

The many-headed Hydra: assessing the Indigenous-hydropower cycle in Costa Rica

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Abstract

This article explores the intersection of hydropower development and Indigenous rights within the context of climate governance. A historical rift between dam supporters and opponents has evolved into a contentious ebb and flow of dam proposal-resistance between hydropower industries and Indigenous communities around the world. Conflicts have recently intensified as dams are promoted as a climate mitigation strategy and are increasingly encroaching on Indigenous territories. Research analyzes a case study in Costa Rica, where an Indigenous-hydropower cycle emerged from a 50-year feud between the national electricity institute (*Instituto Costarricense de Electricidad* or ICE, pronounced E-say) and the Brörán peoples over development of the Térraba river—each time the state proposed a dam, the Brörán peoples defeated it, and another would emerge in its place. In this article, I ask why dam building continues despite the multitude of critiques and documented negative social-ecological consequences of hydropower projects. To address this question, I introduce the adaptive cycle, which serves as a heuristic model to investigate how and why the cycle continues, as well as to understand the power, justice, and equity issues involved in climate decision-making processes. Through a political ecology framework, I assess the hybridity of interrelated social-ecological, political, and economic factors encompassing the human-water nexus, conceptualized as a hydrosocial territory. Analysis suggests a rigidity trap that spans across multiple scales of governance causes the cycle to repeat, and given the current acceptance of hydropower within the climate governance arena, the cycle is likely to continue.

Keywords: political ecology, Costa Rica, Indigenous rights, hydropower development, climate governance, adaptive cycle

Résumé

Cet article explore l'intersection du développement hydroélectrique et des droits Indigène dans le contexte de la gouvernance climatique. Un fossé historique entre les partisans et les opposants des barrages s'est transformé en un flux et reflux controversé de résistance aux propositions de barrages entre les industries hydroélectriques et les communautés Indigène du monde entier. Les conflits se sont récemment intensifiés alors que les barrages sont promus comme une stratégie d'atténuation du climat et empiètent de plus en plus sur les territoires des peuples Indigènes. La recherche analyse une étude de cas au Costa Rica, où un cycle Indigène-hydroélectrique a émergé d'une querelle de 50 ans entre l'institut national de l'électricité (Instituto Costarricense de Electricidad ou ICE, prononcé E-say) et les peuples Brörán sur le développement de la rivière Térraba – chaque fois que l'État proposait un barrage, les peuples Brörán le battaient et un autre émergeait à sa place. Dans cet article, je demande pourquoi la construction de barrages continue malgré la multitude de critiques et les conséquences socio-écologiques négatives documentées des projets hydroélectriques. Pour répondre à cette question, j'introduis le cycle adaptatif, qui sert de modèle heuristique pour étudier comment et pourquoi le cycle continue, ainsi que pour comprendre les questions de pouvoir, de justice et d'équité impliquées dans les processus de prise

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de decisión climática. À travers un cadre de 'political ecology', j'évalue l'hybridité des facteurs socio-écologiques, politiques et économiques interdépendants englobant le lien homme-eau, conceptualisé comme un territoire hydrosocial. L'analyse suggère qu'un piège de rigidité qui s'étend sur plusieurs échelles de gouvernance provoque la répétition du cycle, et compte tenu de l'acceptation actuelle de l'hydroélectricité dans le domaine de la gouvernance climatique, le cycle est susceptible de se poursuivre.

Mots clés: political ecology, Costa Rica, droits Indigènes, développement hydroélectrique, gouvernance climatique, cycle adaptatif

Resumen

Este artículo explora la intersección del desarrollo hidroeléctrico y los derechos Indígenas en el contexto de la gobernanza climática. Una ruptura histórica entre los partidarios y los opositores de la represa se ha convertido en un flujo y reflujo polémico de resistencia a la propuesta de la represa entre las industrias hidroeléctricas y las comunidades Indígenas de todo el mundo. Los conflictos se han intensificado recientemente a medida que las represas se promueven como una estrategia de mitigación climática y están invadiendo cada vez más los territorios Indígenas. La investigación analiza un estudio de caso en Costa Rica, donde un ciclo Indígena-hidroeléctrico surgió de una disputa de 50 años entre el instituto nacional de electricidad (Instituto Costarricense de Electricidad o ICE, pronunciado E-say) y los pueblos Brörán por el desarrollo del río Térraba – cada vez que el Estado proponía una represa, los pueblos Brörán la derrotaban, y en su lugar surgiría otra. En este artículo, pregunto por qué continúa la construcción de represas a pesar de la multitud de críticas y las consecuencias socioecológicas negativas documentadas de los proyectos hidroeléctricos. Para abordar esta pregunta, presento el ciclo adaptativo, que sirve como modelo heurístico para investigar cómo y por qué continúa el ciclo, así como para comprender los problemas de poder, justicia y equidad involucrados en los procesos de toma de decisiones climáticas. A través de un marco de ecología política, evalúo la hibridación de factores sociales, ecológicos, políticos y económicos interrelacionados que abarcan el nexo humano-agua, conceptualizado como un territorio hydrosocial. El análisis sugiere que una trampa de rigidez que se extiende a través de múltiples escalas de gobernanza hace que el ciclo se repita y, dada la aceptación actual de la energía hidroeléctrica en el ámbito de la gobernanza climática, es probable que el ciclo continúe.

Palabras clave: ecología política, Costa Rica, derechos indígenas, desarrollo hidroeléctrico, gobernanza climática, ciclo adaptativo

1. Introduction

Hydropower is promoted within the climate governance arena for its perceived ability to produce clean, renewable, and sustainable energy, leading to a global boom in development (Zarfl *et al.*, 2015). Simultaneously, opponents cite the well-documented, irreparable social and ecological impacts of dams (specifically large-scale dams of which this article is concerned) in their fight to remove them and/or resist their construction (e.g. McCully, 1999; Oliver-Smith, 2009; WCD, 2000). The historical rift between these positions has evolved into a contentious ebb and flow of dam proposal-resistance between communities and hydropower industries around the world. For example, in India, the Adivasi peoples were in a tug of war with the government over development of the Sardar Sarovar dam on the Narmada River beginning in the 1980s, and until it was completed in 2017 (Dwivedi, 2020). Similarly, since 1989 Indigenous peoples in Brazil resisted multiple plans for the Belo Monte dam on the Xingu River until it was opened in 2016 (Ribeiro & Morato, 2020). This article exposes a 50-year feud in southwestern Costa Rica between Indigenous peoples, who form the majority opposition to new dams in the region, and the national electricity institute (*Instituto Costarricense de Electricidad* or ICE, pronounced E-say), who repeatedly propose hydropower projects on the Térraba River. I refer to this as an Indigenous-hydropower cycle because I focus this discussion on the role and agency of the Brörán peoples (with whom I worked) in their resistance of state-proposed hydropower projects.

In 1970, ICE planned the Boruca-Cajón mega-dam that would have produced energy to process bauxite in situ and bring *progress* to the less developed southwestern region, while flooding Indigenous territories in the process. Over the next four decades, ICE proposed two more hydropower projects in that same area: in 1980, the Gran Boruca was promoted to bring energy sovereignty, and in 2006, the Diquís was proposed as a climate mitigation solution. All three mega-projects were eventually cancelled, as I argue, due to resistance led by the Brörán peoples living in Térraba territory who would have been directly affected by each project. The Brörán

peoples believe that dams on their sacred river would sever their connections to place, destroy their surrounding environment, and interfere with the futures they imagine for themselves.

