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Article

Dams and Damages. Conflicting Epistemological Frameworks and Interests Concerning “Compensation” for the Misicuni Project’s Socio-Environmental Impacts in Cochabamba, Bolivia

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Abstract: The Misicuni multipurpose hydraulic project was designed to transfer water from a neighboring watershed to the Cochabamba Valley in the center of Bolivia for domestic, hydropower, and agricultural use. The project involved the construction of a 120 m high large dam and a 19 km transfer tunnel, which negatively affected the rural indigenous host communities that were deprived of productive lands, houses, and livelihoods. This article critically analyzes the process to compensate for harmful effects, demonstrating the existence of divergent knowledge systems, interpretations, and valuing of what was affected and how the impacts had to be compensated. The analysis shows that the compensation was fundamentally a process of negotiation about the meaning and the contested commensuration that was implemented in a context of unequal power relations between state institutions and the indigenous population. This led to unfavorable arrangements for the affected communities. The article details the discussions about impacts, knowledge, and values of key elements of the compensation process and highlights how “compensation” was embedded in the wider struggle over territorial control and natural resource governance. The unreliability of the state institutions worsened the negative impacts for the rural communities because the negotiated outcomes were not always materialized.

Keywords: large dams; socioenvironmental impacts; compensation measures; knowledge systems; commensuration; negotiation; territorial control; Bolivia

1. Introduction

The Misicuni Project (the project’s official name is Proyecto Multiple Misicuni, translated as Misicuni Multipurpose Project. For reasons of simplicity, in the text we use the colloquial name Misicuni Project) is a long-awaited water transfer project to deliver water to the central Bolivian city of Cochabamba and surrounding municipalities. Construction started in 1997 and operation began in the 2017/2018 period. The multipurpose project consists of a large dam and a transfer tunnel to conduct

water from the Misticuni watershed to the Cochabamba valley (Figure 1), where it is used to generate hydropower, after which it is distributed for domestic use and irrigation.

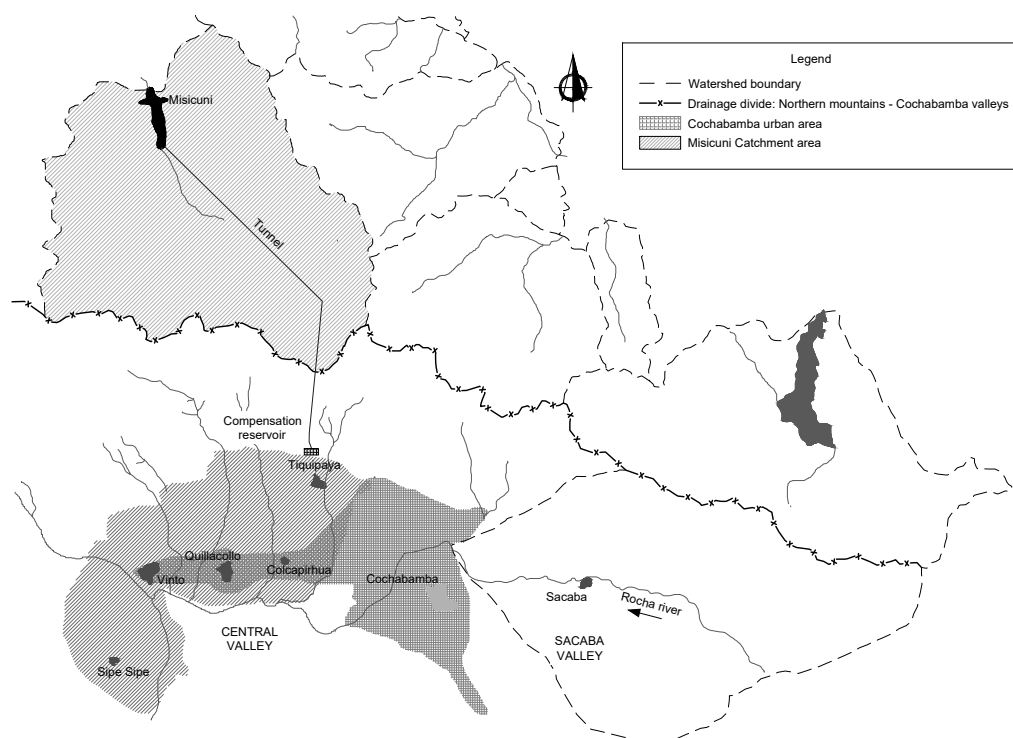


Figure 1. Location of the Misticuni project in relation to the Cochabamba Valley, Bolivia. Elaboration: Paul Hoogendam and Ronald Brañez.

Water delivery from the Misticuni dam is a relief for the inhabitants of the Cochabamba valley. From the 1940s onward, they suffered periods of serious water scarcity. Since then, the Misticuni project became visualized as the main solution to resolving the water shortage and inducing regional development [1,2]. The Misticuni additional water volume is quite substantial compared to actual water availability; the Misticuni water more than doubles the drinking water volume for the over 1,100,000 residents of the Cochabamba metropolitan area and almost doubles irrigation water as well [3,4]. After decades of frustration and doubts about the project's implementation, optimism reigns among city dwellers and irrigators about its outcomes. The Misticuni Company office shares this optimism, pleased with the conclusion of the construction works and the accomplished water storage.

In stark contrast to this, the highland indigenous peasant communities—where the dam was built—persist in protesting against the project. They demand fulfillment of unresolved commitments and claim their share in future benefits [5]. The community leaders express disillusion and deception about the impact on their livelihoods, territory, and communities, and about the way the compensation process has evolved. Their opinions strongly influence neighboring communities who object to additional water transfer projects because of the negative experiences with the Misticuni project.

In this article, we analyze the reasons why the highland communities feel unsatisfied with and deceived by the compensation process and results. We describe the different compensation measures taken and analyze the compensation process, showing how this, even in a context of well-intentioned state organizations, obliged the communities to constantly struggle for their rights and defend their knowledge frameworks related to water and dignified territorial livelihoods (see also the conceptual backgrounding in this special issues' introductory article [6]).

As part of our analytical exercise, we compare the Misticuni events with the framework developed by the World Commission on Dams (WCD) on compensation measures. After their worldwide evaluation of the impacts of large dams, the WCD formulated a series of strategic priorities and policy

principles for future dam development, incorporating the changing ideas on human rights, the right to development, and the imperative nature of sustainability [7], as well as including considerations to ensure that negotiation and decision-making processes are fair to the host communities affected by the construction of mayor hydraulic works (see also [8–10]).

