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Cities, States, Commons and collective action problems: A study on validifying, or falsifying, the viability of polycentric water governance

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Citation

Hoch, Y. (2022). *Cities, States, Commons and collective action problems: A study on validifying, or falsifying, the viability of polycentric water governance*.

Version: Not Applicable (or Unknown)

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Note: To cite this publication please use the final published version (if applicable).

Date: 13.06.2022

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Course: Master Thesis International Organization

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Wordcount: 9518 (excl. tables)

Cities, States, Commons and collective action problems

A study on validifying, or falsifying, the viability of polycentric water governance

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1. Abstract

State-centric, collective resource governance in a world of finite resources is an undertaking struggling with opportunistic behaviour and competitive thinking. Rapidly developing climate change makes the ability of collective action on vital resources only more difficult. Although states band together in global organisations to address shared issues such as water shortages the academic literature finds state-led collective action to be inadequate for effective, sustainable resource governance. The suggested solution to the found collective action problems is a change in governance approach, namely polycentrism. This study aims to analyse the viability of polycentric governance in global organisations by applying a comparative content analysis on two global institutions, one based on state and one on municipal membership. These two organisations will be analysed and compared on their ability to collectively govern water resources and avoid collective action problems, which are categorized in coordination, cooperation and division problems. The comparison bases on the organisation's membership type, being state or municipal, the institution's networking structure and the paradigm used for resources which is found to influence discourse and thus governance. If the global organisation based on municipal membership is able to compensate for the found collective action flaws of the state-membership based organisation and vice versa the case can be made that polycentrism is viable. If not, the realizability of polycentrism can be put into question.

2. Introduction

In 2011 Ethiopia began constructing the Grand Ethiopian Renaissance Dam (GERD) holding back water from the Blue Nile River influencing the amount of water flowing into the Nile River, which supplies parts of Sudan and all of Egypt. Both countries have attempted to bind Ethiopia to a deal dictating the quantities of water the dam is allowed to hold preventing Ethiopia to have definite control over the river's water flow (Aljazeera, 2021). Although negotiations have been hosted by the African Union and the United Nations Security Council, inter-statal organisations tasked to solve international disputes via dialogue, the disputing states have not found any solution to this date. Evidently examples can be found where collective governance of shared water resources between states is conducted more successfully, for example in the European Union (EU) where the Water Framework Directive harmonizes international water governance among the organisation's members (Eckstein et al., 2010, p. 118; Hering et al., 2010; UN-Water, 2018, p. 7). In a global perspective however, harmonizing water governance on an international level remains an exception and poses a threat to environmental sustainability and international geo-political stability (Eckstein et al., 2010; Gupta, Pahl-Wostl & Zondervan, 2013; Midttun et al., 2011; UNEP, 2011).

Although collective action between states regarding collective water governance is possible, GERD visualizes collective action problems within International Organisations (IOs) and between states. For clarification, "collective action occurs when more than one individual is required to contribute to an effort in order to achieve an outcome" (Ostrom, 2004, p. 1). Collective action problems arise when states aim for personal benefit without contributing to more cost intensive collective actions which would ensure a shared benefit between participating states (p. 1). Regarding the example of GERD collective action in form of joint governance between Egypt, Sudan and Ethiopia would allow for shared benefits around the shared water source. However, costs can be decreased and benefits increased, by not being bound to any regulations and simply controlling the water flow, leaving the states downstream worse off. Hence, the fundamental problems inspected in this paper are the challenges which states can witness when attempting to collectively govern shared water resources within IOs.

A widely suggested solution to the arguably inefficient state-centric collective governance approach is polycentrism (Brando et al., 2019; Gupta, Pahl-Wostl & Zondervan, 2013; Hagen & Crombez, 2019; Kaul, 2012; McGinnis & Ostrom, 1992; Ostrom, 2000). Polycentrism is based on the combined governance of local, regional, national and global levels altogether, instead of relying solely on state-centric governance allowing, according to Hagen and Crombez (2019), a more efficient approach to collective resource governance (p. 123).

However, such a governing system does not exist to this date on a global scale although IOs such as UNEP push for changes towards such governance systems. As of yet, the academic literature focuses on the theoretical benefits polycentric governance has on collective resource governance, less so on its practical realizability on a global scale regarding water governance or other resources of low excludability and high rivalry, also known as Commons (Hagen & Crombez, 2018, p. 108). The goal of this study is to fill this apparent informational gap by determining the realizability of polycentrism and its practical ability to circumvent collective action problems witnessed by collective, state-centric water governance. Thus, the research question for this study is:

To what extent can polycentric governance circumvent collective action problems found in state-membership based IOs regarding collective water governance?

For that, one municipal-membership based and one state-membership based IO are comparatively analysed for their ability to avoid collective action problems in form of coordination, cooperation and division problems. The independent variables influencing the presence, or absence, of collective action problems are the inspected IO's organisational networking structure and its resource governance paradigm, which are both found to influence collective action (Brando et al., 2019; Scholz, Berardo & Kile, 2008). If the found information indicates mutual flaw compensation and also indicates realizability of such a governance structure, say through a change of inclusivity or changing policy trends of the inspected IO, the findings of McGinnis and Ostrom (1992), Brando et al. (2019) as well as Hagen and Combrez (2019) can be strengthened.

This study's results find, that municipal-based IOs can compensate for the flaws found in state-based IOs and vice versa and that polycentrism is theoretically viable showing potential to become also practically viable. There seems to be only one, yet fundamental hurdle preventing polycentrism to be realizable: the central position of the state regarding resource governance and its rational of competitiveness and hegemony, especially in arid biomes where water witnesses high rivalry between consuming states. This mindset appears to influence the willingness of states to admit more governing power to lower governance tiers such as municipalities. This maintenance of centralized power by the states thus prevents the necessary sharing of power and responsibility for polycentrism to become realizable.

