



MI CUENCA ES TU CUENCA

A comparative Analysis of watershed-based governance within and outside Costa Rica

Megan Lancaster, J.D. Candidate
Stephanie Pocatko, J.D. Candidate
Oswaldo Medina-Ramirez, Ph.D. Student

Table of Contents

Introduction to Watershed-Based Governance.....2

 Collaborative Water Governance.....2

 Analytical Framework.....2

 Comparative Analysis.....3

Oswaldo Medina-Ramirez, Ph.D. Student—UF Anthropology

An International Perspective: A Centralized and Polycentric Approach..... 3

 A Case Study of the Murray-Darling River Basin.....4

 A Case Study of the Ewaso Ng’iro River Basin6

Megan Lancaster, J.D. Candidate—UF Law

Water Governance Regimes in Costa Rica.....8

 A Case Study of the Tárcoles River Basin.....10

 A Case Study of the Arenal-Tempisque River Basin12

Stephanie Pocatko, J.D. Candidate—UF Law

Watershed-Based Governance: General Analysis and Observations.....13

General Considerations and Implications for Research in the

Tempisque-Bedero Watershed Conclusion.....14

Oswaldo Medina-Ramirez, Ph.D. Student—UF Anthropology

Executive Summary.....14

Introduction to Watershed-Based Governance

Oswaldo Medina-Ramirez, Ph.D. Student—UF Anthropology

To understand watershed-based governance it is important to break its two components (water and governance) and establish the relationship between them. A watershed is the geographic area through which water flows across the land and drains into a common body of water (stream, river, lake, or ocean). In general, water comes from rainfall and storm-water runoff. However, there are cases in which water comes from artificial water bodies such as artificial lakes, generally called subsidized-water systems. Watersheds are also a setting for interactions between humans and natural systems; Some authors have described watersheds as complex social-ecological systems. Generally, management of watersheds implies several activities related with natural resources management where different stakeholders at different levels are involved. Water management is a key element of water governance processes. Ansell and Gash argues that governance “encompasses various aspects of the governing process, including planning, policy making, and management.”ⁱ According to SIWI and UNDP, “Water governance refers to the political, social, economic, and administrative systems in place that influence water’s use and management.”ⁱⁱ Batchelor argues that “water governance is more about the decision-making processes than the decisions themselves.”ⁱⁱⁱ

Collaborative Water Governance

Environmental governance scholars have argued that governance regimes that promote strong coordination among stakeholders are more likely to succeed in conservation and adaptive efforts. Collaborative governance, implies the interaction of public and private stakeholders that engage in consensus-oriented decision making such as public policy or system’s management decisions. Collaborative governance is considered to be more appropriate for integrated and adaptive management regimes needed to cope with the complexity of social-ecological systems and to promote their resilience. Collaborative governance is considering a type of governance in which public and private actors’ work collectively in distinctive ways, using particular processes, to establish laws and rules for the provision of public goods.^{iv} According to Yafee, factors that promote bridging and cooperation can be divided in three main sections: situation-specific factors, process-related factors, and institutional context.^v Also, there are factors that constrain bridging: situational factors, process-related factors, societal context, institutional context. Authors such as Ansell and Gash argues that other factors that promote cooperation are: face-to-face dialogue, trust building, and the development of commitment and shared understanding.^{vi}

Analytical Framework

Theories, models, and frameworks related to natural resources governance with an especial emphasis in the role of collaboration for water governance have been previously reviewed for this course. In the review, the "governance requirements for a robust governance," proposed by Dietz, Ostrom and Stern proposes good governance requirements and the strategies to reach those requirements.^{vii} Some of the general principles for robust governance of environmental resources are “involve interested parties in informed discussion of rules (analytic

deliberation) and allocate authority to allow for adaptive governance at multiple levels from local to global (nesting). Collaboration plays a key role in both of the principles described before.

A conceptual and methodological approach for interdisciplinary sustainability assessments of water governance was also analyzed. Schneider proposed the “sustainability wheel” as an approach that combines sustainability principles, sub-principles (indicators), and the scoring of these indicators taking into consideration qualitative and quantitative data from an interdisciplinary team or researchers.^{viii} The proponents of this approach argues that the interdisciplinary analysis of the water governance system is “systemic understanding that relates hydrological, ecological, social, economic, technical, legal, and cultural aspects is the fundamental basis of a sustainability appraisal.”^{ix} However, for the purpose of this analysis, special attention had been paid to the indicators related to collaboration processes. The “justice principle” in which indicators include: distributed justice, procedural justice, and contextual justice. Additionally, the “adaptive capacity” principle has the following indicators: material and financial capital, collaborative capacity, institutions and entitlements, resource efficiency, and learning capacity. Ansell and Gash proposed a “model for collaborative governance” based on a meta-analytical study of 137 cases of collaborative governance in different policy scenarios.^x They identified variables that promote or constraint what they called “successful collaboration.” These variables include the prior history of conflict or cooperation, the incentives for stakeholders to participate, power and resources imbalances, leadership, and institutional design. They also identified factors that they argued are key within the collaborative process itself.

Comparative Analysis

The purpose of utilizing this comparative and analytical approach (based on the analytical frameworks described above) is to conduct a preliminary analysis which will be developed and streamlined to construct context-specific conceptual framework for the Tempisque-Bebedero watershed in the Northwest of Costa Rica. This analysis is based on four cases of watershed-based governance regimes within and outside of Costa Rica. In these empirical case studies, collaboration plays a crucial role to promote or constrain sustainable water use. Based on the analytical frameworks described before, the analysis sections have been divided into three main components: general description of the study site; source of authority, key organizations, and Stakeholders; and analysis and observations.

An International Perspective: A Centralized and Polycentric Approach

Megan Lancaster, J.D. Candidate—UF Law

As Costa Rica contemplates reforming its current water law, international perspectives can provide guidance as to how a nation’s water reform policy can directly affect its water governance regimes. First, this section of the paper discusses how Australia’s 2007 Water Act created a regime shift from a decentralized governance approach to a strongly centralized approach with the objective of addressing environmental degradation and drought within the Murray-Darling River Basin. Secondly, this paper examines a regime shift in water governance

throughout Kenya as a response to the country's 2002 Water Act that moved water governance from a centralized approach to a polycentric model by examining the Ewaso Ng'iro River Basin.

Case Study of the Murray-Darling Basin Water Governance Regime

The Murray-Darling Basin (MDB), covering four states and one territory in south-eastern Australia, is an iconic watershed systems governed by institutional and social-ecological complexity. More than 30,000 wetlands (sixteen internationally recognized wetlands under the Ramsar Convention) are encompassed within the Basin.^{xi} The Murry and Darling Rivers are Australia's longest rivers and subject to varying flows, thus dramatically impacting the volume of available water for its users.^{xii} Inhabitants, including a large indigenous population, predominately rely on tourism and agriculture, as the basin supplies nearly two-thirds of Australia's irrigated agricultural production.^{xiii} Climate models predict that the MDB will likely experience extreme variability, less predictable rainfall, and gradually become more dry.^{xiv} As a result, the Basin's water governance system must be equipped to respond to more extreme patterns of drought and flooding, particularly regarding irrigation practices.

