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ORIGINAL ARTICLE

Injustice flows along Itaya River: capabilities from living with river rhythmicity in Bajo Belén, Iquitos, Peru

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Abstract
In riverine contexts shaped by seasonal fluctuations, communities cultivate ways of living with water that reflect deep social and ecological entanglements. This study focuses on Bajo Belén, a peri-urban community along the Itaya River in the Peruvian Amazon, where residents live with *vaciante* (dry season) and *creciente* (flood season) through practices that sustain their livelihoods. Using a braided approach by weaving living with river rhythmicity, the Capabilities Approach, and Environmental Justice, we analyze 41 storytelling sessions (2022–2024). Our findings show drought and flood processes; and how community capabilities are built through living with the river, yet remain unrecognized in state responses such as forced relocation. This non-recognition leads to non-inclusive procedures and an unequal distribution of blame and responsibility. We argue for governance that respects plural ways of living and supports community-defined aspirations. Situating care, recognition, and capability within river governance offers new pathways for more just, relational, and adaptive responses to environmental uncertainty.

Keywords Capabilities · Environmental justice · Drought · Flood · Latin America

Introduction

Riverine communities that live with uncertain conditions such as seasonal river fluctuations or in extreme cases, droughts and floods, are liminal spaces of understanding complex human–environment relationships (Adger 2003; Bankoff 2001; Pelling 2003). These are liminal spaces where practices and knowledges continually shift in response to river fluctuations and environmental change, creating dynamic human–environment relationships deeply braided with river-based activities such as fishing, agriculture, and transportation (da Cunha Ávila et al. 2021; Langill and Abizaid 2020; Vasconcelos et al. 2022). These activities evolve over time as communities constantly learn how to live with and anticipate the cycles of the river. Being dynamic is central to how communities live with the river and sustain their hydrosocial relationships as its fluctuations change (Vasconcelos et al. 2022; Vogt et al. 2016). This situated dynamicity shows that droughts and floods affect groups differently, reflecting uneven hydrosocial relations, unequal distribution of infrastructure, and limited access to decision-making processes (Linton and Budds 2014).

While there have been growing theoretical calls to embrace pluralistic and relational epistemologies, empirical applications of these frameworks remain limited (Ingold 2022; Kimmerer 2013; Whyte 2017). In particular, the dynamic hydrosocial learning ecologies are significantly underexplored (Jackson et al. 2022). Our research contributes to this gap by offering insights into how riverine communities in the Peruvian Amazon navigate the cyclical *vaciante* and *creciente*, revealing the entangled, uncertain,

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and adaptive dimensions of socio-ecological life along the river (Fals Borda 2015; Jackson et al. 2022). Specifically, we look into two riverine communities situated along Itaya River and located close to Iquitos City, an urban area within the lower Peruvian Amazon.

This paper is organized into four sections: Braiding, Methodology, Results, and Discussion. The Braiding section outlines the three conceptual strands guiding our analysis. The Methodology details the case study context, storytelling sessions, reflexive processes, and analytical approach. In the Results, we present stories of living with river rhythmicity, and how injustices emerged through the relocation process. The Discussion revisits the key concepts to critically reflect on our findings.

Braiding conceptual strands

We propose a three-strand braid that interweaves: living with river rhythmicity, the Capabilities Approach, and Environmental Justice (see Fig. 1). Each conceptual strand carries its own analytical weight, and when braided they form a more intricate tapestry that better captures the texture of human–environment relations (Haraway 1988; Kimmerer 2013). The resulting braid generates nuanced meaning-making that shows how living with river rhythmicity underpins community capabilities in uncertain environments, and how these interwoven relationships form the foundation for equitable environmental justice.

Strand 1: living with river rhythmicity (vaciante and creciente)

The concept of "living with" originates from ecological, philosophical, and anthropological discourses that emphasize a relational, co-existential approach to human–environment interactions (Bennett 2010; Escobar 2018; Haraway 2016; Kimmerer 2013; Krause and Harris 2021a, b). Rather than positioning nature as controlled or separate, this perspective emphasizes reciprocity between human and more-than-human entities (Escobar 2018). Applied to riverine contexts, it recognizes rivers as living entities with their own rhythmicity, patterns of seasonal rise and fall that structure socio-ecological life (Jackson et al. 2022; Krause and Harris 2021a; Linton and Budds 2014; Zwarteveen and Boelens 2014).

While seasonal fluctuations such as the *vaciante* (dry season) and *creciente* (wet season) in the Peruvian Amazon have long shaped local livelihoods, they are increasingly destabilized by human interventions including deforestation, urbanization, and infrastructure development (Abram 1996; Gorenstein 2021). These hydrological rhythms regulate ecological processes and structure everyday life, from fishing to transportation and housing patterns. Yet, when fluctuations become intensified, turning into extreme droughts or floods, they intersect with existing vulnerabilities, turning ecological cycles into socio-environmental risks (Langill and Abizaid 2020). In such contexts, living with the river requires the development of knowledge systems, practices, and ethics attuned to the river's changing rhythms (Jackson et al. 2022; Krause and Harris 2021a; Strang 2020, 2024).

This approach aligns with Fals Borda's concept of amphibian communities who move between water and land with adaptive flexibility and relational insight (Fals Borda 2015; Lomeli and Rappaport 2018). These lifeways reflect longstanding socio-environmental identities, rather than temporary coping strategies. However, such relational and place-based ways of knowing are often marginalized by dominant governance models (Boelens 2022; Roca-Servat and Ocando 2019). By acknowledging river rhythmicity and the amphibian knowledge embedded in these communities, we argue for a reorientation of river governance—one that respects uncertainty, recognizes adaptive capacities, and