This article is based on the first author's responsibility for the water balance study for the Misicuni irrigation component [11] and his over 20 years of working experience as a water professional and action-researcher in technical, social, and political discussions before, around, and since the occurrences of the Cochabamba Water War (2000). Both authors have worked and lived in Andean countries for several decades, interacting with state, peasant, and indigenous organizations in academic and action research. We studied the historic development of the Misicuni project through the revision of technical reports and local and international scientific studies. Review of the Misicuni internal reports, in-depth interviews with the Misicuni technical staff responsible for compensation measures, and group interviews with former and actual leaders of the affected communities provided us with detailed information of the Misicuni compensation policy, measures, and outcomes. We triangulated their opinions with a detailed review of newspaper articles about the conflicts that emerged during the construction works, followed by renewed interviews with responsible professional staff and community leaders on their current interpretation of historical events. Personal conversations with peasant leaders in the main surrounding areas (where additional transfer projects are proposed) provided us with the interpretations of neighboring communities about the compensation measures taken by the Misicuni project. All interviews took place in 2017 and 2018.

The structure of the article is as follows. In the second section, we describe the Misicuni project's history, its main hydraulic works, and the biophysical and socioeconomic setting of the indigenous communities where these works are located. We also show how preparatory studies presented an almost virgin territory, minimizing the very existence of these communities and the project's socio-environmental impacts. This led to a rather limited compensation plan, which during implementation was fiercely contested by the communities. In the third section, we develop our theoretical framework to analyze the Misicuni compensation process. We start with the comprehensive framework of the WCD for compensation measures and extend the analysis to matters of authority, power, and knowledge in negotiation processes regarding territorial change. As we argue here, the issue of "commensuration" is crucial. In the fourth section, we apply these analytical viewpoints to scrutinize three critical compensation issues in the Misicuni project: expropriation of land, compensation for construction aggregates, and mitigation of dried wetlands. We show how in each of these issues, the compensation process was a field of contestation and negotiation about knowledge, meaning, and value. Finally, in our conclusions, we argue that a crucial part of compensation processes is the unequal struggle over decisions that must be made on what is lost, what is to be compensated, the meaning and values of displaced items, beings and relationships, and the measurement units for compensation. These decisions are made within a context of unequal economic, political, institutional, and discursive power relationships and are marked by particular worldviews and epistemologies within the wider struggle about territorial control and natural resource governance.

2. History and Imaginaries of the Misicuni Project

2.1. The Misicuni Multipurpose Project

In the first half of the 20th century, the population of Cochabamba city and its neighboring municipalities started to suffer from water shortage, which over the last decades became more severe due to accelerated population growth. One of the main proposals to resolve water scarcity was to transfer water from the nearby Misicuni watershed located in the mountain range north of the city, a natural drain to the Amazon River. By the end of the 1950s, a first serious substantive outline of the Misicuni multipurpose water transfer project was made. It encompassed three dams located 1600 m higher than the city, a transfer tunnel from the Misicuni watershed to the Cochabamba Valley, and a

hydropower plant at the valley floor. The transferred water would generate hydropower and then be distributed for domestic use and irrigation. Power supply and irrigation were considered to be elementary conditions for regional modernization through agricultural intensification and industrial development [1,2].

In the early 1970s, a prefeasibility study was done to determine the project's costs. This study confirmed the need to construct the dams, transfer tunnel, hydropower plant, drinking water distribution network, and a full-fledged 5000-hectare irrigation system. The high costs of the project and the then political preference for investment in agriculture and power generation in the oriental departments of Bolivia jeopardized the construction of the Misicuni project for decades [2]. A series of popular mobilizations from the 1970s to the 1990s kept the proposal for the Misicuni project alive, making it synonymous with departmental development and regional identity [12–14]. Finally, popular and political pressure made state and international development banks fund its construction [15].

For its implementation, the Misicuni Company was founded—an autonomous public enterprise responsible for contracting preparatory studies (hydrology, geology, engineering, environmental impact, etc.), construction works, and supervision. As a public enterprise under control of central government, the Misicuni Company had a great scope to request cooperation of other state institutions in order to solve project related problems.

Misicuni construction works took place in subsequent phases. Between 1997 and 2005, the transfer tunnel was excavated, and perforation activities took place from both ends, which led to the first period of intensive contact with the indigenous communities at the upstream end of the tunnel. After tunnel delivery, administrative and financial problems slowed further implementation, but eventually, in 2009, the state contracted a consortium to build the dam and complementary hydraulic works in the Misicuni valley. Eventually, by the end of 2016, the dam was ready to collect water, and by the end of 2017, it entered into operation.

Overall, the following works were constructed (see Figure 1): A 120 m high dam with an overall water volume of 180 million cubic meters and an inundation area of 470 hectares; a 19.4 km tunnel from the Misicuni reservoir to the Cochabamba valley; A 120 MW hydropower plant aside a 350,000 m³ compensation reservoir to temporarily store the processed water for later distribution among domestic use and irrigation.

From a social and political perspective, the Misicuni project suffered a history of ups and downs that are extensively documented in [15]. She characterizes the project as “vernacular modernism” since it was promoted and defended by coalitions of city dwellers and Cochabamba Valley peasant irrigators as opposed to “high modernism” projects that used to be activated by a modernizing state elite [16,17]. However, from our examination, we concluded that the popular interest in and defense of the project did not result in a more protective stand towards affected host communities. Similar to the position and actions of dominant mega-hydraulic proponents in other cases around the world (e.g., [18–26]), the popular supporters (city inhabitants and valley peasants) ignored the fate of the affected highland indigenous communities.

The urge to construct the Misicuni project increased during the 2000 Cochabamba Water War due to the pressure of a coalition of city dwellers and surrounding peasant irrigators. On the one hand, urban population and their political representatives saw the Misicuni project as a final and conflict-free solution to the drinking water scarcity when compared to the alternative of drilling extra wells in the nearby valley, which was highly contested by the surrounding municipalities. On the other hand, peasant irrigators saw the Misicuni project as a solution to their irrigation water problems and a way to avoid city dwellers' claims over existing water sources over which peasant families held customary rights (e.g., [27–29]). For them, Misicuni resolved both practical and normative issues that were threatened by the urban-steered capitalization process that led to the Water War [30,31]. Neither of the two groups included in their analysis the fortune of the highland communities [13].

It is striking to see that in the extensively documented Cochabamba Water War portrayed with images of social justice for the rural and urban poor (e.g., [28,32–34]), the far poorer indigenous

families living in the inundation area of the Misicuni dam were mainly ignored (with few exceptions like [12,15]). Many critical studies that emphasized the negative effects of water privatization and modernization embraced the Misicuni project because of it being a solution supported by the “water warriors” from Cochabamba city and neighboring irrigators, ignoring issues of social injustice for the indigenous highland communities. This uncritical support was due to scholars/activists’ unfamiliarity with the Misicuni valley and its inhabitants. In the popular and academic imaginary, the Misicuni dam was to be constructed in no-one’s land [35,36]. As Nixon [37] (p. 75) stated, “. . . through the invention of emptiness (. . .) ‘underdeveloped’ people on ‘underdeveloped’ land can be rendered spectral uninhabitants whose territory may be cleared for the staging of the national theatrics of mega dams”.

