

HYDROSOCIAL TERRITORIES IN THE
ATACAMA DESERT:
*An ethnographic analysis of changing water
practices in Toconao, Chile*

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I, Cristian Fernando Olmos Herrera, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Dedicated to Titi and Rola for encouraging me to follow my dreams

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Abstract

Water shapes the territory and people's lives through its flows, generating conflicts and harmony on its path. The flows of water frame the spatial configuration and are a fundamental element of the interaction between people, social institutions and their environment. Water is also an essential component of solidarity in the local culture and traditions of rural communities in the Atacama Desert in northern Chile.

This study analysed an indigenous community, where a Corporate Social Responsibility (CSR) programme of a mining company resulted in spatial and social changes of water practices. The research is based on the perspective of political ecology and followed an ethnographic approach to provide an in-depth understanding of the relations between the company's interventions and the hydrosocial territory. To achieve this, the research investigated changes in water management in the case of a CSR programme called Atacama Tierra Fértil (ATF), which was implemented in the Indigenous Community of Toconao in northern Chile.

The analysis of the daily use of water resources revealed how multiple interests within the community in response to the CSR programme transformed the landscape and at the same time shaped the social development of the area. Personal interests, a commodification of natural resources and the control over the territory have reconfigured spaces of decision-making and social relations. The nuanced analysis of changes in the hydrosocial territory suggests that CSR programmes from the mining sector contribute to tensions, which are manifest in decreasing solidarity, cooperation, respect, and local autonomy within the community and its institutions.

Impact Statement

This research contributes to conceptual knowledge on hydrosocial territories in the context of Andean rural communities and specifically explores changes in water practices around irrigation canals. Through the case of Toconao in northern Chile, this thesis unfolds the spatial manifestation of power relationships around water and the influence of corporate social responsibility programmes from mining companies on decision making process about water management.

This thesis aims to create impact in communities, academia and through supporting networks and alliances. The following activities have already contributed to this objective or are planned for the near future.

1. Community impact

I presented my research to the community of Toconao at the beginning and end of my fieldwork in November 2014 and 2015. I also presented initial results to the '*Consejo de Pueblos Atacameños*' (the Council of Atacameño Villages) to share findings with their community team. I aim to return to Toconao in 2019 to conduct a focus group and reflect with community participants on the practical implications of my research. I further aspire to publish a comic book which makes my research accessible to different generations through the use of colloquial language. The format of a comic book lends itself to generate awareness of the younger inhabitants of the Atacama Desert about the implications of corporate social responsibility programmes from the mining sector.

2. Academic impact

I presented my research at several conferences in the UK, Europe and Latin America. The following conferences and seminars were an opportunity to share findings with other students and academics in fields such as geography, planning, architecture and development studies.

- 7th International Seminar on Vernacular Settlements. Re-assessing Vernacular Architecture, Istanbul, October 2014;
- Latin American Congress of Political Ecology, Santiago, October 2014;
- 5th Encounter of Urban Design ‘Water and Cities’, Antofagasta, September 2015;
- The Royal Geographical Society’s Annual Conference, London, September 2016;
- Living Maps seminar, London, 2017;
- Round Table: The Economic Accomplices of Pinochet’s Dictatorship, Oxford, May 2017;
- International workshop: Soil and Land Stewardship, Mechelen, April 2018.

I further published a book chapter (in Spanish) called ‘*Autonomy in times of economic complicity: Mining expansion and water practices in the north of Chile*’ in a book on economic complicity in Chile edited by Bohoslavsky et al. 2018. Moreover, I plan to publish research findings in journals such as ‘Water Alternatives’, ‘Water International’, ‘Estudios Atacameños’ and ‘Environment and Urbanization’.

3. Creating alliances and networks

Finally, the research created impact through supporting the establishment of networks between communities and civil society groups that work in developing planning. I facilitated events, which stimulated discussions about mining extraction and the impacts of mining initiatives on rural communities in Latin America. These included a seminar called ‘Life on the frontlines of mining conflict in the Americas’ in London, October 2018. This event brought together academics and community leaders from Colombia, Chile, South Africa and the United States and supported the establishment of a network between Chile and the UK-based researchers and activists.

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List of Abbreviations and Acronyms

ATF	<i>Atacama Tierra Fértil Programa</i> <i>‘Fertile Land in the Atacama’ Programme</i>
CONADI	<i>Corporación Nacional de Desarrollo Indígena</i> National Corporation for Indigenous Development
CNR	<i>Comisión Nacional de Riego</i> National Irrigation Commission
CORFO	<i>Corporación de Fomento de la Producción</i> Chilean Economic Development Agency
CSR	Corporate Social Responsibility
DOH	<i>Dirección de Obras Hidráulicas</i> Directorate of Hydraulic Works
DGA	<i>Dirección General de Aguas</i> General Water Directorate
INDA	<i>Instituto Nacional de Derechos Humanos</i> National Institute of Human Rights
INDAP	<i>Instituto de Desarrollo Agropecuario</i> Institute of Agricultural Development

INE	<i>Instituto Nacional de Estadísticas</i>
	National Statistics Instituto
MOP	<i>Ministerio de Obras Públicas</i>
	Ministry of Public Works
OECD	Organisation for Economic Cooperation and Development
SQM	<i>Sociedad Química y Minera</i>
	Chemical and Mining Society

Chapter 1 Introduction

1.1 A political ecology perspective on scarce water in a vast desert

The inhabitants of the Atacama Desert in northern Chile are increasingly concerned about the deterioration of their traditions and practices related to water, but these concerns are often made invisible by the economic discourses of the mining sector. The cleaning of the canals is a vital practice for the irrigation work which is carried out each year by the Andean communities, which Atacameños are part of. As a teenager, I have volunteered cleaning irrigation canals in a town called Socaire. This experience has shown me that the activity is a reflection of Andean people's identity and their political conflicts and reaffirms their belonging to the specific territory. In a context of mining extraction, these water-related practices become a social space where inhabitants negotiate control over water and land (Bolados & Babidge, 2017). However, these practices are no longer just local issues; they have become part of a water crisis, an urgent topic that requires much debate and mobilisation.

The Atacama Desert is the driest region in the world (Clarke, 2006). Scarce water and vast territory play key roles in the identities of the region's inhabitants and their communities (Boelens & Gelles, 2005). The desert also contains the largest worldwide deposits of several minerals, such as copper, nitrate and lithium (Arias, Atienza, & Cademartori, 2014; Phelps, Atienza, & Arias, 2015; Yáñez & Molina, 2008). The Chilean state promotes an extractive model of interaction with natural resources that takes away territorial control from local indigenous communities (Tecklin, Bauer, & Prieto, 2011). This creates a double conflict, over water use and over territorial expansion, in which the local autonomy of rural communities is continuously reduced. This thesis adopts a political ecology perspective to support a better understanding of the environmental and social effects of mining, as well as of the social and local conflicts relating to water practices in rural communities.

Historically, water in the Atacama Desert has been the fundamental resource for social, cultural and economic life (Figure 1.1). Water both shapes and is shaped by cultures, economies and landscapes (Bakker, 2009). Life in the Andes depends on the use, management and conservation of water resources, which form part of the Andean

*'cosmovision'*¹ (Yáñez & Molina, 2011). Water management is defined as the process that shapes *'how organisation, decisions, order and rule are achieved in heterogenous and highly differentiated societies'* (Bridge & Perreault, 2009: 476). Drawing from the literature on water management and political ecology, this thesis aims to contribute to a better understanding of hydrosocial territories and water management in terms of solidarity, access and local autonomy.

A historical analysis of Atacama culture reveals how water cycles have been an important and decisive factor throughout history. During the colonisation process, Spanish authorities found themselves unable to control the movement of the Atacameños in the vast territory of the desert (Bittmann, Le Paige, & Nuñez, 1978). They developed a strategy for constructing irrigation systems with the use of indigenous techniques. The aim was to persuade communities to settle down in a specific place, thus eliminating their nomadic culture (Imilan, 2007; Nuñez & Dillehay, 1995). The strategy led to the establishment of the 18 communities currently settled around the Atacama Salt Lake. Each has a specific irrigation system that has been constructed according to the different water sources and topographical characteristics (Cuadra, 2000; Gundermann & González, 1995; Orrego, 2002).

The research analyses a single case study: the indigenous community of Toconao, which is located in the middle of the Atacama Desert. It has approximately 647 residents, half of them permanent (Instituto Nacional de Estadísticas - Chile, 2017). The aim of this qualitative research is to investigate water practices in relation to the different traditions associated with irrigation. It thereby shows how closely cultural and ritual practices are intertwined with the economic and agricultural activities of Toconao. The thesis is based on ethnographic research in which I followed water practices during different seasons of the year to observe how people manage scarcity and abundance of water, how they organise its distribution and what conflicts and agreements emerge from all this.

¹ The indigenous cosmovision is linked to sacred ideas attached to both land (Pachamama) and water (Patta hoi) (Gelles, 2000). Natural resources have a special meaning in the Atacameño *'cosmovision'*, relating to the gods and protection. This relation is manifested in the practice of various offerings ceremonies and rituals made to the land and water (Bustos & Blanco, 2004).

Figure 1.1 | View of the Atacama Desert from the town of Toconao



Source: Author

In many villages, water management is strongly shaped by struggles (i) over water rights between small-scale agricultural and large-scale mining uses, and (ii) between the indigenous rights to community-based water management and individualised rights to commercial activity (Cuadra, 2000). According to the General Water Directorate, registered rights to the river-, canal and springwater of Toconao currently amount to 581.3 litres per second for all water uses (Dirección General de Aguas, 2017). However, in reality, communities have few rights to their local water resources – especially since the start of the Pinochet dictatorship in 1973, when the state gave priority to water use for developing mining projects rather than supporting small-scale agricultural uses (Yáñez & Molina, 2011). The Constitution and the Code of Water, which were established in 1981 under the dictatorship, separated ownership of land from that of water and imposed a system of private ownership of water rights (Prieto, 2014). The Code was written to encourage the free market and business investment, placing minimal restrictions on the exploitation of water resources (Bauer, 2013; Budds, 2013). Over the past decades, it has generated a paradoxical situation in which owners of water have no land and landowners have no water.

Another important historical development was in 1995, when Toconao was legally recognised as an indigenous village. This meant that the Indigenous Law of 1993 could be applied to the village, which recognises water rights as an ancestral property of the Atacama communities and enables them to regulate their own water resources. The most important aspect of the Indigenous Law is that it assigns water rights to the community as a whole rather than to individual community members (Cuadra, 2000). Therefore, the current water system is characterised by private ownership of water rights; every farmer, who is part of the association, has private usufruct of water which is protected by the local statutes of the Irrigators' and Farmers' Association of Toconao.

Toconao's main potable water supply comes from the Toconao River, which descends from the Andean mountains and is the property of the community (Hidalgo Lehuéde, 1982). Traditionally, the water is equitably distributed within the village using a complex system of canals. These are opened and closed according to a clear shift system in order to enable agricultural production in the village. Irrigation canals

connect agricultural plots with each other; they are constructed considering the shape of the landscape. In Toconao, the system of irrigation canals has a total length of about 17,000 metres and irrigates an area of 92 hectares. Canals connect all agricultural plots, which are built around these connections. This means that farmers depend on their neighbours and on cooperation and solidarity in the community. This thesis aims to understand the interconnected structure of the canals in relation to the social structure that gives them life.

The social structure strongly relates to the day-to-day water practices of the community, which are embedded in annual cycles of activities related to the irrigation canals. These annual cycles make it clear that water management in Toconao is not only about distributing water as a physical resource in an equitable manner within the community. Water practices also have important cultural and spiritual dimensions, which increase the complexity of water management and demonstrate how deeply embedded local and indigenous knowledge is. Through festivities, people develop practices that create bonds between their work, their ancestors, the members of the community and their friends, and between the ancient and contemporary water infrastructure and the natural and divine world. Jessica Budds and Jamie Linton (Budds, Linton, & McDonnell, 2014; Linton & Budds, 2014a, 2014b) speak of these kinds of cycles as ‘hydro-cosmological cycles’ which frame the everyday practices and rituals around water as part of a community identity.

The ways in which rituals of water are performed, different roles are assigned and local knowledge is acquired and passed on are closely linked to effects of power in the village. Water-related activities require each participant to contribute labour towards the physical maintenance of the system of irrigation canals (Rodríguez, 2006). Currently, these rituals and power relations are being challenged in many ways. One example relates to the cleaning of the canals. This is an annual activity that is physically necessary to maintain the canals, but that also includes many rituals (Bolados & Babidge, 2017; Castro Lucic, 2007; Lagos, Mendoza, Ampuero, & Hernandez, 1988; Matus de la Parra, 1993). The ritual represents ethnic and political legitimation in a context of a growing demand for natural and cultural resources – and in some cases of disputes over territory and resources with global industries such as

mining (Bolados García, 2014a). Such practices are community activities that reflect the internal politics and identity of the community, reaffirming forms of belonging.

However, many farmers have externalised the work: they pay other people to participate in the activity for them and do the physical work. This contradiction shows that different interests and agendas exist within the community and that community traditions are becoming increasingly part of a market (Babidge & Bolados, 2018). The cleaning of the canals in the community of Toconao is configured today not only as a ritual of social and political affirmation, but as an effect of the neoliberalisation of nature. This thesis is motivated by the need to better understand these nuances and changes and the power struggles they imply.

Mining companies are playing an important role in ongoing changes in the Atacama Desert. One of the most powerful companies operating in the area is SQM S.A, the biggest lithium mining enterprise in Chile and the second largest in the world. According to the US Geological Survey (2018), the company extracts one-fifth of the world's known lithium resources. SQM's mining activities are based in the middle of the Atacama Salt Lake; the company is therefore the direct neighbour of the community of Toconao. Beyond its mining activities, which compete directly with the community for the local water resources, SQM also produces more subtle changes through inserting its development model into the community via Corporate Social Responsibility (CSR) programmes.

One of these CSR programmes has been being rolled out in Toconao since 2008: the '*Atacama Tierra Fértil*' (Fertile Land in the Atacama – ATF) programme. It aims to produce wine in the desert and to promote the development of a winemaking community through collaboration with local farmers and a multidisciplinary team of professionals hired by the company. SQM made wine production attractive for the community through organizing wine-tasting activities, a yearly wine fair and national awards that give recognition to the community's work. The company helped to create a brand, which in turn generated a new identity for the farmers as winemakers.

However, the ATF programme currently works with only 20 people, of whom at the time of my fieldwork only 50% were actually benefiting from selling wine or grapes

(Sociedad Química y Minería, 2015). Through selecting a small number of beneficiaries, SQM created a fragmentation in the community, especially because the selection criteria were not transparent. The programme generated a dichotomy in visions of the future development of the village: on the one hand, economic development through the new wine production; on the other, traditional agriculture. Many community members have become concerned about the changing forms of irrigation that wine production implies and the high expenses and water quantities required for the production of wine in the village.

Hence, although indigenous communities in northern Chile have officially regained control of their water and its administration through the community rights given by the Indigenous Law of 1993 (Cuadra, 2000; Yáñez & Molina, 2011), they are continuously challenged to defend them and maintain control over their water. CSR programmes impose a development model which many inhabitants fear will change both water practices and power relations in the community. While water has a fundamental role in local agriculture and the development and culture of Toconao, it is no longer the people's biggest concern. Initial fieldwork interviews showed that particularly the elderly are worried about changes in the territory, the loss of traditional practices and rituals, and increasing individualism, all linked to the mind-set of the mining programmes. This thesis therefore aims not only to position mining activities in terms of the extraction of water resources from the community, but to reveal the many ways they influence community development – economically, culturally and socially – and how these changes are manifested in local water practices.

1.2 Research objectives and research questions

The thesis aims to examine changes in water management through the implementation of the SQM S.A ATF programme. In order to do so, it is necessary to address existing research gaps in relation to the different water practices in the village and their contribution to water management. Fundamentally, there has been a lack of consideration of everyday and small-scale forms of local water practices as the enacting of rights and local norms. How to address water conflicts that are generated through external forces connected with mining initiatives but not emerging directly from the extraction of natural resources? To respond to this challenge, this thesis

focuses on a case involving disputes between the farmers of Toconao. In this way, I want to understand who are the beneficiaries of the new irrigation systems brought by the ATF programme and who are the other farmers, who maintain traditional methods of irrigation. Thus, it is hoped to achieve a better understanding of the consequences of the implementation of new forms of development emerging from extractive industries. The thesis does not engage analytically with the extraction of natural resources per se, but rather focuses on changes to the autonomy of decision-making in water management through the incorporation of the CSR programme.

The thesis uses the concept of hydrosocial cycles² to identify the sources of these conflicts, power relations, social changes and decision-making processes, which are then critically discussed in order to answer the following research questions:

1. How do changes in water management since the implementation of the CSR programme manifest themselves in the use of the canals?
2. How do everyday water practices reflect the decision-making power of different actors in community decision-making processes?
3. How have these changes in water practices affected community autonomy since the start of the CSR programme?

The research questions are embedded in a conceptual understanding of water and territory and their importance for Andean communities based on literature from political ecology, which focuses on the power relations around water. I use the political ecology lens not only to delimit the theoretical terms of the research, but also as a methodological tool to orientate the analysis. Rodríguez-Labajos and Martínez-Alier state that *'political ecology studies how the distribution of power determines the use of the natural environment between categories of humans and with regard to other species'* (2015: 538). More specifically, the thesis analytically explores social territories of water, the hydrosocial cycle and the construction of hydrosocial

² The hydrosocial cycle focuses on how social and power relations shape the nature and dynamics of water and its circulation, and how water is influenced by social processes occurring at a wide variety of spatial and temporal scales (Budds et al., 2014).

territories *'as spatial configurations of people, institutions, water flows, hydraulic technologies and the biophysical environment that revolve around the control of water'* (Boelens, Hoogesteger, Swyngedouw, Vos, & Wester, 2016: 24).

I argue that local conflicts around water in the Andean territory are not limited to large-scale environmental conflicts with extractive industries, which are already well researched (Bebbington, 2009; Bebbington, Arond, & Dammert, 2017; Bridge, 2004a; Cuba, Bebbington, Rogan, & Millones, 2014; Gudynas, 2013; Prieto, 2015a). Rather, water has a connection to traditional forms of living, spirituality, meaning, belief and *'cosmovision'* that are characteristic of Andean communities. These aspects of traditional ways of life are part of the local life, its politics and forms of belonging in the communities of the Atacama Desert. Bolados and Babidge (2017) argue that these elements of the social space are subject to forms of subordination and asymmetry of power, which then shape negotiations and control over land and water. As Gelles (1996: 88) mentions, they *'must be understood in terms of a cultural model that encodes their implementation and the relationship to political forces at the local, regional, national, and international levels'*.

Therefore, the analysis in this thesis goes beyond economic and technical concerns and puts more focus on the clash between local traditional forms of irrigation and new ways to irrigate. This clash is related not only to control over the irrigation systems, but also to the cultural conflicts that define and organise them in Toconao. Histories of water are partly cultural, and through these histories it is possible to understand current struggles (Oré, 2011). Furthermore, it is a fundamental condition of local-level water politics that the irrigation canals relate to wider structures of power and domination (Rasmussen, 2015).

In Toconao, water belongs to the community and the traditional distribution and organisation model conflicts with the new vision of the state and private sector. This raises a dispute over the control of water and the regulation of local irrigation practices. Hence, it is fundamental to explore questions of power in relation to water in Toconao. Indeed, it is a fundamental condition for local-level politics of water that the irrigation canals relate to wider structures of power and domination. By examining irrigation

canals and water practices, I demonstrate how these spaces and practices have been affected by competing rationales concerning resources, power, efficiency and equity.

1.3 Key argument of the thesis

The thesis attempts to contribute to a better understanding of the Atacameño community's traditional water practices, that are closely related to the territory. Through its analysis of the hydrosocial territory, the thesis aims to understand CSR programmes in Toconao in terms of their impacts on the configuration of space, local practices and power relations. The analysis focuses on three components: 1) Solidarity and cooperation in relation to the identities of water institutions in the Andes; 2) Access to water and opportunity to make decisions about water management; and 3) The spatial manifestation of local autonomy in the occupation and use of the territory.

This thesis also aims to make a methodological contribution, combining observations, drawings, GPS tracking and participatory photography workshops within an ethnographic approach as vehicles to understand social and territorial change. This mixed-methods approach responds to calls for interdisciplinary studies to comprehend hydrosocial territories (Boelens et al., 2017, 2016). The use of mobile methods informs a better understanding of a hydrosocial territory that moves beyond the instrumental analysis of power relations towards spatial, temporal and practical analyses.