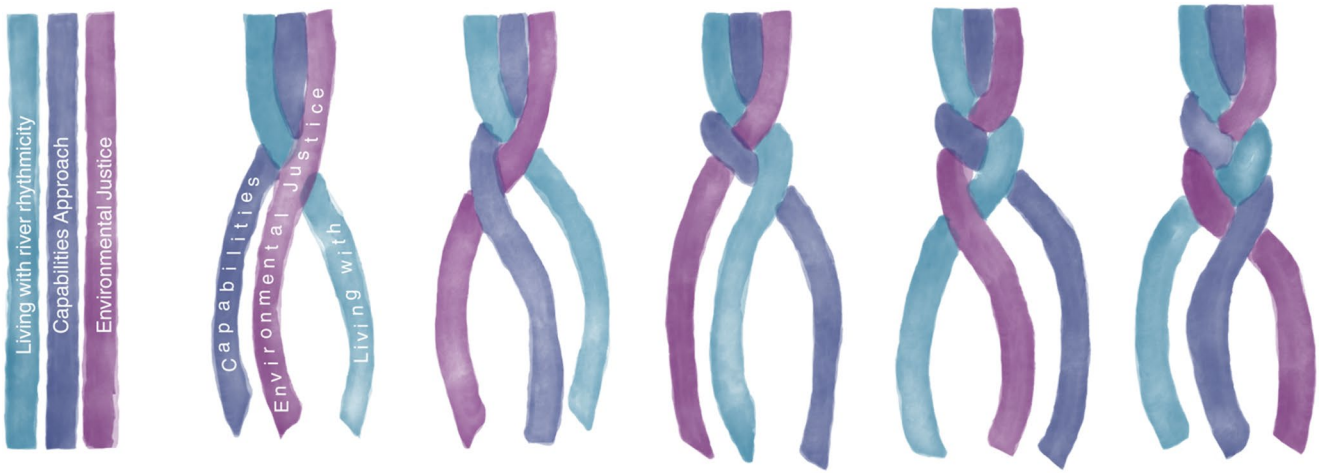

Fig. 1 Understanding from individual strands vs a three-strand braid

supports more plural, situated ways of living with dynamic environments.

Strand 2: capabilities approach

We weave the principles of Capabilities Approach (CA) into our analysis to emphasize the importance of enabling individuals and communities to lead lives they value in relation to river rhythmicity (Nussbaum 2011; Sen 1999). CA underscores that well-being is not simply determined by access to resource, but by the ability to convert those resources into meaningful practices within specific environmental contexts (Robeyns 2005; Schlosberg 2012). In riverine contexts, this includes the capacity to diversify livelihoods, maintain cultural identities, and adapt to hydrological fluctuations (Chann et al. 2024; Mehta 2014).

However, river governance has been dominated by control-and-manage paradigms that tend to treat rivers as a resource to be quantified and tamed (Boelens 2014; Chann et al. 2024; Duarte-Abadía et al. 2015; Perreault 2014; Roca-Servat and Ocando 2019). This logic underpins many development interventions, including relocation programs, which are framed as protective responses to environmental risk. Yet, such relocations frequently move communities to areas where their human–environment relationships cannot be maintained, severing access to river-based livelihoods, knowledge systems, and cultural practices (Mikulewicz 2024; Schlosberg 2012). This disconnection undermines core capabilities that communities have cultivated in response to river dynamics, such as adaptive mobility, seasonal agriculture, and social cohesion rooted in place. Applying the Capabilities Approach thus enables a more nuanced analysis of how governance frameworks can constrain or enhance material conditions and shape the relational and ecological dimensions of well-being (Schlosberg and Carruthers 2010; Whyte 2017; Wood-Donnelly 2023).

Strand 3: environmental justice

Lastly, we weave Environmental Justice (EJ) into our framework to highlight how riverine communities disproportionately bear the burdens of environmental degradation, while being excluded from the benefits and decision-making processes tied to river governance (Schlosberg 2007; Wood-Donnelly 2023). Originating from struggles against environmental racism and socio-environmental inequality, the EJ movement calls for the fair treatment and meaningful involvement of all people, regardless of identity or income, in environmental decision-making (Schlosberg 2012). Applied to river contexts, EJ reveals how pollution, displacement, and top-down interventions impact communities who are often least responsible for environmental harm, but most affected by it. These communities are also least resourced to resist, and least recognized in the framing of governance responses (Hoque et al. 2021; Wood-Donnelly 2023).

To examine these injustices, we engage with the three pillars of environmental justice—recognition, procedural justice, and distributional equity (Schlosberg 2012). In the context of river governance, most injustices stem from failures of recognition, particularly the dismissal of how communities live with rivers, including their rhythmic practices to seasonal changes. Building on this, we draw from the work of Boelens and Roca-Servat who offer powerful critiques of dominant water governance paradigms that ignore the social and relational dimensions of rivers. Boelens (2022) introduces the concept of riverhood to describe rivers as relational entities co-produced through human-nature interactions. Riverhood challenges state-led, control-oriented policies by foregrounding rivers as territories of socio-political struggle and cultural meaning. Similarly, Roca-Servat (2019) conceptualizes hydrosocial territories as everyday lived spaces where communities shape and contest water governance through their practices, values, and knowledges. Both perspectives encapsulate the complexities of living with river rhythmicity, where seasonal changes are not disruptions to be fixed, but patterns to be lived with, adapted to, and anticipated.

When river governance fails to recognize these hydrosocial relations and temporal rhythms, it undermines the community capabilities that emerge from them. This erasure reflects deeper power asymmetries that shape who gets to define the river, how it is governed, and who is rendered invisible in the process. By foregrounding these lived relationships and their rhythmic foundations, EJ allows us to interrogate governance models that seek control over coexistence.

By braiding together the concepts of living with river rhythmicity, Capabilities Approach, and Environmental Justice, this research offers a plural and situated framework to foreground complex human–environmental relationships (Nussbaum 2011; Schlosberg 2012). This framework advances scholarly discussions by demonstrating how capabilities are not static attributes, but are actively shaped through communities' embodied and temporal relationships with the river that deserve proper recognition (Jackson et al. 2022; Nussbaum 2011).

In this paper, we explore these issues with the following questions: (1) How are droughts and floods experienced by riverine communities; (2) What capabilities do communities develop by living with Itaya River; and (3) How do the emerging narratives of living with rhythmicity influence the forms of environmental injustices in the area?

Methodology

Context setting in Bajo Belén

Our research takes place in the riverine villages of Sachachorro and San Francisco in Bajo Belén (lower Belen) (Fig. 2). Bajo Belén is located along the Itaya River, and is currently composed of 56 small villages (Gorenstein 2018, 2021). As of 2022, Belén district recorded 76,140 inhabitants (Ministerio del Ambiente, Perú 2018). These communities are known for building houses on stilts and floating structures, and their proximity to the city is a key economic driver. The local economy is predominantly reliant on the river, with activities such as fishing, small-scale agriculture, and the trade of local crafts and products that they sell in *Mercado de Belén* (Belén market). Transportation and daily life are inextricably linked to the waterways, highlighting the river's role to livelihoods and access to social services.

Migration to Bajo Belén began in the 1940s (UCL 2020). Since then, the communities have experienced regular river fluctuations—*vaciante* (dry period for ~6 months) and *creciente* (wet period for ~6 months)—and have adapted by building floating houses or houses on stilts (Astolfo et al. 2024; Gorenstein 2021). These housing forms enable flexible living with the river, as spaces are repurposed across seasons (e.g., storage during *vaciante*, boat garage during *creciente*). However, the regular river level fluctuations have become points of contestation with government classification of the area as high-risk.