2.2. The Socio-Environmental Context of the Dam and Reservoir Site

In reality, however, almost 200 families inhabit the 470 hectares inundation area, making up a total population of around 1200 people. These families are part of eight rural indigenous communities: Patapampa, Misicuni, Uyuni, Sivingani, Cochamayú, Aguadas, San Isidro, and Putucuni (Figure 2). Their communal territories consist of adjacent land strips that lead up from the valley bottom to the upper parts of the surrounding mountains. Their spatial organization is a localized version of the vertical dominion of agro-climatological zones common to most Andean regions. Access to different altitudinal zones enables communities to combine distinct climatic conditions and natural resource qualities.

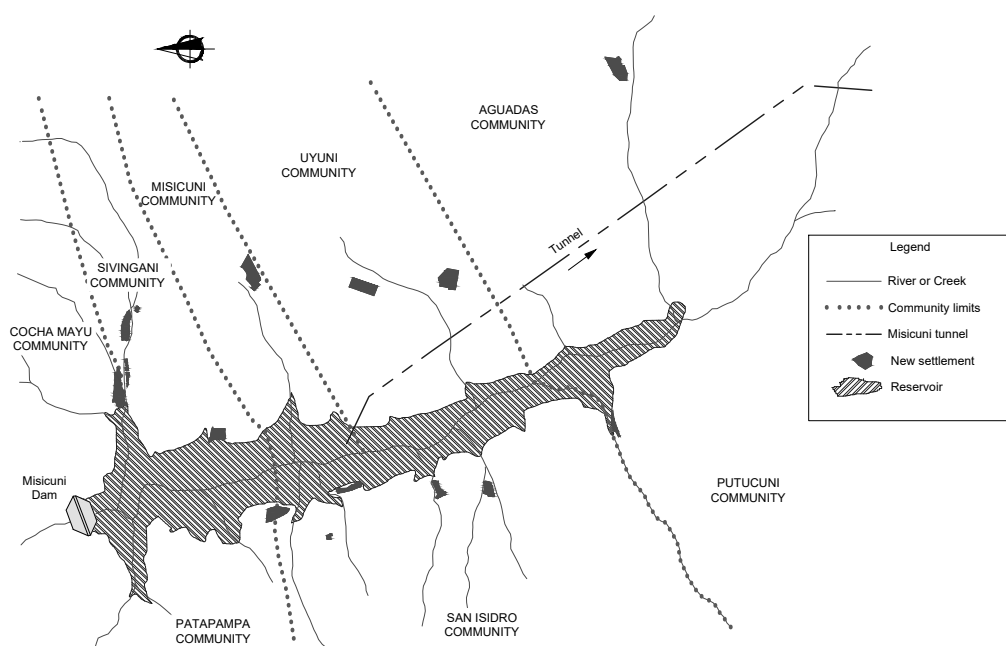


Figure 2. Communities in the Misicuni inundation area. Based on [38]; elaboration: Paul Hoogendam and Ronald Brañez.

The spatial organizations of these communities are alike—the valley bottom near the river, relatively protected from harsh climate conditions, is used for houses, agricultural plots, and wetlands. The lower mountainsides are covered by scattered plots on steep slopes, whereas the upper mountainsides are used for sheep, alpaca, and llama grazing. Agricultural production changes with altitude—the valley floor plots are used to grow potatoes and oca (*Oxalis tuberosa*), whereas the steeper mountainside plots are used for cold resistant crops like oat, barley, and bitter potatoes (*Solanum curtilobum*, used to produce freeze-dried potatoes that can be conserved for years). Soil qualities differ strongly by altitude—the flat plots near the river have more clayey, relatively deep

soils with moderate to good fertility because of decades of incorporating organic material and manure, whereas the slope plots have stony, shallow, and chemically poor topsoils.

The highland families are organized in indigenous peasant communities with leadership rotating among all members. The main language spoken is Quechua, although most people, especially the young, also speak Spanish. Collective action covers many communal needs, like building the main road to the eight communities. Before the Misicuni project, the communities hardly had access to basic services, but water was available from many natural springs and the Misicuni River. There were no tap or sanitation systems, no electricity, and no telephone coverage. Two communities had schools up to 8th grade (12 years old) and one community had a very precarious health center but without regular attendance. Until the arrival of the Misicuni project, the region lacked municipal support for community improvement.

The living conditions in the Misicuni communities are extremely harsh and all families are poor to very poor. Although families engage in agricultural production and husbandry, the nearly 3800 m altitude, the low temperatures, and the hail and frost risks make production unreliable. Most of the produce is used for household consumption; only a minor part is sold at regional markets. Though seasonal labor migration is part of most families' economic strategy, the main resource base of their livelihood is their land.

2.3. The Compensation Process

The studies and discussions about the Misicuni project hardly mentioned the communities in the Misicuni river basin. The first environmental assessment study stated that the project would flood the living area of approximately 20 families and might cause some erosion around the construction site [39]. The official 1996 environmental impact study mentioned that construction would entail "clearance of approximately 140 hectares of cultivable land" and "resettlement of approximately 400 people currently living in the flood zone". Keeping up with a "philosophy of environmental protection", the Misicuni Company promised to "resettle and compensate the population, inform them about the project, and respond immediately to any grievance, complaint, or protest" [40] (p. 47). Clearly, the aim of the environmental studies was to present the project's negative impacts as almost negligible and repairable via compensation, resettlement, and information (see also [23]).

Soon after starting tunnel excavation, the Misicuni Company began a campaign to measure land and landed improvements (houses, corrals, fences, trees). The families initially cooperated but, due to the uncertainty about compensation, shortly after protested and demanded basic agreements about future actions. After a period of negotiation, in 1998, the Misicuni Company signed a general agreement with the communities' leaders that determined six conditions to proceed to future land transfer: emission of land titles, evaluation and compensation, a social base line study, evaluation of houses and improvements, relocation of the cemetery, and technical assistance for agricultural and husbandry production.

The emission of land titles was necessary for the Misicuni Company to obtain official property rights. Therefore, families' land titles were to be formally registered and then transferred to the Misicuni Company (for the politics and complexities of such formalization, see [41]). A university consultancy unit contracted by the Misicuni Company realized the valuation of the land, identifying several categories of land quality and their respective values [38]. The mean value paid for was 870 USD per hectare, making up a total of 409,000 USD [42]. No value was assigned to land without productive use, house parcels, wastelands, and riverbeds.