3. Literature Review

As this study inspects the practical ability of polycentrism to circumvent collective action problems witnessed by state-membership based IOs regarding collective water governance, it is important to clarify the used categories of collective action problems. This thesis compartmentalizes collective action problems into three categories namely coordination, cooperation and division problems (Olivier, 2019). Olivier successfully used these categorizations to analyse and link collective action problems to the creation of formal institutional arrangements. Thus, the categorization provided by his paper can also be applied to this study as institutional collective action problems are analysed as well. The first category is the coordination problem. It occurs whenever actors benefit from joint action but “transaction costs in the assignment of tasks and communication between the parties” cause uncoordinated action hampering ultimately the collective’s benefit (Olivier, 2019, p.163). Thus, when conducting the analysis any content indicating communicative flaws between institutional members, an argument for the presence of the coordination problem can be made. The second category of collective action problems is the cooperation problem which “emerges when the goals between the parties differentiate incentivising parties to behave opportunistically” (Olivier, 2019, p.163). Hence, if the analysis provides information on the presence of diverging approaches to a collective goal resulting in opportunistic behaviour such as freeriding, this category of collective action problems can be confirmed. The final category is the division problem which occurs “either when the achievement of specific gains will cause some parties to suffer more losses than the rest, or when parties have disagreements on how to distribute the costs or benefits of their joint work” (Olivier, 2019, p.163). By including these three categories into the analysis this thesis aims to conduct an in-depth analysis allowing for more nuanced conclusions regarding collective water governance in IOs.

Remaining with the topic of collective water governance, scholars partaking in the academic debate agree on the crucial role of IOs in achieving transboundary cooperation, collaboration and problem solving (Grandi, 2020; Ivanova, 2010; Midttun et al. 2011; Scholz, Berardo & Kile, 2008). However, IOs whose members are states are criticised continuously in the found literature due to their member’s national interests and competitive rational (Brando et al., 2019; Kaul, 2012). This repeated criticism towards state-centric collective governance and the hegemonic position of state-membership based IOs led to the widely shared suggestion that the traditional, state-centric approach to collective water governance appears inefficient and restrictive in its policy making (Davidson, Coenen & Gleeson, 2019; Eckstein et al., 2010; UNEP, 2011). One widely shared reason for the converging academic argument towards the

need for a collective governance reform derives from the act of freeriding. Freeriding essentially bases on the assumption that all actors participating in multilateral engagements aim to predict the outcome in competitive market situations, allowing to minimize contribution costs whilst increasing individual profit as much as possible (Ostrom, 2000). Hence, freeriders participate in the collective consumption of a resource but avoid contributing to the costs of maintaining that resource and keeping it accessible. For example, freeriders would try to acquire as much as possible of a shared resource, say acquiring and consuming water by building a dam, allowing them to have a cheap and readily accessible resource whilst consumers downstream are worse off. This kind of behaviour leaves those who do contribute to the aforementioned costs at a diminished profit, incentivising them to commit to the same behaviour motivating every actor to take what it can leaving the resource overexploited and less accessible to the others (Brando et al., 2019; Hagen & Crombez, 2019).

The found conclusions of the literature put the ability of a “single, all-encompassing governance regime that can weigh all interests and has universal applicability” into question and recognize the need for change towards a more inclusive, localized and sustainable approach to water governance (Eckstein et al., 2010; Hagen & Crombez, 2019, p.120; UNEP, 2011; UN-Water, 2018). As already mentioned, polycentrism diverges from state-centric collective governance and aims to include governance actors ranging from the municipal level up to global governance entities, each with their share of decision-making power. This requires the inclusion of local, municipal decision-making in a global organisation in order to ensure localized, yet global collective governance (Gupta, Pahl-Wostl & Zondervan, 2013; Hagen & Crombez, 2019). However, there are already IOs consisting of municipal members which govern locally but also collectively on a global scale (Davidson, Coenen & Gleeson, 2019; Grandi, 2020). So, if there are global organisations which conduct collective international yet localized governance why also include states in the process? Well, the sources underline that the impact of a purely ‘glocal’ approach, meaning global governance conducted by local actors, to collective policy making is politically and economically limited (C40 Cities, 2018; Davidson, Coenen & Gleeson, 2019; Midttun et al., 2011). This underlines the need for increased independence from governance bodies that control funding or policy guidelines for municipalities (Davidson, Coenen & Gleeson, 2019; Midttun et al., 2011; Tosun & Leopold, 2019). Hence, the fusion of municipal-membership based IO’s with state-membership based IOs is essential for polycentric governance and global collective water governance to be viable (Gupta, Pahl-Wostl & Zondervan, 2013; Hagen & Crombez, 2019). Hence, the need for polycentric governance is widely agreed upon within the academic debate and different IOs

have been analysed for their ability to govern collectively. However, no applicable analysis could be found to provide an empirical analysis regarding the practical realizability of polycentric resource governance which forms the informational gap this study aims to fill.

4. Theoretical Framework

The theoretical causes for institutional collective action problems are manifold but necessary to inspect in order to understand the analysis. One argument underlining the tendency of states to seek collective action and yet struggle to find multilateral agreements can be based on the Realist paradigm. Based on Waltz (1979) and Mearsheimer (2014), Troulis and Mazis (2019) underline that the paramount goal of the state is to survive and engage in profitable activities, in the broadest sense, increasing the chance of survival. This can be achieved in several manners. Firstly, survival can be ensured by becoming a hegemon may it be in a military or economic sense which increases influence over peers, or adversaries, through power politics (Mearsheimer, 2014). Secondly, a state's survival can be facilitated by cooperation and joint profit. Profit can range from security, to economic or social profits, such as military alliances preventing attacks from adversaries or increased trade spilling over to social and political profits. Hence, in order to maximise the actor's own profits, including minimized costs to achieve them, actors gather together in order to tackle a commonly perceived issue, often creating formal organisations and institutions to reach shared goals (Mearsheimer, 2014). This perspective will be useful in analysing the members' activities of both inspected IOs.

Another theoretical lens relevant for studying the case studies is provided by Hagen and Crombez (2019). Their article underlines that "size and complexity of global Commons prevent actors from achieving successful collective action in single, world-spanning, governance systems" (p.120). Furthermore, they state that "a successful governance regime must lead to a perceived benefit for the participating actors that is higher than the perceived costs. But governance on such a level is costly and inefficient while the direct benefits to the participants are unclear" (p.124). Their solution to this governmental conundrum is polycentrism which avoids bottom-up or top-down governance approach but focuses on linking and coordinating activities between the governance levels (p. 124). Through such demarcated roles each governance level receives a specific operational range and correlating responsibilities allowing, arguably, for more effective resource governance (Hagen & Crombez, 2019). Hence, the two aforementioned theoretical lenses look at how governmental entities ensure survival by engaging in profitable activity and how collective governance can increase its effectiveness through inclusivity and compartmentalization.

