservation.org/priorities/working-with-governments

Conservation International (CI). (2025c). *ASL Brasil: Projeto Paisagens Sustentáveis da Amazônia*. Conservation. Retrieved from https://www.conservation.org/brasil/iniciativas-atuais/paisagens-sustentaveis-da-amazonia

Coordination of Indigenous Organizations of the Brazilian Amazon (COIAB). (2025a). *Unite to Organize, Strengthen to Conquer.* COIAB. Retrieved from https://coiab.org.br/a-coiab/nossa-luta/

Coordination of Indigenous Organizations of the Brazilian Amazon (COIAB). (2025b). *Projects.* COIAB. Retrieved from https://coiab.org.br/gerencias/projetos/

Coordination of Indigenous Organizations of the Brazilian Amazon (COIAB). (2025c). *There is no solution to the climate crisis without us!* COIAB. Retrieved from https://coiab.org.br/mobilizacoes/clima/

Cunningham, S., & Hermans, L. (2018). Capturing problem perceptions: Comparative cognitive mapping. In Hermans, L., Cunningham, S., de Reuver, M., & Timmermans, J., *Actor and Strategy Models: Practical Applications and Step-wise Approaches*. Wiley.

https://doi.org/10.1002/9781119284772.ch9

Cuppen, E., Nikolic, I., Kwakkel, J., & Quist, J. (2020). Participatory multi-modelling as the creation of a boundary object ecology: the case of future energy infrastructures in the Rotterdam Port Industrial Cluster. Sustainability Science, 16(3), 901-918. https://doi.org/10.1007/s11625-020-00873-z

De Bruijn, H. & Porter, A. L. (2004). The Education of a Technology Policy Analyst – to Process Management. Technology Analysis & Strategic Management, 16(2), 261-274. https://doi.org/10.1080/09537320410001682919.

Dell'Angelo, J., Rulli, M. C., & D'Odorico, P. (2018). The Global Water Grabbing Syndrome. *Ecological Economics*, *143*, 276–285. https://doi.org/10.1016/j.ecolecon.2017.06.033

Dellapenna, J. W., & Gupta, J. (2009). *The evolution of the law and politics of water* (Vol. 29). Dordrecht: Springer. https://doi.org/10.1007/978-1-4020-9867-3

Dodge, J., Metze, T. Approaches to policy framing: deepening a conversation across perspectives. *Policy Sci* **57**, 221–256 (2024). https://doi.org/10.1007/s11077-024-09534-9

Douglas, M. & Wildavsky, A. (1982). Risk and Culture: An Essay on the Selection of Technical and Environmental Dangers. Berkeley: University of California Press

Dryzek, J. S. (1997). The politics of the earth: Environmental discourses. Oxford University Press.

Empresa Brasil de Communicacao (EBC). (2004). *Brazil signs accord to ensure fresh water quality.* ECB. Retrieved from https://memoria.ebc.com.br/agenciabrasil/noticia/2004-08-30/brazil-signs-accord-ensure-fresh-water-quality

Enciso, A. M., Baquero, O. L., Escobar-Carbonari, D., Tapasco, J., & Cerón, W. L. (2022). Variability of precipitation recycling and moisture sources over the Colombian pacific region: A precipitationshed approach. *Atmosphere*, *13*(8), 1202. https://doi.org/10.3390/atmos13081202

Enserink, B., Bots, P. W. G., van Daalen, C., Hermans, L. M., Kortmann, L. J., Koppenjan, J., Kwakkel, J. H., Ruijgh-van der Ploeg, M. P. M., Slinger, J., & Thissen, W. A. H. (2022). *Policy Analysis of Multi-Actor Systems*. (2nd edition ed.) TU Delft OPEN Publishing. https://doi.org/10.5074/T.2022.004

Entman, R. M. 1993. "Framing: Toward Clarification of a Fractured Paradigm." *Journal of Communication* 43 (4): 51–58.

Falkenmark, M., & Rockström, J. (2004). *Balancing water for humans and nature: the new approach in ecohydrology*. Routledge.

Falkenmark, M., & Rockström, J. (2006). The new blue and green water paradigm: Breaking new ground for water resources planning and management. *Journal of water resources planning and management*, *132*(3), 129-132. https://doi.org/10.1061/(ASCE)0733-9496(2006)132:3(129)

Falkenmark, M., & Rockström, J. (2010). Building water resilience in the face of global change: From a blue-only to a green-blue water approach to land-water management. *Journal of Water Resources Planning and Management*, *136*(6), 606-610. https://doi.org/10.1061/(ASCE)WR.1943-5452.0000118

Feng, C., Yang, L., Luo, M., & Liu, Q. (2023). A framework of payments for water-related ecosystem services (PWES) based on green water management. *Journal of Cleaner Production*, *425*, 138930. https://doi.org/10.1016/j.jclepro.2023.138930

Food and Agriculture Organization of the United Nations (FAO). (2019). *Flying Rivers – how forests affect water availability downwind and not just downstream.* FAO. Retrieved from https://www.fao.org/in-action/forest-and-water-programme/news/news-detail/en/c/1190278/

FAO. 2020. Unpacking water tenure for improved food security and sustainable development. Land and Water Discussion Papers. Rome. https://doi.org/10.4060/cb1230en

Food and Agriculture Organization of the United Nations (FAO). (2025a). *About FAO*. FAO. Retrieved from https://www.fao.org/about/about-fao/en/

Food and Agriculture Organization of the United Nations (FAO). (2025b). *Promoting coherence and coordination on land and water.* FAO. Retrieved from https://www.fao.org/land-water/overview/en/

Frente Parlamentar da Agropecuaria (FPA). (2025). *História da FPA.* FPA. Retrieved from https://fpagropecuaria.org.br/historia-da-fpa/

Gamper, M. (2022). Social network theories: An overview. *Social networks and health inequalities*, *1*(1), 35-48. https://doi.org/10.1007/978-3-030-97722-1_3

Garcia, X., Estrada, L., Saló, J., & Acuña, V. (2024). Blueing green water from forests as strategy to cope with climate change in water scarce regions: The case of the Catalan river basin District. *Journal of Environmental Management*, *353*, 120249. https://doi.org/10.1016/j.jenvman.2024.120249

Global Commission on the Economics of Water (GCEW). (2024). The economics of water: Valueing the hydrological cycle as a global common good. Economics of Water. https://economicsofwater.watercommission.org/report/economics-of-water.pdf

Global Commission on the Economics of Water (GCEW). (2025a). *About us.* Water Commission. Retrieved from https://watercommission.org/about/

Global Commission on the Economics of Water (GCEW). (2025b). *IWMI to host Secretariat of the Global Commission on the Economics of Water.* Water Commission. Retrieved from https://watercommission.org/news/iwmi-to-host-secretariat-of-the-global-commission-on-the-economics-of-water/

Global Environment Facility (GEF). (2020). *TDA/SAP Methodology.* IW Learn. Retrieved from

https://www.iwlearn.net/manuals/tda-sap-methodology
Global Environment Facility (GEF). (2025a). *Organization.* GEF. Retrieved from https://www.thegef.org/who-we-are/organization
Global Environment Facility (GEF). (2025b). *Great Green Wall Initiative.* GEF. Retrieved from https://www.thegef.org/what-we-do/topics/great-green-wall-initiative
Global Environment Facility (GEF). (2025c). *Freshwater.* GEF. Retrieved from https://www.thegef.org/what-we-do/topics/international-waters/freshwater
Global Environment Facility (GEF). (2025d). *Amazon* GEF. Retrieved from https://www.thegef.org/what-we-do/topics/amazon

Global Water Partnership (GWP). (2025a). *What is the network?* GWP. Retrieved from https://www.gwp.org/en/About/who/What-is-the-network/
Global Water Partnership (GWP). (2025b). *Strategy, Workplans, Progress Reviews.* GWP. Retrieved from https://www.gwp.org/en/About/how/Strategy_Workplans_Progress_Reviews/

Granovetter, M. S. (1973). The strength of weak ties. *American journal of sociology*, *78*(6), 1360-1380. https://www.jstor.org/stable/27763921380. https://www.jstor.org/stable/2776392
Green Climate Fund (GCF). (2025a). *Home.* GCF. Retrieved from https://www.greenclimate.fund/
Green Climate Fund (GCF). (2025b). *Areas of work.* GCF. Retrieved from https://www.greenclimate.fund/themes-result-areas
Green, J.K., Seneviratne, S.I., Berg, A.M. *et al.* Large influence of soil moisture on long-term terrestrial carbon uptake. *Nature* **565**, 476–479 (2019). https://doi.org/10.1038/s41586-018-0848-x

Group on Earth Observations (GEO). (2025). *Our Mission*. Earth Observations. Retrieved from https://earthobservations.org/about-us/our-mission
Guo, Z., Feng, C., Yang, L., & Liu, Q. (2024). Bridging the gap: An interpretable coupled model (SWAT-ELM-SHAP) for blue-green water simulation in data-scarce basins. *Agricultural Water Management*, *306*, 109157. https://doi.org/10.1016/j.agwat.2024.109157

Hajer, M. (1995) The Politics of Environmental Discourse: Ecological Modernization and the Policy Process. Clarendon Press, Oxford.
Hajer, M. A. (2002). Discourse coalitions and the institutionalization of practice. In *The Argumentative Turn in Policy Analysis and Planning* (pp. 51-84). Routledge.
Hajer, M. A. (2006). Doing discourse analysis: coalitions, practices, meaning. In *Words matter in policy and planning: Discourse theory and method in the social sciences* (pp. 65-74). Koninklijk Nederlands Aardrijkskundig Genootschap. https://hdl.handle.net/11245/1.289572

