Water in the Andes from the Mid-Nineteenth Century to 1950

Water Management: Tensions, Risks, and Legislation. An Articulating Socio-Environmental Perspective

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Temporal and spatial scales are necessary tools to critically understand social and environmental processes. The borders of the event and the conjuncture, as well as those local and national, are insufficient to comprehend what will happen in the long term or on a global or even regional horizon. However, this insufficiency does not imply exclusion, but rather a combination of scales in a complex structural view. Perhaps one of the broadest structures is the Anthropocene: the epoch structure currently sounding alarm bells about the commons, including water.

With the starting premise thus outlined, this chapter asks how water management in the Andean region – urban and rural – shifted in the rupture of the nineteenth century and the dawn of the twentieth century: a fundamental moment of changes towards "modernizing" according to the logic of the ideal of progress. Specifically, reference will be made to different enclaves in the current Andean countries of Colombia, Peru, Ecuador, Venezuela, Bolivia, Chile, and Argentina, thus seeking a regional perspective that will take certain case studies as indicators of shared trends concerning the overarching theme.

In turn, the topic will be broken down into three areas of interest: the interactions between local and state power and social actors linked to water use and management; the transformations of space that gradually pose risk conditions for communities; and the legislative journey that has accompanied and shaped these tensions and modifications in the space and control of water.

Water Use and Management: Interaction and Tension in Andean Water Spaces

As an introduction, this section will note the perseverance in the occupation of Andean enclaves and the central role of local institutions in managing water spaces.

Next, it will analyze the conflicts over administering watercourses linked to irrigation techniques. Finally, this section will observe the modernizing hygienist projects and one of its articulating axes: water.

The spaces we inhabit today have shaped us in the long term. Although the toponyms have largely lost the trace of their past sounds, the material and symbolic location of these places constitutes us. The settlements and exchange crossings in the Andes have been maintained over time despite the sixteenth-century colonial fracture and the effects of population and land administration. One of the key elements for settlement in a place is precisely its access to fresh water. In this light, the Andean space – the northern Andes in particular – constitutes one of the most important regions in the world, with high levels of rainfall, large surface water basins, and biomes that function as water regulators (Hosftede 2003: 1).

An example of this large freshwater influx and the continuity of inhabited spaces is the populations of the three regional axes in the current borders of Ecuador. Before the sixteenth century, these groups were already located in or traveled on the "thaws of the Pichincha volcano in Quito, in the Daule River in Guayaquil, and the four rivers (Tomebamba, Yanucay, Tarqui, and Machángara) of Cuenca" (Martínez Moscoso 2019: 32). In Colombia, the San Agustín, San Francisco, Arzobispo, and San Cristóbal rivers surround and delimit the city in the Cundiboyacense altiplano of the Bogotá savannah (Osorio Osorio 2009: 2); and in Peru, the conquistadors' gaze went to the coast, to the valley of the Rímac River (Lossio 2003: 18), a valley in which they would found the city of Lima "on top of an aquifer of approximately 390 square kilometers with a depth of 100 to 500 meters"; "water percolation from the mountain range and the Rímac River" served to fill the aquifer, giving rise "to springs and *puquios* [subterranean aqueducts] that provided (and still provide) drinking water to the people of Lima" (Bell 2014: 94).

When the Andes gradually became part of the modern world system, the *cabildo* was the local government body that dealt with colonial needs for the administration of the water space and had jurisdiction over both the land and the management of the water system. The *cabildo* was, therefore, the "axis of urban life, of daily life, of the public, and of the state in the localities," and its power did not diminish at the beginning of the Republic (Borrero Vega 2015: 75–76). With names such as *cabildo* of the *ancien régime*, constitutional city council, or republican municipal corporation of the nineteenth century, this governmental body constituted an organizing pillar of the local territory and water space which, far from being an administrative abstraction, was composed of the colonial or republican elites, thus marking a series of tensions. One of these was the tension between the public interests it was meant to serve and the demands of class, among others, when it came to the distribution and management of water. Another existed between local rivalries and the public policies of the government and central state, which gradually became the organizing axis for the territory and its common goods during the republican period.

When reviewing the judgments of different documentary sources from the colonial period, one can observe the recurrent conflicts between neighbors over watercourses and their diversion, use, and passage.

Thus, the tension between local administrative institutions, the economic-political power groups, and the population over which an intersectional power of domination is exercised in different spaces is palpable. If what happened with irrigation, water courses, and land dispossession is considered, this assertion can be better understood as applicable to the late nineteenth and early twentieth centuries, but which structurally precedes and follows this time frame.

Irrigation Conflicts and Structural Dispossession

As indicated above, the northern Andean area has angular and abundant water complexes. This condition would allow, a priori, that there is no scarcity for irrigation and that the amount of cultivated land transcends, in a high percentage, a dependence on rainfall, that is to say, that irrigation is "a water complement in rainfed crops" (Ruf and Núñez 1991: 95). Moreover, irrigation and drainage are ancestral knowledge and techniques, which for centuries made "water a network of interconnection, integrating human needs with the constraints imposed by the ecological structure" (Rodríguez Gallo 2019: 211). However, despite the circumstances and aforementioned knowledge, irrigation is an element of dispute, dispossession, and scarcity in the long term: a situation that began with the different colonial administrations and officials who were previously familiar with it as a technique and, therefore, projected its use to control space, common goods, and populations.

This project, already established and in operation, reveals its deep cracks of structural dispossession during the twentieth century, even within the legal frameworks that resulted from supposedly inclusive republicanism in this regard. In the Ica Valley, in present-day Peru, the 1902 Water Code was applied, which recognized Indigenous authorities for water management and creating syndicates of landowners and peasants in charge of the infrastructure and monitoring of distribution. In this normative context, the demands of dispossessed groups reached a level of enunciation and action that evidences the dissymmetrical use and control of the commons. The breaking point came with the Parcona massacre in 1924 and the consequent disappearance of the village that constituted the meeting place of the peasant organization: "the Indigenous people, through their union organization, had managed to improve water management, thus clashing with the interests of the landowners" (Apacarana Puquio 2017: 60).