With that, the study aims to analyse the inspected IOs' perception of collective water governance by using the independent variable of resource governance paradigms. The concept of resource governance paradigms is twofold, namely Public Goods and Commons. According to Brando et al. (2019) the Public Goods paradigm is "concerned with effectively tackling issues of a global nature, through more inter-state cooperation and international institutions" whilst the Commons paradigm reflects "the ideal of self-governance of social movements and communities wary of market logic and state hierarchy" (p.570). Hence, resources categorized as Public Goods are governed *over*, due to the according discourse, by states based on a top-down approach, whereas resources categorized as Commons base on shared power *with* other actors (p. 570). These paradigms allow this study to determine how the inspected IOs and their members frame their perception of profit. Through collective governance or through hegemony?

Regarding the analysis of the effect inclusivity and compartmentalization can have on collective governance this study will use the independent variable, organisational networking structure. Scholz, Berardo and Kile (2008) conclude in their article that the networking structure used by actors within an organization influence the group's ability to collaborate, increase group member credibility and share information. On the one hand, a high-density networking structure, in which all members know each other and can directly interact with each other, increases multilateral agreement, actor credibility and reduces information, bargaining as well as rule enforcement costs (p. 401). However, the reach and collaboration potential of this networking structure is considered limited, meaning that activities conducted in such structures affect only directly participating members (p. 396). On the other hand, the high-centrality networking structure is found to provide an advantage in asymmetric coordination, meaning independent individual activity whilst aiming for a collective goal, and collaboration whilst having a further-reaching inclusivity (p. 396, p. 401). Hence, depending on the networking structure, some factors promoting collective action problems could be more prevalent in either of these networking structures.

Thus, the resource governance paradigm and the networking structure used by the inspected IOs need to be able to promote collective governance, rather than causing collective action problems. This leads to the following research expectations:

1. The municipal-membership based IO is able to avoid collective action problems that can be found in the state-membership based IO regarding collective water governance.
2. Information on state-centric collective governance needs to show tendencies or trends of power recession to municipal governance.

3. Only if both assumptions can be confirmed the validity of polycentric governance, regarding collective water governance, can be ratified.

5. Methodology

5.1. Case selection

As this study aims to verify or falsify the viability of polycentrism, it dedicates to theory testing. As already mentioned, polycentrism bases on the inclusion of local, regional and statal governance actors to form a global IO. For evaluating the realizability of a polycentric governance body, municipal, regional and statal actors need to be analysed in their ability to govern water collectively on their own governance tier and need to be later compared in their ability to compensate found collective governance flaws of the other governance tiers. Unfortunately, no applicable region-membership based IO, meaning an international organisation with members consisting of a country's states, provinces or cantons, could be found, leading to the analysis of only municipal-membership based and state-membership based IOs. For cases to be relevant for this study they need to fulfil a specific set of prerequisites. Firstly, the included organisations need to have similar goals regarding collective water management. For this study the organisations should aim for climate mitigation, adaption and social development by including collective water governance into their agenda. By including these three prerequisites, the inspected organisations need to conduct collective action on multiple issues, allowing more detailed analyses with the aforementioned variables and theories. Furthermore, both organisations need to have different governance levels, one basing on municipal and the other on statal membership, and yet have a global membership.

An ideal case study for the global institution based on statal membership is the United Nations Environmental Programme (UNEP). As part of the United Nations (UN) system, the founding of this institution was motivated by the aim of it being the leading international institution regarding environmental protection (Ivanova, 2010, p. 31). Due to the expected global environmental role of this institution and its membership consisting of UN member states, UNEP provides an ideal case study for researching the influence of statal-based membership on the institutional structure in turn influencing the impediment of collective action problems. The second case study is a global institution that bases on municipal membership forming a 'glocal' governance structure. The inspected institution is C40. Several institutions have sprung up that base on municipal governance over the past decades. However, as Tosun and Leopold (2019) demonstrate, most institutions are either regionally restricted, say within European or Asiatic boundaries and focus their activities either on adaption to or the

mitigation of climate change (p. 8). Only two institutions are found to focus on both task ranges: The Climate Group and C40. However, the Climate Group focuses on the development and implementation of sustainable energy infrastructure within cities, whereas the task conducted by C40 range from lobbying global and national agendas regarding sustainable development to specifically scaling up action regarding urban adaption to water scarcity (C40, 2022). Hence, due to the similarities in task range to UNEP, the membership number reaching until recently 96 and its global reach, C40 can be considered the most valid case study for this comparative analysis.

5.2. Methods of data collection and analysis

The following data collection and analysis should allow the identification and interpretation on the effects of the independent variables, organisational networking structure and organisational resource governance paradigm on the categorized dependent variables of collective action problems namely coordinative, cooperative and division problems. The data collection will base on project reports provided by the UN and C40 archives between 2004 and 2019. A content analysis of the sources will then search for the presence or absence of indicators of the Public Goods or Commons paradigm as well as those of high-density or high-centrality networking structures. This in turn will facilitate the analysis of found coordination, cooperation and division problems. In order to find indicators of the Public Goods paradigm, this paper will look at content related to the normative implications of this paradigm which are described by Brando et al. (2019). These are: 1) monocentrism and top-down governance, which will be looked for by searching for the keywords ‘sovereignty’ and ‘ownership’, due to the governance *over* resources; 2) anthropocentrism, which essentially is resource extraction focused on the benefit of humanity disregarding environmental effects, this study will search for human consumption focused content such as ‘consumption’ and ‘development’ (Eckstein et al., 2010, p. 13); and 3) the keyword ‘governance’ as the discourse on resource governance within the inspected organisation may point at general content not included in the previous keywords ideally complementing found information. For the Commons paradigm this study focuses on content demonstrating shared power *with* other actors. Hence, this paper searches for content containing the keywords ‘shared responsibility’ for a resource, consequentially also a focus on ‘cooperation’ between consuming actors as well as ‘eco-centrist’ governance approaches. Regarding the organisational networking structure, high-density networks are identified through indicators of multilateral connections, dense interaction with organisational members, increased credibility, high collaboration involvement and reduced information and

bargaining costs (Scholz, Berardo & Kile, 2008). On the other hand, high-centrality networks are identified through indicators of bilateral connections between the organisations' members. Also, indicators and keywords 'extensive networks', 'increased information finding' and 'asymmetric coordination', which essentially means that the IO's members can operate independently from one another whilst still collectively working towards a shared goal, are searched for.