While conducting ethnographic research in Costa Rica regarding the Diquís, I began to understand that what was happening at that time was just the most recent phase of an ongoing historical cycle. I liken the repetitive momentum of the Indigenous-hydropower cycle to the many-headed Hydra. In classic Greek mythology, the Lernaean Hydra is the aquatic serpentine monster whose heads regrew each time they were cut off. Hercules was sent to destroy the Hydra as one of his twelve labors. Similarly, the Brörán peoples work to stop hydropower projects, but for each dam they terminate, another one inevitably rises in its place. Brörán-led resistance has delayed and legally challenged three dam projects, ultimately leading to their cancellation, but community members anticipate more. A Brörán elder explained that ICE is a "*gusano*", a pejorative "worm" – referring to the omnipresence of the company and its hegemonic control over the country's water resources. The legendary Hercules eventually cauterized the neck of each head he cut off and decapitated the one immortal head, ultimately sealing the Hydra's fate. The Brörán peoples are hoping to match Hercules' success and one day terminate their Hydra (hydropower) by affording the Térraba River permanent protection.

I position my discussion of hydropower development within the framework of hydrosocial territories—the hybridity of social-ecological, cultural, economic, and political institutions involved in human-water relations (Boelens *et al.*, 2016; Linton & Budds, 2014; Swyngedouw, 2009). The hydrosocial territory explores "the circulation of water as a hybridized socio-natural flow that [transcends] nature-society boundaries" (Swyngedouw, 1996, p. 66). The concept recognizes that society and water are coproduced and inherently interrelated in complex ways; it therefore encompasses a broad spectrum of interactions between peoples and aquatic resources beyond the political. Through this framework, we can better understand how conflicting knowledges and imaginaries regarding the future of the human-water nexus intersect and interact. Indigenous knowledges generally contrast from Eurocentric, capitalist-based knowledges, as they are based on different worldviews and functional value systems (Little Bear, 2000). For example, a Eurocentric perspective focuses on water as a political-economic resource (via hydropower) that can be utilized for climate mitigation and sustainable development (e.g. Escobar, 2008). An Indigenous perspective places water (e.g. a river) as a culturally significant entity with spiritual, inherent value (see Middleton Manning, 2018; Muru-Lanning, 2016). Scholars recognize distinctions between Indigenous and Western/Eurocentric knowledges that are formed through different ways of interpreting the world, but also stress that these knowledges intersect in a myriad of ways as "jagged worldviews collide" (Little Bear, 2000; see also Agrawal, 1995; Latulippe & Klenk, 2020).

In this article, I engage with the hydrosocial territory to assess why dam building continues to be promoted as a climate mitigation solution despite wide-spread negative social-ecological impacts. At what point will large-scale hydropower projects become unacceptable as mitigation solutions within climate governance? To address these concerns, I introduce the adaptive cycle. In its design as an ouroboros, the adaptive cycle provides a visual representation of cyclical shifting between change and persistence, growth, accumulation, restructure, and renewal (Figure 1). This rhythmic transformation illustrates the dynamic and constantly fluctuating patterns of order and chaos of four phases: the exploitation or growth phase (r), the conservation phase (K), the release or creative destruction phase (Ω), and the reorganization phase (α). The growth and accumulation of a system occur between the exploitation and conservation phases, which typically happen slowly, as skills, knowledges, and other attributes are gathered by various actors, institutions, and organizations operating within the system. The release to reorganization phases happens at faster rates leading to renewal. Between the reorganization and exploitation phases, certain components may exit the system. The adaptive cycle is influential in understanding the dynamic nature of interlinked physical and social systems as they adapt to new elements (Gunderson & Holling, 2002), and in this case, is utilized to assess the political, socio-cultural, and economic elements of a hydrosocial territory, which are influenced by the various knowledges involved in decision-making processes. Not only does the Hydra narrative align with the cyclicity of the adaptive cycle, but it reflects Indigenous worldviews on temporal cycles (e.g. Coulthard, 2010), as well as the repetitive temporality of capitalism (e.g. Castree, 2009; Halvaksz, 2008).

The complex interconnected relations of entangled, hybrid, spatial, and temporal factors in a hydrosocial system can be assessed by the nested adaptive cycles that reciprocally impact and influence each other to varying degrees, in a panarchy. Within the panarchy, large, slow systems that act to stabilize through

accumulated knowledges interact with small, fast systems that experiment and bring about change. Theoretically, the multitude of interactions across scales combine learning and continuity so that a system can adapt or change in response to shifting variables (Holling, 2001).

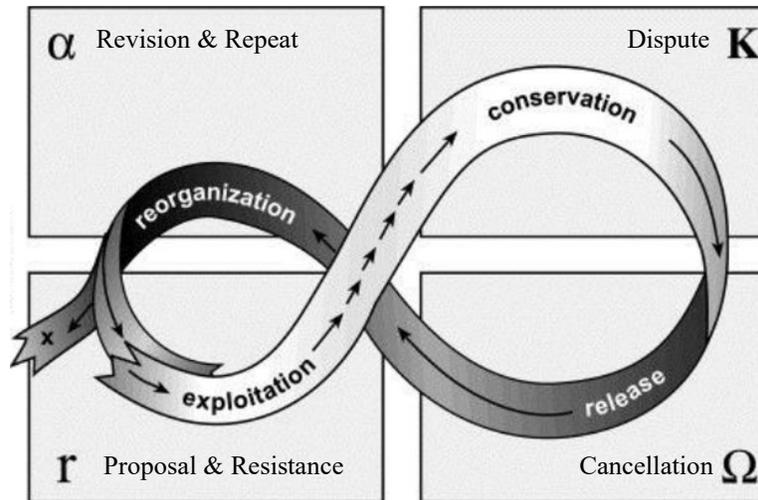


Figure 1: Adaptive cycle illustrating the four phases of persistence and change combined with the six stages of the Indigenous-hydropower cycle. Adapted from Gunderson and Holling (2002).

The adaptive cycle (and its nested panarchy) has been used extensively to study adaptation, vulnerability, and resilience in various social-ecological systems (see Folke *et al.*, 2005; Jacka, 2015; Leslie & McCabe, 2013; Pelling & Manuel-Navarrete, 2011; Walker *et al.*, 2004), as well as environmental governance regimes (see for example Berkes, 2017; Ostrom & Janssen, 2004). I apply the adaptive cycle and its related panarchy to assess how the dynamics of hydrosocial territories play out in particular ways of building dams. Therefore, the adaptive cycle serves as a heuristic model to investigate how and why the hydropower cycle continues, as well as to understand the power, justice, and equity issues involved in climate decision-making processes; it can specifically point to the fractures within a system where one or more of the basic functions of a system or its components cease to operate.

I approach this research through a political ecology framework, as it incorporates the intersection of ecology and political economy, as well as the power dynamics that underlie their relations (Blaikie & Brookfield, 1987) and undergird environmental governance (e.g. Adger *et al.*, 2001; Brosius & Campbell, 2010). Anthropologist Christine Folch (2019) advocates for the use of political ecology in understanding the power of dams in her investigation of the reciprocal impact of human-water relationships involved in the *becoming* of the Itaipu dam in Brazil. As Folch (2019, p. 4) argues, Itaipu "turn[ed] the Paraná River into a political-electrical machine", linking sovereignty and security to water. I apply the framework to examine the power structures (and their underlying knowledges) that allow large-scale hydropower projects to continue to be supported in climate governance despite strong resistance by local communities and repeat failures of the industry. I argue that Costa Rica's hydropower cycle is sustained by a top-down rigidity trap, a persistent maladaptive state that prevents ICE or climate leaders from producing or implementing innovative or alternative ideas to hydropower and thus preventing a regime shift (cf. Carpenter & Brock, 2008).

