



CLIMATE JUSTICE AND PARTICIPATORY RESEARCH: BUILDING CLIMATE-RESILIENT COMMONS

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ISBN 978-1-77385-408-3

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Hydroelectricity, Water Rights, Community Mapping, and Indigenous Toponyms in the Queuco River Basin

Camila Bañales-Seguel

Introduction

The conceptualization of climate justice points to the fact that the negative impacts of the globe's warming climate are distributed unequally throughout the human population. It is the more vulnerable communities and individuals who feel the effects of climate change more adversely. Moreover, these key groups tend to have a disproportionately low responsibility for the human causes of climate change.

The supremacy of market-oriented policy ideas of dominant countries in the international environmental arena (Ciplet & Roberts, 2017; Newell & Taylor, 2020; Schlosberg & Collins, 2014) is part of a development model that has disregarded alternative forms of life-systems, including Indigenous livelihoods and non-human living beings (Lindenmayer & Laurance, 2016). These policy ideas are embodied in the UN's Sustainable Development Goals, which have in many cases served as a smokescreen for further environmental destruction (Zeng et al., 2020). One example is the international promotion of hydropower as a renewable source of energy (Lacey-Barnacle et al., 2020). Widespread support for renewable energies has often obscured the way in which energy generation projects are implemented, what their impacts are

for local communities, and how “development”-driven inequities today are exacerbated by climate change.

This chapter invites the reader to learn about a place-based experience in an Andean river basin, located in the ancestral territory of Mapuche-Pewenche Indigenous People called Wallmapu (see Map 1, page 29). The principal objective of the research undertaken was to articulate local Indigenous knowledge and scientific knowledge about rivers to strengthen the river’s resilience as a social-ecosystem. To achieve this goal, a participatory science outlook was adopted to implement strategies for co-production of knowledge that would lead to a more thorough understanding of the functioning of the Queuco River.

The Queuco River gathers the waters from diverse tributaries and flows freely among Andean mountains to meet the Biobío River—a river so large that its Indigenous name is *Butaleubü* (the Big River) and local Indigenous knowledge speaks of its sibling galactic river—the *Wenuleubü*—or Milky Way. The confluence between the Queuco and the Biobío rivers is named *Tratrawüñko*, meaning encounter of big waters.

The Biobío is the second longest river in Chile (about 380 km long); it is located in the biogeographic transition between central and southern Chile, and forms part of the Valdivian Temperate Rainforest hotspot. This river network holds the highest diversity of native fish species in the country, including two endemic species, all of which are under threat of extinction (Vila & Habit, 2015). The river stands out for its enormous hydroelectric potential, which is estimated at around 2,902 MW (Ministerio de Energía, 2016).

Some decades ago, the Biobío used to be known worldwide by the white-water sports community as one of the most epic journeys from the mountains to the ocean. But since the mid 1990s the free-flowing waters of the Biobío have been interrupted by the construction of three mega-dams: Pangue (1996), Ralco (2004), and Angostura (2014). These dams use the river’s high hydroelectric potential to produce energy for the Chilean Central Interconnected System.

The construction of these dams faced strong opposition from the local Indigenous Mapuche-Pewenche communities and diverse national and international conservation and activist groups. At the time of their evaluation and construction, the Chilean State had still not ratified International Labour Organization Convention n°169, the Indigenous and Tribal Peoples Convention, and there was no consultation or consideration for Indigenous

communities' rights. The construction of the Ralco dam—the most controversial of them all—involved the relocation of eighty-one Mapuche-Pewenche families (approximately four hundred people) belonging to the Ralco Lepoy and Quepuca Ralco communities (Moraga, 2001; Namuncura, 1999). Their resistance was not enough to succeed against the country's development goals oriented towards economic growth and private profit.