Hao, Y., Mao, J., Bachmann, C.M. *et al.* Soil moisture controls over carbon sequestration and greenhouse gas emissions: a review. *npj Clim Atmos Sci* **8**, 16 (2025). https://doi.org/10.1038/s41612-024-00888-8

Hermans, L., Cunningham, S., de Reuver, M., & Timmermans, J. (2018). *Actor and Strategy Models: Practical Applications and Step-wise Approaches*.Wiley. https://www.wiley.com/en-nl/Actor+and+Strategy+Models:+Practical+Applications+and+Step+wise+Approaches-p-9781119284703

Hussein, H. (2017). Whose 'reality'? Discourses and hydropolitics along the Yarmouk River. *Contemporary Levant*, *2*(2), 103-115. https://doi.org/10.1080/20581831.2017.1379493

IBM. 2023. IBM SPSS Statistics 29 Documentation. https://www.ibm.com/support/pages/node/6607043#en

IBRAM Brazilian Mining. (2024). *For a critical and strategic minerals policy for brazil and the future: Fundamentals and guidelines.* IBRAM. Retrieved from https://ibram.org.br/wp-content/uploads/2024/11/IBRAM_Politica-MCE_Fundamentos-e-diretrizes_ING.pdf
IBRAM Brazilian Mining. (2025). About IBRAM. IBRAM. Retrieved from https://ibram.org.br/en/about-ibram/
Instituto Nacional do Semiárido (INSA) (2025). *Comissão Nacional de Combate à Desertificação (CNCD) será lançada em Brasília*. Government of Brazil. Retrieved from https://www.gov.br/insa/pt-br/assuntos/noticias/comissao-nacional-de-combate-a-desertificacao-cncd-sera-lancada-em-brasilia
Inter-American Development Bank (IDB). (2025). *Support for the institutional and technical strengthening of CIC Plata.* IDB. https://www.iadb.org/en/project/RG-T4118
Intergovernmental Panel on Climate Change. (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability. Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar6/wg2/
International Union for Conservation of Nature and Natural Resources (IUCN). (2024). Source to Sea Platform. IUCN. Retrieved from https://waterandnature.org/all-initiatives/source-to-sea-platform/
International Union for Conservation of Nature and Natural Resources (IUCN). (2025a). *Our Union.* IUCN. Retrieved from https://iucn.org/our-union
International Union for Conservation of Nature and Natural Resources (IUCN). (2025b). *Freshwater and Water Security.* IUCN. Retrieved from https://iucn.org/our-work/freshwater-and-water-security
International Union for Conservation of Nature and Natural Resources (IUCN). (2025c). *IUCN expert Commission.* IUCN. Retrieved from https://iucn.org/our-union/expert-commissions
International Union for Conservation of Nature and Natural Resources (IUCN). (2025d). *GEF and GCF implementation*. IUCN. Retrieved from https://iucn.org/our-work/gef-and-gcf-implementation

International Union for Conservation of Nature and Natural Resources (IUCN). (2025e). *Amazonia 2.0*. IUCN. Retrieved from https://iucn.org/our-work/projects/amazonia-20
International Union for Conservation of Nature and Natural Resources (IUCN). (2025f). *Sustaining fair and effective conservation of protected and conserved areas to help secure the biodiversity conservation and climate function of the Amazon Basin*. IUCN. Retrieved from https://iucn.org/our-work/projects/sustaining-fair-and-effective-conservation-protected-and-conserved-areas-help
International Union for Conservation of Nature and Natural Resources (IUCN). (2025g). *Protected areas and land-use.* IUCN. Retrieved from https://iucn.org/our-work/protected-areas-and-land-use
International Water Management Institute (IWMI). (2025a). *Our funders.* IWMI. Retrieved from https://www.iwmi.org/about/funders/
International Water Management Institute (IWMI). (2025b). *Partnerships.* IWMI. Retrieved from https://www.iwmi.org/about/funders/
International Waters Governance. (2025). *Amazon Basin*. International Waters Governance. Retrieved from http://www.internationalwatersgovernance.com/amazon-basin.html
Jackson, S., & Head, L. (2021). The politics of evaporation and the making of atmospheric territory in Australia's Murray-Darling Basin. *Environment and Planning E: Nature and Space*, *5*(3), 1273-1295. https://doi.org/10.1177/25148486211038392
Jasechko, S., Sharp, Z., Gibson, J. *et al.* Terrestrial water fluxes dominated by transpiration. *Nature* **496**, 347–350 (2013). https://doi.org/10.1038/nature11983

Jenkins-Smith, H. C., Nohrstedt, D., Weible, C. M., & Ingold, K. (2018). The advocacy coalition framework: An overview of the research program. *Theories of the policy process*, 135-171.

Khan, N., Jhariya, M.K., Raj, A., Banerjee, A., Meena, R.S. (2021). Soil Carbon Stock and Sequestration: Implications for Climate Change Adaptation and Mitigation. In: Jhariya, M.K., Meena, R.S., Banerjee, A. (eds) Ecological Intensification of Natural Resources for Sustainable Agriculture . Springer, Singapore. https://doi.org/10.1007/978-981-33-4203-3_13

Kim, H., Rao, S.R., Kapustin, E.A. *et al.* Adsorption-based atmospheric water harvesting device for arid climates. *Nat Commun* **9**, 1191 (2018). https://doi.org/10.1038/s41467-018-03162-7

Keys, P. W., Van der Ent, R. J., Gordon, L. J., Hoff, H., Nikoli, R., & Savenije, H. H. G. (2012). Analyzing precipitationsheds to understand the vulnerability of rainfall dependent regions. *Biogeosciences*, *9*(2), 733-746. https://doi.org/10.5194/bg-9-733-2012
Keys, P. W., Barnes, E. A., Van Der Ent, R. J., & Gordon, L. J. (2014). Variability of moisture recycling using a precipitationshed framework. *Hydrology and Earth System Sciences*, *18*(10), 3937-3950. https://doi.org/10.5194/hess-18-3937-2014
Keys, P. W., Wang-Erlandsson, L., Gordon, L. J., Galaz, V., & Ebbesson, J. (2017). Approaching moisture recycling governance. *Global Environmental Change*, *45*, 15-23. https://doi.org/10.1016/j.gloenvcha.2017.04.007

Keys, P. W. and Wang-Erlandsson, L. (2018). On the social dynamics of moisture recycling, Earth Syst. Dynam., 9, 829–847, https://doi.org/10.5194/esd-9-829-2018

Keys, P. W., Porkka, M., Wang-Erlandsson, L., Fetzer, I., Gleeson, T., & Gordon, L. J. (2019). Invisible water security: Moisture recycling and water resilience. *Water Security*, *8*, 100046. https://doi.org/10.1016/j.wasec.2019.100046
Kingdon, J. W. (1984/1995). Agendas, Alternative and Public Policy. Boston: Little, Brown and Company.
Koster, R., Jouzel, J., Suozzo, R., Russell, G., Broecker, W., Rind, D., & Eagleson, P. (1986). Global sources of local precipitation as determined by the NASA/GISS GCM. Geophysical Research Letters, 13(2), 121-124.
Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago University Press.

Lal, R., Negassa, W., & Lorenz, K. (2015). Carbon sequestration in soil. *Current Opinion in Environmental Sustainability*, *15*, 79–86. https://doi.org/10.1016/j.cosust.2015.09.002

Lettau, H., Lettau, K., & Molion, L. C. B. (1979). Amazonia's hydrologic cycle and the role of atmospheric recycling in assessing deforestation effects. Monthly Weather Review, 107(3), 227-238

Maciag, R. (2018). Discursive Space and Its Consequences for Understanding Knowledge and Information. *Philosophies*, *3*(4), 34. https://doi.org/10.3390/philosophies3040034

Martinez, J. A., & Dominguez, F. (2014). Sources of Atmospheric Moisture for the La Plata River Basin. *Journal of Climate, 27,* 6737-6753. https://doi.org/10.1175/jcli-d-14-00022.1

Metze, T., & Dodge, J. (2016). Dynamic Discourse Coalitions on hydro-fracking in Europe and the United States. *Environmental Communication*, *10*(3), 365–379. https://doi.org/10.1080/17524032.2015.1133437

Metze, T. (2010). *Innovation Ltd.: Boundary work in deliberative governance in land use planning*. Delft: Eburon Academic.