Understanding dam development (and related decision-making processes) within the hydrosocial territory is imperative for facilitating just and equitable solutions to the climate crisis. Moreover, applying a political ecology focused investigation into neoliberal projects across scales of governance allows for the opportunity to find "better, less coercive, less exploitative, and more sustainable ways of doing things" (Robbins, 2012, p. 12). This project adds value to the discussion of hydrosocial territories as it is one of few examples

where the hydropower industry was defeated by Indigenous peoples, and illustrates the utility of the adaptive cycle in assessing the social-ecological consequences of hydropower projects as well as the knowledges and decision-making processes involved in their development.

2. Research area and methodology

This article is the result of multi-sited, mixed-methods research conducted for 14 months between 2016-2020 in Costa Rica (where climate policies are enacted) and at international climate and hydropower meetings (where climate policies are orchestrated). My primary field site was Térraba, a 9,355 hectare legally designated Indigenous territory (established in 1956) located in the Buenos Aires municipal district of Puntarenas province in southwestern Costa Rica (Figure 2). Térraba is the ancestral homeland of the Brörán peoples, approximately 600 of whom reside in the territory alongside roughly 1,200 non-Indigenous peoples. The territory is bordered on its eastern and southern sides by the Térraba River, the longest and one of the last undammed rivers in the country. The river swells seasonally with five meters of annual rainfall, which flows down the steep gradient of the Talamanca mountains, making it the ideal location for dam development. On its 160 kilometer journey to the Pacific Ocean, the Térraba winds past numerous small towns, seven Indigenous territories, and through the sprawling mangroves of the RAMSAR protected Térraba-Sierpe National Wetlands. While in Térraba, I conducted interviews with community members, participant observation, and social-ecological research (vegetation transects and avian surveys) to understand peoples' knowledges of and relations with nature, and thus their reasons for resisting certain forms of development.



Figure 2: Location of Indigenous territories throughout Costa Rica. Térraba is visible in navy blue, underlined in red, in the lower, southern section of the country next to Boruca in green.

Source: <https://ministeriopublico.poder-judicial.go.cr/index.php/component/icagenda/38-visita-a-territorio-indigena>

I also conducted ethnographic research at three international climate and hydropower conferences, though here I focus on my attendance at the World Hydropower Congress, the biennial meeting of the International Hydropower Association (IHA) in Paris, France, held in May 2019. The Congress' goal was to expand the use of hydropower to aid each country in achieving their pledged emissions reductions in the Paris Agreement, as well as the United Nations Sustainable Development Goals.

3. Situating Costa Rica's Indigenous–hydropower cycle within the adaptive cycle

For the past 50 years, ICE has attempted to construct three hydropower projects on the Térraba River, which have pitted the state-run electricity company against local communities and Indigenous peoples who resist dam development. The most often cited reason for opposing large-scale hydropower projects by Indigenous community members was that they would destroy the sacred river and significantly disrupt their connections to place through inundation of spiritual sites and ancestral lands. One Brörán elder believed that "the dam would ruin the land, the culture, traditions, and food. We would lose it all. It affects everything." Another elder explained that hydropower does not align with the Brörán conception of development, which places significantly more importance on projects that culturally align with their belief systems than economic growth, (e.g. small-scale aquaculture projects, poultry enterprises, and local farmer's markets). Others said that they don't need more energy to fulfill their livelihoods nor did they believe they would receive any from new hydropower projects.

One of my key interlocutors expressed his concern over development of the Térraba River, recalling the first time hydropower proponents came to get his support for a dam and he told them, "never in my life will I agree. I am not going to sell my community [for energy]." He argued that he didn't need a fancy degree to know that environmental and livelihood damage will occur if the dam is built. Another elder added that "Our worldview is directly linked to land and water, which are two fundamental aspects for us and our spirituality." In traversing through the forest conducting transects with community members, this link became clear as almost every species we documented had cultural significance, as leaves for medicinal purposes, fruits for nourishment, and wood for building materials.

Despite resistance to large-scale hydropower, national leadership has maintained its desire to develop the country's untapped rivers because, according to a representative from ICE, hydropower is needed for its transition into a low carbon economy (pers. comm., 8 June 2018; see also IHA, 2019; Fletcher, 2010). Tensions between Indigenous peoples and the hydropower industry has spurred a cycle akin to the many-headed Hydra, as described below.

Very simplistically the stages of Costa Rica's hydropower cycle are: (1) Proposal: a hydropower project is introduced and supported by the state and/or the national electricity company; (2) Resistance: Indigenous groups oppose the project and work to stop it through various resistance strategies; (3) Dispute: opposing sides attempt to convince each other of the validity of their position and use new strategies or rhetoric to shift attitudes, during which time there are lengthy delays in construction; (4) Cancellation: plans to develop the hydropower project are revoked; (5) Revision: the project is modified by the state–hydropower industry while Indigenous peoples build their resistance toolbox; (6) Repeat: the cycle is repeated as a new project is proposed. Each new cycle, while following this pattern, is infused with a multitude of actions and interactions on an array of spatial and temporal scales, all of which are operating at different speeds and intensities. Each of these six stages fit into the four phases of change represented in the adaptive cycle (Figure 1).

The proposal for a hydropower project spurs the model's exploitation phase. ICE accumulates resources like land rights and construction permits. They promote their project at local, regional, and international conferences, media outlets, and civil or academic settings. Developers seek external support and resources to construct the project, develop a budget and blueprints, work on promotional campaigns, and hire contractors to begin risk and impact assessments. In this phase, the rhetoric for the project emerges in support of the decision to build a new dam, either for progress, energy sovereignty or climate mitigation, as was the case for the Boruca-Cajón, the Gran Boruca, and the Diquís, respectively, as described in the following sections.

Very soon after the project is proposed, a majority of the Indigenous peoples respond with resistance, movements that operate in parallel to the state-hydropower campaign within the exploitation phase. Resistance activities include marches, street protests, road blockades, writing to politicians, networking with human rights, environmental and other NGO groups, social media campaigning, and filing legal suits with regional government municipalities, among others. Actions and reactions during this time happen at faster time scales and intensities to keep up with quickly shifting methods on each side of the debate. Within Térraba, community members are divided in their perspectives of proposed projects, with the majority of the Brörán peoples consistently opposing dam development, while a small group of Indigenous peoples have sided with ICE, eager to prosper from the promise of economic growth. Complicating matters exponentially, is the fact that 90% of Térraba territory is illegally occupied by non-Indigenous peoples who broadly support dam development.

The growing conflict between pro- and anti-dam positions within the community and across the country eventually stabilize into a dispute during the conservation phase, at which time, the project is at a standstill while the two opposing sides fight legal battles. This phase is marked by lengthiness, less intensity, and slower reaction times, although tensions within Térraba between Indigenous and non-Indigenous peoples periodically flare up over identity politics and land tenure issues. Indigenous community members work during this time to enforce their autonomy through the Indigenous Law No. 6172, established in 1977, which prohibits non-Indigenous peoples from living within Indigenous territories. The law also states that Indigenous territories are to be governed by their own traditional communal structure, which historically is an elder's council. Yet in the 1980s the state implemented its own governance system locally known as ADI that outranks the elder's council in political and economic matters leading to disputes between the two entities.

