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Research

Adjusted to reality? Mandate and functioning of the General Integral Commission of the Grande Tárcoles Rivershed in Costa Rica

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ABSTRACT. The Grande de Tárcoles River in Costa Rica is one of the most polluted and degraded river basins in Central America. At the same time Costa Rica is a country internationally recognized for progressive environmental management. At least on paper, the country fosters sustainable river management in the form of integrated water resources management (IWRM). In the specific case of the Grande de Tárcoles River there is the General Integral Commission of the Grande Tárcoles River basin (CGICRGT) assigned to manage the basin in an integral manner. How this works in practice has so far not been investigated. Therefore, in this article we examine the formal and informal design and working practices of the CGICRGT and determine which type of river basin organization (RBO) it represents. Based on a mixed-method approach combining document analysis with semi-structured qualitative interviews we found that the CGICRGT contains elements of both, an agency RBO and a coordinating RBO. Although coordinating the river management works well to a certain extent, critical challenges remain that hinder a fully successful management of the basin and in consequence the improvement of its ecological status. Amongst them count the overlapping responsibilities of national and local institutions, the missing participation of some important institutions, the lack of financial and personnel resources, slow progress in terms of time, and a lack of motivation of the participating institutions. Although the CGICRGT presents an excellent platform for the integrated management of the Tárcoles river basin its progress will be too slow and its impact too small as long as all participants do not prioritize its work and integrate and motivate all important actors.

Key Words: *institutional analysis; institutional interplay; integrated water resources management; Latin America; river basin organizations; water governance*

INTRODUCTION

Costa Rica has gained global recognition for its commitment to environmental conservation, attributed to its National Conservation Area System and progressive environmental policies. Notably, the country has led the way in implementing innovative initiatives like payments for ecosystem services programs and its National Decarbonization Plan. These efforts have earned Costa Rica prestigious accolades, including the Champions of the Planet Award in 2019 and the Earthshot Prize in 2021 (Pérez 2021).

However, despite these achievements, Costa Rica faces significant challenges in managing its natural resources. One of the most pressing issues relates to the outdated and ineffective regulations governing watershed management. The Law of Waters (*Ley de Aguas*), enacted in 1942 when the country's social and ecological landscape was vastly different, remains in place. During that time, the agricultural sector held considerable political influence, and there was no awareness of the potential exhaustion of the agricultural frontier (Astorga 2016). Subsequent legislation, like the Forest Law of 1996, introduced more stringent conservation regulations, including protections for riparian zones (Brumberg et al. 2021).

Despite these legislative advancements, some of which exist only on paper and others with tangible outcomes like the reversal of forest loss across the country (Morse et al. 2009, Aguilar-González et al. 2018), Costa Rica continues to grapple with issues such as watershed pollution, inequitable water rights and subsidies, and a lack of community participation in watershed management. These issues are consistently documented in the State of the Nation Reports published by Costa Rica's public universities (Astorga 2016, Programa del Estado de la Nación en Desarrollo Humano Sostenible 2016, Herrera 2017).

Part of the root causes of this situation can be traced to the political interests surrounding water in Costa Rica, which are dominated by powerful monoculture and hydroelectricity sectors. These interests have persistently lobbied against reform efforts undertaken by various governments, technical experts, and environmental organizations over the past two decades (Alpizar 2013, 2019). One notable reform initiative involved proposing a constitutional amendment to recognize the right to water as an integral component of environmental rights, enshrined in Article 50 of the Costa Rican constitution (Molina 2020). Although this reform was initially seen as a step toward breaking the monopoly of power in water-related matters, it also underscored the existing power dynamics. Unfortunately, the reform could not encompass rights related to sanitation and participation concerning water rights. Similarly, other legal reforms, such as the Regional Agreement on Access to Information, Public Participation, and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement), aimed at enhancing public participation in environmental governance, face opposition from similar lobbying interests (Madrigal and González 2021).

In an effort to improve the management of its rivers, Costa Rica has adopted a river basin approach for integrated water resources management, as outlined in various legal initiatives (García 2008). This approach encompasses several key aspects, including the

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incorporation of diverse societal sectors into water resources management to represent various uses and users, the consideration of economic, social, and environmental dimensions of sustainability, and the active involvement of multiple stakeholders in decision-making processes (Global Water Partnership 2000, Biswas 2004, Grigg 2008, Lubell and Edelenbos 2013).

One illustrative example of this approach is the Tarcóles Commission, while another notable instance is the Commission for the Management of the Reventazón River Basin (COMCURE; Ballestero and López 2017). These initiatives underscore Costa Rica's commitment to a more holistic and inclusive approach to managing its water resources.

In 2022, the emergence of a new conservative administration in Costa Rica has led to the suspension of several participatory processes. The shifting policy landscape indicates a trend toward centralizing responsibilities and adopting a more top-down management approach, primarily aimed at reducing government expenditure. Additionally, a prominent narrative of the new administration revolves around the streamlining of environmental regulations to facilitate private sector activities, with the overarching goal of revitalizing the Costa Rican economy (Molina 2022).

Research on integrated water resources management encompasses scientific investigations into the categorization and governance of river basin organizations (RBOs; Alaerts 1999, Huitema and Meijerink 2017, Pellegrini et al. 2019). It extends to the examination of international river basin organizations (Schmeier et al. 2016) and the complexities of transboundary water governance involving multiple countries (Rivera-Torres and Gerlak 2021, Bukhari and Brown 2022). Although a majority of examples originate from European and North American countries (Cook et al. 2016, Morris et al. 2016, Ross and Connell 2016, Pellegrini et al. 2019), studies pertaining to basins in Asia, Africa (Meissner et al. 2016, Meijerink and Huitema 2017, Salimi et al. 2019, Peguita and Solntsev 2022), and Latin America (Trimble et al. 2022) are increasingly gaining prominence.

In light of the challenges mentioned above, including the enhancement of water management and the harmonization of diverse interests, it becomes imperative to assess the practical effectiveness of integrated water resources management (IWRM). Given this context and identified research gaps, the primary objective of this paper is to scrutinize both the formal and informal structures and operational procedures of the General Integral Commission of the Grande Tárcoles River Basin in Costa Rica, hereafter referred to as the Tárcoles Commission. Specifically, we aim to address the following research question: How does the classification of the Comisión General Integral del Río Grande de Tárcoles (CGICRGT) as a type of RBO, in accordance with Meijerink and Huitema's framework (Huitema and Meijerink 2017, Meijerink and Huitema 2017), correlate with its performance in implementing IWRM practices for the Tárcoles River? To explore this question, we employ a case study methodology that combines the analysis of official documents from the Tárcoles Commission with the examination of semi-structured qualitative interviews conducted with commission members.

METHODS

Analytical framework

For our analysis, we adhere to the RBO typology as developed by Huitema and Meijerink (2017). This typology is derived from Elinor Ostrom's institutional analysis and development framework (Kiser and Ostrom 1982, Meijerink and Huitema 2017). The core concept underlying this framework is that institutions represent a nested set of rules that shape action situations and, in turn, influence the behavior of actors.

To characterize RBOs, Huitema and Meijerink (2017) employ five distinct types of rules initially defined by Ostrom: (1) Authority rules: These rules define the scope of authority within an RBO and prescribe which entities, such as the RBO itself or external actors like professional bodies, interest groups, or citizen groups, can take specific actions. They also dictate the procedures for ordering, processing, and terminating actions. (2) Aggregation rules: These rules specify the formulas for evaluating individual choices and calculating collective choices. They emphasize rationality in decision-making processes. (3) Boundary rules: Boundary rules delineate the geographical jurisdiction of the RBO and establish entry and exit conditions for participating actors. (4) Information rules: These rules govern information channels, stipulating when they are open or closed. Additionally, they define an official language for acceptable arguments and delineate procedures for processing evidence. (5) Pay-off rules: Pay-off rules determine how benefits and costs are distributed among participants in various positions within the RBO.

Drawing upon these diverse rule types, Huitema and Meijerink (2017) categorize RBOs into four distinct types: (1) autonomous RBOs that operate independently and possess mechanisms for democratic control; (2) agencies that are tasked with specific functions by the government and are held accountable to governmental authorities; (3) coordinating RBOs that are established by government partners seeking collaboration, and their accountability lies with these partner entities; and (4) partnerships that represent bottom-up governance arrangements initiated by various stakeholders, including civil society organizations (their accountability primarily extends to their participating members).

It is important to note that the proposed typology consists of ideal types in the Weberian sense. In other words, these categories are theoretical concepts and may not precisely mirror real-world RBOs (Meijerink and Huitema 2017).