Compensation for the houses was done likewise. A survey measured and valued the houses of 175 families. For 110 families, replacement houses were constructed on uphill sites appointed by the communities, while 65 families preferred to receive compensation in cash. Most of the latter later regretted their preference, since the new houses cost 10 times more than the compensation money granted. The project also paid in cash for corrals and other landed improvements. Furthermore, the project transferred three churches, a health center, and a cemetery to higher lands. Between 2009 and

2013, the Misicuni Company helped in moving all family belongings and paid for Catholic services for reburial of human remains [42].

After signing the 1998 general agreement, at first, the local population no longer opposed tunnel construction. Their quietness changed when reservoirs and springs started to dry out due to underground water flows into the recently excavated tunnel. To avoid protests, the Misicuni Company constructed community drinking water systems. However, these did not resolve the problems of watering animals and irrigation. Even so, communities' complaints were diluted after finishing tunnel construction in 2005, more so because they remained living in their homes and cultivating their already expropriated lands.

This situation lasted until the beginning of the dam construction in 2009. Before reinitiating construction works, experts contracted by the Misicuni Company updated the Environmental Impact Study [43]. This time, the description of the local communities was more precise, but the assessment of impacts on the indigenous population was, at most, naive. In its socioeconomic paragraph, the study foresaw "in general, positive impacts (for the local population), because of all year water availability and improvement of inhabitants' living conditions" [43] (p. 103), thus making a direct association between new reservoir water availability and increased well-being while ignoring that the local population had always lived in water abundance. Contrary to analyzing the local population as those affected by the project, the document even blamed the "local floating population" (expulsed from their inundated homes) as a possible source of "proliferation of poor houses, of bad appearance, without good sanitation services" and for being a pollution risk to the reservoir. Most strikingly, it stated that the local population would "negatively impact the scenery of the reservoir, for its esthetical quality will be spoiled by the incursion of *elements foreign to the natural environment*" [43] (p. 118, our italics).

Thus, the environmental experts turned the local population from "impacted" into "impactors" and from local inhabitants into foreigners, while at the same time transforming the dam and reservoir into "natural elements" of an Andean scenery that need to be conserved. Consequently, the study did not propose any mitigation measures beyond the already completed compensation process for the future inundation of land and houses, thus stimulating institutional blindness and ignoring the need for resources for the Misicuni Company's future interactions with the local communities.

This double neglect was the basis for the difficult relation between communities and the Misicuni Company. During construction works, the communities had to claim and protest for any demand to be heard. From 2009 onwards, they protested, among other causes, for the repair of fallen bridges, compensation for three extra hectares of land at the dam site that were not transferred in the earlier process, health care, electrification, a fish-culture tourism project, roads to the new hamlets, construction of two new bridges, and assistance for lost crops. They even had to threaten with roadblocks and encampment occupation to enforce their claims.

During this period, the local communities became far better organized in their position vis-a-vis the Misicuni Company and other state institutions involved. This was enhanced by concrete negative changes in their livelihood conditions. Dam-construction works obliged them to leave their homes, whereas their lands were excavated for aggregate exploitation. It was also result of their experience. The community leaders learned that the Misicuni Company reacted slowly to their demands, promised more than they could accomplish, and often argued that claims were beyond the company's responsibility, redirecting their demands to other (unreliable) state institutions.

To obtain stronger commitment from the institutions involved, in 2011, the peasant leaders proposed the conformation of a high-level commission, demanding participation of the departmental governor, the municipal mayor, members of parliament, and peasant union's representatives, aiming to streamline responsibilities and assure compliance of concrete agreements. Although originally the Misicuni Company and the departmental government did not agree to its conformation, they afterwards recognized its functionality since many compensation measures required complex political and institutional coordination.

Together with the conformation of the high-level commission, in 2012, the Misicuni Company set up a socioenvironmental unit to coordinate activities with and for the communities and introduced a mitigation trust fund for resettlement and environmental measures. This fund was used to quickly respond to all kinds of claims (avoiding long administrative procedures), thus tempering communities' protests. According to a Misicuni Company technician, "without the trust fund, the construction would never have been completed" (interview Misicuni technician, 2 April 2018).

3. Dams and Damages, Rights and Risks, Negotiation and Power

3.1. Dams and Damages

Large dams are often seen as fundamental for the provision of water and energy to an ever-growing part of the global population. Whereas from the 1950s until 1970s, such major hydraulic works were greatly embraced as positive developments, per se, awareness grew after the 1980s about the adverse consequences of dam construction and hydraulic control (see the overview in the introductory paper to this special issue, [6]). Human relocation, loss of sustainable livelihood, and damage to ecosystems prevail among the main negative outcomes mentioned. In some cases, the number of people affected is stunningly high, running into tens or hundreds of thousands for a single dam, with extreme cases as the Three Gorges Dam in China, where, according to official figures, 1.13 million people (but probably many more) have been displaced.

It is overly common that affected communities are not rightly compensated, leading to what is shamefully referred to as "resettlement poverty", as, for example, at Sudan's Merowe dam, where 50,000 people were violently displaced by the government and then experienced a 10–65% increase in poverty over two years because of poorer soil fertility and water access [16]. Such statements give credit to the general conclusion that large dam projects induce development and marginalization and give benefits and burdens in differential ways for different groups of people [7,44–48]. The burdens are often seen as inevitable for the sake of development and its need for water and hydropower. As Johnson stated in her description of the dramatically unjust history of Guatemala's Chixoy Dam, the loss of livelihoods of the affected communities "are casualties in the climate change opportunism accompanying efforts to build global 'clean, green energy' systems" [49] (p. 180) (see also [25]).

3.2. The WCD Framework on Compensation for Dam Damages

One of the important issues for the perception about benefits and burdens is how communities and people affected by dam construction are compensated for their losses and inconveniences. An important reference in this respect is the WCD's recommendations about reparation, restitution, and restoration of livelihoods and land compensation for relocated host communities [7]. These recommendations build on existing agreements and policies at national and international levels (among others: 1986 UN Declaration on the Right to Development, 1992 Rio Declaration on Environment and Development).

The comprehensive summary of the WCD Fifth Policy principle about compensation for affected populations reads:

"Rather than benefiting from them, many of those affected by dams are aware only of their negative impacts. To redress the balance, a process of joint negotiation with such groups is required, based on recognition of rights and assessment of risks. The aim of these negotiations is to agree on legally enforceable mitigation and development provisions, which recognize entitlements that improve livelihoods and quality of life. States and developers are responsible for resettling and compensating all affected people and satisfying them so that their livelihoods will be improved by moving from their current situation. Legal means, such as contracts and accessible recourse at national and international levels, should be used to ensure that responsible parties fulfill their commitments to agreed mitigation, resettlement and development provisions". [50] (p. 14)

This policy principle attends political, substantial, and procedural elements. At the political level, it underlines the need to recognize the rights of affected host communities and obliges that the overall outcome for the affected population should be an improvement of their living conditions and livelihood.

