Water Futures: Contention in the Construction of Productive Infrastructure in the Peruvian Highlands

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Abstract: This article explores the potential construction of a water reservoir in Peru's Cordillera Blanca. Proposed by a peasant group, it would have served important productive purposes but have its intake within the perimeter of a national park. Thus, different notions about water and landscape emerge in the encounters between place-based practices and state-sponsored conservation efforts. Empirically tracing the efforts to construct the reservoir, the analytical focus of the article is on how different ways of knowing water within a particular landscape conjure and collide in the process. It is argued that the movement of water extends itself beyond the physical properties of the reservoir and irrigation channels as these are produced in encounters between different notions of the role of water in the landscape.

Keywords: Andes, climate change, infrastructure, rural development, water, landscape

Résumé : Cet article traite du potentiel de construction d'un réservoir d'eau dans la Cordillera Blanca du Pérou. Ce projet, proposé par un groupe de paysans, offrirait des visées productives importantes. Cependant, son apport en eau se situe dans le périmètre d'un parc national. Ainsi, la rencontre entre les pratiques locales et les politiques de conservation parrainées par l'État font surgir différentes notions au sujet de l'eau et du paysage. Cet article retrace les efforts de construction du réservoir et vise à mettre en évidence comment, au cours du processus, différentes manières de connaître l'eau apparaissent et se heurtent. Les cours d'eau se déploient au-delà des limites physiques du réservoir et des canaux d'irrigation, conséquence de la rencontre entre différentes notions du rôle de l'eau dans la nature.

Mots-clés : Andes, changements climatiques, infrastructures, développement rural, eau, paysage

Introduction: Water, Power, and the Engineered Landscape of the Andes

In Andean Peru, landscape studies have focused on the animate landscape, where both rocks and mountains are linked to what Marisol de la Cadena (2015) has recently termed "earth beings" (see also Allen 1988; Gose 1994). Other studies of Andean landscapes highlight how these are related to patterns of power and domination (Orlove 2002; Poole 1987), to patterns of ethnic and cultural difference (Colloredo-Mansfeld 1999; Oedegaard 2011; Orlove 1993; Rasmussen 2015), and engineered through the manipulation of water in irrigation channels, terracing, and drainage. The power of landscape is expressed through different means that are related to cultural and social politics of difference, modes of dwelling, and imaginaries of the good life. This article builds on these insights into the centrality of water in the social and political organisation of Andean landscapes. It explores how water is constitutive of and constituted by different notions of landscapes among rural dwellers of Catac in the northern Andes of Peru. In the current conjuncture of global climate change and neoliberal economic growth, I am particularly interested in understanding both the figurative and real widening gap that emerges as glaciers retreat uphill and people increasingly move downhill. By focusing on how that void is being bridged by water infrastructure, I show the prominence of new forms of knowing water and landscape and link these to emergent imaginaries of past and present.

This article chronicles recent efforts to engineer the Andean landscapes of highland Ancash in Peru. I focus on three projects of productive infrastructure in the southernmost parts of the Cordillera Blanca. All of these aim at extracting water from high-altitude sources and bringing it for use at strategic sites below, and they all tap their sources in territories that are claimed by both the peasants of Catac and the Huascarán National Park. The primary case of concern is that of Queshque, the

intended construction of a water reservoir and irrigation complex. The project, proposed by its users' committee, would store water at high altitude, thereby securing a constant, year-round flow of water ostensibly to increase the production of fodder for genetically improved cattle. The second case proposes a regular irrigation project that extracts water from the wetlands in Kotosh and then – converging with the proposed project at Queshque – brings these waters to more productive grounds at Churana and Catacpata. This project is almost completed, but there have been some irregularities in deciding on the location of the three lower-altitude reservoirs. The final example that I draw from is different than the former two and involves an initiative of the municipality of Recuay, which plans to bring water from the Yanayacu River via pipes. In showing how changes in the flow of water across the landscape in the southern parts of Peru's Cordillera Blanca converge with altered modes of inhabitation, this article explores the changes in the management of irrigation channels and links these to shifting patterns of production and inhabitation – that is, different modes of engaging the landscape.

The article uses a particular set of cases explored during fieldwork in 2014 but builds on prolonged ethnographic engagement in rural communities in the upper part of the Santa River since 2010. The material discussed consists of interviews, document analysis, field trips, and participant observation in meetings. Fieldwork was conducted primarily in and around the town of Catac and the peasant community (*comunidad campesina*) of the same name. In addition to this work, I have been engaging with officers from the Huascarán National Park. Established in 1975, the park encompasses 340,000 hectares of highland scenery, most of it above 4,000 metres. Upon establishment, the park came to include territories under legal possession or traditionally used by peasant communities such as Catac. This has created a situation in which the park currently finds itself in constant negotiations over the proper use of resources and the right to define the meaning of both "resources" and "proper use" (Barker 1980; Lipton 2014).

Landscape and the Topology of Water

I argue that in an Andean context the "sense of place" is connected to the techniques of water management and the new patterns of water domestication (Feld and Basso 1996). I do so by drawing on three cases of water engineering: in Queshque, Kotosh, and Querococha. Within the current economic conjuncture, the construction of productive infrastructure is related to two major processes affecting life in the highlands. The first one is related to social change and the second one to changes in the environment. As people increasingly abandon the high ground in favour of labour opportunities in urban areas, territories are left idle, left to be grazed by flocks tended by contractors, or left to roaming wild bulls. Second, as the glaciers continue to recede due to a warming climate, water availability in the lower-lying areas is becoming an issue. Water is already reported to have become scarcer in certain watersheds in the area, and a reservoir would be an efficient way to mimic the water storage capacities of the glaciers (see Bury et al. 2011; Bury et al. 2013). Within these scenarios, water attains a new place in the social and productive landscapes of Catac. This article documents this shift in the way water produces the Andean landscape by tracing the debates surrounding the construction of the Queshque reservoir and supplementary cases from the two neighbouring sub-watersheds in Kotosh and Querococha. In other words, this is about changes in the productive landscape and how these get entwined with social and environmental changes.