For clarification, Table 1 summarizes the variables that are to be determined to be absent or present as well as their conceptualization and operationalization whereas Table 2 provides a list of indicators for identifying the existence of each of the chosen variables in the analysed texts. This content analysis should allow for a systematic focus on and linking of selected variables as well as enabling in-depth analysis and interpretation of contextual information. After having determined the presence or absence of aforementioned indicators this study will conduct a comparative analysis of the information found on each of the two organisations in order to highlight factors that cause collective action problems. Overall, this analysis approach should allow this study to validate or falsify the effectiveness of polycentric resource governance.

Table 1. Conceptualization and operationalization of relevant variables

Variable	Conceptualization	Operationalization
Coordination Problem	Occurs whenever actors benefit from joint action but "transaction costs in the assignment of tasks and communication between the parties" cause uncoordinated action hampering ultimately collective's benefit (Olivier, 2019, p.163)	Content analysis of reports and academic papers indicating the presence of the coordination problem through information demonstrating unstructured assignment of tasks and communication causing uncoordinated action and decreasing collective benefit (see keywords in Table 2)
Cooperation problem	Emerges when the goals between the parties differentiate incentivising parties to behave opportunistically (Olivier, 2019, p.163)	Content analysis of reports and academic papers indicating the presence of the cooperation problem by highlighting conflicting goals in a collective and opportunistic behaviour (see keywords in Table 2)
Division Problem	Occurs "either when the achievement of specific gains will	Content analysis of reports and academic papers indicating the presence

	cause some parties to suffer more losses than the rest, or when parties have disagreements on how to distribute the costs or benefits of their joint work” (Olivier, 2019, p.163)	of the division problem by highlighting disputes caused by unequal losses or benefits between members (see keywords in Table 2)
Organisational networking structure	Institutional structure influencing the members’ ability to coordinate and cooperate within the institution	Identification and categorization of inspected institution’s networking structure into high-density or high-centrality structures and the from that resulting coordinative and cooperative (dis-)abilities as suggested by Scholz et al. (2008) (see keywords in Table 2)
Public Goods paradigm	‘Power over resource’ mentality, monocentric, state-based and thus top-down based resource governance	Content analysis indicating the presence of this paradigm (see keywords in Table 2)
Commons paradigm	‘Power with others over resource’ mentality, polycentric, municipally or locally and thus bottom-up based resource governance	Content analysis indicating the presence of this paradigm (see keywords in Table 2)

Table 2. Coding frame for content analysis

Concepts	Concepts	Indicators
Resource governance paradigms	Public Goods paradigm	Sovereignty, Ownership, Anthropocentrism, Governance
	Commons paradigm	Shared responsibility, Eco-centric, Governance
Networking structure	High-density	Multilateral connections, dense relationships, dense network, increased credibility, high collaboration involvement, reduced information and bargaining costs
	High-centrality	Bilateral connections, centralized relationship structure, extensive network, increased information finding capabilities, advantage in asymmetric coordination

Collective action problems	Coordination problem	Inefficient communicational transaction costs, unstructured assignment of tasks, uncoordinated action, joint benefit
	Cooperation problem	Incompatible goals or approaches to shared goal, incentives for opportunistic behaviour, freeriding
	Division problem	Disagreements on joint costs or benefits distribution, achievement of goal causes unequal losses or benefits, unacceptable assignment of retributions

6. Results

6.1. Paradigms of resource governance

Starting with UNEP’s paradigm of resource governance, it is important to remind what sources have been used. This study uses project reports and assessments published between 2004 and 2019 by or with UNEP, with content on water governance ranging from legislative to executive recommendations and findings. The information provided by these papers reflect on shortcomings and benefits found in the activities of UNEP and its members regarding water governance. The assessments also include information on how issues are perceived and talked about within UNEP and between its members. Findings show that the current transboundary context regarding water bases on national sovereignty and resource ownership. This governance paradigm maintained by its members conflicts with the developing of international water law for transboundary aquifers that UNEP aims to mainstream internationally aiming to facilitate collective, localized and eco-centric water governance (Eckstein et al., 2010; UNEP, 2011; UN-Water, 2018). Also, the content found on anthropocentric governance indicates UNEP’s increased recognition that this type of governance has been focused on too much in the past and collective as well as individual resource governance requires more eco-centric thinking to ensure global development (Eckstein et al., 2010, p. 18). Overall, UNEP shows that its members “treated water resources as a public good; and struggled to enforce individual or communal property rights” and the assessments and governance of shared, trans-boundary water resources, especially in arid regions such as West Asia, have “been looked at from a national sovereignty point of view and represents a sensitive national issue” (UNEP, 2011, p. 33, p. 113; UNEP, 2015, p. 11).

Regarding C40, similar sources have been searched for resulting in the inclusion of project reports and assessments ranging from 2015 to 2019 and the organisation's website containing detailed information on its structure, activity and approaches to projects since its founding in 2005. The sources demonstrate an absence of sovereignty and resource ownership as well as anthropocentric governance indicators. The lack of content indicating resource ownership or sovereignty may be explained with the limited governmental role and the hierarchical power structures municipalities operate in (C40 Cities, 2018, Grandi, 2020). Legislation, decision making and realization of economic projects of (inter-)national significance, such as GERD, are not in the hands of municipalities but that of the state (Swain & Chen, 2014). The lack of anthropocentric governance indicators may be explained with C40s rationale that ecological degradation caused by human overconsumption negatively affects a city's ability to thrive whereas sustainable governance promotes it (C40 Cities (1), 2022). Hence, the argument can be made that cities are inevitably forced to govern more sustainably than states due to the limited capabilities of resource acquisition and legislative and monetary dependency on the state. Furthermore, indicators of shared responsibility are often used in the context of responsibilities shared between the municipality, the local industry, knowledge institutions and residential groups (Jægerfelt Mouritsen, Vestergaard & Davey, 2017, p.8, 80; Keaney, Brown & Sako, 2016, p.68). However, the concept is not limited to the actors of each individual C40 member itself but also between them. Put simply the shared responsibility between C40 members is the creation of circular knowledge development on tackling climate change within municipal power limits. By sharing individually acquired insights on the C40 platform, other members may apply these projects themselves and perhaps develop new approaches, feeding new insights back to the C40 platform (Acuto & Ghojeh, 2019; C40 Cities (1), 2022; Davidson, Coenen & Gleeson, 2019). Hence, there is not only a localized sharing of responsibility within municipalities but also a cooperation-based sharing of responsibility for collective climate mitigation and adaptation (C40, 2021; Grandi, 2020, p.83). Thus, it becomes visible that C40 and its members base their discourse noticeably on the Commons paradigm, which can be explained with the inherent dependency on locally available resources such as water and the support of the state, other investors and fellow C40 members (C40 Cities (6), 2022).