From an epochal understanding, there is an opposition between the owners of *estancias* and *haciendas* and the peasant communities. Outside explicit frameworks of violence – and in its broad and constant contexts – conflicts could be resolved by "capturing an unexploited resource in a neighboring basin; as well as by capturing

water downstream from existing systems if the resource [was] fed by other tributaries"; or, equally, by "capturing water upstream from existing systems," which generated "water mobilization conflicts at the intake level" (Ruf and Núñez 1991: 98). In many areas of the Andes and in present-day Ecuador, traditional irrigation canals coexist with those created by state administrations in the twentieth century; the installation of horizontal hydraulic structures, being costly, coexist mostly with vertical ones, which use natural streams as much as possible (Ruf and Núñez 1991: 101). Hence, canals and conflicts, old and new, configure water supply and management relations in an antagonistic structure.

This structure, under the concept of "accumulation by dispossession" – using Harvey's (2004) notion – can also be seen in Santiago de Chile. In 1900, when faced with a biting drought, "the state set as a priority objective the safe provision of water for the population," which was the basis for "greater control of the rivers of the Province of Santiago"; this also led to the enactment of law number 2139 of canal associations, whose board of directors "became, de facto, a court of first instance to resolve any matter, dispute, or conflict occurring within the margins of the canals and over the waters transported by these aqueducts" (Castillo 2020: 26–27). Thus, "the law on canal associations of 1908 and the Chilean Water Code enacted in 1981 are two pieces of evidence that allow us to insinuate that the water accumulation by dispossession has been a process validated at the beginning of the twentieth century and deepened throughout this one" (Castillo 2020: 33).

Thus, irrigation water control and land dispossession are two elements intertwined in the administration of Andean space. Bolivia also demonstrates this in its constant struggles for water, which go beyond the legal framework based on a water law from 1906; these struggles reveal the inadequacy of the regulatory body of the 1970s and 1990s or even the early twenty-first century (SEMAPA). But this entanglement is also ratified in spaces such as the governance of Tucumán, which, although it does not have deep roots with the north Andes in its preconquest process, shares with it "institutions and some common policies" – as Córdoba was part of the Peruvian viceroyalty until almost the end of the Colony (Tell 2011: 418). In this way, between 1870 and 1880, provincial or municipal governments arrogated direct or imminent dominion over the land, selling it, giving it in emphyteusis (land concession contract in exchange for the annual payment of a fee or rent), or charging rent (Tell 2011: 421–422).

Urban Sprawl, Hygiene Movement, and Water Management

Local institutions organize the water space and exercise an intersectional power of domination. From there, public policies for land and population management are outlined, both in rural and urban areas, which are indissolubly intertwined. Properly placed in the cities' challenges at the end of the nineteenth century, the whole

system of water collection, conduction, and distribution started to become obsolete. The city was dense and no longer had sufficient resources "for those who make it grow, for those who come from other spaces" in these regional centers, believing they needed to "sign modernization documents with the rubric of unappealable progress" (Luzuriaga Jaramillo 2013: 140).

The above statement, referring to Quito, can be reflected in other Andean urban places that became poles of population growth and densification, since the last decades of the nineteenth century for several of them. For example, Bogotá, which had about 40,000 inhabitants around 1842, grew to about 85,000 in 1881 (in Osorio Osorio 2009: 6); then, between "1900 and 1925, the original population of 100,000 inhabitants practically doubled" (Gallini et al. 2014: 7). Also of note, Santiago's population increased from about 190,000 in 1885 to 333,000 by 1907 (Fernández Domingo 2015: 120). They were considered poles, either because they constituted regional axes with the resulting administrative services in the territory and opportunities for social mobility or because of the productive growth linked to some type of raw material exploitation. An example of this was the productive mountain areas in Venezuela, which experienced the growth of the network of Andean settlements from the last quarter of the nineteenth century until the third decade of the twentieth century. Growth here was consolidated "with the boom in the coffee economy, whose export volumes stimulated the construction of railroads to the ports south of Lake Maracaibo" (Rojas López cited in Pulido 2011: 108).

Other variables are associated with population growth, such as pressure on the cities' ecological structure. With the exponential growth of the population, spaces experienced pressure on common goods, which deteriorated: high consumption of firewood, pollution of water sources due to vertical logics of use, and ecosystemic imbalance due to soil alteration are a few of the elements observed in the different Andean cities in the first quarter of the twentieth century. Thus, in Bogotá, the wetlands "decreased from several thousand hectares at the beginning of the century, to 50,000 hectares in 1938 to only 500 hectares in 2005" (Gallini et al. 2014: 7).

Likewise, a variable of densification of already urbanized spaces can be observed as a fundamental social element when analyzing the transformation of the Andean urban poles, since, simultaneous to a displacement of the elites to other spaces – such as to La Mariscal in Quito, or to the southeast and north of Las Delicias avenue in Santiago de Chile (Fernández Domingo 2015: 120) – there is also an intra-territorial migration and phenomena of population densification and tenancy; or, even, the creation of slums (*tugurización*) (Lossio 2003: 20). In fact, population growth did not necessarily imply architectural growth – as when, for example, the elites moved in – but rather a concentration in existing buildings, with the frequent phenomena of over-occupation. These places were targeted by the hygienist control, being considered possible "foci of infection."

In fact, linked to these and other variables is the management of public and private spaces by local institutions. With the systematic growth of inhabitants and occupied areas, the ruling elites were faced with the challenge of the polity's health, often depleted by epidemics and water diseases, such as typhoid fever, dysentery, enteritis, "*enfermedad de los cotos*" (swollen thyroid), dropsy, and very high infant mortality rates (Fernández Domingo 2015: 124). The paradigm shift that occurred with the pasteurian revolution, the emphasis on social medicine, and the growing body of empirical information from microbiology and chemical analysis were articulated into a modernization project legitimized by the pathway toward progress and the white-mestizo hygienist civilizing project (Luzuriaga Jaramillo 2013).