1.4 Structure of the thesis

The outline of the thesis is as follows. Chapter 2 provides a theoretical discussion of political ecology and its contribution to understanding the role of water within indigenous communities in northern Chile. Ethnographic and historical approaches to water, territory and Andean communities are reviewed and contrasted in terms of their understanding of power relationships. Looking particularly at the case of the hydrosocial territory of the Atacama Desert, this literature review reveals a theoretical gap in the understanding of concepts of solidarity, access and autonomy.

Chapter 3 presents the qualitative methodology used in this thesis. The chapter justifies the selection of the indigenous community of Toconao as a case study. It starts by assuming my positionality, followed by an elaboration of the research epistemology.

The qualitative data sources of the thesis are based on a mobile ethnography, which included observations and semi-structured mobile interviews. Ethical challenges encountered during the fieldwork are reflected upon. Finally, the chapter presents the research design and analytical framework employed to analyse the hydrosocial territory.

Chapter 4 contextualizes the case. It explores and reflects upon the relationship between the Atacameño culture and the Water Code in a mining context. The chapter discusses the importance of water in shaping the Andean landscape, but also how water has been shaped through centralised laws and policies, of which many were created during Pinochet's civil-military dictatorship. The chapter seeks to understand the consequences of norms and legislations around water and their implications for villages around mining settlements.

Chapters 5, 6 and 7 are the empirical chapters. Each chapter presents an analysis of space, time and practices based on the framework proposed in the methodological chapter. Chapter 5 looks at the concepts of solidarity and cooperation around water, Chapter 6 at the decision-making processes and how decisions are reflected in access to and control over space and practices of water, and Chapter 7 at the concept of autonomy and how decisions around water are influenced by the implementation of CSR programmes.

Chapter 8 discusses the results of the thesis. It starts by summarizing the research findings and takes a critical look at the concepts developed in previous chapters. To conclude, chapter 9 discusses the thesis's broader implications and possibilities for future research.

Chapter 2 Construction of the hydrosocial territory

Introduction

Research on political ecology is characterised by being critical and action-oriented. It plays an important role beyond academia in people's political claims and practices, and tends to exhibit a focus on people who have been involved in disputes over territories and resources (Tom Perreault, Bridge, & McCarthy, 2015). Political ecology occupies a theoretical-practical territory where diverse disciplines, thoughts, ethics, behaviours and social movements converge (Leff, 2003). In general terms, it emphasises how the unequal conditions under which actors may communicate over natural resources can shape human and environmental relations (Escobar, 2008; Walker, 2005), causing '*fundamental changes in the management of nature and the rights of people*' (Robbins, 2011: 5).

Martínez-Alier (2002) posits political ecology as the study of conflicts concerning resource distribution. Such conflicts encompass contestations of access to and control over natural resources, particularly those that are connected with livelihoods (Escobar, 2008). For Berkes (2004: 624), political ecology also analyses power relations among actors in terms of the ways decisions are made and benefits shared; it interprets events with reference to the behaviour of actors in pursuit of their own political agendas. Thus, political ecology studies how the distribution of power, both between humans and in their relationships with other species, determines the use of the natural environment (Bryant & Bailey, 1997; Bustos, Prieto, & Barton, 2014; Tom Perreault et al., 2015; Robbins, 2011).

Only in the past ten years have studies of political ecology begun directly challenging the dialectical, political economy-focused approach to the relationship between the human being and a particular context (Bryant, 2015). Several lines of argument suggest that political ecology can be understood as a framework that seeks to define the relationship between political economy and ecology (Molina, 2016). Thus, the lens of political ecology allows this thesis to understand nature as something inevitably intertwined with a construction of processes and social production, rather than as a phenomenon that exists by itself (Bustos et al., 2014).

Previous studies in the field of political ecology have examined water as a resource and the relationships, social conflicts, power relations and ecological dynamics that connect to it (Boelens et al., 2016; Budds, 2004; Gelles, 1996; Leff, 2015; Linton & Budds, 2014a; Rodríguez-Labajos & Martínez-Alier, 2015; Seemann, 2016; Swyngedouw, 2009). These studies have analysed the relevance of water quantity and quality for conflicts over water as a commodity, especially struggles emerging from mining extraction (Rodríguez-Labajos & Martínez-Alier, 2015). Such conflicts suggest a close correlation between transformations in the hydrological cycle and disputes over natural resources such as water. On the one hand, such transformations take place at the local, regional and global levels; on the other, they occur in relation to social, political, economic and cultural power (Swyngedouw, 2009).

Perreault (2014) highlights the need to link water to the social relations that produce it and give it meaning. These social relations are always historically constituted and exist within a context of uneven power. As Perreault points out: *'water cannot be understood apart from a theory of space; and like space, water is socially produced'* (Perreault, 2014: 237). This means that particular spatial forms of water emerge out of the frictions of social relations and are therefore inherently political. In other words, water is socially produced as an outcome of social practices, perceptions and relationships over time and space.

A considerable amount of literature has been published on the political ecology of water (Alimonda, Pérez, & Martín, 2017; Bakker, 2003, 2010, 2012; Bell, Allen, Hofmann, & Teh, 2016; Boelens, Perreault, & Vos, 2018b; Budds, 2009; Bustos et al., 2014; Leff, 2015, 2003; P. P. Mollinga, 2008; Tom Perreault et al., 2015; Prieto, 2015c; Rodríguez-Labajos & Martínez-Alier, 2015; Strang, 2004; F. Sultana, 2015; Trawick, 2002). Boelens (2015; 2017) argues that struggles over water can also involve disputes over meaning, norms, knowledge, imaginaries, identity, authority and discourses. Some writers have focused on the destructive impact of 'mega-hydraulic infrastructures' and 'extractive industries' on local livelihoods as well as water privatisation and monopolisation practices which dry up indigenous and peasant territories (see for example: Agnew, 2011; Bauer, 2008; Bebbington, 2009; Bridge, 2004; Gudynas, 2013, 2016; Odell, Bebbington, & Frey, 2018). However, there is a

gap in the research in relation to invisible, everyday and small-scale forms of local water rights and norms, that is, in relation to conflicts that are generated through external forces connected with large-scale mining activities, but which do not directly emerge from the extraction of natural resources.

There is no doubt that water and society have a complex and particular historical and sociological relationship in different regions. Shaw and Thaitakoo (2010) suggest that this relationship is central to social theories of civilisation and state, community and collective action, and culture and common property. The theoretical umbrella of political ecology provides space to explore how social relations of power intertwine and intersect with both the material and symbolic dimensions of water. These shape access to water among different social groups, generating narratives around water management and water as spaces emerge. Furthermore, political ecology seeks to understand and visualise how people's relationships with water are configured through power in spatial and temporal terms (Swyngedouw, 2009).

Literature in Andean studies, especially the work of Paul Gelles (2000) and Paul Trawick (2002), has highlighted several questions of power concerning water. These are related not only to control over irrigation systems, but also to the right to culturally define and organise these systems. These authors indicate the importance of irrigation canals as connectors between local-level politics and broader structures of power and domination. Mattias Borg Rasmussen (2015: 6) also addresses water as a manifestation of power, and argues that '*water in different forms infiltrates the political, affecting equity, distribution, and modalities of governance*'. In some cases, conflicts around water reveal issues of the presence or absence of the state, peasant and community politics, and cooperation.

In the Andean context, a number of studies have begun to examine conflicts between indigenous livelihoods, mining and water (Babidge & Bolados, 2018; Bebbington, 2000, 2009; Bebbington et al., 2008; Budds, 2004; Budds & Hinojosa, 2012; Budds & Sultana, 2013; Bustos et al., 2014; Tom Perreault, 2013, 2015). Such research on the entanglement of people, place and politics is fundamental to understanding the changes in the relationship between inhabitants, the state, the private sector and the

environment that are currently taking place in the Andes. Rasmussen and Lund (2018) argue that mining transforms the landscape. Therefore, changes in relationships are an essential entry point to explore not only contestations over water and natural resources but also the transformation of the environment.

This thesis reinforces the idea that political ecology represents a broad and flexible analytical framework based on a critical conceptualisation of human interaction with nature. It adopts the lens of political ecology in order to stress that human interactions with the environment are mediated by political and cultural forms and forces (Gelles, 1996). It sees human–nature relations as being marked by both conflict and cooperation (Escobar, 2008; Martínez-Alier, 2002; Robbins, 2011), mediated by power relationships (Boelens, 2015; Boelens et al., 2017; Budds, 2004; Tom Perreault, 2014).

This theoretical chapter discusses the concepts of water, territory, power and community through the lens of political ecology in order to establish an understanding of the construction of hydrosocial relations in the Atacama Desert. The aim of the chapter is to construct a theoretical framework that blends elements of political ecology and spatial theory. It opens the discussion by dissecting the meaning of water and power. It then analyses the concept of territory from a geographical perspective and, finally, addresses the construction of hydrosocial territories. The chapter explores the ‘trialectic’ relation between space, time and practices, arguing that hydrosocial territories are generated by power, community and territory (Soja, 1996).

Water, territory, power, community and hydrosocial territories

This section explores five theoretical concepts that are applied to address the research gap, in particular the lack of attention that has been paid to the concepts of solidarity, access and autonomy in everyday and small-scale forms of local water practices as the enacting of rights and local norms. Water and territory are central concepts not only to understand meaning in Andean communities, but also to address how social and political relations are part of the specific hydrosocial cycles in these communities. Water and territory are contested concepts within the mining context, which means the hydrosocial cycle is inevitably imbued with power relations. This section presents a

reflection on how these concepts have been conceptualised in academia. It elaborates the definitions of water, territory, power, community and hydrosocial territories that are adopted in this thesis. This provides the groundwork for the analytical framework developed in the following chapter (methodology).

2.1 Approaching water

‘Water forms the landscape. It can carve out a deep river gorge, a tiny rivulet in mud, or a great U-shaped glacial valley. Water shapes the coastal edges, endlessly re-forming, hollowing-out and removing them and carrying them away into the sea. Cycles of water freeze, thaw and shatter rock. It is a relentless solvent, breaking things down and transporting them. It is always dissolving things’ (Kovats, 2014: 171).

For the sake of conceptual and methodological rigour, it is essential to clarify the definitions of water that underlie this thesis. The applied theories relate explicitly to the role of water in the construction of communities, and to the definition of what can be called a fundamental element of hydrosocial territories. A review of literature on the concept of water from a political ecology perspective supports an understanding of conflicts over water use and practices, which feeds into the elaboration of the analytical framework of this thesis.

Water may be defined in multiple different ways. But all definitions posit it as a key element of production of socio-spatial configurations as well as an influential source of meaning and conflict. The latter is exacerbated in water-scarce areas like the Atacama Desert, where access to water is more difficult due to the extreme weather conditions. Water flows connect places, spaces and people to each other. Gelles (2000) claims that it is necessary to understand the use of water in order to understand the concept of community as well as the history of specific societies (Ekers & Loftus, 2008). Linton (2010: xvii) also claims that ‘*the state of water always reflects, in one way or another, the state of society*’. From an anthropological perspective, Hastrup (2013: 59) argues that ‘*water configures societies in particular ways, and to generate particular values. River flows, canals, and wellsprings frame particular social worlds*’. Therefore, for the researcher to explore societies, it is fundamental for him to understand the power of water.

Throughout history, human societies have developed elaborate systems to ensure fair access to the means of life and livelihood, including water (Strang, 2009). Water shapes locations, forms, ecology, prosperity and health (Bell, Allen, Hofmann, & Teh, 2016: xv). According to Strang (2004: 21): *'water is a metaphor of social, economic and political relationships – a barometer of the extent to which identity, power and resources are shared'*. Water is a diverse element in its materiality, form and temporality (Bear & Bull, 2011; Budds, 2009; Linton, 2010).

Veronica Strang (2004) emphasises the need to comprehend water as a vital element in the construction not only of the identity of individuals, but of identities at local and national level. The meaning of water that manifests in any particular time and place can therefore be seen as a function of the relative power of different social actors (Linton, 2010: 13). Along the same lines, Gelles (1996) notes that Andean communities have to be understood as inherently conflicted and characterised by a cultural orientation that joins local identity and the production of sacred landscapes. In the same vein, Andolina, Laurie and Radcliffe (2009: 131) argue that: *'In the indigenous world, water, like rocks, mountains, and trees, is conceived as a living being that feels, converses, watches, and protects. This concept is rooted in the harmonious relation between human and nature'*. Water, in this sense, exists apart from human influence as rainfall, in aquifers and oceans, as soil moisture and evaporation and in other forms. Simultaneously, it is produced and enacted through human labour and social action within given frameworks such as irrigation systems, fountains, water laws, sewer systems, thirst or customary rights. As Figure 2.1 shows, water gains meaning through cultural beliefs, historical memory and social practices. It exists in discourse and symbolism and as a physical and material thing. Water is therefore neither purely 'natural' nor purely 'social' but simultaneously and inseparably both: it has a hybrid 'socio-nature' (Perreault, 2014: 234).

Water is part of the territory, and vice versa. It both shapes and is shaped by the territory. Water crosses borders and connects institutions, interests and aspirations on different scales (Orlove & Caton, 2010). These connections can generate conflicts. Ward (1996) describes water problems as *'a crisis of social responsibility'*. Conversely, Strang finds that water, in general terms, has been dematerialised,

rendered *'a metaphorical abstraction...in which it ceases to be particular to any place or group'* (Strang, 2004). A deterritorialised and dematerialised understanding of water is problematic because it *'denies the reality of local, specific human–environmental relationships and alienates the medium through which an individual can identify with a locale and its other inhabitants'* (Linton, 2010: 20). These different conceptualisations of water and its connection with society allow us to recognise water as a social product, and thus its potential to be changed as a result of changes in society.

Figure 2.1 | Meaning of water



Source: Author

Strang's (2004) work on 'dematerialised water' is complemented by Kalaora's (2001) study of the 'deterritorialisation' of water. He notes how the conquest of water by means of its conceptual abstraction and technical control has broken relations that otherwise bind specific groups of people to the waters of particular territories. A corollary of the 'placelessness' of modern water is the transfer of water control to placeless discourses of hydrological engineering, infrastructural management and economics. Kalaora (2001) describes this in terms of a 'deresponsibilisation' by which people leave to experts all responsibility for maintaining relations with water.

For Linton (2010: 19), the modern idea of water as *'an objective, homogenous, ahistorical entity devoid of cultural content is complemented by its physical containment and isolation from people and reinforced by modern techniques of management that have enabled many of us to survive without having to think much*

about it'. What follows from this is that: *'modern water has entered a critical phase where it is recognised as untenable, or unsustainable, and that this crisis is forcing us to think about, and get involved with, water in ways to which we are little accustomed'* (Linton, 2010: 19). Worster (1985: 5) writes: *'Quite simply, the modern canal, unlike a river, is not an ecosystem. It is simplified, abstracted water, rigidly separated from the earth and firmly directed to raise food, fill pipes, and make money'*.

There is a close relationship between modern notion of water and the modern state – or, as in the case of Toconao, between modern water and private enterprises like mining companies. Essentially, the state has materially engineered modern water as a resource, while water resources have strengthened the apparatus of the state (Linton, 2010). Therefore, the literature review in this section suggests that, although water has historically been produced in relation to social practices, modern water is supposedly independent of social relations.

2.2 A conceptual understanding of the territory

Most people have a feeling of belonging to a certain territory and can name it, for example, as their home country. Commonly, socially constructed territories such as nation-states are shaped through symbolic values. Territories, delineated by particular spatial boundaries, are impregnated with a portion of space through symbols, rituals, languages and morals which determine the appropriate behaviour expected of the territory's inhabitants. This social behaviour reinforces itself in a cycle, continually redefining the territory as the rightful framework for the appropriation of space (Duarte, 2017: 51).

Tim Cresswell (2013: 12) defines place as *'how we make the world meaningful and the way we experience the world'*. He argues that the attribution of meaning to places has to be seen in the context of power. As Swyngedouw and Boelens (2018: 117) point out: *'territory is the socio-materially constituted and geographically delineated organisation and expression of and for the exercise of political power'*. In contrast to Cresswell, Duarte (2017) argues that power is more related to the concept of territory, which can be seen as a device that is designed to control resources (Brighenti, 2010: 62). Territories can take multiple forms, but all have in common the appropriation of

space through some form of control (Duarte, 2017: 52). Thus, the ownership of a space is still a socially designed device, one which legitimises those who belong to a territory above those who are merely passing through it.

Research on the relationship between space and territory tends to emphasise that people shape territories and territories shape people (Storey, 2012). Hence, territories are more than spaces with boundaries; rather, they can be seen as a fusion of meaning, power and space (Delaney, 2009). It is important to stress that space and territory are not equivalent terms. Space is the anterior term, because territory is generated from space through the ‘territorialising’ actions of an actor. Delaney (2005) introduces the concept of the ‘grammar’ of territory as a way of analysing dynamic social processes and practices, and there are several implications of this grammar. Firstly, territory needs to be understood in terms of its relationship to space, a political-economic and political-strategic relationship. Secondly, it needs to be explored as a bounded space. Thirdly, it should be viewed as a political technology, that is, as a way of controlling land (Elden, 2010a).

Different scientific disciplines focus on different aspects of territory. For international relations theory, territory is an aspect of sovereignty; for anthropology, it is an expression of collective identity; for environmental psychology, it is a way to promote privacy; human geography uses it as a tool to explore other concepts, such as political authority, individual autonomy or rights (Elden, 2010a). What the different disciplines have in common is a view of territory as a conceptual device and an instrument designed for managing a space and the objects, people and actions within it.

Elden (2010a) argues that territory needs to be understood in terms of its relation to space as a ‘bounded space’. Building on Foucault and Heidegger, he stresses (2010a: 811) an understanding of boundaries not just as an element that separates territory, but *‘as a second-order problem founded upon a particular sense of calculation of space’*. Physical boundaries are the most obvious device for demarcating a territory. The power of boundaries is to control those living within them and to protect the territory from those living and acting outside of it. In contrast to Elden, Duarte (2017: 48)

argues that territory is not necessarily a bounded space. Rather, boundaries are by definition devices which are critical of territory – even when they are fluid or unclear.

Following the same idea, territory can be understood as closely related to the nation-state (Elden, 2010b). In the Western definition, territory is a political and legal term that relates sovereignty, land and people (Elden, 2009). Another approach to territory sees it as an outcome of territoriality, which means that it is related to a specific strategy of human behaviour. Elden's definition shows that territory must be seen as a historically and geographically specific form of political organisation and political thought (Elden, 2010b). All social sciences relate territory to human social creations or the question of how human associations and institutions organise themselves in space. They also agree that territory is dynamic and vibrant and that it has a metaphysical and a material component, which is important for differentiating collective and individual identities (Castells, 2010).

In contrast to the Western view, a number of authors have considered territory as a portion of nature, and therefore a piece of space, to which a particular society lays claim, guaranteeing to all or some of its members stable rights of access, control and use in relation to all or part of the resources that are present, desirable and able to be exploited by the society (Barros, 2000; Castro Lucic, 2000). Territory is in this way a social appropriation of space in which people incorporate into their sociocultural structures the characteristics of the landscape they inhabit (Méndez & Romero, 2018). Thus, the Andean definition of territory contests the Western by positing territory as a sacred habitat emerging from the earth itself, the 'Mother Earth' or '*Pachamama*', and the water that makes it fertile (Castro Lucic, 2000; Nuñez, 2007).

In order for a territory to be accepted by different social groups living in the same space, common practices and rules are established. Those living in a territory, even temporarily, are subject to its rules and practices, which are enforced by institutions. The legitimacy of a territory depends on the recognition of its rules and institutions by social groups living in other territories as well. The rules of two territories can be completely different, even antagonistic towards each other, but they have to be mutually recognised as legitimate in order to turn space into a territory (Duarte, 2017).

Therefore, the role of space can be fundamentally understood as an extension of discourses and cultural practices around a specific territory (Hopkins & Pain, 2007; Horton & Kraftl, 2008; Vanderbeck, 2007).

In order to gain an understanding of the limits of a territory, it is important to elaborate on the possible meanings of territorial identity and territoriality. On the one hand, territorial identity is a process in itself; it is a construction with personal and collective characteristics within a specific spatial context or locality. On the other hand, territoriality is a form of domination or management of a certain area. Territoriality is associated with the concept of spatiality, grasped as a property or condition of a space. Nonetheless, in many cases those who organise and dominate a territory also pursue elements of identity (Duarte, 2017: 46).

Soja (1996: 19) stated that *'territoriality...is a behavioural phenomenon associated with the organisation of space into spheres of influence or clearly demarcated territories which are made distinctive and considered at least partially exclusive by their occupant or definers'*. He argued that this organisation happens through three processes: competition, conflict and cooperation. These processes are to be analysed in terms of resources, power and social organisation. This is closely tied up with control, which is the ability to make authoritative decisions; the maintenance of order, which refers to the enforcement of authority; and legitimation, which means social integration.