Landscapes are not just locations or sceneries. They are imbued with meaning, being both part of social worlds and creating them. Landscapes are therefore produced by those who inhabit them (Hirsch and O'Hanlon 1995; Ingold 2000; Tilley 1994). However, such phenomenological perspectives on landscapes have tended to avoid questions of power (Escobar 2001; Massey 2006). In terms of the constitutive role of water in the production of landscapes, it can therefore be useful to consider recent theorisations of waterscapes (Budds and Hinojosa 2012; Swyngedouw 1999, 2009). This perspective foregrounds uneven socio-ecological arrangements over time and space, where landscapes are produced by power relations pertaining to the distribution of water and the contestations over the modification of waterways. In other words, landscapes are produced in intimate contests between a wide range of actors with different capabilities and notions of progress in which water is a central signifier. Part of a hydro-social modernisation process, productive water infrastructures therefore provide an analytical entrance point for understanding the topological dynamics of the production of particular landscapes (Swyngedouw 2007).

To understand the transformation of landscape associated with flows of water, I focus on a particular kind of infrastructure linked to production and consumption. This infrastructure, however, is not just about the water but also about the future and visions of modernity. Infrastructure has a double nature: it is both a thing in itself (in this article: the pipeline, the concrete intake) and a relationship between other things (in this article:

people, land, water) (Larkin 2013). It mobilises themes of belonging and engagement with political communities and alternative futures (see Anand 2011, 2012 for urban water provision in Mumbai; Féaux de la Croix 2011 for dams in Kyrgyzstan). The irrigation channels are part of the productive infrastructure of the country – by bringing water to the fields, they enhance and create possibilities for economic activities. I am therefore interested in looking both at the ways the confluence of land and water is imagined in encounters over infrastructure and at the "geological, social and temporal specificity" of these infrastructures of water (Harvey 2012, 83). Second, as a corollary of these specificities, a focus on infrastructure highlights the new social imaginaries that emerge as the relationship between land, water, and people is shifting (Hastrup 2013; Taylor 2002). As Katie Meehan (2014) has recently argued for the case of water infrastructure in Tijuana, Mexico, these not only cultivate state power but also lead to the emergence of alternative spaces of rule and the authority delimiting it. By looking at productive infrastructures, I point to the specific interface between the state in its different manifestations and people in encounters over the meaning of landscape and, consequently, at the ways in which state institutions, peasants, and other actors may seek to control the flow of water.

Imaginaries about the state in the Andes are connected to ideas of progress (Degregori 1986). Since Philip Abrams's (1988) seminal article warning against reifications of the state, an increasingly vast body of literature has sought to elicit the ways in which the state is both a real, but disaggregated, reality and a spectral fantasy – an idea of a coherent body politic (Goldstein 2012; Gupta 2012; Hansen and Stepputat 2001; Krupa and Nugent 2015; Navaro-Yashin 2002; Nugent 1997; Taussig 1997). Materialities and imaginaries of the state are the products of concrete encounters and distinct historical processes (Mitchell 1991). As David Nugent (1997, 2010) has succinctly argued, the state comes into being through concrete everyday interactions with a broad variety of institutions, actors, and agendas that only attain meaning because they relate to ideas about what the state is and could be. Constantly in the making, the state is therefore both perceived as an entity and as a disaggregated set of actors. In the descriptions that follow, the peasants of Catac establish both alliances and antagonisms with state agents of municipalities, water bureaucracies, and conservation agencies with divergent understandings of water, development, and progress.

Discussing how ethnographers should go about studying the state, Penny Harvey (2005, 124) argues that the challenge is "to identify material traces which can be engaged ethnographically and which open up, rather than close down, further perspectives on the structures and practices through which this particular mode of power is effected and reproduced." For the concern with infrastructures, this implies that not only must we understand the geo-references through which the water moves – its location in the landscape – but also how these spaces are composed by power relations (Harvey 2012). Infrastructure is an apt starting point for discussing how amphibious spaces emerge through encounters on a variety of scales. In these encounters, the water that flows through the landscape does not exist outside either the physical or social world. Materially and symbolically, it is tied to the production of place. I show how the Andean landscape is a contested field over which the central and local governments increasingly seek to gain control and, yet, by creatively adopting the new water vernaculars of the Andes, the communities display great adeptness in appropriating, negotiating, and defining the new meanings of the landscape even in times when the future seems unsettled and the present impermanent (see Rasmussen 2016a).

Water Infrastructures in the Andes

The Andean landscape is deeply humanised (Young and Lipton 2006). The intimate connections between people, place, and production have inevitable links to the social organisation of water (Boelens and Gelles 2005; Boelens, Hoogesteger, and Rodriguez de Francisco 2014). Studies of water and production in the Andes highlight the interconnectedness between land, production, and social identity. A central feature of the domestication of the rugged landscape is therefore the control of water. By controlling water, one is able not only to expand the extent of cultivation in time and space but also to exert a great deal of control over people relying on irrigated water (Golte 1980). In the Andes, the control of water is therefore a key element in local stratification (Guillet and Mitchell 1994).

The environment, the engineered landscape, and the water channels are closely connected to social organisation and knowledge (Valderrama and Escalante 1988). Traditionally, a focus of concern over water in the Andes has been on the practices of irrigation and terracing (Gelles 1994, 2000; Guillet et al. 1987; Paerregaard 1994; Trawick 2001, 2003). The early studies of irrigation in the Andes (structuralist and substantivist) focused on the architecture and Inca heritage of the vast irrigation complexes of the southern Andes (Guillet et al. 1987; Murra 1972; Sherbondy 1982; Zuidema 1964). Later studies sought to link irrigation to village politics and

internal segmentation (Gelles 2000; Trawick 2003). Such studies have shown how the functioning of the irrigation systems is deeply entangled in local power structures and how the social organisation of water is connected to wider, extra-community forms of political organisation – for example, national water legislation and regional power figures as well as the particular physical layout of the river and its flow through the different communities. Consequently, more recent studies of water politics have changed focus from internal politics and traditional non-statutory institutions to the role of the state in water provision and distribution (Boelens and Doornbos 2001; Boelens and Gelles 2005; Budds and Hinojosa 2012; Rasmussen 2015).

