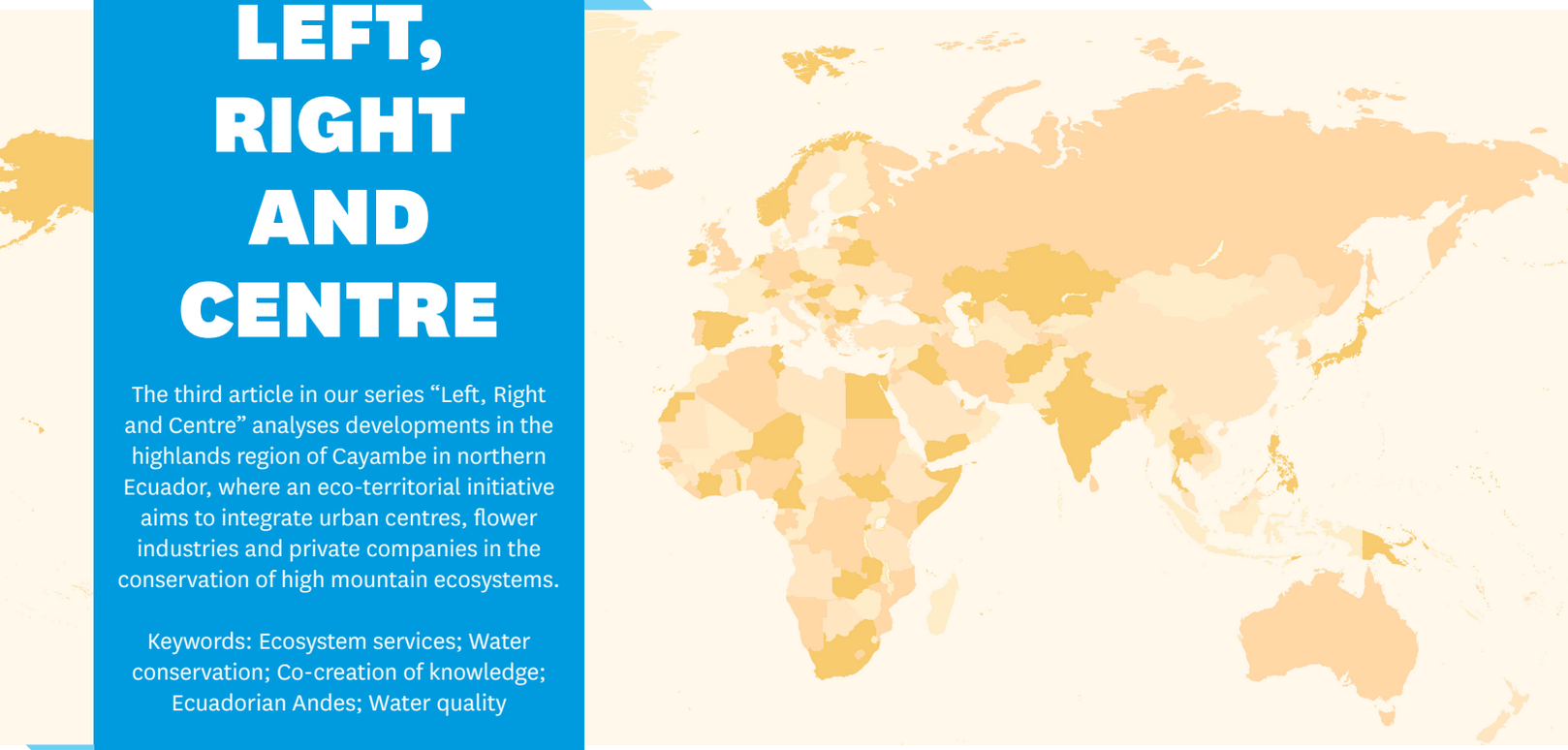
LEFT, RIGHT AND CENTRE

The third article in our series "Left, Right and Centre" analyses developments in the highlands region of Cayambe in northern Ecuador, where an eco-territorial initiative aims to integrate urban centres, flower industries and private companies in the conservation of high mountain ecosystems.