In this context, the various processes for the provision of drinking water services in the urban Andes, whether massive or incipient, must be situated. They generally took place in the last decades of the nineteenth century and the first decades of the twentieth century, with pipes being laid in the midst of various discourses, projections, resource shortages, and infrastructure works. Globally, however, they were laid and fastened in response to the urgency for a continuous supply of hygienically controlled water. The combination of supply and hygiene proved its effectiveness time and again in terms of the inhabitants' health. It was necessary to implement multiple central and satellite strategies to ensure the aforementioned duplicity. When the river flows that fed the consumption of Bogotá decreased, a sharp sanitary crisis arose; the proposed solution aimed at protecting the hydrographic basins linked to the maintenance of these flows. With this, a notable "decrease in mortality from waterborne diseases [occurred]: mortality rates from typhoid fever dropped from 136 deaths per 100,000 inhabitants in 1915 to 58 deaths per 100,000 inhabitants in 1921" (Gallini et al. 2014).

The pathway toward progress and control over the watersheds was not implemented on the basis of a general agreement. Dissent, rivalry, class interests, and resistance to dispossession marked the tonalities of these antagonistic structural processes, mentioned above for irrigation, but which are clearly observed in the poles of urban expansion. Antagonisms and struggles also took place between local governments and the central state. In fact, another transversal element to consider is that, within the process of institutionalization of water management both in the city and in the countryside, there are moments of overlapping, dominance, and regency between these two orders. In the transition from the nineteenth to the twentieth century, the state and its bureaucratic apparatus sought to control the projects traditionally handled by local institutions (Maiguashca 1992: 194). Likewise – with great clarity in the implementation of potable water conduction and distribution systems – the need to call on private enterprise manifested, "since it was a service that demanded large investments," whose "execution could not be fragmented and implied a more complex industrial and commercial organization" (Matés 2016: 23).

In 1906, the central power marked the push for 2,800 meters above sea level in Quito. But by 1915, the Congress decreed that "the Quito Municipal Council should assume all the powers that correspond to the Government in the service and construction of drinking water, canalization, and paving works" (Luzuriaga Jaramillo 2010: 38). In the middle of this phase, a Düsseldorf corporation was contracted to build the first treated water plant in the city in 1913. This plant had serious management problems in times of flow variability, which were foreseeable in a high-altitude equatorial climate, as later reports would expose. In fact, the works frequently carried out were not sufficient to ensure supply service. It was necessary to contract additional works, opting "to explore larger and more distant watersheds" to "build dams, reservoirs, and treatment plants" (Gallini et al. 2014).

Those previous assumptions that seemed to be decisive for adequate or inadequate water management in the cities were now a thing of the past. The Bourbon contributions in this regard already appeared as echoes of the colonial past; even the new republican policies of the first and second half of the nineteenth century seemed outdated. With the new century, the combination of private resources, the expansion of state control, some key revenues acquired as export peripheries, and the constant of available labor for projects of national and local interest set a new standard in the magnitude and power of provisioning services and implementing population management dynamics.

Water was, therefore, an articulating element of the modernizing projects of the city, both in its supply as treated and in the management of sewage and waste disposal; both aspects of the same horizon of human habitability; both transversal aspects in sanitary planning, which does not occur in unison throughout the populated territory but in a socially constructed cartography. This planning entailed much more intensive institutional action regarding the environment and its transformation.

Gradually, municipal ordinances became one of the guiding bodies of rules that led cities and citizens to irrevocable practices. These were not only citizen practices, however, but also practices of space, turning it into a temporal materiality of social decisions. In fact, some natural enclaves due to their geomorphology or runoff had to be filled, diverted, etc.; this work was done in a constant and exponential manner. Thus, these transformations responded to specific ways of inhabiting the territory, of producing on the land, and of understanding and managing water spaces in the different Andean enclaves.

To speak of landscape transformation implies speaking of the transformation of the societies that construct it and that are structured in it; it implies speaking of dissent, resistance, and tensions over territories, water, and horizons of being and producing in the world; it also implies speaking of political decisions that account for modifications and risks that are difficult to reverse (Peltre 1989: 63), or that are politically challenging due to the structural change they would entail. Thus, the fol-

lowing section will focus precisely on the risks involved in their social construction and long-term policies.

Viewing Risks and the Anthropocene from the Urban Andes

The so-called radical school of disaster studies emerged in the late 1960s and early 1970s among English-speaking students and researchers, mostly in the United States, who questioned both a naturalistic and behavioralist reading (one's own fault, poor individual choice, etc.) of disasters. Situations of risk were considered to be the mark of bad development, social asymmetries, and incoherence in the relationship between societies and the environment. Political economic readings were applied, mobilizing social and power relations, institutional functioning, the social position of social groups, etc. as explanatory mechanisms. For this school, disasters are not natural (O'Keefe et al. 1976). Moreover, any problem linked to the environment (resources, degradation, preservation, etc.) is the result of a social, historical, and spatial context, both in its material dimensions and in the ways in which it is defined and managed (Wisner et al. 2004; Ribot 2019). These perspectives are valid when referring to risk, water, or the Anthropocene (Rebotier 2021).

With regard to water, although not limited to it, this section will follow the evolution of the social relationship with the environment and will study the place of risks in Andean urban societies from independence until the mid-twentieth century. It will develop the cases of Caracas and Quito as starting points to question the dominant view of the Anthropocene and the current global environmental crisis. Furthermore, the epistemological scope of the experiences and representations of the Anthropocene and the relationships with water and the environment observed in the urban Andean Americas will be emphasized.

Wanting without Power: The Rise of Ideas of Control and Reduction of Nature.

Between pragmatic conceptions and technical knowledge and beliefs, traditional knowledge, and superstition, urban colonial America was built on the basis of different paradigms, from which the environment, the presence/absence of resources, natural phenomena, etc. were dealt with (Musset 2002; Diaz 1956). After the struggles for independence, modern ideas that considered the environment as a set of forces alien to society, which must be tamed, both to exploit and to civilize, were disseminated and consolidated. The spread of these ideas took hold with societies that became independent and with nations that were built in opposition to central power, as well as savagery and disorder, with a focus on progress. The phrase that Simón Bolívar, the Venezuelan Liberator, would have pronounced in the ruins of Caracas after the earthquake of 1812 and in the middle of the war of independence is

still famous: "If nature opposes us, we will fight against it, and we will make it obey us!" (cited in Altez 2006). This also exists as a remnant in the literary canon of the region's several countries: the allegory of the civilized nation and the civilized city as opposed to wild and rudimentary features (often rural and peasant) that, nevertheless, are part of the constitution of national identities (Gallegos 1929).