The cases of infrastructure in Queshque, Kotosh, and Querococha show how imaginaries of both water and production have changed over time. In the Andes, place, people, and production are intimately connected (Boelens and Gelles 2005). "Huanoquiteños repeatedly tell us," write Linda Seligmann and Stephen Bunker (1994, 227) in the concluding remarks to their study on the abandonment of irrigation infrastructure in Huanoquite, southern Peru, "that their infrastructure can be expanded or maintained only through the intervention of 'el poder,' authority, whether in the form of a centralised state, a development agency, or some other social or supernatural power." The old Inca irrigation systems that used to feed the fields around this community in the Cusco region are being abandoned. Like William Mitchell (1994), the authors report on a social fragmentation where production is being moved from collective to individual strategies. The introduction of a cash economy, higher rates of migration, and changing patterns of land tenure have also led to a change in the perception of the environment. The geographical concepts have changed alongside changes in the knowledge of topography and natural cycles. Citing Catherine Allen (1988), the authors show how Andean cosmology has been inseparable from technological control of the environment and the socio-political organisation. To this, they add that indigenous topographic perceptions and geographic and geological knowledge are crucial for attempts to modify the environment. Here, the villagers find themselves trapped by these narratives of the origin of water and the powers water manipulation entails that lie beyond the reach of the community members.

To the Huanoquiteños, then, the ability to manipulate land and water hinges upon a very particular kind of knowledge that has been lost. However, it leads us to inquire into other kinds of knowledge needed to modify the environment and, furthermore, to ask how these changes in knowledge regimes are reflected in the connection to the land. Ultimately, this is a question of the kinds of places wherein knowledge sits.

Climate Change, Water Scarcity, and the Abandonment of the Countryside

To understand the current reconfigurations of landscape and irrigation practices, it suffices as a first move to look at the Andean horizon of the Cordillera Blanca. Over the past 40 years, the glaciers of the Cordillera Blanca have lost up to an estimated 30 percent of their mass. Repeat photographs and close studies of glacier mass balance bear testimony to the remarkable rate of glacial retreat (Carey 2010; Vuille, Kaser, and Juen 2008). For people who have spent their lives dwelling in proximity to the glaciers, the change of appearance is deeply felt. There is an emotional attachment to the mountains and glaciers, and in the recent past, these were sites of veneration and ritual practices (see, for example, Bolin 2009 for the Cusco region; Paerregaard 2013a for Arequipa).

However, in Catac, engagements with the so-called earth beings are limited and do not form part of the politics of water distribution (de la Cadena 2015). That said, this is also a phenomenon that marks an important difference between generations and, perhaps more significantly, between those who continue to inhabit the altitudes and those who have shifted to a more urban lifestyle. To the former, water is a source not only of life but also of death and evil spells (Gelles 1995; Gose 1994). When I visited the high grounds of Raria, Valeriano, my friend and guide, would make offerings to the abuelo, Grandfather Mountain, to secure us a safe passage. Some candy, alcohol, and one of my energy bars kept us from trouble. Others from the older generation are also sure to inaugurate the field and pay their dues to the water at higher altitudes to make sure that neither animals nor humans suffer the harms from the capricious beings lurking underneath.

Mark Carey (2010) writes about how people in the northern part of the valley around Parón Lake would remove scientific equipment from the lake because it was believed to disturb the beings residing in the water. And while walking across the highland puna grasslands with Nestor, a 30-year-old man who resides in his parents' household in Churana, he would warn me against beings luring us into the water. But when I went to Queshque with Jhonatan – Nestor's cousin, who was born in Churana, the young president of the irrigator's commission, university student, peasant son, and contracted overseer of the construction at Kotosh – and Mario, the driver from the municipality, we did so in a four-by-four truck most of the way and with no worries about any

kind of earth beings, even though we ventured far into the depths of the valley, as I had done with Valeriano.

The differences between generations and across modes of inhabitation in their perception of water do not go unnoticed. While in Raria with Valeriano, we sat down to rest after the steep ascent up to the wetlands of the high valley, leaning our backs against the remains of an adobe wall. We noticed several of these decaying walls as we walked through the landscape. With only one active household, Raria is a place where one clearly notices the impacts of a trend associated with the general loss of stewardship of the land – the young people are leaving the countryside. Life in the altitudes is described as rough and unpleasant – "pure sacrifice" – and an increasing number of youngsters are staying in the town of Catac or even moving away to study in Huaraz or to the coastal attractions in Lima, Huacho-Barranco, or Chimbote. That said, the town of Catac has in itself enough economic movement, and with its location on the Lima–Huaraz highway, it is well-connected to both cities, so as to maintain a fair number of people and even attract some outsiders from the eastern escarpments of the Andes.

Queshque is one of the four major watersheds that make up the territory of the Comunidad Campesina de Catac. Literally translated as "peasant community," a comunidad campesina is a territorial organisation of highland dwellers. An associative enterprise, it is organised socially and productively around a commonly owned territory. In the case of Comunidad Campesina de Catac, this is around 66,000 hectares of land, which was shared by more than 700 members as of 2014. In 2015, the membership reached almost 1,000 households. The territory extends from the brink of the Santa River (the lowest point is approximately 3,600 metres) to the highest peaks of the Cordillera Blanca, at more than 5,000 metres. The lower areas near the town of Catac are cultivated fields of cereals and tubers, but most of the territory is destined for the herds of ovine livestock. The community has reserved for itself a plot of land for communal herds both in the low-lying (3,800–4,000 metres) parts of the sector of Pampajalca, where genetically improved specimens of sheep are tended by salaried workers, and in Kotosh, the watershed neighbouring Queshque to the north.