Tensions escalated with the *Belén Sostenible* (Sustainable Belen) project, started in 2012, which aimed to construct 2050 houses with proper sewage and sanitation (Estrada et al. 2018). Amid partial progress, the government halted the project in 2014 after declaring a state of emergency under Law 30921, mandating relocation from Bajo Belén (Espinoza and Alvarado 2023; Estrada et al. 2018). Citing seasonal floods as justification for the relocation, authorities excluded communities from decision-making and used intimidation to enforce relocation (Gorenstein 2021). Residents who stayed argued that the state perpetuated narratives of danger and underdevelopment to legitimize displacement, reflecting conflicting risk perceptions

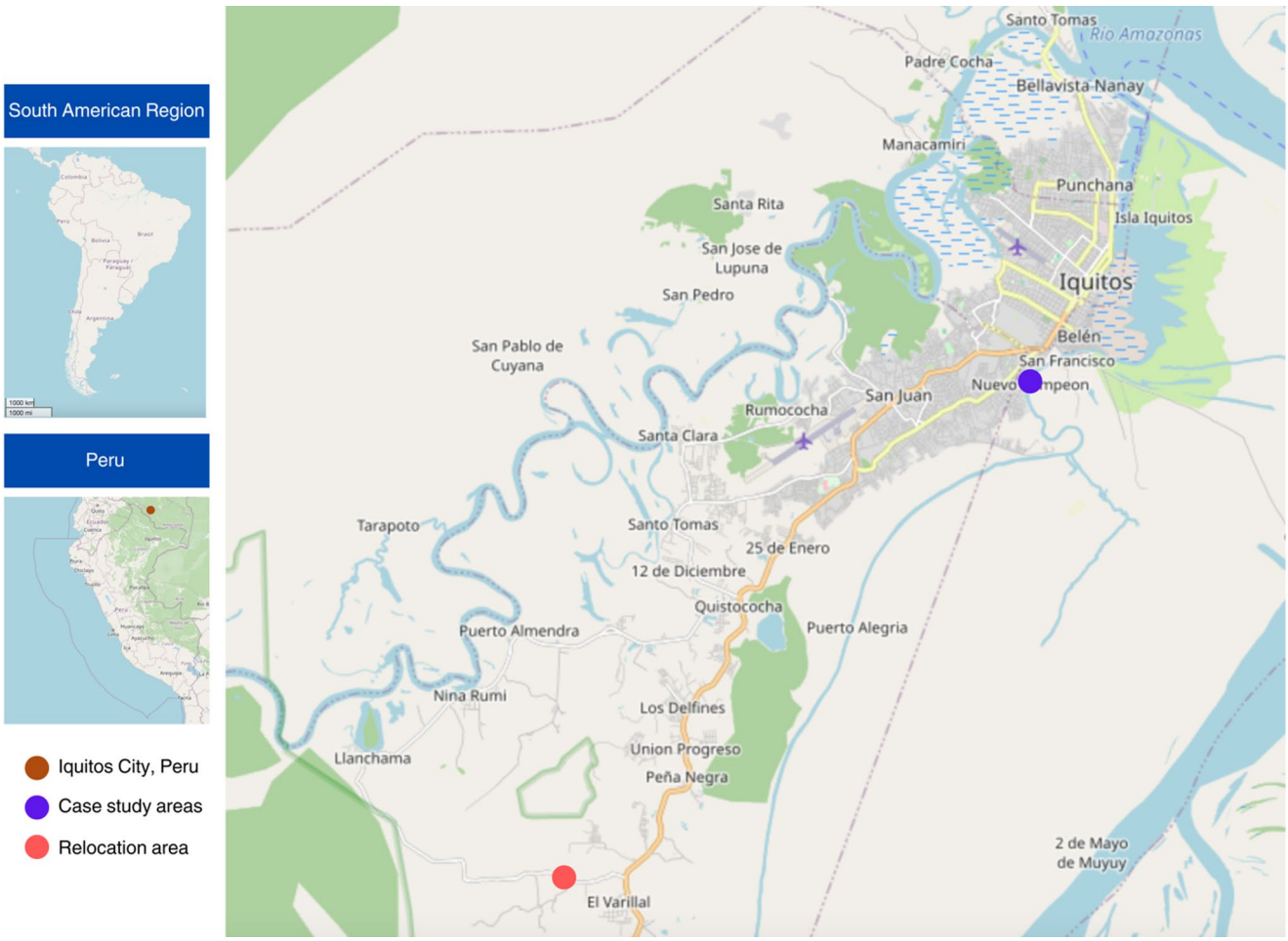

Fig. 2 Map of the case study areas and the relocation area. (Source: OpenStreetMap)

and development agendas (Coffman 2021; Gorenstein 2018, 2021) (Fig. 3).

Careful braiding through storytelling, poetic ethnography, and policy review

Our approach recognized that knowledge production is never neutral, but entangled with affect, ethics, and power (Puig de la Bellacasa 2017). In contexts shaped by marginalization, environmental precarity, and institutional distrust, we employed storytelling and poetic ethnography to engage with the affective, political, and relational dimensions of fieldwork. Storytelling was a way to value different stories and emotions coming from living with river rhythmicity. Although storytelling overlaps with interview methods in structure and logistics, storytelling differs by foregrounding the participants' own narrative arcs and emotional registers (Cunsolo Willox et al. 2013; Frank 2010; Kovach 2021; Hou 2025). The first author used poetic ethnography as a reflexive and affective practice, using field notes, conversations, and observations to reflect on the emotional and political textures of life in a precarious riverine environment.

We conducted three rounds of fieldwork in Bajo Belén:

- *Scoping visit (November 2022, vaciante)*: The first two authors together with research collaborators from Lima and Iquitos introduced the project to community leaders and held preliminary conversations about experiences with droughts and floods.
- *First round of storytelling sessions (April to May 2023, creciente)*: The first author and five research assistants from Iquitos conducted 26 individual storytelling sessions on boats or in homes, constructing memory timelines of past droughts and floods using semi-structured prompts.
- *Second round of storytelling sessions (May 2024, creciente)*: The same team conducted 15 follow-up sessions to expand on timelines and co-construct a calendar of river-related activities. Three key policies[1]—two on the relocation project, and one on disaster and risk management—were also reviewed for contextual grounding and analytical support.

The first author used poetic ethnography[2] as a reflexive process to engage with the emotional and political tensions of fieldwork. During the visit, government representatives often questioned the relevance of narrative methods given the availability of risk assessments, revealing epistemic hierarchies that privilege technical over lived knowledge (Denzin and Lincoln 2005; Phan 2022). Writing poetry became a way to process these encounters and reflect on affect, ambiguity, and partial truths in high-tension research setting (Faulkner 2020; Prendergast 2009). These poems were not analytical outputs, but a reflexive means of staying attuned to the communities' stories.