Metze, T. (2014). Fracking the Debate: Frame Shifts and Boundary Work in Dutch Decision Making on Shale Gas. *Journal of Environmental Policy & Planning*, *19*(1), 35–52. https://doi.org/10.1080/1523908X.2014.941462

Michels-Brito, A., Ferreira, J.C. & Saito, C.H. Source-to-sea, integrated water resources management, and integrated coastal management approaches: integrative, complementary, or competing?. J Coast Conserv 27, 66 (2023). https://doi.org/10.1007/s11852-023-00999-z

Ministério da Integração e do Desenvolvimento Regional (MDR). (2025a). *SINGREH- Sistema Nacional de Gerenciamento de Recursos Hídricos.* Government of Brazil. Retrieved from https://www.gov.br/mdr/pt-br/assuntos/seguranca-hidrica/cnrh/sistema-nacional-de-gerenciamento-de-recursos-hidricos

Ministério da Integração e do Desenvolvimento Regional (MDR). (2025). *Apresentação- Secretaria Nacional de Segurança Hídrica- SNSH.* Government of Brazil. Retrieved from https://www.gov.br/mdr/pt-br/assuntos/seguranca-hidrica/apresentacao

Ministério das Relações Exteriores (MRE). (2024). *Amazon Cooperation Treaty Organization – ACTO.* Government of Brazil. Retrieved from https://www.gov.br/mre/en/subjects/international-mechanisms/regional-integration/amazon-cooperation-treaty-organization-acto

Ministério das Relações Exteriores (MRE). (2024). *Amazon Cooperation Treaty Organization – ACTO.* Government of Brazil. Retrieved from https://www.gov.br/mre/en/subjects/international-mechanisms/regional-integration/amazon-cooperation-treaty-organization-acto

Ministério do Meio Ambiente (MMA). (2025). *Institucional*. Government of Brazil. Retrieved from https://www.gov.br/mma/pt-br/acesso-a-informacao/institucional-quem-e-quem

Molle, F. (2008). Nirvana Concepts, Narratives and Policy Models: Insights from the Water Sector. Water Alternatives, 1(1), 131-156. https://www.water-alternatives.org/index.php/allabs/20-a-1-1-8/file

Mongabay. (2023). *Brazil Supreme Court quashes time frame proposal in win for Indigenous rights.* Mongabay. Retrieved from https://news.mongabay.com/2023/09/brazil-supreme-court-quashes-time-frame-proposal-in-win-for-indigenous-rights/

Morini, F. (2018). Adapting Dynamically to Change in Diplomacy: A Comparative Look at Special Envoys in the International Arena. *The Hague Journal of Diplomacy*, *13*(4), 545-571. https://doi.org/10.1163/1871191X-13041002

Mu, Y., Biggs, T. W., & De Sales, F. (2021). Forests mitigate drought in an agricultural region of the Brazilian Amazon: Atmospheric moisture tracking to identify critical source areas. *Geophysical Research Letters*, *48*(5), e2020GL091380. https://doi.org/10.1029/2020GL091380

Mukhtarov, F., & Cherp, A. (2014). The hegemony of integrated water resources management as a global water discourse. In *River Basin Management in the Twenty-First Century: Understanding People and Place* (pp. 3-21). CRC Press (Taylor & Francis Group). https://doi.org/10.1201/b17168

Musie, W., & Gonfa, G. (2023). Fresh water resource, scarcity, water salinity challenges and possible remedies: A review. *Heliyon*, *9*(8). https://doi.org/10.1016/j.heliyon.2023.e18685

Mvogo, D.M. (2024). *Water Under the Paris Agreement: An Unexploited Potential?. Liverpool Law Review*, *45*(3), 409-424. https://doi.org/10.1007/s10991-024-09362-0

Netizen. (2010). Brazil: The Amazon Forest: Photos [Photo]. Netizen. Retrieved from https://www.netizen.page/2010/11/brazil-amazon-forest-photos.html

Nikolopoulou, K. (2023, May 01). *What Is Selection Bias? | Definition & Examples.* Scribbr. Retrieved August 12, 2025, from https://www.scribbr.com/research-bias/selection-bias/

Nikolopoulou, K. (2025a, January 14). *What Is Cognitive Bias? | Definition, Types & Examples.* Scribbr. Retrieved August 12, 2025, from https://www.scribbr.com/research-bias/cognitive-bias/

Nikolopoulou, K. (2025b, January 24). *What Is Confirmation Bias? | Definition & Examples.* Scribbr. Retrieved August 12, 2025, from https://www.scribbr.com/research-bias/confirmation-bias/

O'Connor, J. C., Dekker, S. C., Staal, A., Tuinenburg, O. A., Rebel, K. T., & Santos, M. J. (2021). Forests buffer against variations in precipitation. *Global Change Biology*, *27*(19), 4686-4696. https://doi.org/10.1111/gcb.15763

Organisation for Economic Co-operation and Development (OECD). (2022). *OECD takes first step in accession discussions with Argentina, Brazil, Bulgaria, Croatia, Peru and Romania*. OECD. Retrieved from https://www.oecd.org/en/about/news/press-releases/2022/01/oecd-takes-first-step-in-accession-discussions-with-argentina-brazil-bulgaria-croatia-peru-and-romania.html

Organisation for Economic Co-operation and Development (OECD). (2024). *UN and OECD to closely align global work in water and sanitation*. OECD. Retrieved from https://www.oecd.org/en/about/news/press-releases/2024/11/un-and-oecd-to-closely-align-global-work-in-water-and-sanitation.html

Organisation for Economic Co-operation and Development (OECD). (2025). *Water*. OECD. Retrieved from https://www.oecd.org/en/topics/water.html

Organization of American States (OAS). (2005). *La Plata River Basin.* OAS. Retrieved from https://www.oas.org/en/sedi/dsd/iwrm/Past_Projects/Documents/LaPlata_Brochure.pdf

Organization of American States (OAS). (n.d.a). Home. OAS. Retrieved from https://www.oas.org/en/

Organization of American States (OAS). (n.d.-b). *Mission-Framework*. OAS. Retrieved from https://www.oas.org/en/sedi/dsd/IWRM/about_IWRM/mission-framework.asp

Organization of American States (OAS). (n.d.-c). *Follow-up and Implementation: Mandates*. OAS. Retrieved from https://www.summit-americas.org/sisca/env.html

Organization of American States (OAS). (n.d.-d. *Mission-Framework*. OAS. Retrieved from https://www.summit-americas.org/sisca/env.html

Pokorny, B., Pacheco, P., de Jong, W. *et al.* Forest frontiers out of control: The long-term effects of discourses, policies, and markets on conservation and development of the Brazilian Amazon. *Ambio* **50**, 2199–2223 (2021). https://doi.org/10.1007/s13280-021-01637-4

Powlson, D. S., Whitmore, A. P., & Goulding, K. W. T. (2011). Soil carbon sequestration to mitigate climate change: a critical re-examination to identify the true and the false. *European Journal of Soil Science*, *62*(1), 42–55 https://doi.org/10.1111/j.1365-2389.2010.01342.x

Pülzl, H., Wydra, D., Obeng-Odoom, F., Arts, B. J. M., Edwards, P., Kleinschmit, D., ... & Park, M. S. (2024). Current forest-related discourses. In *International Forests Governance: A critical review of trends, drawbacks, and new approaches* (pp. 83-118). IUFRO.

Peng, S., Zhou, Y., Cao, L., Yu, S., Niu, J., & Jia, W. (2018). Influence analysis in social networks: A survey. *Journal of Network and Computer Applications*, *106*, 17-32. https://doi.org/10.1016/j.jnca.2018.01.005

Planalto Brazil. (2024b). *DECRETO Nº 11.960, DE 21 DE MARÇO DE 2024.* Government of Brazil. Retrieved from https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2024/Decreto/D11960.htm

Planalto Brazil (2024a). *Lula announces measures to fight Amazon drought: 'No one will be forgotten'.* Planalto. Retrieved from https://www.gov.br/planalto/en/latest-news/2024/09/lula-announces-measures-to-fight-amazon-drought-2018no-one-will-be-forgotten2019

Qadir, M., Jiménez, G. C., Farnum, R. L., Dodson, L. L., & Smakhtin, V. (2018). Fog Water Collection: Challenges beyond Technology. *Water*, *10*(4), 372. https://doi.org/10.3390/w10040372

Quintanilla, M., Leon, A.G., & Josse, C. (2022). *Amazonia Against the Clock: Where and how to protect 80% by 2025*. Amazonia80x25. Retrieved from http://dx.doi.org/10.13140/RG.2.2.12932.40320

Quinn, J. D., Reed, P. M., Giuliani, M., & Castelletti, A. (2017). Rival framings: A framework for discovering how problem formulation uncertainties shape risk management trade-offs in water resources systems. *Water Resources Research*, *53*(8), 7208–7233. https://doi.org/10.1002/2017WR020524

Ramalho, W. (2025). Temporal Landmark and the Politics of Time: Roots of a Historical Blunder. *Revista Brasileira de História*, *45*, e-287819. https://doi.org/10.1590/1806-93472025v45n98-04

Ramírez, E.G. (2021). *Brazil's Parliament and other political institutions.* European Parliament. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/659447/EPRS_BRI(2021)659447_EN.pdf

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155-169. https://doi.org/10.1007/BF01405730

Sabatier, P. A. (1988). An Advocacy Coalition Framework of Policy Change and the Role of Policy-oriented Learning Therein. Policy Sciences, 21(2-3), 129-168. https://doi.org/10.1007/BF00136406

Salamé, L., McKinney, D.C., Delli Priscolli, J., Koike, T., Moss, J., Tignino, M., McIntyre, O., Hussein, H., Motlagh, M., Wolf, A.T., De Silva, L., Carmi, N., Türk, D., & Münger, F. (2021). Water Discourses. In: Bogardi et al., *Handbook of water resources management: Discourses, concepts and examples*. Springer Nature. https://doi.org/10.1007/978-3-030-60147-8_7

Scharpf, F. W. (1997). Games Real Actor Play. Actor-centered Institutionalism in Policy Research. Boulder, CO: Westview Press.