There is an important difference between the northern and the southern parts of the community. In the southern sector of Pampajalca, which includes by far the largest of the four watersheds, that of Pachacoto and the Raria sub-watershed, people hold their animals in a system of rotation. It means that they spend the dry Andean summers in the higher parts (approximately 4,200–5,200 metres) and retreat to the lower parts (around 3,700–4200 metres) during the rainy season. In the northern sectors of Queshque, Churana (which includes Kotosh) and Chacaypampa, the majority of the dwellings are fixed year round. All of the area is served by irrigation channels, most of which are dug out, with no interior lining of concrete. The channel constructed for Kotosh, to which I return below, was the first to bring water down in pipelines, and the projected irrigation complex of Queshque would be the first to include both the damming of water and the piping of water downslope.

The irrigation systems themselves are not officially part of the Comunidad Campesina de Catac. As per legislation, each channel is managed by a users' committee. These are, in turn, organised at a larger level in a commission and by the regional irrigator's organisation. Among other things, these organisations are in charge of solving water conflict between the channels. The Queshque Channel, to which we turn our attention shortly, is headed by Lucas Sanchez. The committee gathers 150 users and can charge member fees, coordinate activities of maintenance or improvement, and regulate the water distribution among its users. Also within Catac, each channel has its own water distribution system; there is no regularised system throughout the territory. Smaller channels have turns over the course of a day; others may have allocated water for only half a day. Some can irrigate every week; others only once or twice a month. As I discuss below, this is an area that has traditionally enjoyed plentiful water supplies. But, in recent years, the peasants report that water is becoming increasingly scarce.

The changes of the environment therefore feed into changes in the production system and changes in the very terms of engagement with the landscape. I asked Jhonatan, who is – as mentioned above – a key figure in local water management and, currently, the president of the Comisión de Regantes San Yldefonso, whether they have noted a difference in water availability, to which he answered:

> *Each day we sense the crisis even more. Before, there was no committee. In terms of distributing the water, there was no administration. Everyone irrigated at will. There were no problems. But beginning in 2003, the committee began to worry because people began to want water to water their pastures.*

There is a seeming contradiction in Jhonatan's reply. Before there were no committees and no problems; now there is water management and there are problems. Jhonatan is alluding to a very common perception of

the changing patterns of water availability in Catac. A previous abundance with very little need for formal management has been replaced by prolonged periods of scarcity. As a consequence, more rigorous schemes for water distribution are being implemented. Institutionally, the governance of water has been divorced from the governance of land. We return to the consequences of this shift later in this article.

Thus, the altitudes are no longer the prime site of economic activity in Catac. The high-altitude residences are often either in the hands of people of quite advanced age or managed on a daily basis by outsiders working for either a paid salary or a share in the offspring. To Valeriano – and others that are dwelling in the altitudes – this outlook is reflected in one's respect for the earth and its beings:

> *People no longer pay their tributes to the abuelo [the mountain deity]. They have left the manadas behind, and when they leave the hardship of the altitudes they also stop paying respect to the abuelo that has protected them. We are only old people left up here. All the young ones now study in universities to become professionals with big salaries. I think that it is good that Catac advances, but I feel sad that the young people forget.*

Such drastic social changes go hand in hand with the environmental changes described above. Rural lives are being redefined as the relative balance between on-farm and off-farm household activities shifts. The majority of members of the peasant community maintain a fair number of animals in their possession, but they are only to some extent engaged in the everyday maintenance of the herd. Instead, the animals serve as an economic buffer to people with poor access to the formal credit system.

Below I detail how new irrigation initiatives are being proposed facing these twin movements of environment and people. The gap between glaciers and people is widening, as the glaciers continue their slow retreat uphill and the high altitude livelihoods gradually lose their attraction. This gap represents not only an actual separation in space but also a figurative widening of the gaps between beings of this world and the other. Experiences of water scarcity and narratives of an imminent water crisis with no water at all combine with socio-demographic movements toward the bottom of the valley to create a sense of urgency. As Karsten Paerregaard (2013b) describes for Tapay in southern Peru, a community that has had a more sustained engagement with the earth beings until fairly recently, Andean peasants have changed their focus in terms of water management. He argues that the Tapeños no longer rely on their relationship to the mountain deities to procure water. Instead, this role has been taken over by the new water bureaucracy of the state. In the next section, I show a similar dynamic.

The Case of the Queshque Reservoir

In many ways, the situation in Catac resembles what Seligmann and Bunker (1994) described for Huanoquite more than 20 years ago. Traditionally, the landscape served not only as a site of production but also as a repository of meaning. However, a restructuring of the production systems, reshuffling of land tenure, and an increasing articulation to the market economy has led to a disarticulation with the landscape. However, instead of loss, the case of Catac shows how the peasants of this community are able to use these opportunities creatively and engage in other kinds of knowledge and ways of making the water flow. This resituating of the constituency of water in the landscape also entails a resituating of knowledge.

"From here to over there the dam should be," Jhonatan's pointing arm follows an imaginary line from where we are standing, across a ravine, to a point on the opposite side. We are standing in the area known as Queshque, at approximately 4,300 metres above sea level. A valley formed by the glacial movements of the past, Queshque's concave shape narrows at the point where we are standing. It is a stunning place. At the far end of the valley, we can see the glaciers of the Cordillera Blanca. Between us and the glaciers, two lakes are formed. A third one is located further up, beyond our sight. The dam that Jhonatan wants to build would merge those two lakes and flood several of the now-abandoned homes that used to be inhabited by people of his father's generation. Jhonatan, himself in his early thirties, has done what many others of his age are doing – he has moved to the nearest town, where opportunities of labour and leisure are much greater. He is also a university student and, importantly, a central figure in local water management.

