ALTERNAUTAS

(Re)Searching Development: The Abya Yala Chapter

Vol.9 – Issue 2 [December 2022]

Knowledge politics around water, development and ecosystem services in Ecuador: creative encounters and resistances

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Accepted: 08 August 2022 / Published online: 05 September 2022

How to cite:

Dupuits, E. & Mancilla Garcia, M. (2022), Knowledge politics around water, development and ecosystem services in Ecuador: creative encounters and resistances. *Alternautas,* , 9(2), 175-200. DOI: https://doi.org/10.31273/an.v9i2.1149

University of Warwick Press
http://www.alternautas.net

ISSN - 2057-4924

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Knowledge politics around water, development and ecosystem services in Ecuador: creative encounters and resistances

Abstract. A vast amount of literature has investigated the conflicts between different ways of conceiving development in Latin America. Particular attention has been paid to power differentials among knowledge systems when it comes to decision-making, values and practices over water resources. The Ecosystem Services framework is often analysed as an example of technical and scientific tool typically produced by multilateral organisations, cooperation agencies and international experts. They are presented as discourses competing with environmental and water justice claims, or local and traditional knowledge, although they can sometimes support them and/or try to incorporate them. The question that arises is how are different water development knowledge coproduced or resisted at the crossroads between the global and local scales. This paper aims to respond to this research question examining the efforts of the Kayambi People's Confederation to create, negotiate and scale-up a water conservation funding scheme based on reciprocity and territorial values in the Ecuadorian highlands. The analysis is based on a participatory research methods approach, including a social survey, semi-structured interviews and local immersion. This contribution highlights the creative engagement of diverse actors in designing, cocreating and diffusing a diversity of perspectives on development. It challenges the frontiers between technoscientific and grassroots knowledge by paying attention to the situated practices of different actors. It argues that the coproduction of water and development knowledge between various actors is the result of negotiating, cocreating and resisting values possibly in tension.

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Keywords: Development; Knowledge politics; Water justice; Coproduction; Ecosystem services; Ecuador

Resumen. Una vasta literatura ha investigado los conflictos entre diferentes formas de concebir el desarrollo en América Latina. Se ha prestado especial atención a las diferencias de poder entre los sistemas de conocimiento cuando se trata de la toma de decisiones, valores y prácticas sobre los recursos hídricos. El marco de Servicios Ecosistémicos a menudo se analiza como un ejemplo de herramienta técnica y científica producidamuchas vecespor organizaciones multilaterales, agencias de cooperación y expertos internacionales. Se presentan como discursos que compiten con los reclamos de justicia ambiental y del agua, o con el conocimiento local y tradicional, aunque en ocasiones pueden apoyarlos y/o tratar de incorporarlos. La pregunta que surge escómo se coproducen o resisten diferentes conocimientos sobre el desarrollo y el agua en la encrucijada entre las escalas global y local. Este articulotiene como objetivo responder a esta pregunta de investigación examinando los esfuerzos de la Confederación del Pueblo Kayambi para crear, negociar y ampliar un esquema de financiamiento para la conservación del agua basado en la reciprocidad y los valores territoriales en el páramode Ecuador. El análisis se basa en un enfoque de métodos de investigación participativa, que incluye una encuesta social, entrevistas semiestructuradas y lainmersión local. Esta contribución destaca el compromiso creativo de diversos actores en el diseño, cocreación y difusión de una diversidad de perspectivas sobre el desarrollo. Desafía las fronteras entre el conocimiento tecnocientífico y el de base atendiendo a las prácticas situadas de diferentes actores. Argumenta que la coproducción de conocimiento sobre agua y desarrollo entre varios actores es el resultado de negociar, cocrear y resistir valores posiblemente en tensión.

Palabras clave: Desarrollo; Política de los conocimientos; Justicia hídrica; Coproducción; Servicios ecosistémicos; Ecuador

Introduction

On May 22, 2021, the central topic of the World Water Day was "Valuing water"[3], showing the importance of recognising the various forms of knowledge and practices around water resources, including productive, socioeconomic and cultural values based on ecosystems, infrastructure or services. Water resources are the cornerstone of Payment programs for Ecosystem Services through the implementation of conservation funds at the local or regional level, and the promotion of integrated watershed management practices (Porras et al. 2013).