Source of Authority, Key Organizations, and Stakeholders

In response to drought, environmental degradation, and growing patterns of fragmentation among water governance organizations, Australia passed the 2007 Water Act, 2007 National Plan for Water Security, and the 2012 Murray-Darling Basin Plan (MDBP).^{xv} The 2007 Water Act marked a major operational shift in water governance for Australia, which had previously relied on a system of state dominated agencies playing principal roles in the creation, implantation, and delivery of water policy.^{xvi} The Water Act became the principle policy mechanism for advancing water sustainability goals and established two new cooperative but independent bodies—the Murray-Darling Basin Authority (MDBA) and the Commonwealth Environmental Water Holder (CEWH).^{xvii} In 2013, to further support the coordination of federal and state bodies, the Intergovernmental Agreement on Implementing Water Reform (IGA) was enacted to increase the effective implementation of water reforms in the MDB—particularly with the implementation of the MDBP.^{xviii} The National Partnership Agreement on Implementing Water Reform in the Murray-Darling Basin (NPA), further supplements the IGA by providing large amounts of federal financial support to the MDBP for meeting performance outcomes.^{xix}

The MDBA is the “single body responsible for overseeing water resource planning in the Basin[,]” but coordinates with CEWH regarding the management, planning, and monitoring of water availability for the Basin's water portfolio; CEWH reports directly to the MBDA.^{xx} The Authority is comprised of six members who confer with the Australian Competition and Consumer Commission (ACCC) (providing consultation to the Minister for Water on water markets and infrastructure rules), the Bureau of Meteorology (providing the National Water Account through the collection and publication of water information), the Productivity Commission (providing five-yearly reports on the effectiveness of the MDBP), and the Department of Agriculture and Water Resources (providing policy advice and support for program implementation).^{xxi} Unlike the previous governing body, the Murray-Darling Basin Commission that was comprised of and reported to various governmental agencies, the MDBA is an independent governance body.^{xxii} The MDBA articulates a broad framework for the Basin's

water management by identifying annual management priorities and strategies, and reports to the Commonwealth Minister for Water.^{xxiii} The Authority is comprised of the following five divisions: (1) Office of Compliance (responsible for compliance and enforcement through accounting, auditing, and reporting activities on key commitments, such as water trade rules and the protection of water for the environment.); (2) Partnerships (responsible for collaboration with strategic partners, including the states, for implementing key projects and activities within the MDBP); (3) River Management (responsible for partnering with states to lead water operational needs and environmental concerns on the Murray and Darling Rivers); (4) Science and Knowledge (responsible for guiding the collection, curation and use of the data for evaluation); and (5) Corporate Strategy and Services (responsible for providing support services to other divisions).^{xxiv}

On a state level, the MDBA works with the Ministerial Councils, which approves the MDBA's annual cooperative plan.^{xxv} The Council is comprised of one member from each basin state—the Australian Capital Territory, the Commonwealth, New South Wales, Queensland, South Australia, and Victoria.^{xxvi} This body further consults each of the MDB's Basin Officials Committee (BOC), which further coordinates with smaller Basin Community Committee (BCC).^{xxvii} State agencies then look to more localized Catchment Management Authorities (there are 22 major catchment, or sub-catchments in the MDB) to gather specific water needs from water managers and river operators.^{xxviii} Prior to the formation of the two highly centralized federal-level bodies, the MDBA and CEWH, the planning and delivery of water services was contained in single agencies within each state.^{xxix} Local and state organizations are given some monitoring control, but CEWH remains the primary agency responsible for direct monitoring of the system, but relies on supplemental monitoring from private and NGO partners.^{xxx} Now, the 2007 Water Act calls for MDBA to consult with state agencies to identify demands and priorities at a state and local level, so CEWH can meet delivery needs.^{xxxi}

Analysis and Observations

The structural reforms of 2007 undoubtedly shifted Australia's water governance to a more centralized, top-down approach of water management. Initially, this shift addressed concerns about fragmentation and the ineffective governance of natural resources, but as time passed the shift has begun creating new and arguably more burdensome obstacles to successful water governance. Perhaps the most persistent critique of Australia's governance reform is the lack of public engagement at a local level, particularly the engagement of indigenous groups and small scale agricultural stakeholders.^{xxxii} Though there was an attempt to engage marginalized groups, the government's actions have often been called "symbolic" rather than informative.^{xxxiii} Support for decisions in developing a socially dynamic and strong water management system is central to its success.^{xxxiv} Failing to engage stakeholder in a meaningful and consistent means could also challenge Australia's governance, as there will likely be shortcomings in identifying specific communities' common interests, thus increasing system vulnerability. Furthermore, state and local agencies have noted a decrease in communication and transboundary cooperation due to competition for funding, as grants are agencies most common sources of funding.^{xxxv}

Currently, the MDBP and the MDBA are under mounting scrutiny due to accusations of corruption and their inability to meet project goals, which is disrupting the credibility and

governance in the Basin and Commonwealth. In January 2018, a Royal Commission into the Murray-Darling Basin was launched regarding the transparency of the MDBA and its accuracy in reporting and modeling.^{xxxvi} This ongoing investigation challenges the integrity of the MDBA, as the Authority is the centralized repository of data and it refuses to have its members testify before the Royal Commission (a state body).^{xxxvii} This refusal sparked a pending judicial question of federal and state powers within the Commonwealth.^{xxxviii} Additionally, the New South Wales government is in the process of passing new legislation diluting the effectiveness of the MDBA by allowing the state's minister to opt out of the 2007 Water Act.^{xxxix} These current allegations further question the effectiveness of a centralized, top-down approach in that this form organizational design may create an accountability void, particularly if there is a single-keeper of information that is not effectively designed to disperse and receive information from multiple, diverse levels.