The dream of Jhonatan and his fellow members in the peasant community upon whose lands we are standing consists of the following: to dam the lakes at Queshque and improve the irrigation channels that already lead water from the river to the lower parts. The damming of the valley would create a reservoir to act as a buffer in times of water scarcity, which is believed to be imminent in the area due to climate change and glacial recession. Instead of the current open and unlined channel, the now abundant waters of the Queshque complex would be enclosed in pipes, thus

reducing loss to filtration and evaporation, descending to a lower-altitude reservoir, where they would then be distributed to fields of improved pastures for enhanced dairy production. This would reflect the general trend in which the high-altitude residences and production zones are increasingly being abandoned in favour of lower-altitude economic activities. Jhonatan explains:

> *In the higher part, life is pure sacrifice. The sons and daughters do not want to live on the puna anymore. In the future, they will be dedicated to bringing the animals to the lower-lying altitudes. It is convenient that it is in the lower parts. That it is better controlled, more technified. Better animals. Leave the high ground so that it can recover. As you have seen, it is affected [by the animals].*

This project is verticality reimagined (Mayer 1985; Murra 1972, 1985). Going from a logic in which different production zones combine into a more complete household-income portfolio, the efforts to create a reservoir at Queshque and transport water from the uncomfortable high areas to the lower-altitude pastures in the proximity of the urban centre reflect shifts in the role that the environment plays in the local economies. It is therefore not about "extending existing cultivation" in time and space, as the classic insights on irrigation would have it but, rather, a matter of intensifying production in particular places while leaving others idle (Guillet et al. 1987). By constructing the reservoir in Queshque, the peasants of Catac effectively redefine the upper areas from ones of production to ones of provision. This reflects the trends in which the production zones of the upper grounds are increasingly being abandoned.

There is one caveat to this plan; however, Queshque is located inside the Huascarán National Park. It is a scenic place with its lakes and glaciers, and it is home to a large population of the endemic *puya raimondi*. This plant grows up to 12 metres high and blossoms only once during its lifetime, but it does so spectacularly, with more than six thousand flowers and millions of seeds. The area is also home to iconic species such as puma, vicuna, and condor. The Huascarán National Park was established on 1 July 1975 (Barker 1980; Lipton 2014), following the aftermath of the agrarian reforms of Velasco. In Catac, these drastic reforms provided the final push to get rid of the landed elite, whose abusive tenure regime had been subject to an ongoing recovery of the lands since the early 1950s. The impacts of the reforms were uneven and did not necessarily secure the land for those who worked it, as promised in the inaugural speech (Velasco 2005). In Ancash, the territorial order of things was further unsettled by the devastating earthquake in 1970 (see Bode 1989; Carey 2010). This created the opportunity for the realisation of an idea that had already been proposed in the beginning of the 1960s: to preserve the rugged wilderness of the Cordillera Blanca. When this finally became a reality in 1975, it happened without much local consultation. In Catac, I was told by the then president of the community that there was no information and no consultation.

Initially requiring the total abandonment of all non-native species, the park administration soon realised that this would be impossible to enforce. In 1978, they allowed sheep and cattle herding inside the park nucleus. Currently, the everyday activities of the high-altitude herders are limited by the fact that they carry out their livelihood activities inside a national park. They can manipulate wetland areas by way of drainage (much to the despair of the park administration, who are worried about the crucial role of these efforts in the hydrological cycles of the mountain ecosystems), and in spite of official restrictions on the number of animals, they continue to sustain herds beyond these limits (again, according to the park administration, causing deprivation of the highland pastures). They also collect some medicinal plants. The biggest change in management practices brought about by the park has been the almost complete abolishment of the traditional burning of pastures that occurs region-wide around the San Juan celebrations at the end of the rainy season. The primary sites of direct confrontation between the park and the peasants from Catac have been in the areas of tourism related to the Pastoruri Glacier, extraction and artisanal mining operations, and concrete construction. The project in Queshque pertains to the latter.

The aspirations to reconfigure local water distribution reveal both the emergent alignments of interests as well as enduring antagonisms both within the state apparatus and between state institutions and civil society. I asked Lucas Sanchez, president of the Queshque Users' Committee, about the challenges to constructing the Queshque irrigation complex:

> *The only problem that we now have is with the park. The park does not allow us to draw out channels, because we are located in the buffer zone. So the park makes it harder for us. They sometimes make it complicated for us to construct channels, make reservoirs, and all that. Because if there weren't this kind of opposition … Of course, you have to take care of the plants – I mean; the flora and the fauna. When we make channels we change the ecosystem. Therefore, the park makes it hard for us. But then, if we think about the future, we need this water with the irrigation channels, with reservoirs, with dams.*

> *We need it. If there are none, if we don't do that, in the future there will be no more water. We want to leave this to the future [generations]. Because we have ended [all that water] that was going to be in the future. So the least we can do is to leave this water for the next generation. The glaciers won't be able to supply. For sure, there will be no glaciers.*

Several issues are folded into the irrigation projects in this narrative: conservation, production, and concerns for the future. In Huanoquite, Seligmann and Bunker (1994) describe how the irrigation system is associated with the ancestors who constructed it. Its function, its use, and the applicable knowledge were all linked to the past; the knowledge is no longer available. Lucas and Jhonatan, by contrast, orient their irrigation practices in the future of the landscape. There will be no glaciers. The ones to recur are not the apus or the ancestors and their knowledge but, rather, the water bureaucracies. I look into these in the following sections.

Water Bureaucracies and Visions of the Landscape

Our four-by-four pickup truck stops on the side of the road heading toward the Kahuish tunnel connecting the Callejón de Huaylas side with the eastern slopes of the Cordillera Blanca in Conchucos. Inside the Toyota's cab are the mayors of Recuay and Ticapampa, an engineer from the Local Water Authority, Autoridad Local del Agua (ALA), office in Huaraz, and the mayor's driver. In the back of the pickup climbing the winding roads from Catac are representatives of the Catac peasant community, users of the irrigation channels tapping water from the Yanayacu-Querococha watershed, and myself, the anthropologist. We are heading to this place to perform the official visual inspection of it, the site of the intake for the new pipeline, which will bring potable water to the provincial capital of Recuay. Heretofore, the inhabitants of that city have had to drink the reddish waters from the sources in the Cordillera Negra. This construction should therefore improve the quality and availability of water in town.

Some 50 metres farther up the road from our designated parking spot, I notice a green signpost: Parque Nacional Huascarán. As we walk down the slopes toward the river, the mayor of Recuay, a talkative and energetic young man who is serving his second term as mayor, explains the imagined trajectory of the pipeline: "*It would have been better to place the intake closer to the lake*," he tells the walking crowd. "*But we decided to put it here, outside, in the buffer zone. If you construct something inside the park, they want you to account for every little plant, every little animal. It's too much trouble*."