Making sense of stories

Data analysis was conducted collaboratively by the first four authors through two iterative coding stages. First-level coding of all transcripts helped identify recurring themes

Fig. 3 Timeline of events from the 2012 flood to the creation of Belén Sostenible project. Sources: Coffman 2021; Gorenstein 2018

[1] The policies will be introduced and elaborated in the results section.

[2] Poetic ethnographic pieces: Diez (10) for 2022 fieldwork, Abril (page 11) for April 2023 fieldwork, The interview, for May 2024 fieldwork (https://wearenotdata.org/).

related to capabilities and lived injustices, informing a codebook grounded in Capabilities Approach and Environmental Justice (see Supplementary Material). A thematic narrative analysis then examined patterns, meanings, and structures across participants' stories (McAlpine 2016; Rolón-Dow and Bailey 2021), revealing how communities live with, and are constrained by droughts and floods. In reporting the results, we use assigned aliases to protect the participants' anonymity (Fig. 4).

Meaning-making through living with droughts and floods

This section is divided into three parts that answer the following research questions: (1) How are droughts and floods experienced by riverine communities; (2) What capabilities do communities develop by living with Itaya River; and (3) How do the emerging narratives of living with rhythmicity influence the forms of environmental injustices in the area?

Defining and differentiating drought and flood processes and impacts

A *vaciante* normally begins in June and ends around October or November. During *vaciante*, the river shrinks, and only small boats can pass through the river (Fig. 5). The community members use these small boats to transfer people and goods from one side of the community to another. Most of the residential areas stay dry, residents can walk to the city, children can use the land to play sports, and families with motorcycles (*motocar*) can park their vehicle close to their house. Water pipes and pumps are functional, and several houses that have direct connection to water services have stable access to potable water. However, community members mentioned that they have a waste management issue during *vaciante*. Streets get filled with uncollected solid waste from households. The waste that compiles during *vaciante* is a combination of the current waste, and the uncollected waste during the previous *creciente* that is carried by the river to some areas. Several participants also mentioned that the waste from the city get washed away by rain and end up in Itaya River. This contributes to several cases of dengue, especially among children who stay at home (e.g., children do not go to school).

During *creciente*, the river starts to rise around November to December. During this period, families with houses on stilts move their belongings to the second floor, and those with floating houses need to tie their house to a stable post. The whole area is inundated, and the community needs to travel by boat (i.e., one is a small boat or *canoa*, and the other is a slightly bigger boat (*peque peque)* that has a small engine that can carry more people and travel faster). Children cannot play outside, and families with motorcycles need to park the vehicle far from their house. Water pipes often do not function and access to potable water is often disrupted, prompting people to find other sources of water.

Despite the challenges presented by the river fluctuations and transitions, the community members have developed ways of understanding the river. This is evident from the practices such as preparing or repairing their houses for *vaciante* and *creciente*, and shifting their main sources of livelihood (i.e., planting staple crops and vegetables, and fishing). River fluctuations create opportunities that communities use to support their families and pursue their aspirations such as having different livelihoods, shifting

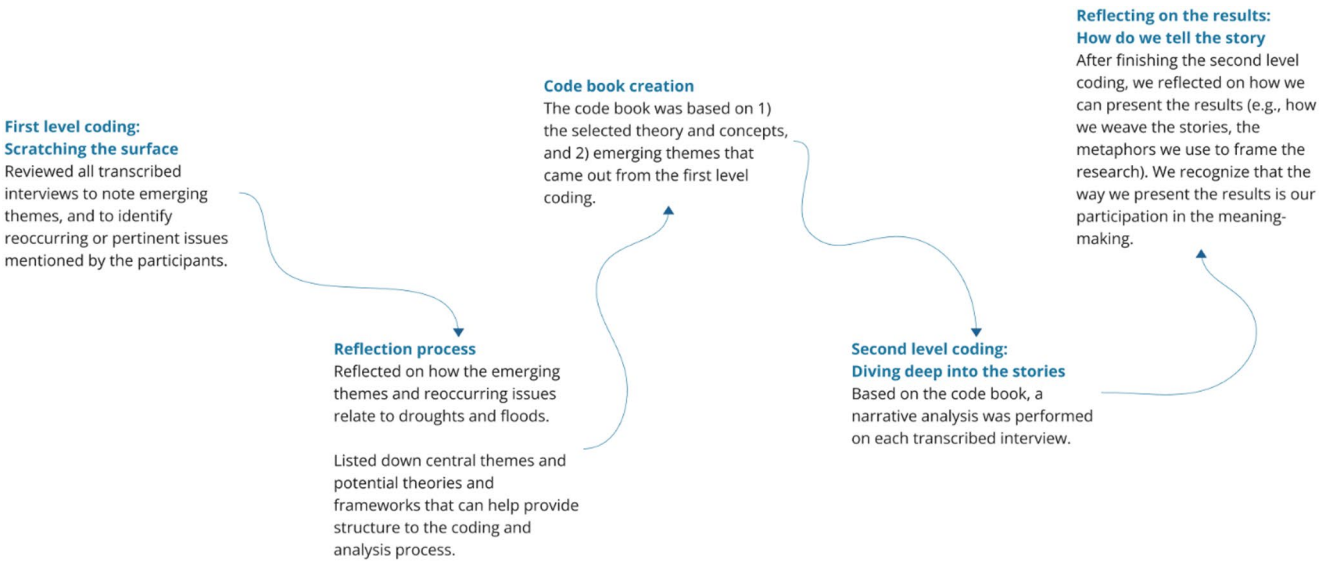

Fig. 4 Reflexive process of meaning-making and analysis

Fig. 5 Bajo Belén in different seasons (*Vaciante* in November 2022, *creciente* in April 2023, *creciente* in 2024)

between different activities such as agriculture and fishing, and living peacefully by the river.

Understanding the *vaciante* and *creciente* dynamics is prerequisite to defining how drought and flood occur in the area. Based on the storytelling sessions, we drew out definitions of drought and flood. A drought occurs when the *vaciante* is prolonged or when the expected *creciente* is delayed (river level does not rise when it normally should); or when river levels are lower than expected. Drought was also described as a lack of rain and strong heat. A flood occurs when there is a sudden rising of the river to levels that are beyond a normal *creciente;* when a rise happens unexpectedly during a *vaciante*; or when the *creciente* happens earlier than expected. For both drought and flood, timing of occurrence is one of the most critical element, together with intensity, and duration. Based on the storytelling sessions, we identified drought and flood years, and the different processes of how the communities experienced them (Fig. 6).

Ramon (storytelling in 2023), a fisherman from San Francisco, remembered that during the 2014 drought, *"The river was very dry, people passed to the other side… (but) the boats can't leave, the river dried up and they couldn't bring the products."* Hence, prices of commodities like plantain increased, and they had to look for cheaper options. Aside from affecting fluvial transportation and food options, the communities also did not have access to safe drinking water.