Science Panel for the Amazon (SPA). (n.d.). About Us. SPA. Retrieved from https://www.sp-amazon.org/about

Science Panel for the Amazon (SPA). (2021.) Amazon Assessment Report 2021. Nobre C, Encalada A, Anderson E, Roca Alcazar FH, Bustamante M, Mena C, Peña-Claros M, Poveda G, Rodriguez JP, Saleska S, Trumbore S, Val AL, Villa Nova L, Abramovay R, Alencar A, Rodríguez Alzza C, Armenteras D, Artaxo P, Athayde S, Barretto Filho HT, Barlow J, Berenguer E, Bortolotto F, Costa FA, Costa MH, Cuvi N, Fearnside PM, Ferreira J, Flores BM, Frieri S, Gatti LV, Guayasamin JM, Hecht S, Hirota M, Hoorn C, Josse C, Lapola DM, Larrea C, Larrea-Alcazar DM, Lehm Ardaya Z, Malhi Y, Marengo JA, Melack J, Moraes R M, Moutinho P, Murmis MR, Neves EG, Paez B, Painter L, Ramos A, Rosero-Peña MC, Schmink M, Sist P, ter Steege H, Val P, van der Voort H, Varese M, Zapata-Ríos G (Eds). United Nations Sustainable Development Solutions Network, New York, USA. Available from https://www.theamazonwewant.org/spa-reports/ . DOI:10.55161/RWSX6527

Science Panel for the Amazon (SPA). (2024). Policy Brief: Conserving the Amazon's Freshwater Ecosystem's Health and Connectivity. Retrieved from https://www.theamazonwewant.org/spa-reports/ .

Spracklen, D., Arnold, S. & Taylor, C. Observations of increased tropical rainfall preceded by air passage over forests. *Nature* **489**, 282–285 (2012). https://doi.org/10.1038/nature11390

Spracklen, D. v., & Garcia-Carreras, L. (2015). The impact of Amazonian deforestation on Amazon basin rainfall. *Geophysical Research Letters*, *42*(21), 9546–9552. https://doi.org/10.1002/2015GL066063

Sreeshna, T. R., Athira, P., & Soundharajan, B. (2024). Impact of Climate Change on Regional Water availability and demand for Agricultural production: application of Water Footprint Concept. *Water Resources Management*, *38*(10), 3785-3817. https://doi.org/10.1007/s11269-024-03839-3

Starke, J. R., Metze, T. A., Candel, J. J., Dewulf, A. R., & Termeer, K. J. (2023). 'Green future'versus 'Planetary boundaries'? Evolving online discourse coalitions in European bioeconomy conflicts. *Journal of Cleaner Production*, *425*, 139058. https://doi.org/10.1016/j.jclepro.2023.139058

Simoens, M. C., Fuenfschilling, L., & Leipold, S. (2022). Discursive dynamics and lock-ins in socio-technical systems: an overview and a way forward. *Sustainability Science*, *17*(5), 1841-1853.

Stovel, K., Golub, B., & Milgrom, E. M. M. (2011). Stabilizing brokerage. *Proceedings of the National Academy of Sciences*, *108*, 21326-21332. https://doi.org/10.1073/pnas.1100920108

T., Cornell, S.E., Steffen, W., Bai, X., & Rockström, J. (2022). A planetary boundary for green water. *Nature Reviews Earth & Environment*, *3*(6), 380-392. https://doi.org/10.1038/s43017-022-00287-8

Te Wierik, S. A., Gupta, J., Cammeraat, E. L., & Artzy-Randrup, Y. A. (2019). The need for green and atmospheric water governance. *Wiley Interdisciplinary Reviews: Water*, *7*(2), e1406. https://doi.org/10.1002/wat2.1406

te Wierik, S. A., Cammeraat, E. L. H., Gupta, J., & Artzy-Randrup, Y. A. (2021). Reviewing the Impact of Land Use and Land-Use Change on Moisture Recycling and Precipitation Patterns. *Water Resources Research*, *57*(7). https://doi.org/10.1029/2020WR029234

The Nature Conservancy (TNC). (2020). *The Amazon Approaches Its Tipping Point*. Nature Conservancy. Retrieved from https://www.nature.org/en-us/what-we-do/our-insights/perspectives/amazon-approaches-tipping-point/

The Nature Conservancy (TNC). (2025a). *Who we are.* The Nature Conservancy. Retrieved from https://www.nature.org/en-us/about-us/who-we-are/

The New York Times. (2024). *Argentina Mulls Exiting Paris Climate Deal.* The New York Times. Retrieved from https://www.nytimes.com/2024/11/14/world/americas/argentina-exit-climate-deal.html

Tuinenburg, O. A., Theeuwen, J. J., & Staal, A. (2020). High-resolution global atmospheric moisture connections from evaporation to precipitation. *Earth System Science Data Discussions*, *2020*, 1-24. https://doi.org/10.5194/essd-12-3177-2020

United Nations, The United Nations World Water Development Report 2020 – Water and Climate Change. UNESCO, Paris. ISBN 978-92-3-100371-4

United Nations, The United Nations World Water Development Report 2021 – Valuing Water. UNESCO, Paris. ISBN 978-92-3-100434-6

United Nations, The United Nations World Water Development Report 2022 – Groundwater: Making the Invisible Visible. UNESCO, Paris. ISBN 978-92-3-100507-7

United Nations, The United Nations World Water Development Report 2023 – Partnerships and Cooperation for Water. UNESCO, Paris. ISBN 978-92-3-100576-3

United Nations, The United Nations World Water Development Report 2024 – Water for Prosperity and Peace. UNESCO, Paris. ISBN 978-92-3-100657-9

United Nations, The United Nations World Water Development Report 2025 – Mountains and glaciers: Water towers. UNESCO, Paris. https://doi.org/10.54679/LHPJ5153

UN Development Programme (UNDP). (2022). *The "flying rivers" protecting the water cycle: The Wampís guard the phenomenon that supplies water to three Andean countries.* UNDP. Retrieved from https://stories.undp.org/the-flying-rivers-protecting-the-water-cycle

UN Environment Programme (UNEP). (2023). *A river of hope for tropical rainforests*. UNEP. Retrieved from https://www.unep.org/news-and-stories/speech/river-hope-tropical-rainforests

United Nations Environment Programme (2024). Progress on Water-related Ecosystems. Mid-term status of SDG Indicator 6.6.1 and acceleration needs, with a special focus on Biodiversity. Retrieved from https://www.unwater.org/sites/default/files/2024-08/SDG6_Indicator_Report_661_Progress-on-Water-related-Ecosystems_2024_EN.pdf

UN Sustainable Development Group (UNSDG). (2025). *Who We Are*. UN. Retrieved from https://unsdg.un.org/about/who-we-are

UN-Water. (n.d.) *UN World Water Development Report. https://www.unwater.org/publications/un-world-water-development-report*

UN-Water. (2020). *UN-Water Analytical Brief on Unconventional Water Resources*. Geneva, Switzerland. Retrieved from https://www.unwater.org/app/uploads/2020/08/UN-Water-Analytical-Brief-on-Unconventional-Water-Resources.pdf

UN Water. (2024). *UN Secretary-General's Special Envoy on Water announced.* UN Water. Retrieved from https://www.unwater.org/news/un-secretary-general%E2%80%99s-special-envoy-water-announced

UN Water (2025). *About UN-WATER*. UN Water. Retrieved from https://www.unwater.org/about-un-water

United Nations Convention on Biological Diversity (UNCBD). (2011). Convention on Biological Diversity: Text and Annexes. CBD. Retrieved from https://www.cbd.int/doc/legal/cbd-en.pdf

United Nations Convention to Combat Desertification (UNCCD). (2022). *Convention*. UNCCD.

Retrieved from https://www.unccd.int/sites/default/files/2022-02/UNCCD_Convention_ENG_0_0.pdf
United Nations Convention to Combat Desertification (UNCCD). (2025a). *Convention*. UNCCD. Retrieved from https://www.unccd.int/convention/overview
United Nations Convention to Combat Desertification (UNCCD). (2025b). *Land Degradation Neutrality*. UNCCD. Retrieved from https://www.unccd.int/land-and-life/land-degradation-neutrality/overview
United Nations Convention to Combat Desertification (UNCCD). (2025c). *Conference of the parties*. UNCCD. Retrieved from https://www.unccd.int/convention/governance/cop
United Nations Economic Commission for Europe (UNECE). (n.d.). *Transboundary Water Cooperation Coalition.* UN Sustainable Development. Retrieved from https://sdgs.un.org/partnerships/transboundary-water-cooperation-coalition
United Nations Economic Commission for Europe (UNECE). (2023). *Committing to advance transboundary water cooperation worldwide for sustainable development, climate action, stability and peace (side-event at the UN 2023 Water Conference).* UNECE. Retrieved from https://unece.org/environmental-policy/events/committing-advance-transboundary-water-cooperation-worldwide
United Nations Framework Convention on Climate Change (UNFCCC). (1992). *United Nations Framework Convention on Climate Change*. UNFCCC. Retrieved from https://unfccc.int/sites/default/files/convention_text_with_annexes_english_for_posting.pdf
United Nations Framework Convention on Climate Change (UNFCCC). (2025). *What is the United Nations Framework Convention on Climate Change?* UNFCCC. Retrieved from https://unfccc.int/process-and-meetings/what-is-the-united-nations-framework-convention-on-climate-change
United Nations Treaty Collection. (2025). *12. Convention on the Law of the Non-Navigational Uses of International Watercourses (status at 25-05-2025).* UN Treaties. Retrieved from https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-12&chapter=27&clang=_en

United Nations Statistics Division. (2024). *SDG Indicators.* UN DESA. Retrieved from https://unstats.un.org/sdgs/metadata/?Text=&Goal=6&Target=6.4

Van Beek, L. M. G., Metze, T., Kunseler, E., Huitzing, H., de Blois, F., & Wardekker, J. A. (2020). Environmental visualizations: Framing and reframing between science, policy and society. *Environmental Science and Policy*, *114*, 497-505. https://doi.org/10.1016/j.envsci.2020.09.011

Van de Graaf, H. & Hoppe, R. (1989). Beleid en politiek. Een inleiding tot de beleidswetenschap en de beleidskunde. Muiderberg: Coutinho

Van den Brink, M. and T. Metze. 2006. *Words Matter in Policy and Planning*. Utrecht: Netherlands Graduate School of Urban and Regional Research.