Case Study of the Ewaso Ng'iro Basin Water Governance Regime

The Ewaso Ng'iro Basin (ENB) is located on the north-eastern side of Mount Kenya (within Mount Kenya National Park) and is sourced by the mountain's glaciers. The area is characterized by spring and fall rainfalls of about 500 millimeters annually, which rarely exceeds 1000 millimetres.^{xi} Thus, the river is a green oasis and provides essential irrigation for agricultural production.^{xii} At the end of colonial rule in the early 1960s, the Republic of Kenya's newly formed federal government retained many of the preexisting British water governance strategies.^{xiii} During this transition, the basin was characterized by large-scale European cattle ranches, but today the basin is punctuated by a complex system of large cattle ranches that have been subdivided into smaller agricultural parcels.^{xiii} The Republic of Kenya continued this centralized, colonial system of natural resource control until the mid 1990s; this thirty-year period was one of formalized rules, but limited enforcement and compliance at a local level.^{xiv} Beyond widespread enforcement and compliant issues throughout the area, the ENB is characterized by rapid population growth and episodes of drought during this postcolonial period.^{xlv}

Source of Authority, Key Organizations, and Stakeholders

In the late 1990s and early 2000s, Kenya began its transition from a centralized governance regime to one that would growingly recognize the role of local stakeholder and later be classified as a polycentric approach.^{xlvi} Uniquely, the Water Act of 2002 established a new path for recognizing community water management institutions, and the Act was further fortified by a 2007 amendment that provided a process for implementing regulations.^{xlvii} Kenya has continued developing its water law in a decentralized manner through proposed irrigation reform and the 2013 Crop Act (later revised in 2016), which repealed 1977 water regulations restricting access through strict licensing laws for various stakeholders.^{xlviii}

The Water Act created two formal institutions—the Water Resource Management Authority (WRMA) and the Water Users Association (WUA).^{xlix} The WRMA is the federal authority, under the Ministry of Water and Irrigation, responsible for developing policy, regulations, and allocations; a WUA is a catchment-level organization that provides consultation for permitting, conflict resolution, and allocation recommendations.¹ These governance

organizations have a variety of overlapping roles and responsibilities—permitting, monitoring, and enforcement on local, regional, and national levels.^{li}

Prior to the establishment of regional WRMA offices within each of Kenya’s water basins, jurisdiction was based on political districts rather than the geographical boundaries of the Basin.^{lii} WRMA regional offices work directly with the WUAs within its jurisdictional basin. As a result, both institutions have been able to more effectively meet the constituents water needs through more holistic implementation of policy.^{liii} WUAs first came on the stage through the Water Awareness Creation Campaign initiative by the Ministry of Water Development and the Laikipai Research Program in the late 1990s, which sought to build strong, independent grassroots stakeholders with its basin.^{liv} WUAs were recognized as governing bodies in 2004 and formally recognized in the 2007 amendment of the 2002 Water Act.^{lv} Per the Act’s requirements, WUAs must include all users and stakeholders within the hydrological area and develop a personalized constitution that allows active participation of all stakeholders.^{lvi} Once the participants have agreed upon a written constitution to govern the area, they submit the constitution and by-laws to WRMA for approval.^{lvii} Currently, there are 450 formally recognized WUAs in Kenya, thirteen of which are in the ENB.^{lviii} Each body is comprised of executive committee with representatives from all sectors (CEOs of major agricultural producers, individual riparian users, community organizations, and additional users) of the watershed.^{lix}

WUAs further coordinate with more localized bodies, Community Watershed Project (CWPs). As of 2017, there are twenty-five recorded CWPs in the ENB, but they are not formalized bodies like WUAs and WRMAs.^{lx} CWPs are organized more organically, small in nature, and highly autonomous, with a universal goal of allowing small scale users, normally for domestic consumption, to actively participate in governance on a daily basis.^{lxi} Like the WUA, the concept of the CWP predated the Water Act, but has organically adapted to be a key stakeholder in the new governance system, and the twenty-five within the ENB play a central role in rationing water and infrastructure maintenance.^{lxii}

Analysis and Observations

It is important to note that WUAs are not government agencies or organizations, and their primary purpose of design is conflict resolution and data collection a small scale. However, the role of WUAs continues to grow as they work closely with WRMA and CPWs and further improve methods of communication.^{lxiii} It is through the WRMAs that WUAs derive their authority to monitor and enforce permit terms and provide conflict resolution between competing stakeholders.^{lxiv} Regarding permit allocations, WRMA creates the formalized permit agreements, but does not remain present in the catchment-community.^{lxv} Instead of direct oversight for the permitting process, WRMA regional offices are required to consult with the appropriate WUA before issuing a permit to the user.^{lxvi} However, in times of resource scarcity, WUAs do have the authority to develop temporary water rationing schedules and allocations; preventing and resolving conflict is a primary goal for WUA.^{lxvii} A WUA’s ability to allocate water during drought is an essential power and has been an effective tool in preventing conflict at the localized CWP level.^{lxviii}

Additionally, WUAs and WRMA work jointly to promote water conservation, education, and environmental awareness in which WUAs are the face of the programs, but further supported on a larger scale by WRMA.^{lxi} Notably, WUAs and various other groups have become empowered to experiment with new methods for conservation, improved storage, and rain water collection leading to further preservation of the river and limited manipulation of watercourse.^{lxx} Most importantly, WUA provide a responsive means of addressing volatility within the community and provides a pathway to ensuring the water needs of the stakeholders are met.^{lxxi} However, this governance system has its shortcomings in regard to the availability of resources, financial assistance and the ability to properly maintain water infrastructures.^{lxxii} Kenya's ENB is an example of a polycentric approach that combines active participation from civil society and meaningful legal reforms to address the needs of a community. It is neither a top-down or a bottom-up approach, but the materialization of a governance system that recognized existing centers of authority and found the means to support them.

International Perspective

The juxtaposition of these case studies provides valuable insight into the role of policy reform and responsive governance in a water-resource-context. Policy reform must provide the means to which stakeholders can actively participate within the process to ensure a responsive and robust water governance system. Generally, a polycentric governance systems is praised for its ability to promptly respond to uncertainties and new variables, like effects of climate change and situational water conflict, as seen in Kenya.^{lxxiii} Thus, mechanisms for participation at local levels are essential to establishing a community's common interest, particularly with regard to marginalized groups, and the information gathered from this participation—in conjunction to monitoring and reporting—must be conveyed, or the governance system can become vulnerable, like that in the MDB. A centralized system is further effectuated by its posture over an existing system, rather than integrating the existing system into the new approach. Ultimately, nested governance, inclusivity, and autonomy are fundamental factors for the effective water governance in both basins.^{lxxiv}

Water Governance Regimes in Costa Rica *Stephanie Pocatko, J.D. Candidate—UF Law*

The international community has long regarded Costa Rica as a policy lab for sustainable development, conservation, and natural resource management. The Costa Rican government began enacting environmental legislation in the early twentieth century, with the earliest concept of protecting areas dating back to 1863, when the government set aside tracts of land to be excluded from road-clearing cuts.^{lxxv} The following decades saw a slow but steady rise in the number of conservation and natural resource management efforts undertaken by the Costa Rican government, including two laws which passed in 1923: Law No. 52, prohibiting the dumping of sewage and waste from dairy farms and slaughterhouses into the nation's rivers, and Law No. 68, aimed at the general protection of watershed systems.^{lxxvi} In 1948, civil unrest resulted in the establishment of a new government, the "Second Republic," with important consequences for the trajectory of conservation efforts in Costa Rica.^{lxxvii}