Several closely related terms are used to frame thinking in connection with the concept of territory, including 'land' and 'terrain'. Land is related to property, meaning that it is a finite resource that is distributed, allocated and owned. It is also a scarce resource, over which there is competition. The possession of land means power, and conflict over land is a key indicator of power struggles (Delaney, 2005). Terrain, too, is closely related to power: it allows the establishment and maintenance of order. A standard definition of terrain is a land belonging to a town or another entity, such as a religious order. Terrain is limited land associated with a military strategy. It is related to violence as a way to seek legitimation and authority (Mbembe, 2001 in Elden, 2010a). In the Andean context, territory is associated with land, and thus also with the demands on it

and the struggle for control over its natural resources such as water, vegetation, soil, subsoil and animals (Castro Lucic, 2000).

Overall, existing studies highlight the need to recognise that *'Territory is a historical question: produced, mutable and fluid. It is geographical, not simply because it is one of the ways of ordering the world, but also because it is profoundly uneven in its development. It is a word, a concept and practice, where the relation between these can only be grasped genealogically. It is a political question, but in a broad sense: economic, strategic, legal and technical. Territory must be approached politically in its history, geographical and conceptual specificity'* (Elden, 2010a: 812). Therefore, in this thesis, territory will be understood in the context of representation, appropriation and control – in broad terms, as an operation of power.

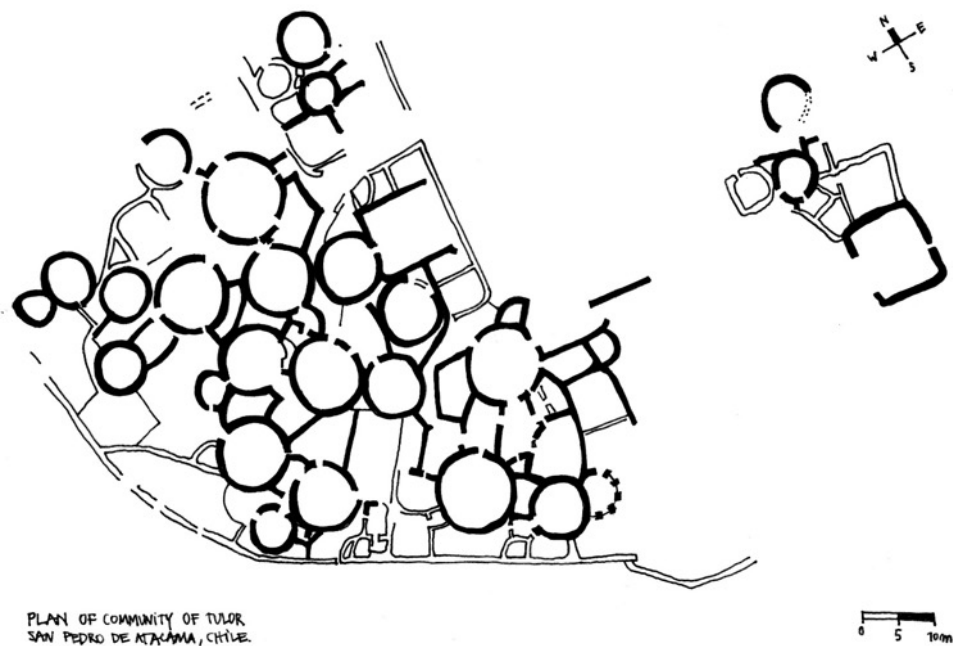
2.2.1 Andean territory

This thesis recognises water in the Atacama Desert as the key element that organises and structures different towns and their people. The first towns were founded close to the rivers or streams or in humid areas, where techniques of irrigation enabled the gradual development of a water culture (Nuñez, 2007). Territorial planning and the handling of water at the community level through mechanisms like irrigation systems for agriculture and canals for daily use, can be seen as representing the cultural and political heart of the community. Inhabitants of the desert live in a permanent relationship with nature and learn to improve their conditions of living with it. They have been building their own history in the most arid and driest desert on the planet, vanquishing the challenges thrown up by the space. The anthropologist Lautaro Nuñez (2007) states that the Atacameños have domesticated the landscape to survive, conquering the problems of land, water and long distances within the immensity of the desert. Water has been essential, not only as a means to survive but as a key element in the construction of Atacama culture. The connection with water is a result of social interactions in a specific spatiality, generating opportunities and ecological limitations at the same time. Therefore, water in Atacameño culture can be seen as a reflection of interactions between different levels of power and a symbol of participation, cooperation, debate and difference. Hence, water is the physical and social

representation of power in a specific time and space, interweaving origin and development (Gundermann & González, 1995).

The most important form of territory in the Atacama social structure is the *'ayllu'*. *'Ayllus'* possess a degree of autonomy while at the same time depending on each other in the use of water, which determines the organisation of the entire village (Figure 2.2). The *'ayllus'* are socio-territorial units characterised by family groups of isolated lands, which in their interior contain predial structures in which irrigated agriculture is practised (Sepúlveda Rivera, Molina Otárola, Delgado-Serrano, & Guerrero Ginel, 2015). The structure of the *'ayllu'* responds to a duality, where water is the unifying element. The interconnected structure of irrigation canals within the *'ayllus'* can be understood as a demonstration of the domestication of territory. Del Rio (2002) defines *'ayllus'* as *'a standalone element, but at the same time, the settlement is a sum of ayllus'*.

Figure 2.2 | Ayllus and their interrelationships



Source: Author based on Saavedra & Altamira (1971)

The Atacameño understanding of territory consists of three coexisting layers: natural forces, Gods or divinity, and inhabitants. These layers interact at different levels: above-surface, surface and subsurface. They have a clear relation to the water cycle,

which includes rainfall, rivers and underground aquifers. This understanding of territory shows the strength that indigenous worldviews bring to the management of scarce water resources. It is manifested in an interweaving of local worldviews, water flows and water control practices (Boelens, 2014). Thus, Atacama culture emerges from the people's relationships with water use, especially in regard to the development of agriculture in the desert (Nuñez, 2007).

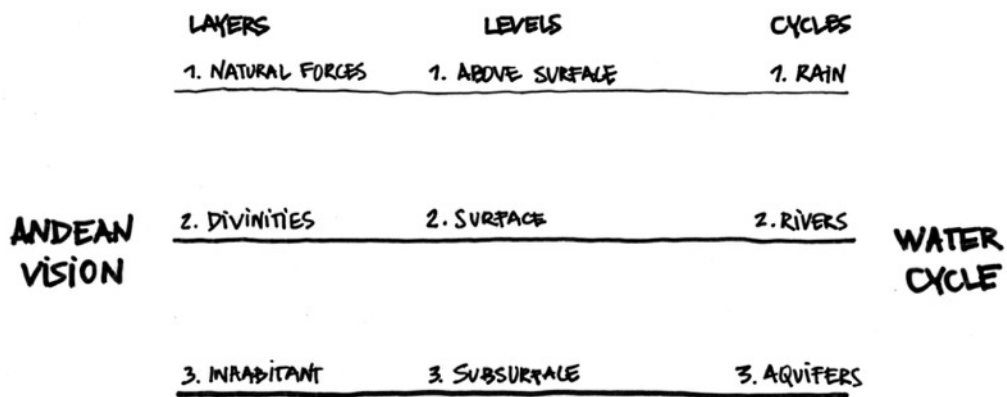
Improvement of water management generates a resource surplus that can be exchanged with other communities. The regional development of settlements in the Atacama started with the construction of canals for agriculture. The canal system therefore contributed to the emergence of permanent settlements. Aboriginal communities built the canals themselves, which were designed in such a way that water could flow to every community member. Such systems are highly sensitive and depend on everyone executing with a community spirit his/her right to the water. This means that everyone has to allow the water to continue to flow, not deplete it for his/her own benefit.

The concept of territory in the Andes is based on notions of mobility (Núñez, 1992) and verticality (Murra, 1975) rather than on boundaries of private property. Verticality is reflected in the water cycle and associated with the control of different ecological zones. This already hints at the contradictions between the industrial model of the extraction of water resources and the Andean perspective prevalent in the Atacameño communities. The vertical dimension adds height and depth to the horizontal plane, for example in relation to the continuity between groundwater and surface water in the hydrosocial cycle (Bridge, 2013). This vertical understanding of the territory generates the possibility of an engagement between different levels of the land, as Figure 2.3 shows.

Nuñez (1995) suggests that landscape is what we can dominate with our eyes. Landscape is part of nature that we make our own, something that we take over. Therefore, to produce landscape is to reduce the scale of nature and its relationship to everyday practices. People perform everyday water practices in order to improve not only their water security, but also their connection to their territory. The daily practices of the canal-users include techniques and traditions of managing water. However,

water is associated not only with technical practices, but with practices of cooperation and solidarity as well as with tension and disputes (Zinzani, 2017). In this thesis, water practices are the cyclical practices performed for the maintenance of the canals, such as cleaning, repairing or improving the canals, as well as practices of the division and distribution of water, shift work and irrigation association meetings.

Figure 2.3 | The Andean understanding of territory in relation to water



Source: Author based on Nuñez, 2008

In Andean culture, the concept of place is alive, connecting with natural elements and different phenomena of the territory. The concept of '*Pachamama*', or 'Mother Earth', was established over generations. It postulates land not only as a physical entity, but as fundamental and necessary to life (Nuñez & Warnken, 2011). As already explained in relation to the concept of the '*ayllu*', irrigation systems are forces that shape the territory and comprise the fundamental structural elements of a village. They therefore contribute to the particular identities of villages in the desert (Barón, 2005).

Nuñez (2007) states that Andean identity is characterised by constantly evolving internal processes and modes of cultural integration. Identity in the Andes is conditioned by linguistic and racial diversity, diversity of climate, large-scale agricultural activity, worldview ('*cosmovisión*'), religiosity and equality among human beings, both men and women. Nuñez (2008: 233) describes these influential elements as combining to produce the 'Atacama spirit' or the 'Andean spirit'. They underlie the set of cultural practices that Atacameños refer to as '*costumbres*' (*customs*). '*Costumbres*' are considered key markers of the legitimacy of an

indigenous identity. Prieto (2016b: 29) defines *'costumbres'* as *'performances rooted in cultural values and practices of water attached to a certain moral economy'*. They are manifested in practices like payments to land, carnival or religious celebrations, community work and farming. Therefore, through the *'costumbres'*, people recognise the existence of a shared genealogical connection, reinforce communal bonds, practice reciprocity, and identify themselves as territorially placed (Prieto, 2016b).

One question that is particularly relevant for this study is how theoretical debates include communities and their understanding of territory. Addressing this question will allow an analysis of community capacities and practices to generate claims regarding the production of territory. Such an analysis will also give voice to the points of view of individuals, communities, ethnic groups or the inhabitants of the Atacama Desert as a whole. The production of the Andean territory inevitably leads to a discussion of power. It is possible to consider aspects of power at multiple scales, from the macro-scale of government to the micro-scale of groups or individual interactions (Storey, 2012). Coming back to Kalaora's (2001) concept of the *'deterritorialisation'* of water, it is of fundamental importance in this thesis to locate the concept of territory in the desert context. Water is not only a fluid that flows through a territory; rather, it is essentially territorial. It shapes geographical spaces through its passage. This research emphasises the importance of discussing the political dimension of territory and of adding a community perspective to this political discourse.

2.2.2 Power over water and territory

'We must cease once and for all to describe the effects of power in negative terms: it 'excludes', it 'represses', it 'censors', it 'abstracts', it 'masks', it 'conceals'. In fact, power produces; it produces reality; it produces domains of objects and rituals of truth. The individual and the knowledge that may be gained of him belong to this production' (Foucault, 1991: 194).

In order to build an analytical framework, this section presents theoretical views on power and how it is produced through water management to generate injustice, inequality and exclusion (Budds & Sultana, 2013). Water is life, but it also means power relations and contestation among uses and users (Boelens, 2015). Different discourses of water management shape access to and control over water, meaning that

water is intricately enmeshed in, and reflective of, power relations (Swyngedouw, 2004b). An analysis of the relationship between water and territory can therefore contribute to revealing power relations that are configured in a specific space and time.

In Andean societies, water is a highly contested resource in terms of irrigation and the different meanings it might be assigned (Gelles, 2000). Relationships of water and power are intersected and intertwined, especially concerning technological interventions. Technology shapes differences in access to the resource within the community, how inhabitants construct particular discourses concerning water management and efficiency, and how that is reflected in the production of areas of inequality (Ekers & Loftus, 2008; Linton, 2010; Swyngedouw, 2004b, 2009). Therefore, technology plays a big role in the capacity of inhabitants to transform the Andean territory.

Lukes (2005) suggests that the concept of power is closely connected to the idea of 'interests': '*...A exercises power over B when A affects B in a manner contrary to B's interests*'. Lukes' main argument is that power is fundamentally contested (Lukes, 2005). Mark Haugaard (2008, 2011, 2012b, 2012a) has been able to show that social power has two sides, 'power to (capacity to act in concert – empowerment) and power over (violence and coercion – domination)'. He writes that there are two foundations for these forms of power: physical resources (natural power) and social structures. Connecting the ideas of Haugaard and Lukes with the context of the Atacama, the space of the irrigation canals is imbued with power relations, which constitute the canals as cultural artefacts. Lukes (2005) highlights the need to bring another experiential dimension to the conceptualisation of power. Thus, the exercise of power in the Andean territory does not merely emerge from access to specific resources, as something external. Instead, it is also related to the experience and use of the land through practices.

Guzzini (2005) claims that the concept of power has a performative role in people's discourse, particularly political discourse: how discourse conceives of power makes a difference to how we think and act in general, especially in political contexts. Following this idea, Newton (2008) argues that, although political sciences nowadays

place a focus on formal institutions, a political-anthropological perspective provides another way of understanding decision-making mechanisms. This political-anthropological lens highlights the necessity to *'look for how, when and where decisions are being made, who is influenced by them and upon which norms and values choices are based'* (Newton, 2008: 25).

Rasnake (1988) elaborates on concepts of authority and power among Andean communities. He states that these two concepts are always linked in social analysis; however, it has not been easy to achieve a satisfactory definition for either. Here he draws on Max Weber, who sees power as *'the possibility of imposing one's will upon the behavior of other persons'* (Weber, 1978: 942). Weber considers that power is too broad a term to be useful for sociological research. He seeks to move beyond it, developing the notion of *'domination as power resulting from a socially recognised position of leadership'*. According to Weber (1978), the main reasons for a social group to accept a particular system of domination may vary: motives such as self-interest, emotional attachment, convention, response to coercion or the recognition of economic power may be at work. Yet, when individuals uphold an order because of their belief in the legitimacy of the system – that is, when leaders exercise their domination legitimately – then leaders have authority. Authority, then, is a legitimate act of domination (Rasnake, 1988b).

Foucault (1980) discusses the relationship of space and power extensively in *Power and Knowledge*. For him, power is both productive and negative, locally defined and yet immanent within particular fields of technology and action (Crampton & Elden, 2007: 2). On the other hand, space for Foucault is a vital part of the battle for control of individuals, and not a question of domination. In the same vein, Driver (1985) notes that there is a pending discussion on governmentality when we talk about the spatial implications of the historical transformations of power. Space, knowledge and power are necessarily related. Foucault suggests that *'it is somewhat arbitrary to try to dissociate the effective practice of freedom by people, the practice of social relations, and the spatial distributions in which they find themselves. If they are separated, they become impossible to understand'* (Foucault 1984: 246).

Foucault mentions that one element of power is the power of knowledge: *'that which is woven of space elicits space, gives itself space through an ordinary opening and removes space to take it back into language'* (Foucault, 2007: 166). As Foucault (1980: 52) states: *'power and knowledge depend on each other: power cannot be exercised without knowledge, and knowledge necessarily engenders power'*. Commenting on the relationship between power and knowledge, Foucault (1980: 133) reminds us: *'the exercise of power perpetually creates knowledge and, conversely, knowledge constantly induces effects of power'*. Thus, on the one hand, power produces reality, knowledge and truth claims; it even produces the ways in which *'truth is made true'* (Boelens, 2015: 15). On the other hand, truth is linked in a circular relationship with systems of power, which produce and sustain it, and with effects of power, which it induces and by which it is extended (Foucault, 1980).

Boelens (2015: 12) notes that *'power both produces and controls reality and its subjects, forging their beings and moulding their minds. The norms often are not explicitly expressed in legal rules.'* Likewise, Foucault (1991) holds the view that *'norms are the naturalizing vehicle for an invisible, subordinating power of normalisation'*. But Boelens (2015) is more concerned with the fact that researchers who cannot observe norms and rights in action without interpreting and thus perpetuating the network of power relations that defines them. Norms are displayed and reproduced, including both the dominant and subordinated.

In Weber's (1978) classic analysis of power, based on 'power-over', elites apply power to dominate the subordinated against their will. This analysis was challenged by Foucault's analysis, in which power is not controlled or exercised by agents, but 'subject-less' (Boelens, 2015). By contrast, Lukes (2005) asserts that power is both subject-centred and agent-centred. Sometimes, people actively participate in their own subjection through self-correction, often unintentionally, and sometimes they are intentionally forced by powerful agents to subordinate themselves. Where the first process is subtle, invisible, inclusive and 'bottom-up', the latter, agent-centred process may occur both subtly and through 'classic', visible, outright oppressive forms of power (Boelens, 2015: 14). In the context of this thesis, Andean communities are

dominated not only by the actions of the state, but also by the private sector, which neither shares, nor has respect for, their cultural values.

In his book *Water, Power and Identity: The Cultural Politics of Water in the Andes*, Boelens (2015) notes that forms of power are based on people's confidence in one another, people's ability to come together through mutual commitments and rely on actions that create and maintain hope. 'Power to' is enabling, based on skills and capabilities to shape the territory. Additionally to these forms of 'power-over', 'power-with' and 'power-to', Moffat, Geadah and Stuart (1991) identify an individualised 'power-within' based on inner strength and uniqueness, identity and self-acceptance. Boelens (2015: 15) observes that *'this 'power-within' is to be detached from just individual selves and is also a powerful mechanism practised by Andean collective selves in the struggles vis-à-vis normalisation. Together, these forms or mechanisms of power appear to combine or intermittently replace each other in day-to-day practice'*.

2.3 Community

The idea of community is of central discursive and moral importance in a wide variety of fields. Virtual communities, rural communities, indigenous communities, transgender communities or any number of others may exist at varying structural levels in different societies (Creed, 2006). Boelens (2015: 133) highlights the need to understand communities *'as complex, multi-layered entities whose members, differentiated by class, gender, status, and often by ethnicity, try to construct and reaffirm social and territorial bonds because of mutual dependence: continuing and improving their livelihoods and well-being requires a shared rights system and institutions for collective action to defend and control certain fundamental individual and common resources'*. However, in order to limit the concept of community, the emphasis of this literature review will be placed on communities that are built upon a shared space, such as indigenous, rural or suburban communities.

According to De Sousa Santos, Nunes and Meneses (2008: xx), the concept of community in relation to indigenous populations in the Andes concerns nature, knowledge, historical experience, memory, time and space as configuring ways of life.

These authors state that *'the concept of community is related with their (indigenous people) identity that is strictly bound to a notion of territoriality, associated with responsibilities to a territory, which is defined as a collective of space, human groups, rivers, forests, animals, and plants'*. Lucic (1997, 2007) sees community as manifesting challenges and needs to collectively create, refine and reaffirm shared material infrastructure as well as norms, values, rights and symbols.

Creed (2006) holds a similarly critical view, providing a prospective theoretical approach for contemporary scholars who might wish to unpack this multifocal idea and analyse it in ways that are reflective of its importance in local, ethnographic contexts. As Creed (2006: 22) states: *'Community is an aspiration envisioned as an entity'*. Creed suggests that communities must not be seen so much as concrete socio-spatial categories, but rather should be interpreted mainly in terms of the ideals that they represent. Other researchers, however, have found that it is also relevant to understand communities as entities, as wholes that are at least partially closed to the outside world (Stanger, 2008). Boelens (2015: 133), for example, argues that community is an effort, a process and a capacity to materialise dependency through negotiated cooperation and conflict avoidance, to work together under conditions of diversity, and to direct a limitless network towards a common resource management objective. Thus, a community is an entity that reflects individuality and integrity, acting for its inhabitants with autonomy.