At the substantial level, it draws attention to the correct understanding of what is lost and should be compensated for—not just resources but livelihood, not just land but territory. The WCD acknowledges that displacement refers to both “physical displacement” and “livelihood” displacement (or deprivation): “the inundation of land (. . .) also affects the resources available for (. . .) productive activities. In the case of communities dependent on land and the natural resources base this often results in the loss of access to traditional means of livelihood, including agricultural production, fishing, livestock grazing, fuelwood gathering and collection of forest products” [7] (p. 103). It also implies that the compensation policy should include all mitigation measures needed to protect affected communities from involuntary risks related with their new environment.

On the procedural level, the policy principle underscores the need for a decision-making process based on the pursuit of negotiated outcomes conducted in an open and transparent manner and inclusive for all legitimate actors involved, agreement on the way to implement the measures decided upon, and the possibility to demand full compliance of negotiated agreements and commitments. The WCD recommends setting up a multi-stakeholders platform that discusses the possible impacts on the host communities, establishes a Mitigation, Resettlement, and Development Action Plan, defines mechanism for dispute resolution, supervises the work of the mitigation and development office, and sets up an independent field monitoring team for continuous monitoring of implementation [7].

3.3. Compensation as a Political but De-Politicized and “Equalizing” Construction

The proposal of the WCD, while recognizing the contested nature of defining “impact” and deciding on “compensation”, is at the same time a pragmatic way to socially engineer towards solutions and institutional arrangements. It highlights the importance of access to information, agreeing on institutional frameworks, debating the contents and images of (and contradictions between) expert and “lay” knowledge, and the access to concrete resources and decision-making power.

Indeed, in mega-hydraulic project development and dam compensation negotiations, a crucial part of the struggle is over decisions that must be made on what is lost, what is to be compensated, the meaning and values of displaced items, beings and relationships, and the measurement units for compensation. All of these decisions are marked by particular worldviews and epistemologies, often divergent normative and moral frameworks regarding the relationships and issues at stake, and the possibility of devising and recognizing shared rules and norms.

A problem in projects such as Mísicuni is that the arena of divergent knowledge systems in which the definition of “rightful compensations” takes place is characterized by highly unequal economic, political, and discursive power relationships (as elaborated more generally in the introductory paper of this special issue). As in many places of the world, water expertise and the corresponding policy and project decision-making privileges in Bolivia are largely reserved for those who are political-economically selected to hold water knowledge, speak water truths, and exercise water authority (see also [48,51,52]). “Rightful” water authority, rather than following from actually knowing local water cultures and territorial realities, importantly originates in economic structures, cultural politics, and gender divisions. In turn, legitimate hydraulic expertise, territorial planning, and the labeling of “efficient and rational water development” banks on their formal accreditation by officialdom and powerful economic interest groups [53–55]. Dam engineers and the mega-hydraulic projects they work on commonly symbolize the denial of connections between power and knowledge, while their hidden moralism of “good water governance”, “water efficiency”, and overall modernist progress is pervasive. This, in conjunction with the status of being a representative of scientific reason, makes the large dam development expert into a powerful political actor in territorial transformation and compensation processes. Behind the mask of neutrality, the social conventions and political choices

that are basic to building large dam schemes—as in Misicuni—are depoliticized, justifying far-reaching interventions and territorial transformations (see also [56]). Implicitly, the affected indigenous communities that accept the rules of mega-hydraulic water management and territorial modernization get the label of the “compatible poor”—they are worthy of receiving charitable compensation guided by expert-based decisions. By contrast, indigenous and peasant communities that do not accept the rules and regulations of modern hydro-territorial re-patterning are on the wrong track not just socially, institutionally, and productively (by sticking to “bad practices”), but also ethically; these “incompatibles” are the cause for their own poverty and backwardness. Progress will unfortunately but rightly undermine or take away their water and territorial rights.

No matter the progressive or conservative background of the ruling elites and water administrators, such modernist-moralist background importantly colors the compensation negotiation process that is set up in dam projects such as Misicuni. The question of who may or may not express their interest, which interests, and how to frame these, is part of the discussion. In repeated instances, peasants and construction workers are denied to do their say for the sake of general interest. Time and again, project officials renew their belief in an imaginary, universal, expert-planned model of “modern water management” and “rational territorial ordering” to control irregularities, correct incapacities, and subdue Andean nature and peoples’ stubbornness to efficiently deliver water and energy to the urban majorities and industrial areas (e.g., [13,23,56–61]). As the Misicuni case manifests, the urge to morally decide what is right and what is wrong comes from a desire to establish the universal substance, values, and norms of large-scale water and territorial planning expertise and from a need to legitimize the expert community’s own epistemic position as neutral and apolitical, thus legitimizing decision-making and shaping water policy agendas [51,62,63].

A fundamental, mostly unconscious challenge and effort of mega-hydraulic compensation programs is the issue of commensuration, which is “the expression or measurement of characteristics normally represented by different units according to a common metric (. . .) Commensuration transforms qualities into quantities, difference into magnitude” [64] (p. 315,316). Most professional studies and academic investigations, even when dedicating attention to the economic facets of this equalization process (in terms of commodities and prices), neglect enormous social and cultural importance. As these authors argue, “commensuration can render some aspects of life invisible or irrelevant (. . .) Commensuration changes the terms of what can be talked about, how we value, and how we treat what we value. It is symbolic, inherently interpretive, deeply political . . . ” [64] (p. 314,315).

Similar to all other compensation programs (see also the introduction paper [6]), the Misicuni project can be understood as a huge cultural and epistemological “purification endeavor”. Particular information is given particular meaning in accordance with formal and (universalistic) expert notions, while inconvenient facts and knowledge, or peoples’ territory and livelihood understandings, may be actively sidelined or overlooked [52,65–67].

A crucial aspect of commensuration processes is the pressure to present all issues at stake as commensurable, even when the affected population claim their special nature and incommensurability (see [68]). Whenever they decide to engage in conversations about compensation, they will have to express their interests in a common metric. “Negotiation requires commensurating with the enemy: it requires comparing the cherished with the reprehensible in ways that make the former less distinctive, less incomparably valuable than it once was. Not surprisingly, movements that stake their identities on incommensurables—radical democracy, heavenly truths, and native lands, for examples—face a dilemma even coming to the bargaining table” [64] (p. 337).

The fundamental challenge for affected communities and grassroots alliances who claim for repair and compensation, therefore, is to negotiate not just the issues and amounts to be compensated but also the very terms of “comparing” and “equalizing” the meaning and values of things, beings, relations, processes, and contexts. As the introduction paper states, “beyond the conflict over the material means of production and the socio-political/hydro-technological re-patterning of humans and non-humans

in dam-affected territories, there is the struggle over the control of the means of knowledge production, as well as the battle over who controls societal power to determine what counts as ‘normal’, legitimate and valid knowledge” [6].