The pipeline drawing water from the Querococha watershed to the provincial capital in Recuay brings along a well-deserved improvement of the water quality in that town. What interests me more than discussing the health benefits to the urbanites of the administrative centre of the upper parts of the Santa Valley are the alliances evident in this encounter on the bank of the river: the mayors of the rural municipalities affected by the pipeline (Recuay, Catac, Ticapampa), the users' committees from the affected channels (those who also have their intake from this river and who may find themselves in increased competition over the amount of water), the representative from the ALA ensuring that the environmental requirements are in place and that the river maintains its ecological stream flow (*caudal ecológico*) in spite of yet another user extracting water from the riverbed, and the delegation from the comunidad campesina in Catac, through whose territories the pipeline would cut its way.

The ALA is part of the new institutionalisation of water within the National Water Authority framework that followed the 2009 Law of Hydrological Resources (Ley 29,338). Based on a principle of Integrated Water Resource Management, the engineers working in this institution are in charge of allocating water rights to different users based on social priorities and ecological principles (Oré and Rap 2009). In practice, however, community members, park administration, and municipality representatives are able to reveal stories of a very flexible institution that readily gives permits to the expansion of the range of water uses following a logic of putting every drop of water to productive use. The community members are ambiguous about this issue. While they seek alliances with the engineers in instances of productive infrastructure, they have fiercely resisted such distribution priorities on occasions of water rights allocated to mines (see Rasmussen 2016b). With respect to the other state institutions involved, the rural municipalities preoccupied with producing concrete developments often align with the ALA. At the park administration, frustrations mount as they repeatedly see water rights granted at will without consultation or consideration of the ecological and aesthetic value of certain waterways.

The absence of the national park administration was also remarkable. The mayor's comment as we approached the site for the future intake had resonance in the small crowd. Most have had experience with the requirements of the national park in matters of construction. The head of the national park later told me that he had driven by the site enroute to Huaraz from an inspection in

Conchucos. He had noticed the cars parked on the side of the road, and our small party gathered on the bank of the river. But he had not been informed about this final inspection before the commencement of the construction and, in spite of this being inside the buffer zone, had not been asked about the park's opinion. This is not unusual for the infrastructure projects led by authorities at all levels of government. The care for "little plants and animals" is not high on the agenda; concrete is.

Large-scale projects such as an Amazonian road entail an inherent promise of speed and connectivity (Harvey and Knox 2008). This association between concrete and speed should be taken as more than a literal statement of the increased connectivity that the roads create (Taussig 2004). Concrete is intimately linked to modernity and visions of progress (Cameron 2009). With its ability to be both malleable and hardened, it also provides a provocation to Andean notions of stone, earth, rocks, and mountains – the materials that make up the Andean cosmos (Harvey 2010). This vision of progress and prosperity is one that, to a large extent, is shared by peasants and authorities and one that has been noted elsewhere as well (Boelens and Gelles 2005; see also Rasmussen, forthcoming). In Catac, the inhabitants are ambiguous about the earthquake in 1970. While it levelled the town and caused region-wide devastation, it also created the opportunity for making a thoroughly modern town with a neat grid outline and concrete walls. The concrete of the town and the productive infrastructure alike feed this sense of living in a town of progress. The new irrigation projects contrast with the pre-existing ones in several important ways: first, they are pipelines rather than open ditches. The majority of channels in Catac are what the peasants themselves term "rustic" (*rústico*) – that is, unlined – implying a great loss of water to evaporation and filtration into the ground. Second, the construction of the channels is accomplished with state project money and salaried labour rather than communal, locally organised labour.

The modernity of the channels in terms of their materiality and the way they articulate social relations is explicitly linked to the modernisation of the Cataqueño countryside. No longer a matter of community organisation, the construction of these projects is to be sustained through paid labour (*jornales*), and carried out by a bid-winning consortium that is accountable to the local government rather than directly to the water users. It means that rather than relying on the collective mobilisation of labour (*faena*), these projects have become part of the regular job market, where those hired are those who are well-connected. When a new project is being announced, word runs fast in these highland towns: Who is in charge of hiring the workers? Who may know that person if I don't? While aimed at sustaining agriculture, these projects are therefore also connected to the rural economies of labour, development, and progress.

"*Why did they have to paint these blue?*" the head of the national park asked me. He did not expect me to provide an answer as to why the intake at Kotosh – located suspiciously near a fragile wetland zone inside the park nucleus – had been painted in a bright blue colour that can be seen from afar amidst the dull brown-green colours of the grasslands. A native of the Huaraz area and himself the son of poor and illiterate farmers and merchants, he knows well the role that the visibility of infrastructure plays. In the 1990s, the Fujimori administration painted everything from irrigation infrastructure to schools in luminescent orange. Today, apparently, the colour of public infrastructure of the Andes is blue. And, in Lima, at the time of this writing, since the return of Castañeda to the town hall, everything is yellow – from buildings to flowers. In a context of the shifting presence of state authorities working at different levels of government, the strategic visibility of infrastructure works as a sign of both modernisation and progress as well as government care and intervention (see Cameron 2009; Carse 2012; Larkin 2013; Swyngedouw 2007).

The rhetorical question that the head of Parks asked me in his office, looking at the pictures I had taken during my recent visit to the newly constructed, but not yet inaugurated, irrigation complex at Kotosh, was not induced by concerns of who is currently in power and capable of determining the colour of infrastructure. It was a question of landscape aesthetics. Kotosh is the watershed in the neighbouring Queshque. The irrigation complex consists of a regular intake tucked in between a wetland and the steep slope typical of these high-altitude glacial valleys and a pipeline bringing water to three low-lying reservoirs. Together with the new water provisions from Queshque, Kotosh aims to heighten agri-pastoral production in the Catacpata plateau. For the park, two kinds of impacts are of major concern in relation to such projects: first, the hydrological impact on ecosystems and, second, the aesthetic impact on the landscape. The pipeline is laid underground, and its trajectory is covered with the natural grasses known as *ichu*. In time, the canal will therefore vanish into the landscape. But the blue intake machinery remains highly visible.