Van der Ent, R. J., Savenije, H. H., Schaefli, B., & Steele-Dunne, S. C. (2010). Origin and fate of atmospheric moisture over continents. *Water Resources Research*, *46*(9). https://doi.org/10.1029/2010WR009127

van Hulst, M., Metze, T., Dewulf, A., de Vries, J., van Bommel, S., & van Ostaijen, M. (2024). Discourse, framing and narrative: three ways of doing critical, interpretive policy analysis. *Critical Policy Studies*, *19*(1), 74–96. https://doi.org/10.1080/19460171.2024.2326936

Villar, P. C., de França Doria, M., Panizza de León, A., de Souza, F. A. O., Amore, L., Borús, J., … Fariña Gómez, D. (2023). Governance in the La Plata River Basin and OECD principles: an opinion survey of transboundary water professionals. *Water International*, *48*(6), 707–726. https://doi.org/10.1080/02508060.2023.2263627

Wang, L., Jie, F., & He, B. (2024). Changes of blue and green water in arid inland dissipation area based on coupled surface water and groundwater model. *Journal of Hydrology: Regional Studies*, *56*, 102010. https://doi.org/10.1016/j.ejrh.2024.102010

Wang-Erlandsson, L., Tobian, A., Van der Ent, R. J., Fetzer, I., te Wierik, S., Porkka, M., Staal, A., Jaramillo, F., Dahlmann, H., Singh, C., Greve, P., Gerten, D., Keys, P.W., Gleeson,
Wang, L., Jie, F., & He, B. (2024). Changes of blue and green water in arid inland dissipation area based on coupled surface water and groundwater model. *Journal of Hydrology: Regional Studies*, *56*, 102010. https://doi.org/10.1016/j.ejrh.2024.102010

Wang-Erlandsson, L., Stockholm Resilience Centre, Berg, A., Gerten, D., & Lundberg Ingemarsson, M. (2022). The role of freshwater in climate mitigation: Biophysical interdependencies. In *The essential drop to reach Net-Zero: Unpacking freshwater's role in climate change mitigation*. Stockholm International Water Institute. https://siwi.org/wp-content/uploads/2022/10/the-essential-drop-to-reach-net-zero_chapter-2.pdf

Weinberg, J., Fang, Q., Zandaryaa, S., Leslie, G., & Nickum, J. E. (2021). Introduction to the special issue on source-to-sea management. *Water International*, *46*(2), 135–137. https://doi.org/10.1080/02508060.2021.1901190
Weng, W., Costa, L., Lüdeke, M. K., & Zemp, D. C. (2019). Aerial river management by smart cross-border reforestation. *Land use policy*, *84*, 105-113. https://doi.org/10.1016/j.landusepol.2019.03.010
Weng, W., Luedeke, M. K., Zemp, D. C., Lakes, T., & Kropp, J. P. (2018). Aerial and surface rivers: downwind impacts on water availability from land use changes in Amazonia. *Hydrology and Earth System Sciences*, *22*(1), 911-927. https://doi.org/10.5194/hess-22-911-2018

World Economic Forum (WEF). (2024). *What are the Amazon's 'flying rivers' – and how does deforestation affect them?* World Economic Forum. Retrieved from https://www.weforum.org/stories/2024/07/amazon-water-flying-rivers-latin-america/

World Economic Forum (WEF). (2025). *Davos 2025: Meet the Indigenous leaders attending the Annual Meeting.* World Economic Form. Retrieved from https://www.weforum.org/stories/2025/01/meet-indigenous-leaders-davos-annual-meeting-2025/

World Meteorological Organization (WMO). (2024). State of Global Water Resources report 2023. WMO. https://library.wmo.int/records/item/69033-state-of-global-water-resources-report-2023

World Meteorological Organization (WMO). (2025). *Overview*. WMO. Retrieved from https://wmo.int/about-wmo/overview

World Meteorological Organization (WMO). (n.d.). *WMO Hydrological Observing System (WHOS) WMO.* Retrieved from https://wmo.int/site/wmo-hydrohub/focus-areas/increasing-capacity/wmo-hydrological-observing-system-whos

Wunderling, N., Wolf, F., Tuinenburg, O. A., & Staal, A. (2022). Network motifs shape distinct functioning of Earth's moisture recycling hubs. *Nature Communications*, *13*(1), 6574.

Xia, Q., Qian, C., Du, D., & Zhang, Y. (2021). Conflict or cooperation? How does precipitation change affect transboundary hydropolitics?. *Journal of Water and Climate Change*, *12*(5), 1930-1943. https://doi.org/10.2166/wcc.2021.280

Zemp, D. C., Schleussner, C. F., Barbosa, H. M. J., Van Der Ent, R. J., Donges, J. F., Heinke, J., ... & Rammig, A. (2014). On the importance of cascading moisture recycling in South America. *Atmospheric Chemistry and Physics*, *14*(23), 13337-13359.

Zemp, D. C., Schleussner, C. -F., Barbosa, H. M. J., & Rammig, A. (2017a). Deforestation effects on Amazon forest resilience. *Geophysical Research Letters*, *44*(12), 6182–6190. https://doi.org/10.1002/2017GL072955

Zemp, D., Schleussner, CF., Barbosa, H. *et al.* Self-amplified Amazon forest loss due to vegetation-atmosphere feedbacks. *Nat Commun* **8**, 14681 (2017b). https://doi.org/10.1038/ncomms14681

Zuo, Z., Qiao, L., Zhang, R., Chen, D., Piao, S., Xiao, D., & Zhang, K. (2024). Importance of soil moisture conservation in mitigating climate change. *Science Bulletin*, *69*(9), 1332–1341. https://doi.org/10.1016/j.scib.2024.02.033

Appendix A [1]

Table A.1 Key documents included for qualitative analysis

Actor	Document/ webpage	Reference
UN-Water	United Nations World Water Development Report 2020	United Nations, The United Nations World Water Development Report 2020 – Water and Climate Change. UNESCO, Paris. ISBN 978-92-3-100371-4
	United Nations World Water Development Report 2021	United Nations, The United Nations World Water Development Report 2021 – Valuing Water. UNESCO, Paris. ISBN 978-92-3-100434-6
	United Nations World Water Development Report 2022	United Nations, The United Nations World Water Development Report 2022 – Groundwater: Making the Invisible Visible. UNESCO, Paris. ISBN 978-92-3-100507-7
	United Nations World Water Development Report 2023	United Nations, The United Nations World Water Development Report 2023 – Partnerships and Cooperation for Water. UNESCO, Paris. ISBN 978-92-3-100576-3
	United Nations World Water Development Report 2024	United Nations, The United Nations World Water Development Report 2024 – Water for Prosperity and Peace. UNESCO, Paris. ISBN 978-92-3-100657-9
	United Nations World Water Development Report 2025	United Nations, The United Nations World Water Development Report 2025 – Mountains and glaciers: Water towers. UNESCO, Paris. https://doi.org/10.54679/LHPJ5153
	UN-Water Analytical Brief Unconventional Water Resources (2020)	UN-Water, 2020: UN-Water Analytical Brief on Unconventional Water Resources. Geneva, Switzerland. Retrieved from https://www.unwater.org/app/uploads/2020/08/UN-Water-Analytical-Brief-on-Unconventional-Water-Resources.pdf
GCEW	OECD Economics of Water Report	Global Commission on the Economics of Water (GCEW). (2024). The economics of water: Valuing the hydrological cycle as a global common good. Economics of Water. https://economicsofwater.watercommission.org/report/economics-of-water.pdf
WMO	State of the Global Water Resources 21	World Meteorological Organization, 2022: State of the Global Water Resources 2021. WMO, Switzerland. https://library.wmo.int/idurl/4/58262

[1] The full list of documents / webpages conducted for the quantitative analysis (n=225) is available upon request