[3] United Nations World Water Development Report 2021, "Valuing water", UN-Water, UNESCO.

Ecosystem Services (ES) programs are often designed in the global North and supported with scientific and technical knowledge. When implemented in the field, these programs are received by a set of heterogeneous actors – from local communities to public officers with technical expertise.

Some authors argue that these new arrangements generate tensions between actors with conflicting knowledge and practices that conceive water as a source of life, a common good or an economic resource (Swyngedouw 2009; Vanhulst & Beling 2014; Boelens et al. 2016). Global and regional initiatives for Ecosystem Services conservation typically promote decontextualised understandings of water, which the literature has associated with a commodification of water territories, clashes with local water rights, as well as a depoliticisation of grassroots demands and identities (Boelens et al. 2014; Dupuits et al. 2020). As a response to these issues, water justice movements seek to rethink Ecosystem Services from a more politicised approach that integrates the diversity of actors and interests involved (Boelens et al. 2016; Manosalvas et al. 2021). These political demands revolve around the concept of water justice, which aims to shed light on the unequal distribution of benefits, access and control of water, as well as tensions around water rights, knowledge and cultural practices (Boelens et al. 2018). Water justice movements tend to interpret the global agenda on Ecosystem Services more from an intersectoral and integrated perspective, compared to the deterritorialised and functional Ecosystem Services schemes.

Within this context, the article aims at answering the following research question: How are different water development knowledges coproduced or resisted at the crossroads between the global and local scales? To do so, it sets its focus on the Ecuadorian case.

In Ecuador, the Organic Law on the Use and Exploitation of Water Resources (LORHUAA), approved in 2014, recognises the role of community organisations in the management and conservation of water resources and services. In this framework, the former National Secretariat for Water (SENAGUA) has been supporting the creation of water protection areas (APH). The Law establishes in article 78 that “water protection areas are the territories where there are hydrographic basins declared of public interest for their maintenance, conservation and protection, which supply human consumption or guarantee food sovereignty. They will be part of the National System of Protected Areas (SNAP)”. The objective of the former SENAGUA, now integrated into the Ministry of Environment, Water and Ecological Transition (MAATE), is to declare APH in the basins threatened by agrobusiness and mining activities.

Part of the Kayambi territory was officially declared as an APH by SENAGUA in 2018. The APH, with a total area of 9,701.93 ha, benefits the communities of El Hato, Huacho Huacho, Monjas Bajo, Asociación Monjas Bajo, Monjas Alto, Pesillo, Cariacu, La Chimba, Puliza, Santo Domingo, Paquiestancia and Ñukanchik Urku, and indirectly all the inhabitants of the Cayambe canton. It is made up of high mountain ecosystems, known as *paramos*, and is located at the border with the protected areas of the Cayambe-Coca National Park, which makes it a key connectivity corridor and buffer zone. The declaration of the APH in the Kayambi territory was supposedly made based on the constitutional rights of indigenous peoples and their knowledge about water resources in the area. However, local leaders denounced the transformation of the initial proposal into an administrative tool lacking the political and territorial demands of the Kayambi people. Some leaders have even called for the repeal of the APH due to political tensions and mistrust.

In the context of the declaration of the APH and the attempts to better conserve water resources in the area, the Kayambi People's Confederation, together with a technical committee made up of the Kawsay Foundation, the Institute of Ecology and Development of Cayambe (IEDECA) and the local government of Cayambe (GADIP), launched the Plurinational Water Fund in 2018. This mechanism illustrates the local adaptation of global payment for ecosystem services programs (Rodary et al. 2016), but also the possible tensions and necessary negotiations that can arise during these processes. This territorial proposal aims to integrate urban centres, flower industries and multinational firms such as Nestlé and Coca-Cola in the conservation of *paramo* ecosystems and water resources. It specifically aims at redistributing the financial benefits obtained through the fund for the consolidation of indigenous communities' organisational capacities and reciprocity. Reciprocity is a fundamental social value of the Kayambi Peoples' territorial initiative, as it opposes to the monetary and economic approach of water funds usually promoted by public-private alliances for urban centres. Before being called the Plurinational Water Fund, the Kayambi peoples were initially proposing a Water Reciprocity mechanism translating the collective identity and solidarity behind water conservation practices in the territory.