Moreover, tensions are exacerbated by the state's lack of enforcement of internationally binding Indigenous protections it has ratified, including the ILO 169 and the Declaration of Rights of Indigenous Peoples, both of which require that states and industries obtain free prior informed consent (FPIC) from Indigenous communities before initiating development projects on their territories. Both sides utilize the structures that they have previously built to support their position, hold their ground, and wait out court decisions. The dispute phase lasts years, sometimes decades, during which time both sides continue to promote their position at regional meetings or conferences, as well as in the public and private arenas.

In each case discussed here, the decision to cancel the dam was made after lengthy conservation phases, and the cycle entered the release phase. At this time, there are celebrations, disappointment, and general chaos as each side digests the news. Within the Indigenous communities, a constant fear remains that hydropower will return. At the state-industry level, decision-makers return to the drawing board to determine how they can fulfill their development imaginaries. The cycle then enters the reorganization phase: a time to innovate, experiment, restructure, and develop new strategies. Within Indigenous communities, leaders expand their networks or strengthen existing partnerships, continue to fight for autonomy and enforcement of their rights, spread information about their rights to neighboring Indigenous communities, and overall they (re)organize themselves for what might come next, all while continuing with the minutiae of daily life. The state-electricity company takes this time to review and revise plans, and decide how to ensure energy security, economic growth, and climate mitigation for their country.

In the cases discussed in Costa Rica, each revision period ended in ICE's decision to build a modified version of the previous dam, and the cycle repeated. The following sections assess the cycle as it maps onto the rhetorical trajectory of hydropower on a national-transnational scale from being a symbol of economic and developmental progress (1950-1970s), to a mode of energy security and sovereignty (1980-2006), and finally, with an emphasis on its promotion as a climate mitigation strategy (2006-2018); as discussions of the Boruca-Cajón, the Gran Boruca, and the Diquís illustrate, respectively. The first two cycles are reviewed briefly, with more detailed attention given to the Diquís.

In the beginning: Dams as a symbol of progress (1950-1970s)

The hydropower cycle began in the 1950s, when the Costa Rican government initiated plans to develop the southern region. In 1956, the Aluminum Company of America (ALCOA) was granted a 25-year mining concession to explore for bauxite in the Valle del General, in Pérez Zeledón, near Térraba territory (Carls &

Haffar, 2010). In 1968, the Costa Rican government reevaluated their contract and aimed to increase their financial gain in the partnership by processing bauxite in situ using hydropower (Ibid); two years later, the Boruca-Cajón dam was officially proposed to accomplish this goal.

The Boruca-Cajón dam would have been built on the Térraba River, downstream from the Rey Curré Indigenous territory of the Boruca peoples near the town of Cajón. As a mega-dam, it was designed to stand between 250 meters high and produce 832 MW of energy (Todd, 2013). It would have flooded the entire community of Rey Curré and countless towns upstream, including central Térraba with its 12,581 hectare reservoir, requiring relocation of at least 3,500 Indigenous peoples. Boruca and Brörán peoples resisted the project for its projected direct social, cultural, and ecological impacts, the negative consequences on their futures, and the fact that they were neither consulted about nor included in the decision-making process. Both the proposal and resistance of this project developed during the exploitation phase.

Despite growing national opposition to the project, on April 24, 1970, the Costa Rican government passed a resolution to build the Boruca-Cajón dam. A large-scale protest led by Indigenous peoples and university students resulted, stalling construction of the dam and shifting it into the conservation phase. As a direct result of state-wide protests, ALCOA ended its contract in 1975; the project was officially cancelled and the release phase began. This moment of successful resistance has come to be known as the birth of Costa Rica's environmental movement. However, not long afterwards, the state revised its plans during the reorganization phase and decided to forge ahead with a hydropower project in collaboration with ICE. The cycle repeated with the Gran Boruca project.

The new wave of hydropower: Energy security and sovereignty (1980-2006)

In 1980, ICE proposed the Gran Boruca (Great Boruca) in the same area as its predecessor. During the exploitation phase, the Gran Boruca was promoted as a way to meet the growing energy demands of the country and support energy sovereignty. The dam would have had a height of 300 meters, a reservoir of 25,000 hectares, and production of 1500MW. Local Indigenous communities immediately responded with resistance, while archaeological studies were conducted in the impact zone (see Drolet, 1983; Lange & Stone, 1984). The project quickly shifted into the conservation phase, which continued for more than two decades while ICE navigated the conflicts surrounding archaeological findings, opposition from Indigenous and environmental groups, and legal battles.

In 2001, the Gran Boruca received a boost when Mexico's president proposed the Mesoamerica Integration and Development Project, which includes the energy sector known as SIEPAC (for its Spanish acronym). The Gran Boruca, and later the Diquís, were key components of the SIEPAC plan, as they would connect Costa Rica's more developed northern corridor with the less developed southern region, adding international pressure for the dam's construction.

According to Costa Rican anthropologist José Luis Amador (2004), the Gran Boruca project was the first-time ICE worked with an Indigenous community and therefore they applied caution as they learned to navigate "ethnic-development", realizing their actions would not only affect this project, but all future projects in Indigenous territories. ICE maintained that they were working in the best interest of the Indigenous peoples; however, there was obvious discontent on the part of the Indigenous peoples. As a result of continued conflict, the state requested that the Ombudsman mediate between Indigenous communities and ICE (Ibid).

Eventually in 2004, ICE hired a well-known contractor from Columbia (INGETEC) to conduct an impact study on the proposed mega-dam. The company advised ICE not to build it because of its dangerous proximity to a fault line near Cajón. ICE cited this finding as the reason for promptly cancelling the Gran Boruca. Yet again, the reorganization phase resulted in little technological innovation or experimentation. Shortly thereafter, a new hydropower plan was proposed 24 kilometers upstream and the cycle repeated in the name of "clean energy."

Diquís hydropower project: A climate mitigation strategy (2006-2018)

In 2006, ICE proposed the Diquís hydropower project. ICE worked to gain support for these new development plans from regional communities by rebranding their hydropower sector. First, they held a competition for school students to name their newest proposal and "Diquís" was selected because it means "great waters" or "great river" in the native language of the Boruca. Next, ICE developed a motto for the Diquís project, which was, "Let's produce electricity, but only while safeguarding that communities and nature receive as little impact as possible" (ICE, 2007 in Carls & Haffar, 2010, p. 113).

The same year, the Costa Rican president signed a nationwide "Peace with Nature" accord, which declared that Costa Rica would become 100% carbon neutral by 2021, and the Diquís was listed as the central axis of this renewable energy plan (ICE, 2017). ICE described the Diquís as "meet[ing], in a cost-efficient manner, three of the goals of national planning: addressing the increasing demand, compensating for variations in new sources of electricity generation that complement the diversification of the electricity matrix, and reducing the country's CO₂ emissions" (ICE, 2018, p. 31-32). In 2008, the Executive branch proclaimed the Diquís a "matter of national interest", providing ICE with additional funds and legal protections from the state to complete the project, and allowing them to begin technical studies in Térraba territory without consultation with Brörán peoples (Kaltmeier, Thies, & Raab, 2014).