Although the intention to do away with the obstacles of nature was widespread, it turns out that, until the last quarter of the nineteenth century, in the case of Caracas, there were no major transformations of the urban landscape nor significant interventions to the environment. What today is known as the capital of Venezuela is remembered as a "city of red roofs" (because of the tiles) of little importance and little demographic dynamism (until the 1930s). The historic site is located at just under 1,000 meters above sea level, at the foot of Mt. Avila, in the San Francisco valley drained by the Guaire River. Due to the low intensity of occupation, the hilly landscape and slopes do not pose significant landslide problems. Historically, in relation to the environment, the greatest challenge had been to tame water and the course of the streams, both to have water available and to protect against the ravages of violent flows. Earthquakes were viewed as the greatest danger to the historic urban settlement of Caracas as was well demonstrated by the seismic history of the city (Altez 2006). More than just physical mechanisms, it was also due to the overflow of urban morphology and the considerable expansion of the city advanced in the twentieth century that risks multiplied and became much more complex (Imbesi and Vila 1995).

As for great paradigmatic frameworks, in the period after the wars of independence, Raúl Villavicencio (1838–1920) is considered to have introduced positivist ideas and progress to literature and social sciences in Venezuela. The influence of Adolph Ernst (1832–1899) in the area of natural sciences is also noteworthy. However, the road from modern ideas to practice was a long one. The consideration of sanitary risk is a case in point. Between independence and the 1860s, the danger of epidemics brought by sailors was of constant concern to local authorities, who increased the quarantine regulations and orders without much innovation or other response. It is also worth noting that Caracas did not regain the population level it had before the earthquake of 1812 and the wars of independence – which caused a considerable number of deaths – until after the 1870s (Rebotier 2008). Ways of occupying space evolve more slowly than ideas.

In 1870, with the coming to power of the "Illustrious American," Antonio Guzmán Blanco, a material rupture in the relationship between the environment and the urban landscape was noticeable. Guzmán Blanco introduced a French modernism inspired by the Beaux Arts and promoted the hygiene movement of the time. Urban facilities were improved, and the relationship with water was rationalized (a sanitation code was adopted in 1880). The sanitation issue or the issue of water supply became central – a phenomenon also observed in other Andean cities in

the previous section – as evidenced by Caracas' modernization plan in 1908, the construction of the city's aqueducts, and the creation of several water-related institutions in the early 1910s (González Casas 2002). The city's modernization led to a significant and unprecedented increase in the urban population of Caracas without it occupying more space (Rebotier 2011). The densification process continued until the late 1920s when technical progress made it possible to overcome the obstacles of nature (distance, ravines, slopes, etc.) in a concrete manner.

Power without Fear: Accelerated Transformation of Urban Landscapes

The arrival of the tramway in Caracas caused a radical change in urban morphology and in the relationship between the city and the environment. Large housing developments were able to develop further and further away from the historic heart of the Venezuelan capital. It was the beginning of the colonization of the San Francisco valley, the valley of Caracas (Baby-Collin and Zapata 2006). For this purpose, it was necessary to fill or embank many of the ravines (laid north to south) and tributaries of the Guaire River (oriented west to east), which score the slopes of El Avila.

However, the new ways of inhabiting the city, the possibility of the spatial expansion of the urban fabric, and the disappearance of numerous bodies of surface water also introduced unprecedented urbanity. It was an experience far removed from the environment, far from the nostalgic (and strongly idealized) memory of "the city of red roofs" prior to the urban landscape's modernization. The modern Caracas of the twentieth century ceased to be the city of neighborhoods and springs, becoming a city of oil, automobiles, and gated communities. It is the power of the "bourgeois nightmare" (Fogelson 2005): an eagerness to control the conditions of urban life, from the characteristics of the environment to the type of socio-spatial interactions one has (Almandoz 2002; Caldeira 2001).

The massive process of invisibilizing nature is noticeable in the region's cities as modernization advanced and the technical capacities for intervention were consolidated. The city of Quito has a chronology similar to that of Caracas, although with a time lag, involving a transformation of urban morphology, urbanity, and the physical modification of the landscape. The site in the upper valley of Quito has a meridian orientation (north to south). The spatial expansion of the city in this valley (both from the north and to the south) affected the flat parts, but also part of the lateral slopes (particularly the slopes of Pichincha, to the west). Many streams obstruct the valley of Quito. They have a main west-to-east route, from the peaks of the Pichincha to the rivers of the Quito valley, which drain to the north (for example, with the Monjas River) or to the south and east (for example, with the Machángara River). The massive filling of the creeks (concomitant with the urban expansion of Quito) opened the way for large circulation infrastructures (oriented north-south) while at the same time occupying smaller, unfilled creek beds (Perrin et al. 2000).

Recent work on urban risks in Quito (D'Ercole and Metzger 2004) has shown the multiplicity of hazards present on the site, as well as the complexity of risk situations in the Ecuadorian capital. However, as in Caracas, while a much smaller occupation of space, the biggest problems are related to water (scarcity, access, excess). In addition, more than the seismic threat (not as severe as in Caracas), Quito has no less than eight volcanoes within a 100 km radius, which exposes the urban site to possible consequences of volcanic eruptions from lahars (at least for access to the city) to ash falls and seismicity associated with eruptive activity.

Mudflows (articulating slopes, gullies, and deposits of ash or movable material) are still present disasters in the Ecuadorian capital (as in La Gasca in 2022), but they already have a known history of the denial of urban site's environmental features. From the Regulatory Plan of the early 1940s onwards, the meridian dynamics of the city's physical expansion were built against the hilly morphology of the valley (Sierra 2000; Godard and Bermudez 2005).