The results presented in this article are based on a research project developed between the International University of Ecuador (UIDE) and the University of Geneva (UNIGE), and financed by the University of St Gallen, Switzerland, for the period 2020-2022. In the context of this project, the main author conducted twelve semi-structured interviews, as well as various field trips, with key leaders from the Kayambi People's Confederation, IEDECA and GADIP Cayambe. A survey was also conducted towards 20 respondents to analyse local perceptions of Ecosystem Services and water justice.

This article highlights the creative engagement of diverse actors in designing, cocreating and disseminating a plurality of water conservation knowledge forms at the crossroads of diverse knowledge traditions. It challenges the borders between technoscientific and local knowledge, focusing on the situated practices of different actors. It is argued that the coproduction of knowledge on water conservation between indigenous communities, parish and municipal governments, the national government and private companies, within the framework of the creation and negotiation of the Plurinational Water Fund, is the result of a sustained negotiation among actors holding different, sometimes opposite, values. We will see how these actors move forward with tensions, situating our study beyond the analytical framework of oppression and resistance.

Recent debates on Ecosystem Services and water knowledge

In recent years, we have seen an increase of Payment for Ecosystem Services programs and of the literature that has evaluated these initiatives (Matulis 2014; Andersson et al. 2015; Bohan 2016; Crouzat et al. 2016; Dee et al. 2017; Jericó-Daminello et al. 2021). In the case of water resources, the multiplication of Payment for Watershed and Hydrologic Ecosystem Services programs has led to the implementation of local and regional water conservation funds (Southgate & Wunder 2009; Martin-Ortega et al. 2013). These funds have come to integrate the promotion of economic and market-based practices (Porras et al. 2013). At the Dublin International Conference on Water and the Environment in 1997, one of the four principles approved involved defining water as an economic good. Today, the United Nations Sustainable Development Goals, particularly through SDG6 "Clean Water and Sanitation", is mainly articulated around an approach of 'global governance through goals', which tends to be associated with scientific and technical knowledge (Kanie et al. 2017).

The concept of Ecosystem Services originally aimed at drawing attention to the importance of ecosystems in providing goods and services to society (Costanza 2000). The concept of ES as fuelled much debate that has been particularly animated over two aspects: the Payment for Ecosystem Services (PES) and the proposal that "Ecosystem Services" be abandoned for "Nature's Contribution to People" (Díaz et al. 2018). We will focus here on the rationale underpinning the debate on PES as it is of particular importance for our argument. Indeed, while the original intention of valuating monetarily ES was to raise awareness on the role of ecosystems in supporting and sustaining all economic activities, this has been strongly criticised as a pathway to introduce neoliberal perspectives on nature in the management of ecosystems. Some authors adopt a

more nuanced perspective, showing the complexities of PES in real life, where they come often more as a subsidy or support from governments to communities than anything else (Hahn et al. 2015). Besides accusations of neoliberalism, the framework of ES, as presented for example in the Millennium Ecosystem Assessment, is denounced for disregarding cultural and traditional values (Norgaard 2010), something that was incorporated into the work of the IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (Pascual et al. 2017). This did not put an end to the debate, as the question that subsequently arose was whether values were understood in their own logic, or rather instrumentalised (West et al. 2019; Chan, Gould, and Pascual 2018). As part of this lively debate, some authors have suggested diverse approaches to rethinking ES through their coproduction between biophysical and social dimensions, and their coconstitution with humans and non-humans (Schaich et al. 2010; Himes and Muraca 2018; Budds & Zwarteveen 2020).

Various scholars have studied the emergence of multi-stakeholder networks and regional governance institutions in the field of water conservation focusing on negotiation as an approach to make sense of the relations among diverse actors (Hoogesteger 2012; Siegel 2016; Dupuits 2021). Green development projects and alliances are emerging in Latin America as tools to conserve water resources while promoting inclusive development within the frame of the SDGs. This is the case for example of the Latin American Alliance of Water Conservation Funds, created in 2011 by the Inter-American Development Bank (IDB), FEMSA Foundation, the Global Environment Facility (GEF), the Climate Protection Initiative (IKI) and The Nature Conservancy (TNC).