We continue to apply Meijerink and Huitema's framework (2017) in our analysis of the RBO's performance. This analysis focuses on its ability to "enhance (1) coordination across levels of government, policy sectors, and between public and private parties; (2) the accountability of water policies; (3) the legitimacy of water policies; and (4) the environmental effectiveness of policies." We applied this framework to the case of the CGICRGT.

Case study

The Tárcoles River Basin (known as Río Grande de Tárcoles in Spanish) is situated in Costa Rica's Central and Central Pacific region, covering an extensive area of 2,165.99 km², which accounts for approximately 4.2% of the country's total surface area (Figs. 1 and 2). Within its boundaries, this region encompasses two conservation areas, constituting geographical subdivisions within Costa Rica's protected area system. There are

Fig. 1. Map of Tárcoles River Basin and the Comisión General Integral del Río Grande de Tárcoles subcommissions.

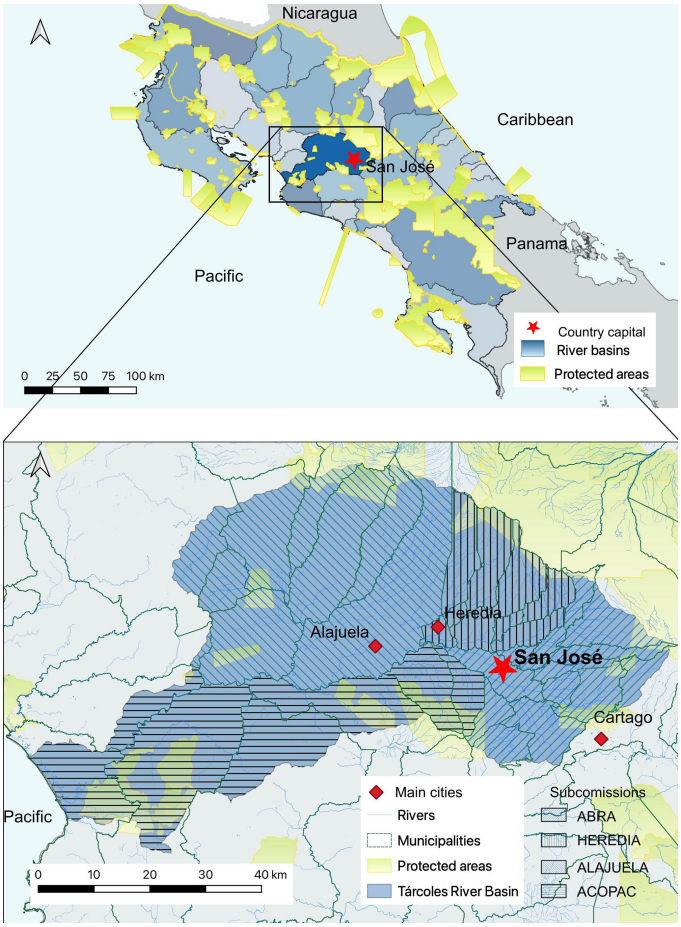
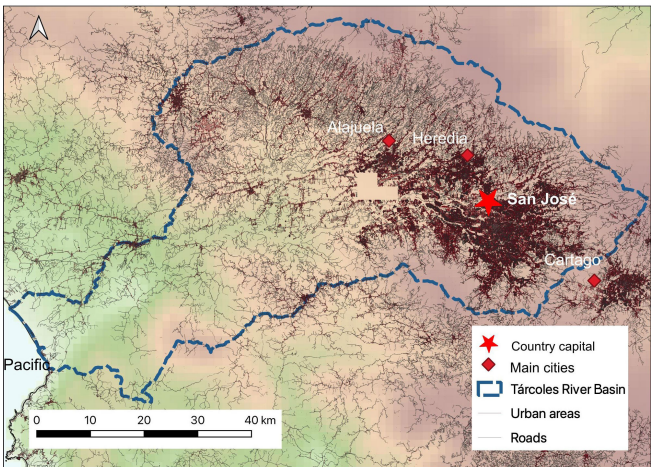


Fig. 2. Urban areas and elevation (0–2550 masl) in the Tárcoles River Basin. Data Source: Sistema Nacional de Información Territorial, Costa Rica (https://www.snitcr.go.cr/; blank space in map is original missing information).



a total of 12 natural protected areas, 38 municipalities (with most concentrated in the Greater Metropolitan Area [GAM]), two sub-basins, namely Río Virilla and Río Grande, and approximately 22 micro-basins (MINAE 2013).

The significance of the Tárcoles River Basin is underscored by its rich biodiversity and the multitude of ecosystem services it provides. These services are indispensable for national development, including the provision of water resources for human consumption, irrigation, and hydroelectric potential, among others. Notably, the GAM encompasses the country's capital, San José, along with three major cities: Alajuela, Heredia, and Cartago. A striking statistic reveals that 53% of Costa Rica's population resides within the GAM, which also hosts nearly 80% of the nation's industrial activity and accounts for 50% of its coffee production (Rojas 2011).

However, it is crucial to acknowledge that the Tárcoles River faces a severe environmental challenge. Arguably, it stands as Central America's most polluted river. This pollution is primarily attributed to the significant urban and industrial activities occurring within its basin and the absence of adequate measures for waste and sewage disposal and treatment (Bower 2014). The Tárcoles Commission draws inspiration from certain prior organizational initiatives that played a pivotal role in voicing concerns and taking action against the environmental degradation within the river basin and its consequential impacts on the local population.

In 2004, the Garabito Ecological Party, with the support of CoopeSoliDar R.L., the Ombudsman's Office of the Republic, and the Municipality of Puntarenas, took a significant step by filing an *amparo* (a legal action aimed at protecting constitutional rights and guarantees) with the Constitutional Court of the Supreme Court. This legal action targeted the executive branch of the Government, local governments, and various state organizations in response to the escalating pollution levels in the Tárcoles River, which were severely affecting communities in the lower reaches of the watershed.

On 27 April 2007, the Constitutional Court issued Resolution number 5894-2007, commonly referred to as the "Voto Garabito." This ruling found the state to be in breach of its constitutional duty to effectively protect the environment.

In this article, we analyze the current state of the Tárcoles Commission. This commission was established through Executive Decree N°38071-MINAE in 2013, with the primary objective of fulfilling the mandates outlined in the Voto Garabito. The commission operates as a governing body with the overarching goal of implementing comprehensive initiatives. These initiatives encompass the coordination, planning, protection, and restoration of the Tárcoles River Basin.

One of the fundamental principles guiding the commission is the need for member organizations to collaborate and coordinate their efforts effectively. This collaboration aims to prevent redundancy and conflicts among entities and actors operating within the geographic area covered by the commission, as stipulated in Article 3 of the Internal Operating Rules of the commission.

Table 1. Overview of data sources. CGICRGT = Comisión General Integral del Río Grande de Tárcoles.

Documents	Interviews	Focus groups
Decreto Ejecutivo Nº 38071-MINAE, published in Gaceta Nº 34 on 28 October 2013)	1 Participant in Subcommission ACOPAC (local level)	Subcomission Heredia (12 participants: 8 local and 4 national level)
Internal Operating Regulations of the CGICRGT	2 Participants in Subcomission Alajuela (local level)	Subcomission San José/ABRA (13 participants: 6 local and 7 national level)
Rules for the advisory councils of the CGICRGT	2 Participants in Subcomission San José/ABRA (local and national level) 2 Participants in Subcomission Heredia (local level) 1 Member of the Coordination of CGICRGT (national level)	

Data collection and analysis

We conducted semi-structured interviews with actors participating in the Tárcoles Commission, considering participants from its four administratively subdivided sub-commissions, along with other experts in water governance and river management in Costa Rica. In total, we conducted eight in-depth expert interviews and two focus groups with representatives from two sub-commissions (Table 1). The focus groups were organized at the invitation of these two sub-commissions, whereas we interviewed key organizations in the other two sub-commissions. This approach allowed us to obtain a well-rounded perspective on the commission's overall functioning and practical rules.

The interviewed representatives mainly held leadership roles or had extensive experience within the commission, making them experts in their respective fields. Despite the relatively small number of interviews, we reached information saturation. To complement our interview analysis, we conducted a document analysis, which included reviewing the executive decree governing the commission (Decreto Ejecutivo Nº 38071-MINAE), the Internal Operating Regulations of the Tárcoles commission (Reglamento Interno de Funcionamiento de la Comisión de Gestión Integral de la Cuenca del Río Grande de Tárcoles), and the procedures for the advisory councils of the Tárcoles commission (procedimientos consejos consultivos CGICRGTárcoles). It is worth noting that the last two documents were not officially published but were provided by the Tárcoles Commission upon our request.