With the filling of these dams, more than 4,600 ha of native forest and ancestral Pewenche land were flooded, including ceremonial sites and cemeteries. The State blatantly disregarded Indigenous communities and their livelihoods, incorporating forms of “participation” based on misinformation and division of the communities for the company's benefit, deepening the environmental injustice (Álvarez & Coolsaet, 2020). It is not just human communities living in this territory that have been affected: the aquatic communities of organisms that coexist within the river ecosystem have also been hurt by the construction of these projects. For example, native fish that were endemic (only occupying this river) have been extirpated from areas that are restricted upstream and downstream by dams (Habit et al., 2006; Valenzuela et al., 2019). The Biobío became a tragic example of how the dominant development model disregards alternative life systems, such as Indigenous cultures and lifestyles and non-human living beings (Lindgren, 2018). The forced displacement of Indigenous communities also showed how neo-liberal economies based on Nature's exploitation perpetuate colonialist logics and lead to what has been defined as “ecocide” (Crook et al., 2018; Higgins et al., 2013) on Indigenous lands.

Today, diverse environmental threats are still menacing the Biobío, its tributaries such as the Queuco, and their human and non-human inhabitants. In the middle of the COVID-19 pandemic in 2020, construction began for a fourth hydroelectric dam, which was approved by government authorities in 2015: Central Hidroeléctrica Rucalhue. And in early 2021, a new project proposal to construct a fifth dam (Central Hidroeléctrica Huequecura) was registered with the Environmental Impact Assessment Service and is currently undergoing the evaluation process within this state institution. These projects reflect a national policy to promote hydropower as clean energy (Pacheco, 2018); however, the compounding impact on ecosystems has not been adequately accounted for through the evaluation process.

Also, since 2018 a private corporation named “Reguemos Chile” has begun pushing for the construction of a so-called “hydric highway” to

transport large volumes of water from rivers in southern Chile to central and northern Chile. The aim of this development project is to irrigate nearly a million hectares of export-oriented agricultural land and contribute to powering more hydro-power plants along the way. The justification from the powerful agriculture industry for this massive water transfer is that southern rivers have surplus water and that “water is lost to the sea.” Another argument is “inter-regional solidarity,” considering the harsh decade-long drought that central and northern Chile is facing. The corporation even claims that the project would help mitigate the effects of climate change.

These narratives mask strong economic interests, power imbalances in the Chilean water market model, and a profound scientific negationism that ignores evidence showing that negative social-ecological impacts largely outweigh the economic benefits of such projects (Vargas et al., 2020). Scientists from multiple universities and research centres have provided evidence against the water transfer project, indicating that it is a short-term solution that would only deepen climate injustices (Colin et al., 2021; Figueroa et al., 2020; Zúñiga & Ramos, 2021). Water scarcity is a reality at the national level, driven by climate change (Boisier et al., 2018; Garreaud et al., 2013; Rojas et al., 2019) and by the market-based water allocation model in Chile (Bauer, 2004; Budds, 2020). If all factors are considered, addressing water injustices would involve other “solutions” than further destruction of ecosystems.

One of the first rivers that the proposed water transfer project would affect is the Queuco River, where an average of 33 m³/s (cubic metres per second) monthly between May and November are projected to be extracted. According to the company’s documents, this projection was established based on water rights records for the river and its tributaries. However, these water rights have been allocated without any official river gauging station in the river or consideration of climatic projections on future water availability. Direct measurements of discharge and river levels show that this amount of water currently exceeds what actually flows through the Queuco during one of the highest discharge periods of the year (May–July). As climate change reduces precipitation and snow pack in this Andean basin, water scarcity will become more acute and future discharge is expected to decrease.

Through the analysis of water rights in the Queuco river basin, hidden threats to water bodies were unveiled—particularly the fact that an alarming 99.98 per cent of water rights in the basin are currently owned by people and companies from outside the basin, based on General Water Directorate data

(DGA, 2022). Many of these rights are registered for hydropower generation, so even if there are no projects developed or proposed yet, this constitutes a latent threat.

The Chilean Water Code, implemented mid-dictatorship in 1981, conceptualizes water as a natural resource over which property rights can be held. The underlying paradigm behind this law conceptualizes Nature as an object, as a commodity (Svampa, 2015). A development model that considers Nature a mere provider of natural resources is what has led to the current social-ecological crisis. At a global scale, it is precisely this paradigm that is being challenged by civil society activists, public demonstrations, and “side event” discussants at global climate change meetings, such as the United Nations Framework Convention on Climate Change annual “Conferences of the Parties” (COPs). From a legal angle, there are global advances in what has been called a rights revolution for Nature as a way to effectively protect nature. There are examples of rivers around the world being recognized as legal subjects (instead of as objects/resources), and it has been established through court rulings that their rights should be protected. In this sense, rivers have served as entities that reflect larger dynamics of environmental protection (Álvarez-Marín et al., 2021).