However, some scholars have argued that these new arrangements have caused tensions between actors holding opposite perspectives on the ontology of water (Bonelli et al. 2016; Dupuits et al. 2020). Indeed, governing water is radically different if one conceived of water as a source of life associated with cultural values (Orlove and Caton 2010), a common good or an economic resource. Global and regional ES conservation initiatives tend to produce a ‘commodification’ of water territories and clashes with local water rights, as well as a ‘depoliticisation’ process (Boelens et al. 2014).

Water justice movements have aimed at politicising water governance schemes, and in particular ES programmes, to include a diversity of understandings in the crafting and implementation of these programmes (Boelens et al. 2016; Manosalvas et al. 2021). Through the inclusion of diverse voices, the objective of these movements is to shed light on how dominant understandings of water that exclude local perspectives and concerns () reproduce the unequal distribution of benefits, access and control over water, and perpetuate tensions

around water rights, knowledge and cultural practices (Lansing 1987; Mitchell 2002; Boelens et al. 2018; Mancilla García and Bodin 2019b).

Conceptual framework: development, knowledge politics and coproduction in Latin America

The knowledge politics of development have been widely studied by scholars working on the Latin American continent (Acosta 2011; Vanhulst & Beling 2014; Gudynas 2015; Svampa 2015). This work has highlighted the conflicts between the hegemonic understanding of development as economic development, inherited from Western modernity, and the attempts to move towards a "post-development" world, insisting on decoloniality and territorial alternatives (Fals Borda 2009; Escobar 2018, 2019). However, the local appropriation of globally produced knowledge, and the tensions it produces among actors embedded in particular territories need to be further studied (Dupuits et al. 2020). The objective of this paper is to reflect on the processes of negotiation, adaptation and coproduction that emerge in the encounter of different knowledge traditions. To do so, it focuses on the interplay of knowledge produced at the global and local scales, paying particular attention to the power dynamics of knowledge (co)production at the science-grassroots interface (Vadrot 2016; Bréthaut et al. 2019).

The interactions between various forms of knowledge have been studied from a political ecology perspective, through the notion of environmental knowledge politics (Horowitz 2015; Foyer & Dumoulin 2017; Ulloa 2019; Boelens et al. 2019; Ulloa et al. 2020). Local environmental knowledge – or alternatively indigenous knowledge or traditional ecological knowledge – refers to a "cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes 2012: 7). Additionally, the ontological politics related to environmental knowledge production have also been studied, calling attention to the importance and visibility of more-than-humans, and their many worlds, in knowledge construction and struggles (Blaser & de la Cadena 2018; Mancilla-García & Bodin 2019a, 2019b, 2020).

The processes of knowledge (co)production and resistance are two specific dimensions of the concept of knowledge politics, leading to different forms of social interaction between actors inserted in specific scales and holding diverse interests. From a critical geography perspective, scale is defined as a social construction shaped by the representations and interactions of actors (Smith 1993;

Swyngedouw 2004). Coproduction refers to the collaboration between a diverse range of state and non-state actors to create and deliver public services (Goodwin 2019). Knowledge coproduction processes often involve increased professionalisation and the acquisition of expertise for civil society organisations, which may lead to a disconnection with local realities and diversity (Laurie et al. 2005). At the same time, knowledge coproduction can imply an increased visibility and capacity for civil society actors. This paper aims at contributing to this literature by going beyond the dynamics of collaboration and coproduction at work, and shedding light on the possible resistances that emerge in the implementation and negotiation of specific programmes that bring together actors embedded in different knowledge systems.

This paper also aims to enrich the transdisciplinary dialogue opened by some authors between political ecology and science and technology studies (STS), by focusing specifically on the concept of knowledge politics (Goldman et al. 2011; Mancilla-García 2016). More specifically, there is a need to study development knowledge politics from the science-policy interface lenses. A central area that illustrates the challenges of this interface is that of ES conservation, as previously discussed (Vadrot 2014). STS also emphasizes the science-policy interface in the coproduction of environmental knowledge, indicators, and associated discourses as well as the role of individuals, community platforms and grassroots organisations in these dynamics (Jasanoff 2004; Pedregal et al. 2015; Mancilla-García 2015; Miller & Wyborn 2020).