The government of the Second Republic was oriented around education and social services, establishing a political tradition of placing emphasis on public works.^{lxxviii} Toward the end of the twentieth century, this political tradition led to the passage of several laws aimed at the protection and management of resources related to water.^{lxxix} The Wildlife Conservation Law of 1992 (Ley de Conservación de Vida Silvestre No.7317) established wetland ecosystems as a public interest, while the Organic Environmental Law of 1995 (Ley Orgánica del Ambiente No.7554) defined tropical wetlands, and the Forestry Law of 1996 (Ley Forestal No.7575) limited the destruction and use of mangroves.^{lxxx} In 1998, the Legislative Assembly passed the Law of Biodiversity (Ley de Biodiversidad No.7788), in which the government recognized the possibility of declaring wetlands as protected areas, dedicated to the conservation and protection of biodiversity, soil, hydrological resources, cultural resources, and the services provided by wetland ecosystems in general.^{lxxxi} When the Ramsar Convention was ratified in 1991, Costa Rica committed to conserving and rationally managing wetlands designated for inclusion in the List of Wetlands of International Importance.^{lxxxii}

Despite Costa Rica's reputation as an environmental policy lab, an effective water governance regime is lacking within the country. The existing water law was established in 1942, a modification of the first regulation from 1884, and while a new water law was proposed in 2003, the Legislative Assembly has yet to revise or replace the 1942 law.^{lxxxiii} A number of national authorities is charged with the responsibility of water management, including the Ministry of Environment and Energy (MINAE), the Water and Sewage Institute (AyA), and the National Service of Irrigation and Draining (SENARA).^{lxxxiv} Additionally, the Institute of Electricity (ICE) has power over water governance with respect to hydroelectric generation, producing about 82% of all hydroelectric power within the country.^{lxxxv}

On a national scale, MINAE and AyA are obligated to coordinate with each other and with other governmental agencies in the management of water-related activities.^{lxxxvi} While MINAE and AyA hold a large degree of power within the national water governance regime, there is little institutional guidance on how the agencies should coordinate and who should be involved in the decision-making process at regional and local scales.^{lxxxvii} MINAE primarily administers water rights with respect to water delivery and largely controls the water-use domain, monitoring and enforcing water-use related policies and rights.^{lxxxviii} It does not generally share information relating to water governance with AyA.^{lxxxix} For its part, AyA is responsible for maintaining public water supplies and monitoring water transport.^{xc} Kuzdas, et al. found that regionally, MINAE and AyA do not generally coordinate with each other in water-related activities, while other agencies such as the National Groundwater, Irrigation, and Drainage Service (SENARA) are often not present. This lack of institutional coordination has resulted in a fragmented and continually shifting political regime, in which stakeholder agencies exchange authoritative positions with respect to water governance.^{xci}

In order to give a greater impetus to the issue of wetlands within MINAE, the National Wetlands Program was established by Executive Decree No. MINAE-28058, which in turn established the National Advisory Council on Wetlands, comprised of six members representing governmental agencies and four members representing universities and other non-governmental organizations.^{xcii} The National Wetlands Program became a key instrument utilized by the National Environmental Policy Plan of 1996-2000, which proposed the basic principle that

environmental aspects should be integrated in the decision-making processes of both the public and private sectors, in a consistent and systematic manner, guided by the common goal of achieving sustainable development.^{xciii} The creation of the National Wetlands Program indicated a shift toward the collaborative management of resources in Costa Rica, signaling that environmental protection and the conservation of natural resources should be a shared responsibility involving the coordination and cooperation of activities and stakeholders from both the public and private sectors.^{xciv} However, an in-depth analysis of water governance in Costa Rica evidences a fragmented system which has not yet reached the goal of collaborative polycentrism.

Case Study of the Tárcoles River Basin Water Governance Regime

Costa Rica contains thirty-four river basins, including the Grande de Tárcoles River Basin, the drainage area of the Río Grande de Tárcoles.^{xcv} The Tárcoles basin extends from mountain ranges that cover the middle of the country to the central Pacific coast, emptying into the Gulf of Nicoya.^{x cvi} The basin comprises 4.2% of the total land area of Costa Rica, making it a fairly large area relative to the other basins in the country.^{x cvii} Although it comprises only 1/25 of Costa Rica's total land area, the Tárcoles basin is home to two million out of the nation's population of four million.^{x cviii} Despite the thick concentration of urban and industrial centers, 37% of the basin's land use is dedicated to crops and pasture, including coffee farming, dairy farming, and cattle ranching.^{x cix} Water resource problems plague the basin, resulting from the concentration of people, industry, and agriculture in the area, and financial and governmental constraints have prevented infrastructure development from keeping pace with the area's rapid economic development and population growth.^c The 2001 "State of the Nation" report pointed to the Tárcoles basin as a principal focus for the issues of water resource vulnerability and water quality vulnerability—Costa Rica's biggest environmental concerns.^{ci}

Several environmental concerns affect water resource and water quality vulnerabilities within the basin, including sewage, solid waste, and water pollution; deforestation; and increasing water demand, among others.^{cii} Domestic and industrial wastewater flows into the basin on a massive scale, only 4% of which is treated, as the area lacks adequate sewage treatment facilities.^{ciii} Urban and agricultural runoff, as well as rubbish, enter the basin's rivers and streams relatively unimpeded, worsening water quality and adding high concentrations of coliforms, heavy metals, and suspended solids.^{civ} Pollution levels are so high in the basin that, by the time the Tárcoles empties into Gulf of Nicoya, "red tide" conditions can be observed, limiting coastal tourism in the area.^{cv} Water quality in the basin is among the worst in Costa Rica. Indeed, the basin contains three of the nation's provinces with the lowest coverage of quality drinking water, with 31% of the basin's population receiving untreated drinking water and 42% receiving water that is not regulated or monitored with respect to water quality.^{cvi}

Participating Stakeholders and Source of Authority

In 1992, officials and staff of the Municipality of San José, recognizing the need for an adaptive governance regime within the basin, organized a seminar entitled "The Rio Grande de Tárcoles River Basin: Looking Toward the Future."^{cvii} Negotiations between stakeholders continued after the seminar's completion, resulting in the formation of the Coordinating

Commission for the Río Grande de Tárcoles (CRGT), a group of stakeholders committed to improving water governance within the basin.^{cxviii} CRGT members sought recognition by the Costa Rican government and, in a joint effort, persuaded MINAE to recognize the Commission by executive decree in April of 1993.^{cxix} Today, the CRGT is comprised of nineteen members, including five nongovernmental organizations and six municipalities.^{cx} The creation of the CRGT marked the beginning of Costa Rica's efforts to organize a structure for river basin management, and since the creation of the CRGT, several basin organizations have been established in other basins throughout the country.^{cxii}