The interviews were conducted in March and April 2019 and primarily focused on the commission's participants, their influence within the commission, their motivations for participation, and the benefits they derived from it. Additionally, we inquired about the commission's inception, its operational procedures, activities, financing mechanisms, and decision-making structures. All interviews were conducted with the interviewees' consent, subsequently transcribed in full, and analyzed using the qualitative content analysis framework outlined by Kuckartz (2002). We employed MAXQDA software for data management and interview coding. In the categorization of our RBOs, we applied coding based on various rule types as proposed by Huitema and Meijerink (2017). We also used categories to comprehend the RBO's structure, encompassing actors, tasks, objectives, origins, structure, and impact (Table 2). Subsequently, we utilized the RBO typology outlined by Huitema and Meijerink, cross-referencing it with the elements observed in our RBO to determine its classification among the four identified RBO types: autonomous, agency, coordinating, or partnership (Table 3).

Table 2. Codebook for interview analysis on river basin organizations (RBOs) in Costa Rica.

Category	Definition
Origin	Information about the creation of the RBO: place, year, actors, rules.
Tasks	Objectives and tasks the RBO has to fulfill.
Authority rules	Which positions can take which actions, how actions are ordered, processed, and terminated. The scope of authority. Authority of actors outside RBO (e.g., professional bodies, interest groups, citizen groups).
Aggregation rules	Formulae for weighing individual choices and calculating collective choices; tension between interests; majority or consensus in decision making; values, e.g., justice in decision making.
Boundary rules	Geographical boundaries around the jurisdiction of the RBO; entry and exit conditions for actors.
Information rules	Established information channels; conditions under which they are open or closed; official language of acceptable arguments, evidence to be processed. Handling of different types of information.
Pay-Off rules	Distribution of benefits and costs to participants.
Impact	The general impact the RBO has on the management of the Tárcoles River Basin.

RESULTS

Institutional design characteristics of the Tárcoles commission

Boundary rules

Clause 6 of Decree 38071 delineates the boundaries of the RBO as the Grande de Tárcoles River Basin, covering an area of 2155.5 km², encompassing 38 municipalities (the decree provides the list of them) and approximately 22 micro-basins. These boundaries serve as the foundation for the interpretation of Articles 1 and 2, which define its objectives. Consequently, the commission holds responsibility for overseeing the river basin that comprises the aforementioned territory, as well as the organizations mentioned in Article 4, which are an integral part of it by legal mandate, as elaborated below.

Clause 9, Decree 38071 outlines the dispersion and fragmentation of responsibilities among various organizations, including government entities, community associations, academia, the private sector, and non-governmental organizations. These

Table 3. Institutional design features for different types of river basin organizations (RBOs; adapted from Huitema and Meijerink 2017).

Institutional design features	Autonomous RBO	Agency RBO	Coordinating RBO	Partnership RBO
Authority rules	Authority rules stipulate the independent position of the organization vis-à-vis other government organizations. Specify, which aspects of the water cycle are exclusively controlled by the organization;	A mandate that the organization derives from another body (e.g., a ministry or a set of ministries). The organization has a specific and limited mandate that orientates its mission; this can be economic development related, but also more focused on ecological goals. Although the organization can work relatively independently and its actions will not continuously be watched, if performance is not satisfactory the founding organization can discontinue the river basin organization. The organization is relatively free to seek out ways of achieving its goals;	The organization has no authorities of its own, but it has been founded as a facilitator of coordination between organizations that do have responsibilities in the field of water management. These bodies need to consent to the existence of the coordinating body and their agreement will delineate the responsibilities that the coordinating basin organization can take up. In most cases this will include a research and plan function. If the organization performs well in the eyes of its founders, the tasks may be expanded;	The organization is a bottom-up initiative and has control over a resource that is commonly owned or controlled by the partners. The partnership has a conservation or a sustainable-use purpose, and controls use;
Aggregation rules	The organization is in full control over the issues within its jurisdiction. In certain cases, control over the decisions of the organization may rest with an elected body, in others it will rest with an appointed and independent leadership. Natural science, engineering, and economics play dominant roles in the decisions of the organization (rational decision making); technical quality of its work is of the highest importance to the organization. The organization may have veto power over decisions by other government bodies that affect water;	The organization has attained delegated control over one issue, but is likely to have little leverage over organizations that have similar or related tasks, and coordination mechanisms might be lacking. Control over the decisions of the organization rests with an appointed leadership, which depends on fulfilment of that mission for its continuation. Natural science, engineering, and economics play dominant roles in the decisions of the organization (rational decision making), but cost-effectiveness is the main guiding principle;	The coordinating river basin is founded to better plan policy making, to avoid counterproductive measures by the various founding bodies and to stimulate synergy. Because the river basin organization has multiple founders, diverging interests are present; the founding organizations will have required decision making either by consensus or by large majorities (e.g., two-thirds of the required votes);	Deliberation and consultation between the partners are key; decisions are made on the basis of consensus;
Boundary rules	The geographical boundaries of the organization's jurisdiction will be based on the (perceived) boundaries of the river basin. The staff working at the organization mainly consists of experts in the natural sciences or in engineering. In some cases the political leadership may be elected freely. The organization is likely to have established procedures for involving (certain) stakeholders and ordinary citizens in its decisions and sees this as a way to build a constituency;	The geographical boundaries of the organization's jurisdiction will be derived from the government that establishes it. The staff working at the organization mainly consists of experts in the natural sciences or in engineering. The organization has few legal obligations when it comes to involving stakeholders and ordinary citizens in its decision processes, but it may opt to organize stakeholder processes in support of attempts to attain its goals;	The coordinating river basin organization is likely to include organizations that are orientated toward very different geographical scales, but the organizations involved cannot cross the jurisdictional boundaries of their combined territories. Because the organization is fundamentally about administrative rationality (see under "Aggregation rules"), only government bodies participate in the basin organization; there might be contacts with certain stakeholders, but the general public is not involved in decisions;	Joining the partnership is on a voluntary basis. Social control within the partnership implies, however, that membership does imply a set of obligations. As such, social control is so essential for the functioning of partnerships, most operate on the local or regional level, which is the level where participants can know each other;

(con'd)

Information rules	Arguments from the natural sciences, engineering, and from economics are valued very highly. The assumption is that the body has the most relevant expertise on water, and tries to communicate this to other bodies, whose agenda is less water focused. Accountability for decisions rests with the appointed or elected leadership;	The organization has a duty to report to its founding organization and this line of communication is the most important one. The organization must view its tasks in a narrow way, and only information that is relevant to its task is collected and considered. In debates about its decisions, cost-effectiveness arguments play a major role, although engineering and natural science arguments are also weighted. The agency sees members of the public as customers rather than citizens and approaches them in this fashion;	The coordinating river basin organization does its own research, which generates information about potentially conflicting measures or creates a larger, cross-jurisdictional perspective on problems and issues. To achieve good levels of coordination, the participating organizations need a safe environment in which they can resolve their conflicts without too many onlookers. Access to information about what is being discussed will therefore be restricted in many cases;	Partnerships put the concerns of the participants first. Local knowledge and local memory guides decisions, but not to the complete exclusion of scientific knowledge, which might also be available. The key point is that such information is processed through the prism of the interests of the partners. Partnerships are under no obligation to share the information they have with those outside the partnership;
Pay-Off rules	The organization has its own source of income (e.g., has its own tax base); the rules specify which groups contribute to the income of the organization; these rules may have several bases, including the "polluter pays" principle. Spending is broadly related to "water purposes" and payment of taxes will in some cases be related to having a say in the management of the organization.	The organization has a set budget, provided by the founding organization to achieve goals that are stipulated in a specific way. There may be rewards for (some) staff members of the organization if the stipulated targets are being met. Such targets may include "customer satisfaction."	All participants contribute to the functioning of the coordinating basin organization, but keep most of their own budget.	All partners involved are likely to have a direct stake in the decision process and they will seek decisions that protect the interests of those involved. In some cases such decisions may entail costs for non-members, but such costs are considered less relevant.

responsibilities are also dispersed among the municipalities of Vázquez de Coronado, Moravia, La Unión, Curridabat, Montes de Oca, Goicoechea, Tibás, Aserrí, San José, Escazú, Santa Ana, Mora, Desamparados, Alajuelita, San Isidro de Heredia, San Rafael de Heredia, Santa Bárbara, Flores, Barva, Santo Domingo, Belén, Heredia, San Pablo, Alajuela, Poás, Grecia, Valverde Vega, Palmares, San Ramón, Naranjo, Atenas, Orotina, San Mateo, Turrubares, Esparza, Garabito, Mora, and Puriscal (as specified in Clause 9, Decree 38071). Additionally, the commission possesses the flexibility to convene and collaborate with other organizations beyond those explicitly listed in Article 4 whenever necessary to achieve its objectives.