This extreme drought was followed by a flood in 2015. Susan (storytelling in 2023), a mother from San Francisco mentioned that while they were aware that a flood can happen, they did not expect a sudden, intense flood during that *creciente*. *"The neighbors thought that the water was not going to come quickly but this time it came in one go,"* Susan recalled. Hence, some of them could not prepare their houses nor stock food. The flood impacted households differently based on their abilities to prepare prior the flood. Some families who had prepared earlier for high water levels (e.g., by increasing the height of their houses on stilts, creating floating houses, or making/buying small boats that they could use during the flood) shared that they were not as affected as their other neighbors who were not able to prepare.

The extreme flood in 2012 was an important event for the community, because the event disrupted their livelihoods, and they also had to relocate to schools which were elevated higher than most houses. *"Some of our neighbors had to leave our homes. So did I. I left my house, I went to live on a raft, because even the high houses were flooded. The houses that were flooded went to the school at the back area of the community. They said that they took in all the neighbors from here,"* Kevin (storytelling in 2023), a previous community leader from San Francisco, recalled how the 2012 flood forced most of the community members to leave their houses. Because the flood was sudden, they were not able to prepare their houses nor harvest early from their farms. *"There was no fish. There was nothing for you to eat, we had to get up early to go shopping. Everything was expensive, because there was nothing,"* Tricia (storytelling in 2023), a mother from San Francisco, recalled.

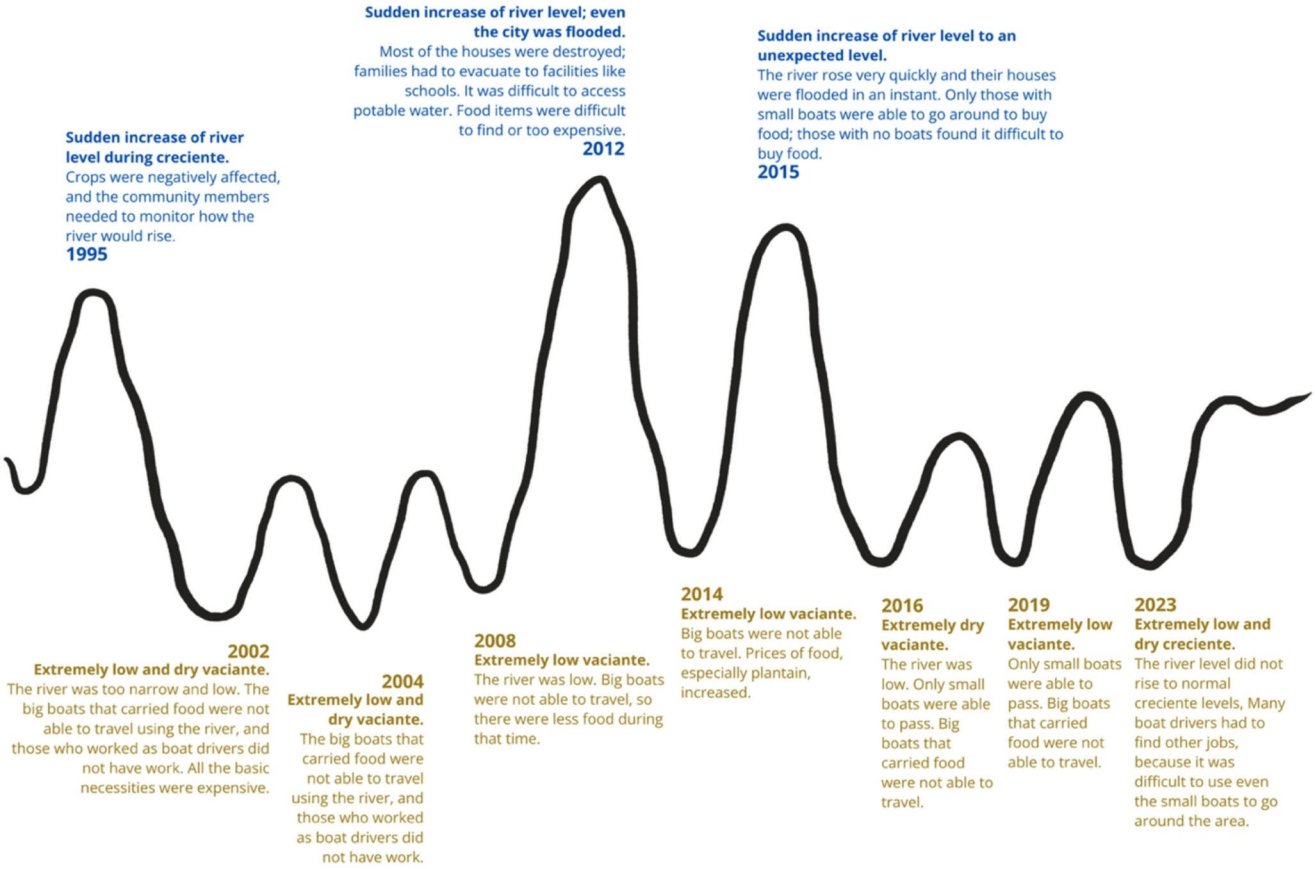

Fig. 6 Memory timeline of different drought and flood characteristics and processes

"(We) learned to prevent (those impacts) for ourselves. (You learned) to prepare yourself, to prepare by planting cassava, and to save more for farina. For example, (at that time) nobody had enough cassava, and the fariña (flour) was 6–7 soles a kilo (€1.45–1.69)," Marcel (storytelling in 2023) explained how living through the 2012 flood made them more aware of how to prepare for *creciente* and potential floods. Unlike other floods, Iquitos City was also severely flooded in 2012. This was turning point for communities in Bajo Belén, because policies used this specific case to justify their relocation.

While several impacts can occur for both drought and flood (e.g. lower crop yields, less fish higher prices, diseases), some were event-specific (Fig. 6). During drought, participants mentioned more health-related issues such as stomach aches and diarrhea. They associated these health issues to the poor waste management in the area during the dry season. During flood, they mentioned that it was more difficult to access services such as schools or hospitals. Some schools were used as evacuation centers, so classes were disrupted until the flood receded.