Fearing the Risks without Remembering that the Illusion of Control Has Always Been Questioned

Disasters always arouse similar reactions: What were the technical conditions of the accident? How or where can one invest in order to better prevent similar situations in the future? How did the systems of control and surveillance fail? But in the end disasters are neither recent nor are they an exception. This is evidenced by Pierre Peltre's work on mudflows in Quito, taking information from the beginning of the twentieth century. Modernization of the urban site by no means put an end to the disasters. On the contrary, since the environment was supposedly tamed, the damage has become more severe (Peltre 1989), as evidenced by another episode at La Gasca in 1975.

Some authors propose that the modern idea of domination of nature has always been an illusion. Jean-Baptiste Fressoz's thesis proposes that a dominant narrative was socially imposed in a particular context; he constructs a history of industrial risk by emphasizing that confidence in industrial development and progress was never as unanimous as was claimed a posteriori within Europe during the Industrial Revolution. This happened only because alternative and unwavering voices could never, at that time, make themselves heard (Fressoz 2012). In the philosophy of science, Bruno Latour defends the idea that "we were never modern" (Latour 1991). Rather we have told ourselves stories of power and control, denying the agency of forces and assemblages outside the will of human societies.

Such modern confidence was globalized as a result of the "collision of worlds" at the cost of colonization and westernization of the world (Gruzinski 2006). A world-ecology emerged, materialized by the consequences of the great Colombian Exchange (of species and ecosystem connections), as well as by the spread of mercantile capitalism based on the subordination of nature (Moore 2003). The

logic of exploitation, extraction, and appropriation was enhanced by the capacity to intervene in the environment to transform it in a way unprecedented in the history of the Earth.

It was also possible, however, thanks to the amnesia, if not the denial, of other ways of thinking about the inhabiting of societies in the world (Mignolo 2011). It is precisely the recovery of alternative ways of thinking about our dwelling and how we occupy space and interact in (and with) our environment that has led us to contemplate the limits of modernity, such as the utilitarian and technical vision of relations to the environment, to water, or to risks.

Legislation and Modifications in the Use of Water in the Andes

Having analyzed up to this point the uses and management of water in its interaction and tension in Andean water spaces, as well as risks and the Anthropocene from the urban Andes, this section focuses on an element that traverses the transformations of the landscape and the relationship with water spaces in an angular way. The following deals with the legislation that accompanies, transforms, directs, and complicates the water use.

Napoleon Bonaparte's fame among jurists is mainly explained by the promulgation of the Civil Code of 1804, a legal project that constituted the main milestone of the codification euphoria of the nineteenth century (Fernández Rosas 2005) and an expression of the liberal and enlightened rationality that sought a detailed and systematic regulation of all aspects of social life. Among them, property was a particularly sensitive issue: it has to not be forgotten that the French Revolution was essentially a bourgeois revolution and that a good part of its explanation lies in the demand for a property regime that would not privilege the state or the nobility but allow its peaceful and full ownership to the bourgeoisie as well.

In short, the Napoleonic Civil Code meant a transformation of the feudal and absolutist property regime (Fernández Rosas 2005) based on the demands of the liberal ethos. This change should not be read in isolation: the French Revolution was also a turning point for legal science as a whole, which orbited until then around the sovereignty of absolute monarchs (Flórez Ruiz 2012) that was supported by the providentialist theory of legitimization of royal power (Hernández Becerra 2008). After 1789, its focus, however, turned to the newly created category of civic and liberal rights, which deified freedom and private autonomy as the insurmountable limits to the power of the state (García de Enterría 1994). In other words, the French Revolution brought with it the dominance of private over public law and, by deepening and making more evident the separation existing since the Roman Empire between these two universes (Vergara Blanco 2010), the Napoleonic Code consolidated this new relationship.

The Napoleonic Code and its Implications for Water Use in the Andes

The citizen's prominent role in social life after the Revolution explains, in turn, the regulation of the ownership and water use contained in the Napoleonic Civil Code. Indeed, as is evident in what is established between articles 640 and 648, under the rules of the Napoleonic Civil Code, the use, enjoyment, and control of water was a matter of the private individual and only marginally that of the state. It was the members of a community who controlled the waters, with no other limitation than that imposed by the rights of others, and it was only in the case of conflict between individuals that the state took on a certain relevance. This is only one of the innumerable manifestations of the minimalist conception of the public apparatus, reduced to the role of mere gendarme of the social contract (Rincón Córdoba 2004).

It might be surprising that an analysis of water law in the Andean region takes into account French codification, especially if one considers that the period under study here is the transition between the nineteenth and twentieth centuries, that is, the post-colonial period. However, the amazement dissipates if one accounts for the profundity of European influence. Thus, even after the American processes of independence – and still today – metropolitan logics have managed to perpetuate themselves in all forms of social life, including law.

Specifically, Andrés Bello was fundamentally inspired by the Napoleonic codification in drafting of the Chilean Civil Code of 1855. This transplantation finds its explanation in two circumstances: firstly, the fact that in our continent Bonaparte's Code was conceived as the symbol of the Revolution and of new ideas, propitious for independence and forged on the philosophical anvil of the Enlightenment; secondly, the fact that the adoption of Francophile legislations served precisely as a gesture of affirmation of the new national projects in the American continent (Fernández Rosas 2005: 172), as in fact also occurred in Europe (Hinestrosa 2006: 6–7). It is unsurprising that, with few variations, Bello's Code contains, between its articles 833 and 838, the same provisions on water use as those outlined in the Civil Code of 1804. These original provisions were generally repealed and sometimes modified by Article 9 of the 1951 *Código de Aguas*, which almost a century later gave the state a prominent role in the administration of inland waters. This greater power can be seen, for example, in numeral 4 of article 7 of the same codification, where it is established that it is incumbent upon the state "to police and surveil the waters and prevent works from being carried out or destroyed in natural watercourses for public use without the corresponding authorization. It shall also prevent water from being extracted from the same watercourses without title or in greater quantity than that which corresponds." (Código de Aguas 1951: Art. 7)

Again, it may seem strange that the Chilean experience should be considered representative of everything that happened in Latin America in relation to water regulation between the nineteenth and twentieth centuries. However, there is a histor-

ical reason: Bello's work served as a model for other Latin American civil legislations and, in particular, for the legal discipline of waters in the Andean region. Fernández Rosas (2005) explains it as such: "In the search for models, a homogeneity can be observed in all of Latin American republics. Curiously, in terms of political organization, all of them adapted the North American system, but in terms of civil rights, at least in the eighteenth century, one way or another, the French model was followed" (170).