Our analytical perspective is that of feminist technoscience, an approach that has gained particular track in STS. Feminist technoscience focuses on invisible, marginal or excluded actors who often remain outside conventional analyses. Donna Haraway (1995) developed the concept of "situated knowledge", understood as the valorisation of localised knowledge and the understanding of science and technology from their places of enunciation and production (Haraway 1988). She invites us to go beyond the dichotomy between subject and object engendered by rational modernity and question instead that boundary, challenging the place and role of the researcher and the "researched". This perspective also seeks to analyse the processes of technoscience's domination over nature and the oppressed peoples and assume shared responsibility (Barad 2007; Haraway 1992, 2016).

Therefore, the objective of this research is to analyse the forms of knowledge valued by the different actors involved in development practices, their cross-fertilisation dynamics as well as their possible tensions. In the case of locally produced water conservation schemes, we aim to understand to what extent these schemes are an adaptation of global and regional ecosystem services knowledge, and what type of interpretations (economic, social, cultural, ecological) are valued by local actors.

Methods

This article is based on the feminist technoscience approach previously described and includes a participatory approach – i.e. an approach bringing together academic and other types of knowledge – aiming at understanding local perceptions of Ecosystem Services. To achieve this objective, the participation of local actors was part of the research process, which aimed at coproducing knowledge relevant for these actors and stimulate their empowerment (Fritz & Meinherz 2020). Participatory research occurs when researchers work collaboratively with community members (and sometimes other external actors) involved in a problem (Trimble et al. 2014). In this particular research, local members of IEDECA and the municipal government were involved in various stages as co-researchers, from the identification of water values in the area to the dissemination of the results in communities. In addition to the coproduction of knowledge, this strategy allows addressing local problems, articulating and promoting academic knowledge with local ones.

The selection of one particular case study – The Plurinational Water Fund proposed by the Kayambi Peoples' Confederation in Ecuador – is justified because of its particular socio-political dimension. The Plurinational Water Fund is a concrete example of a funding mechanism to conserve water at the local scale that emerges in opposition to the dominant monetary and economic approaches of PES promoted at the global scale by non-community actors. In this regard, it illustrates the local and territorial processes of coproduction, negotiation and resistance between various values and knowledge around water conservation programs.We have conducted semi-structured interviews and a social survey as complementary to the participatory research approach. Indeed, all the data collected is being socialised and further discussed during the research process with the key participants through individual meetings, focus groups and field trips. Qualitative data collection was conducted through the local dissemination of a short survey and the realisation of twelve semi-structured interviews with key informants[4], which aimed at understanding how they perceived the links between Ecosystem Services, water conservation and water justice in the Kayambi territory. In total, 20 people participated to the survey (through an online

[4] Key informants were selected regarding their direct involvement in the creation and/or negotiation of the Plurinational Water Fund. While we sought to have a good diversity of actors represented (local and national government, NGOs, community leaders), we could not made direct interviews with private companies due to the sensibility of the topic in the area.

document and face-to-face interactions) belonging to the municipal government, local communities, private sector and academia (see Table 1). The small size sample of the social survey is justified because of the need to spend quality time with the face-to-face respondents in the explanation and analysis of the different questions and to conduct a deep analysis of the answers. The survey consisted mainly in open-ended questions regarding local perceptions on water services in the Kayambi territory[5]. It also included a question for rating water quality in the area in a scale from 0 (bad quality) to 10 (good quality). Based on the interviews and surveys' results, we were able to build a typology of the main values attributed to water in the Kayambi territory. This was made by analysing the keywords used by the informants while referring to water resources in their daily life, working activities or conservation practices.

Category of respondents	**Social survey**	**Interviews**
Public authorities	5	5
Community actors	8	3
NGOs	2	2
Academia	5	2

Table 1. Respondents to survey and interviews.

Coproduction and resistances in the negotiation of the Plurinational water fund in the Ecuadorian highlands

In the following paragraphs, we analyse the different values attributed to water by the actors involved in the construction and negotiation of the Plurinational water fund.