Understanding these experiences can be complemented when looking at river levels recorded by the National Meteorological and Hydrological Service of Peru (*Servicio Nacional de Meteorología e Hidrología del Perú*, *SENAMHI)*. SENAMHI is responsible for monitoring water levels and setting official thresholds used to declare emergency or high-risk situations in local and regional areas. This risk identification is based on how current river level deviate from historical averages. Historically, water levels in Itaya River during *creciente* averages around 117–118 m above sea level (m.a.s.l.) (Fig. 7). This means that SENAMHI can declare a flood once the water level exceeds the *creciente* average for a given time. During the *vaciante* season, average river levels drop to about 106–108 m.a.s.l. In recent years, particularly 2023–2024, the *vaciante* season intensified, resulting in river levels falling approximately 2 m below the seasonal norm, severely impacting navigation, fishing, and daily water access. By mid-2024, early rains led to a partial recovery during *creciente*, but peak water levels remained below average. The risk categorization relied only on hydrological data and overlooked communities' lived experiences. This became clear during the 2023–2024 drought, when the government declared a state of emergency only in late 2024.

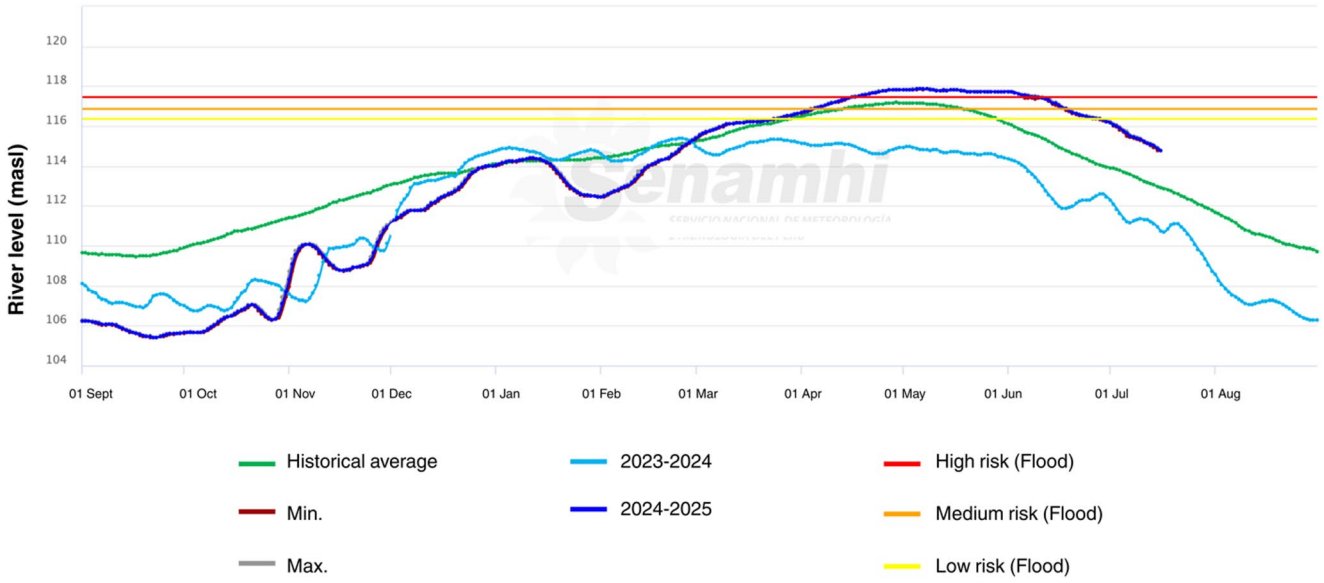

Fig. 7 Hydrogram of river level from Enapu Station (hydrological monitoring station close to the case study area). (Source: www.senamhi.gob.pe, legends were translated for this paper)

Table 1 Capabilities from *vaciante* and *Creciente*

Capabilities	Vaciante	Creciente	Vaciante and creciente
Livelihoods and economic opportunities	Farming and knowing which crops to plant, Belén market, ability to earn from being a motorcar driver within the community and in the city	Fishing and knowing where to fish, Belén market, ability to earn from being city boat drivers within the community, or motorcar driver in the city	Making and selling artisanal crafts, earning from operating canteens or small bars within the community
Social and public services	Access to potable water, able to use groundwater pumps		Access to market, schools, hospitals, city center Able to use rainwater for washing clothes, and cooking
Culture, and sense of identity and community	Strong sense of identity as a farmer (comes from their knowledge and being flexible with the cropping systems, and feeding the family from their own harvest)	Strong sense of identity as a fisherman (comes from their knowledge of the river, and feeding the family from fishing activities)	Community meetings to discuss issues within the community, sense of peace from living close to the river, sense of being accustomed to the river fluctuations, strong sense of being Beleniño/as

Vaciante and *creciente* as sources of capabilities

Community members see the river fluctuations as sources of capabilities, and as something that they are already accustomed to living with (Table 1). Both the *vaciante* and *creciente* support capabilities that enable community members to thrive and live lives that they value with the river. Among the different capabilities, the community members' capability to switch between farming and fishing throughout the year gives them flexibility in terms of livelihood options, and also a sense of identity for being a farmer or a fisherman. These are the capabilities, and the identities that were not taken into consideration by the relocation project. Instead, what was highlighted was the imminent danger that the river posed, and the costly financial demands of supporting such way of living.

> "I previously lived in Pebas (another district within Iquitos City), from there I moved to live here (in San Francisco). Because of living here, I am able to send my children to school. My family and I live here more comfortably. I also speak for those who have become accustomed to living here. Living in the center of the city is more complicated, that's why I decided to live here now, and we have stayed. We have gotten used to it." (Storytelling session in 2023) (see Supplementary Material for the Spanish transcript).

Marcel, who has been living in San Francisco for almost 20 years, explained how he has developed a sense of being accustomed to living with the river. He mentioned that his

reasons for moving to Bajo Belén was that it was close to public services such as schools, hospitals, and markets; and that the area was more peaceful and livable than the city. He added that if a family can adjust to the conditions and learns how to live with the river, then it is easy to get accustomed and continue to live in the area.

Droughts and floods as extreme events: constraints to capabilities

Community members consider the annual fluctuations of the river as a constant part of their lives; however, extreme *vaciantes* (drought) and extreme *crecientes* (flood) constrain their ways of living. Droughts affect the quantity and quality of fish catch, the types of crops they can eat, prices of commodities, and mode of transportation. Several participants recalled that in 2002 there was a drought that affected the entire city.

> ".. it was 2002, there was an extreme vaciante that attacked the entire city, the river usually remains a little wide, but that year was the most extreme vaciante, it was very narrow just like a thread… then the boats that were working could no longer pass and they also couldn't do their business… They were affected, even the fishermen, the fish did not enter the river because it was very polluted from here [points to the river to indicate where they would usually fish]. The lakes that accompany the river [farther into the Amazon River there are areas where small lakes form where migratory fish go to] and there it was possible to fish, but here everything has dried up. The fishermen were affected, and the price of the fish has risen to the sky." (Stotelling session in 2023).