Indeed, it constitutes a combination of geographical and political boundaries. Geographically, the entire river basin, encompassing the sub-basins, constitutes the commission's operational domain. The 38 municipalities serve as a political-administrative and geographical delineation, a factor that was also taken into account when, for pragmatic reasons, the workload was divided into four sub-commissions, as stipulated in Article 10 of Decree 38071.

According to Article 4 of the decree establishing the commission, it is required to include representatives from the following organizations: (a) Ministry of the Environment and Energy (MINAE) through the National System of Conservation Areas (SINAC), which assumes the role of chairperson; (b) Ministry of Agriculture and Livestock (MAG); (c) Ministry of Health; (d) National Power and Light Company (CNFL); (e) National Groundwater, Irrigation and Drainage Service (SENARA); (f) National University (UNA); (g) University of Costa Rica (UCR); (h) National Technical University (UTN); (i) The municipalities involved; (j) Non-governmental organizations (NGOs); (k) Local organizations; (l) Office of the Ombudsman of the Republic (DHR), participating as a guarantor of good environmental and human rights practices.

Each organization is expected to appoint two representatives, a primary delegate and an alternate. Although the number of participating municipalities is intended to correspond to the 38 municipalities mentioned in Clause 9, there is no specified number for NGOs and local organizations; each of them will designate their own two representatives.

This composition is justified by the legislative mandates of the government organizations involved in natural resource protection and conservation. For instance, in the case of academia, it is based on the public order of the listed universities. In the case of the private sector and local organizations, it aligns with constitutionally recognized principles of citizen participation and the broad interest in the right to a healthy and ecologically balanced environment (as stated in Article 50 of Costa Rica's Constitution). However, none of these organizations have specific roles defined within the commission, except for SINAC, which was designated as the leader of the commission at its inception. Furthermore, the distinction between local and national organizations is not clear-cut, as some national organizations like SENARA may have regional or local offices.

The Tárcoles Commission is organized into four regional sub-commissions, each responsible for distinct areas within the Tárcoles Basin: Subcommission ABRA, situated in the

metropolitan area of the capital, San José; Subcommission Heredia; Subcommission Alajuela; and Subcommission ACOPAC, which encompasses the river's mouth (Fig. 1). "It was decided to work in regional sub-commissions because there were too many actors involved. So, what was done? Dividing by proximity, which municipalities could go to Heredia, others to Alajuela, others to San José in the central part and those that are further down which are Garabito, Escazú and Santa Ana" (Int. 11).

Regarding the inclusion or exclusion of parties in the decision-making process, the commission adheres to the guidelines set forth in Decree 38071. Voting rights are reserved exclusively for official organizational members. Nonetheless, it appears that the participation of other organizations is approached flexibly, as previously mentioned, in alignment with the decree's intent. On the one hand, not all the member organizations outlined in the decree consistently and actively participate. On the other hand, organizations that are not officially affiliated are encouraged to engage in the process.

Authority rules

The mandate of the Tárcoles Commission extends throughout the entire basin, as articulated in Clause 6 of the Executive Decree establishing it. This jurisdiction encompasses the Grande de Tárcoles River Basin, its sub-basins, and the 22 micro-basins within it. The primary objective of the commission is to facilitate the coordination of responsibilities among the various entities and stakeholders composing it, with the overarching aim of rehabilitating and holistically managing the basin (as outlined in Article 2 of the Executive Decree).

The decree delineates six specific objectives, which are as follows: (a) to develop, implement, and monitor an integrated management plan for the Río Grande de Tárcoles Basin; (b) to coordinate and establish comprehensive actions among the responsible organizations to control activities that generate environmental impacts; (c) to enhance the management and evaluation of financial, logistical, and human resources, ensuring efficient internal and external commission management; (d) to identify existing biophysical conflicts within the Tárcoles Basin, facilitating the development of land use planning and zoning to continually improve its management; (e) to facilitate actions aimed at raising awareness among individuals, companies, and stakeholders to encourage changes in behavior conducive to the proper management of natural resources; and (f) to manage and propose actions necessary to reduce contamination levels resulting from solid and liquid waste generated in the basin, alongside its comprehensive rehabilitation.

Furthermore, Clause 14 underscores the significance of conceptualizing environmental education as a vital tool for raising awareness among stakeholders within the basin. This education aims to enrich their skills and knowledge, ultimately fostering their engagement in integrated basin management (MINAE 2013).

As previously mentioned, the establishment of the Tárcoles Commission was a response to a court decision known as Voto Garabito. This commission was created with the explicit purpose of fulfilling the court's specific mandates outlined in the decision mentioned above. These mandates called for the ministries and municipal governments to undertake the following actions: holistically eliminate pollution sources throughout the entire watershed; initiate measures to commence the process of mitigating the environmental damage within the basin to the extent possible; coordinate the necessary efforts to comprehensively address the environmental issue discussed in this case.

It is important to note that the creation of the commission was prompted by this third mandate, originating from the court's decision. However, the specific design and configuration of the commission were not directly prescribed by the court's decision itself.

The executive decree stipulates that the SINAC, acting on behalf of MINAE, assumes leadership of the commission. The representative from SINAC holds the position of executive secretary and coordinator. The decree also allows for the possibility of rotating the executive secretary among different commission members starting from the third year, following a procedure outlined in the operational regulations. Although leadership and coordination are designated to SINAC, the executive secretary is elected by a simple majority vote of all active members for a two-year term, with the potential for re-election. As of now, there has been no change in this position.

Each organization appoints two representatives to the commission, and regional sub-commissions may be established as needed. Furthermore, Clause 13 of the document states that municipalities have the option to delegate their responsibilities to public organizations, including federal ministries and their local branches. It reads, "[M]unicipalities may share their responsibilities with the Public Administration in general, a relationship that must be developed in the terms defined by law (Article 5 of the previous Municipal Code, Article 7 of the new Code), which establishes the obligation of "coordination" between municipalities and public institutions." Voluntary collaboration is the prevailing rule because of municipal autonomy.

In daily work, this problem is unresolved, and there is a rivalry between the formal coordinator, SINAC, and the municipalities. SINAC, however, has only de facto power because it is the coordinating organization: "Because SINAC presides but SINAC does not command" (Int. 11). The municipalities, in contrast, have local power: "They are the ones who have much more responsibility than the Ministry of Health or ... SINAC, right? In terms of the management of the municipality. Because they are in charge of everything: management, waste, education, etc." (Int. 11).

The municipalities are also the active ones that mainly use their resources for activities in the river basin. "For me, the municipalities are the ones who have the power here. Because they are the managers, they are the ones who are involved in the field with the management of the territory" (Int. 6). According to some interviewees, they are fulfilling the tasks SINAC is responsible for in the commission: "The municipalities are assuming the role that would correspond to SINAC. ... We are practically doing all the work of identification of wastewater discharges and bypasses or irregularities in the treatment plants and they are gaining all this field work" (Int. 7).

There is insecurity about the responsibilities, and while SINAC sees the responsibilities at the municipal level, municipalities say that public organizations like SINAC or the Ministry of Health have more responsibility to solve certain problems. "The problem is that the law establishes that although the municipalities are the coordinators and guardians at the local level of the environmental part, the responsibilities are not above the MINAE or the Ministry of Health" (Int. 7).

Besides the rivalry of the public organizations and the municipalities, there is also a rivalry amongst the different municipalities, which makes collaboration difficult: "It is even easier to negotiate with external governmental actors, from the central government, from the central state, because they handle this issue of integrity or integrality at the national level. Among local governments there is a zeal. A zeal for the territory" (Int. 8). That these rivalries do not break into a bigger fight or paralyze the activities is because the participating organizations are aware that they have to fulfil the objectives of the sentence from the Constitutional Court. "One of the issues is the invasion of protected areas, which at the same time as the Garabito vote, the resolution of the Attorney General's Office requires us ... to recover the protection areas of rivers and streams in Costa Rica" (Int. 7).

However, it is not clear if there are sanction mechanisms if the commission as a whole is not fulfilling its duties: "The vote is legally binding ... you have to do it. But what happens if you don't do it, there is no established sanction" (Int. 7). The lack of participation of each organization is reported to the Constitutional Court: "The commission developed a report for the Constitutional Court on who are the people who attend. For example, I attend on behalf of the Ministry of Health. But if it is reported that the Ministry of Health does not attend the commission, the Constitutional Court could take measures against the Ministry of Health that has not attended the meeting" (Int. 10).

Aggregation rules

Decision making in the commission, in the general assembly as well as in the sub-commissions, is done by majority rule. All organizations that are officially part of the commission mentioned in Decree 38071 and present in the respective meeting vote through their representative or substitute: "Of those [organizations] who are mentioned in the regulations, each one has a representative and an alternate. They are the ones who have the vote" (Int. 2).