Boelens (2015) notes that there are formal ways of representing local communities' perceptions of themselves and academic constructions of community. Some representations of community focus on borders. Community borders are not only territorial but also social and political. They are the boundaries within which rights and obligations are exercised as sanctioned by the community organisations (Boelens, 2015). These geographical, physical and social boundaries need to be collectively constructed. Communities, then, are arenas where diverse actors negotiate and coalesce to agree among diverse interests. They determine the rights, rules and conditions under which resource management strategies are going to be realised, and allow risks, conflicts and contingencies to be controlled as much as possible (Boelens, 2015). To be part of a community, it is necessary to be considered a member or citizen,

and this implies a process of the construction of identity. It also means that inhabitants living in a particular territory are not only subject to its rules, but ideally also accept them as part of their territorial identity. Thus, they will identify themselves with the values attributed to particular objects and actions.

2.3.1 Unpacking the Andean community

As outlined above, the concept of community can be understood in terms of the common and collective ideas of a specific group of people. However, in the context of this thesis, it is necessary to ask: What does it mean to be an indigenous, Atacameño, Andean community in particular? What are the similarities, overlaps and differences between these communities?

This research sets out to explore co-existing ideas of community, and how these are activated in various competing but connected policies and practices. Thus, it goes beyond seeing the rural indigenous community solely as an extended space, as a political unit or form of social organisation. The everyday life of Andean communities questions the models and stereotypes that often characterises the ‘indigenous community’ and ‘peasant community’ (Bebbington et al., 2008). The ‘initial community myth’ has already been largely dismantled by ethnographic comparative studies revealing the differences among societies which are referred to together as seemingly homogenous ‘communities’ (Guevara-Gil, 2006). Furthermore, rather than ‘closed corporate communities’ (Ekern, 2011) or ‘noble commons’ (Hames, 2007), Andean communities are stratified groups. Boelens (2015) stresses that studies on communities need to note that identities of ‘*comuneros*’, ‘*campesinos*’ or ‘*indigenas*’ cross regional identities and geographical borders. Different images of community co-exist, as Li (1996: 523) argues: *‘Divergent images of community result not from inadequate knowledge or confusion of purpose, but from the location of discourse and action in the context of specific struggles and dilemmas’*. Gelles (Boelens & Gelles, 2005; Gelles, 1996, 2000) notes that the representation of the Andes is easily romanticised by the observation of rituals, beliefs, norms and collective actions. He critiques representations that assign Andean livelihood strategies and worldviews to the margins, thus generalising key components of Andean cultural identity.

Research on Andean communities has drawn on debates that are influenced by particular ideological paradigms in academia and by political motivations. Boelens (2015: 123) argues that *'indigenist populist and romanticising schools...have focused on the Andean community as a relatively authentic, self-regulating entity [while others] (especially structuralism and modernist paradigms) have tended to develop one-sided views of 'black-box communities' as articulated constructs and consequences of capitalism and the world market'*. For Gelles (2000), the Andean community is to be understood as a complex group of practices and social institutions that belong to a specific territory. Similarly, Boelens (2015) asserts that the notion of community is contested in Andean history. Hence, communities should be situated in a globalising environment while also emphasising that they are contextual, based on political or academic conventions within their own context.

In Latin America, diverse context-specific self-conceptualisations of *'comunidad campesina'* or *'comunidad indigena'* interweave with pre-Columbian imperial history, state extraction structures, official recognition policies and broader class and ethnic identity struggles, making the notion of community extremely complex (Núñez, 1992). *'Sumak Kawsay'*, or ideas of *'Buen Vivir'*, reflect the purpose of Andean thought. Gudynas (2011) defines *Sumak Kawsay* as a mode of existence that is in equilibrium with all other elements of *'Pachamama'*. This mode of existence includes other beings, such as animals, plants, minerals, stars, spirits and divinities (Turnhout, Van Bommel, & Aarts, 2010) and is governed by the principles of relationality, complementarity, correspondence, reciprocity and cyclicity (Estermann, 2013, 2015). Similarly, Rodriguez (2016) suggests that *'Sumak Kawsay'* represents the ideal of the indigenous social project, understood as an epistemic proposal based on the Andean ways of life and their institutions. In the same vein, Boelens (2015) states that there is a presentation of the Andean community in binary frameworks. This means that it is presented as a construct which is separate and distant from the West in both a positive and a negative sense. Separation from the pre-Columbian past ignores multi-layered, dynamic constructions of Andean identity within broader networks of power, culture and meaning.

The key issue with the conceptualisation of Andean communities is that scholars and activists have ignored ethnic and cultural pluralism in favour of a romantic vision. In his ground-breaking investigation into communities in the Peruvian Andes, Boelens (2015) concluded that researchers accentuate cultural-spiritual continuity since Inca times rather than stressing socialist inheritance. He emphasised that this perspective naturalises the concepts of ‘community’ and ‘indigenous people’ as *‘pan-Andean organisational patterns, rules and relationships, irreducible and constant throughout history’* (2015: 80). Academic approaches construct ideal-type communities outside space and time, where tradition, custom and solidarity ideologies mask internal class formation. This cultural relativism, or ‘communitarism’, subordinates individual rights to the collective (Boelens, 2015). Therefore, the Andean worldview influences all human, natural and divine behaviour, generating the essence of Andean community.

Notions of community, however, are highly contested conceptually and empirically. Different schools present community images in different ways, legitimising actions to either protect or change normative arrangements (Escobar, 2008, 2011, 2014; Li Murray, 1996, 2010; Starn, 1994; Stoltenborg & Boelens, 2016). A large number of published studies describe ‘Andean communities’ in terms of contextual and historical evidence as much as of regimes of representation, thus focusing on particular interests, truths and perceptions (see for example: Alonso Barros, 2004; Boelens, 2014; Boelens & Zwarteveen, 2005; Bolin, 1990; Gelles, 1996; Guillet, 1981; Gundermann & Vergara, 2009; Morales, 2014; Núñez, 1992; Perreault & Green, 2013; Prieto, 2016; Rasmussen, 2015; Rasnake, 1988a; Trawick, 2001). These investigations present evidence that diversity is enormous and that the identity or even the existence of the Andean community cannot be assumed beforehand. It can only be continuously and reiteratively discovered. In 2015, Boelens described the community as shaped by ‘insiders’ and ‘outsiders’, its definition attached to its definer. *‘Campesinos’* and *‘indigenas’* re-appropriate what is denied to ‘andeanity’, *‘lo andino’* or *‘la comunidad’*, generally with a clear ‘political objective’: *forming alliances and counter-discourses to challenge overt and covert dominations’* (Boelens, 2015: 132).

Commenting on identity, Boelens (2015: 9) argues that: *‘ethnicity and Andean/indigenous identity is simultaneously a political strategy by local communities*

and supra local organisations to defend their rights vis-à-vis the colonial/postcolonial State and other powerful water interest groups, and based on historically grounded cultural forms of collective action, resource management and identity formation'. Whether in relation to gender, class, ethnicity or any other dimension of social analysis, Boelens' perspective – resonating with postcolonial anthropology's pronounced interest in 'history', 'process' and 'power' – has been influential in the development of understandings of the Andes. The Andes is understood as a place of synthetic and shifting identities that have grown out of the multi-layered interactions of the local, the regional and the global since pre-Columbian times (Starn, 1994). Therefore, by definition, Andean communities operate under conditions of legal pluralism. Different socio-legal sources and water rights exist, encountering and influencing each other in the same hydro-ecological and socio-political space (De Sousa Santos, 1995, 2011, 2013).

Furthermore, to understand the Chilean Andean organisational dynamics, it is necessary to consider the action of the Chilean state as another factor of influence. Since 1994, it has encouraged the formation of indigenous communities and associations under the terms of the Indigenous Law N° 19,253 (Gundermann & Vergara, 2009). In the Chilean context, historically, the most important collective Andean organisation has been the local community. However, it has been weakened since new, state-recognised institutions were created with the Indigenous Law. There is a confrontation between different institutions and a power dynamic in the management and control of natural resources. The main agencies responsible for executing the indigenous policy are the National Indigenous Development Corporation (CONADI) and the Origins Programme (initially dependent on the Ministry of Planning and currently on CONADI) (Gundermann & Vergara, 2009).

2.3.2 Community of Toconao and the common property regimes (CPR)

One of the main concerns for all communities located in the Atacama Desert is the regulation of natural resources, especially the control and supply of water for human and agricultural consumption. The primary common property resource management system operates under the committees of water associations and rural drinking water committees. Those institutions have their own legislation (statutes), with detail the

responsibilities of water users and sanctions for non-compliance. Even though water use has changed since the implementation of new irrigation systems due to wine production, the common property management system has resisted modifications and pressures from grape farmers, who need more water, different water supply systems, and water accumulation infrastructure. Frequent discussion about water uses and distribution happened in the water assembly, with a polarisation of discourses taking place between present leaders managing the common property regime and farmers associated with the ATF program.

The principal rights of farmers within the committees are: water use for agricultural purposes, participation in the general assembly (giving vote and voice to their representatives), and participation in several committee activities. The duties of participants are paying fees to the committee, obeying the statutes, and participating in communitarian work (such as the cleaning of the canals and emergency duties). The common property regime protects the ownership of land, water and family ties generating trust and solidarity among farmers. However, some activities, rights and obligations are limited only to farmers who belong to the water committee.

Indigenous common property resource management systems promote the ideals of collective well-being, solidarity and responsibility (Ashenafi & Leader-Williams, 2005; Berkes, 2008; Berkes & Palmer, 2015), which are challenged by the emerging discourse from the mining sector, which is promoting water savings, and the need of using new techniques of accumulation and irrigation (Sociedad Química y Minería, 2015). The mining sectors' social program breaks the social relations that are at the core of common pool resource management, as they are giving priority to the water resource rather than social and cultural interactions. This generates failures in the administration of natural resources, which are exacerbated due to pressures on the natural and social system induced by the economic and political power of the mining sector.

The scale of Toconao, with a limited number of farmers, make its common property regime comparatively simple, because the definition of the limits of common property resources and their cultural and social understandings are more explicit (Lu, 2001).

However, the appearance of agents, who are external to the community (such as CSR programs) as well as their affiliation with the state, generate failures to the regime. New practices and uses of water encouraged by the ATF programme have changed traditional cooperative activities of the entire water committee; practices have been replaced by more individual and industrialized practices that wine production requires. In contrast to the types of activities that farmers of Toconao engaged in before as a community (payment to the land/water, exchange of seeds, mingas, cleaning of the canals, and communitarian works, improvement of the canals), current activities follow external, economically-guided influences. Norms about the distribution and accumulation of water as a common property have changed additional to practices of cooperation, solidarity and access.

Goodland, Ledec and Webb (1989) found that there are five factors that lead to the failure of traditional systems of common property regimes. They include overexploitation of natural resources and more participation in the market economy; decay of traditional values; increase in population and consumption of natural resources; use of technology focused on production; and the centralization of power. Each of these factors is relevant to the observed changes in common property regimes in Toconao. This research emphasizes those factors that generate changes in the hydrosocial territory such the implementation of a new irrigation system, and the physical, social and political implications of this new way of doing agriculture.

Traditional farmers began to observe what they call “bad practices”, whereby some took advantage of a traditional flood irrigation system and were unwilling to continue using that form of irrigation, especially when their new crops needed other forms of irrigation for wine production. One farmer told me change in the irrigation system meant not only a physical transformation in her orchards, but social consequences for the cooperation and solidarity with other farmers in relation to the use of water.

Well, in this sector (Bosque Viejo), irrigation by flooding is maintained, it remains as tradition. But for example, in the "Campo sector" farmers already have implemented other systems, drip irrigation systems. Over there, they have grapevines, for the wine production. But those vines are different from the ones we have here, and it is not like

before. I could put a drip irrigation system if I want, but that implies to build a small water tank. I could implement it, but I would also need solar pumps that allow me to irrigate my orchards. But that involves a higher cost and also removes surface for cultivation. It would require me having more water and taking away the option for another farmer to use water, and I would have to accumulate water at night. I think in the end, it's not that efficient (Sabine).

2.4 Social territories of water

Several studies have noted that water was seen in the past as a simple technical issue, and that only in recent years has its social side gained recognition. Karen Bakker (Bakker, 1999, 2000, 2002, 2003, 2010, 2012; Bakker, Simms, Joe, & Harris, 2018) was among the first to raise the question of how we can understand water as a lubricator of social functions and life itself. She defines water both as a product of social labour and as a factor of production, but also – more importantly – as universally necessary for individual bodies and for civilisations. Similarly, Swyngedouw (2004b, 2004a) notes that water can be understood as a product of historically sedimented social actions, institutions, struggles and discourses. In turn, water helps to shape the social relations through which it is produced and enacted. Water and society are, as Swyngedouw (2004b, 2004a), Loftus and Sultana (2012), Boelens, Perreault and Vos (2018) and many others have pointed out, mutually constitutive.

Water flows through landscapes, technologies and cities, connecting places, spaces and people. Water circulation is dependent upon institutions and practices as much as on the hydrological cycle (Bakker, 2002); it is not only socially produced, but also socially enacted (La Porte, 1994). According to the World Development Report of the World Bank (2017), natural resources are one of the major drivers of conflicts. It does not matter if they are scarce or abundant; natural resources are associated with violent struggles. Harvey writes that: *'Resources can be defined only in relationship to the mode of production which seeks to make use of them and which simultaneously 'produces' them through both the physical and mental activity of the users'* (Harvey, 1974: 265). Commenting on water as a natural resource, Hoogesteger (2013) and Mosse (2008) argue that natural or human-induced modifications of water flows transform or destroy social linkages, lived spaces and boundaries as they produce new

social, land and water configurations. These in turn create and transform socio-political hierarchies, conflicts and forms of collaboration. Therefore, water, society and nature are interconnected and reciprocally determining elements that together organise as specific socio-natural networks. A key contribution of this work has been to demonstrate the reproduction of power relations through water flow, quality and quantity, as well as access and rights to water. Only by viewing water and society as simultaneously social and natural can we address both ecological governance and environmental justice (Perreault, 2014: 233).

2.4.1 Water, territory and community = hydrosocial cycle

‘Whereas H₂O circulates through the hydrological cycle, water as a resource circulates through the hydrosocial cycle – a complex network of pipes, water law, meters, quality standards, garden hoses, consumers, leaking taps, as well as rainfall, evaporation, and runoff’ (Bakker, 2002: 774).

According to Linton (2008, 2010, 2014), there is an urgent need to improve understandings of water use for basic human needs. The notion of the ‘hydrological cycle’ is helpful here in its conceptualisation of water as a physical substance governed by continuous circulation at a variety of geographical scales. However, one of the limitations of the concept is that it tends to appear only in natural-scientific contexts. It remains disconnected from water’s social, ecological, cultural, geographical and religious contexts, reducing it to the formula H₂O (Linton & Budds, 2014a). The field of political ecology has sought to address this shortfall by applying the concept of ‘hydrosocial cycle’ (Budds, 2009; Budds et al., 2014; Linton, 2008, 2010; Linton & Budds, 2014a; Swyngedouw, 2009). Research in the field has emphasised the importance of analysing the relationships between the political, social, economic and power-related aspects of water (Ridolfi, 2014).

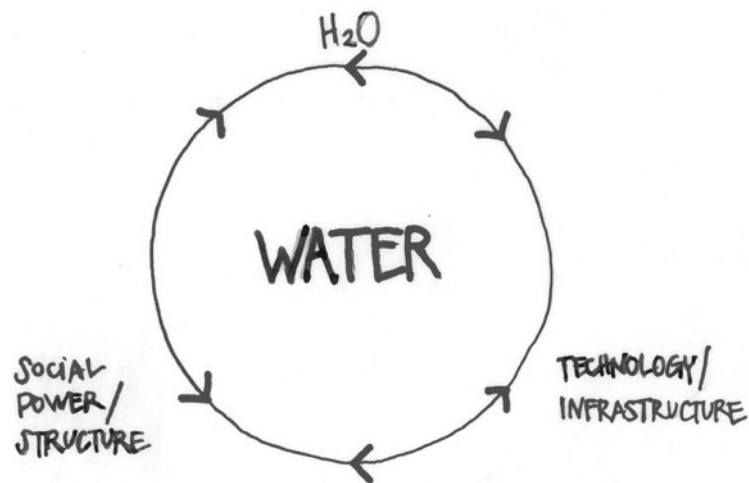
As mentioned above, Linton (2010) outlines the ‘essential relations between water and society’. He compares the hydrosocial cycle as scientific concept with older ideas about the circulation of water. He examines its importance as the predominant mode of thinking about the ways in which water flows through the hydrosphere. Linton also shows how articulations of the hydrological cycle within government agendas in mid-

twentieth-century America facilitated unprecedented manipulation and control of rivers. He proposes a new approach for thinking about water in relation to both social and hydrological circumstances: *'Water combines nature and society, the properties of H₂O, the material practices of people, and the effects of discourses'* (Linton, 2010: 36). In the same vein, Budds, Linton and McDonnell note that *'Through the framework of the hydrosocial cycle, the objective is not to simply integrate water and socio-political factors, but rather to elucidate how water is produced through social and political processes, and how water shapes social structures, relations and identities, and with what effects across space and time'* (Budds, Linton, & McDonnell, 2014: 168).

Mollinga (2014) notes that the hydrosocial cycle is a way to observe the circulation of water as a combination of the physical and social process, which avoids simplistic analyses of the water cycle. Swyngedouw (2009) considers that hydrosocial research is a new approach to the analysis of the *'intricate and multidimensional relationships between the socio-technical organisation of the hydrosocial cycle, the associated power geometries that choreograph access to and exclusion from water, as well as the uneven political power relations that affect flows of water'* (Swyngedouw, 2009: 59). Therefore, this hydrosocial perspective merges the different dimensions and scales of the technical aspect with social relations in the irrigation process. Coward (1977, 1979, 1990) states that social relationships are interconnected and related to the creation and the maintenance of irrigation infrastructure. In the Atacama, this is reflected in the administration of the canals and irrigation shifts, and in the mutual respect shown in the use of the canals. Therefore, it is necessary to understand nature from a more political perspective and to understand the power asymmetries that exist in water distribution through irrigation canals.

Linton and Budd (2014) argue that approaches around the hydrosocial cycle deliberately focus on the social and political nature of water (Figure 2.4). They adopt a relational-dialectical approach to conceptualise the hydrosocial cycle as a socio-natural process by which water and society make and remake each other over space and time (Linton & Budds, 2014a).

Figure 2.4 | The hydrosocial cycle



Source: Author based on Linton & Budds (2014)

Cook and Swyngedouw (2012) suggest that the concept of the hydrosocial cycle should be used as a framework to help reveal how water flows are produced through different political, social and economic power relations. Additionally, the concept has been adopted to reveal the influence of capital accumulation and the inequalities of access to water induced by water management practices as well as water commodification and its social effects (Cook & Swyngedouw, 2012).

Bolding and Mollinga (2004) point out that there is also a need to focus on hydrosocial cycles as networks of social relations that connect local human actors and nonhuman actors to broader political, economic, cultural and ecological scales. These scales are produced through contestations within social practices, environmental processes and structural forces (Bridge & Perreault, 2009; Swyngedouw & Heynen, 2003). Bolding and Mollinga (2004) propose two main characteristics of hydrosocial networks: span and durability. Span is connected with the spatial, social, material and institutional connecting different water flows, while durability is associated with the strength of these connections and how they are maintained over time.

The hydrosocial cycle can also be used as a broader framework for researching critical political ecologies of water (Boelens, 2014; Boelens, Perreault, & Vos, 2018a; Linton & Budds, 2014a). Budds and Sultana (2013) argue that over time it is possible to reveal

the relationships of power produced through water and how they generate inequalities, exclusion and impoverishment. Therefore, this research aims to study how the hydrosocial cycle has been produced and transformed through the development of interventions around water in the last decade.

The literature presented so far can be used towards the construction of an analytical framework to help explore the hydrosocial cycle, stories of life in the community of Toconao, and how various interventions from the government or private actors around irrigation canals produce and change power relations. The consequences of these interventions include the modification of the watercourse, canal maintenance requirements and new irrigation systems. The close relationship between water, space and identity has merged issues around the control of water, irrigation systems and the Andean territories through which the water flows. Therefore, there is a need to analyse the hydrosocial cycle together with the cycle of Atacameño culture in order to understand different efforts that control local water resources.