Legal Discipline of Water in the Andean Region

The first civil codification prior to Bello's Code was that of Santa Cruz, promulgated in Bolivia in 1831. Its name alone suggests an imitation of Napoleon's Code since it was during the government of Marshal Andres de Santa Cruz that the norm was put forward (Guardia 2003). The French tradition was evident in the privatized vision of water regulation, evident between articles 376 and 381, which was only slightly tempered by the 1906 Water Law, since it did not abandon the nineteenth-century approach (Alurralde Tejada et al. 2003: 142) and was still in force in spite of its modifications (Gutiérrez Gronemann 2006: 98).

Almost three decades before the Civil Code of 1861, inspired by that of Don Andrés Bello, the first Water Law was issued in Ecuador in 1832, regulating "access to water through a system of aqueduct easements, on the basis of broadly guaranteeing individual private property rights over water resources" (cited in Acción Ecológica 2022). Its first reform came in 1936, with a law that "incorporates the principle that the public domain of state or fiscal property includes water" (Acción Ecológica 2022).

Subsequently, the Peruvian Civil Code of 1852 replicated the Napoleonic Code between its articles 1131 to 1135. This was later modified by the Water Code of 1902, which considered water as a good of public use, although in practice the logics of private dominion over the water resource managed to perpetuate until 1911, the year in which there was a new reform (Guevara Pérez 2015. 326–327).

With the Civil Code of Páez of 1862, Venezuela emulated the French and Chilean codifications (Guardia 2006: 193), and in the 1867 Code, private ownership of water prevailed. However, the Venezuelan case is curious because the reforms of 1916, 1921, 1924, 1924, 1931, 1936, and 1942 confirmed a private – in contrast to a public – law approach in the other Andean traditions at the beginning of the twentieth century.

On the other hand, the Civil Code of the Argentine Republic of 1871, drafted by Dalmacio Vélez Sarsfield, not only did not represent an exception to the general rule of the French legacy but it is considered to be an even more Francophile than the Chilean code. In Title XIII of Book III, the Argentine codification emulates the Civil Code but also makes the regulation more detailed and meticulous. In this case, it is impossible to identify a regulation that reformed the liberal civil legislation on water

matters for the first time due to the Argentine federal system that implies a water code or law for each province, which establishes its own criteria "for the allocation of water resources, conditions of use, authorization, and concession regime."

Finally, the Colombian civil codification of 1873 replicated the French model between articles 891 and 896. With Law 113 of 1928, a state logic in water administration was implemented in the country since Article 9 established that the National Government was the supreme administrator of public goods, among which water resources were already included.

Table 1: Year of Adoption of First Water Legislation and Reform in Andean Countries

Country	**Year of the Adoption of the First Republican Water Legislation**	**Year of Adoption of the First Water Reform**
Bolivia	1831	1906
Ecuador	1832	1936
Peru	1852	1902
Chile	1855	1951
Venezuela	1862	1916
Argentina	1871	N/A
Colombia	1873	1928

Source: Authors' own elaboration.

Conclusions

This chapter has examined from three broad perspectives how water management changed in the Andean-urban-rural region at the turn of the nineteenth century and the beginning of the twentieth century. To this end, it has recovered colonial, independence and modernizing echoes of the last century, thinking of this range of spatial and temporal scales, which is fundamental when dealing with water as a common social good. At first, local institutionalism was placed as the central axis to understand the administration of water spaces in the long term and as a centralizing force of modernizing discourses and practices in the different Andean cities that grew demographically and spatially in the first decades of the twentieth century. To

this view of urban management were added the tensions between institutionalism, regulations, and social actors in rural spaces that demanded water access and control in the breaks that arose regarding irrigation policies, among other issues.

Thus, already denoting an inescapable relationship between the management of common goods and socio-political interests, the second section focused on the empowerment of interaction with – and often against – nature, which intensified with technical innovations and with the increase of material capacities at the end of the nineteenth and beginning of the twentieth century. But it is a question not only of material capacity but also of paradigms, visions, and epistemologies (Quijano 1992; Dussel 2000). From a certain angle, the Anthropocene is the paradoxical epoch in which the consequences of human activities on the Earth system culminate, and the fragility of the habitability and conditions of existence of such supposedly potent societies is recognized. The recognition of the existential character of risk situations draws attention to the limits of modernity and appeals to looking toward alternative visions and epistemologies when thinking of the future and sustainability (Mignolo 2001; Alimonda 2017), perhaps breaking with long traditional regulations that have oriented our relationships with the environment and common goods like water.

This chapter, in closing, has sought to highlight the construction of a body of law with modernizing paradigms that have been questioned here. Thus, it has shown that the transition between the nineteenth and twentieth centuries was marked by the desire to consolidate the national projects founded after American independence through the implementation of centralized state apparatuses that could penetrate in a capillary manner in their respective territories. This desire to continue colonizing the territory after the Colony, that is, this kind of *criollo* colonialism in the absence of Spanish metropolitan power, had as a condition of possibility a mutation in the conception of the state and its role in society, broadening the state's administrative structure, the law applicable to its activity, and its relationship with individuals. The transformations that Andean legal systems, generally speaking, have undergone in the area of water law should be interpreted in this context: from the classical liberal states that strictly respected the use, enjoyment, and free control that individuals could exercise over water resources to the states that have actively intervened in their management through administrative policy mechanisms, assuming a prominent role that has continued to gain power, and could be reviewed from an inclusive, proactive, and critical social plurality.

Translated by Eric Rummelhoff and revised by Luisa Raquel Ellermeier.

References

Acción Ecológica. 2022. "No solo se trata de una nueva ley de aguas." March 24. https://www.accionecologica.org/no-solo-se-trata-de-una-nueva-ley-de-aguas/.

Alimonda, Héctor, Catalina Toro Pérez, and Facundo Martín. 2017. *Ecología Política Latinoamericana. Pensamiento crítico, diferencia latinoamericana y rearticulación epistémica*. 2 vols. Buenos Aires: CLACSO/Universidad Autónoma Metropolitana.