Although a fraction of the size of its predecessors, the Diquís would still be the largest hydropower project in Central America—a mega-dam with a height of 179 meters, width of 600 meters, and production capacity of 650 MW, enough to supply energy to one million people annually. Although the World Commission on Dams (2000) cautioned against building such mega-projects because of their large-scale social-ecological impacts, ICE was determined to develop the Diquís, defending its choice by arguing that "large reservoir dams are needed to provide power during the dry season" (Carls & Haffar, 2010, p. 134).

The Diquís project was immediately met with Indigenous resistance during this exploitation phase because it would impact 15,000 Indigenous peoples living in seven territories. It would directly inundate lands of the Brörán peoples in Térraba and of the Cabécar peoples in China Kichá, and indirectly impact the Boruca peoples living in Rey Curré and Boruca, the Bribri peoples living in Salitre and Cabagra, and the Cabécar peoples in Ujarrás. Many of these lands are already illegally occupied by non-Indigenous peoples, and dam proposals exacerbate tensions within communities (e.g. Campregher, 2010; Hite, 2018).

Brörán community members marched in protest and leaders filed a lawsuit in court against ICE on March 21, 2010, citing that ICE failed to obtain FPIC. Some of the Brörán elders filed a request for consideration under the early warning and urgent action of the United Nations Committee on the Elimination of Racial Discrimination for the lack of FPIC, other rights' violations, and physical threats they faced from local non-Indigenous peoples over dam resistance. Thus, the cycle shifted into the conservation phase.

On July 21, 2010, the United Nations Committee on the Elimination of Racial Discrimination responded to Indigenous peoples' requests for international assistance in ensuring their rights, finding that the Brörán peoples' "requests to be afforded the opportunity to participate in decision making to-date have been rejected by State officials as being premature" (Habtom, 2010). That same year, the University of Texas School of Law responded to the Brörán peoples' request for support, revealing that "a failure on the part of the Costa Rican state to meet its international obligations and protect the rights of the Teribe peoples, in the context of the PHED [Diquís] and beyond" (Hunter, Jenkins & Orton, 2010, p. 86). In 2011, Dr. James Anaya, former United Nations Special Rapporteur on the rights of Indigenous peoples, visited Costa Rica and recommended that the government develop a pathway to achieving FPIC prior to moving forward with development (see Anaya, 2011).

As a result of growing international pressures, Costa Rica's Supreme Court ordered ICE to halt all construction on November 1, 2016. The Court ruling overturned the 2008 "national interest" decree, arguing it was unconstitutional because the boundaries of the project were not discussed with the Indigenous communities that would be directly impacted by the dam's construction and resulting reservoir. The court reinforced a previous order from September 2011 stating that ICE could not legally resume work until a two-year consultation process between the government and representatives from all 24 Indigenous territories was completed. The consultation process, completed between March 2016 and March 2018, resulted in ratification of the General Mechanism for Consultation of Indigenous Peoples, a legal pathway for obtaining FPIC. Months

later, in November 2018, Irene Cañas Diaz, Executive President of Grupo ICE, made a surprise announcement that the Diquís project was indefinitely suspended, thus initiating the release phase.

Years later, now in the reorganization phase, the Brörán peoples continue to focus their energy on increasing their legal rights and autonomy. On March 14, 2021, a collective of Indigenous representatives and organizations in the region published an open letter on social media in favor of long-term protection of the Térraba River. The group made seven specific declarations, stating: (1) We reject the current norm by which the Ministry of Environment and Energy allows exploitation of up to 90% of water from river sources; (2) We reject the national environmental flow decree that may change the exploitation limit, and protect only 20% of water in rivers (arguing that this decree would exacerbate ecosystem destruction from climate change); (3) We reject excessive contamination from agro-industrial corporations and their monocultures; (4) We have a duty to care for our rivers and their biodiversity; (5) We have the right to resist neoliberal models of development. We support a just transition to dignified and sustainable life; (6) We call for the rapprochement of all organizations along the Térraba River to recover overexploited tributaries and defend them from threats; and (7) We recognize the Térraba River as a living being with rights to exist with dignity.

Meanwhile, ICE has been revising its future energy plans. In 2019, they launched the National Decarbonization Plan, which will focus on reducing greenhouse gas emissions from the country's leading polluting sectors: transportation, energy, waste management, and agriculture. With ICE's historical specialty in dam building, their complete withdrawal from hydropower seems unlikely and yet, in a surprise turn, ICE recently (and quietly) announced a national moratorium of all new hydropower development until at least 2028 (Perry *et al.*, 2021). Ironically, the announcement to halt hydropower projects in Costa Rica came as the IHA announced its plans to hold the next World Hydropower Congress there in September 2021. The IHA Chief Executive expressed his enthusiasm for holding the meeting in Costa Rica, stating "with its strong commitment to hydropower and sustainable development, it's hard to think of a better host" (IHA, 2019). The juxtaposition of a country with a hydropower moratorium hosting a pro-dam conference certainly presents interesting discussions within the hydrosocial territory between local and global scales of governance and decision-making that need to be examined further. In terms of the hydropower cycle in Costa Rica, a pause in development means that while a short-term moratorium is certainly welcomed by the Brörán peoples, it is no different than other periods of revision or reorganization during which time each side of the hydropower debate prepares for the next stage.

4. The rigidity trap

I contend that the Indigenous-hydropower cycle has continued (and threatens to continue) because of a rigidity trap, created through over-standardization of institutes that reduce flexibility and increase future vulnerability (Rogers, 2013; see also Gunderson & Holling, 2002). As Carpenter and Brock (2008, p. 40) argue, "long-term success [of a system] depends on maintaining the capacity to adapt through change." The blanket acceptance of hydropower as a climate mitigation strategy undermines a system's ability to naturally adapt. Within the reorganization phase, the system (i.e. ICE) should experiment, learn from previous mistakes, invest in innovation, develop new technologies, and importantly, collaborate with impacted peoples to develop solutions that incorporate local knowledges and socio-ecological complexities. Instead, the state-energy system maintains its status quo by revising its plans and proposing a new hydropower project of a different scale, in a new location, with a new name, and a new rationale. The cycle has run three continuous loops thus far, which I argue is because of specific feedbacks that occur on a small, local scale through the power of ICE and Indigenous resistance, and globally, on a large scale as hydropower is maintained through the neoliberal logic of global climate governance.

ICE have historically advanced their agenda of increasing hydropower through their institutional autonomy, which is maintained by its public, not-for-profit-nature, its technical expertise, and its political and financial independence from large-scale government regulation that has allowed for a "degree of independence from short-term interests" (Wilde-Ramsing & Potter, 2006, p. 71). These factors have played a significant role in shielding ICE from the detriments of privatization that typically accompany neoliberal reform (Perry & Berry, 2016). ICE's autonomy places them in a hierarchical position of power regarding resource exploitation. And

although ICE proclaims to focus on sustainable development, they are not accounting for the development imaginaries of the Indigenous peoples in Térraba when they continue to revise and resubmit their plans for hydropower. Moreover, it is important to note that Indigenous peoples, namely the Brörán peoples and their collaborators, are key drivers of the hydropower cycle. Without their vigilant resistance over the past 50 years, there would be no cycle as ICE would have undoubtedly completed one of their proposed hydropower projects.