On a general trend, to the question asked in the social survey on the perception of water quality (in relation to the degree of contamination and access to drinking water) in the Kayambi territory, the respondents evaluated water quality between 4 and 9, showing a general medium positive average rating.

[5] The social survey and semi-structured interviews included questions related to the main services provided by water to human development and natural ecosystems; the situation and challenges of water conservation in the area; the types of practices adopted by respondents to contribute to water conservation in the area; and the role of local communities in ensuring water conservation.

According to most of the respondents, the main sources of contamination in the area are flower plantations, the lack of wastewater treatment in communities and urban centres, and agricultural activities. Several respondents also mention the inadequate culture of preserving water and the lack of awareness in urban centres. Instead, the key role that communities play in protecting the *paramo* and preventing fires in times of drought is highlighted as good practices for conserving watersheds.

A first vision defended by community-based organisations in the area is linked to the *socio-organisational value of the territory and water*. The main organisation representing the indigenous communities of the area is the *Kayambi People's Confederation*. One of its key roles is to ensure that there is a participatory, inclusive and comprehensive development of water conservation and management proposals so that it does not affect water guardians, known as *Urku Kamas* meaning guardians of the *paramo*, who ensure the protection of watersheds on a voluntary basis. The Kayambi Peoples' Confederation has been working for two years on guidelines for the declaration of the Kayambi Water Protected Area and has been deeply involved in the negotiations around the Plurinational Water Fund. The technical consultation table on the Plurinational Water Fund is made up of the Kayambi Peoples' Confederation, the municipal government of Cayambe, IEDECA, and the Kawsay Foundation. The idea is to first define a consolidated proposal from the Confederation so that external actors (public authorities, international cooperation agencies and private companies) can further enter the negotiation. This process serves to prevent technical considerations from overriding community interests.

For the leaders of the Kayambi Peoples' Confederation, the water fund should not be considered from the perspective of environmental services. More than a classical funding scheme, the main objective is the space of reciprocity and the human factor. According to a technician from IEDECA, "there is a territorial vision that goes beyond watersheds and basins, it is more a socio-organisational vision.[6]" It does not mean a payment for water protection, but rather a payment to generate capacities in the community, research on paramos' state of conservation, mitigation of environmental damage, and restoration and recovery of wetlands areas. The president of the local government of Cangahua mentions the improvement in the conservation of the *paramos* thanks to community decisions[7]. He indicates how the *urku kamas*[8], a Quechua word that means *paramos* keepers,

[6] Interview with a technician from IEDECA, 01/02/2021, Zoom
[7] Interview with the president of the parish government of Cangahua, 05/06/2021
[8] Mojanda es custodiada por los urku kamas - El Comercio

play a key role in protecting the *paramo* on a reciprocal basis[9]. In the 9 communities that are part of Cangahua, a community member takes turns every week to control the *paramo* on a voluntary basis. The objective of the water fund is therefore the economic redistribution of the profits from the floriculturists, companies and urban centres that benefit from water to the communities and the *urku kamas* who take care of water in an honourable way.

A second vision attributed to water and territory is linked to the *productive approach towards food sovereignty and security*, which is defended by both *the communities and the government authorities at the local level*. According to the president of the local government of Cangahua, "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"[10]. In this sense, a central objective of the water fund is to support the creation of productive development programs and raise awareness among the communities, so that they do not plant native trees in watershed areas. For example, in Cangahua, the "Cangahua demonstration territory"[11] project is being developed, with the purpose of achieving the productive development of the area with a focus on rights, environmental sustainability and gender equality, supported by the Ministry of Agriculture and Livestock (MAG). The objective of the project is to diversify production with the use of agroecological practices and sustainable technologies.

A third value attributed to territory and water is related to a *technical vision of the production of information on availability and conservation of water resources*, which is mainly defended by *local government authorities*. The current mayor of Cayambe sees the management of *paramos* as a territorial strategy. The municipality seeks to promote the exercise of indigenous jurisdiction to resolve community issues, particularly the key issue of water[12]. The objective is to break with the practices of imposing regulations from the municipality without consulting the communities. As indicated by our interviewees, this was a common practice under the previous administration that inevitably generated tensions with the communities. This new approach seeks to ensure the inclusive management of *paramos* and control of the agricultural frontier[13].