Locally in Chile, many demands emerged during a massive popular uprising in 2019 that centered around environmental conflicts, particularly water conflicts. These uprisings led to a national plebiscite to change the 1980’s constitution. Currently Chile is undergoing a constituent process and many proposals are being debated about how to relate to and with Nature in a less predatory manner. Different ways in which Nature’s rights can be protected have been put forth by diverse members of the Constitutional Convention as well as citizens, interest groups, and organizations, through the participation platform implemented for this purpose.

In late 2021, two representatives of the Queuco and BioBío communities travelled to Glasgow, Scotland to participate in COP 26. As founding and leading members of the activist groups in their territories—Malen Leubü (a women’s rafting team and collective from Alto Biobío), Red por la Defensa del Río Queuco (RDRQ—Queuco River Defense Network) and Grupo Juvenil SDL Rucalhue (Rucalhue Lirquén Seeds Youth Group; the Lirquén River is a tributary of the BioBío). They travelled as delegates of the non-governmental organization (NGO) Ríos to Rivers to deliver an important message at the United Nations climate forum: “Stop recognizing dams as clean energy.” Ríos

to Rivers is dedicated to youth exchanges from different endangered watersheds, supporting youth leaders as the next generation of river guardians.

It was through one of these exchanges, held in the summer of 2019 in the upper Biobío River basin, that I initially met youth from local Pewenche communities who were members of the Malen Leubü, RDRQ, and Ríos to Rivers. I learned that their objective is to raise awareness about the new projects being pushed that threaten the Biobio and Queuco rivers. Our conversations led to finding common ground on the goal of learning about river well-being and constructing strategies for social-ecological resilience.

Decolonizing River Science

The study of rivers has traditionally been conducted from mono-disciplinary perspectives. Broad and deep research began to grow in disciplines such as hydrology, fluvial geomorphology, and ecology to improve human understanding of river systems. In recent decades, scholars from these disciplines have begun to collaborate and study rivers from more complex, inter-disciplinary approaches. This recognition that rivers are social-ecosystems (Dunham et al., 2018) accepts that natural and social dimensions are connected and inter-dependent. Such a framework considers humans as explicitly inseparable from Nature, and is especially appropriate to study territories with a focus on the feedbacks between social and ecological dimensions that lead to overall system resilience (Berkes & Folke, 1998; Folke, 2006). This also has opened a venue for dialogue between Western scientific disciplines and different knowledge systems such as local and Indigenous knowledge (Agrawal, 1995; Pretty, 2011).

My QES-funded research project, named "Keuko Leubü: Learning and Living with the Queuco River in Pewenche Territory," built a case study which was a key part of my doctoral research on river resilience and social-ecosystems in Indigenous territories of southern Chile. This research constituted an attempt to move the academic frontier one step closer towards a trans-disciplinary and decolonial approach to studying river systems.

The Queuco River is located in the upper Andean portion of the Biobío River basin, bordering the frontier between Chile and Argentina. Beyond this current political boundary, the basin is located in ancestral Indigenous Mapuche-Pewenche territory. This land has been historically inhabited by Pewenche communities and displaced Mapuche communities from both

Chile and Argentina. Currently, there are six established Mapuche-Pewenche communities in the basin: Callaqui, Pitril, Cauñicú, Malla Malla, Trapa Trapa and Butalelbún.

The main research activities I undertook in this project involved extensive field work during a six-month stay at Ralco, the only small town within the Pewenche territory of Alto Biobío. Moving to and living near the Queuco River and its riverside Pewenche communities was fundamental for two reasons: (1) to continue my work despite COVID-19 transportation restrictions and (2) to achieve a better cultural immersion and closeness to the experience of living in this territory and learning from the local inhabitants' perspectives. I conducted a series of semi-structured interviews, group interviews, or walking interviews (Evans & Jones, 2011; Guber, 2011) with diverse local inhabitants in the different communities living in the Queuco valley. The main focus was placed on *ngütram*, the local traditional format of extended conversation ranging across a series of topics.