Keywords: Ecosystem services; Water conservation; Co-creation of knowledge; Ecuadorian Andes; Water quality



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KNOWLEDGE CO-PRODUCTION, ECOSYSTEM SERVICES AND WATER CONSERVATION: NEGOTIATING THE PLURINATIONAL WATER FUND IN THE ECUADORIAN HIGHLANDS

by Dr Emilie Dupuits, Dr Cecilia Puertas and Prof Jörg Balsiger

1. Teaser

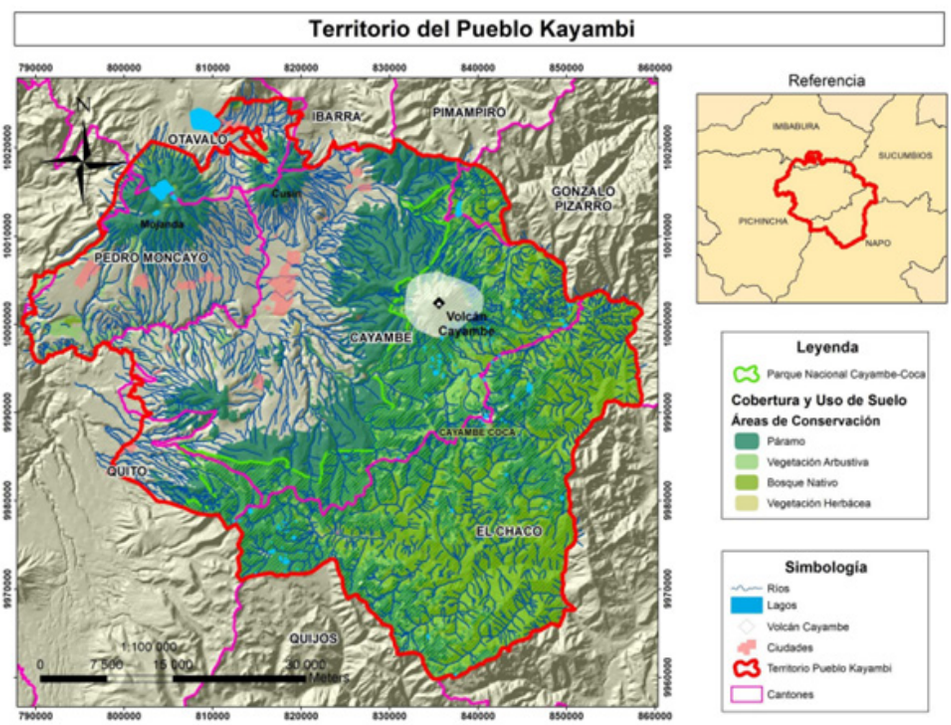
This policy brief analyses recent developments in the highlands region of Cayambe in northern Ecuador, where the Confederation of the Kayambi People has proposed the creation of the Plurinational Water Fund. This eco-territorial initiative aims to integrate urban centres, flower industries and private companies in the conservation of high mountain ecosystems, known as páramos, and to redistribute benefits to support the social development of indigenous communities and community resilience. The mechanism illustrates the local adaptation of global payment for ecosystem services programs, but also the possible tensions and necessary negotiations that may arise. The transdisciplinary analysis combines semi-structured interviews with leaders from the Confederation of the Kayambi People, the Institute of Ecology and Development of Cayambe (IEDECA) and the local government of Cayambe; a survey of local perceptions of ecosystem services and water justice; and water quality measurements from two climatic seasons. We argue that the co-production of knowledge on water conservation between indigenous communities, local and national governments and private companies, within the framework of the creation of the Plurinational Water Fund, is the result of the negotiation of contested worldviews. The analysis drawn in this policy brief reveals that while some water values can be co-produced and negotiated, other ones remain in tension and resistance, complicating the construction and approval of the Plurinational Water Fund in the Kayambi territory.