Analysis and Observations

The creation of the CRGT by way of executive decree offered a less time-consuming and more politically feasible alternative to seeking recognition through a law enacted by the Legislative Assembly; however, the choice had important—and somewhat regrettable—ramifications on the CRGT's capacity to undertake water management projects.^{cxiii} The executive decree did not grant to the CRGT any formal management responsibility, merely legitimizing its existence as a collaborative body for the transfer and development of information and management plans, and MINAE has never defined the roles of the various organizations and agencies participating in the CRGT.^{cxiiii} Additionally, MINAE failed to earmark funding for the CRGT and, to date, has not provided the Commission with a budget.^{cxiv} Finally, executive decrees are easily altered in comparison to national laws and may be ignored by subsequent administrations.^{cxv} As a result of these limitations, the CRGT has largely relied on the good will of participants and strangers in its development and implementation of water management plans.^{cxvi}

The Costa Rican government's reluctance to engage in decentralized (low-level) decision making is evident in its treatment of the CRGT. On a national scale, institutes such as MINAE, ICE, and AyA are extremely important and politically influential, sometimes hindering the CRGT's efforts to govern within the basin. In 2001, a newly appointed MINAE official was named president of the CRGT, even though he had not been previously involved with the CRGT or any other basin management effort—a result of the new MINAE minister's efforts to take a more direct role in managing the Commission.^{cxvii} Since the appointment of the new president, participation in the Commission has steadily declined, and its activity has reached an all-time low.^{cxviii} While the creation of the CRGT seemingly pointed to a shift away from centralized governance, many of the Commission's members view the new minister's actions as an effort to re-centralize the Commission.^{cxix} Blomquist, et al. (2005) argue that, if the national government does not commit to decentralization, the Commission, lacking legal authority, is “unlikely to proceed rapidly toward autonomy and authority unless AyA and ICE acquiesce.”^{cxix}

In practice, the CRGT functions as a roundtable, providing a place in which participants can meet to discuss water management issues, share information, and develop resource management plans.^{cxxi} Because there is no established channel for feedback or coordination with nongovernmental organizations and municipalities lacking representation within the commission, participation seems to be limited to member-stakeholders.^{cxixii} Notwithstanding these limitations, during the years when the CRGT was most active, it accomplished several initiatives, including the development of a Program for Integrated Management of Natural Resources in the basin.^{cxixiii}

Other accomplishments include the implementation of a Volunteer Plan Program, in which businesses presented plans to establish waste treatment programs, and an Ecological Flag Program, which recognized businesses and civil-society organizations that had initiated resource protection and recovery activities within the basin.^{cxxiv} However, since the centralized government's treatment of the CRGT changed—about five years after the Commission's inception—uncertainty and a lack of resources have plagued the project, severely limiting its capacity to participate in managing the basin.^{cxxv} Thus, while the creation of the CRGT does suggest a shift toward a bottom-up style of governance, the national government's efforts to maintain control over the Commission has had a re-centralizing effect on water governance within the basin.

Case Study of the Arenal-Tempisque River Basin Water Governance Regime

The Arenal and Tempisque river basins, located in the Guanacaste Province in Northwest Costa Rica, are artificially connected by an electricity and irrigation project, spearheaded by ICE.^{cxxvi} The Arenal reservoir basin represents 1% of the nation's total land area, while the Tempisque basin contains a similar land mass.^{cxxvii} The Tempisque river is critical for development and conservation within the country: draining a large region that empties into the Gulf of Nicoya, the river effectuates abundant and diverse ecological, economic, and social interactions.^{cxxviii} Guanacaste experiences a marked dry season, during which high water demand creates conflict in the region, and climate scientists anticipate that the province will experience significantly less rainfall in the near future.^{cxxix} Regional agricultural development is concentrated in the lower and middle part of the basin, requiring a large amount of water from the Arenal reservoir.^{cxxx} Expanding agriculture and tourism, along with rural development programs and general population growth, will likely reduce available water supplies in Guanacaste in the coming years.^{cxxxi}

Participating Stakeholders and Source of Authority

In 1997, MINAE created the Commission for the Implementation and Development of the Arenal Tempisque River Basin (CIDECAAT) with the goal of coordinating, regulating, and promoting activities which would involve local and national stakeholders in regional water governance.^{cxxxii} CIDECAAT, like the CRGT, was officially recognized by MINAE in an executive decree (Executive Decree No. 37187-MINAET).^{cxxxiii} The Commission is comprised of representatives from governmental agencies and institutes—including MINAE, ICE, and AyA, among others—and representatives from affected municipalities, universities and nongovernmental organizations.^{cxxxiv} The executive decree provides for a seven-member Board of Directors, which is comprised of representatives from ICE, AyA, and other national agencies—designated as permanent Board members—along with three elected representatives.^{cxxxv} Represented stakeholders are permitted to appoint an Executive Director whose responsibilities include the administrative management of projects promoted by the Board of Directors.^{cxxxvi} The Commission is obligated to meet at least once every two years.^{cxxxvii}

Analysis and Observations

CIDECAT has not been the subject of much outside literature, and extensive study about how the Commission functions with regard to collaboration and stakeholder input is lacking; however, the lessons learned from the Tárcoles case study lend themselves to an understanding of CIDECAT's capacity to govern and manage natural resources on a regional scale. Vargas and León (2012), the Commission's secretary and coordinator, respectively, purport that the Commission maintains constant communication with its participating stakeholders; however, it is unclear exactly how much opportunity exists for stakeholder input.^{cxviii} Given the composition of the Board of Directors, national agencies such as ICE and AyA seem to hold more decision-making power than nongovernmental organizations and other represented entities.

Like the CRGT, CIDECAT was created by an executive decree, which, being “an instrument of lower rank than a [national] law, cannot confer management responsibilities” to the Commission.^{cxix} Executive Decree No. 37187-MINAET does not provide a budget for CIDECAT or grant the Commission any power to effectuate resource management plans.^{cxl} In spite of these limitations, CIDECAT has achieved several notable objectives, each made possible through the support of various member agencies and institutions. Such accomplishments include preserving wild fauna, reforesting more than 120 hectares of land, and minimizing water contamination in the basin.^{cxli} Additionally, CIDECAT has launched an environmental education program, focusing on local communities within its area of influence, and the Commission also helped coordinate a geological study to determine the vulnerability of the basin's aquifers, made possible with support from the University of Costa Rica—a represented stakeholder—and several private businesses which lack representation in the Commission.^{cxlii} While CIDECAT has been praised as being a successful river basin commission in comparison to the CRGT, more data is needed in order to grade its efficacy as a regional governing entity.^{cxliii}

Watershed-Based Governance: General Analysis and Observations

The analysis and observations of the key elements that constrain and facilitate collaborative governance in the analyzed cases are congruent with collaborative water governance literature. Among the key elements that constrains collaborative governance in the study cases are the high centralization of governance regimes (Murray-Darling Basin – MDB; Tarcoles River Basin – TRB; and the Arenal-Tempisque river basin- ATRB) which have reduced the system's adaptive capacity. Decentralization of authority is one of the principles for good governance proposed by Dietz, et.al. There have been efforts to decentralize the decision making process, however as in the case of the Coordinating Commission for the Río Grande de Tárcoles (CRGT), there is lack of authority to allow for adaptive governance at multiple levels from local to global (nesting and polycentric governance). Stakeholder participation and analytical deliberation is another of the governance principles proposed in the framework. Participation is one of the biggest issue in the case of the MDB, TRB, ATRB watersheds. In the case of the Ewaso Ng'iro Basin (ENB), local participant engagement was one of their governance strengths and improved their ability to influence de decision making processes. However, in this case, there is a lack of vertical integration, which makes economic resources more difficult to access for local stakeholders.