2.4.2 Waterscapes

As described in the last section, the hydrosocial cycle should be defined as ‘a socio-natural process’ (Hommes, Boelens, Duarte-Abadía, Hidalgo-Bastidas, & Hoogesteger, 2018). Budd and Hinojosa-Valencia (2012) discussed the relationship between water and society, and how this is reflected in the concept of ‘waterscapes’ as a socio-spatial configuration of water flows. The term ‘waterscape’ is increasingly being taken up in research that links water and social power relations. A waterscape is defined by Budds and Hinojosa as: *‘the ways in which flows of water, power and capital converge to produce uneven socio-natural relations...in which social power is embedded in, and shaped by, both water’s material flows and its symbolic meanings’* (Budds & Hinojosa, 2012: 124). Therefore, the aim of this thesis is to explore different flows of water and capital, in order to decode inequalities in space and time. Such inequalities are shaped by power relations and defined as the main characteristics of waterscapes (Bakker, 2002; Bouleau, 2014; Budds, 2009; Bull, 2011; Ekers & Loftus, 2008; Linton & Budds, 2014a; Tom Perreault, Wraight, & Perreault, 2012; F. Sultana, 2010; Swyngedouw, 1999, 2004b).

Budd and Hinojosa-Valencia (2012) assert that the flows of water are not the only main characteristics of waterscapes. Also fundamental are the institutions of water, artefacts related to water and imaginaries that give shape and expression to power. Commenting on the power of water, Ekers and Loftus (2008) focus on the importance of everyday practices around water, rather than on large-scale infrastructure of waterscapes. On the one hand, such practices are, in de Certeau's words, '*networks of mobile, intersecting writings and manifold stories*' (de Certeau, 1984: 93), where inhabitants craft their own spatial fictions and, more often than not, invent ecological solutions to their dilemmas. On the other, Perreault (2014) found that the scale of a waterscape is analytically flexible and thus attentive to uneven relations of power. So, a waterscape perspective highlights the power relations that flow through, are reflected in and are reproduced by complex assemblages (Tom Perreault et al., 2012).

To put this theoretical approach in context, Boelens, Perreault and Vos (2015; 2018) reflect on Andean waterscapes and the '*water myths and oral traditions*' that mobilise local communities as well as preserving the status quo. Boelens (2015) argues that water traditions transmit or justify power over water or control over natural resources, but also provide hope for the future of Andean communities. Boelens concludes: '*Throughout Andean history, control over mythical water-power production and water-related constructs of origin and distinctiveness have been crucial for ruling classes to regulate and normalize society; and as counter-normative narratives they have been equally important to challenge this power and dominance*' (Boelens, 2015: 26).

Power and waterscapes are also connected through technology and external interventions (Linton, 2010). Several authors have discussed this in their treatment of questions concerning water and power (Boelens, 2015; Ekers & Loftus, 2008; Gelles, 2000; Linton, 2010; Perreault, 2013; Sultana, 2013; Swyngedouw, 2004a, 2004b, 2009). Further, they analyse how inhabitants construct a particular discourse of water management and how this is reflected in the production of areas of inequality, called 'uneven waterscapes' (Budds, 2009). Designing and managing a water society through technology discourses and techniques of governance becomes an important issue for indigenous communities (Boelens, 2015).

A 'water-user community' is characterised as a collective identity connected by particular water sources and socio-technical canal systems (Hoogesteger, 2013). It demands a shared normative system as the outcome of its decision-making processes and requires a physical and territorial water control space that needs to be limited by physical, natural and human boundaries (Boelens, 2015).

This research aims to look at practices around small irrigation canals in the Atacama Desert, arguing that the practices of the chosen indigenous community are not seen as important cultural activities for the state and private sector. However, these activities, which include water practices, give form to the social relations among the inhabitants of this uneven landscape. Micro practices in this specific waterscape are reflected in the socio-spatial configuration, linking social and geo-ecological processes (Budds & Hinojosa, 2012).

2.4.3 Hydrosocial territories

As mentioned in the previous sections of this chapter, the concepts of hydrosocial cycle and waterscapes play a fundamental role in the production of water through social relations and power (Hommes et al., 2018). However, previous studies have shown that these notions have focused largely on formal discourses, and that less consideration has been given to the multiplicity of hydrosocial territories that co-exist within the same space (Boelens et al., 2018b).

The term hydrosocial territories was introduced by Boelens et al. (2016) and defined as follows: *'The contested imaginary and socio-environmental materialisation of a spatially bound multi-scalar network in which humans, water flows, ecological relations, hydraulic infra-structure, financial means, legal-administrative arrangements and cultural institutions and practices are interactively defined, aligned and mobilised through epistemological belief systems, political hierarchies and naturalizing discourses'* (Boelens et al., 2016: 2). The authors argue that territorial struggles go beyond fighting for control over natural resources, also involving contestations over meaning, norms, knowledge, identity, authority and discourses.

Power and knowledge are involved in dialogues about hydrosocial territories and can be seen as constituting a politics of truth which legitimates certain water knowledges, practices and governance forms while discrediting others (Boelens et al., 2016). Claims to knowledge are connected with claims to nature and society, generating dominant hydrosocial territories. Consequently, the production of water knowledge focuses on the issue of how to align local users and livelihoods with imagined ‘multi-scalar water-power’ hierarchies (Boelens, 2015). According to Boelens, *‘powerful hydrosocial territories envision to position and align humans, nature and thought within a network that aims to transform the diverse socio-natural water worlds into a dominant governance system with ‘dominance’ often characterised by divisions along ethnic, gender, class or caste lines, frequently sustained by modernist water-scientific conventions’* (Boelens et al., 2016: 6).

Inhabitants are producing and re-producing hydrosocial territories, although not necessarily in ways they design or desire (Agnew, 1994). Spatially speaking, hydrosocial territories are created through intersections of everyday practices, flows of water and technologies that give form to social, natural and political spaces (Boelens et al., 2016). These territories are the result of intersections in which frontiers and links with environment and society are created by inhabitants through social practices and knowledge. Boelens, Perreault and Vos (2018) observe that the meaning and values of hydrosocial territories are contested in many aspects. This contestation establishes methods of exclusion and inclusion and, hence, of the distribution of benefits between inhabitants of the territory. These distributed benefits can create new modes of water governance as well as hydrosocial territories, generating costs and benefits for the direct actors. Boelens, Perreault and Vos (2018a: 108) note that *‘non-dominant hydrosocial territories often are physical, cultural, socio-legal and political spaces that enable water users to manoeuvre in local water worlds as well as in broader political webs that determine water control’*. Therefore, to understand hydrosocial territories, it is necessary to analyse the historical, cultural and political context.

Designing or creating new hydric elements, such as new irrigation canals, accumulation tanks or drip irrigation systems, requires an understanding of the logic of the dominant hydrosocial territories. Boelens (2016) suggests that in order to create

or transform hydric elements it is necessary to understand the cultural context, technologies and political relations, as well as rules of distribution and efficiency. Hence, it is important to understand how diverse forms of socio-natural knowledge of environmental problems depoliticise forms of social and economic inequality as well as issues of recognition and inclusion.

2.4.4 Hydrosocial territories and the context of Atacama Desert: a frame of analysis

The mining boom in the last decades in northern Chile has brought transformation in the hydrological territory of the Atacama Desert. The mining extraction per se does not just reflect this change. It is related to the implementation of new hydro-structures and the increase in water consumption for agricultural initiatives, promoted by the social programs of the mining companies through their corporate social responsibility programs. These changes have occurred in contexts of new power relations between different farmers who produce their orchards in Toconao and who, in some cases, have generated conflicts over the use and management of water.

Gerardo Damonte (2015) argues that the concept of hydrosocial territory is founded on three interrelated concepts: hydropower, hydrosocial cycle and territory. Power is based on local actors, and how they can generate ways of getting control over water (Bakker, 2003; Swyngedouw, 2004b). Likewise, control is expressed by technical and expert discourses through which the dominant political knowledge seeks to subordinate local knowledge and practices of water (Boelens, 2014; Thomas Perreault, 2005; Vos & Boelens, 2018; Worster, 1985). This power relationship is a complex process that emerged from the historical relationship between water and society (Lees, 1994). This connection between water and society is what Linton and Budd call hydrosocial cycle (Linton & Budds, 2014a). The specific space where the relationships between society and water are manifested is the hydrosocial territory.

Elden (2010) claims that territories are socio-physical constructions where social actors build, based on their visions, interests and territorial narratives, the limits of a given territory. For this reason, the physical conformation of a territory is mediated by the relations of power and conflict between different territorial visions. The

hydrosocial territory defines the articulation of three territorial spaces: the physical spaces of water (water infrastructure and water systems), social spaces (uses and practices of water) and political-administrative spaces (discourses of territorial development and regulation).

As mentioned in previous chapters, the case of this research focuses on the construction of a new irrigation system coming from the mining sector's social initiatives. Those initiatives are part of a specific political project that aims to build and take control of the territory of Toconao. The implementation of the new irrigation system as well as the introduction of new crops for the production of wine generates forms of power derived from water control (Swyngedouw, 1999). Therefore, this thesis seeks to analyse how the political, economic and social project of the mining company, endorsed by the government of Chile, manages to redefine the hydrosocial territories of the Atacama Desert.

2.5 Final Comments

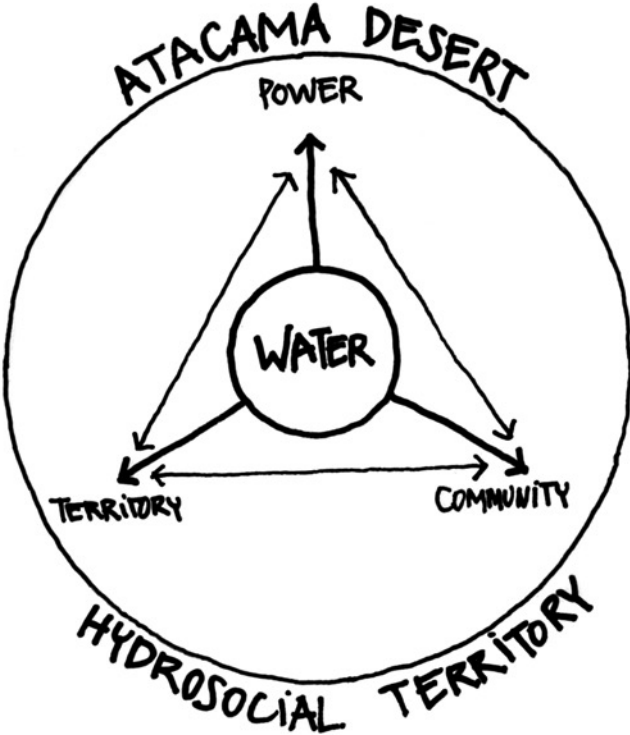
This chapter has reviewed the current literature that informs the analytical framework, centring on the field of political ecology towards better understanding hydrosocial relations in the territory of the Atacama Desert. The literature review has discussed the meaning, use and control of water, as shown in Figure 2.5.

The political ecology perspectives on water and changes in the hydrosocial cycles are based on observed unequal access to natural resources. Physical and social changes are manifested in conflicts over water and in decision-making regarding water management. Access to water reflects and reproduces power relations. Yet, there is a research gap as to how external initiatives impact hydrosocial territories, as little attention has been paid to the concepts of solidarity, access and autonomy in everyday and small-scale local water practices. The political ecology literature begins to address this gap. Yet, the contribution of spatial, temporal and practical lenses of hydrosocial territories has not been explored. In this research, access to water, solidarity and autonomy are assessed based on a definition of hydrosocial territories that considers power relations around water.

Thus, the following chapters explore the political ecology of water in order to respond to the following research questions: How do changes in water management since the implementation of the CSR programme manifest themselves in the use of the canals? How do everyday water practices reflect the decision-making power of different actors in community decision-making processes? How have changes in water practices affected community autonomy since the start of the CSR programme?

Chapter 3 presents the methodological approach adopted to address these questions, as well as outlining the particular methods used. Chapter 4 explores the identified research gap in the particular context of Toconao in the Atacama Desert. Chapters 5, 6, and 7 (the analytical chapters) each look at a different set of relationships in the triangle presented in Figure 2.5.

Figure 2.5 | Structure of the literature review



Source: Author

Chapter 3 Methodology

Introduction

This chapter presents the methodological approach to researching a single case study, which examines hydrosocial territories in the town of Toconao as well as changes in water management through the implementation of the ATF programme. It elaborates on the qualitative research design, which includes data gathering through ethnographic field work and data analysis of spatial, temporal and practical implications of water management. The chapter is organised into four parts, which follow the research progress in a chronological order to highlight the gradual development of the study. Therefore, the first section elaborates on my role and positionality as a researcher and the criteria for selecting the town of Toconao in northern Chile as a single case study. Second, the chapter describes the ethnographic approach to the field work, which emphasises the importance of mobility and mobile methods for understanding flows of water and people in Andean communities. The third section details data gathering methods, which include drawings, participatory observations, informal conversations, participatory mapping exercises and semi-structured interviews with farmers, community leaders and workers from the mining company SQM. Fourth, I reflect on the fieldwork experience before introducing the analytical framework, which allows for analysing hydrosocial territories and critically examining the relations between community, territory and power.

3.1 Positioning my role in the research

Since the beginning of the PhD research in September 2013, I was aware of the importance of positionality in shaping the assumptions, uncertainties and biases of this research. I am a Chilean architect with work experience in the Atacama Desert and this PhD research has been motivated by my knowledge of water injustices and their manifestations in small villages and towns in the North of Chile. This knowledge stemmed from my personal and professional life, where I was frequently confronted with the low interest of the regional government in indigenous issues and isolated localities. This can be partly attributed to the extreme centralisation of public policies that limits the decision-making power of regional governments as well as the failure

of the national government to recognise the demand and interests of localities in the Atacama Desert.

In order to understand changes and power relationships in water use and indigenous water management practices, I decided to conduct ethnographic fieldwork for a year in the locality of Toconao. Kellett (2011: 342) defines fieldwork as a *'symbiotic social process in which data, identities and texts are mutually constructed through the act of conducting research'*.

The implications of my positionality in fieldwork became most apparent during my time in Toconao between November 2014 and November 2015. Before arriving to town, I presented my research at a congress of political ecology in Santiago, the capital of Chile, where I met academics who gave me advice and contact details for San Pedro de Atacama. I started having informal conversations with people who previously worked in Toconao and received the contact details of one community leader through a relative of mine. This information was essential to start approaching Toconao. I arrived as an outsider to Toconao: a Chilean architect from London doing ethnographic research about water practices in the town. However, I grew up in the region, which made me less of an outsider than other researchers.

Literature on ethnographic research in indigenous communities emphasises that gaining access requires time to build trust and relationships. Researchers need to find ways of contributing to the community and to be open to learn from its members. At the beginning of the fieldwork, it became apparent that many inhabitants of Toconao had developed hostility towards research projects due to negative experiences. According to a community leader, many researchers demonstrated a lack of commitment and hardly communicated the results of their investigations with the inhabitants. To overcome this research fatigue, I decided to get involved with local issues around water, and I tried to contribute something useful to the inhabitants of Toconao while I was conducting my fieldwork

On the one hand, thinking about people's issues and conflicts reflects on who I am and how my own identity impacts my interactions with others. As a newcomer to Toconao, I continuously reflected on my actions and how they helped me to establish trust and

become socially accepted and authorised to move with tranquillity through the village and its irrigation canals. Flowerdew & Martin (2005: 113) refer to this as *'recognising my positionality and being reflexive'*. On the other hand, conducting fieldwork involves putting attention to people's histories, development, and local realities to avoid exploitative research and the perpetuation of relations of domination and control (Sultana, 2007).

Being a Chilean researcher alleviated the scepticism, with which I was confronted, as *'sharing the same background or a similar identity to your informant can have a positive effect, facilitating the development of a rapport between interviewer and interviewee and thus producing a rich, detailed conversation based on empathy and mutual respect and understanding'* (Flowerdew & Martin, 2005: 113). One of the farmers, for examples, mentioned in our first conversation: *'You are also Atacameño, you are from the coast, and our territory extends over there'*. This quote relates to the discourse of the Chilean anthropologist Lautaro Nuñez (2007) about the extension of the Atacameño culture. He explained that the coast, where I am from, was the place where Atacameños exchanged products with other communities. The words of the farmer signified an invitation to the town, and a welcome to the farmers' family. This early action was fundamental, as it consequently lead to me being introduced to the community leader and other members of the community of Toconao.

An important component of this research was the commitment to constantly maintain and reaffirm the relations that I generated in the space and time of the flows of water, people's stories, and the knowledge that was produced through the process of this fieldwork. The relations were strengthened through my engagement and support in cleaning and maintaining the irrigation canals. This process was reciprocal. On the one hand, I was able to listen to local issues while I was working in the canals. On the other hand, I appreciated the need of some farmers to be listened to, giving me the possibility of directing discussions in an atmosphere of respect. The relationship with people was always respectful, although the older generation addressed me as *'Don Cristian'*, which marked distance. My relationship with younger inhabitants of Toconao, especially the professionals who supported me in a participatory mapping exercise, focus groups and participatory photography workshop, was more horizontal.

Over the course of the fieldwork I felt increasingly close to the community of Toconao. We shared several values and concerns such as being isolated from the rest of the country, observing a decreasing importance of local traditions for many community members, a changing understanding of the concept of community, and a failure to be heard and recognised by authorities. Through this closeness to many community members, I was able to design and apply a range of methods, which were sensitive to the power relations during the fieldwork. Mutual respect, sensitivity in complex issues and the ability to share my own conflicts with the inhabitants generated a more balanced relationship with the community. To date, I keep in contact with some of the people I have collaborated with and we continue talking about future projects or strategies in the town.

However, despite strengthening my relations with many farmers and sharing daily activities, I continuously had to justify and explain my presence as a researcher in the town. Living in Toconao also meant that I did not limit myself to gathering data about the management of irrigation canals and therefore became aware of broader issues in the community. These included the relations between different farmers and the roles and struggles of local committees and associations. I particularly noticed that my enduring presence in Toconao triggered changes in the power relations within the local associations, particularly those related to farming activities in Toconao. For example, some association members became more critical about ongoing changes in water management in Toconao, especially after I presented preliminary results of my research. Others were trying to benefit from my background as an architect, asking me for technical support in the formulation of social projects. I was challenged in my position as a researcher, because I was invited to technical meetings about water management and asked for suggestions and opinions on improving particular issues.

Despite these challenging experiences, I also became aware that researching, working and living in an indigenous community comes with the caveat of romanticising some practices as well as the concept of community. My participation in activities such as indigenous organisations' events, rituals and agricultural work, were merged with my practical commitment to the community. This, in turn, made my physical and emotional presence grow throughout the fieldwork. The experience of an entire year

of fieldwork marked my professional career and my emotional commitment. This aligns with Coffey, who states that, '*our experiences of the fieldwork symbolize both socialization into an academic research discipline and a more personal status passage*' (Coffey, 1999: 105). To de-romanticise my perspective on water practices and the community of Toconao, I occasionally left the village and went to Antofagasta to evaluate my stance and critically reflect on my perceptions.

In sum, conducting fieldwork over 12 months marked me personally. During the fieldwork, everything seemed to be an object of observation, including my own emotions. As an architect taking an ethnographic research, I lived a different and unique experience. I was relatively close to my home city Antofagasta and my family but had little contact with them. Being in the desert exacerbates and deepens human relationships through a feeling of being isolated from other areas while also establishing close, everyday relations with neighbours and inhabitants of Toconao. The fieldwork therefore tested my own identity and the relationship with the inhabitants of the village, which Augé (2007: 22) describes as '*a trip outside of myself*'. This generated ethical questions, but also political concerns in my research, which related to being involved in daily discussions about water or raising new concerns and questions to the inhabitants through my data collection activities. I observed how my personal experience impacted on the data collection process and how this embodied experience helped to structure and define the knowledge gained (Kellett, 2011).

3.1.1 Toconao: justification of a single case

Initially, this research set out to examine three indigenous communities that are bordering the Atacama Salt Lake: Toconao, Peine and Socaire. However, upon arrival, I decided to focus specifically on the indigenous community of Toconao as single case study. This decision was determined by four connected reasons. First, it was possible to observe the spatial and social transformation of a specific community. This was reflected in the changes in local water infrastructure and distribution of water as well the power relationships related to the use of the resource. Toconao as a single case gave me enough information in order to understand those changes. Second, it was more feasible considering the remoteness of localities and the complexity of being able to get in contact with community leaders. Third, the shortage of time and resources to

make a comparative study. Finally, the need to be able to gain an in-depth understanding of a specific case. This includes the perceptions of farmers and other water users within the community in regard to corporate social responsibility programmes and their implementation, decision making, social relations and changes in the territory.

Although I focus on a single case, there were interactions, which required me to move beyond Toconao and investigate particular activities in Socaire and Peine. These two villages have different interactions and relations with mining companies compared to Toconao and I was interested in observing whether there are differential impacts in regard to traditions and rituals. I therefore participated in the cleaning of canals ritual as well as meetings in the three towns and observed differences in the process and participation.