ICE's decisions to pursue hydropower are supported within climate and hydropower arenas by the rhetorical shift that broadly positions hydropower as a clean, renewable source of energy within neoliberal climate governance. The Intergovernmental Panel on Climate Change affirmed that hydropower is likely to continue expanding in its global importance in fighting the climate crisis, stating that "Hydropower offers significant potential for carbon emissions reductions... The significant increase in hydropower capacity over the last 10 years is anticipated in many scenarios to continue" (Kumar *et al.*, 2011, p. 441). The United Nations Framework Convention on Climate Change argues that hydropower remains a cornerstone of the world's renewable energy sector and therefore is considered key to implementation of the Paris Agreement (UNFCCC, 2018). The IHA is eager to aid countries in their fulfillment of national climate goals by doubling global installed capacity of hydropower by 2050 (Berga, 2016; Kumar *et al.*, 2011).

The combined local-level control of ICE and the promotion of hydropower by the transnational climate governance community curate a space that not only favors hydropower but also ignores alternative solutions, such as promoting a decrease in consumption patterns, improving efficiency of electricity grids, retrofitting abandoned dams, increasing solar or wind power, applying Indigenous knowledge to natural resource management and conservation, or promoting local, small-scale innovations. The very same false dichotomy that positions "capitalist markets [as] the answer to their own ecological contradictions" allows hydropower to continue as a solution to the climate crisis despite its contribution to increased greenhouse gas emissions (Büscher *et al.*, 2012, p. 29; Fearnside, 2004, 2005). The overall project to neoliberalize the atmospheric and environmental commons through development initiatives has relied on concealing the gap between the rhetoric of hydropower and the negative realities of its social, cultural, and ecological outcomes (Büscher & Fletcher, 2015), creating the conditions for the hydropower cycle to continue.

Furthermore, the difficulty in shifting away from hydropower at the international scale may be due to what Hale and colleagues (2013) refer to as "institutional inertia", wherein large organizations have difficulty transitioning to new technologies or incorporating new interests into their agendas. For example, in Brazil, Hess (2018) shows that a variety of structural conditions and resource compositions support the country's "technological lock-in" on hydropower. Similarly, Goldstein (2017) illustrates these technophilic beliefs in Brazil, where nuclear professionals support nuclear technology for its potential rather than its flaws, even after lessons from the Fukushima disaster were well circulated. Speakers at each of the climate and hydropower conferences I attended continue to promote various forms of hydropower despite their well-known social-ecological consequences.

Will the cycle repeat?

In May 2019, I spoke with ICE president Sra. Cañas at the World Hydropower Congress. The decision to cancel the Diquís was ultimately hers so I asked if she would discuss the factors involved in making that decision. She explained

When they [ICE] ran all the simulations...the system didn't require a plan as big as Diquís. If we build the Diquís, we are not going to be able to put that electricity into the system. We have to pay for the project, but we can't sell electricity. There is no space in the system right now. Basically, that is all the criteria why we decided to postpone the Diquís (emphasis mine) (16 May 2019).

As I let this statement sink in, I had two immediate thoughts. First, I was taken aback by her use of the word *postpone*. I recalled something that my primary interlocutor had said to me previously in Térraba (April 2019; original in Spanish), "The Diquís has not gone. It will return in another form. But when it returns, it will

be worse...maybe they will come back and say they want to continue the Diquís." With this in mind, I asked Sra. Cañas to elaborate on whether or not the Diquís or another hydropower project would be built in the future. She replied

I can't be sure of that because we already have a renewable matrix. We already have enough. I don't know if we are going to need it, depends on a lot of things. If we are going to face a higher increase in demand, I don't know. Some people say it will increase. Electricity is always a necessity. I can't say, when are we going to need it, maybe we are going to need it. But I don't know when (16 May 2019).

Secondly, in contrast to my suspicion that the decision to cancel coincided with the official formulation of a consultation mechanism, Sra. Cañas assured me, it was really based on storage capacity, national demand, and the company's inability to sell excess electricity on the regional SIEPAC grid because Nicaragua's infrastructure was inadequate. While I believe that Sra. Cañas' reasons were legitimate, I contend that Indigenous resistance efforts were directly responsible for delaying the project for almost fifteen years, and the prospect of engaging in another lengthy delay waiting for the consultation process to be completed was a significant deterrent. She did not mention the complicated legal battles that ICE faced due to Indigenous resistance as part of the cancellation, nor did she discuss the violations against Indigenous rights that ICE perpetuated. Moreover, legal battles and delays directly caused by resistance were likely responsible for skyrocketed final project costs: originally slated to cost US\$1.4 billion in 2007, the project was running at US\$3.6 billion in 2014 (Arias, 2017). With over US\$146 million invested by ICE, consumers were increasingly concerned about the nation's growing debt and energy price hikes (McPhaul, 2018).

5. Conclusion

Political ecology allows for a way to critically interrogate human-nature relationships by focusing on the underlying power dynamics that inform (and are informed by) them. It is therefore a practical way through which to study hydrosocial territories, which conceptualize spatial and temporal configurations of the hybridity of co-produced human-water relations. Additionally, incorporating the adaptive cycle as a heuristic tool is a useful addition to political ecology research on hydrosocial territories for understanding interconnected relationships and interactions between different knowledges and conceptions of development, among other factors.

In applying the adaptive cycle here, we understand that locally, ICE did not confer with Indigenous peoples during the reorganization phase, and globally, the international governance community continues to promote simple solutions to complex problems without considering local realities. Presumably, the next time a project is proposed in Costa Rica, the newly established consultation process will take place and incorporate the concerns of the affected Indigenous peoples (although Indigenous consent is not required in the process). An effective FPIC process, which the consultation promises to afford in part, may allow for innovation, restructuring, exploration of new ideas, appreciation and application of divergent conceptualizations of development, and incorporation of diverse cultures, knowledges, and imaginaries, creating space for establishing more just and equitable pathways towards a sustainable future.

Thus far, Brörán peoples have used the sword of Indigenous rights to sever the Hydra's (hydropower) heads; it is yet to be determined if they will ever be able to cauterize the one immortal head (neoliberal climate governance), as the conditions that support hydropower across various scales have not altered significantly. It is certain that they do not intend to stop their resistance if or when a new hydropower project is proposed in the future. As my collaborators in Térraba related, they are tired of this fight, it is a nightmare, but there is no other option than to fight because they must protect their lands and lives. But, if they no longer had to worry about the threats of mega-hydropower projects, they could have a quiet, more peaceful life relaxing with their families and spending time cultivating their farmlands.

Other ethnographic research that is focused on decision-making processes can similarly apply the adaptive cycle as an assessment tool to break down and examine the interlinked events/stages and knowledges

within a system. It will be especially useful in situations where conflicting power dynamics among multiple stakeholder groups are on-going; it may reveal patterns or biases not previously recognized, where maladaptive governance strategies can be pinpointed and replaced. Also, it may highlight justice and equity issues regarding Indigenous rights and FPIC processes that can be more adequately addressed. Therefore, this method answers calls for identifying "historical causal explanations of social-ecological systems stuck in maladaptive rigidity traps" (Méndez, Amezaga & Santamaria, 2019, p. 29). This information will strengthen our recognition of resilient and vulnerable systems, and expose those who are "attached more to a particular political analysis or ideal—even to the failure of that ideal—than to seizing upon possibilities for radical change in the present" (Brown, 1999, p. 20). Such recognition will allow for changes in climate governance that more effectively utilize place-based knowledges and responds to particular local social and environmental conditions. Politicians and industry likewise can take the opportunity to innovate, and thus move past the rigidity trap and potentially drive a regime shift.