In alignment with the goals of the partner organizations (the activist NGOs named above) and collaborating community members, this project sought to work on two main strategies of participatory science: river level monitoring and collective mapping of the river and its basin. Participatory science or open science encompasses a wide array of methodologies in which non-scientists are involved in scientific research. This involvement can happen in many ways, ranging from community members participating in the collection of data, to their being more deeply involved through the very development of the research questions being studied, and deciding the methodologies for carrying out the research. In this case, members of the local youth organization Red por la Defensa del Río Queuco (Queuco River Defense Network) were protagonists in the river monitoring as well as the mapping workshops.

Participatory River Monitoring

Community monitoring of the river was an example of participatory action research. With the help of local networks, we implemented two training workshops oriented towards youth and local community members. These workshops aimed to teach basic hydrological principles and to frame the importance of community participation in the context of commons governance of the watershed and external pressure for natural resource exploitation.

Engaging with these local organizations helped to continue and strengthen the participatory monitoring of the river's water levels.

Ecological research methods were used to better understand the functioning of the Queuco River. For the ecological dimension, in May 2021 we conducted the first of two field campaigns to sample aquatic communities. These campaigns focused on gathering habitat information and samples from the riparian habitat to characterize the fish communities as an indicator of river ecosystem health. The first four-day campaign included three technicians from the University of Concepción Fish Laboratory along with three members of the Pewenche riverside communities as participants. The data obtained from these field campaigns were analyzed so that the next field campaign could add to the results. An already meaningful outcome from these campaigns was testing a new, participatory manner of conducting biological field work in Indigenous territory. Bringing together local youth and community members with scientists and technicians from the university for the field campaigns is a first step towards getting to know each other better, building respect, and diminishing myths and mutual ignorance between these distant and quite different human groups.

Another research activity nourishing this strategy was the installation of a physical river gauge to measure the variations in river discharge (Figures 10.1 and 10.2). This river gauge helped to improve the precision of our community measurements, which were recorded using the citizen science cell-phone app CrowdWater. At the monitoring site, in March 2020, we installed a digital river gauge with the support of an experienced technician from the Hydraulic Laboratory of the University of Concepción. The first data retrieval from this gauge was in late June 2020. The measurements from this digital gauge served to complement and validate the measurements from the community monitoring efforts (by taking cellphone photos, from a fixed location, of the river level in relation to a water gauge held at a fixed place in the river). Community monitoring already has yielded a year-round time series of river fluctuations, and is on-going. This monitoring initiative began at the start of the pandemic restrictions in May 2020. So far, we have implemented four monitoring sites in the Queuco River and one site in the Biobío River; we have collected 476 observations contributed by 21 community participants.

The main challenge related to this river monitoring strategy, as reported by the participants, was that they had to commit part of their personal time to travelling to the measuring site, located 8 km from Ralco, where most



Figs. 10.1 and 10.2 Top, bike ride to the Queuco River bridge, 8 km from the nearest town, where the trail to the measuring site starts. Bottom, installation of a physical river gauge for community monitoring.

of them live. This involved biking from their homes, walking down a short trail, and biking back. Still, this distance was not a deterrent for the most dedicated participants, who visited the site year-round, notwithstanding the weather. One participant said, “I loved doing it, I thought it was great because I couldn’t go to the river very often as a Malen (member of the local female rafting team *Malen Leubü*, girls of the river), or participate in other activities, or meetings; I felt this was my way of contributing to the fight and defending the river. I also liked feeling this was my responsibility, giving myself the responsibility of contributing to the river defense.”

Indigenous Counter-Mapping to Reclaim River **Kuibi Kimün** (Ancestral Knowledge)

Our project’s second activity focused on implementing a series of participatory mapping workshops with the riverside communities of the Queuco basin. This required careful team building with members of local communities who helped as facilitators in these workshops and assisted with the systematization, translation, and validation of information. The main challenge had to do with the logistics and organization of the workshops. On the one hand, the work required the team members to commit part of their personal time. It also required prior organization to visit the participants in each workshop, who often lived in remote places and didn’t have electronic means of communication. Finally, the context of the COVID-19 pandemic also made it difficult to carry out the workshops, as some meetings had to be suspended or postponed due to surges in infections in the communities.