3.1.2 The epistemology of everyday practices

During my first conversation with the Community Leader of Toconao, he immediately showed me PhD theses, which have been previously conducted in the town. He told me that these theses had never been touched by any member of the community, and that no one knew what they were about. He perceived previous research as an extraction of people's knowledge for the purpose of obtaining an academic degree. My conversation with him made clear a lack of reciprocity in the delivery of information. Further, I realised the lack of previous cooperation in understanding that researchers and inhabitants are fundamental to create knowledge, manage responsibilities and hierarchies, which has been argued to be essential for ethical research. *'It is critical to pay attention to positionality, reflexivity, the production of knowledge and the power relations that are inherent in research processes in order to undertake ethical research'* (Sultana, 2007: 382).

This experience drove my ambition to write a thesis, which contributes to empirical and practice-based knowledge based on genuine long-term engagement with the case study through an ethnographic approach. This approach allows for revealing everyday knowledge on water management as the outcome of people having to make sense of their encounters with the physical world and other people. It seeks to contribute to

social scientific knowledge by reinterpreting this everyday knowledge into technical language (Blaikie, 2010). An ethnographic study enabled me to pay close attention to the process of generating knowledge together with the inhabitants of Toconao, and producing relevant academic and non-academic outputs of the knowledge production like maps and a photo exhibition.

The epistemological stance of this thesis is constructivism, which situates the examined water practices in a specific space and time. Moreover, constructivism asserts that social phenomena and their meanings are continually being accomplished by social actors (Bryman, 2004). It recognises that social space is not just made up of text and symbolic interactions, but equally of bodies, buildings, roads, tools, food and numerous other material entities (Brinkmann, 2012).

Considering the context of the case study of Toconao, it is important to pay attention to the role of indigenous and traditional knowledge for this thesis. Previous research has established that indigenous knowledge is closely related to natural resource management, attributes of a specific territory, and information held by a particular group that is assumed to live in bounded geographical spaces (Andolina et al., 2009). Cajete (2000: 268) describes indigenous knowledge as *'that body of traditional environmental and cultural knowledge that is unique to a group of people and that has served to sustain those people through generations of living within a distinct bio-region'*.

Similarly, traditional knowledge is linked to the history and experience of a particular place (Middleton, 2015). Therefore, it is necessary to consider Andean epistemologies in the discussion. As mentioned in previous chapters, traditional Andean knowledge has allowed communities to inhabit the Atacama Desert, and to take advantage of its natural resources (Bustos & Blanco, 2004). Knowledge of the territory through the movement between different ecological systems has enabled people to practice their agricultural and livestock activities and to survive in the desert for centuries. It is therefore evident that having and practising traditional knowledge in the Atacameño culture is power, which is expressed in how people make decisions in certain places.

Power is being negotiated, and these negotiations open up spaces for potentially profound social and institutional change in the Andean sector (Bebbington, 2000).

3.1.3 Interpretative approach

Departing from the epistemological stance of constructivism, this thesis takes an interpretivist ontological position, which understands reality as relative and dependant on people's interpretations. Participants produce and reproduce meanings as a necessary part of their everyday activities (Blaikie, 2010). This research aims to understand and interpret these activities related to water management for understanding the specific context of the Andean interpretation and production of the territory.

The research contributes to a deeper understanding of lived experiences of water management by exposing taken-for-granted assumptions about the ways of knowing (Starks & Trinidad, 2007). I approached communities, mining workers and local authorities through questions about interpretations of experience or opinions about them, while putting focus on common features of the lived experiences (see Appendix 1). Adopting an inductive research strategy supported revealing people's perceptions and interpretations of experiences of decision making in relation to water practices under pressures of the mining sector. Analysing these experiences allowed for understanding the current production of the territory and the use of different irrigation systems in the Atacama Desert.

3.1.4 Reflections on positionality

Fieldwork can be conceptualised as reflexive travel (Spencer, 2010). The opportunity of being in the driest desert of the world and at the same time back at home produced a personal and emotional experience in the field, as well as in my writing process. Therefore, defining and negotiating my positionality in the fieldwork on the one hand, has been practical and analytical. On the other hand, it has been emotional and personal work, which is defined by connections, relations and interactions with peoples' lives (Coffey, 1999).

From the start of the fieldwork, I was keen to establish reciprocal and ethical relationships with the people I lived and worked with. Once bonds of trust were created, the inhabitants of Toconao made me feel very comfortable. There was mutual support, because I helped them in their agricultural activities and they provided me with information during informal conversations. I felt a particularly strong connection with elderly people, who frequently invited me to share meals.

However, not everything was positive in the field and I found it difficult to maintain my positionality as a researcher, particularly when my presence exacerbated conflicts and differences in Toconao. Following conflicts, interviews were cancelled, and some people rejected to have a conversation with me, because they perceived my research as advocating against them. For example, my close relationship with traditional farmers led a representative of one of the local associations, who participated in the ATF programme, to reject being interviewed. Not only did he refuse to give me interviews; he further prohibited other members of the board to talk to me. In addition, the *'celadores'* were notified not to give me information about the risk of flooding, maintenance times, and irrigation shifts. Moreover, the Mayor of the Municipality of San Pedro de Atacama refused to talk to me due to my close relationship with the community leaders.

3.2 Ethnographic approach

Fieldwork is itself a *'social setting'* inhabited by embodied, emotional, physical selves. Fieldwork helps to shape, challenge, reproduce, maintain, reconstruct and represent ourselves and the selves of others (Coffey, 1999: 8).

Ethnography was my route to become a part of community activities as well as people's lives. Bebbington (2000: 503) argues that ethnography *'emphasises place, context, case specificity, and authorial insights'*. The ethnographic approach of this research looked at water practices, and particularly social power relationships around the irrigation system in the community of Toconao. It allowed me to examine different uses, traditions, ritual and everyday routines associated with irrigation to show how closely cultural and rituals practices are intertwined with the economic and agricultural

activities in the village. Therefore, through ethnography, I focused on different dimensions of local social and cultural practice.

Ethnography has been a traditional qualitative research approach to document the world from the point of view of the people, who are studied (Katz, 2001, 2002; Lucas, 2016). It relates to the direct observation and documentation of a group or community, their practices and habits, and, primarily, aspects of their culture (Martin & Pavlovskaya, 2009). Ethnography has become important to environmental geographers, particularly political ecologists, who increasingly employ it in fieldwork projects in the Global North and South (Pink, 2013). The power of ethnography emerges from its ability to construct an explanation based on an intimate and profound understanding of the phenomena, social group or place in question (Martin & Pavlovskaya, 2009). This approach therefore helped me as a researcher to submerge myself in Toconao to study what its inhabitants say and do, and to uncover the primary reasons for their actions related to water practices.

I had close interactions with 25 of the 49 active farmers in Toconao for 12 months between November 2014 and November 2015. I was exploring different qualitative methods of data collection such as drawings, pictures, and mapping, which are representations of knowledge, cultural production and individual experience (Pink, 2013). This methodological strategy was supported by an analysis of day-to-day practices about the use of space through graphic representation, interviews, and observations of people's life histories. The analysis was further strengthened by gathering secondary data in the form of local documents about water use, regulations, and social dynamics.

Mobility was a fundamental aspect of the ethnographic approach of this thesis. This is reflected in the diversity of methods used taking into consideration the Andean context. Nuñez & Dillehay (1995) provide an in-depth analysis of the significance of mobility in the Andean culture. They defined the pattern of mobility of Andean communities as a 'rotating mobility' based on five elements: transhumance, verticality, ecological complementarity, exchange and semi-sedentary mobility. Those

elements are associated with the practice of moving livestock from one place to another in a seasonal cycle, in consideration of the agricultural and water cycle.

Mobility also relates to the perception of time. Hidalgo and Grebe (1988) talk about 'Andean temporality' that follows the circular movement of the sun, the east orientation, the connotation of day and night, and the night movement of the stars. Moreover, ethnographic studies indicate that the nomads had a sense of place, territory and time, as well as return (Augé, 2007). Mobility is moreover a practised activity related to time (Cresswell & Merriman, 2013). Through investigations of movement and immobility, Büscher (2011) states that social scientists are showing how various kinds of movements make social and material realities.

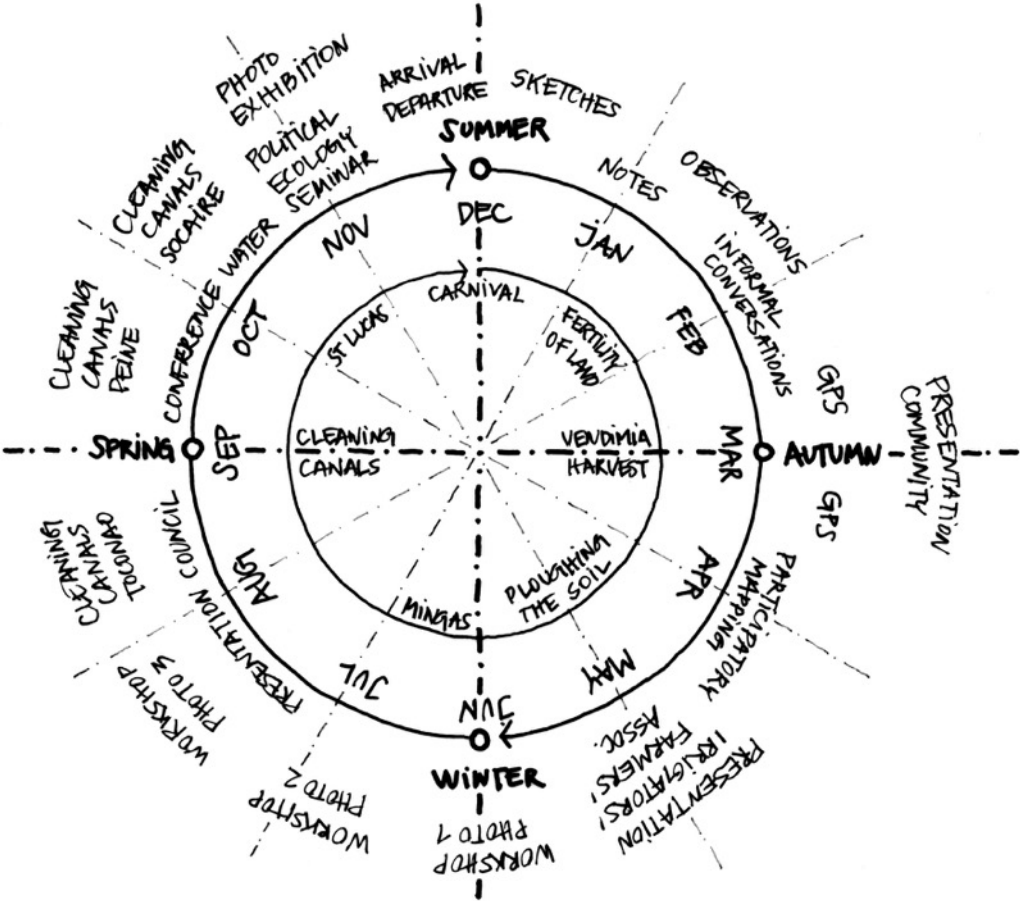
3.2.1 Mobile ethnography

I am still waiting at the mechanic workshop for the Kombi that will transport me into the desert. It seems that I will take more time than I was expecting. The mechanic has not found the missing part, so one more week to wait. I am getting nervous and I have not started yet. At the moment, I do not know what is more precious, time or money that I have been spending to repair the van. I feel that the desert is waiting for me, but it has been there for centuries, people there know about it. Just one more week. I only need to add some oil and check the wheels. All my stuff has been ready for weeks. The interior of the van is prepared: Paper, chairs, a table, small kitchen, and my tools if I need to fix something along the route. I am checking one more time. I am excited and anxious to start this trip, I cannot wait more! Finally, the trip starts (Author's field notes, November 2014).

Considering the concept of mobility means analysing a specific context at different scales to try and understand the history, which is related to the territory. Mobility in this thesis refers not only to my movements within the case study territory, but also to my ability to move through different methods (Figure 3.1). Thus, it implies capturing, understanding, mapping and tracking different types of movements and experiences. Through walking, observing and mapping my experiences and peoples' movements, I entered a deeper level of communication with their worldview. This implies an understanding of the social characteristics of the geophysical environment of the Atacama Desert in order to get closer to the Atacameño way of life, to its knowledge of and relation with the environment and its relations with it. Hence, to understand

everyday activities through mobile ethnography means to produce a reflexive interaction between observations, sensations in movement and cognition (Urry, 2007).

Figure 3.1 | Research mobile cycle



Source: Author

Büscher & Urry (2009) used mobile ethnography as an opportunity to engage with a multitude of mobile, material and embodied practices of making distinctions, relations and places. Recognising the importance of mobility in day-to-day practices brings about the necessity to follow these movements rather than gathering and analysing data with a sedentary attitude (Gottschalk & Salvaggio, 2015). In this thesis, mobile ethnography supports making sense of everyday life in a society that is structured by water flows. In addition, the approach not only refers to the physical movement of the researcher and the object of investigation. It also addresses the need to observe a variety of phenomena such as agricultural cycles, water cycles, and movements of people that require to be observed simultaneously from a practical and theoretical point of view of mobility (Novoa, 2015).

In his book *'Mobilities'*, Urry (2007: 40) explains *'mobile ethnography in a practical way through walking or traveling with others as a social commitment to understand the worldviews of other people'*. It can also involve 'participation-while-interviewing', in which the ethnographer first participates in patterns of movement, and then interviews people, individually or in focus groups, as to how their diverse mobilities constitute their patterning of everyday life. The implications for this thesis were that I was not only aware of activities around irrigation canals. Additionally, I was experiencing water management, feeling the sun, listening and being part of the conversations, supporting the daily work, enjoying and sometimes suffering during arduous tasks of cleaning the canals. This means following people around and engaging with their worldviews through mobility (Novoa, 2015).

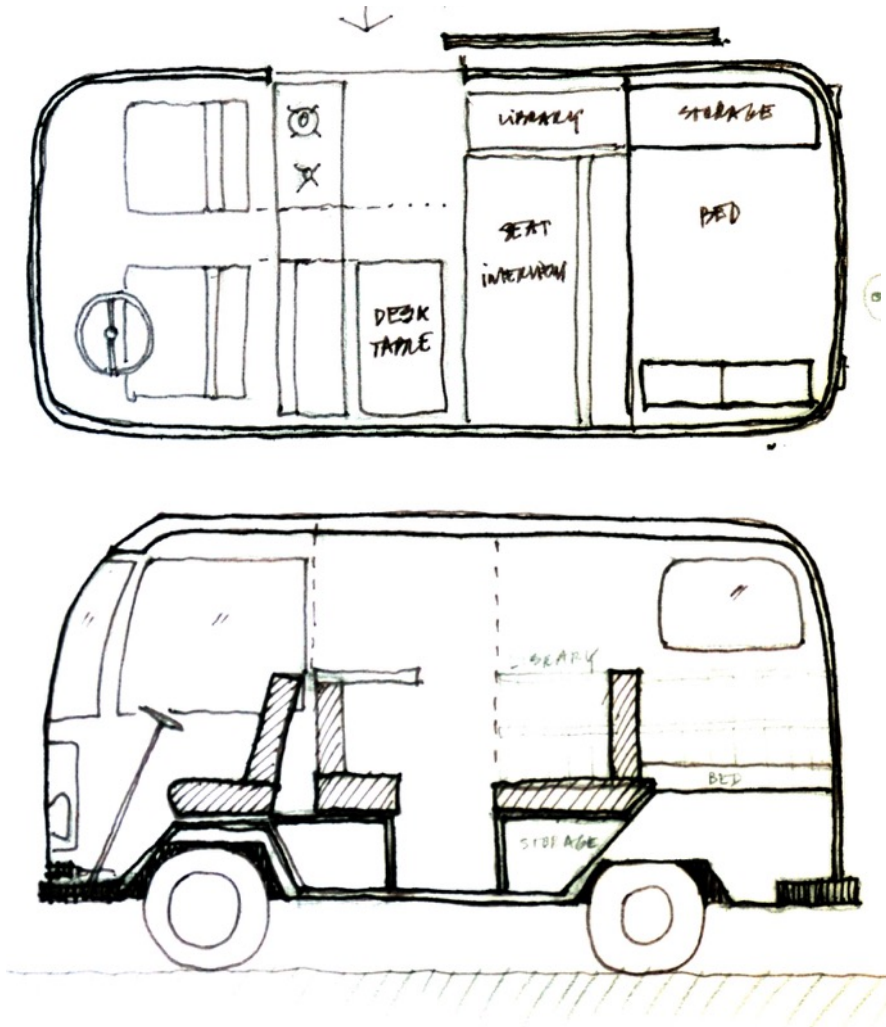
Augé (2007) proposed an understanding of the relationship between mobility and time in ethnographic studies based on two dimensions: on the one hand, as a researcher it is necessary to learn to move in time and to understand the history of the town and its movements. On the other hand, it is necessary to be able to escape the barriers of the time in which one lives and to create more freedom.

3.2.2 Mobile methods

The first commandment for every good explorer is that an expedition has two points: the point of departure and the point of arrival. If your intention is to make the second theoretical point coincide with the actual point of arrival, don't think about the means – because the journey is a virtual space that finishes when it finishes, and there are as many means as there are different ways of 'finishing'. That is to say, the means are endless (Guevara, 2004).

The research was designed using mobile methods, which entailed using a camper van as a tool to explore and gather data from the vast territory in the Atacama Desert (Figure 3.2). Thereby, I aimed to reflect on the flows of water and peoples' relationships with the resource. The car itself was used as a research- and workspace to host conversations, as means of transport as well as for mapping peoples' understanding of their realities. It provided enhanced flexibility to move in a region with a lack of routes and possibilities for accommodation.

Figure 3.2 | The camper van as a mobile tool



Source: Author

As mentioned in the previous section, ethnographic fieldwork was conducted for a year to be able to observe agricultural, seasonal and cultural cycles – including religious rituals and Pagan ceremonies – that relate to water practices in Toconao. Following these cycles did not only require me to move across different agricultural sectors within Toconao and nearby communities, but also to shift between various methods to obtain more information about a given context. Büscher & Urry (2009: 99) argued that *'the mobilities turn folds analysis into the empirical in ways that open up new ways of understanding the relationship between theory, observation, and engagement'*. Therefore, through the study of people's movements and their relations to water, I was able to understand how various movements around the irrigation canals reflected social realities. Taking my movements as a basis, and through the observation of the actions and relationships of people in their orchards and irrigation canals, it was possible to understand rituals, patterns and dynamics in their practices.

Figure 3.3 | Focus group inside the camper van



Source: Author

Nevertheless, there was an unexpected change to the idea of using the camper van as a mobile tool. Beyond giving me mobility in the desert, it became the focus of attention for many inhabitants of Toconao. The camper van was transformed into a useful element to transfer people from one community to another, which moreover gave me the opportunity to get connected to other places. It enabled me to conduct two focus groups with ten participants following photographic exercises (see Section 3.3.3), because the van provided the necessary shade and seats for the elderly participants (Figure 3.3). Hence, additional to its role as a mobile tool, the van became a small space where participants shared their stories of everyday practices connected with the flows of water.

3.3 Data gathering

Given the sensitive and multifaceted nature of the research area, a number of techniques were used to gather, synthesize and verify data. I applied a ‘mixed-methods

research', because bringing a variety of methods together allowed me to read the village and the relations between water, territory, water management practices and traditions (Kara, 2015). The fieldwork methods are aligned with the need for understanding the hydrological cycles and relationships with social practices around water. They included observations, drawings, informal conversations, supporting people in their daily water management routines, photographic workshops, semi-structured interviews, and geo-referencing people's day-to-day work on the land.

The methods additionally allowed me to relate to different aspects of time. Everyday methodologies such as observing, drawing and living in the town allowed me to focus on the lived experience in the present moment rather than the future or past (Cresswell & Merriman, 2013). Conducting interviews, drawings, observations and informal conversations throughout the year was also an instrument for understanding my changing role within the community and the processes of relationship building with the inhabitants of Toconao. Further, inviting residents of Toconao to become an active part of this research got us engaged in discussions about the different understandings of the future social, economic and cultural development of their town. The engagement with local committees and associations gave me the opportunity to participate in community meetings, where we talked about issues concerning water and water management.

3.3.1 Everyday drawing as observational ethnographic practice

Drawing is the first visible form in my works...the first visible thing of the form of the thought, the changing point from the invisible powers to the visible thing...It's really a special kind of thought, brought down onto a surface, be it flat or be it rounded, be it a solid support like a blackboard or be it a flexible thing like paper or leather or parchment or whatever kind of surface...It is not only a description of the thought...You have also incorporated the senses...the sense of balance, the sense of vision, the sense of audition, the sense of touch. And everything now comes together: the thought becomes modified by other creative strata within the anthropological entity of the human being (Beuys, 1993 in Ramm, 2005: 66).