The construction of new irrigation projects is suspended between different entities claiming authority and legitimacy to determine the course of water through

the landscape. These have different visions. The national park is naturally concerned with the impacts of the projects on both ecosystems and landscape. The local water authorities are those with the capacity to allocate water, which is, by law, under the patrimony of the Peruvian state. And, locally, both the Catac community and the municipality are advocates of this kind of project. It means that irrigation and the consequent moulding of the landscape are deeply embedded in local and regional bureaucratic structures.

At the end of a prologue on José María Arguedas's short story "Agua," Rutgerd Boelens (1998) reflects on the implications of the story in the present. He suggests that, even though the old patterns of oppression have changed, water distribution continues to be a conflict-ridden field. Pointing to the "universalist and objective" measures of the technocrats, Boelens rhetorically asks: "The interventions of today, have they replaced the old hacienda? The engineer, lawyer or sociologist, is he the foreman of yesterday?" (xxvii [my translation]). The material here suggests that he is partly right, yet the peasants of Catac also show great adeptness in engaging with these new languages of water, finding ways of creating strategic alliances with parts of the water bureaucracy. Jhonatan, the president of the irrigation commission and contracted as community representative to oversee the construction process of the project at Kotosh, told me this about the initial process after I had asked him whether they needed permission from the park to do the construction inside the park nucleus:

> *First, we had to do the proceeding with ALA [to get the authorisation to use the water]. Later came the park. It insisted that we make studies [of environmental impact] according to the program technical description (*expediente técnico*). With the demands from the community and the municipality, the park had to authorise this. Because water is necessary for a population such as that in Catac. At first, the park resisted. They said that it would bring harm to many animals, the rocks, the wetlands. It is all affected. But you have to see the reality. That it partially affects, but it also partially benefits. It is not just that it affects, but that it also brings benefits to people. We had to put pressure on the park. If we didn't, they would not accept us. Anyway, when we have large projects such as this and Queshque, we have to put a lot of pressure [on the park], and we must comply with the requirements. The water, the environment, the study, so that we do not affect negatively the nucleus zone and the ecosystems.*

There are several balancing acts involved in this statement: between different institutional interests and modes of operation; between definitions of positive and negative impacts; between politics of compliance and politics of pressure. Crucial in the case of Catac are two factors. As I have discussed at length on other occasions, Catac is a peculiar organisation with a deep history of social struggle and currently a profound control of local affairs (Rasmussen 2015, 2016b; see also Osorio 2013). Since the final expulsion of the landed-estate elite in the early seventies, the Comunidad Campesina de Catac has shaped local development in ways equal to the municipality. Driving much economic growth in the district through its communal businesses, they have, as one of its long-standing leaders explained to me, the "capacity to convoke." It means, in other words, that when the general assembly in the peasant community organisation decides to take action, it can mobilise 700 households. That includes most inhabitants in the town of Catac. Historically, this has implied a tight connection between the grassroots democracy of the community and the elected representatives of the municipality. According to community leaders at large, there is rarely a decision in the municipality that has not been approved by the community. This balance appears to have been changing lately, as the municipality – with poor funding since its institution in 1965 – has increasingly gained access to public coffers due to the decentralisation process and mining levies destined for rural municipalities. In the cases of Queshque and Kotosh, these are led by local governments with the support of the community and the users' committees. I look further into these dynamics of development and the topologies of infrastructure in the following section.

The Transformation of Landscape

The process of constructing the reservoirs, intakes, and pipelines in Kotosh and Queshque is intimately bound to the political economy of infrastructure and the current conjunctures in Peru, where the increased funds due to mining activities have created a boom in irrigation projects in Ancash. The Huascarán National Park is therefore dealing with several projects of productive infrastructure that seek to bring water from the preserved highland sources to lower-lying production zones. In their classic study on irrigation and society in Cusco, Carlos Valderrama and Carmen Escalante (1988) argue that the community members have acted like, and felt like, guardians of the water and the glaciers. This was a role inherited from their ancestors that they were obliged to pass on to their heirs. It was key to the sustainability and continuity of irrigation and the community. Water for irrigation, therefore, is constitutive of the power of the group of people controlling it. This is a point that has been reiterated in several studies on

irrigation, water, and power (for example, Gelles 2000). Therefore, they argue that the hydraulic system and the system of knowledge and beliefs associated with irrigation are fundamental to the continued sustainability of the community management of the environment. This is what allows them to survive in the hostile and dry Andean landscapes.

The discussion of the reworking of the Andean landscape in Catac displays some important discontinuities in relation to this otherwise insightful comment. Of course, one should note that while their study was conducted on the dry slopes of the western Andes, Catac is located in an inter-Andean valley with plenty of water in the ground, as glaciers and as precipitation. In spite of these differences, some observations are worth noting. First, time's arrow has been reversed – instead of looking into the past for guidelines as to how proper water management is carried out, the demographic changes are exacerbated by environmental changes, and irrigation is much more a matter of looking forward. This fundamental reorientation of irrigation practices also changes the kind of knowledge necessary to engage with the predicted water scarcity. The second point is a corollary. Knowledge about water, and, in particular, the enhancement of water availability, is no longer located in old forms of social hierarchies. Instead, the procurement of water pertains to the state bureaucracy of water, and the knowledge of how to engage with this is therefore profoundly bureaucratic and technological. This brings us back to Penny Harvey's (2005) point about the kind of effects that are produced by the state, which are, as we see here, in tight connection to grassroots mobilisations.