Cristina, mother from San Francisco, recalled not being able to pass through the river, and the high prices of commodities during the drought in 2002. Other participants recalled a drought in 2016 that lasted for three to four months. In these months, food prices increased, and it was impossible to use the river. The prices increased, because the food sold in the markets was transported from Nauta (a semi-urban area three hours by land from the city). Moreover, people had to walk longer, and it was difficult to harvest from their farms; on a normal *vaciante*, they would be able to use small boats to reach their farms easier, and to load the harvest on their boats.

> ".. it has dried well about 7 years ago. During that shortage, we needed to walk to the other side of the river[3]and food supplies were scarce because the boats could not pass. Only small rivers came, so they sold us expensive food from the Iquitos-Nauta highway. Plantains, *cassava*, fish, all of that were scarce, and that lasted 3 to 4 months and it was sad, because people couldn't fish. You only had cassava or bananas but far away for them to carry because the river had dried up." (Storytelling session 2023)

Floods also impact communities. The community members consider floating houses more adapted to the river, as a floating house would easily rise with the river as compared to a house on stilts that can either get carried away or get fully flooded. Flood experiences and memories mostly rely on the visible lines and marks on the houses that indicate the highest flood in the previous years. However, most participants recalled that when the 2012 flood came, not even the floating houses were safe. During that flood, almost the entire city was affected.

> "All of Iquitos and all the houses were affected, let's say that my mother's house is like this now [Points to the floor to show an example of the height of the house]. And it was not known for how long it is going to grow. At that time, it was not known how far it [the river] would grow, so the houses that had a single base, which are like that without a raft or roof [Points to several single base houses of the neighbors] have been covered and everything has been lost, so people were slept schools, in some premises that the government provided." (Storytelling session in 2023).

Cristina recalled how the flood destroyed most single-base houses. Their livelihoods were also affected; their boats were washed away, and even if they had a boat, the current was too strong to use the river for transportation. They did not have a stable source of potable water, so prices for water also increased.

Injustices rooted in non-recognition of capabilities

What emerged from our analysis is that the injustices stem from non-recognition of the communities' ways of living and capabilities that lead to non-inclusive procedures, and unequal distribution of responsibilities, and harms. In this section, we present lived experiences of non-recognition.

[3] During normal *vaciante*, they can still use small canoes to pass through the river, and it would only take them less than an hour; using canoes helps them more easily carry food or harvest from their farms. But during the 2016 extreme *vaciante*, they had to walk for hours to get food and harvest from their farms.

Table 2 Exclusionary features and impacts on Bajo Belén of the policies

Policy	Exclusionary features	Impact on Bajo Belén
Law 30291	Centralized functions and control; no consent with the local institutions; relocation mandated by law but without participatory measures	Communities were unable to negotiate; ignored river-based livelihoods
Ministerial Resolution 160–2015	Technical delimitation based on flood thresholds without consultation and understanding of local lived realities	Erased lived seasonal knowledge and communal thresholds; legitimized displacement
Loreto Regional Disaster Risk Plan 2021–2024	Absence of local participation protocols; urban-centric orientation	No allocation of disaster risk management resources to Bajo Belén; minimal inclusion of the communities' vulnerabilities in risk planning

The non-recognition can be characterized by the lack of acknowledgment of and support to the communities' capacities and their aspirations to continue living with the river. This non-recognition is evident through laws enacted (Law 30291[4], Ministerial Resolution 160–2015[5], Loreto Regional Disaster Risk Plan 2021–2024[6]) (see Table 2); the selection of the relocation area; and the decision and communication processes of the relocation project. In the policies mentioned, *creciente* was only framed as a constant risk that made the area uninhabitable; and did not include provisions on consultation with and participation of communities.

This was also reflected with the decision to move the communities to a buffer zone of the Allpahuayo-Mishana National Park which is a sandy forest landscape where agricultural practices are limited. The area is 13 km away from the city (1 to 1.5 h by bus from the city), so members of the family who work in the city, and the children who go to school need to travel almost 3 h per day, and pay 3–4 soles (€0.73–0.97). The relocation area was only meant to move them away from the risk without considering necessary enabling conditions to help communities live the lives they envision. The non-recognition of the communities' identities and capabilities breeds a cycle of neglect both towards the communities and the river. With this, the government can justify arguments that communities are stubborn and do not take care of the river. However, the declining state of the river is a manifestation of the contested meaning-making among the communities and the government.

> "We already see individually what we need do to survive, if we are going to ask for support from the government, there is none. They tell us it is going to come, and it does not come. This is how they practically forget us." (Storytelling session in 2023).

Juan, a fisherman from San Francisco, recalled how the government neglected their needs, and eventually forgot about them. The community members have needs during *vaciante* and *creciente* that the government does not attend to. For example, during *vaciante*, the communities expressed the need for assistance with regular waste collection to lessen health-related issues caused by piles of garbage. During *creciente*, they expressed the need for stable access to potable water and need for fumigation to lessen dengue cases.

> "There is no change, I can tell you that because the authorities do not want or do not have that capacity or interest in the people. That is what I can tell you because since I have come, just like this, there is no change in the water or the town, nothing." (Storytelling session in 2023).

Paula, a mother from San Francisco, emphasized the government's lack of interest to work with their communities. This continuous neglect is reflected from people's stories, especially during droughts and floods when the communities grapple with impacts, with no support from the government.

Discussion

In this section, we reflect on how injustices have become lived experiences in Bajo Belén, and how non-recognition of the communities' capabilities lead to non-inclusive procedures, and unequal distribution of blame and responsibilities. Non-recognition often legitimizes exclusionary and technocratic development models that disrupt community life, such as forced relocations, flood control megaprojects, and pollution-intensive infrastructure (Boelens 2015; Mikulewicz 2024; Young 1990). Living with *vaciante* and *creciente* is a meaningful practice through which identities, livelihoods, and freedoms are constituted. When these lived relationships are ignored, whether through relocation or rigid governance regimes, capabilities are eroded, and environmental injustice is reinforced (Boelens 2022; Schlosberg and Carruthers 2010).

[4] Law 30291: Law declaring the relocation of the population of the lower zone of the District of Belén, Province of Maynas, Department of Loreto to be an emergency and of public necessity.

[5] Ministerial Resolution 160–2015: The delimitation of the Lower Zone of the District of Belén, Province of Maynas, Department of Loreto.

[6] Loreto Regional Disaster Risk Plan 2021–2024: Identifies measures, programs, activities and projects to eliminate or reduce existing disaster risk conditions.