Being an architect, drawing and sketching became normalised practices in my professional development as elements of representation and interpretation. In research,

drawing emerged as a method of investigation, a form of dissemination, and as research object (Lucas, 2016). Kovats (2014: 165) argues that *'Drawing is an evidence of thinking, evidence of going from place to another. One draws to define one thing from another.'*

In this thesis, drawing is considered a basic tool for understanding relationships in a given space from an analytical perspective. In a vast territory, drawing also reduces the scale and allows for seeing the context and relationships on a piece of paper. Therefore, the practice of drawing gave me the basic references of the space, on which the analysis is focused on. It gave me a spatial framework for working in dimensions. Drawing was also part of my personal connection with the context and environment and it became my first filter to understand spatial relationships, uses, their qualities and materiality.

Drawing can be understood as a method of interpretative research based on the understanding of the relationship between the craftsman, the drawing and the drawn subject (Gravestock, 2010). Causey (2017) argues that drawing is an ethnographic method based on personal exploration. The subjectivity gives the drawing an interpretative apparatus to perceive new ideas, thoughts and actions in a determined context. Taussing (2011) states that drawing is more than the result of seeing. Rather, it is a collection of fragments of the world and a subjective form of documenting the visual context. Similarly, Le Corbusier (1968) argues that to draw is not just to look with the eyes, it is to observe, to discover. It is necessary to draw to internalise what has been seen and what will remain inscribed in our memory (Hidalgo, 2015). Studying the space of irrigation canals meant trying to understand space from the articulation of its physical and material parts, which the drawing allowed me to apprehend through personal perception and interpretation. Drawing is a language, a science, a medium of expression, a medium of transmitting ideas (Berger, Petit & Le Corbusier, 1968: 5). Kabir (2012) states that drawings are fundamental for research for four reasons: Seeing, understanding, visualizing and making relationships. For this research, drawings helped me to see what is, to understand what happened, to visualise to understand differences, making relationships to different actions, spaces or practices.

Drawing on location gave me the opportunity of relating myself to my surroundings as well as to observe and learn about the behaviour of those around me. Hence, drawing helped me interpret everyday life and water management in Toconao and to communicate my observations and interpretations of it. Drawing became a way of capturing a sense of place, sharpening my observational skills and improving my visual vocabulary.

Drawing as a process supported this ethnographic research beyond being a data gathering method. Rather, drawing and spending time in a particular place within Toconao gave me the possibility of sensory experiences involved in the process of drawing. These included smells, sounds, and the sun of the desert and the wind of the ravines, which gave me a deeper understanding of the local context.

3.3.2 Participatory workshops and mapping

By conducting observations and conversations on a day-to-day basis, I understood that the most frequent users of irrigation canals and crop orchards were elderly people. Having that information, I conducted a series of workshops with the elderly club of Toconao to better understand their interpretations of the relationships between farmers, water management practices, and changes over time.

Part of the workshop was a mapping exercise, where I followed an understanding of mapping as a multisensory research method regarding its ability to evoke relationships between place, lived experience, and community (Powell, 2010). Participatory mapping helped me to understand the spatial manifestations of cultural, political and economic relations in Toconao. 27 members of the club of elderly people called '*San Lucas*' (Figure 3.4) participated in the workshop, which was conducted at the '*Sede de la Comunidad de Toconao*' (the community centre). The activity was conducted in May 2015 after months of establishing trust with the farmers.

The purpose was to give recognition and visibility to the participant's experiences, histories and spaces related to water practices. Further, the workshop aimed to discuss the weaknesses, strengths and potential spaces of the town for improving water management. Additionally, it provided insights into power relations and conflicts

around the water resource through mapping them spatially. The activity was supported by a group of young people and local workers, who helped to facilitate the participatory mapping exercise as well as the following workshop discussion.

Figure 3.4 | Participatory workshop



Source: Author

One of the emerging topics discussed in the workshop was the extension of the territory of Toconao, which was revealed through mapping. Mapping was used as a mechanism to communicate and explain '*multiple and time-based narratives of territories*' (Allen, Lambert, Apsan Frediani, & Ome, 2015: 269). The map therefore became a fundamental visualisation that included history, folklore, natural history and hearsay into spatial reading.

The work with the group of elderly people helped to build up a longitudinal narrative about their spatial experiences of the territory. Furthermore, it provided the possibility for conversations on a drawn map of the locality, where each participant had to locate and point out, where s/he lived. Through this exercise, many participants began to see family relationships or to remember stories about particular spaces. They discussed possibilities to make the relation and importance of water in the territory visible through mapping uses and practices associated with water resources. Additionally,

participants debated problems associated with water management and distribution as well as possible practical solutions that could be implemented as a collaborative action.

3.3.3 Pictures of an exhibition: collecting stories and memories

After the first workshop, I continued working with the group of elderly do deepen the understanding of their interpretation of the hydrosocial territory. I conducted photography workshops to create a collective account about the territory which addresses problems of water management, the need to be listened to, resistance to mining and strategies for transformation or improvements. The photo workshops were conducted in a 30-day period between August and September 2015 with eight members of the club of the elderly ‘San Lucas’ (Figure 3.5). The rationale for using photography as a tool was to gather the participant’s diverse visual interpretations of the territory, now and in the past, and to discuss them together in a group (Figure 3.6). Photography provided an entry point to discuss the problems, needs, resistance and strategies that are used to improve and transform water management.

Figure 3.5 | Local photographers of the club of the elderly ‘San Lucas’



Source: Author

The workshop was organised in four stages: (1) an introductory session teaching basic elements of analogue photography like framing, focus, aperture, and composition. Participants obtained a theoretical background, which was taught by a professional photographer; (2) This was followed by a field trip, where participants practised the theoretical foundations (Figure 3.7). They were accompanied at all times by a professional photographer and two assistants. Participants were instructed to take photos of the territory, the use of water, and its irrigation canals. (3) In the third phase, photographs were printed and subsequently discussed in the group. Each participant argued why the photos were taken and what they wanted to express with them. Then, the participants selected photos for the public exhibition at the end of the fieldwork. (4) The final phase was the exhibition, which was located in the main square of the town.

Figure 3.6 | Photography discussion workshop



Source: Author

The aim of the photography workshop and exhibition was to gain a better understanding of the interaction between the inhabitants of Toconao and their environment, which is fundamental to many problems of Atacama communities at the moment; they are affected by tourism, territorial disputes, pollution, mining, migration and forms of environmental degradation. Highlighting particular characteristics of

social life, this method captured the visual perceptions of the services of maintaining the canals, local authorities and changes in water management. Moreover, the method allowed observations of the recognition of different power relations and how they are structured and supported in water management.

Figure 3.7 | Workshop participants photographing the irrigation canals



Source: Author

Photographs helped refine the participants' abilities to reflect on and explain their experiences and perspectives (Wilson & Milne, 2015). When participants discussed the meaning of the photographs, they actually tried to find out something together. Some of the questions that they discussed through pictures were: Why is this place so important to you? What was that place like before? What bothers you about this place? What could improve from that place? Has the place undergone many changes? Do you visit the place frequently? Have you done anything to improve it? What does water mean to you in your daily routine? What is the photos' relation to water and territory? What would you recommend the young generations of Toconao regarding the use of water? through pictures, participants generated narratives and reflected upon their own lives in Toconao.

The use of photography and the conversation in the focus groups and the exhibition stimulated intense debates. The selection of pictures for the exhibition allowed participants to engage in the discussion through a collective process of analysing their meanings. During a focus group discussion, every participant explained choices, perspectives and motivations behind the selection of photos. During the exhibition, local photographers talked about their photos with the visitors including other residents, family members, representatives of local authorities and community leaders. Photos became a bridge for talking about inhabitants' perceptions of the town with the local authorities, highlighting the need to make improvements in the irrigation canals, and showing the necessity of collaborating to facilitate changes.

Figure 3.8 | Photographic exhibition



Source: Author

The pictures that participants took speak about the town, the environment, the territory and its history, its social and spatial forms and its characteristics. Therefore, the photographic exercises were understood as part of the ethnographic approach that helped understanding and identifying the meanings of social processes (Manzo, 2013). The curation of the exhibition provided an opportunity to show a diversity of narratives

around aspirations and memories of the canals and water management (Figure 3.8). The workshop and exhibition supported the development of empirical knowledge that explores areas of social experience and, in particular, the spatial, temporal, bodily and emotional relations of elderly inhabitants to Toconao. All participants took pictures and explained the reason for their photographs to the visitors of the exhibition. Not only did they produce and collect information and provided their perspective. Moreover, photography had the potential to empower participants involved in this local activity through making topics, which were important to them visible. These topics included sustainable community development and water management.

3.3.4 Interviews

This research paid particular attention to anecdotes and I conducted semi-structured interviews to substantiate and complement them.

Anecdotes from our everyday lives can be enlightening when we teach or explain what we mean to others, and when those anecdotes come from everyday conversations and observations when properly conceived, can be much more than merely anecdotal (Brinkmann, 2012: 83).

The Spanish Royal Academy defines '*anécdota*' as a '*brief account of a curious fact that is done as illustration, example or entertainment*' and as '*circumstantial or irrelevant event*'. On the other hand, the English Oxford Dictionary describes 'anecdote' as '*a short amusing or interesting story about a real incident or person*'. It is a simple and short story that highlights a main point, issue, or argument in the conversation, with a special humourist or funny tone. Michael (2014) argues that the narrative of an anecdote and its format demand to be told and to be circulated. This argument is interesting for my fieldwork, because I frequently listened to the same anecdotes with different narratives but the same funny tone.

Fleming (2011) describes anecdotes as a brief narration, often anonymous, of a historical event of little effect but of great importance, which concludes with a thematic point. The anecdote as the narration of a singular event is the literary form or genre that uniquely refers to the real. For Fineman, an anecdote is '*a historeme, i.e., the smallest unit of historiographic fact*', which therefore raises the question of the

'historiographic integration of event and context' (1989: 56). The anecdote creates a space for something new to emerge, and therefore, an anecdote opens up a new history. The central question that Michael (2014) asks, is how anecdotes can be related to doing social scientific research. This becomes especially critical, when the anecdote is about a narration of singular events, often based on hearsay and beyond verification (Fleming, 2011). Where is the evidence in the anecdote?

In Toconao, the accumulation of different anecdotes about irrigation constructs a specific narrative of this town as well as spatial and social narratives of the canals. I collected anecdotes through informal conversations during the agricultural work in the orchards. The fluidity of contrasting anecdotes provides the texture of stories and practices. Hence, those anecdotes became an important and rich source of knowledge that reflected social and personal aspects of everyday life.

Additionally to the collection of anecdotes, I conducted semi-structured interviews to elicit inhabitant's stories of their understandings of water and the daily activities in the irrigation canals. Data were collected through 'participation-while-interviewing'. This allowed emphasising the importance of the researcher being part of the movements and activities of communities, while interviewing people individually or in groups to understand how their diverse movements and activities shape patterns of everyday life (Büscher & Urry, 2009).

Figure 3.9 shows that 35 interviews were conducted. Interviewees were selected based on their connection with water practices and agriculture. Figure 3.9 reveals that interviews were conducted with three groups of water users: farmers, community leaders, and SQM mining workers. Interviewees belonged to a variety of Irrigators' and Farmers' Associations such as those from Toconao, Aguas Blancas, Celeste, Vilaco and represented different institutions such as SQM, ALMA, and CONADI. Complementary interviews were done with representatives from other communities, especially community leaders from Peine, Solcor, Quito and Socaire. Just over half of the sample (60%) was male, of whom 48% were farmers. 92% of female interviewees were farmers, and only one was a mining worker. All farmers interviewed

described themselves as indigenous or part of the Lickanantay or Atacameño ethnic group.

Figure 3.9 | List and profile of Interviewees

RESPONDENTS	OCCUPATION / ROLE	AGE	GENDER	ETHNICITY	AFFILIATION
1. RODRIGO	FARMER	68	MALE	LICKANANTAY	TOCONAO
2. FRANCISCO	FARMER/AGRONOMIST	35	MALE	LICKANANTAY	TOCONAO/AGUAS BLANCAS/SQM
3. DANIEL	FARMER	62	MALE	LICKANANTAY	TOCONAO
4. CLARA	FARMER/ENGINEER	39	FEMALE	LICKANANTAY	TOCONAO
5. JULIA	FARMER	68	FEMALE	LICKANANTAY	TOCONAO
6. SEBASTIÁN	FARMER/CIVIL ENO.	35	MALE	LICKANANTAY	TOCONAO
7. IONACIA	FARMER	79	FEMALE	LICKANANTAY	TOCONAO
8. TOMÁS	PRESIDENT OF COUNCIL A.V.	45	MALE	LICKANANTAY	SOCALRE/COUNCIL
9. LUCAS	SQM MINING WORKER	63	MALE	-	SQM-ANTOFAGASTA
10. TERESA	FARMER/MINING WORKER	48	FEMALE	LICKANANTAY	TOCONAO/SQM
11. CAMILA	FARMER/SHEPHERD	72	FEMALE	LICKANANTAY	VILALCO
12. ALEJANDRO	COMMUNITY LEADER	40	MALE	LICKANANTAY	TOCONAO
13. JUAN	COMMUNITY LEADER	34	MALE	LICKANANTAY	SOLCOR
14. NICOLA	FARMER	34	FEMALE	LICKANANTAY	TOCONAO/SQM
15. ANTONIO	FARMER/CRAFTSMAN	72	MALE	LICKANANTAY	TOCONAO
16. DAVID	FARMER/COMMUNITY LEADER	46	MALE	LICKANANTAY	TOCONAO/AGUAS BLANCAS/SQM
17. SAPHIRE	FARMER	98	FEMALE	LICKANANTAY	TOCONAO
18. CARLOS	INDIGENOUS ADVISER	55	MALE	LICKANANTAY	QUITO - GOVERNMENT.
19. ESTEBAN	FARMER/ENGINEER/MINER	35	MALE	LICKANANTAY	TOCONAO-CALAMA.
20. MARTIN	FARMER/TOUR GUIDE	45	MALE	LICKANANTAY	TOCONAO/CONADI
21. SANDINO	FARMER/ENGINEER	36	MALE	LICKANANTAY	TOCONAO/ALMA
22. KENA	SQM MINING WORKER	43	MALE	-	SQM-TOCONAO
23. KARINA	FARMER	68	FEMALE	LICKANANTAY	TOCONAO/CELESTE/SQM
24. CRISTIAN	FARMER	28	MALE	LICKANANTAY	TOCONAO/JERE
25. PEDRO	FARMER	33	MALE	LICKANANTAY	TOCONAO
26. ROVANDO	FARMER/ADM.	47	MALE	LICKANANTAY	TOCONAO/SQM
27. PAULA	SQM MINING WORKER	36	FEMALE	-	SQM-TOCONAO
28. MARTINA	FARMER/NURSE	67	FEMALE	LICKANANTAY	TOCONAO/SQM
29. FERNANDA	FARMER	52	FEMALE	LICKANANTAY	TOCONAO
30. MARIA	FARMER	63	FEMALE	LICKANANTAY	TOCONAO
31. EDUARDO	COMMUNITY LEADER	40	MALE	LICKANANTAY	SOCALRE
32. MAURICIO	FARMER	58	MALE	LICKANANTAY	TOCONAO/SQM
33. DIEGO	FARMER	61	MALE	LICKANANTAY	TOCONAO
34. MIKANDA	COMMUNITY LEADER	59	FEMALE	LICKANANTAY	PEINE
35. CELILIA	FARMER	70	FEMALE	LICKANANTAY	TOCONAO/SQM

Source: Author

I interviewed 25 farmers, which comprised three groups: participants of the ATF programme (5), farmers who did not participate in the programme (15), and farmers without water rights (5). A shortfall of this research was the low representation of ATF participants, as many refused to be interviewed by researchers. All participating interviewees gave written consent to be interviewed after I explained the specific interview process and research aims to them (see Appendix 2). As mentioned before, interviews and informal conversations took place at various stages of the agricultural cycle to gain a better understanding of water practices in different seasons and to be able to follow annual rituals and traditions.

A challenge arose from the difference between my understanding of time and the temporal conception of the inhabitants of the town. This manifested in spending much time waiting and coordinating interview schedules as well as several misunderstandings. It was complicated to coordinate meetings with farmers due to

their work. Therefore, I decided to do the interviews while they were working in their orchards. This approach also gave me the opportunity to become part of their work routine and I helped them in their everyday activities. Considering that Toconao is a small town, some interviewees hesitated to openly discuss power conflicts and political differences within the community. At the end of the fieldwork, interviewees expressed their views more openly and directly. This thesis, nevertheless, refrained from using the names of interviewees.

In order to understand the movements of people and land and water use, all interviews were georeferenced. This goes beyond the method of 'shadowing' or following people in their everyday occupations (Jirón, 2010). It was important for me to experience farming and water management routines and time that people spend on their daily activities. Interviews along everyday activities gave me the opportunity to access some reflexive aspects of lived experience in situ, such as the emotional and personal relationship that some farmers had with their land and agricultural products. I asked questions related to fluidity, places, uses, relationships, emotions, patterns of movement, boundaries, imagining, remembering, places on the move, and modes of knowing, as well as access to farming sectors, required acts of negotiation, and acts that in the past were not necessary (see Appendix 1).

All interviews were audio recorded and analysed in London after the fieldwork. The interviews were transcribed and drawn to prepare them for thematic analysis. Interviews were examined through content analysis, which followed a process of inductive coding using the textual analysis software MAXQDA12. Three central concepts emerged from an initial analysis of interviews, which have consequently been explored in more detail: solidarity, access and autonomy. These are intertwined to understand the central idea of changes in water practices and have therefore been incorporated into the analytical framework, which is described in the following section.

In sum, the data collection strategy included a mix of drawing observations, interviews and conversations as well as participatory workshops. The observations focused on how inhabitants live in the desert under contextually specific environmental, social

and economic conditions. The length of the fieldwork allowed to generate detailed observations over time that provided specific insights about how communities embody meaning to the management of water and the creation of a hydrosocial territory.

3.4 Data analysis and reflection

The (re)construction of fieldwork is an intertextual event. Remembering the field merges field notes, memories, written accounts, memorabilia and personal biography (Coffey, 1999: 111).

Reflecting on the data collection and its further processing has been an important part of my research during and after the fieldwork. The central question for me has been: How do I tell the stories collected in the territory?

3.4.1 Drawing as mode of analysis

Drawing is the element of connection. Drawing water casts a net into the water, into the '*sea of stories*', and catches a selection of thoughts, images and glinting things that attempt to describe our interconnected condition, one thing reflecting another, through the depths of time and space (Kovats, 2014: 12).

In the last decades, researchers coming from architecture and anthropology have had shared interests in spatial forms and ways of human dwelling, as well as methods and tools for collecting information (Stender, 2017). They have utilised the concept of time to measure and understand changes in the ethnographic analysis (Novoa, 2015). Time in the ethnographic analysis looks for changes in the everyday practices, spatial layouts and the study of local culture. Time is one of the essential elements of mobile ethnography (Muskat, Muskat, & Zehrer, 2018).

Therefore, this research aimed to be more agile, intuitive, and in-depth compared to traditional field research. Mobile ethnography supports a better understanding of the chronological stories of farmers and people on Toconao, the movement of water and practices of farmers in their orchards. Personal diaries, daily observations, drawings and conversations with farmers, as well as the use of technology like location tracking, enrich the analysis of use and flows of water and its practices. The continuous and everyday analysis of specific locations helps to be more precise with the information

gathered in the context. Hence, the use of mobile ethnography allows for capturing and exploring the mobilities of people and interpreting boundaryless dynamic settings (Monika Büscher et al., 2011; Muskat et al., 2018; Urry, 2007).

Mobile ethnography in combination with drawing methods were essential to collect the findings of this research. First, mobile ethnography allowed for understanding changes in water management not just through the difference of farmer's movements, but also through narratives of water practices and their manifestations in the territory. Second, drawings were part of my own interpretation and representation of farmers stories combined with precise information of people's movement. Mobile ethnography in combination with drawings pushed me to be more involved with the community and to further my reflections and interpretations of situations, relationships, and social structures.

Hence, I argue that an analysis through drawings and mobile ethnography of water practices in Toconao reveals local hydrosocial relations as mobile, locally embedded and responsive to transformation. Interpreting through drawings how people see the manifestation of water practices, shows their impacts on the hydrosocial territory. The analysis of water practices shows local hydrosocial relations as dynamic and receptive to change as well local responses, knowledge of the water management. This understanding, in turn, is fundamental to reveal the impacts of changing water practices on the hydrosocial territory.