Table 3: Summary of paradigm indicators

Indicators	UNEP	C40
Sovereignty and ownership	Governance of shared resources bases on national sovereignty	Indicators on sovereignty and ownership of water could not be found
Anthropocentrism	UNEP members are found to focus continuously on anthropocentrism	Population can only benefit if resource is consumed sustainably and quality can be upheld
Eco-centrism	UNEP pushes its members for eco-centric governance approaches	Sustainable and eco-friendly consumption is necessary to ensure long-term quality and sufficiency
Responsibility	UNEP's calls for responsibility to govern sustainably seems overshadowed by focus of resource ownership	Responsibility for action lays with each city to consume sustainably. Shared responsibility bases on the sharing of found knowledge on how to become more sustainable
Governance	General focus on consumption and ownership of resource	Focus on de-centralized but collective action

6.2. Organisational networking structure

In order to identify which networking structure is present within UNEP this study looks at the organisation's goals and collaboration approach regarding collective governance. UNEP's overarching goal is to "provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life" in a sustainable manner (UNEP (1), 2022). However, this stated goal does not fit the actions conducted by UNEP. Although the organisation's goal-making procedures are inclusive to all UN member-states, its goal of informing and enabling nations and peoples to improve their quality of life falls arguably short (Ivanova, 2021, p.205-206; UNEP (2), 2022). UNEP does not reduce information costs for its members due to its "normative mandate", administering multilateral environmental agreements and conducting related projects directly (Ivanova, 2021, p.201-202; Macdonald Stewart, 2016, p. 40). By strictly controlling project planning and implementation UNEP appears to acquire and analyse data for itself rather than providing collected data to its member states (Macdonald Stewart, 2016, p.61). This found lack of inclusion and mutual engagement in projects seems to lower UNEP credibility which in turn

decreases collaboration with but also between its members, as the forum in which collaboration is facilitated is not sufficiently appreciated (Ivanova, 2021, p. 214; Macdonald Stewart, 2016; UN-Water, 2018). The lack of collaboration between member-states appears to be especially present when policies influence resource consumption. When looking at project evaluations conducted in West Asia, collaboration between states struggles due to political tensions caused by water disputes (Ivanova, 2021, p. 100; UNEP, 2011, p. 22). In summary, UNEP's promotion of universal inclusion on global environmental policy making points towards multilateral connections and dense interaction between its members indicating a high-density networking structure. The diminished bargaining costs through the inclusivity of its policy-making process during conventions also support UNEP's categorization as high-density networking structure. However, credibility between the members and of UNEP itself in addition to the IO's lack of diminished costs of information sharing demonstrate either a flaw in the realization of this networking structure or a tendency towards a high-centrality structure. However, the indicators of high-centrality networks show flaws as well. Although, projects within member states are led by UNEP which points at centralized governance, seen in high-centrality networks, indicators of increased information finding capabilities were not found, due to UNEP's refusal to act as knowledge hub. Overall, this paper finds that UNEP applies high-density and high-centrality network features, although with apparent flaws in the effective fulfilment of both prerequisites.

The goals set by C40 focus on climate action and the facilitation of a "science-based and collaborative approach to help the world limit global heating to 1.5°C and build healthy, equitable and resilient communities" (C40 Cities (1), 2022). Decision making within the organisation is left to the administrative leadership, although these decisions restrict themselves to the administrative tasks of the organisation such as, nuancing goals and service provision to its members. Decisions on how to achieve the set goals are left to the individual member (C40 Cities, 2018). Information sharing is a task that C40 dedicated itself to extensively. Triennial summits, workshops conducted by members are funded by C40 promoting the interaction and sharing of information between the members directly (C40 Cities, 2018; C40 Cities (5), 2022). However, C40 acts also as freely accessible central knowledge hub and collective databank on the knowledge created and developed by its members. Annual reports published by C40 also provide insight into the most innovative projects conducted that year, promoting knowledge development. Hence, by facilitating the development and sharing of knowledge between its members, C40 allows the tackling of environmental issues in a collective manner without intervening into municipal decision-making and agency. With that, C40's networking structure

can be summarized. The funding of conventions and workshops promotes direct, multilateral connections between the members but ‘standard operation’ outside of these events indicate bilateral connections between C40 and its members, demonstrating both high-density and high-centrality networking capabilities. The act of providing yearly reports and collective knowledge and the growing membership of C40 over the years, indicate a high degree of credibility of the organisation, as well as between its members (Acuto & Ghojeh, 2019; Davidson, Coenen & Gleeson, 2019). C40 also increases information finding capabilities, which can be considered the core task conducted by C40 and its members. Furthermore, the organisation’s approach to collectively act on issues in a de-centralized yet collaborative manner underlines C40’s ability to promote asymmetric coordination, as each member chooses its own approach to achieving the set goals. Overall, C40 appears to maintain a hybrid networking structure utilizing the strengths of each to increase collective governance efficiency.

Table 4: Summary of networking structure indicators

Table 4.a: High-density indicators

Indicators	UNEP	C40
Multilateral connections	Participation in goal-setting includes all members	Facilitated during regular summits and workshops
Relationship and network density	High due to decision-making being done in conferences	High when summits and workshops are in place
Credibility	Low due to UNEP’s ‘normative mandate’	Apparent high credibility
Collaboration	Limited between members due to UNEP’s ‘normative mandate’	Decentralized yet high collaboration through circular knowledge development and conducting workshops
Information and bargaining costs	Facilitated although inefficient due to UNEP’s focus on acquiring information for itself instead of sharing it	Facilitated through summits, workshops and C40 database

Table 4.b: High-centrality indicators

Indicators	UNEP	C40
Bilateral connections	UNEP's projects are centralized and controlled by the organisation	Applicable in 'standard operation' when connections base on information provision between C40 database and its members
Relationship and network density	High due to decision-making being done in conferences	Low when conducting 'standard operation'
increased information finding capabilities	Partially applicable for UNEP itself and inapplicable for members, due to UNEP's 'normative mandate'	Facilitated through provision of centrally gathered and shared information
advantage in asymmetric coordination	Possible due to UNEP's control over conducted projects	Facilitated through de-centralized agency but centrally established goals