In order to move forward with currently paralyzed negotiations of the Fund, four sets of recommendations are made: 1) For their community-based initiative of a Water Reciprocity to be accepted and implemented, indigenous communities could negotiate with public and private actors, and look for an integration of their local knowledge and practices with the technoscientific knowledge produced by more powerful actors. 2) The actors holding power in decision-making structures, being the municipal and central government as well as the private sector, should facilitate the implementation of participatory processes and equity principles when negotiating the modalities of execution of the Plurinational Water Fund. 3) The information produced by indigenous communities and the knowledge they hold on to their territory and water sources should be considered as legitimate as the technoscientific data produced and asked by municipal authorities and private companies. 4) When scaling-up community-based initiatives on water conservation, key values on water and ecosystem services such as reciprocity and solidarity should not be abandoned or side-lined to the benefit of others..

2. Introduction

In 2018, the ex-National Secretary of Water (SENAGUA) officially established the Water Protection Area (APH, *Área de Protección Hídrica*) of the Kayambi territory (Figure 1). It has a total area of 9,701.93 ha and benefits four communes, three development committees and indirectly all the inhabitants of the Cayambe canton. The APH is made up of *páramo* areas on the border with the Cayambe-Coca National Park, which makes it a key connectivity corridor and buffer zone. The demand to establish the APH Kayambi was initially made based on the constitutional rights of indigenous jurisprudence and the communities' knowledge of their territory. However, local leaders denounced the reduction of the territory integrated into the APH, mainly including watersheds, which does not reflect the integral vision of the territory from indigenous communities. Some leaders have even called for the repeal of the APH due to political tensions and mistrust.

Figure 1: Kayambi people's territory (Source: Kayambi People's Confederation)



In complement of the establishment of the APH and with the objective to better conserve water resources in the area, the Kayambi People's Confederation, together with a technical committee made up of the Kawsay Foundation, IEDECA and the municipal government of Cayambe, started to build the Plurinational Water Fund in 2018. This mechanism specifically aims at redistributing the financial benefits obtained through the fund for the consolidation of indigenous communities' organisational capacities and reciprocity. Socio-cultural reciprocity is a fundamental and comprehensive social value of the Plurinational Water Fund initiative that encompasses the priority given to monetary and economic approach of water funds usually promoted by public-private alliances for urban centres. Indeed, prior to settling on the name Plurinational Water Fund, the Kayambi peoples' Confederation proposed a Water Reciprocity mechanism that would embody the collective identity and solidarity underlying water conservation practices in the territory.

In this policy brief, we aim to examine how the absence of effective local participation and multilevel coordination undermines the adoption of the Plurinational Water Fund. The objective is to uncover the processes of co-creation, negotiation and resistance between knowledge around ecosystem services and water justice at the local scale.

3. Analysing water conservation as knowledge co-production

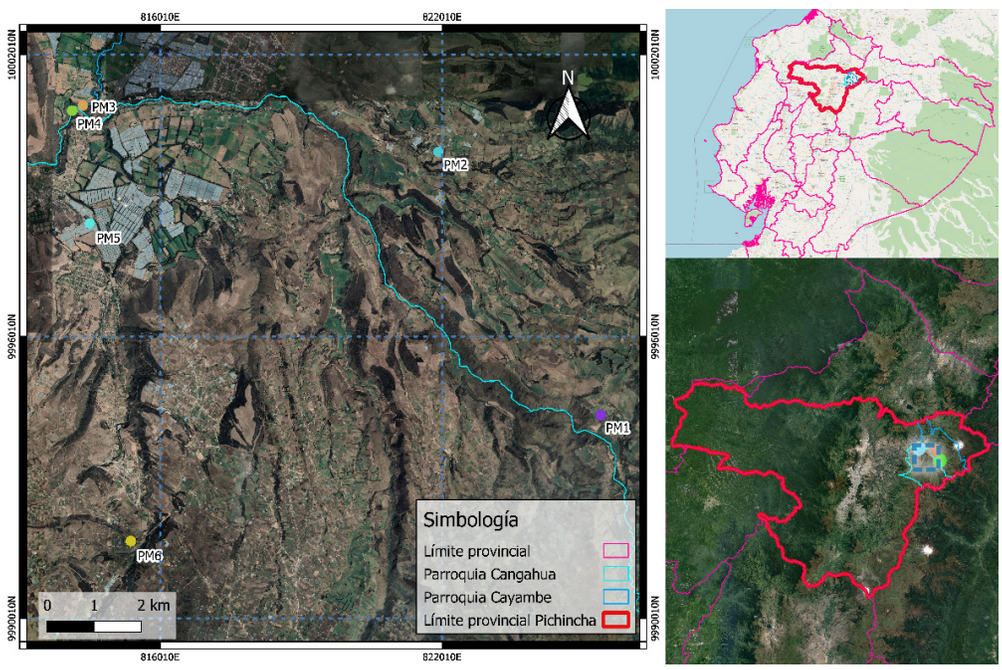
In order to untangle the political dynamics and its consequences for just and inclusive water conservation, scholars have increasingly turned to analyse the interactions between different forms of knowledge from a political ecology perspective, through the notion of environmental knowledge politics (Horowitz, 2015; Foyer and Dumoulin, 2017; Ulloa, 2019; Boelens et al., 2019; Ulloa et al., 2020). Local environmental knowledge, sometimes called traditional indigenous or ecological knowledge, refers to a "cumulative body of knowledge, practice and belief, which evolves through adaptive processes and is transmitted from generation to generation by cultural transmission, about the relationship of living beings (including humans) with each other and with their environment" (Berkes, 2012, p. 7).