As we know from the panarchy model, change at small scales occurs faster, and large-scale shifts take more time. We have now been exposed to over two decades of neoliberal-based logic driving climate governance and the failures of a market-based system are becoming apparent (with continued increases in greenhouse gases and global temperatures), but momentum is building in Indigenous and climate justice communities at the local scale demand change, and potentially to cause a regime shift to more equitable and sustainable policies internationally.

References

- Adger, N., Benjaminsen, T.A., Brown, K., & Svarstad, H. (2001). [Advancing a political ecology of global environmental discourses](https://doi.org/10.1111/1467-7660.00222). *Development and Change*, 32(4), 681-715. <https://doi.org/10.1111/1467-7660.00222>
- Agrawal, A. (1995). Dismantling the divide between Indigenous and scientific knowledge. *Development and Change*, 26(3), 413-439. <https://doi.org/10.1111/j.1467-7660.1995.tb00560.x>
- Amador, J. L. (2004). [La comunidad indígena de Curré y el proyecto hidroeléctrico Boruca. Identidad étnica y proyectos nacionales de desarrollo](#). *ÍSTMICA. Revista de la Facultad de Filosofía y Letras*, (8), 108-128.
- Anaya, J. (2011). The situation of the indigenous peoples affected by the El Diquís hydroelectric project in Costa Rica. In Report of the Special Rapporteur on the rights of indigenous peoples, edited by civil United Nations General Assembly Human Rights Council 18th session: Promotion and protection of all human rights, political, economic, social and cultural rights, including the right to development. A/HRC/18/35/Add.8, ed, 4-12.
- Arias, L. (2017, 8 April). Reduced electricity rates this year? Don't hold your breath. *The Tico Times News*. Retrieved June 25, 2022 from <https://ticotimes.net/2017/04/08/electricity-tariffs-costa-rica>
- Berga, L. (2016). The role of hydropower in climate change mitigation and adaptation: a review. *Engineering*, 2(3), 313-318. <https://doi.org/10.1016/J.ENG.2016.03.004>
- Berkes, F. (2017). Environmental governance for the anthropocene? Social-ecological systems, resilience, and collaborative learning. *Sustainability*, 9(7), 1232. <https://doi.org/10.3390/su9071232>
- Blaikie, P. M., & Brookfield, H. C. (1987). *Land degradation and society*. Methuen.
- Boelens, R., Hoogesteger, J., Swyngedouw, E., Vos, J., & Wester, P. (2016). Hydrosocial territories: a political ecology perspective. *Water International*, 41(1). <https://doi.org/10.1080/02508060.2016.1134898>
- Brosius, P. J., & Campbell, L. M. (2010). [Collaborative event ethnography: conservation and development trade-offs at the fourth World Conservation Congress](#). *Conservation and Society*, 8(4), 245. <http://doi.org/10.4103/0972-4923.78141>
- Brown, W. (1999). [Resisting left melancholy](#). *Boundary 2*, 26(3), 19-27.
- Büscher, B., Sullivan, S., Neves, K., Igoe, J., & Brockington, D. (2012). [Towards a synthesized critique of neoliberal biodiversity conservation](#). *Capitalism Nature Socialism*, 23(2), 4-30. <https://doi.org/10.1080/10455752.2012.674149>

- Büscher, B., & Fletcher, R. (2015). [Accumulation by conservation](https://doi.org/10.1080/13563467.2014.923824). *Review of Political Economy*, 20(2), 273-298. <https://doi.org/10.1080/13563467.2014.923824>
- Campregher, C. (2010). Shifting perspectives on development: An actor-network study of a dam in Costa Rica. *Anthropology Quarterly*, 83(4), 783-804. <http://doi.org/10.1353/anq.2010.0019>
- Carls, J., & Haffar, W. R. (2010). *Conflict resolution of the Boruca hydro-energy project: renewable energy production in Costa Rica*. Continuum.
- Carpenter, S. R., & Brock, W. A. (2008). [Adaptive capacity and traps](#). *Ecology and Society*, 13(2), 40.
- Castree, N. (2009). The spatio-temporality of capitalism. *Time & Society*, 18(1), 26-61. <https://doi.org/10.1177/0961463X08099942>
- Coulthard, G. (2010). [Place against empire: Understanding Indigenous anticolonialism](#). *Affinities: A Journal of Radical Theory, Culture, and Action*, 4(2), 79-83.
- Drolet, R. (1983). Al otro lado de Chiriquí, el Diquís: Nuevos datos para la integración cultural de la región Gran Chiriquí. *Vínculos*, 9(1-2), 25-76.
- Dwivedi, R. (2020). *Conflict and collective action: The Sardar Sarovar project in India*. (1st ed). Routledge India. <https://doi.org/10.4324/9780367817589>
- Escobar, A. (2008). *Territories of difference: place, movements, life, redes*. Duke University Press. <https://doi.org/10.1515/9780822389439>
- Fearnside, P. M. (2004). Greenhouse gas emissions from hydroelectric dams: controversies provide a springboard for rethinking a supposedly 'clean' energy source. An editorial comment. *Climatic Change*, 66(1), 1-8. <https://doi.org/10.1023/B:CLIM.0000043174.02841.23>
- Fearnside, P. M. (2005). Do hydroelectric dams mitigate global warming? The case of Brazil's Curuá-Una Dam. *Mitigation and Adaptation Strategies for Global Change*, 10(4), 675-691. <https://doi.org/10.1007/s11027-005-7303-7>
- Fletcher, R. (2010). When environmental issues collide: climate change and the shifting political ecology of hydroelectric power. *Peace & Conflict Review*, 5(1), 1-15.
- Folch, C. (2019). *Hydropolitics: the Itaipu dam, sovereignty, and the engineering of modern South America*. Princeton University Press.
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environmental Resources*, 30, 441-473. <https://doi.org/10.1146/annurev.energy.30.050504.144511>
- Goldstein, D. M. (2017). Fukushima in Brazil: undone science, technophilia, epistemic murk. *Culture, Theory and Critique*, 58(4), 391-412. <https://doi.org/10.1080/14735784.2017.1357480>
- Gunderson, L. H., & Holling, C. S. (2002). *Panarchy: Understanding transformations in human and natural systems*. Island Press.
- Habtom, G. (2010). The situation of the Térraba Indigenous people of Costa Rica: A request for consideration under the early warning and urgent action procedures of the United Nations Committee on the Elimination of Racial Discrimination (Seventy-Seventh Session). UN Committee on the Elimination of Racial Discrimination UNOG-OHCHR. Geneva, Switzerland.
- Hale, T., Held, D., & Young, K. (2013). *Gridlock: Why global cooperation is failing when we need it most*. Polity.
- Halvaksz, J. A. (2008). Whose closure? Appearances, temporality, and mineral extraction in Papua New Guinea. *Journal of the Royal Anthropological Institute*, 14(1), 21-37. <https://doi.org/10.1111/j.1467-9655.2007.00476.x>
- Hess, D. J. (2018). The anti-dam movement in Brazil: Expertise and design conflicts in an industrial transition movement. *Tapuya: Latin American Science, Technology and Society*, 1(1), 256-279. <https://doi.org/10.1080/25729861.2018.1548160>