	State of the Global Water Resources 22	World Meteorological Organization, 2023: State of the Global Water Resources 2022. WMO, Switzerland. https://library.wmo.int/idurl/4/68473
	State of the Global Water Resources 23	World Meteorological Organization, 2024: State of the Global Water Resources 2023. WMO, Switzerland. https://library.wmo.int/idurl/4/69033
	State of the Global Climate	World Meteorological Organization, 2024: State of the Global Water Resources 2023. WMO, Switzerland. https://library.wmo.int/idurl/4/69033
ACTO	Strategic Action Plan	Amazon Cooperation Treaty Organization (ACTO). (2018). *Strategic Action Program: Regional Strategy for Integrated Water Resources Management in the Amazon Basin*. ACTO. Retrieved from https://otca.org/en/wp-content/uploads/2021/01/Strategic-Action-Program-SAP.pdf
	Transboundary Diagnostic Analysis- Amazon Basin	Amazon Cooperation Treaty Organization (ACTO). (2018). *Regional Transboundary Diagnostic Analysis of the Amazon Basin- TDA*. ACTO. Retrieved from Transboundary-Diagnostic-Analysis-TDA.pdf
	ACTO Forests Program for the Basin and Amazon Region	Amazon Cooperation Treaty Organization (ACTO). (2021). *ACTO Forests Program For the Basin and Amazon Region*. ACTO. Retrieved from PROGRAMA-BOSQUES-I-ENGLISH_FM_FINAL-17.12.21.pdf
	Amazonian Strategic Cooperation Agenda	Amazon Cooperation Treaty Organization (ACTO). (2010). *Amazonian Strategic Cooperation Agenda*. ACTO. Retrieved from Strategic-Agenda-of-Amazon-Cooperation.pdf
CIC	Strategic Action Plan	Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata (CIC). (2016). *Strategic Action Program for the La Plata Basin- TDA*. CIC. Retrieved from strategic_action_program_for_the_la_plata_basin.pdf
	Transboundary Diagnostic Analysis- Plata Basin	Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata (CIC). (2016). *Transboundary Diagnostic Analysis for the La Plata Basin- TDA*. CIC. Retrieved from transboundary_diagnostic_analysis_for_the_la_plata_river_basin.pdf
OAS	DECLARATION OF NASSAU	*Nassau Declaration*, Adopted on October, 4 2023,

	FOR SUSTAINABLE DEVELOPMENT IN THE AMERICAS	OEA/Ser.K/XLIII.4CIDI/RIMDS-IV/DEC.1/23 Retreived from https://scm.oas.org/IDMS/Redirectpage.aspx?class=XLIII.4%20CIDI/RIMDS-IV/DEC.&classNum=1&lang=e
	INTER-AMERICAN CLIMATE CHANGE ACTION PLAN 2023-2030/	*Inter-American Climate Change Action Plan 2023-2030*, Adopted on October, 4 2023, OEA/Ser.K/XLIII.4CIDI/RIMDS-IV/doc. 7/23 rev. 2 Retreived from https://scm.oas.org/IDMS/Redirectpage.aspx?class=XLIII.4%20CIDI/RIMDS-IV/doc.&classNum=7&lang=e
	50 Years of Water Diplomacy in the Americas	Organization of American States (OAS). (2018). *50 Years of water diplomacy in the Americas*. OAS. ISBN 978-0-8270-6579-6. Retrieved from LibroDelAguaEnglishAbril24_2018 Final (3).pdf
Science Panel for the Amazon	Amazon Assessment Report 2021	Science Panel for the Amazon. 2021. Amazon Assessment Report 2021. Nobre C, Encalada A, Anderson E, Roca Alcazar FH, Bustamante M, Mena C, Peña-Claros M, Poveda G, Rodriguez JP, Saleska S, Trumbore S, Val AL, Villa Nova L, Abramovay R, Alencar A, Rodríguez Alzza C, Armenteras D, Artaxo P, Athayde S, Barretto Filho HT, Barlow J, Berenguer E, Bortolotto F, Costa FA, Costa MH, Cuvi N, Fearnside PM, Ferreira J, Flores BM, Frieri S, Gatti LV, Guayasamin JM, Hecht S, Hirota M, Hoorn C, Josse C, Lapola DM, Larrea C, Larrea-Alcazar DM, Lehm Ardaya Z, Malhi Y, Marengo JA, Melack J, Moraes R M, Moutinho P, Murmis MR, Neves EG, Paez B, Painter L, Ramos A, Rosero-Peña MC, Schmink M, Sist P, ter Steege H, Val P, van der Voort H, Varese M, Zapata-Ríos G (Eds). United Nations Sustainable Development Solutions Network, New York, USA. Available from https://www.theamazonwewant.org/spa-reports/ . DOI: 10.55161/RWSX6527
Indigenous Peoples Organizations (COICA)	The Amazon against the clock: a Regional Assessment on Where and How to protect 80% by 2025	Quintanilla, Marlene, Alicia Guzmán León, Carmen Josse. 2022. The Amazon against the clock: a Regional Assessment on Where and How to protect 80% by 2025. https://amazonia80x2025.earth/
Big Agriculture	Bayer Water Strategy	Bayer. (2025b). *Water Security Builds Our Resilience to Climate Change*. Bayer. https://www.bayer.com/en/sustainability/water-stewardship
	Bayer Water Position	Bayer. (n.d.). *Water Position*.

		Bayer Water Position
	Cargill Water	Cargill. (2025c). *Water*. Cargill. Retrieved from https://www.cargill.com/sustainability/priorities/water
	6 Facts you should know about water use in agriculture Cargill	Cargill. (2025b). *6 facts you should know about water use in agriculture*. Cargill. Retrieved from https://www.cargill.com/story/agriculture-water-use

Appendix B

Table B.1 Actors' characteristics

Actor	Abbreviation	Mission / vision / objective(s)	Resources
UN-WATER	UNW	The overarching focus of our Members and Partners is to support UN Member States to sustainably manage water and sanitation.	• Position in the network • Organisation • Financial support • Position in the network
UN Environmental Programme *Ecosystems division*	UNEP-1	UNEP's core mission is to find solutions to the triple planetary crisis. As the leading global authority on the environment, the institution helps its Member States to foster climate stability, live in harmony with nature and forge a pollution-free future, supporting the achievement of all 17 SDGs.	

UN Environmental Programme *Climate change division*	UNEP-2	UNEP's core mission is to find solutions to the triple planetary crisis. As the leading global authority on the environment, the institution helps its Member States to foster climate stability, live in harmony with nature and forge a pollution-free future, supporting the achievement of all 17 SDGs.	• Organisation • Financial support • Position in the network
UN Forum on Forests	UNFF	Reverse the loss of forest cover worldwide, enhance forest-based economic, social and environmental benefits, increase significantly the area of protected forests worldwide, and reverse the decline in official development assistance for sustainable forest management.	
UN Convention to Combat Desertification	UNCCD	The UNCCD is the global voice for land. We promote practices that avoid, reduce and reverse land degradation and are the driving force behind Sustainable Development Goal 15 and Land Degradation Neutrality.	
UN Department of Economic and Social Affairs	UNDESA	UN DESA is a pioneer of sustainable development and the home of the Sustainable Development Goals (SDGs), where each goal finds its space and where all stakeholders can do their part to leave no one behind. We are a leading analytical voice for promoting inclusion, reducing inequalities and eradicating poverty, and a champion for tearing down the barriers that keep people in poverty.	
UN Development Programme	UNDP	UNDP is the United Nations' lead agency on international development. We support countries and communities as they work to eradicate poverty, implement the Paris Agreement on climate change and achieve the Sustainable Development Goals. We advocate for transformative change, and we connect countries to the resources they need to help people build a better life.	
UN Sustainable Development	SDNS	As the world's largest knowledge network for the Sustainable Development Goals (SDGs), the UN Sustainable Development Solutions Network (SDSN) works under the auspices of the UN Secretary-General to mobilize the world's universities, think tanks,	• Position in the network

Solutions Network	and national laboratories to identify and develop global and local solutions for action on the world's most critical sustainable development challenges. We operate at the intersection between science, policy, and development practice to promote the SDGs and the Paris Agreement through education, research, policy analysis, and global cooperation.	• Platform
UN Economic Commission for Latin America and the Caribbean ECLAC	Provides substantive secretariat services and documentation for the Commission and its subsidiary bodies; Undertakes studies, research and other support activities within the terms of reference of the Commission; Promotes economic and social development through regional and subregional cooperation and integration; Gathers, organizes, interprets and disseminates information and data relating to the economic and social development of the region; Provides advisory services to Governments at their request and plans, organizes and executes programmes of technical cooperation; Formulates and promotes development cooperation activities and projects of regional and subregional scope commensurate with the needs and priorities of the region and acts as an executing agency for such projects; Organizes conferences and intergovernmental and expert group meetings and sponsors training workshops, symposia and seminars; Assists in bringing a regional perspective to global problems and forums and introduces global concerns at the regional and subregional levels; Coordinates ECLAC activities with those of the major departments and offices at United Nations Headquarters, specialized agencies and intergovernmental organizations with a view to avoiding duplication and ensuring complementarity in the exchange of information.	• Financial support • Position in the network
UNESCO Intergovernmental Hydrological Programme UNESCO IHP	The UNESCO Intergovernmental Hydrological Programme (IHP) is the only intergovernmental cooperation programme of the UN system dedicated to water research and management, and related education and capacity development. It addresses national, regional, and global water challenges, by supporting the development of sustainable and resilient societies.	• Organisation • Position in the network