These authors point to the need to go beyond the dichotomous views that oppose expert and local knowledge, in order to highlight their strategic encounters, political use and dynamic intertwining, within the framework of unequal power structures (Robbins, 2003; Li, 2013). On the one hand, indigenous and grassroots movements can strategically use scientific and expert knowledge to gain credibility and support, for example through the production of community environmental monitoring (Bäckstrand, 2004; Sanchez-Vasquez, 2019). On the other hand, scientists and technical experts should also use indigenous knowledge to produce information and knowledge, for example in relation to climate science (Hernandez et al. 2022).

A transdisciplinary approach was used to help understand local perceptions of ecosystem services while providing scientific data on the reality of water pollution and conservation. To achieve this, the participation of grassroots actors and the inclusion of their experience in the research processes were crucial for co-producing relevant knowledge for society and stimulating the empowerment of marginalized actors and social learning (Fritz and Meinherz, 2020). Participatory research occurs when researchers work cooperatively or collaboratively with community members (and sometimes other external actors) involved in a problem (Trimble et al., 2014). The various actors participated in the different stages of the water quality analysis and the dissemination of results. In addition to the co-production of knowledge, this strategy also improves the conditions for addressing or solving local problems, articulating and promoting academic and local knowledge.

The La Chimba and Cangahua river basins (Figure 2) were selected during a field trip carried out in February 2021 with the help of local guides and government authorities from the municipality of Cayambe. The selection of these areas is justified by their strategic dimension regarding the priority of water production and conservation. The area's water resources are affected by the melting of the Cayambe glacier due to climate change, and the intensive use of water by the Cayambe-Pedro Moncayo irrigation canal and other hydraulic infrastructure projects. These activities among others, have altered the flow regimes of many of Earth's rivers, with negative impacts on biodiversity, water quality, and ecological processes (Palmer & Ruhi, 2019) indicating the close relationship between quantity and quality..

Figure 2: Water quality assessment points, Cayambe, Ecuador (UIDE)



4. Negotiation and resistance in water knowledge co-production dynamics

In the chemical analyses, results were shown with critical values in some sampling points, with non-compliance in parameters such as nitrites and nitrates in PM3 (Granobles River - shortly before the junction with the Guachalá river), PM4 (Guachalá River, Point of Pisque channel catchment - tunnel) and PM5 (Cangahua River - Perugachi Irrigation System). In the microbiological analyses, the point with the greatest non-compliance with regulations is PM1 (La Chimba River - Olmedo Parish); which implies that these bodies of water must be analysed and controlled in order to preserve aquatic life. Additionally, a correct treatment system must be managed if you want to use these waters to make them drinkable and suitable for human consumption.