One member of a sub-commission mentioned that it is not always easy to reach an agreement at the regional level. This is due to the limited negotiation capacity of the local municipal governments but also because the representative of the municipality is often from the environment department and has only limited decision-making power within the municipality. Therefore, if the organization's representatives in the commission would be the ones that have decision power in their organization, chances for implementation of decisions would be better: "So in this line I have to integrate the real authorities of the organization, those who have decision-making power, so that any decision taken by any organization that is represented here has the character of a recommendation" (Int. 8).

Information rules

In relation to information regulations, Decree 38071 covers various aspects outlined in Article 9: "c) Facilitate the establishment of an information system designed to facilitate the exchange of experiences at both national and regional levels"; "g) Promote the dissemination of accomplishments associated with the management of the Tárcoles River Basin"; and "i) Compile the necessary technical reports detailing the advancements and accomplishments expected from the ministries by the judicial and administrative authorities concerning the Grande de Tárcoles River Basin matter."

The Tárcoles commission serves as the central platform for facilitating the exchange of information among the participating organizations. As a result, sub-commissions convene either on a monthly or bi-monthly basis, while the general assembly meets every three months.

During the general assembly, all members of Tárcoles commission, including a primary representative and an alternate from each organization, as well as the coordinators of each sub-commission, convene. However, there are no limitations on the number of attendees from member organizations, and they are free to participate in the meetings with as many individuals as they deem necessary.

In addition to these face-to-face meetings, communication between the coordination team and the sub-commissions, as well as among the sub-commissions themselves, relies on various channels such as e-mail, mobile phone chats, and cloud services for document exchange. "Mobile phone chats. E-mail, etc." (Int. 2). "We created a WhatsApp network with all the actors representing each organization and we keep in contact with them. We also have Drive, we upload all the information and from the meetings, from the calls, from the minutes, from the agreements, the reports, that each one issues, we upload them in Drive and we all have access so that we can communicate" (Int. 7).

To document their activities, each sub-commission compiles minutes during their meetings. During each assembly gathering, the sub-commission coordinators provide updates on their progress and submit reports, necessitating quarterly submissions as outlined in Article 28 of the Internal Operating Rules of the commission. Subsequently, the commission's coordination consolidates these reports to prepare an accountability report for the relevant jurisdiction, demonstrating the commission's operational performance. "Four times a year we hold a general assembly, where each coordinator of the sub-commission presents the progress of each, the work plan" (Int. 11). "They [SINAC] have to make an annual report to the [Constitutional] Court on the basis of these quarterly reports on all actions to respond to the sentence on part of the organizations involved" (Int. 9).

Because of this structure, communication has its peaks and lows. "There is very little. Let's say that communication is like, it has peaks. So there is a peak before the meeting to see if everyone is going to go to the meeting or not, and after that, let's say, the minutes are socialized ... And then they are passed or not passed and then it starts again" (Int. 1).

For internal operations, the commission has established several thematic concepts that encompass the knowledge it incorporates and addresses. These concepts include water resources, solid waste management, land use planning, and risk management.

Additionally, there are two cross-cutting concepts: environmental education and citizen participation. "Since 2014, they have sat down to see what would be the most convenient indicators to report that really reflect that the basin is recovering. So, in 2016 we have already landed a little more [made this more concrete] to be able to reach those indicators. We have water resources and solid waste management, land use planning and risk management. We have a cross-cutting concept because all the issues are touched upon. These are environmental education and citizen participation. Although it is cross-cutting, we can carry out specific activities" (Int. 11). These concepts are used for communication with the public: "all of the concepts are going to see or have to develop communication and information actions for the population" (Int. 4).

The composition of the Tárcoles commission is diverse, aiming to encompass a wide range of interests and expertise. The participating organizations include central government bodies responsible for the environment, such as MINAE, formally represented by SINAC and informally by the Water Directorate, whose representatives participate in meetings. Municipalities are also actively involved, primarily through their environmental departments, contributing to the prevalence of environmental protection expertise.

Agricultural knowledge, though, should ideally be integrated through the Ministry of Agriculture (MAG), which, however, exhibits limited activity in this context. Conversely, the National Institute for Housing and Urbanism (INVU), responsible for national territorial planning, actively engages with the commission despite not being a formal member organization.

There appears to be a gap in technical expertise related to water management and infrastructure, which could be supplied by organizations such as AyA (National Service of Water and Sewage) or ICE (Costa Rican Electricity Institute). Furthermore, the presence of private enterprises or organizations involved in local development is notably lacking.

The commission engaged the services of CATIE and SISTEMAS GEOESPACIALES SGSA as consultants to craft a basin management plan, which was unveiled in May 2021. Simultaneously, all sub-commissions were tasked with gathering baseline data for the basin to provide essential input for the management plan. Consequently, the commission initially prioritized the establishment of a baseline and the formulation of a management plan as significant milestones, delaying the commencement of monitoring activities to assess the effectiveness of their actions.

Payoff-rules

The decree that created the Tárcoles commission states in its Art. 7 that the "State organizations shall allocate logistical, budgetary and human resources to the extent of their possibilities, and within the respective legal framework, to support the operation of the Executive Secretariat of the commission for the Integral Management of the Río Grande de Tárcoles Basin." This means that the RBO has no budget of its own for its activities, but every involved organization contributes with its resources as possible.

This rule is followed by the participating organizations. They invest what they can, which is basically manpower and time, to participate in the meetings. "The commission has no money ... The commission, as it is made up of people from municipalities, public organizations, what we do is define a project and I put in as much money from myself, from the organization, but not in colones but in labor, in the working time of the civil servant" (Int. 11). The organizations invest their manpower, and mainly, the municipalities also invest money in concrete activities. However, the contribution is voluntary. "At the moment what is allocated for the Garabito vote is voluntary on the part of the municipalities. So I can put in one colón each year ... and tell the constitutional court, but I did put money in there. It is one colón" (Int. 8). The budget of the environmental management division of the municipalities is small, about US$3200/year; they invest in activities they would do anyway, not especially for the commission, but they will inform of these in the commission's report.

Although the activities are small and independent of each other, the organizations reinforce that they "sum up," and, taken together, have an impact on the improvement of the situation of the river. "Because at the end of the day, what the different actors here have been ordered to do is to recover the basin of the Río Grande de Tárcoles. So reforestation activities in protected areas with the recovery of the basin. Solid waste management activities at the end of the day are less waste that ends up in the micro-watershed. The issue of the environmental easements of protection areas with control and protection activities and denouncements. Notifications, demolitions. All of this adds up to the recovery of the basin. So I would say that each of the things that people are doing here in terms of ecological blue flags, biological corridors and environmental education" (Int. 5).

The only organization that invests a greater amount of money in the Tárcoles commission's work is SINAC as a coordinating organization. They receive a certain percentage of the water fee tax, which they invest in the work of the commission, apart from financing the staff for the coordination. However, it is not comprehensible where exactly the amount of 303 million Costa Rican Colones come from (SINAC 2021). There is no indication in the expense budget that there is a fixed amount from a direct source that is destined to fund the Tárcoles commission, and that defines it as an expense guaranteed by a special fund, which makes it vulnerable to policy orientation changes and general budget restrictions. Other organizations support with education: "ICE supports with education (*bandera azul ecológical*)" (Int. 7). The universities support with free studies. "They [universities] have a lot of research and it doesn't even cost. Because it's done by trained students. But they are not very, very involved in ecology, biological corridors, environmental education" (Int. 2).

The Tárcoles commission as RBO Type

In accordance with the analyzed regulations, the Tárcoles commission exhibits characteristics of a mixed RBO type, encompassing elements of both an agency and a coordinating river basin organization (Table 4). It is noteworthy that these two RBO types also emerged as the predominant ones in the 11 cases scrutinized by Meijerink and Huitema (2017).

However, the Commission can be characterized as follows by their very specific set of rules:

Boundary rules

The geographical jurisdiction of the organization is delineated by the jurisdictional decree that originally established it, closely aligned with the boundaries of the river basin. Sub-commissions

Table 4. Institutional design features of the Tárcoles Commission. RBO = river basin organization.