General Considerations and Implications for Research in the Tempisque-Bedero Watershed

Experiences of the analyzed cases can improve the social learning for water governance in the Tempisque-Bedero basin. It is important to analyze the possibility to incorporate some of the elements that have been used in the present analysis. It is important to understand the social dynamics of the area with special emphasis to the prior history of conflict or cooperation related to water use. An important element of study could be the recent conflicts for water-related issues such as the case of Sardinal. In the other hand there are different platforms for institutional coordination in the area (such as CIDECAAT, Consejos Territoriales de Desarrollo Rural, and other) which need to be studied to understand the institutional dynamics and the stakeholder's incentives for their participation in those platforms. Another important consideration is power and resources imbalances. This is of special importance for the Tempisque-Bedero basin because of the diverse nature of the basin's stakeholders which hold different types of resources and power relations. A crucial step to promote collaborative processes among stakeholders involves understanding their existing relationships and networks that they have established. A key element for water governance is to be clear in what type of water use is being governed. For this reason, a relationship between different water uses should be established. In the case of the Tempisque-Bedero basin these uses could be human consumption, hydro-electric production, and agricultural production.

At the national level in Costa Rica, the institutional and legal frameworks for water governance have been identified as the main issues that constrain collaborative water governance. Overall, the institutional level of the water management system is characterized by a lack of definition in the roles between institutions, limited clarity of the management power held by each group, with each actor granted little incentive by the system to cooperate across sectors. For these reasons, future research into these water law initiatives is important to build an understanding of the national context and how broader political culture and actions influence the specific governance activities in the basin.

From the experience of the cases analyzed, it is important to consider that adaptive capacity is highest in regimes characterized by a balance between top-down and bottom-up flows of authority/influence. Collaborative governance is considered to be more appropriate for integrated and adaptive management regimes needed to cope with the complexity of social-ecological systems and their resilience. Collaborative governance regimes facilitated interdisciplinary research on complex, multilevel systems; finally leading to the conclusion that watershed basin governance should engage people across the boundaries of public agencies, levels of government, and the public and private spheres.

Executive Summary

Watersheds are an important setting for interactions between humans and natural systems. The management of watersheds is a key element of the system's governance and implies several activities related to natural resources management involving different stakeholders at various levels.

Collaborative governance is a type of governance in which public and private actors work collectively in distinctive ways, using particular processes, to establish laws and rules for the provision of public goods. Collaborative governance is considered most (if we say "more," we'll need to say what it is more appropriate than--that is why I decided to say "most") appropriate for the integrated and adaptive management regimes which are needed to cope with the complexity of social-ecological systems and to promote their resilience. A comparative analysis has been used to show examples of watershed-based governance within and outside of Costa Rica. In the empirical case studies (contained in this essay?), collaboration plays a crucial role in promoting or constraining sustainable water use. Our analytical framework is based on the governance requirements for a robust governance, the (Ostrom's?) sustainability wheel, and a model for collaborative governance (can we name the model? Where did it come from/who developed it?). For the purpose of this analysis, special attention has been paid to the indicators related to collaborative processes. The analysis sections have been divided into three main components: general description of the study site; source of authority, key organizations, and Stakeholders; and analysis and observations. The purpose of utilizing this comparative and analytical approach is to conduct a preliminary analysis (no comma here) which will be developed and streamlined to construct context-specific conceptual framework for the Tempisque-Bebedero watershed in the Northwest of Costa Rica.

The international cases are based on the analysis of the Murray-Darling River Basin in Australia and the Ewaso Ng'iro River Basin in Kenya. In the case of Australia, the 2007 Water Act created a regime shift from a decentralized governance approach to a strongly centralized approach with the objective of addressing environmental degradation and drought. In the case of Kenya, there was a regime shift throughout Kenya in response to the country's 2002 Water Act that moved water governance from a centralized approach to a polycentric model. The Costa Rican cases are based on the Tárcoles River Basin and the Arenal-Tempisque River Basin. In both cases institutional coordination platforms have been created; however, institutional coordination is still one of the biggest issues constraining collaborative governance processes. Overall, the institutional level of the water management system is characterized by a lack of definition of management roles between institutions and limited clarity with regard to the management power held by each group, with each actor granted little incentive by the system to cooperate across sectors.

Through these case studies, bottom-up and top-down governance approaches have been analyzed and articulated. In Costa Rica, at the national level, the institutional and legal frameworks for water governance have been identified as the main issues constraining collaborative water governance. From the experience of the cases analyzed, it is important to consider that adaptive capacity is highest in regimes characterized by a balance between top-down and bottom-up flows of authority and influence. Collaborative governance regimes facilitated interdisciplinary research on complex, multilevel systems.