Almandoz, Arturo. 2002. *Planning Latin America's capital cities, 1850–1950*. London: Routledge.

Altez, Rogelio. 2006. *El desastre de 1812 en Venezuela: sismos, vulnerabilidades, y una patria no tan boba*. Caracas: Fundación Empresa Polar.

Alurralde Tejada, Juan Carlos, Pablo Salón, and Rene Orellana. 2003. "Legislación de aguas en Bolivia. Encontrando bases comunes." *Fermentum. Revista Venezolana de Sociología y Antropología* 36: 134–149.

Apacarana Puquio, Paula. 2017. "Agua y conflicto: el manejo de agua de regadío en el Valle de Ica, 1915–1925." *Diacrónica (CEHIS-UNMSM)* 6, no. 4: 51–62.

Baby-Collin, Virginie, and Emilio Zapata. 2006. Caracas, entre métropolisation et fragmentation urbaine. *Géoconfluences*, June 25. https://geoconfluences.ens-lyon.fr/doc/typespace/urb1/MetropScient2.htm.

Bell, Martha. 2014. "Agua y poder colonial: ciclos, flujos y procesiones en el manejo hídrico urbano en Lima durante el siglo XVII." *Boletín del Instituto Riva-Aguero* 37: 75–121.

Borrero Vega, Ana Luz. 2015. "Cuenca en el siglo XIX: cabildo, ayuntamiento y municipio, el tránsito de la ciudad colonial a la republicana." Aspectos de su historia urbana. *Revista Pucará* 26: 73–89.

Caldeira, Teresa. 2001. *City of walls. Crime, segregation and citizenship in São Paulo*. Berkeley: University of California Press.

Castillo, Sebastián. 2020. "Sistemas hidro-sociales, gestión estatal y legalización del rol de privados: efectos de la sequía y la lucha por el agua a inicios del siglo XX en la Provincia de Santiago." *Revista Historia* 2, no. 27: 9–36.

Código de Aguas. 1951. *Ley 9909*. Article 7. April 13 (Chile).

D'Ercole, Robert, and Pascale Metzger. 2004. *La vulnerabilidad del Distrito Metropolitano de Quito*. Quito: Ekseption.

Díaz, Manuel G. 1956. *El agresivo obispado caraqueño de don Fray Mauro de Tovar*. Caracas: Biblioteca Rocinante.

Dussel, Enrique. 2000. "Europa, modernidad, y eurocentrismo." In *La colonialidad del saber: eurocentrismo y ciencias sociales. Perspectivas latinoamericanas*, ed. Edgardo Lander, 41–53. Buenos Aires: CLACSO.

Fernández Domingo, Enrique. 2015. "Estudio sobre la génesis y realización de una estructura urbana: la construcción de la red de alcantarillado de Santiago de Chile (1887–1910)." *Revista Historia* 1, no. 48: 119–193.

Fernández Rozas, José Carlos. 2005. "El Código de Napoleón y su influencia en América Latina: Reflexiones a propósito del segundo centenario." In *El derecho internacional en tiempos de globalización: libro homenaje a Carlos Febres Pobeda* Vol. 1, ed. Carlos Eduardo Febres Fajardo, 151–190. Mérida: Universidad de los Andes.

Flórez Ruiz, José Fernando. 2012. "De Maquiavelo al Estado postmoderno. Paradigmas políticos de aproximación al fenómeno estatal." *Revista Derecho del Estado* 29: 107–144.

Fogelson, Robert. 2005. *Bourgeois Nightmares: Suburbia 1870–1930*. New Haven: Yale University Press.

Fressoz, Jean-Baptiste. 2012. *L'apocalypse joyeuse. Une histoire du risque technologique*. Paris: Seuil.

Gallegos, Rómulo. 1929. *Doña Bárbara*. Barcelona: Araluce.

Gallini, Stefania, Laura Felacio, Angélica Agredo, et al. 2014. "Las corrientes de la ciudad: una historia del agua en la Bogotá del siglo XX." *Environment & Society Portal, Virtual Exhibitions* 3.

García de Enterría, Eduardo. 1994. *La lengua de los derechos. La formación del Derecho Público europeo tras la Revolución Francesa*. Madrid: Real Academia Española.

Guardia, Amelia. 2003. "La codificación boliviana: una respuesta jurídica al liberalismo." *Politeia* 31: 53–77.

———. 2006. "La codificación civil de Páez." *Politeia* 36: 171–198.

Guevara Pérez, Edilberto. 2015. "Evolución histórica de la Legislación Hídrica en el Perú." *Revista de Derecho Administrativo* 15: 319–334.

Gutiérrez Gronemann, Diego. 2006. "Bolivia." In *Gobernanza del agua en América del Sur: dimensión ambiental*, ed. Alejandro Iza and Marta B. Rovere, 97–126. Gland/Cambridge: UICN.

Godard, Henri, and Nury Bermúdez, ed. 2005. *Balance de los estudios urbanos (1985–2005). La cooperación IRD-Municipio de Quito*. Quito: Ifea/IRD/DMQ.

González Casas, Lorenzo. 2002. "Caracas: Territory, architecture and urban space." In *Planning Latin America's capital cities, 1850–1950*, ed. Arturo Almandoz, 114–140. London: Routledge.

Gruzinski, Serge. 2006. *Les quatre parties du monde*. Paris: Points.

Harvey, David. 2004. "The 'New' Imperialism: Accumulation by Dispossession." *Socialist Register* 40: 63–87.

Hernández Becerra, Augusto. 2008. *Las Ideas Políticas en la Historia*. Bogotá: Universidad Externado de Colombia.

Hinestrosa, Fernando. 2006. "El Código Civil de Bello en Colombia." *Revista de Derecho Privado* 10: 5–27.

Hofstede, Robert. 2003. "Gestión de servicios ambientales y manejo de áreas naturales en cuencas andinas." In *Memorias del Foro Regional Sobre Pago de Servicios Ambientales*, ed. FAO. Arequipa: FAO.