As the next sections’ evidence of the Misicuni case manifest, though strongly influenced by unfair (but changing) power relations, the “knowledge of socionatures”, their commensuration in the negotiation process, and the compensations that sprout thereof are importantly determined by interacting epistemologies and require affected communities’ learning in the struggle. This transdisciplinary co-creation of knowledge involves both confrontation and mutuality among the water user, policy, and scientific communities (see also [6,48,69,70]).

4. Compensation Issues and the Struggle about Meaning and Value

4.1. “Expropriation of Land” Versus “Lost Livelihoods”

The main impact of the Misicuni project was the loss of agricultural, pasture, and housing land at both sides of the river, from near the valley floor up to 130 m above it. In total, the Misicuni Company had to liberate 470 hectares, nearly 75% of which was in active use for farming, grassland, and housing. The river flow, riverbeds, and wastelands occupied the other 25%.

Since the inundated area was in use by local communities, it had to be transferred to the state (represented by the Misicuni Company) through a process of expropriation. According to the 1884 Expropriation Law, the expropriated party is entitled to receive in exchange for the expropriated object a compensation equivalent to its economic value. This value is to be established by two experts, one appointed by either party, with the eventual help of a settling third expert. The Misicuni Company contracted the Cochabamba University for valuation. Their work consisted in marking the plot boundaries, defining land qualities, and identifying constructions and landed improvements (walls, corrals, fences). The expert team identified five land quality categories and established differentiated values. In the absence of a referential land market, they defined extremely low prices (from 400 to 2000 USD per hectare). In total, the project paid only 409,000 USD for land compensation, averaging around 2000 USD per family. The highest amount a family perceived was less than 8000 USD (interview with Misicuni technician, 2 April 2018).

These figures illustrate how the forced commodification of agricultural plots was highly disadvantageous for the highland indigenous families. Experts set extremely low prices to the land based on its low agricultural productivity and the lack of local land markets. They did not consider the high value of the land for the Misicuni project, nor the fact that it was the crucial resource for the communities’ livelihoods. To compare, at the Cochabamba valley floor during the same time period, the cheapest agricultural land was valued 50,000 USD per hectare. Consequently, with compensation money, affected families could not purchase land elsewhere to produce for self-subsistence.

Some families protested against the low prices but eventually accepted and signed the transfer agreements, albeit not completely at free will. Community leaders mentioned that the Misicuni Company created division among the communities to weaken their bargaining position (“First they talked in our organization, but then they started individual talks, telling us that the others had already accepted”, interview with community leader, 8 March 2018) and threatened them to accept the offer (“If you do not take this money, you will simply lose it. It will return to the state (. . .). The dam will be constructed anyway. The police may come, or they will militarize this area”, interview with community leader, 6 March 2018).

In retrospect, community leaders concluded that they were not prepared for the negotiations with the Misicuni Company and did not know their rights (collective interview, 5 March 2018). Almost all decisions were induced or imposed by the Misicuni Company—claiming legal arguments, officials decided what could or could not be compensated, what was to be measured, who defined its value, and what could or could not be discussed. In their retrospection, leaders repeatedly mentioned their lack of control over the compensation process and expressed their ignorance and distrust as to the outcome of

decisions made. As one leader expressed, “We made a mistake measuring our land (agricultural) plot by plot. We should have measured our land as a whole (including wasteland, tracks, etc.). For in the end, we lost everything”. Another added, “We wanted to do another study (on the value of our lands), but we did not have the money for it”. A third one explained, “The Misicuni Company threatened our lawyer not to interfere with the compensation process”.

The indigenous families hardly had any experience with government intervention and did not know their legal rights. Their disadvantageous position made them accept the compensation money. However, communities quickly learned from their earlier disappointing experience. In 2010, when the dam height was changed from 85 to 120 m, the Misicuni Company needed to expropriate three extra hectares. When constructors invaded the not yet compensated land, local communities blocked the road and negotiated a far higher price for the extra unproductive steep land, considering its crucial importance for the project 8.080 USD per hectare, 10 times higher than their productive (interview with Misicuni technician, 6 May 2018).

Their leaders’ main critique on the expropriation process is, however, that it only considered the (presumed) commodity value of land and not its use value for families’ livelihoods. The expropriated plots were by far their most productive agricultural land, improved through decades of human investment in soil fertility and structure, and the main resource to sustaining their agriculture-based livelihood. In contrast, higher up on the valley’s steep flanks, plots do not join similar conditions in terms of slope, water, fertility, and climatic conditions, and are not suited for all crops that form part of the household diet, and topographic conditions make access far more difficult. In the years after relocation, crops on the hillside plots suffered from drought, hail, frost, and diseases, affecting especially the potato production, the main staple and most important cash crop. After relocation, family income from agricultural production reduced considerably [71–73]. In 2016, resettled families demanded the transfer of top soil material from the valley bottom to the slope plots to improve productive conditions to sustain their livelihoods, but this demand was not approved.

Similar to cases described by Dye [16] and Hidalgo, Boelens and Isch [58], the Misicuni compensation process was an example of top-down thinking, valuing supposed experts’ knowledge over engagement with the local community within the logic of contracting experts for rapid assessments. While the Misicuni Company technicians and university consultants focused on physical size and monetary value, indigenous families were concerned with their ability to continue their livelihoods (see also [24,74]). Community leaders framed the destruction of livelihoods as the main unfairness in the compensation process. This opinion was even stronger under younger leaders, many of whom blamed their parents for having sold their family patrimony for a miserable sum of money, depriving their children of a sufficient resource base for subsistence.

4.2. Extraction of Construction Aggregates: Deceit, Deception, and Loss of Faith

Another critical issue in the compensation process is related to the aggregates for constructing the dam body and auxiliary works, which were extracted from the subsoil of the recently expropriated family plots. It was only after they sold their lands that indigenous families became aware of the resource wealth they had handed over, whereas project officials knew from the start that the area that was to be inundated was also the site for extracting construction materials. In fact, the dam design had changed from a concrete to a rockfill body in view of the abundant presence of nearby available rockfill.

Both the recent constitution [75] and the specific law on aggregate administration and regulation (Ley 3425, 2006 and its bylaw [76]) determine the right of indigenous communities to participate in the benefits of non-renewable resources within their territory. In the case of aggregates, community projects (such as riverbanks conservation, irrigation projects, productive improvements, etc.) deliver the benefits. In view of these recently created rights, community leaders interpreted the silence about the plan to collect aggregates from the expropriated fields as a deliberate deceit by the Misicuni Company. Even worse, they see it as a cynical detail that the best aggregates were situated precisely in those terrains that were expropriated at zero cost since they were categorized as “nonagricultural

use". They blame themselves and the Misicuni Company for not having received a better deal. A community leader framed his disappointment as follows: "About the aggregates, we simply did not know. We were sleeping. So much material they have used from our land. They already knew but did not tell us. As far as we knew, the aggregates would come from Cochabamba, but in the end, it was all taken from our land" (community leader, 2 March 2018).