In 2014, I discussed the challenges facing the community with a man who would become its president the following year. While maintaining a herd with some of his kin, his main economic activities are now located in the town of Catac as well as in the regional capital of Huaraz. An eloquent man, he provided the following analysis:

> *Look, for some time now the production in the countryside in Catac has been in a state of crisis. For various reasons. One of them is related to the weather here. There is lack of pastures. The rain arrives late; leaves late, too. And the more latent problem is that people are abandoning the countryside because of the demand for labor in the city. Because of the current situation in Peru. Because of mining activities.*

He elaborated on how his ancestors for generations had sustained themselves by being dedicated to the land, and he continued:

> *But nonetheless, a while ago we made reference to the economic bonanza of the country because of mining. Imagine now that the mines leave tomorrow. Who will create the resources? The state is not prepared to face the absence of this activity. There is no alternative for our continued maintenance … There is no assurance that just because some of us have professions we will be secured all life. So we will have to go back to this activity at some point. [The economic boom] is just momentary. Because [agro-pastoralism] can support us, we invest in it, too. We invest.*

Here both future and past are folded into the present. These investments are small scale, like the fencing of lands, the purchase of medicines to treat animals, or the use of fertilisers for crops, as well as those on a much larger scale such as the coordinated efforts to improve the irrigation systems and open up lands to improved pastures. Such projects are costly, though, and beyond the immediate capacities of the farmers. They must therefore seek support in networks outside the community boundaries. His analysis of the situation is partly shared by the authors of the report made by Consorcio Queshque (2014), which won the bid to construct the project:

> *Since time immemorial, the areas in Catacpata and Queshque have been primary sites of agricultural production in Catac. They therefore represent a motor of development of agriculture, which sustains 70 percent of the total population of the district. Nonetheless, to this date and in spite of the technological advances and the economic growth advertised by regional and national authorities, in these areas production continues to be traditional, water is distributed inadequately, and there is a lack of infrastructure which would allow people to attend to more agricultural land … Facing low productivity, many choose not to commercialise their products; [they] abandon agricultural production and migrate to the urban centers that do not offer them a better quality of life nor an improved socioeconomic situation.* [Translated by the author]

Further to this report, they note the overlapping interests between the Comunidad Campesina de Catac, which "for the sake of improving the conditions of the agricultural activities have put the territories at free disposal to whatever improvement that can come about" (Consorcio Queshque 2014), the irrigation committee (whose 150 members are "*at least 99 percent also members of the community*"), and, consequently, also the ALA in Huaraz:

> *The interest of the irrigators committee, like that of the Comunidad Campesina de Catac and ALA Huaraz, is to secure that there is a sufficient amount of water at their disposal, and that the management of the water (including its administration) is the most appropriate … leading to a higher level of production and, consequently, a higher level of income.*

Such projects of productive infrastructure draw together a host of different actors with aligning and divergent interests. While the project at Querococha was carried out by the Recuay Municipality and the project at Kotosh by the Region of Ancash, Queshque is located within the municipality of Catac. Consequently, it is the head engineer who must – in his own words – "reconcile" and "mediate" between the interests of the Comunidad Campesina de Catac, which de facto includes the irrigation committee and ALA Huaraz, which expedited the approval almost by default, on the one side, and the Huascaran National Park, on the other side.

The current transformation of the Andean landscape is remarkable. In addition to ubiquitous environmental change, rural municipalities have access to greater funds due to the mining royalty levy, and the central government allocates funds for infrastructure such as roads and irrigation, the latter currently through the program Mi Riego. To understand how configurations of water are constitutive not only of the projected infrastructures but also of the landscapes that they traverse, I have focused on the intersections between different kinds of state and non-state organisations, visions, and interests. The infrastructure of water emerges in these encounters between networks, reshaping the Andean landscape. As the flow of water is altered, the future of the relationship between place, people, and production is unsettled. Future and temporality, writes Jane Guyer (2007), can be reconfigured and rearticulated. Even though the near future remains present in the everyday practices that are carried out in relation to the management of the water, the far future changes shape with the attention to climate change. The negotiations of water futures stretch themselves beyond mere technocratic solutions (even if the engineers of the ALA and municipalities seek to mask them as such) and become constitutive of the sense of place and the production of the landscape.

Conclusion

By the end of my 2015 fieldwork, the project in Queshque was still underway. Negotiations between the peasants in Catac and the park were ongoing – the park focusing on the feasibility of the project and the peasant representatives insisting on the right to define the course of the community. Kotosh was stalled due to discrepancies as to the location of the lower-lying reservoir through which the water would be distributed to the fields. And Querococha was almost finished, meaning that the inhabitants of Recuay are by now drinking water that is of much better quality.

By focusing on these processes of construction and the contentious encounters over the hydrology of the high-altitude areas controlled by the national park regulations but under daily use by the peasant communities, I have discussed the implications of local-level conceptualisations of water at the interface between conservation, water bureaucracies, and customary use and the role that these play in the redefinition, reconstruction, and manipulation of particular landscapes. The current economic conjuncture in Peru has meant that funds hitherto unseen in the Andean municipalities are available. While there has been great confusion over how to spend this money, and the consequent abuse of the funds, it has also opened up new and ambitious projects (see, for example, Cameron 2009). The park administration currently deals with several projects of the same or greater economic magnitude as Kotosh and Queshque that seek to bring water from high-altitude sources via modern pipelines to low-altitude fields. To the park, this presents both a challenge and an opportunity – a challenge with regard to fragile ecosystems and the impact that both the construction process and the long-term presence of concrete structures may have on these ecosystems as well as possibilities for renewed cooperation and a diminishment in the number of animals lowering the quality of water and soil in the high valleys.

To the peasants of Catac and beyond, the new water infrastructure resituates water in both the physical and social landscapes. Demographic and environmental changes make for a situation in which the permanence of social topographies becomes unsettled. Imaginaries of imminent water scarcity and the gradual vacating of the high-altitude residences require the peasants to rethink their engagement with the landscape. The relationship between people, place, and production shifts as water systems are being redefined and reconfigured. The case of Catac also shows how this is a moment not only of loss but also of renewed opportunities, as the entrepreneurial peasants of this highland community show great adeptness and creativity in combining old and new languages of water, life, and landscape. To engage with water bureaucracies, of course, is both suggestive of, and dependent on, the power relations that shape water futures and produce new landscapes. Knowing water now pertains to a distinct realm of extra-village politics. The new water vernaculars entail

ways of negotiating and defining the meanings of the landscape even in times when the future seems unsettled and the present impermanent.

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