Institutional design features	Elements from Agency RBOs	Elements from Coordinating RBO
Authority rules	A mandate that the organization derives from another body (for example, a ministry or a set of ministries). The organization has a specific and limited mandate that orientates its mission; this can be economic development related, but also more focused on ecological goals. Although the organization can work relatively independently and its actions will not continuously be watched, if performance is not satisfactory the founding organization can discontinue the river basin organization. The organization is relatively free to seek out ways of achieving its goals;	The organization has no authorities of its own, but it has been founded as a facilitator of coordination between organizations that do have responsibilities in the field of water management. These bodies need to consent to the existence of the coordinating body and their agreement will delineate the responsibilities that the coordinating basin organization can take up. In most cases this will include a research and plan function. If the organization performs well in the eyes of its founders, the tasks may be expanded;
Aggregation rules	The organization has attained delegated control over one issue, but is likely to have little leverage over organizations that have similar or related tasks, and coordination mechanisms might be lacking. Control over the decisions of the organization rests with an appointed leadership, which depends on fulfilment of that mission for its continuation. Natural science, engineering and economics play dominant roles in the decisions of the organization (rational decision making), but cost-effectiveness is the main guiding principle;	The coordinating river basin is founded to better plan policy making, to avoid counterproductive measures by the various founding bodies, and to stimulate synergy. Because the river basin organization has multiple founders, diverging interests are present; the founding organizations will have required decision making either by consensus or by large majorities (for example, two-thirds of the required votes);
Boundary rules	The geographical boundaries of the organization's jurisdiction will be derived from the government that establishes it. The staff working at the organization mainly consists of experts in the natural sciences or in engineering. The organization has few legal obligations when it comes to involving stakeholders and ordinary citizens in its decision processes, but it may opt to organize stakeholder processes in support of attempts to attain its goals;	The coordinating river basin organization is likely to include organizations that are orientated toward very different geographical scales, but the organizations involved cannot cross the jurisdictional boundaries of their combined territories. Because the organization is fundamentally about administrative rationality (see under "Aggregation rules"), only government bodies participate in the basin organization; there might be contacts with certain stakeholders, but the general public is not involved in decisions;
Information rules	The organization has a duty to report to its founding organization and this line of communication is the most important one. The organization must view its tasks in a narrow way, and only information that is relevant to its task is collected and considered. In debates about its decisions, cost-effectiveness arguments play a major role, although engineering and natural science arguments are also weighted. The agency sees members of the public as customers rather than citizens and approaches them in this fashion;	The coordinating river basin organization does its own research, which generates information about potentially conflicting measures or creates a larger, cross-jurisdictional perspective on problems and issues. To achieve good levels of coordination, the participating organizations need a safe environment in which they can resolve their conflicts without too many onlookers. Access to information about what is being discussed will therefore be restricted in many cases;
Pay-Off rules	The organization has a set budget, provided by the founding organization to achieve goals that are stipulated in a specific way. There may be rewards for (some) staff members of the organization if the stipulated targets are being met. Such targets may include "customer satisfaction."	All participants contribute to the functioning of the coordinating basin organization, but keep most of their own budget.

within the organization are structured around the boundaries of conservation areas and three sub-basins. Although various organizations operate at different geographical scales, these organizations can transcend these boundaries, particularly when regional government entities can be overridden by national authorities. Primarily, government organizations are engaged in these efforts. The workforce within these organizations predominantly comprises experts in natural sciences or engineering, with the latter being less common and typically associated with environmental management organizations. Notably, there are no established procedures for involving stakeholders or ordinary citizens in the decision making.

The rules are in accordance with those established by an agency known as RBO. The geographical boundaries are determined by the Constitutional Court, which establishes them. The staff working in the participating organizations are experts in natural sciences or engineering. Although the organization has limited legal obligations when it comes to involving stakeholders and ordinary citizens in its decision-making processes, it may choose to organize stakeholder engagement processes or collaborate with other important organizations to achieve its goals. As for the coordinating RBO, the commission includes organizations oriented toward different geographical scales, mixing national and local entities. The involved organizations are not allowed to extend beyond the jurisdictional boundaries of their combined territories. Given that the organization primarily focuses on administrative rationality, government bodies are the main participants in the basin organization, with some interactions with specific stakeholders. However, the general public is not involved in decision making, and universities, business organizations, and NGOs are largely absent from the process.

Authority rules

The commission holds a comprehensive mandate that encompasses the condition of a pollution-free river throughout the entire basin. It was established through an executive decree. The authority to issue mandates is divided between SINAC as the coordinating organization on the one hand and the municipalities on the other hand.

In terms of RBO types, the commission exhibits typical characteristics of an agency RBO, as its mandate is derived from another body, the Constitutional Court. Furthermore, it enjoys a significant degree of freedom in pursuing a broad objective, namely, ensuring a healthy river. Additionally, it displays characteristics of a coordinating RBO, having been established as a facilitator for coordinating efforts among organizations responsible for water and environmental management.

Aggregation rules
Decisions within the commission are made through a majority rule system. It appears that there is no unified vision for the river's development, resulting in the generation of synergies among the participating bodies. Various interests are represented, and efforts are made to achieve objectives by categorizing them into six distinct concepts. However, not all relevant stakeholders are included in these efforts. Unfortunately, there is limited room for action because of financial constraints, and the commission is left to address this issue on its own, as mandated by the court rule.

This reflects the typical characteristics of an agency RBO. The commission has limited influence over organizations with similar or related responsibilities, and coordination mechanisms may be deficient. Given the nature of the participating organizations, the decision-making process is predominantly influenced by experts in natural science, engineering, and economics, emphasizing rational decision-making principles. Cost-effectiveness is the primary guiding principle. Additionally, it exhibits traits of a coordinating RBO as it actively fosters synergies among participating organizations, even in the presence of divergent interests. Decision making relies on majority votes, with each representative holding voting rights.

Information rules
The commission is mandated to report to the Constitutional Court, which initiated its establishment. Information exchanged primarily pertains to technical aspects, including the collection of indicators and the implementation of operational plans. There appear to be minimal substantive discussions or decision making occurring at the commission level, possibly taking place at the municipal level instead. Local knowledge is integrated through local administrators, with occasional engagement with civil society for educational or other activities, albeit not on a consultative or decision-making basis. In general, information rules lack transparency. There is very limited publicly available information about the commission and its work on websites or social networks, and documents must be requested to access them.

Similar to an agency RBO, the commission has an obligation to report to the Constitutional Court, and this line of communication is of paramount importance. Based on the attitudes and responses of the interviewed members, as well as the investigated reports, it appears that the commission is primarily active in fulfilling its mandate rather than proactively addressing environmental issues. The organization approaches its tasks in a narrow manner, focusing solely on collecting and considering information relevant to its specific mission. In a manner akin to a coordinating RBO, the commission conducts its own research to generate information. Furthermore, to prevent potential legal disputes, the commission fosters a cooperative environment among participating organizations, aiming to resolve conflicts internally.

Pay-off rules
The commission relies solely on contributions from participating organizations in terms of workforce and finances because it does not have its own budget. SINAC provides additional funding for coordination purposes. The commission lacks an independent source of income. Although all participating organizations play a role in supporting the coordinating basin organization's operations, they primarily allocate the majority of their budgets to their own activities. This setup presents a challenge in that funding decisions, control, and endorsements are made not by the commission itself but by the respective participating organizations.

Being both an agency and a coordinating RBO, the commission serves as a highly effective and well-established platform for facilitating exchange, communication, and learning among participating organizations (Trimble et al. 2022). Coordinating or partnership RBOs generally encounter less resistance over the long term (Meijerink and Huitema 2017).

The pay-off rules align with those of a coordinating RBO. All participants contribute to the operational costs of the coordinating basin organization while retaining the majority of their own budgets.

Performance of the Tárcoles commission
To evaluate the performance of the RBO, we assess its coordination, accountability, legitimacy, and environmental effectiveness, as outlined by Huitema and Meijerink (2017). Although all four elements are documented in its founding charter, the commission's real-world performance falls short because of its limited effectiveness in carrying out its activities.

Coordination
Coordination pertains to the RBO's capacity to enhance coordination across government levels, policy sectors, and various public and private stakeholders. Although the Tárcoles commission exhibits several characteristics of a coordinating RBO, its performance in this aspect is somewhat mixed. Coordination involves orchestrating the activities of different actors to achieve specific objectives (Bodin 2017). In this regard, the commission excels by serving as an excellent platform for exchange and communication among participating organizations, and SINAC effectively coordinates certain river-related activities, such as data collection, for establishing a social-ecological baseline. It brings together actors with diverse opinions and interests.

However, for effective problem-solving, cooperation, defined as negotiations and deliberations to reach mutual agreements (Bodin 2017), is essential. In this regard, the RBO's performance is less satisfactory. This is due to the absence of a shared vision for the river basin, incomplete representation of all interests within the commission, and a complex interplay of institutions involving both local and national organizations. Consequently, groundbreaking decisions that find common ground are rare.

Accountability
When assessing the accountability of the RBO, we consider the extent to which democratically legitimized bodies can oversee and evaluate its organizational conduct. In the case of the Tárcoles commission, the RBO is answerable to the Constitutional Court, which, unlike an elected government body, operates as a branch of the justice system, representing the third branch of

government. This differs from other RBOs, where, if accountability is robust, they are answerable to ministers or the government (Meijerink and Huitema 2017).