- ⁱ Chris Ansell & Alison Gash, *Collaborative Governance in Theory and Practice*, 18 J. OF PUB. ADMIN. RES. AND THEORY 543, 548 (2007).
- ⁱⁱ WATER GOVERNANCE FACILITY, <http://www.watergovernance.org/governance/what-is-water-governance/> (last visited Jul. 8, 2018).
- ⁱⁱⁱ CHARLES BATCHELOR, WATER GOVERNANCE LITERATURE ASSESSMENT 1 (Int'l. Inst. for Env'tl. Dev. 2007),
- ^{iv} Ansell, *supra* note 1, at 545.
- ^v Steven L. Yaffee, *Why Environmental Policy Nightmares Recur*, 11 Conservation Biology 328, 336 (1997)
- ^{vi} Ansell, *supra* note 1, at 545.
- ^{vii} Thomas Dietz, Elinor Ostrom, Paul C. Stern, *The Struggle to Govern the Commons*, 302 SCIENCE 1907, 1908-1909 (2003).
- ^{viii} Flurina Schneider, Mariano Bonriposi, Olivier Graefe, Karl Herweg, Christine, Homewood, Matthias Huss, Martina Kauzlaric, Hanspeter Liniger, Emmanuel Rey, Emmanuel, Reynard, Stephan Rist, Bruno Schädler & Rolf Weingartner, *Assessing the sustainability of water governance systems: the sustainability wheel*, 58 J. ENVTL. PLAN. & MANG. 1577, 1587-1588 (2014).
- ^{ix} *Id.* at 1580.
- ^x Ansell, *supra* note 1, at 550.
- ^{xi} *Celebrating Murray–Darling Basin wetlands on World Wetland Day*, COMMONWEALTH ENVTL. WATER OFF. (Feb. 1 2017) <http://www.environment.gov.au/water/cewo/media-release/celebrating-murray-darling-basin-wetlands-world-wetland-day> (last visited Jun. 19, 2018).
- ^{xii} *Geography*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/discover-basin/landscape/geography> (last visited Jun. 19, 2018).
- ^{xiii} Zachary Bischoff-Matson, *Integrative Governance of Environmental Water in Australia's Murray–Darling Basin: Evolving Challenges and Emerging Pathways*, Environmental Management, 60 ENVTL. MGMT. 41, 42-43 (2017); Jason Alexandra, *Evolving Governance and Contested Water Reforms in Australia's Murray Darling Basin*, 10 WATER (SPECIAL ISSUE) 2, 6-7 (2018), <http://www.mdpi.com/2073-4441/10/2/113>.
- ^{xiv} Alexandra, *supra*, note 15 at 8-9.
- ^{xv} Avril Horne & Erin O'Donnell, *Decision making roles and responsibility for environmental water in the Murray-Darling Basin*, 18 AUSTL. J. WATER RES. 118, 118-120 (2014); Lain Dare & Mark Evans, *Understanding water governance: the case of Australia's Murray-Darling Basin*, 38 POL'Y STUD. 411, 415 (2017).
- ^{xvi} Dare, *supra* note 15, at 414-16.
- ^{xvii} *Water Act 2007* (Cth) p XIV div 1 (Austl.), Bischoff-Matson, *supra* note 13, at 47.
- ^{xviii} *Intergovernmental Agreement on Implementing Water Reform in the Murray-Darling Basin 2013* (Austl. Cap. Terr., Cth, N.S.W, Queensl, S. Austl., Vict) s 2 (Austl.).
- ^{xix} *National Partnership Agreement on Implementing Water Reform in the Murray-Darling Basin 2014* (Austl. Cap. Terr., Cth, N.S.W, Queensl, S. Austl., Vict) pt III sub-div 12(a) (Austl.).
- ^{xx} *About Commonwealth Environmental Water*, DEPT. OF ENV'T AND ENERGY, <https://www.environment.gov.au/water/cewo/about-commonwealth-environmental-water>. (last visited Jun. 18, 2018); *The Authority*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/about-us/governance/authority> (last visited Jun. 18, 2018);
- ^{xxi} *Government Partnership*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/about-us/partnerships-engagement/government-partnerships> (last visited Jun. 19, 2018).
- ^{xxii} Bischoff-Matson, *supra* note 13, at 47.
- ^{xxiii} *The Authority*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/about-us/governance/authority> (last visited Jun. 18, 2018).
- ^{xxiv} *Corporate Structure*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/about-us/corporate-structure> (last visited Jun. 18, 2018).
- ^{xxv} *Ministerial Council*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/about-us/governance/ministerial-council> (last visited Jun. 18, 2018).
- ^{xxvi} *Water Act 2007* (Cth) p I div 1 (Austl.).
- ^{xxvii} *Id.*
- ^{xxviii} Anna M. Roberts, Eloise J. Seymour, & David J. Pannell, *The Role of Regional Organisations in Managing Environmental Water in the Murray–Darling Basin, Australia*, 30 ECON. PAPERS 147, 148 (2011); *Geography*, MURRAY-DARLING BASIN AUTH., <https://www.mdba.gov.au/discover-basin/landscape/geography> (last visited Jun. 19, 2018).
- ^{xxix} Bischoff-Matson, *supra* note 13, at 48-49.

-
- xxx Bischoff-Matson, *supra* note 13, at 48.
- xxxi Horne, *supra* note 15, at 123-124.
- xxxii *Id.* at 50.
- xxxiii *Id.*
- xxxiv Philip J. Wallis & Raymond L. Ison, *Appreciating Institutional Complexity in Water Governance Dynamics: A Case from the Murray-Darling Basin, Australia*, 25 WATER RESOURCE MGMT. 4081, 4082, 4092-4094 (2011).
- xxxv Bischoff-Matson, *supra* note 15, at 48.
- xxxvi Isabel Dayman, *Scientist accuses Murray-Darling Basin Authority of interfering with research in scathing account*, ABC AUSTRALIA (Jun. 25, 2018, 4:35 PM), <http://www.abc.net.au/news/2018-06-26/scientist-accuses-mdba-of-interfering-with-research/9907808>.
- xxxvii Anne Davies, *Murray-Darling royal commission: injunctions will not stop flow of information* THE GUARDIAN (Jun. 14, 2018, 19:00 PM), <https://www.theguardian.com/australia-news/2018/jun/14/murray-darling-royal-commission-injunctions-will-not-stop-flow-of-information>
- xxxviii *Id.*
- xxxix Michael Slezak, *Murray-Darling: Proposed water laws a 'recipe for killing the river', Labor and Greens say*, ABC AUSTRALIA (Jun. 19, 2018, 4:10 PM), <http://www.abc.net.au/news/2018-06-20/proposed-murray-darling-water-laws-recipe-for-killing-river/9887038>.
- xl Boniface P. Kiteme & John Gikonyo, *Preventing and Resolving Water Use Conflicts in the Mount Kenya Highland-Lowland System through Water Users' Associations*, 22 MOUNTAIN RESEARCH & DEV. 332, 332-333 (2002).
- xli *Id.*
- xlii Elizabeth Baldwin, Camille Washington-Ottombre, Jampel Dell'Angelo, Daniel Cole, & Tom Evans, *Polycentric Governance and Irrigation Reform in Kenya*, 29 GOVERNANCE: AN INT'L J. OF POL'Y, ADMINI., & INSTS. 207, 212 (2015).
- xliii Baldwin, *supra* note 43, at 222; Kiteme, *supra* note 40, at 333.
- xliv Paul McCord, Jampel Dell'Angelo, Elizabeth Baldwin, & Tom Evans, *Polycentric Transformation in Kenyan Water Governance: A Dynamic Analysis of Institutional and Social-Ecological Change Governance*, POL'Y STUD. J. 633, 641 (2017).
- xlv Kiteme, *supra* note 40, at 333.
- xlvi Baldwin, *supra* note 43, at 208.
- xlvii Jampel Dell'Angelo, Paul F. McCord, Drew Gower, Stefan Carpenter, Kelly K. Caylor, & Tom P. Evans, *Community Water Governance on Mount Kenya: An Assessment Based on Ostrom's Design Principles of Natural Resource Management*, 36 MOUNTAIN RESEARCH & DEV. 102, 102 (2016).
- xlviii The Crop Act (2013) Cap. 16 § 14 (Kenya).
- xliv The Water Act (2002) Cap. 8 § 3 (Kenya).
- l *Id.*
- li McCord, *supra* note 44, at 637.
- lii *Id.* at 642.
- liii *Id.* at 643.
- liv Kiteme, *supra* note 40, at 334.
- lv Baldwin, *supra* note 43, at 217; Hanspeter Liniger, John Gikonyo, Boniface Kiteme, & Urs Wiesmann, *Assessing and Managing Scarce Tropical Mountain Water Resources*, 25 MOUNTAIN RESEARCH & DEV., 163, 169 (2005).
- lvi *Id.* at 218.
- lvii *Id.*
- lviii Kiteme, *supra* note 40, at 335; Liniger, *supra* note 55, at 168.
- lix Kiteme, *supra* note 40, at 334.
- lx McCord, *supra* note 44, at 646.
- lxi *Id.* at 647-648.
- lxii *Id.*
- lxiii McCord, *supra* note 44, at 651, 652.
- lxiv Baldwin, *supra* note 43, at 218.
- lxv *Id.* at 218-219.
- lxvi McCord, *supra* note 44, at 644.
- lxvii *Id.*
- lxviii Kiteme, *supra* note 40, at 337.
- lxix *Id.*