6.3. Coordination problems

As mentioned, coordination problems occur whenever actors engage in joint action but “transaction costs in the assignment of tasks and communication between the parties” cause uncoordinated action hampering ultimately the collective’s benefit (Olivier, 2019, p.163). Hence, this paper will look at indicators of (in)efficient communication, indicators of (un)coordinated action and how they influence joint benefit in the inspected IO. When looking at UNEP reports, indicators regarding the unstructured assignment of tasks could not be found. UNEP created a clear roadmap and goals whilst providing the participating countries with country teams and delegates tasked to oversee their respective projects and provide guidance to the state. However, regarding communication UNEP has found in 2011 that “shared water resources have not received adequate public debate, which has contributed to widening the communication and coordination gaps among countries” (UNEP, 2011, p. 113). Inefficient communication could also be seen in several, separate projects which were part of a global initiative named UNDAF. These projects “were often obscured rather than clarified by their respective design and reporting” due to a lack in “coherent shared results framework, logical framework analysis, and monitoring and evaluation strategy” (Macdonald Stewart, 2016, p.61). Looking at indicators of uncoordinated actions, the UNDAF report points at shortcomings in the integration of some smaller tranche projects, seemingly resulting from a lack in clear

communication (Macdonald Stewart, 2016, p. 61). This lack of coordinated action due to communication can also be found in a 2011 report. There UNEP highlights the urgent need for West Asia and Arab countries to cooperatively invest in technology development aimed at decreasing shared water stress and to engage in joint water governance on transboundary water basins (UNEP, 2011). When looking at the limited outcomes of these projects, it becomes clear that the joint benefit, here the efficient realization of UNEP projects can be decreased by incoherent communication and rather uncoordinated action by UNEP.

When looking at C40, the approach to coordination is less complex. Considering that C40 focuses on providing access to coherently evaluated best practices to realize environmental projects municipalities have the liberty to independently decide on how to realize the projects they committed to (C40 Cities, 2018). Hence, tasks remain with each individual member, making any additional assignment of tasks between members and C40 obsolete. Considering communication, C40 conducts regular conventions and funds workshops for its members to exchange their knowledge directly (C40 Cities (5), 2022). However, their main task remains with collecting, evaluating and sharing the information. The ability of C40 members to access that database in combination with its ability to choose its own approach to reach the organisation's goals diminishes the dependence on communication and coordination between members themselves and C40 making any coordination voluntary and basing on municipal rather than state wide projects.

These findings can be connected to the first research expectation which states that C40 is able to avoid collective action problems witnessed by UNEP. So, does this apply in the case of coordination problems? Clearly, UNEP experiences coordination problems, especially due to communication and partially uncoordinated action. This can be explained with UNEPs hierarchical structure allowing it to maintain its 'normative mandate' and through that its centralized management of large-scale projects, arguably causing the identified issues. C40 on the other hand appears to impede coordination problems within its own organisation. C40's limited task range, basing on the facilitation of connecting its members and providing information, allows its members to conduct its project on its own, or if wanted with other members, without interference of the IO. Through this hybrid networking structure promoting high-density interaction between members and high-centrality information gathering, dependence on successful coordination within C40 is being, arguably successfully, avoided. Hence, the existence of coordination problems within C40 appears less likely to occur.

Table 5: Summary of coordination problem indicators

Indicators	UNEP	C40
(in)efficient communication	Struggle with coherent analysis, monitoring and evaluation strategy across projects, and inadequate public debate on water governance widening coordination and communication gaps between countries	Projects are conducted by each member individually, C40 acts merely as information and goal provider
(un)coordinated action	Clear, collective setting of goals but returning information was inadequate to develop better approaches for future projects	Due to decentralized approach to the projects, coordination is not a prerequisite whilst still allowing for collective action towards a shared goal
Influences on joint benefit	Issues in communication and coordination are found to diminish joint benefit due to competitive thinking and focus on benefit by the individual states	Clearly demarcated roles of C40 administration and members and the decentralized approach make it unlikely for C40 and its members to witness decreased joint benefit.

6.4. Cooperation problems

Cooperation problems “emerge when the goals between the parties differentiate incentivising parties to behave opportunistically” (Olivier, 2019, p.163). For that this paper looks at content indicating disagreements between UNEP members regarding water governance and indicators pointing at incentives for or actions of opportunistic behaviour. When looking at indicators of statal interests and goals in the reports, a clear picture of competitiveness regarding resource ownership can be seen. A 2011 UNEP report highlights increased competition between water resource sharing countries in West Asia due to “the control of shared surface and groundwater flows from up- and down-stream countries”, “political tension in the past has resulted in reduction of upstream releases” and the from that resulting in increased “competition for natural resources and intensification of disputes over water allocation” (UNEP, 2011, p. 14, 22, 35, 38). This mindset can also be found when looking at GERD (Swain & Chen, 2014). Even though there are examples of cooperative success, for example EU’s WFD, this paper argues that water resources crossing arid biomes appear to suffer more under cooperation problems than biomes suffering less under water scarcity

(Eckstein et al., 2010; UN-Water, 2018). This can be underlined with a 2015 UNEP report stating that the low unit value of water, its dispersed and unpredictable nature make the resource difficult to monitor and control, ultimately leading to little or no economic benefit when enforcing resource monitoring and policies (UNEP 2015, p.45). This underlines the incentive to act opportunistically and simply maintain ownership of water instead of increasing costs for sharing it, when water is scarce.

C40's collective governance approach and its members' political power position seem to prevent observable cooperation problems. Due to C40's passive support, namely the collection and sharing of knowledge between its members and funding of conventions and workshops, the organisation relies on the motivation of its members to individually achieve the goals that have been set by C40 (C40 Cities (1), 2022). In regards to incentives of opportunistic behaviour, the actors' political position, their resource governance paradigm and networking structure seem to make any kind of opportunistic behaviour obsolete. Firstly, municipalities are not in the position to be able to declare ownership over a resource and are instead inherently dependent on what they can afford or are naturally supplied with (C40 Cities, 2018). Secondly, also the Commons paradigm used by municipalities, caused by the necessity to use resources such as water sustainably, the subsequent eco-centric rational and C40s networking structure, promoting a circular knowledge development process, create the mentality that long-term individual benefit is only achievable through joint benefit (C40 Cities (1), 2022). Hence, the combination of these factors seems to prevent the perceived need to act opportunistically.