The commission is obligated to submit a report on its activities to the Constitutional Court as a formal requirement to fulfil its mandate. Although this requirement is met, it remains uncertain whether the court conducts any review or provides feedback on the presented results or if there are any provisions for sanctions in cases of non-compliance with the mandate.

Legitimacy

Legitimacy pertains to how the public perceives water management. In the case of the Tárcoles commission, the RBO's input legitimacy is relatively low because of the absence of involvement from key local stakeholders who should ideally be integrated. In practice, the majority of participating organizations consist of municipalities and state administration entities, with limited engagement from a wider public represented by NGOs, local organizations, and universities. Furthermore, the knowledge base is heavily skewed toward technical expertise, neglecting other essential forms of knowledge, such as ecological and social insights.

There is a lack of effective communication within the sub-commission because its members primarily submit reports rather than engaging in discussions or collaboratively shaping a shared vision during the assembly. In this context, it becomes evident that merely enhancing stakeholder participation, as extensively explored in prior research (e.g., Moellenkamp et al. 2010, Jager et al. 2016, Soria et al. 2021), is insufficient. What is needed is active participation and engagement from the organizations included in the commission itself.

Regrettably, instead of involving all entities within the commission, SINAC chose to outsource the development of the management plan. SINAC's role was limited to having the sub-commissions collect specific baseline data. Consequently, a unified vision for how the basin should be managed has never been formulated, neither with the participation of all entities within the commission nor with input from the broader public.

Environmental effectiveness

There has been long-standing engagement in the Tárcoles River Basin; however, for many years now, the river has ranked as the most polluted in Central America. The environmental effectiveness appears to be quite low, as noted in the "Elaboration of the diagnosis biophysical and socioeconomic diagnosis of the territory" (Sistema Nacional de Áreas de Conservación 2021), which is part of the management plan, despite the efforts of the Tárcoles Commission. A more recent microbiological study indicates elevated contamination levels, particularly during the rainy season, and the river's pollution is categorized as "incipient" according to the Dutch index (Pérez Gómez et al. 2021).

As in other case studies, the impact of smaller projects within the RBOs, such as initiatives focused on ecosystem rehabilitation (e.g., wetland protection areas) or community projects related to water resource management (e.g., bio-gardens and water harvesting), remains unmeasured. There is a pronounced upstream-downstream issue at play, as the pollution of the Tárcoles River primarily stems from inadequate land use and human activities within the GAM, where wastewater treatment is either insufficient or nonexistent (Pérez Gómez et al. 2021).

Implications of the institutional design characteristics for their performance

The institutional design characteristics of the RBOs carry significant implications for their ability to achieve the objective of a clean river basin. In line with the findings of Meijerink and Huitema (2017), we have identified several critical challenges, including institutional interplay, the (de-) centralization dilemma, resource availability, and time constraints. Additionally, we have recognized that motivation for participation poses another significant challenge.

Institutional interplay

The Tárcoles Commission's geographical scope is defined by both hydrological and political boundaries, which allows for a certain alignment between its geographical scope and management scale (Young 2006, Moss 2012). An ecological fit is achieved through the basin approach (Epstein et al. 2015).

Within the government, two types of organizations are involved: local entities, such as municipalities, which are responsible for specific river sections, and national organizations, like ministries, which comprise various hierarchical and sectoral entities as mandated by Costa Rican law for each Ministry. This mix of governance levels presents challenges because there is no clear rule or structure governing the engagement of national organizations at different levels, leading to a lack of horizontal alignment. Additionally, a vertical alignment of the involved societal sectors is lacking because not all potential stakeholders and their interests are adequately represented. Private enterprises, NGOs, and civil society have no representation, and universities, as institutions for education and research, have limited presence. The participation of MAG and DHR is notably deficient.

This highlights the challenge that achieving a spatial fit necessitates considering not only the natural boundaries but also the political, socioeconomic, and cultural aspects within a social-ecological system (Biswas 2004, Moss 2012). Giving greater consideration to the institutional interplay among organizations aligns with the conclusions drawn by Salimi et al. (2019).

This also underscores the limitations of agency RBOs, as revealed by Huitema and Meijerink (2017), stemming from the concept of institutional layering, wherein the new institution becomes just another layer within an already intricate setting (Campbell 2009, van der Heijden 2011). This situation leads to two notable consequences in terms of resources and inclusion, which will be developed in the following paragraphs.

First, some institutions seek to restrict the resources allocated to the new organizations, encompassing financial resources, information flows, and decision-making authority. They achieve this either through their institutional design or by refraining from collaborating with RBOs once they are established. Second, because the formation of RBOs often originates from sources external to the entities traditionally responsible for water management, significant organizations may not be included or engaged in the process.

Dilemma of (de-)centralization

The described institutional interplay alludes to the next aspect, the dilemma of (de-)centralization. The delineation of responsibilities between the national and regional branches of organizations, as well as between municipalities and decentralized government branches, remains unclear. This ambiguity hampers

the establishment of a sound social fit (Epstein et al. 2015). The system appears to be situated somewhere between a monocentric system, predominantly controlled by SINAC as the central authority, and a polycentric system, composed of various governing authorities operating at different scales (Morrison et al. 2019).

In terms of institutional layering, such as the structure of biological corridors, it appears that this approach functions more effectively as a conservation strategy. Local stakeholders actively engage in the management of these corridors through participatory platforms known as Local Biological Corridor Committees. Some organizations, instead of commissioning separate efforts, prefer to align their activities with the corridor and report them within the commission's framework. Consequently, there can be overlapping activities.

Regarding the role of municipalities in integrated watershed governance arrangements, we can affirm the existence of the four barriers as identified by Mancilla García et al. (2019): (1) clarifying how administrative responsibilities are allocated among municipalities, basin councils, and other organizations with overlapping mandates, both at the intra- and inter-hierarchical levels.; (2) establishing effective collaboration between municipalities and other stakeholders to address issues that originate from within and beyond municipal boundaries; (3) identifying financial and regulatory impediments that hinder municipal participation in basin-level planning processes; (4) discovering means to harmonize short- and long-term considerations encompassing biophysical, institutional, and political dynamics.

Availability of resources

As is typical for a coordinating RBO type, the commission lacks its own budget for operational purposes and cannot generate its own income. This limitation is evidently the most significant impediment to achieving greater effectiveness. Apart from a few activities undertaken by SINAC, such as the development of the management plan for the river basin or technical assessments of the ecological health of water bodies within it, the majority of activities are of a small scale. They are primarily funded by the municipalities, whose annual budget allocation for the environmental department amounts to approximately 4000€. The available manpower resources are scarcely sufficient to sustain meetings of the sub-commissions and the assembly.

So far, there are two exit options used by the commission: first, to get support from civil society to do voluntary work in activities like tree planting: "For example we have had reforestation campaigns. But we ... and 100 volunteers, planted 1000 trees. It was a municipal effort and almost an individual initiative" (Int. 2); second, to look for international support with programs of international organizations: "The other detail is that we have been looking for external financing mechanisms. And at the international level, there have also been sessions and two projects have been presented that ultimately seek very similar objectives, and I mentioned one that is financed by the GEF that has to do with the María Aguilar inter-urban biological corridor, many of the elements of which are practically the same as those we developed at the sub-commission level" (Int. 10). These projects, however, are already in place and just counted on the list of activities of the commission. A common fund for the commission could really improve this situation because the governance of the projects does not substitute for the governance of the commission and somehow colonizes its agenda.

Time

The commission's progress in enhancing the river's condition has been hindered by resource constraints, resulting in a slow pace of advancement. Since its establishment in 2013, there has been limited work on the diagnostic aspect, and a management plan was only completed and presented in 2021. Although every organization contributes minimal effort to the commission's work, it lacks the necessary priority, which is especially critical given the urgent environmental and social challenges at hand.

Another issue linked to time is the reliance on specific administrative regulations and procedures. According to the Forest Law (*Ley Forestal*) enacted in 1996, the riverbanks are designated as protected zones. However, in reality, these areas are occupied by legal or illegal structures that existed prior to the law's enactment in many locations. Nevertheless, the process of demolishing these structures involves lengthy legal and administrative proceedings that can span several years. Moreover, a recent moratorium on the prosecution of these cases was implemented through a legal reform in early 2022. Both these aspects align with one consequence of the mismatch of scales in social-ecological systems (Cumming et al. 2006), specifically that the social response time is excessively sluggish.

Given the current rate of progress, the ecological restoration of the river will require several decades. Although the management plan represents a promising initial step, its swift implementation is doubtful without additional financial resources and staff. This raises the concern that it may become outdated before execution even commences.