The study area has a high diversity of macroinvertebrates (Figure 3). Ephemeroptera was the most representative order, which could be an indicative of a good condition of the water bodies sampled in the study area, since no species of Ephemeroptera can survive high levels of pollution. However, the analysis show variable water qualities. The BMWP/Col and EPT indices indicate that the water in the study area has a good quality in the rainy season, and between regular and acceptable in the dry season. The points PM3 (Río Granobles, shortly before the union with the Guachalá river) in the rainy season, and PM5 (Cangahua River - Perugachi Irrigation System) in the dry season, presented the lowest water quality values. The La Chimba river is the one with the best water quality in both seasons. In the dry season, the qualities dropped in two of the four points and in the area in general.

Figure 3: Macroinvertebrates analysis (Cecilia Puertas)

In the study area there is a large presence of agriculture, livestock and floriculture that are negatively impacting the bodies of water. In addition, some sampled points receive sewage and solid waste from urban and industrial activities in the area, which contribute to the deterioration of water quality. Therefore, it is recommended to implement greater control in both industrial and domestic liquid discharges, and solid waste, which negatively affect water quality. Additionally, wastewater treatment systems must be implemented to improve and recover the quality of aquatic life in these rivers.

The analysis drawn in this policy brief reveals that while some water values can be coproduced and negotiated, other ones remain in tension and resistance, complicating the construction and approval of the Plurinational Water Fund in the Kayambi territory (Figure 4).

Figure 4: Macroinvertebrates analysis (Cecilia Puertas)

Values derived from water services	Main actors	Knowledge resistance, negotiation and cocreation
Socio-organisational (reciprocity, territory, community development, social ties)	Kayambi Peoples' Confederation, IEDECA, Kawsay Foundation	Cocreation with the productive value; Negotiation with the technoscientific value; Resistance with the economic and politico-legal values
Productive (food security and sovereignty)	Peasant and indigenous communities, parish governments	Cocreation with the socio-organisational value
Technoscientific (information production)	Municipal government, drinking water public firm	Cocreation with the productive, economic and politico-legal values; Negotiation with the socio-organisational value
Economic (technology, water flows)	Multinational companies, flower industries, urban centres	Cocreation with the productive, technoscientific and politico-legal values; Resistance with the socio-organisational value
Politico-legal (administrative)	Central State (MAATE, SNAP)	Cocreation with the productive, technoscientific and economic values; Resistance with the socio-organisational value

The analysis drawn in this policy brief reveals that while some water values can be coproduced and negotiated, other ones remain in tension and resistance, complicating the construction and approval of the Plurinational Water Fund in the Kayambi territory (Figure 4).

Two values that are cocreated are the socio-organisational value defended by indigenous peoples and the productive value promoted by local governments in the area. The objective of the Plurinational Water Fund is to promote productive alternatives for local and indigenous communities. For example, to ensure the conservation of páramos and watersheds, local and indigenous communities ask for economic alternatives in the lower parts of the water basin to ensure incomes and local development.

"We give an environmental and cultural value to water, not an economic value. Water is also the basis for food production, sovereignty and security, with agroecological practices" (President of the local government of Cangahua).

Other values are inserted in more complex processes of coproduction, negotiation and resistance depending on interactions between actors and the different phases of the construction of the Water Fund. During a fieldtrip to the páramo of Nukanchik Urku in Cangahua, the local guardians of the páramos, known as Urku kamas, explained that there is a cultural value of water linked to reciprocity and the socio-organisational capacities of the Kayambi people (Figure 5). Reciprocity is one of the central values in the reproduction of community organisation and water conservation in the Andean páramo (Manosalvas et al. 2021). At the same time, these values create dynamics of negotiation or resistance with the technoscientific, economic and politico-legal values of environmental services mainly defended by the local municipality, the private companies and the central State.

"There is a territorial vision that goes beyond watersheds and basins, it is more a socio-organisational vision" (Technician from IEDECA).