From the part of the officials, silencing the issue of the aggregates dormant under the community soils was a conscious decision. Since land valuing was based on topsoil evaluation only, and the available budget was established considering these values, they had no budget to pay higher prices because of aggregate presence. Nonetheless, one of the technicians acknowledged that the deliberate deceit undermined the local population's confidence in the Misicuni officials; it generated a jealous anger about the lack of compensation for what proved to be an extremely valuable resource for dam construction. He also argued, however, that over time, the Misicuni Company more than compensated for the aggregate use by financing projects to improve living conditions (conservation measures, roads, etc.). Still, peasants' deception persists—they argue that taking away their resources for free has importantly reduced the total project costs to the benefit of the government, but they had paid the costs.

4.3. Drying Springs and Wetlands

Before dam construction, the Misicuni watershed counted with numerous water sources. Water sprang from the mountainsides through hundreds of small wells, creating a myriad of ponds and flows. Especially in the communities Aguadas ("Watery"), Uyuni, and Putucuni, water was abundant. On moderate slopes, this water abundance gave way to the creation of wetlands (bofedales) with a variety of hydrophytic plants, which formed an essential part of the fodder for the llama and alpaca herds. Almost 6% of the total Misicuni watershed consisted of wetlands [43].

During the excavation of the tunnel, several local springs diminished their flow and even completely dried out, which made communities protest and claim for restoration. At first, project planners and contractors' engineers strongly denied their claims, arguing that tunnel excavation did affect uphill springs. Even though the geological study determined that the tunnel trajectory passed through two geological faults with rock fractures and possibly high permeability rates, no evaluation studies were done regarding the future impacts of the tunnel on the mountainous water bulb, uphill reservoirs, and springs. Ironically, the experts' denial of the local communities' worry and claims coexisted with their own observation that "there was an extreme lot of water in the tunnel" (interview geotechnical expert, 3 May 2018)—so much that, at the upper end of the tunnel, water had to be pumped out continuously to permit perforation activities.

From the local peasants' perspective, it was obvious that all this water was drained from the veins that fed existing springs; they had never dried out before and suddenly all depleted. Experts did not have any data to deny this local historic knowledge, although their expert opinion on the non-interference between tunnel digging and wetlands drying was expressed as "factual knowledge", but in fact they had no long-time data to sustain it. Their image of prestigious and objective knowledge bearers was deployed to defend the Misicuni Company's interests and deny peasants' claims. To diminish protests, in 2003, the Misicuni Company constructed drinking water systems for the new hamlets as part of the resettlement agreement and as compensation for lost waters.

After years of unfruitful, unrealistic expert argumentation and in view of abundant evidence, experts started to acknowledge the influence of the tunnel on local water sources and flows. The empty tunnel functions as an open mountain vein, drawing water from nearby permeable layers. The 2009 Environmental Impact Study mentioned the drying up of more than 200 water sources in the socioeconomic description chapter, but this was not officially recognized at the level of engineering studies—an example of how institutional knowledge is not equally shared and acknowledged by its units. Eventually, the Misicuni Company decided to implement a measurement campaign, combining field measurements, observations, and testimonies, leading to the conclusion that nearly 230 springs

dried out because of the company's activities. After the communities included the mitigation of lost water sources in the 2012 demands lists, the Misicuni Company constructed two small dams and distribution networks in Putucuni and Uyuni to extenuate the most serious manmade water problems (interview with Misicuni technician, 6 May 2018).

4.4. Closure Experiences

Towards the end of construction works, in July 2016, the communities proposed a list of pending and new demands to the departmental authorities: a network of roads and bridges to reach the new hamlets aside the reservoir; an irrigation system drawing on reservoir water; transport of rich soil from the valley bottom to their new plots; greenhouses for seed production; solar panels; river and reservoir access for livestock; fish farms; scholarships and additional teachers for the valley's new public boarding high school; 600 additional homes for the communities' youth; and a well-stocked, first-rate hospital. This list is a clear indication of persisting needs, as well as an opportunity-driven proposal to perceive whatever they could while there were still construction activities going on.

Since water accumulation in the reservoir started in 2017, construction activities were reduced to a minimum, which made local communities worry about the fulfillment of earlier promises and rethink their demands strategy. The next citations show their preoccupation:

"In August 2016 we organized a road block to demand for roads and bridges. At that moment we figured out that at the beginning of the dam construction we should have included everything, all our needs, compensations, roads, bridges, houses for everyone, so that at the end of the dam construction all agreements would have been finished as well."

"The dam is ready (. . .) now the works for us are not sure. When the reservoir is filled with water, there will be landslides that may affect our roads and animal paths. We want a signed agreement through which they guarantee fulfillment of repairs, but they say 'let's first see what happens, then we will talk'. It is not like that . . . "

"However, we cannot complain strongly, for instance going to the press, because they say that if we cause problems, there will be no new houses for 2018. You know, we are negotiating for 2018, that is also a thing . . . "

These comments show their distrust towards the Misicuni Company and other state institutions responsible for fulfilling the latest agreements, thus concluding that they should have formulated their demands earlier and claimed contractual obligation to comply with them before the end of the construction phase (which is one of the crucial recommendations in the WCD policy document [7]). The reaction of the Misicuni Company was to avoid upcoming obligations in light of their own uncertain institutional future, using delaying tactics and pressure to reduce further demands.

In 2017, another important shift took place in the communities' demand strategy—from then on, they started claiming a share in project revenues. As a community leader stated, "From last year onward, we are thinking about participation in the benefits of the Misicuni project. Something must come back to our communities. The Misicuni staff say that there are no royalties, you are talking in vain about royalties . . ."—according to Bolivian law, royalties can be stipulated for nonrenewable natural resources only—" . . . But we cannot permit such a huge construction with so many perjuries. We agree that compensation may come in works," (interview with community leader, 8 March 2018).

To operationalize this proposal, the affected communities plea for a new general agreement to grant additional compensation. In their view, the original agreement was related to the dam construction period only, providing compensation for inundated lands and relocation of their homes. They demand a new general agreement to regulate a sustainable livelihood perspective, either in money or in kind. Unfortunately, the first experiences with in kind support are not yet very optimistic; the departmental government implemented a fishery cum ecotourism project but almost without local participation—only a few families took part, mainly because there was no clarity in how the benefits of the new common resource would be distributed.