However, the participants indicate that this co-management relationship does not come without tensions. One area of tension was the production of

[9] Interview with the president of the parish government of Cangahua, 05/06/2021
[10] Idem.
[11] Proyecto de Territorios Demostrativos se presenta en Cangahua, cantón Cayambe – Ministerio de Agricultura y Ganadería
[12] Interview with a technician from GADIP Cayambe, 25/01/2021, Zoom
[13] Interview with a technician from IEDECA, 05/02/2021, Zoom

information on the water resources of the area. For the director of the environment of the municipality of Cayambe, there is a lack of technical documentation that could justify the creation of the water fund and a systematisation of the areas to be conserved[14]. In addition, potential contributors to the fund need to know the projects and areas to be financed. Feasibility studies are being carried out with cartographic information and a hydrological model to identify areas with the greatest amount of water with the help of the Cayambe water company. The fund should help defining conservation and monitoring projects. The Confederation plays a key role of mediator between the communities and the municipality to carry out studies and collect information in the field. IEDECA has made plans for the management of *paramos*, but they have not landed on a budget or specific projects.

A fourth value attributed to water resources is linked to an *economic vision defended by private companies*, especially the flower industry, which joined the negotiation process to finance the water fund mechanism in the area. The water fund mechanism establishes co-responsibility between communities, municipalities and private companies, based on a public-community-private initiative and a trust[15]. To finance water conservation, the fund seeks to involve private companies and industries based in the canton, for example, the Nestlé factory, which has been granted a significant amount of water for 40 years. A proposal was made to the company offering that the Plurinational Water Fund be part of its social and environmental responsibility, for which they showed interest.

However, there is a tension between the objective of the private companies to guarantee the amount of water for their productive activity and the objective of the communities to preserve watersheds and socio-organisational capacities. Some practices are generating mistrust on the part of the communities, for example, when during an environmental round table, groups of agro-exporters proposed to support the community by giving them native plants in exchange for guaranteeing water rights for the private company[16]. Indigenous communities refused this proposal highlighting that they want to maintain autonomy on water rights for the benefit of the community and be able to adjust the amount of water depending on the availability. According to a technician from IEDECA, "we must not politicise, privatise or municipalise water management, so as not to generate conflicts of interests. The fund should remain as a plurinational initiative"[17].

[14] Interview with the director of environment, GADIP Cayambe, 08/02/2021, Zoom
[15] Interview with a technician from GADIP Cayambe, 25/01/2021, Zoom
[16] Interview with a member of IEDECA, 05/02/2021, Zoom
[17] Idem.

Now the water fund management model is in a difficult negotiation stage, leaving the process stagnant. From the perspective of the Kayambi people, a municipal fund should not be created so as not to depend on the political instability of the municipality and party interests. Nor do they want to create a trust, on which they fear to lose control as management might become very technical. The Confederation wants to form a corporation with water users through a commission where the communities would have a greater role. It is a complex process because the indigenous organisations want the fund to be exclusively community-based. However, according to the municipality, it must be understood that water is not only for the communities, but it must also be for private uses[18]. The contributors must be convinced of its usefulness and feasibility.

The latest vision of water and territory is associated with the *politico-legal approach defended by the central government*, through the former Secretary of Water (SENAGUA). This vision is framed in the relationship of historical distrust that exists between the communities and the State[19]. A member of the Aldea Foundation points out that "there is a permanent feeling of threat to the interest of Quito and the Quito Water Fund (FONAG) on the *paramos* of the area to access watersheds[20]." In addition, these tensions tend to be reinforced by the imposition of regulations and laws from the power above without adapting to local realities, organisational forms and the different values that are given to water services. The communities have a different worldview of why protecting the *paramos* from the vision promoted by SENAGUA that considers APH as an administrative act based on regulations. For the communities, conserving the *paramos* is based on the reproduction of life, the historical struggle, the conservation of ecosystem services including the life of plants and animals, and the integral dimension of the communities as part of the territory. According to a technician from the Protos Foundation, three parameters must be considered when promoting water conservation projects[21]: the community's relationship with its territory and *paramo*; the level of legitimacy and control; and the legitimacy of indigenous jurisdiction over ordinary jurisdiction.