Imbesi, Giuseppe, and Elisenda Vila. 1995. *Caracas, memorias para el futuro*. Roma: Editore Gangemi.

Latour, Bruno. 1991. *Nous n'avons jamais été modernes: essai d'anthropologie symétrique*. Paris: La Découverte.

Lossio, Jorge. 2003. *Acequias y gallinazos. Salud ambiental en Lima del siglo XIX*. Lima: Instituto de Estudios Peruanos.

Luzuriaga Jaramillo, Sofía. 2010. "Abastecimiento de agua y políticas de saneamiento en Quito, 1880–1930." *Procesos: Revista Ecuatoriana de Historia* 32: 31–56.

———. 2013. *Quito y sus recorridos de agua. Abastecimiento, discursos y pautas higiénicas modernizantes*. Quito: Universidad Andina Simón Bolívar/Corporación Editora Nacional.

Maiguashca, Juan. 1992. "La cuestión regional en la historia ecuatoriana (1830–1972)." *Nueva Historia del Ecuador* 12: 175–226.

Martínez Moscoso, Andrés. 2019. "La regulación del abastecimiento de agua en Ecuador. Evolución histórica y realidad actual." *Sostenibilidad: económica, social y ambiental* 1: 31–54.

Matés, Juan Manuel. 2016. "La regulación del suministro de agua en España: siglos XIX y XX." *Revista de Historia Industrial* 25, no. 61: 15–46.

Mignolo, Walter D. 2001. "Géopolitique de la connaissance, colonialité du pouvoir et différence coloniale." *Multitudes* 6: 56–71.

———. 2011. *The darker side of modernity. Global futures, decolonial options*. Durham: Duke University Press.

Moore, Jason. 2003. "Capitalism as world-ecology. Braudel and Marx on Environmental History." *Organization and Environment* 16, no. 4: 431–458.

Musset, Alain. 2002. *Villes nomades du nouveau monde*. Paris: EHESS.

O'Keefe, Phil, Ken Westgate, and Ben Wisner. 1976. "Taking the naturalness out of natural disasters." *Nature* 260, no. 5552: 566–567.

Osorio Osorio, Julián Alejandro. 2009. "Agua, montañas y ciudad. Los cerros orientales y Bogotá: abasto de agua y evolución ambiental en el siglo XIX." In *Memorias del VIII Seminario de la Asociación Colombiana de Investigadores Urbano Regionales (ACIUR)*, ed. Instituto de Estudios Urbanos. Bogotá: Instituto de Estudios Urbanos.

Peltre, Pierre. 1989. "Quebradas y riesgos naturales en Quito, periodo 1900–1988." In *Riesgos naturales en Quito: lahares, aluviones y derrumbes del Pichincha y del Cotopaxi*, ed. Pierre Peltre, 45–90. Quito: Corporación Editora Nacional/Colegio de Geógrafos del Ecuador.

Perrin, Jean-Louis, Benoît Fourcade, Jérôme Poulenard, et al. 2000. "Quito face à un risque d'origine naturelle: les laves torrentielles." *Revue de Géographie Alpine* 88, no. 2: 43–57.

Pulido, Nubis. 2011. "El crecimiento urbano en las cuencas de la región Andes de Venezuela y su articulación con el recurso agua." *Revista Geográfica Venezolana* 52, no. 2: 101–122.

Quijano, Aníbal. 1992. "Colonialidad y modernidad / racionalidad." In *Los conquistados: 1492 y la población indígena de las Américas*, ed. Heraclio Bonilla, 437–449. Quito: FLACSO/Libri Mundi.

Rebotier, Julien. 2008. *Les territorialités du risque urbain à Caracas. Les implications d'un construit socio-spatial dans une métropole d'Amérique latine*. PhD diss., Institut des Hautes Études d'Amérique Latine, Université de Paris 3.

———. 2011. "Habiter les territoires et construire les risques, entre empreintes spatiales et logiques sociales – Caracas." In *Habiter les territoires à risque*, ed. Valérie November, Marion Penelas, and Pascal Viot, 81–100. Lausanne: Presses Polytechniques et Universitaires Romandes.

———. 2021. "Les risques et le moment anthropocène. Questions de sciences sociales." In *Les risques et l'anthropocène, regards alternatifs sur l'urgence environnementale*, ed. Julien Rebotier, 5–27. London: ISTE.

Ribot, Jesse. 2019. "Social Causality of our Common Climate Crisis: Toward a Sociodicy for the Anthropocene." In *The Commons in a Glocal World: Global Connections and Local Responses*, ed. Tobias Haller, Thomas Breu, Tine De Moor, et al., 35–53. London: Routledge.

Rincón Córdoba, Jorge Iván. 2004. *Las generaciones de los derechos fundamentales y la acción de la administración pública*. Bogotá: Universidad Externado.

Rodríguez Gallo, Lorena. 2009. "La construcción del paisaje agrícola prehispánico en los Andes colombianos: el caso de la Sabana de Bogotá." *SPAL* 28, no. 1: 193–215.

Ruf, Thierry, and Pablo Núñez. 1991. "Enfoque histórico del riego tradicional en los Andes ecuatorianos." *Revista Memoria*, 2, no. 2: 185–282.

Servicio de Agua Potable y Alcantarillado Cochabamba (SEMAPA). n.d. "Normativa sobre aguas." http://www.semapa.gob.bo/page/water_legislation/37.

Sierra, Alexis. 2000. *Gestion et enjeux des espaces urbains à risque d'origine naturelle: les versants et les* quebradas *de Quito, Équateur*. PhD diss., Université de Paris 8.

Tell, Sonia. 2011. "Tierras y agua en disputa. Diferenciación de derechos y mediación de conflictos en los pueblos indios de Córdoba. Río de La Plata (primera mitad del siglo XIX)." *Fronteras de la Historia* 16, no. 2: 416–442.

Vergara Blanco, Alejandro. 2010. La *summa divisio iuris* público/privado de las disciplinas jurídicas. *Revista de Derecho Universidad Católica del Norte* 17, no. 1: 115–128.

Wisner, Ben, Piers Blaikie, Terry Cannon, et al. 2004. *At Risk: natural hazards, people's vulnerability and disasters*. London: Routledge.