Connecting the information to the first research expectation, namely C40 being able to avoid collective action problems that can be found in UNEP regarding collective water governance, the following can be concluded: Regarding UNEP, water seems to be governed with the Public Good paradigm and thus bases on the economic rational of supply and demand. If demand tends to be high, the ownership over this resource provides profit, may it be in form of economic or political gains. This incentivises opportunistic behaviour in regards to the acquisition of water and the disregard of other consuming states. C40 maintains the Commons paradigm within the organisation and between its members. This can be accredited to the municipalities dependence on naturally supplied water and the dependence on the state or fellow cities to solve short or long-term water stress. Hence, opportunistic behaviour would only lead to short term benefits but eventual ruin, making cooperation and sustainable governance the only viable option.

Table 6: Summary of cooperation problem indicators

Indicators	UNEP	C40
Incompatible goals or approaches to shared goal	Competitive thinking among states makes the reaching of collective governance agreements difficult	Goals are set by organisation but the approach to reach them is left to the individual member. This approach allows for developing new innovations to reach the goals that are then shared
Incentives for opportunistic behaviour	Where water is scarce, profit from resource ownership is higher than where water is plenty. Hence, an incentive for opportunistic behaviour can be found	As profit remains in the acquiring and developing of knowledge on sustainability and not the acquisition of resources, the circular sharing and development of knowledge within C40 makes opportunistic behaviour redundant

6.5. Division problems

Finally, division problems emerge “either when the achievement of specific gains will cause some parties to suffer more losses than the rest, or when parties have disagreements on how to distribute the costs or benefits of their joint work” (Olivier, 2019, p.163). When looking at UNEP, reports underline the considerable hurdles found for motivating states to collectively govern water due to the member-states’ perceived costs of collective governance in comparison to perceived benefits. One costly dedication would be the individual state’s commitment to change the existing infrastructure to become more sustainable. Although small scale projects can be monetarily stemmed rather easily, larger projects may require considerable funding due to extensive ecosystem restoration, meaning the need to disassemble existing grey infrastructure, such as dams and replacing with green infrastructure such as forests or wetlands (UN-Water, 2018, p.6). Another considerable cost worth highlighting is the lack of immediate benefits. The effects of greener water governance will “not always result in immediate societal benefits, governments also face political and economic obstacles in seeking to realign medium and long-term water management strategies rather than providing for the immediate needs of their citizens” (Eckstein et al., 2010, p. xii). Hence, there is a lack of immediate societal, economic and consequentially political profit, which diminishes national political motivation to focus on the state’s own national sustainable water governance. Yet again, long-term benefits are considered to be manifold. For example, the monetarization of sustainable agency by water

consumers, say through payments of environmental services schemes and green bonds, “have been shown to generate returns on investment while lowering the need (and costs) for larger, often more expensive infrastructure required for water resources management and the delivery of water supply and sanitation services” (UN-Water, 2018, p.vi). Furthermore, the protection of water sources, say through reforestation and the re-naturalization of wet- and grasslands in combination with some already existing infrastructure, such as canals or industrial irrigation systems can lead to increased water quality, infrastructure maintenance cost savings and even improved risk reduction such as flooding (UN-Water, 2018, p.4-5). When looking at the dispute between Egypt, Sudan and Ethiopia for example, the prospect of decreased water availability alone, already show an increased likelihood of inter-state conflict. This is also found by UNEP which states that water availability influences inter-statal competitive sentiments, increasing the possibility of disputes between them as long as final water resource sharing agreements are absent (UNEP, 2011, p. 38, 117).

C40 faces similar tasks regarding the rebuilding of existing infrastructure, although for its members the projects remain on a municipal level. However, the organisational structure of collective water governance and its approach to support projects for its members is different. Whereas UNEP’s ‘normative mandate’ makes the IO proactive in its development and implementation of its support, projects conducted by C40 members are conducted individually or in collaboration with other members (Cities100, 2017). C40 maintains non-interfering support such as acting solely as information hub and knowledge provider (C40 Cities (6), 2022). Hence, every member is responsible for their approach, meaning that the achievement of specific gains will cause some parties to suffer more losses than the rest but it is up to themselves to avoid undesired outcomes. Only upon request, C40 provides additional aid in form of consultation and training (C40 Cities, 2018). Nevertheless, already through facilitated connectivity and knowledge-sharing with other C40 members, costs can be minimized by implementing projects based on the knowledge provided by other members (Cities100, 2017, p. 77). Thus, C40 seems able to avoid division problems within its organisation as the support it provides restricts itself to the free exchange of knowledge., giving each member the responsibility to successfully implement the projects they chose. Through that, some parties may suffer more losses than others by achieving the goals set by C40, the non-interfering support of C40 and its members however leave the responsibilities clearly to the individual member. Also in regards to possible disagreements on how to distribute the costs and benefits of any joint work is avoided by C40’s structure, which aims at a global goal, the activities, their costs and resulting benefits are primarily local.

This found information can again, directly be connected to the first research expectation, being that C40 is expected to be able to avoid collective action problems that can be found in UNEP regarding collective water governance. In regards to division problems, the resource governance paradigm seems crucial in the IO's ability to avoid them. When looking at UNEP, which maintains a Public Goods paradigm, shows its members to focus on immediate costs and benefits in regards to their actions. The immediate costs and lack of immediate benefits show a lack of national political motivation to focus on the state's own national sustainable water governance. In regards to collective water governance, the competitive mindset and the scarcity of water is found to make any cooperation between states difficult as water ownership provides geopolitical and economic advantages under such circumstances. Hence, division problems are present and likely to remain in UNEP due to the competitive mindset of its members. On the other hand, C40 maintains a Commons paradigm which forms its members' discourse on water governance. This shows to allow for an organisational structure that clearly demarcates responsibilities to each member and the organisation itself. This results in a non-interfering support approach of C40 and its members which bases on knowledge sharing. With that division problems are unlikely to happen, as the approach to achieving the set goals and the successful implementation of the chosen approach is left to each member. This means that global benefits are shared but the costs lead primarily to local benefits.