-
- lxx Liniger, *supra* note 55, at 169.
- lxxi Dell'Angelo, *supra* note 47, at 110.
- lxxii Baldwin, *supra* note 43, at 219.
- lxxiii *Id.* at 207-208.
- lxxiv Horne, *supra* note 15, at 120-121.
- lxxv STERLING EVANS, *THE GREEN REPUBLIC: A CONSERVATION HISTORY OF COSTA RICA* 53 (1999).
- lxxvi *Id.* at 54.
- lxxvii *Id.* at 55.
- lxxviii *Id.*
- lxxix ELIZABETH ODIO BENITO, MINISTERIO DEL AMBIENTE Y ENERGÍA, POLÍTICA DE HUMEDALES DE COSTA RICA 3 (2001), http://ramsar.rgis.ch/cda/en/ramsar-documents-wurl-policies-national-wetland-21185/main/ramsar/1-31-116-162^21185_4000_0_#II.
- lxxx *Id.* at 6.
- lxxxi *Id.*
- lxxxii *Id.*
- lxxxiii William Blomquist et al., *Institutional and Policy Analysis of River Basin Management: The Tárcoles River Basin, Costa Rica*, World Bank Policy Research Working Paper 3612, at 10 (2005).
- lxxxiv Isabel Guzmán-Arias & Julio C. Calvo-Alvarado, *Planning and Development of Costa Rica Water Resources: Current Status and Perspectives*, 26 *Tecnología en Marcha* 52, 60 (2013).
- lxxxv *Id.* at 55.
- lxxxvi Christopher Kuzdas et al., *Integrated and Participatory Analysis of Water Governance Regimes: The Case Study of the Costa Rican Dry Tropics*, 66 *World Development* 254, 261 (2014).
- lxxxvii *Id.*
- lxxxviii *Id.* at 263.
- lxxxix *Id.*
- xc *Id.*
- xcj *Id.* at 261.
- xcii BENITO, *supra* note 79, at 6; Crea Programa Nacional de Humedales Dentro del MINAE, Decreto Ejecutivo N° 28058-MINAE, published in *Sistema Costarricense de Información Jurídica*, de 23 de julio de 1999 (Costa Rica).
- xciii BENITO, *supra* note 79, at 7.
- xciv *Id.*
- xcv Blomquist et al., *supra* note 83, at 7.
- xcvi *Id.* at 3, 7.
- xcvii *Id.* at 8.
- xcviii *Id.*
- xcix *Id.*
- c *Id.*
- ci *Id.*
- cii *Id.* at 8–10.
- ciii *Id.* at 8.
- civ *Id.* at 9.
- cv *Id.*
- cvi *Id.*
- cvii *Id.* at 14.
- cviii *Id.*
- cix *Id.* at 15.
- cx *Id.*; Crea Comisión de Gestión Integral de la Cuenca del Río Grande de Tárcoles, Decreto Ejecutivo N° 38071-MINAE, published in *Sistema Costarricense de Información Jurídica*, de 28 de octubre de 2012 (Costa Rica).
- cxj Blomquist et al., *supra* note 78, at 13.
- cxiii *Id.* at 15.
- cxiiii *Id.*; Decreto Ejecutivo N° 38071-MINAE.
- cxv Blomquist et al., *supra* note 83, at 24.
- cxvi *Id.* at 15.
- cxvii *Id.* at 24.
- cxviii *Id.* at 18.
- cxviiii *Id.* at 19.

-
- cxix *Id.* at 18.
- cxx *Id.* at 20.
- cxxi *Id.* at 24.
- cxxii *Id.*
- cxxiii *Id.* at 18.
- cxxiv *Id.* at 17.
- cxxv *Id.* at 26.
- cxxvi Lorena Vargas & Alexander León, *Coordinando Esfuerzos para la Integración y Desarrollo en las Cuencas Embalse Arenal y Tempisque*, REVISTA DE CIENCIAS AMBIENTALES, June 2012, at 39.
- cxxvii *Id.* at 39–40.
- cxxviii Isabel Guzmán-Arias & Julio C. Calvo-Alvarado, *Water Resources of the Upper Tempisque River Watershed, Costa Rica (Technical Note)*, 25 *Tecnología en Marcha* 63, 68 (2012).
- cxxix *Id.*; Kuzdas et al., *supra* note 86, at 256.
- xxx Vargas & León, *supra* note 126, at 40–41.
- xxxi Kuzdas et al., *supra* note 88, at 256.
- xxxii Vargas & León, *supra* note 126, at 39–40.
- xxxiii Crea Comisión de Implementación y Desarrollo de la Cuenca Arenal Tempisque (CIDECAAT), Decreto Ejecutivo N° 37187-MINAET, published in Sistema Costarricense de Información Jurídica, de 3 de mayo de 2012 (Costa Rica).
- xxxiv *Id.*
- xxxv *Id.*
- xxxvi *Id.*
- xxxvii *Id.*
- xxxviii Vargas & León, *supra* note 126, at 41.
- xxxix *Id.*; Blomquist et al., *supra* note 83, at 24.
- cxli Decreto Ejecutivo N° 37187-MINAET.
- cxli Vargas & León, *supra* note 126, at 43.
- cxlii *Id.* at 43–44.
- cxliii Blomquist et al., *supra* note 83, at 23.