With the help of four facilitators, one person in charge of documenting and systematizing the workshops, and one audio-visual professional, we carried out three workshops in the communities of Butalelbún, Cauñicú, and Callaqui (Figure 10.3). The plans and methodology, including the choice of workshop participants, was determined as a team along with community members.

Together we designed the structure, objectives and methodology for the mapping workshops. In each *lob* (area composed by a geographical territory and the Pewenche communities inhabiting it), a handful of selected people considered as *kimche* (wise, usually older, persons) in the community were invited to participate in an activity aimed at the recuperation of names of places (toponyms) in *Chedungün* (the Pewenche Indigenous language) and



Fig. 10.3 Collective mapping workshop with local *kimche* (traditional knowledge holders, usually elders).

stories related to water bodies. In the Mapuche-Pewenche worldview, bodies of waters are seen as living entities with whom inter-subjective relationships are established (Aigo et al., 2020). Local toponyms—place names, especially those derived from topographical features—can give us important clues about the way that communities have co-evolved with their environment and established intimate relationships with the places they inhabit (Salazar & Riquelme Maulen, 2020).

The workshop carried out to learn about local toponyms consisted of a presentation on scientific/geographic information on the Queuco River as currently available for the study area. This information was presented as, first, the IGM (Military Geographic Institute)’s 1:50,000 scale maps and, second, high-resolution satellite images of the local area. After sharing these “perspectives” on the territory, we invited participants collectively to draw a representation from the local perspective. In this sense, the work of the local facilitators was essential for the presentation of the workshop’s objectives, information-sharing, evoking stories, the graphical representation of the river (actually drawing on blank paper!), and translating.

We worked on the systematization of information and digitalization using GIS (Geographic Information System mapping). In Butalelbún, the participants identified forty-two toponyms, forty-nine in Cauñicú, and forty in Callaqui. The information gathered aside from the toponyms was of different types: location of ceremonial sites, community meeting sites, historical foreign interventions, social-ecological conflicts, ecological or geomorphological landmarks, places with particular norms related to common water resources and their diverse uses.

Together with the meaning of Indigenous toponyms, we learned diverse *piam* (popular sayings, narratives, or stories) and *epeu* (traditional stories with a moral), which transmit tales and teachings associated with these places. Toponyms teach how people have co-evolved with their environment in time and how they have developed intimate relationships with different spaces through the experience of living there (Salazar & Riquelme Maulen, 2020). A map that gathers these Indigenous toponyms and their associated narratives allows people to get closer to knowing the territory through the lens of the traditional inhabitants' lived experience.

Next Turns in the River

At the heart of this research is a solid intention to achieve knowledge co-production and carry out the research process guided by values of respect, responsibility, reciprocity, and relevance, as inspired by endeavours such as the Decolonizing Water Project (<https://decolonizingwater.ca/>). In line with this, we hope to return the information gathered through this project in a format that is legible and beneficial for different audiences for community use. The GIS information was the scientific basis used to design illustrated maps for teaching purposes. These maps, printed on high-quality Size-A1 paper, will be shared with the rural schools where the workshops were hosted and with local NGO collaborators. Another way of sharing results with the community is via short videos on four topics: the participatory mapping workshops, the river monitoring experience, female leadership in environmental activism and science, and the role of universities as institutions dedicated to knowledge generation. These materials will also be hosted in an open online platform to make the research results widely accessible.

Historically, Indigenous knowledge systems have been seen through the binary lens of savage vs. civilized, undermining their value and making

invisible the right of Indigenous peoples to self-determination. This superiority viewpoint has excluded Indigenous peoples from participating in knowledge creation, even about their own territories and common resources. Advancing beyond this lens requires explicit recognition of the legitimacy of multiple knowledge systems and the affirmation of the responsibilities that academic institutions have to foster horizontal dialogue with diverse knowledge holders. Participatory co-creation of knowledge, including understanding the stories behind the right words for naming places, is a strategy for strengthening opposition to ecologically damaging water diversions and dams through increased collaboration and allyship, political agency, and climate justice advocacy.

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