Table 7: Summary of division problem indicators

Indicators	UNEP	C40
Cost	Costs of large-scale changes in infrastructure, no immediate societal, political or economic profit	Cost of collective cooperation within C40 appears to be restricted to the individual member and its activities
Benefit	Possible returns of investment through monetarization of sustainable action, increased water quality, decreased infrastructure maintenance costs in the long term, decreased international tension and likelihood of disputes	Value-based activity fuelled by solidarity generates added value and benefits for both "donor" and "recipient" cities, in this case through a circular, non-intervening, voluntary-based support directly to a member

Disagreements on joint costs or benefits distribution	Diminished national political motivation to focus on the own but also participate in UNEP projects due to foreign mandate pressures	Although costs and impact generally remain unbalanced through such an approach, they can be led back to the choices made by the individual member, less so by external actors such as C40 or other members
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7. Discussion and conclusion

With the aim to verify or falsify the viability of polycentric governance as proposed by McGinnis and Ostrom (1992), Brando et al. (2019) as well as Hagen and Combres (2019), this study can now summarize the found information, discuss the findings in regards to the research expectations and formulate a conclusion to the research question: *To what extent can polycentric governance circumvent collective action problems found in state-membership based IOs regarding collective water governance?*

When looking at the findings regarding coordination problems, it becomes visible that despite calls for more municipal inclusion, UNEPs hierarchical structure, its centralized management of projects and its ‘normative mandate’ maintains a “single, all-encompassing governance regime that can weigh all interests and has universal applicability”, the governance approach that is being criticised in the academic debate on polycentrism (Hagen & Crombez, 2019, p.120). Through these approaches, UNEP is found to witness coordination problems. C40 on the other hand appears to impede coordination problems through its clearly demarcated task range, basing on the facilitation of connecting its members and providing information. Projects and the responsibility for their success remain with its members. Through the found hybrid networking structure, allowing voluntary high-density interaction between members and high-centrality information gathering in combination with clearly demarcated tasks, dependence on successful coordination within C40 is being, arguably successfully, avoided.

When looking at cooperation problems, within UNEP water seems to be governed with the Public Good paradigm and thus bases on the economic rational of supply and demand. This incentivises opportunistic behaviour resulting in the acquisition of water ownership and the disregard of other consuming states. Hence, UNEP also witnesses cooperation problems, seemingly due to the competitive mindset of its member-states. On the other hand, C40 maintains the Commons paradigm within the organisation and between its members. Due to the municipalities’ dependence on naturally supplied water and the state’s support, joint efforts

with fellow municipalities lower costs and dependence from the state and increase flexibility in finding solutions to shared problems. This in turn motivates cooperation and sustainable governance making freeriding and other opportunistic behaviour unlikely.

Also in regards to division problems UNEP's members, which maintain a Public Goods paradigm, shows a focus on immediate costs and benefits in regards to their actions. The immediate costs and lack of immediate benefits show diminished national political motivation to focus on the state's own national sustainable water governance. Also in regards to collective water governance, the competitive mindset and the scarcity of water is found to make cooperation between states difficult as water ownership provides geopolitical and economic advantages under such circumstances. Collective governance would lead to sharing resources and goals leading to a state's loss of geopolitical and economic power. On the other hand, C40's Commons paradigm allows for an organisational structure that clearly demarcates responsibilities to each member and the organisation itself. The from that resulting non-interfering support approach makes a member's project costs result in local benefits and only in combination with the collective pursuit and achievement of a specific goal a global benefit. With that, division problems are unlikely to happen in C40.

The above-mentioned findings allow now a conclusion based on the previously mentioned research expectations. The first expectation states that C40 is able to avoid collective action problems that can be found in UNEP regarding collective water governance. The found information suggests that C40 is indeed able to avoid the collective action problems witnessed by UNEP, arguably due to the differences in resource governance paradigm and the IOs' networking structures, both amplifying competitive or in the case of C40 collaborative mindsets. The second research expectation states that the found information on state-centric collective governance needs to show tendencies or trends of power recession of states to municipal governments, which is crucial to make polycentric governance possible. However, as Hagen and Crombez (2019) already state: "a successful governance regime must lead to a perceived benefit for the participating actors that is higher than the perceived costs" (p.120). The found information does show that UNEP's calls for increased inclusion of local decision-making but its members remain in a state of competitive thinking, resulting in the perception that giving up control on a resource such as water through collective governance, equals a loss of geopolitical and economic power. Especially in areas where water witnesses high demand but low supply. Overall, no valuable information could be found that demonstrates power recessions from states to municipal governments for more inclusion in the collective governance of resources. Hence, the third expectation, being that only if both assumptions can

be confirmed the validity of polycentric governance, regarding collective water governance, can be ratified does seem confirmable. UNEP and its member states demonstrate that state-centric, competitive thinking hinder collective governance between states, especially in arid biomes. C40 demonstrates that municipalities are more affine regarding collective governance, due to their fundamentally different resource governance paradigm and issue focused networking structure, arguably compensating the collective action problems found in UNEP. However, for this compensation to be realizable municipalities need increased independence from their respective state or the state-membership based IO, here UNEP, needs to adapt to an organisational structure similar to C40's. As the state cannot be found to give the needed political power to its municipalities, despite of recommendations given by UNEP, change in the status quo regarding the national and international power positioning is unlikely.

Hence, in response to the research question *to what extent can polycentric governance circumvent collective action problems found in state-membership based IOs regarding collective water governance*, the realization of polycentric water governance appears unviable under the current conditions. The reason for that bases on the prerequisite that “a successful governance regime must lead to a perceived benefit for the participating actors that is higher than the perceived costs“ (Hagen & Crombez, 2019, p.124). The found unviability of polycentrism regarding water governance is not because of theoretical miscalculations on the side of the academic arguments given by McGinnis and Ostrom (1992), Brando et al. (2019) or Hagen and Combrez (2019). The mere reason is that UNEP shows that its member-states maintain a resource governance paradigm and its organisational networking structure maintains resource competitiveness making the perceived costs of collective water governance higher than the perceived benefits. A truly polycentric global institution is thus not achievable under the current circumstances, and global harmonization of sustainable water governance unlikely. We can thus expect a continuation of international struggles over water putting populations and international prosperity at risk.

Finally, the limitations of this study need to be highlighted. First and foremost, this study focused on a very specific resource shared across borders, whilst there are many more to be inspected for identifying actual trends. Furthermore, the case studies are only two of many that can be used for analysing polycentrism. Hence, the academic debate remains in need of an increased availability of analyses on different resources as well as organisations in order to develop more detailed findings and the actual viability of polycentrism regarding resource governance overall. With that, this study is but a mere indicator on the viability of polycentrism and should not be seen as a definitive answer to the research question.

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