5. Discussion and Conclusions

The history of the Misicuni project gives clear examples of the costs and burdens that large hydraulic modernization projects pose on the host communities that live in the sites where the main construction works and reservoirs are planned. Although the Misicuni project is a case of relatively “good government intentions” constructed mainly by a peasant-favorable regime, it resulted in indigenous communities (although partly compensated) being deceived and perjured by the projects’ interventions.

This outcome contrasts with the expectations about the progressive nature of the Misicuni project, the pro-rural-community nature of Bolivia’s popular government in place since 2006, and the fact that the Misicuni project was an example of “vernacular modernism” [1]. As Laurie, Andolina and Radcliffe [12] already warned, the progressive city-rural beneficiary coalition would not necessarily solidarize with highland indigenous communities that had to be displaced. In that sense, the history of the Misicuni project is as traditional as that of many other hydraulic mega-works. Independent of whom may be the promoters, large hydraulic works put burdens on host communities; final outcomes for them depend on the process of contestation, compensation, institutional responsibilities put in place, and the understanding of what must be compensated to deliver better living conditions for the locally affected.

Initially, the government adopted principles of decision making in almost exclusively top-down ways and valued expert understanding only; local knowledge and experiences were left out of decision making. This denial ensured uncritical thinking about the negative livelihood impacts that were likely to leave the poorest even worse off. Local knowledge and understanding and related local demands were considered only after repeated and often violent protests.

The Misicuni approach to compensation fell strongly behind the WCD recommendations and did not resemble the approach suggested in the WCD Mitigation, Resettlement, and Development Action Plan [7]. In fact, the Misicuni Company had no systematic approach to dealing with negative impacts on the local population and it studied adverse impacts from an environmental angle only. Framing the impact on local communities as part of the environmental impact had a two-fold effect: first, urban environmental experts neglected the impacts on the local highland population and envisioned from an urban perspective only the positive impacts for the city (and “nature”), and second, they accused the local population of being “future contaminating outsiders” [43] (p. 118). The combination of invisibility and accusation led to the absence of measures to protect the local communities from upcoming harms and to a lack of initiatives that could have favored the marginal position of these highland communities. Similar to what Lynch concluded, it also “created an environment where the kind of careful social and environmental research that needed to shed light on potential impacts was not conducted” [77] (p. 11), maintaining the systematic knowledge gaps between project officials and indigenous communities regarding real impacts.

The lack of a systematic plan made the compensation process a tedious story of recurrent opposition of the indigenous population towards the Misicuni Company. Opposition was firstly against direct negative impacts, but along the process became more and more related to territorial authority, compliance mechanisms, and a procedural relation between the host communities, Misicuni Company, and other state institutions. The mutual learning experience led to the successful conformation of a high-level commission, which through monthly meetings improved compliance, although contractual obligations that could have assured clear beneficial results during the construction phase were never established [7]. During the whole process, the affected population was obliged to prove negative consequences, bargain on compensation issues, and control compliance, contrary to what might be expected.

This disadvantageous and vulnerable position of the indigenous communities was manifested in their invisibility during the compensation process. Their claims were largely disregarded and their existence “unimagined”. The Misicuni Company, supported by other state institutions and authorities, imposed its vision on the need for modernization, especially after proclaiming hydropower as a mayor

state policy to accomplish Bolivia's role as an energetic center of Latin America. The public framing of the project as a need for regional and national development enabled the avoidance of the generation of solidarity with (or empathy for) the highland communities' demands. Members of parliament and even the national president openly criticized highland communities for delaying the project by claiming their rights, just as they criticized construction workers for striking when they did not receive their pay [78]. Local communities have not been able to create sympathy for their position nor broaden their social alliances further than the surrounding mountain communities.

As stated, originally the Misicuni Company considered only compensation for land and housing parcels. In this process, different interpretations arose regarding what was to be compensated and how issues had to be valued. Experts reduced the compensation to measurable and commodifiable units, assessing land value on virtual market prices, whereas the local population valued it as part of their livelihood resources. In the end, the legal definition of compensation was imposed, resulting in small monetary compensations per family and depriving them of their resource base. Misicuni illustrates the WCD conclusion that "cash compensation (. . .) even when paid on time, has usually failed to replace lost livelihoods (. . .) They have often been forced to resettle in resource depleted and environmentally degraded areas around the reservoir (. . .) Absence of livelihood opportunities forces affected people to abandon resettlement sites and migrate" [7] (p. 107). The later expropriation of three extra hectares is a clear example of a change in price setting, consciousness, and claim-making capacity; local leaders achieved that it be based on "project necessity" more than on "market" value. Their claim was highly informed by their learning about the aggregates issue. The Misicuni Company got access to the huge aggregate banks by just compensating "worthless" land and withholding the indigenous population from information on the value underneath their plots.

In later issues on impacts and compensations, similar contradictions in knowledge, perception, and valuing occurred. For instance, lost multipurpose springs were replaced with tap systems for human consumption. Only after repeated complaints did communities manage to acquire access to small reservoirs and irrigation systems. To this respect, a common confusion comes to the fore regarding what is to be considered as compensation measures. Whereas project officials upheld that living conditions have improved importantly because of the project, it seems opportunistic to consider the provision of drinking water and sanitation networks, roads, health services, education, electricity, and communication as part of compensation measures—these are basic services to be provided by local or departmental governments. The Misicuni Company helped to accelerate access to these provisions, which should be regarded as a historical debt pay-off rather than a compensation for dam construction.

During the construction of the Misicuni dam, important learning processes took place, combining the issues of contested "meaning" and "values" in the dam-development epistemological battlefield, the depth of the knowledge on the issues at stake, the procedures to deal with them, and how to interpret the opponents' behaviors. For the indigenous leaders, it has meant an intense learning process on state interests, functioning, and reliability. A major problem of this process was that it followed events and almost never permitted them to anticipate later actions. They learned that they had to struggle for justice, even though mitigation measures were at stake. This strengthened the jealousy towards valley inhabitants who received multimillion advantages in water and energy supply, whereas the poorer indigenous communities were deprived from house and land and were involved in a decades' long battle against injustice. This insight, at last, led them to demand for project revenue related co-benefits in the form of yearly royalties or a construction/productive-projects fund based on the recognition of their territorial authority over natural resources. This is the pending issue to be resolved in the operation phase of the Misicuni Multipurpose Project.

Finally, the Misicuni case shows that "compensation" is a politically contested and fiercely fought social construction and not a shared objective decision making process, as suggested by the WCD principles. The modernization project defended by state institutions and Cochabamba's urban and rural groups evidently contradicts with the host communities' interests. The outcome of the struggle to compensate for their losses is, in the end, determined by the power balance between the affected and

the beneficiaries, and thus depends on either's base and instruments of power. While state institutions make use of formal, legal, and institutional norms and rules and impositions, the indigenous population principally builds on their territorial presence, dynamically rooted and collectively enforced norms, and the physical threat to affect water provision to the city.

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