There is a dynamic of coproduction and negotiation between the socio-organisational and technoscientific values, which materialises in the adoption of information production practices based on scientific data by the Kayambi people and non-governmental actors that support the communities in defence of the Plurinational Water Fund. This translates, for example, into the organization of learning workshops by NGOs, such as CARE Ecuador, aimed at municipal technicians and the Kayambi people. This type of collaboration is designed to provide water studies that are considered legitimate by the municipal government and private actors.

Figure 5: Fieldtrip in the community Paramo of Nukanchik Urku with the International University of Ecuador and the University of Geneva (Lucia Galarza)

In the processes of coproduction and negotiation, intermediary actors play a fundamental role in fostering dialogue among conflicting positions and values. For example, the municipality of Cayambe ensures an intermediary role in the production of reliable information on water provision and conservation in the area. It brings support to communities in the production of technical information that can be considered legitimate by the potential funders of the Plurinational Water Fund. Therefore, technoscientific and economic values on water are complementing each other through the collaboration between the municipal government, private companies and the central State. Another important intermediary is the Kayambi People's Confederation which brings a common position and voice from the indigenous communities of the territory and allows for a more balanced power distribution among actors.

"The information is only at a diagnostic level and a complete analysis of how the fund should function and operate is missing" (Environment Department, Cayambe Municipality).

However, the socio-organisational component and the reciprocity value tend to be marginalised in pre-feasibility studies, management models and financial plans, which contributes to rejection and mistrust on the part of the Kayambi people. In addition, although discussions have begun with the private sector to evaluate the financing modalities of the Fund, there are still great tensions between the socio-organisational and economic values promoted by traditionally antagonistic actors.

"The flower growers and businessmen of the city consider the water fund as a way to ensure the flow of water" (Technician from IEDECA).

"The communities have a different worldview of what is meant by taking care of the páramos. It is different from the vision promoted by SENAGUA, which considers APHs as an administrative act based on regulations" (Technician from IEDECA).

Finally, one key source of tensions is the decision-making structure of the Water Fund. While communities of the Kayambi Confederation reclaim their legitimacy to manage the Fund independently to respond to their own interests, private companies and public authorities want to decide which projects will be funded. Additionally, the politico-legal value defended by the central State, based on the conservation of specific and isolated watersheds, does not match with the holistic and integrated interpretation of territorial development by indigenous peoples in the area.

5. Recommendations

Based on the analysis of the Water Fund negotiation in this policy brief, we draw key recommendations that we consider necessary for ensuring knowledge dialogue around ecosystem services and water conservation and justice. The case study contributes to a better theoretical and policy-relevant understanding of knowledge politics by highlighting the interface between coproduction and resistance in the politics of environmental knowledge, ecosystem services and water conservation (Horowitz 2015; Ulloa 2019; Boelens et al. 2019; Ulloa et al. 2020).

1. For their community-based initiative of a Water Reciprocity to be accepted and implemented, indigenous communities could negotiate with public and private actors, and look for an integration of their local knowledge and practices with technoscientific knowledge produced by more powerful actors.
2. The actors holding power in decision-making structures, being the municipal and central government as well as the private sector, should facilitate the implementation of participatory

processes and equity principles when negotiating the modalities of execution of the Plurinational Water Fund.

3. The information produced by indigenous communities and the knowledge they hold on to their territory and water sources should be considered as legitimate as the technoscientific data produced and asked by municipal authorities and private companies.

4. When scaling-up community-based initiatives on water conservation, key values on water and ecosystem services such as reciprocity and solidarity should not be abandoned or side-lined to the benefit of others.

The adoption of a participatory approach has been both a benefit and a challenge for the design and implementation of this research. On the one hand, the early inclusion of the main actors involved in the construction and development of the research proposal has allowed a greater acceptance of the project and easier access to the study sites and the necessary information. Moreover, concrete needs of local communities have been considered in carrying out the research, for example regarding the specific areas where water conservation was to be analysed. On the other hand, in some cases there continues to be a certain degree of distrust from local communities in the processes developed in collaboration with municipal actors, which makes it difficult for the participatory construction of the Plurinational Water Fund. This research opens new perspectives for future collaborations around environmental and territorial education projects between academic and community actors, contributing to cocreation processes for water conservation.

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