UN Framework Convention on Climate Change	UNFCCC	The UNFCCC secretariat (UN Climate Change) is the United Nations entity tasked with supporting the global response to the threat of climate change. The ultimate objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.
UN Conference on Trade and Development	UNCTAD	We help developing countries benefit from the global economy more fairly and effectively, providing data and analysis, facilitating consensus-building and offering technical assistance on issues related to trade and development.
Office of the United Nations High Commissioner for Human Rights	OHCHR	OHCHR, as the leading UN entity on human rights, is mandated to promote and protect the enjoyment and full realization, by all people, of all rights established in international human rights laws, including the human rights to water and sanitation. The work of OHCHR includes monitoring and preventing violations of human rights to water and sanitation, developing thematic research and advocacy, and promoting a human rights-based approach to water and sanitation in cooperation with Member States, the UN system, national human rights institutions and civil society. OHCHR, as the secretariat of the Human Rights Council and treaty bodies, provides secretariat support to the Special Rapporteur on the Human Rights to Safe Drinking Water and Sanitation, which is an independent mandate established under the Human Rights Council's Special Procedures mechanism, as well as to the work of relevant treaty bodies related to water and sanitation.
International Labour Organisation	ILO	The ILO promotes the inclusive governance and capacity building of water supply and sanitation at the community level, with a focus on rural, indigenous communities and women. The ILO also promotes job creation through green works to restore soil and water conservation. Much of this work is done in alliance with other UN agencies. In addition, we promote social dialogue in the water sector providing voice to water workers in the management of water supply. At the political level, the ILO promotes

		the integration of actions to promote SDG 8 (decent work and economic growth) and SDG 6, through events such as World Water Day/World Toilet Day 2016 and several practical publications which highlight subjects such as open defecation, water fetching and access to WASH in the workplace; job creation in water works and in operation and maintenance of irrigation works.	
Green Climate Fund	GCF	The Green Climate Fund (GCF) – a critical element of the historic Paris Agreement - is the world's largest climate fund, mandated to support developing countries raise and realize their Nationally Determined Contributions (NDC) ambitions towards low-emissions, climate-resilient pathways	• Financial support • Organisation • Position in the network
Geneva Water Hub	GWH	Rivers unite communities. Groundwater is a healthy source of sustenance and a buffer against extremes in climate. Drinking water is distributed without discrimination. Water for agriculture and industry is managed intelligently, sustainably and equitably. This is a world where water's nourishing qualities can be channelled to transform political and social tensions. And this is exactly what the Geneva Water Hub works towards on its Mission through to 2035: to advance *the use of water for peace in humanitarian, development, and peacebuilding efforts*.	
Food and Agriculture Organization of the United Nations	FAO	The goal of the Food and Agriculture Organization is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives. With 195 members - 194 countries and the European Union, FAO works in over 130 countries worldwide.	• Knowledge and skills • Organisation • Financial support

World Meteorological Organization	WMO	WMO works to facilitate worldwide cooperation in the design and delivery of meteorological services, foster the rapid exchange of meteorological information, advance the standardization of meteorological data, build cooperation between meteorological and hydrological services, encourage research and training in meteorology, and expand the use of meteorology to benefit other sectors such as aviation, shipping, agriculture and water management.	• Knowledge and skills • Technology, equipment, infrastructure • Financial support
World Bank Group	WBG	Our mission is to end extreme poverty and boost shared prosperity on a livable planet. This is threatened by multiple, intertwined crises. Time is of the essence.	• Position in the network • Knowledge and skills
International Fund for Agricultural Development	IFAD	As an assembler of development finance, we partner with governments, the private sector, civil society and others to provide grants and concessional and low-interest loans to developing countries. This helps to address critical needs and support rural people as they lead their own development. At the International Fund for Agricultural Development, we envisage vibrant, inclusive and sustainable rural communities where people live free from poverty and hunger.	• Financial support • Position in the network • Knowledge and skills
Global Environment Facility	GEF	The Global Environment Facility (GEF) includes several multilateral funds working together to address the planet's most pressing challenges in an integrated way. Its financing helps developing countries address complex challenges and work towards meeting international environmental goals.	• Financial support • Position in the network

			• Knowledge and skills
Global Commission on the Economics of Water	GCEW	To transform the world's understanding of the economics and governance of water, placing a strong emphasis on equity, justice, effectiveness and democracy.	• Position in the network • Knowledge and skills
Global Canopy	GC	Global Canopy is a data-driven not-for-profit that targets the market forces destroying nature. We have a particular focus on halting and reversing global deforestation and its impacts on Indigenous Peoples and local communities. Global Canopy promotes transparency and accountability to motivate and enable action. We provide innovative open-access data, metrics and insights to leading companies, financial institutions, governments and campaigning organisations worldwide, to help them make better decisions about nature, forests and people. Around the world, all of us are connected to the problem of market-driven nature loss and deforestation. It is baked into our international systems of trade and finance. Whether through the products we buy, our pensions, or our financial decisions, we are linked to impacts that we must recognise – and that we can tackle together. Our vision is of transparent and accountable markets in a sustainable and just global economy	• Financial support • Platform
Conservation International	CI	Building upon a strong foundation of science, partnership and field demonstration, Conservation International empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity. We imagine a healthy, prosperous world in which societies are forever committed to caring for and valuing nature, for the long-term benefit of people and all life on Earth.	• Financial support • Platform

World Economic Forum	WEF	The Centre for Nature and Climate is a multi-stakeholder platform that focuses on protecting our environment and fostering sustainable practices. Our mission is to achieve industry decarbonization in line with the 1.5ºC Paris pathway; systems transition in ocean and land use, and resource stewardship in food, water and materials.	• Financial support • Position in the network
Valuing Water Initiative	VWI	The Valuing Water Initiative (VWI) calls for water to be prioritised in decision making through the application of the UN Valuing Water Principles in different water value chains and sectors. We work collaboratively with stakeholders, both inside and outside the water sector, to encourage governments, industries and civil society to bring about the systemic change required to understand, value and manage water to ensure we can live in a sustainable water-secure world. We aim to increase awareness of the many values of water and ensure the collection of best practices and lessons learned on how to identify the value of water in its numerous competing uses are shared between communities, cities and countries.	• Knowledge and skills • Position in the network
World Wildlife Fund	WWF	Our mission is to conserve nature and reduce the most pressing threats to the diversity of life on Earth. Recognizing that the problems facing our planet are increasingly more complex and urgent, WWF focuses its work on six ambitious goals. Through this integrative approach, we can challenge the planet's greatest threats and ensure a healthy future for people and nature. Create a climate-resilient and zero-carbon world. Rebuild food systems to nourish people and nature. Conserve the world's most important forests. Protect freshwater resources and landscapes. Achieve healthy oceans and nature-positive seascapes. Conserve wildlife and wild places	• Financial support

International Union for Conservation of Nature	IUCN	Influence, encourage and assist societies to conserve the integrity and diversity of nature and ensure that any use of natural resources is equitable and ecologically sustainable.	• Position in the network
Organisation for Economic Co-operation and Development	OECD	Our core aim is to set international standards and support their implementation – and help countries forge a path towards stronger, fairer and cleaner societies.	• Position in the network • Organisation • Knowledge and skills
Organization of American States *Department of Sustainable Development*	OAS-WATER	The Water Section of the Department of Sustainable Development (DSD), under the Executive Secretariat for Integral Development (SEDI), works to strengthen the capacity of Member States to implement effective Integrated Water Resources Management (IWRM) strategies and improve water governance in the region.	• Authority, formal power • Position in the network • Organisation
Organization of American States *Department of International Affairs*	OAS-INTER	Fostering relations among its partners in the Hemisphere is a key objective of the Organization. By reaching out proactively, not only to its member states, but also to permanent observers, international organizations, and civil society organizations, the OAS hopes to further promote its aims with the people involved in advancing the Inter-American agenda.	• Authority, formal power • Position in the network • Organisation
Inter-American Institute for	IICA	Our mission is to encourage, promote and support Member States in their efforts to achieve agricultural development and rural well-being through international technical cooperation of excellence. Our vision is to be a modern and efficient institution supported by a platform of human resources and processes that are capable of	• Knowledge, skills

Cooperation on Agriculture		mobilizing the knowledge available in the region and around the world, with the aim of achieving a competitive, inclusive and sustainable agriculture sector that takes advantage of opportunities to contribute to economic growth and development as well as to foster greater rural well-being and sustainable management of its natural capital.	• Position in the network
Inter-American Development Bank	IDB	Since our creation in 1959, we have been dedicated to improving the quality of life for millions of people in our 26 borrowing member countries across Latin America and the Caribbean. We provide financial and technical support to national and sub-national governments and other entities in our region. We conduct cutting-edge research and develop innovative solutions to address development challenges both locally and globally. We work with our non-borrowing member countries and development organizations to channel resources and expertise to Latin America and the Caribbean, promoting development and maximizing the impact of key initiatives. Context-specific: There is a growing scientific consensus that the Amazonia region could reach an irreversible ecological “tipping point,” where it is losing its ability to recover from disturbances such as drought or wildfires. We have no time to waste. 17% of Amazon has already been lost. This context underscores the need to increase collaboration and coordination among all parties to leverage synergies, increase the impact and scale of our projects and financing.	• Financial support
Development Bank of Latin America	CAF	The mission of CAF is clear: to promote sustainable development by providing financial solutions that enhance productivity and competitiveness in member countries. The bank aims to facilitate investments that not only yield economic returns but also contribute to social equity and environmental sustainability.	• Financial support