Motivation for participation

Another aspect of institutional design that impedes better performance is the motivation of the organizational partners. They are obligated to participate in the commission by the mandate stemming from the court decision and enacted by the decree. Consequently, they may not be inherently motivated to engage unless they possess at least some intrinsic motivation to enhance the status of the basin. (For a variety of potential motivations to restore ecosystems, see Clewell and Aronson 2006.) Although there appear to be no tangible sanctions, everyone feels compelled to formally fulfil the mandate. This sense of "duty by the book" is reinforced by the underlying, opaque power dynamics among member organizations, the diffusion of responsibilities, and the lack of clear roles, as well as the modes of communication.

DISCUSSION

To enhance its performance within the framework of its existing institutional design, the RBO can tackle the challenges mentioned above by incorporating a broader range of interests and adopting an adaptive governance approach. Interest representation has thus far been skewed toward the upstream segment within the GAM, where national organizations have a more prominent presence, as observed in the focus groups, compared to local entities. Paradoxically, the upstream segment bears the primary responsibility for the river's subpar environmental performance. Although representatives from each organization may change over time, there seems to be a degree of consistency, albeit not

always involving individuals with decision-making authority within the respective organizations. Furthermore, certain branches of these organizations represent their interests, leaving out other significant entities. For instance, municipalities are represented by their environmental departments, while MINAE is officially represented by SINAC. However, it is worth noting that river basin conservation in Costa Rica is not solely within SINAC's purview, as stipulated in Article 22 of the Law of Biodiversity. Although SINAC enforces specific regulations like riparian area or spring protection, the commission lacks the participation of the two principal advocates of IWRM: the National Service of Water and Sewage (Servicio Nacional de Acueductos y Alcantarillados [AyA]) and the Water Directorate (Dirección de Agua) under MINAE.

In its Law, AyA has, amongst others, the mandate in Article 2 subsection "c" to "Promote the conservation of hydrographic basins and ecological protection, as well as the control of water pollution," subsection "f" that indicates they should "take advantage, use, govern or monitor, as the case, all the waters of the public domain, essential for the due compliance with the provisions of this Law, in exercise of the rights that the State has over them," and subsection "g" to "Manage and directly operate the aqueduct and sewage systems throughout the country" (Instituto Nacional de Acueductos y Alcantarillados 2016). AyA, together with MINAE, must coordinate actions related to the management of hydrographic basins and with the Ministry of Health what corresponds to water contamination in accordance with the Water Law, Mining Code, Organic Law of the Environment, Forestry Law, and Biodiversity Law.

The Water Directorate of MINAE was established under the 1942 Law of Waters. It oversees the National Forum of Waters, a permanent platform for dialogue and information exchange aimed at promoting the integrated management of water resources. This forum facilitates the participation of civil society, public organizations, sectoral groups, academia, and the general public in strategic processes aimed at protecting and sustaining water resources in Costa Rica (MINAE 2018). This office is responsible for granting concessions for spring usage, authorizing projects in riverbeds, and, more recently, leading efforts, often funded by organizations such as GEF and IDB, to update the National Water Policy and the National Policy for IWRM.

We can only speculate about the reasons for the organizations that are absent from representing their interests. This could be attributed to power dynamics within MINAE and its various branches (SINAC, AyA, Water Directorate). Alternatively, it might stem from a lack of interest on the part of MAG, which may not consider agricultural use as the primary source of contamination in the basin. Additionally, it could be due to resource constraints faced by universities when it comes to participating in transdisciplinary research projects with the RBO. Another possibility is that these organizations simply lack the personnel and financial resources required to motivate their participation.

This highlights a clear limitation of our study, which could be explored in future research, along with an examination of the current composition of the RBO and the extent of active participation by its member organizations. Additionally, we did not delve into the previous version of the commission, which seemingly included a more diverse array of stakeholders. Consequently, investigating the historical evolution of Tárcoles River Basin management would be intriguing, although potentially challenging, because of historical source availability.

Although the framework developed by Huitema and Meijerink (2017) proved invaluable in categorizing the RBO and establishing connections between its performance and institutional design characteristics, it is worth noting that the identified challenges are further compounded by motivations and vested interests. Furthermore, it would be beneficial to differentiate between coordination and cooperation when considering the performance indicators of RBOs.

RBOs in other Latin American countries, including Peru, Brazil, Argentina, Uruguay, or Mexico, can offer valuable examples of increased participation (Pacheco-Vega and Basurto 2008, Mancilla García and Bodin 2019, Trimble et al. 2021). Nevertheless, studies on these counterparts also reveal similar challenges to those encountered in the Tárcoles River Basin, such as issues related to coordination among various governance levels, administrative divisions, power dynamics, and interest mediation (Trimble et al. 2021).

It is important to note that participation in RBOs does not inherently grant decision-making authority or guarantee integrated water resource management, as demonstrated in the case of Mexico (Pacheco-Vega and Basurto 2008). Consequently, it is imperative to conduct further investigations not only into the institutional design of RBOs but also into the contextual factors shaping the implementation of policies and legislation (Trimble et al. 2021).

To address the challenges mentioned above, adaptive governance offers a potential solution. This approach entails fostering flexible and learning-based collaborations and decision-making processes that engage both state and non-state actors, often operating at multiple levels. Its primary objective is to dynamically negotiate and coordinate the management of social-ecological systems and ecosystem services across diverse landscapes and seascapes (Castro-Arce et al. 2019).

For the Tárcoles commission, this could involve a proactive outreach to include more organizations from the business, civil society, and educational sectors (universities) in their activities. Furthermore, there is a need to expand the knowledge base beyond environmental and technical aspects to encompass areas such as biodiversity, hydrology, and social sciences. This collaborative effort should focus on building knowledge and understanding of ecosystem dynamics and services, integrating this knowledge into adaptive management practices, supporting adaptable institutions and multi-level governance systems, and addressing external disruptions, uncertainties, and unforeseen challenges.

In the Tárcoles case, there are already multi-level governance structures in place, but they should be assigned clear responsibilities to foster synergies that enhance cooperation among both vertical and horizontal governance institutions. Furthermore, it is imperative to establish a shared vision, particularly among upstream and downstream stakeholders, regarding how to address the challenges associated with the river.

Transparency in revealing institutional interests should also be encouraged, and efforts should be made to involve absentee stakeholders.

Practices related to the management of natural capital, such as protected areas, environmental subsidies, quotas, and regulations, represent essential components of the toolkit. Adaptive governance expands the range of measures available and offers the coordination and context necessary for selecting among these tools, monitoring their impact, and adjusting them as the social-ecological system evolves (Schultz et al. 2015). In this regard, the Tárcoles Commission could collaborate effectively with existing structures related to protected areas or the previously mentioned biological corridors.

However, this process may run counter to the current political stance of Costa Rica's Executive Branch. The conservative government is advocating for centralization of powers, a move that could expose the vulnerability of an agency RBO. Opponents of such an RBO may strongly resist its success and attempt to regain power. Consequently, the commission needs to enhance its capacity as a coordinating RBO. To advance this vision, it is essential to secure support from local governments, civil society, and other branches of government.

CONCLUSION

In this article, we have investigated the organizational structure of the General Integral Commission of the Grande Tárcoles River Basin. Following the typology established by Huitema and Meijerink (2017), we have determined that the Tárcoles Commission exhibits elements of both an agency-based river basin organization and a coordinating RBO. The commission serves as an excellent and well-established platform for exchange and communication among participating organizations, and coordinating or partnership-based RBOs encounter fewer long-term challenges.

However, in order to achieve more effective river basin management and accomplish the goal of improving the ecological status of the river, our findings highlight several challenges. There is significant overlap in responsibilities between national and local organizations, and some crucial organizations, such as the Ministry of Agriculture, do not actively participate or are not part of the commission. Notably absent are entities like the National Service of Water and Sewage, the Water Directorate, and the Costa Rican Electricity Institute.

Moreover, the commission lacks its own budget, clear procedures for making substantial budgetary decisions, and additional personnel resources for its work. These deficiencies have two significant implications. First, participating organizations may lack the necessary motivation to actively engage in the commission's work. This is exacerbated by the commission's establishment through an executive decree in compliance with a court decision, which mandates the participation of these organizations but does not foster a shared vision and mission to address basin-related issues.

Second, progress in commission activities is slow, and its impact remains limited. For instance, it took eight years to develop an official management plan for the basin, which includes some smaller river restoration projects to be implemented. To address the challenges posed by the climate crisis in this critical river basin, the commission's work must accelerate and become more robust.

Author Contributions:

B.S. designed the framework, gathered and analyzed the data, and led the writing of the manuscript. K.C.A. and B.A.G. discussed data, ideas, and materials. All authors contributed critically to the drafts and gave final approval for publication.

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Data Availability:

None of the data/code are publicly available because they contain information that could compromise the privacy of research participants.

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