Discussion: negotiated and resisted values around water in the Kayambi territory

The analysis drawn in this paper reveals that while some water values can be coproduced and negotiated, other ones remain in tension and resistance,

[18] Interview with an engineer from the Cayambe Municipal Firm of Drinking Water and Sewerage (EMAPAAC), Zoom, 13/06/2021
[19] Interview with the director of Protos Ecuador, 19/01/2021, Zoom
[20] Interview with the president of Fundación Aldea, Zoom, 11/06/2021
[21] Idem.

complicating the construction and approval of the Plurinational Water Fund in the Kayambi territory (see Table 2).

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

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. On the one hand, there is a cultural value of water linked to reciprocity and the socio-organisational capacities of the Kayambi people and local communities. Reciprocity is one of the central values in the reproduction of community organisation and water conservation in the Andean *páramo* (Manosalvas et al. 2021). On the other hand, these values enter into 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.

Values on 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

Table 2: Synthesis of water values and their co-creation dynamics (Authors)

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

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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 communities and non-governmental actors that support the communities in defence of the Plurinational Water Fund. This translates, for example, into the realisation of learning workshops by non-governmental organisations such as CARE Ecuador, aimed at municipal technicians and communities. This type of collaboration aims

to provide studies on the water situation in the territory that are considered legitimate by the municipal government and private actors.

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 water conservation initiative. 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.

However, the socio-organisational component and the reciprocity value tend to be marginalised when carrying out pre-feasibility studies, management models and financial plans, contributing to create 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. Moreover, one key element of tensions is the decision-making structure of the water fund. While communities reclaim their legitimacy to manage the fund independently to respond to their own interests, private companies and public authorities want to decide on 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.

Conclusion

Based on a specific case study in the Ecuadorian Andes, this article allowed us to examine the following research question: how are different water development knowledge coproduced or resisted at the crossroads between the global and local scales? Analysing the case of the Plurinational Water Fund proposed by the Kayambi Peoples' Confederation, we were able to observe how multiple local interpretations of Ecosystem Services and water conservation compete and/or interact with each other.

The analysis of the case study contributes to the literature on 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). For their community initiative to be accepted and implemented, indigenous communities need to negotiate with public and private actors, and to adapt their local knowledge and practices by integrating the technical knowledge required by more powerful actors. Moreover, the detailed analysis of this case shows that values that are apparently contradictory and mutually exclusive can co-exist and move forward together at least for a certain period (Schaich et al. 2010; Budds & Zwarteveen 2020). This is happening between the socio-organisational and productive values on water, or between technoscientific and economic values.

However, these negotiation and adaptation processes are not without generating tensions and conflicts within the community organisations themselves and towards their leaders. In addition, tensions arise around the handling of different languages that do not always manage to dialogue and complement each other, as observed between local and technoscientific knowledge on water conservation (Bonelli et al. 2016; Blaser & de la Cadena 2018; Mancilla-García & Bodin 2019b, 2019a, 2020; Dupuits et al. 2020). When scaling-up community-based initiatives on water conservation, key values on water and Ecosystem Services tend to be abandoned or side-lined to the benefit of others. This lack of dialogue often produces a paralysation of negotiations and tensions between the different actors involved.

Finally, the adoption of a participatory approach has been both a benefit and a challenge for the design and conduct 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 the conduction of the research, for example regarding the specific areas to realize water conservation analysis. On the other hand, in some cases there continues to be a certain degree of distrust from local communities towards academic research and the processes developed in collaboration with municipal actors, which makes it difficult for the participatory construction of the project and the results diffusion. Finally, 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.

Acknowledgments

The authors would like to thank the people who have contributed to this research by supporting the field studies, conducting the interviews and disseminating the survey, especially Luis Chicaiza and Mauricio Cisneros from the Institute of Ecology and Development of Cayambe (IEDECA), as well as Luis Caluguillin and Gloria Jiménez from the direction of environment of the municipality of Cayambe.

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