Toward a braided understanding of capacities and injustices

This discussion brings together three conceptual strands—living with river rhythmicity, the Capabilities Approach (CA), and Environmental Justice (EJ)—to unpack the lived experiences of communities in Bajo Belén, and the injustices they encounter. Rather than viewing droughts and floods only as physical hazards, the communities' stories show that these are events braided into their everyday lived experiences that both shape and are shaped by the rhythms of the river (Linton and Budds 2014). These rhythms structure the temporalities of livelihood, mobility, and well-being (Jackson et al. 2022; Krause and Harris 2021a; Strang 2020). However, when state interventions only rely on technocratic, universalist framings of risk, they erase the nuanced relationships through which communities live with the river and sustain their ways of life (Boelens 2022; Fals Borda 2015).

The prevailing siloed approach to risk identification—where policy frameworks focus almost exclusively on flood hazards—reduces the complexity of living with river rhythmicity to a simplistic binary. Such framing neglects the dynamic and cyclical nature of human–river relationships, instead casting river fluctuations as either negative or manageable events to be controlled. In contrast, the narratives shared by community members reveal that living with the river entails a nuanced, continuous engagement with its rhythms (Astolfo et al. 2024; Coffman 2021; Gorenstein 2018, 2021; Langill and Abizaid 2020). This implies that understanding how *vaciante* and *creciente* can turn into extreme drought and flood does not only depend on the physical characterizations of the event; but also with the different characteristics of the community. Community members in Bajo Belén who depend only on one livelihood source might perceive *vaciante* and *creciente* differently, compared to members who are able to switch between multiple livelihood sources. Situated understanding of hydrosocial relations can help make policy processes and decision-making more attuned to the needs of the communities, while also taking into consideration how extreme events can impact different sectors of riverine life.

From a Capabilities Approach perspective, community well-being should be assessed by the real freedoms and opportunities individuals have to pursue lives they value, including their ability to adapt to the river's rhythmicity (Nussbaum 2011; Sen 1999). In Bajo Belén, residents highlighted that living by the river allows them to engage in fishing, transport, and proximity to both nature and the city—activities that reflect forms of agency and place-based identity. As Chann et al. (2024) and Schlosberg (2012) argue, governance frameworks that fail to recognize localized knowledge and contextual values risk reinforcing marginalization rather than reducing vulnerability. When interventions such as relocation are implemented without attention to these situated capabilities, they sever people's relational ties to land, water, and each other; thus undermining the freedoms necessary to adapt and flourish (Mikulewicz 2024).

Environmental justice: recognition, procedure, and distribution

Environmental justice provides a lens to examine how these capability losses are embedded in broader structures of injustice. Recognitional justice is violated when riverine ways of life are portrayed as irrational or irresponsible. In the case of Bajo Belén, the government's framing of the community as vulnerable, dependent, or at risk justifies interventions like relocation, while failing to recognize the socio-environmental knowledge and riverine practices embedded in these amphibian lifestyles (Schlosberg and Collins 2014). This logic of intervention was particularly evident in the selection of the relocation site, which imposed an unfamiliar and unsuitable environment that disregarded the communities' existing livelihood strategies, cultural values, and aspirations. As Boelens (2022) and Roca-Servat and Botero-Mesa (2019) highlight, such framing reinforces hydrosocial exclusions by delegitimizing alternative relationships with the river that do not align with state-centric control paradigms.

The second pillar, procedural justice, is similarly undermined when communities are excluded from meaningful participation in decisions that affect their futures. Community members reported that relocation efforts in Bajo Belén were marked by lack of consultation, coercion, and even intimidation by state actors (Desmaison et al. 2018; Gorenstein 2021). This reflects a broader failure to uphold inclusive governance processes. When policies are top-down and technocratic, they reproduce a form of environmental authoritarianism that blames communities for being "uncooperative" while excluding them from co-producing viable alternatives (Adger 2003; Coffman 2021; Pellow 2018).

The third pillar, distributive justice, is evident in how environmental responsibilities are allocated without adequate support. Residents are often expected to maintain or clean river areas despite having limited access to resources or state services. Meanwhile, urban drainage and waste systems contribute to river contamination without accountability (Claassen 2016; Scott and Smith 2017). These unequal burdens become particularly acute during droughts, when concentrated pollutants exacerbate health risks such as malaria, dengue, and diarrhea.

Lived injustices, rhythmic knowledge, and policy implications

Taken together, these expose embodied, lived, and felt injustices along the Itaya River. Community members describe a growing sense of abandonment, particularly during times of environmental stress when government support is inconsistent or coercive. This points to the urgent need for frameworks and policies that are capable of recognizing the plural ways of life in riverine spaces. In cities like Iquitos, where urban planning privileges central zones and neglects peri-urban settlements like Bajo Belén, we see a continuation of hydrosocial marginalization (Boelens 2015; Desmaison et al. 2018; Estrada et al. 2018; Astolfo et al. 2024). This can be braided through allowing for genuine participatory and inclusive decision-making processes that recognize what riverine communities aspire for, and how they can also work together with local governments to develop local markers and situated thresholds for droughts and floods.

A braided approach enables us to see how the river's rhythmicity is not merely background context but central to shaping what is possible, what is valued, and what is just. It also helps us understand how recognition, participation, and distribution are intertwined in the ability of communities to live well with the river.

Conclusion

In Bajo Belén, Iquitos City, Perú, complex hydrosocial realities arise. We use a braided approach to link three strands: living with river rhythmicity, Capabilities Approach, and Environmental Justice. Braiding these frames helped us make visible the capabilities, aspirations, and constraints of community members that are made invisible in the dominant discourse of risk about the area. In this study, we presented stories of injustices that flow along the river. We used a storytelling approach as a grounded method to elicit complex hydrosocial relations. We explored the questions (1) How are droughts and floods experienced by the community; (2) What capabilities do communities develop by living with Itaya River; and (3) How do the emerging narratives of living with rhythmicity influence the forms of environmental injustices in the area?

Their stories reveal that experiences of extreme events such as droughts and floods are shaped by how these events constrain their capabilities to sustain livelihoods and daily activities. Through storytelling sessions, we constructed a memory timeline of major droughts (2002, 2004, 2008, 2014, 2016, 2019, and 2023) and floods (1995, 2012, and 2015). While communities are accustomed to living with river fluctuations, these events become extreme when they disrupt key capabilities. Despite the challenges, the river enables communities to adapt their livelihoods, access markets and services, and maintain a sense of identity grounded in riverine life. These findings suggest the need for further research into how intra-community differences shape perceptions and practices during extreme droughts and floods.

As hydrosocial relationships deepen and become increasingly strained by extremes such as droughts and floods, sustainable responses must move beyond solutions such as forced relocation. Instead, they must be rooted in an ethic of care that acknowledges the legitimacy of amphibian ways of living, situated capabilities of riverine communities, and the socio-environmental relationships that sustain them. Addressing risk and injustice in this context requires engaging meaningfully with communities to co-produce knowledge, practices, and pathways toward futures in which both people and rivers can thrive.

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