- Hite, E. B. (2018). Political ecology of Costa Rica's climate policy: Contextualizing climate governance. *Journal of Environmental Studies and Sciences*, 8(4), 469-476. <https://doi.org/10.1007/s13412-018-0480-y>
- Holling, C. S. (2001). [Understanding the complexity of economic, ecological, and social systems](https://doi.org/10.1007/s10021-001-0101-5). *Ecosystems*, 4(5), 390-405. <https://doi.org/10.1007/s10021-001-0101-5>
- Hunter, B., Jenkins A., and Orton, S. (2010). Swimming against the current: The Teribe peoples and the El Diquís hydroelectric project in Costa Rica: Human Rights Clinic, University of Texas School of Law. Retrieved June 25, 2022 from <https://law.utexas.edu/wp-content/uploads/sites/11/2010/04/2010-HRC-CRica-ElDiquis-Report-EN.pdf>
- ICE, Instituto Costarricense de Electricidad, ICE. (2017). Planificación y desarrollo eléctrico proceso expansión del sistema: Plan de expansión de la generación eléctrica 2016-2035. May 2017. San José, Costa Rica: Grupo ICE. Retrieved June 25, 2022 from <https://www.grupoice.com/wps/wcm/connect/beb21101-9c67-4acf-964e-c7a00f682040/PEG+2016-2035.pdf?MOD=AJPERES&CVID=IPcDy1N&CVID=IPcDy1N&CVID=IPcDy1N>
- ICE, Instituto Costarricense de Electricidad, ICE. (2018). "Consolidated financial statements." June 2018 Financial Management. San José, Costa Rica: Grupo ICE. Retrieved June 25, 2022 from <https://www.grupoice.com/wps/wcm/connect/7b3f9d3f-3f7f-491f-bdd6-3238d21d0cb5/EF%2Bcon%2BNotas%2BICE%2BConsolidado%2BSet%2B2018%2B%28Def%29.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-7b3f9d3f-3f7f-491f-bdd6-3238d21d0cb5-nDd-COI>
- IHA, International Hydropower Association. (2019). Costa Rica to host World Hydropower Congress. Retrieved from <https://www.hydropower.org/news/costa-rica-to-host-2021-world-hydropower-congress>
- Jacka, J. K. (2015). *Alchemy in the rain forest: Politics, ecology, and resilience in a New Guinea mining area*. Duke University Press.
- Lange, F. W., & Stone, D. Z. (1984). *The archaeology of lower Central America*. University of New Mexico Press.
- Latulippe, N., & Klenk, N. (2020). Making room and moving over: knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Current Opinion in Environmental Sustainability*, 42, 7-14. <https://doi.org/10.1016/j.cosust.2019.10.010>
- Leslie, P., & McCabe, J. T. (2013). Response diversity and resilience in social-ecological systems. *Current Anthropology*, 54(2), 114-144. <https://doi.org/10.1086/669563>
- Linton, J., & Budds, J. (2014). The hydrosocial cycle: Defining and mobilizing a relational-dialectical approach to water. *Geoforum*, 57, 170-180. <https://doi.org/10.1016/j.geoforum.2013.10.008>
- Little Bear, L. (2000). Jagged worldviews colliding. In Battiste, M.A. (ed), *Reclaiming Indigenous voice and vision*, (pp. 77-85). University of British Columbia Press.
- McCully, P. (1996). *Silenced rivers: The ecology and politics of large dams*. Zed Books.
- McPhaul, J. (2018). Costa Rica cancels Diquís hydro project opposed by Indigenous peoples. *Cultural Survival*. Retrieved June 1, 2022 from <https://www.culturalsurvival.org/news/costa-rica-cancels-diquis-hydro-project-opposed-indigenous-peoples>
- Méndez, P. F., Amezaga, J. M., & Santamaria, L. (2019). Explaining path-dependent rigidity traps: increasing returns, power, discourses, and entrepreneurship intertwined in social-ecological systems. *Ecology and Society*, 24(2), 30. <https://doi.org/10.5751/ES-10898-240230>
- Middleton Manning, B. R. (2018). *Upstream: Trust lands and power on the Feather River*. University of Arizona Press.
- Muru-Lanning, M. (2016). *Tupuna awa: People and politics of the Waikato River*. Auckland University Press.
- Oliver-Smith, A. (2009). *Development and dispossession: The crisis of forced displacement and resettlement*. School for Advanced Research Press.

- Ostrom, E., & Janssen, M. A. (2004). Multi-level governance and resilience of social-ecological systems. In Spoor, M. (Ed.) *Globalisation, poverty and conflict*, (pp. 239-259). Springer. https://doi.org/10.1007/1-4020-2858-X_13
- Pelling, M., & Manuel-Navarrete, D. (2011). [From resilience to transformation: the adaptive cycle in two Mexican urban centers](#). *Ecology and Society*, 16(2).
- Perry, D. & Berry, K. (2016). Central American integration through infrastructure development: A case study of Costa Rican hydropower. *Regions & Cohesion*, 6(1), 96-115. <https://doi.org/10.3167/reco.2016.060105>
- Perry, D. M., Harrison, I., Fernandes, S., Burnham, S., & Nichols, A. (2021). Global analysis of durable policies for free-flowing river protections. *Sustainability*, 13(4). <https://doi.org/10.3390/su13042347>
- Ribeiro, H. M. & Morato, J. R. (2020). Social environmental injustices against Indigenous peoples: the Belo Monte dam. *Disaster Prevention and Management*, 29(6), 865-876. <https://doi.org/10.1108/DPM-02-2020-0033>
- Robbins, P. (2012). *Political ecology: a critical introduction*. Wiley.
- Rogers, P. (2013). The rigidity trap in global resilience: Neoliberalisation through principles, standards, and benchmarks. *Globalizations*, 10(3), 383-395. <https://doi.org/10.1080/14747731.2013.787834>
- Swyngedouw E. (1996). The city as a hybrid: on nature, society and cyborg urbanization. *Capitalism Nature Socialism*, 7, 65-80.
- Swyngedouw, E. (2009). The political economy and political ecology of the hydro-social cycle. *Journal of Contemporary Water Research & Education*, 25, 350-363. <https://doi.org/10.1111/j.1936-704X.2009.00054.x>
- Todd, H. (2013). [Conflict assessment of the El Diquís Hydroelectric Project: When renewable energy poses environmental threats & human rights violations](#). *Peace & Conflict Review*, 8(1), 43-58.
- UNFCCC, United Nations Framework Convention on Climate Change. (2018). How hydropower can help climate action. *UN Climate Change News*, Nov. 21. <https://unfccc.int/news/how-hydropower-can-help-climate-action>.
- Viaene, L. (2021). Indigenous water ontologies, hydro-development and the human/more-than-human right to water: A call for critical engagement with plurilegal water realities. *Water*, 13(12), 1660. <https://doi.org/10.3390/w13121660>
- Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). [Resilience, adaptability and transformability in social-ecological systems](#). *Ecology and Society*, 9(2).
- WCD, World Commission on Dams. (2000). [Dams and development: A new framework for decision-making: the report of the World Commission on Dams](#). WCD & Earthscan.
- Wilde-Ramsing, J., & Potter, B. (2006). Blazing the green path: Renewable energy and state-society relations in Costa Rica. *The Journal of Energy and Development*, 32(1), 69-91.
- Zarfl, C., Lumsdon, A. E., Berlekamp, J., Tydecks, L., & Tockner, K. (2015). A global boom in hydropower dam construction. *Aquatic Sciences*, 77(1), 161-170. <https://doi.org/10.1007/s00027-014-0377-0>