International Land Coalition Latin America and the Caribbean ILC ALC	The shared goal of ILC's over 300 members is to realise land governance for and with people at a country level, responding to the needs and protecting the rights of women, men and communities who live on and from the land.	• Position in the network • Knowledge and skills
Big agriculture *Bayer, ADM, Cargill*	Large international grain companies	• Position in the network • Financial support
Intergovernmental Coordinating Committee of the Countries of the Plata Basin CIC	Article I of the Treaty establishes that the contracting parties agree to join forces to promote the harmonious development and physical integration of the La Plata Basin and its areas of direct and significant influence, specifying that to this end, they will promote, within the Basin, the identification of areas of common interest and the implementation of studies, programs and works, as well as the formulation of operational understandings and legal instruments they deem necessary.	• Authority, formal power • Organisation • Position in the network
Amazon Cooperation Treaty Organization ACTO	To be a permanent cooperation, exchange and information forum guided by the principle of reducing regional asymmetries among the Member Countries through its actions, cooperating in national processes for socioeconomic progress and enabling a gradual incorporation of these vast territories into the national economies, promoting regional cooperation actions to improve the quality of life of Amazonian inhabitants, and working under the principle of sustainable development and sustainable livelihoods in harmony with nature and the environment and considering the internal laws of the Member Countries. Achieve sustainable development in the Amazon region reconciling use, protection and conservation of its resources, with equitable conditions that ensure integral sustainable development, effective presence of the State in its different levels of Government and Amazonian populations that fully	• Authority, formal power • Organisation • Position in the network

		exercise their rights and obligations in the framework of the national laws in force and international agreements.	
Pan America Development Foundation	PADF	The Pan American Development Foundation (PADF) is dedicated to building a safer, stronger, and more prosperous hemisphere—because when Latin America and the Caribbean thrive, so does America. For 60 years, PADF has worked to create opportunities and address challenges that impact the entire region, fostering healthier, more just, peaceful, resilient, and sustainable communities. By strengthening the hemisphere, we protect shared values, promote stability, and enhance prosperity for generations to come.	• Financial support • Position in the network
Amazon Waters Alliance	AWA	The mission of the Amazon Waters Alliance is to coordinate science-based actions for public policy advocacy and private sector socio-environmental responsibility strategies. It seeks to conserve the connectivity of the aquatic ecosystems of the Amazon Basin and to address threats to them, especially those that require collective action at multiple scales, including transboundary watersheds and the entire Amazon Basin. Its added value is the possibility of articulated work between indigenous and civil society organizations, government entities, universities and research centers, the private sector, and multilateral agencies to achieve lasting results on a large scale.	• Position in the network
Science Panel for the Amazon	SPA	To synthesize and communicate scientific knowledge about the Amazon, integrated with Indigenous and Local Knowledge (ILK), to accelerate solutions for sustainable and equitable development.	• Knowledge and skills • Legitimacy
Foundation for Amazon Sustainability	FAS	To contribute to the conservation of the Amazon by valuing the standing forest and its biodiversity and improving the quality of life of the Amazonian populations. In 2023, the institution completes 15 years of activities with remarkable results, such as the 202% increase in the average income of thousands of families benefited and the 40% decrease in deforestation in areas covered by FAS between 2008 and 2021.	• Platform • Position in the network

Brazilian Biodiversity Fund	FUNBIO	To provide strategic resources for biodiversity conservation. To be the benchmark in enabling strategic resources and solutions for the conservation of biodiversity	• Financial support • Platform
Indigenous Amazon G9	G9	By strengthening the common demands of Indigenous Peoples in the Pan-Amazon region, participating organizations hope to increase pressure on their governments to take action to guarantee the rights of these peoples and preserve their territories.	• Position in the network • Knowledge and skills
General Coordinator of the Indigenous Organisations of the Amazon Basin	COICA	Generate policies, proposals and actions at local, national and international levels, from the indigenous peoples, nationalities and organizations of the Amazon, with autonomy, sovereignty, strengthened capacities and financial sustainability, for an equitable and differentiated development of the Amazon, enhancing the capacity of indigenous peoples to influence them and strengthening strategic alliances.	• Platform • Position in the network • Knowledge and skills
Amazon Conservation Team	ACT	The Amazon Conservation Team partners with indigenous and other local communities to protect tropical forests and strengthen traditional culture. We see a future where healthy tropical forests and thriving local communities exist in harmonious relationship with each other, contributing to the well-being of the planet.	• Knowledge and skills
Amazon Sacred Headwaters Alliance	AMS	The Amazon Sacred Headwaters Alliance's mission is to permanently protect this bioregion from further industrial-scale resource extraction, and to promote a just transition to a wellbeing bioeconomy. Without the protection of indigenous territories, it is not possible to imagine a living Amazon.	• Knowledge and skills

Amazonia80x25	Amazonia80x25	The initiative “Amazonia for Life 80% by 2025” seeks to avert the tipping point in the largest forest on the planet. The Indigenous Peoples across the basin and allies are raising their voices to make a call to protect the Amazonia and safeguard our future.	• Position in the network • Platform
Articulation of Indigenous Peoples of Brazil	APIB	Promotion and defense of indigenous rights, based on the articulation and union between indigenous peoples and organizations from different regions of the country.	• Position in the network
Instituto Pensar Agropecuária	IPA	Defending the interests of agriculture and providing advice to the Frente Parlamentar da Agropecuária (FPA) through a technical cooperation agreement. The IPA has a unique role in the process of institutionalizing the sector's agenda with the aim of guaranteeing technical support and specific actions that are processed in the National Congress, in addition to promoting dialogue with the Judiciary and Executive branches.	• Position in the network
National Confederation of Agriculture	CNA	The mission of the Brazilian Confederation of Agriculture and Livestock (CNA) is to represent, organize and strengthen Brazilian rural producers. It also defends their rights and interests, promoting the economic and social development of the agricultural sector. To make all this a reality, the CNA brings together rural associations and leaders and actively and permanently participates in discussions and decisions on national agricultural policy.	• Position in the network
Parliamentary Front for Agriculture	FPA	The FPA's objective is to encourage the expansion of public policies for the development of national agribusiness. Current priorities include the modernization of labor, land and tax legislation, as well as the regulation of indigenous lands and quilombola areas, in order to guarantee the legal security necessary for the sector's competitiveness.	• Position in the network
Instituto Brasileiro de Mineração	IBRAM	IBRAM is a Brazilian private non-profit organization, aiming to strengthen the relationships between mining companies and their various publics, such as their	• Position in the network

professionals and suppliers, the government and society. It also works to connect the sector. Encourages innovation, disseminates knowledge, fosters and disseminates good practices, articulating business and development opportunities for the mining industry.

Appendix C

Table C.1. GCEW composition (as of june 2025)

Related organization	***Type of organization***	***Relation to GCEW***
Government of the Netherlands	State actor	Convening and support
OECD		Secretariat support (until February, 2025)
IMWI	International research and innovation institute	Secretariat support (as of February, 24, 2025)
University College London	Academia	Co-chair
Director-General, World Trade Organization		Co-chair
Director, Potsdam Institute for Climate Impact Research	Academia	Co-chair
President, Republic of Singapore	State actor	Co-chair
Mayor of the City of Freetown, Sierra Leone	Municipality	Commissioner
Minister of Foreign Affairs, Mexico	State actor	Commissioner
Chief Economist, Sustainable Development Vice Presidency, World Bank		Commissioner
Former President of the UN General Assembly, Former Minister of Foreign Affairs of Ecuador		Commissioner
Professor, Environmental Law and Policy, Yale Law School	Academia	Commissioner
CEO, Council of Energy, Environment and Water, New Delhi, India		Commissioner
Professor, Faculty of Social and Behavioural Sciences, University of Amsterdam	Academia	Commissioner
Executive Vice President and Director, Center for Global Commons, University of Tokyo	Academia	Commissioner
Executive Director, Global Commission on the Economics of Water, and Former First Special Envoy for		Commissioner

International Water Affairs, Kingdom of The Netherlands		
President, Chinese Society for Urban Studies	Academia	Commissioner
Emeritus President, Club of Rome, South Africa		Commissioner
Former Under-Secretary-General and Associate Administrator, United Nations Development Programme		Commissioner
Director, Indian Institute for Human Settlements	Academia	Commissioner
Executive Secretary, International Whaling Commission Secretariat, and Former Secretary-General, Ramsar Convention on Wetlands		Commissioner
Director, African Department, International Monetary Fund		Commissioner
Founding Director, Bibliotheca Alexandrina, Alexandria, Egypt		Commissioner
Director for the Environment Directorate, OECD		Commissioner
Founder, Green Generation Initiative		Commissioner

Appendix D

Table D.1. High level overview of Amazon and Plata Basin member countries, representations of nature in their constitutions and public policies/laws; water resources management institutions and legal instruments

Country	Intergovernmental basin organization	Constitution	Public Policies/Laws	Water Resources Management Institutions	Legal instruments
Brazil	ACTO; CIC	"ecologically balanced"	National Water Resources Policy	federal states; basin committees; boards and agencies; specialized institutes	Water use permits; subsidies; water fees
Bolivia	ACTO; CIC	right to the environment, which shall be "healthy, protected and balanced"	Law of Mother Earth (2010); Framework Law of Mother Earth and Integral Development for Living Well (2012); Water Law; National Watershed Management Plan	autonomous departmental governments	Water use permits; subsidies;
Peru	ACTO	"healthy, balanced and appropriate"	Water Resources Law; National Water Resources Policy and Strategy	regional governments; basin committees; boards and agencies; specialized institute	Water use permits; subsidies
Colombia	ACTO	"healthy environment"	National Policy for Integrated Water Resources Management	Regional autonomous cooperations; basin committees; boards and agencies; specialized institute	Water use permits; subsidies; water fees
Ecuador	ACTO	"rights of nature or Pacha Mama"	Organic Law on Water Resources, Uses and Exploitation	Specialized institute	Water use permits; subsidies; water fees
Guyana	ACTO	"not detrimental to health and wellbeing"			Water use permits; subsidies
Venezuela	ACTO	"safe, healthy and ecologically balanced environment"	Water Law	regional governments; basin committees; boards and agencies;	Water use permits; subsidies
Suriname	ACTO		Water Supply Act		
Argentina	CIC		General Environmental Law,	reg	
Paraguay	CIC		Law on Water Resources		

Uruguay	CIC		Law on National Water Policy		