The principal medium of my analysis is drawing, which I did during the fieldwork in Toconao through drawing on site, as well as after the fieldwork through drawing my interviews. The lines of my drawings are not simply a sketch of the irrigation canals or a list of numbers and data. Instead, they are a graphical representation of information which defines the graphic language of my research. For me, drawing was also a personal and private experience that depended not merely on my observations, but on my interactions and collaboration with others in the field.

During my fieldwork, drawing analysis happened in constant movement. In a first step, it provided a base map of the community through analysing the movements of the interviewees. Additionally, I created a virtual map with those people, who for reasons

of health can no longer walk through the irrigation canals. The map in these cases resulted from their memories about ways of traveling along the canals. The drawings further provided a narrative and assembled different fragments of stories of peoples' lives in Toconao. The resulting visual diary is an analysis that combines conversations, notes, thoughts and observations, which captures the temporal realities, memories and dreams of the inhabitants of Toconao.

Figure 3.10 | Drawings on location



Source: Author

The places shown in the drawings stimulate nearly all my senses: the deep greens of the leaves, the colours of the flowers and the patterns of light and shade stimulate the sight; there is the sound of moving water in nearby fountains; the smell of warm vegetation, and the perfume of oranges and bougainvillea; the variations in temperature between the hot sunny places and the cooler shady places; the cold water for bathing hands and feet; the textures of the cobbled pathways; and, if one were to pick one of the oranges, or a grapes, the taste would contribute to the place, too (Figure 3.10).

Drawing the conversations and interviews upon my return to London gave me a better understanding of the spatial-social relationships of water management. The drawings visualised the irrigation structure and highlighted, for example, the proximity of cultivable land to the riverbed and how farmers took advantage of geographical conditions such as water descending through gravity to the bottom of the ravine.

In a second step, I drew the georeferenced routes on a map, and plotted life and personal stories around three fundamental themes: Time, space and practices. This helped me to understand the movements in a more analytical way, and in turn allowed seeing the relations of inhabitants with the territory and their everyday histories. This analytical and interpretative filter also sought to be a tool for communication and connection of problems, aspirations, dreams and goals of the interviewee. This graphic perspective crossed the language and technological frontiers, making this qualitative information a more dynamic material can be open to all the inhabitants of the community. These drawings were done in London in parallel to transcribing the interviews and I plan to share them with the interviewees upon returning to Toconao in the near future (Figure 3.11). In sum, the analysis and reflections generated by the drawings provided important insights and directions for the application of the analytical framework, which is outlined in the following section.

3.4.2 Analytical framework

The theoretical chapter discussed the concepts of power, territory and community as parts of the hydrosocial cycle. These concepts make and remake each other over space and time. I have also debated the definition of hydrosocial territories, as *'spatial configurations of people, institutions, water flows, hydraulic technology and the biophysical environment that revolve around the control of water'* (Boelens et al., 2016: 1). I have discussed the role of water in the construction of indigenous communities in the north of Chile, and the notion of those communities in the use of water as importance practice of hydrosocial territories. The role of space is key to understand the extension of discourses and cultural practices and the position of place as territory (Elden, 2010a). And finally, I have discussed that the role of the environment in the daily experience and use of the territory necessarily has to be understood from the interpretative point of view. In order to analyse different narratives of Toconao's water management, I asked how I can develop my analysis with the three factors time, practices and space, which allow me to understand hydrosocial cycles and the production of hydrosocial territories.

Kapstein (2015) argues in her studies of 'intermediate space' in the Atacama Desert that every human action has a spatial aspect; every action and movement has a place within a spatial structure that is defined through its necessities. Similarly, de Certeau (1984, 1985) highlights the need to understand space as a practised place, which is built up by the texture of specific activities. Therefore, activities can be understood as spatial practices (Rendell, 2006) and space as a narrative (Soja, 1996).

Time plays an essential role in the connection between space and practices, as it links to action and mobility. Moreover, time goes beyond concerning the moment of spaces and practices, to thinking how I am researching them, how I am connecting with people and different realities, and different perceptions of time (Kellett, 2011). Therefore, I built my analysis on narratives of space, time, and practices around irrigation canals. These include narratives about surviving in the Atacama Desert, dealing with the scarcity of water, and moving around agricultural land.

Space, time and practices are not just part of the analysis of water management. They also shape the perspective that helps analysing new themes, which resulted from the fieldwork. Taking an inductive approach to this research meant that the analysis was open to explore concepts that emerged from the fieldwork. In the process of coding interviews, the concepts of solidarity, access and autonomy in water management were revealed as central notions. The analysis therefore explored the relationships between space, time and practices with solidarity, access and autonomy.

Based on these considerations, Figure 3.12 shows the framework of analysis in which the hydrosocial cycle gives equal importance to the spatial-temporal-practical factors in hydrosocial territories. The analytical framework explores hydrosocial relations to understand critical political ecologies of water, to recognise water conflicts and capture possible solutions. The triangular relationship between power, community and territory directly links with the information gathered in the field.

The analytical framework shows that the transformation of hydrosocial territories in Toconao is defined through physical, social and political elements. The material and spatial changes in the internal structure of the orchards through the implementation of drip irrigation systems are manifested in some cases as an expansion of the productive areas destined especially to wine production.

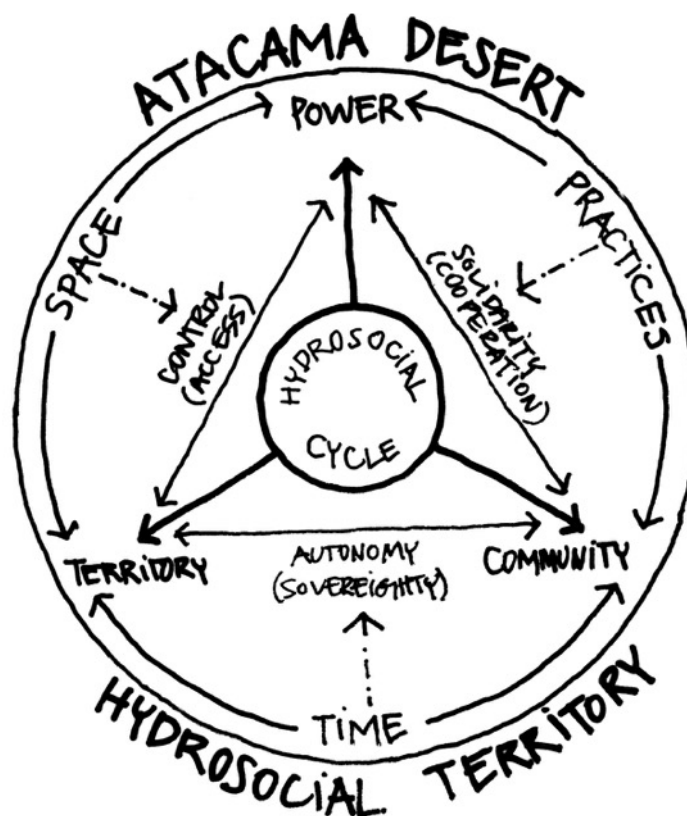
In social terms, changes are related to the clash of agricultural perspectives (changes concerning modern and traditional practices). The agricultural development promoted by the mining company and its water-saving discourses have generated new social relationships between traditional farmers and participants in the ATF program. This change is expressed not only with modern practices in water management and agriculture but also with the constant loss of traditional practices, associated with cooperation and solidarity, such as the cleaning of canals, mingas, sowing and harvests.

Finally, in political terms, changes are observed through the consolidation of the ATF program and ratified by the government institutions, providing support and institutionality to the corporate social responsibility program (changes over time since the implementation of the ATF program). This situation weakens the independence of

small-scale institutions within the community and therefore threatens decision-making autonomy, especially in terms of agricultural development.

Chapter 5, 6 and 7 present the analysis of the empirical data to answer the research questions: 1. How do changes in water management since the implementation of the CSR programme manifest themselves in the use of the canals? 2. How do everyday water practices reflect the decision-making power of different actors in community decision-making processes? 3. How have these changes in water practices affected community autonomy since the start of the CSR programme? Chapter 5 focuses on solidarity, chapter 6 on access and chapter 7 on autonomy. Therefore, the spatial, temporal and practice analysis in chapters 5, 6 and 7 will help to reveal the meaning of solidarity, access and autonomy in order to answer the three research questions.

Figure 3.12 | Analytical framework



Source: Author

3.5 Final comments

In the last decades, researchers coming from architecture and anthropology have had shared interests in spatial forms and ways of human dwelling, as well as methods and tools for collecting information (Stender, 2017). They have utilised the concept of time to measure and understand changes in the ethnographic analysis (Novoa, 2015). Time in the ethnographic analysis looks for changes in the everyday practices, spatial layouts and the study of local culture. Time is one of the essential elements of mobile ethnography (Muskat et al., 2018).

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manifestation of water practices, shows their impacts on the hydrosocial territory. The analysis of water practices shows local hydrosocial relations as dynamic and receptive to change as well local responses, knowledge of the water management. This understanding, in turn, is fundamental to reveal the impacts of changing water practices on the hydrosocial territory.

Figure 3.13 | Methods and list of activities

METHODS	DATES	OBJECTIVES	PARTICIPANTS
SKETCHES (EVERYDAY DRAWINGS)	DEC 2014 - NOV 2015	• OBSERVATION OF EVERYDAY PRACTICES & ENVIRONMENT.	—
INFORMAL CONVERSATIONS	JAN 2015 - FEB 2015	• ORAL HISTORY FIRST APPROACH TO COMMUNITY MEMBERS	FARMERS (12) ACADEMICS (2) MUNICIPALITY (1) COMMUNITY LEADER (1) NGOs (1)
PRESENTATION + PARTICIPATORY WORKSHOP & MAPPING	MARCH 2015	• RECOGNITION & VISIBILITY OF PARTICIPANTS' EXPERIENCES. • ORAL HISTORIES OF THE CANALS & WATER PRACTICES.	FARMERS (27) (ELDERLY GROUP)
SEMI-STRUCTURED INTERVIEWS + TRACKING OF INTERVIEWEES.	FEB 2015 - NOV 2015	• DOCUMENTATION OF PEOPLE'S MOVEMENTS & THEIR TERRITORY • DOCUMENTATION OF WATER PRACTICES • UNDERSTANDING OF CYCLES OF WATER & AGRICULTURE • RITUALS • DOCUMENTATION OF PEOPLE'S USE OF AGRICULTURAL SPACES & TIMES.	COMMUNITY LEADERS (5) SQM WORKERS (3) ATACAMENO COUNCIL (1) INDIGENOUS ADVISER (1) FARMERS ATF (5) FARMERS (15) FARMERS WITHOUT RIGHTS (5).
PHOTOGRAPHY WORKSHOP + EXHIBITION	AUG 2015 - SEP 2015	• COLLECTIVE ACCOUNT OF THE TERRITORY AND ITS ISSUES • VISUAL INTERPRETATION OF THE TERRITORY • RECOGNITION OF POWER RELATIONS • VISUAL NARRATIVES OF PEOPLE'S NEEDS, STRATEGIES AND MEMORIES	FARMERS (5)
PARTICIPATION IN THE CLEANING OF THE CANALS	SEP 2015 - NOV 2015.	• UNDERSTANDING OF WATER PRACTICES • UNDERSTANDING OF CONCEPTS OF SHARING, ANCESTRAL PRACTICES & RITUALS	FARMERS OF PEINE, SOCAIRE & TOCONAO

Source: Author

In sum, this chapter elaborated on the qualitative design of this research, which draws upon ethnographic fieldwork and a mixed-methods approach. I outlined the challenges and opportunities of my positionality in the context of fieldwork in the village of Toconao and framed the study within the epistemology of constructivism. Case study research is informed by an inductive approach, seeking to look at existing phenomenon in relation to the use of water through the lens of hydrosocial territories. It draws from various sources of evidence, such as observations, interviews, drawings and mapping exercises. The selection of methods (Figure 3.13) relates to the aim of understanding the complexity of hydro-social cycles as well as collective and individual water practices.

This chapter outlined the analytical framework, which accommodates the emerging concepts of solidarity, access and autonomy in hydrosocial territories as well as the importance of drawings as analytical tools. The following chapter 4 analyses the contextual and historical background of the case study and reflects on the relationship between Atacameño culture and the national Water Code in a mining context.

Chapter 4 Setting up the context

Introduction

Since pre-Incan times, water has been the central element to shape, distribute and organise the traditional Andean landscape of the Atacama Desert (Bittmann et al., 1978). Sophisticated irrigation systems have been used for centuries to channel the waters from the height of the Andes to a network of canals, which structured towns and settlements in the desert. The water system thereby configured a unique spatial organisation, which has reflected the inseparable relationship between the Atacama society and its environment (Nuñez, 2007). This is manifested through the capacity for cooperation, reciprocity and autonomy (Walsh-Dilley, 2013); inseparable elements from the territory, not only in a material sense but also linked to beliefs and values (Barros, 2000). Therefore, water and territory play an important role in the identity of the inhabitants of communities in the Atacama Desert.

The Atacama Desert is the driest desert of the world, which also contains the largest deposit of valuable minerals like copper, nitrate and lithium (Clarke, 2006). However, the Atacama territory is polluted, looted and devastated, mostly because of mining projects that fragment the space of many communities. The model of extraction of natural resources controls the territory, the quantity and quality of water, which in turn threatens the identity of communities.

Contesting mining activities, however, is extremely challenging considering that the current Chilean economic model is based on the extraction and export of natural resources. Mining interests are protected by a legislative structure created during the Pinochet dictatorship, which has generated inequalities and constant violations of the rights of indigenous communities surrounding the mining production centres (Mundaca, 2014).

Currently, many of the communities near the Atacama Salt Lake are under pressure from the mining sector to exploit their water resources, both superficial and underground, as well as brine and salts reserves (Prieto, 2016c). Those waters are the fundamental element of lithium extraction processes (Yáñez & Molina, 2008). The

present regulation that controls and manages water, the Water Code of 1981, has allowed the privatisation of the water resource, delivering it to the highest bidder under the logic of supply and demand (Yáñez & Molina, 2011). Essentially, the private sector was sponsored by this legislative structure established during the dictatorship.

Moreover, subsequent democratic governments strengthened the law, thereby increasing benefits for economic interests of a specific group and prioritising them over the social interests of the surrounding communities. The regulatory framework has allowed the market to manage water resources. The framework put water management under the rules of private property and protected it through the Constitution of 1980 (Chile Sustentable, 2010). This brought about a fundamental tension between the collective recognition of indigenous peoples' territories on the one hand, and the private water and land market on the other.

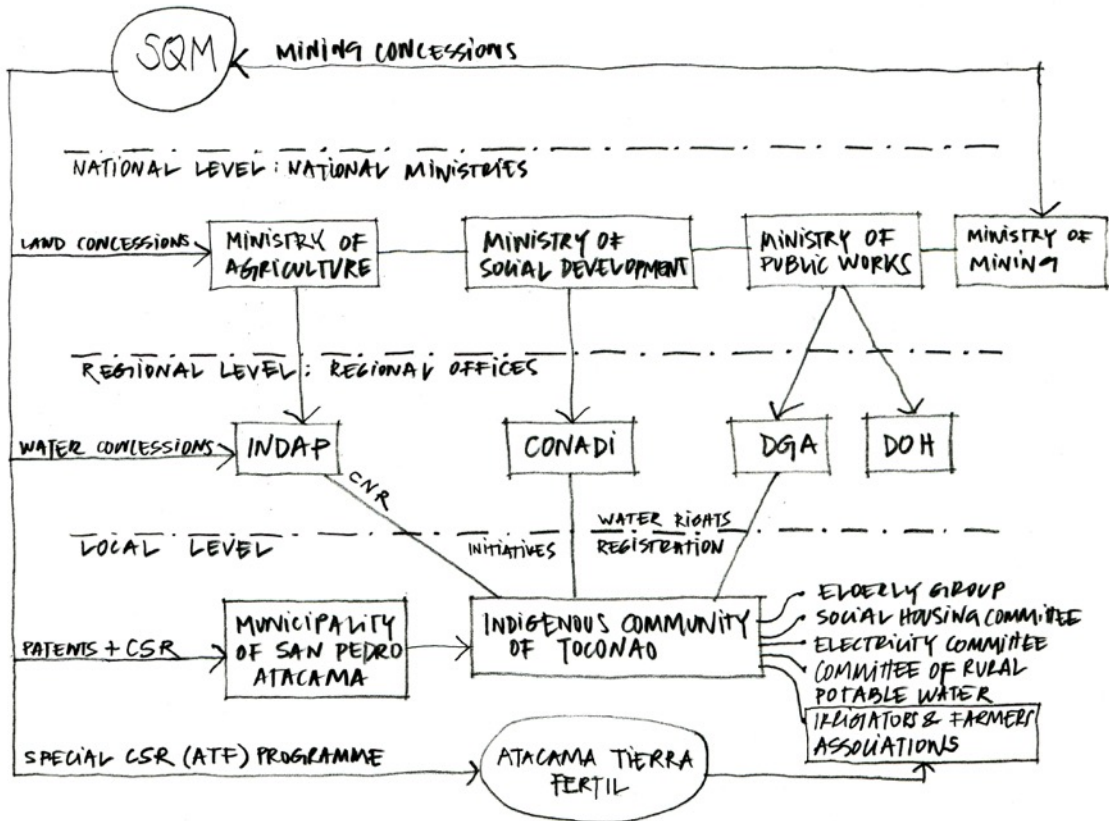
The indigenous community of Toconao is facing constant interactions with a variety of actors and agencies (Figure 4.1). Governmental agencies at the national, regional and local level respond to different interests, which affect local agendas (Molina, 2016). On the one hand, governmental agencies at the national and regional level see the Antofagasta region as a mining territory. Local agencies, on the other hand, push the protection of the territory through local initiatives to rescue and give value to the indigenous agenda and the protection of its ancestral territory.

Mining companies, and in this specific case, SQM S.A through its CSR programmes, are the bridge between national and local levels and act as a catalyst entity for local initiatives. However, the mining company pushes its agenda through its understanding of development for these localities. In other words, there is a clash between national and local development. The tension between those points of view is manifested and explained through the farmers that are part (or not) of the Atacama Tierra Fertil programme. This program is presented as the paradigm of agricultural development.

There is particular emphasis on the ability of producing wine in the driest desert of the world. Several agencies support SQM's development narrative at the national and regional levels by promoting the ATF programme as an example of how private entrepreneurship can produce agriculture of high quality in the desert. Likewise, SQM

argues that the participating farmers are at the forefront of irrigation technology, which is why they constitute an example of "efficient" water resource management. For this reason, ATF program technicians give technical advice to farmers, state officials and regional agencies on how to regulate the use of water efficiently.

Figure 4.1 | Community organisations, regional and state institutions and private sector



Source: Author based on Molina, 2014

Through this intertwined legal and geographic context, the following sections of this chapter seek to understand the consequences of water legislation, on the localities neighbouring the productive mining centres. The aim of this chapter is to describe the historical and political relationship between water and the inhabitants of the Atacama Desert. It further highlights the conflicts over water and the configuration of a territory exposed to the massive extraction of natural resources.

The chapter will analyse the Atacama Desert from the perspective of political ecology based on primary and secondary data. Moreover, the objective of this chapter is to understand the dominion of the mining company Sociedad Química y Minera (SQM S.A.) in the Atacama Desert. The focus is not only on the use of water, but also on productive initiatives in the communities, which have provoked conflicts at the local

level. The chapter is divided in three parts. The first part reviews the historical importance of water in the Atacameño culture as the shaper of the desert territory. The analysis also highlights the ways in which inhabitants of the town of Toconao have been increasingly harmed when managing their water resources under economic pressures from the mining sector. The second part explores the mining context, the current legislation, and the importance of the industry for the economic development of the country. This section analyses the role of entrepreneurs in the privatisation process as well as the private management of water and its effect on the Atacameño communities. Finally, the third part focuses on the conflict between the mining sector and the Indigenous Community of Toconao. It highlights the influence of a corporate responsibility programme on local irrigation systems.

To achieve these objectives, first, it is necessary to understand the legislative framework with its origins in the dictatorship. This framework gives rise to the existing extractivist model through policies of water privatisation and the privatisation of the Sociedad Química Minera (SQM S.A). Second based on ethnographic work carried out during the years 2014-15 and detailed in the methodological chapter – this chapter seeks to understand the importance of water in the community of Toconao and how it has been affected by the provisions of the Water Code and by the privatisation of SQM S.A. Finally, this section analyses the expansion of SQM S.A and the privatisation of water, which is necessary for the production of lithium.

4.1 Lickanantay: a water culture that belongs to the Atacama Desert

The Lickanantay or Atacameño culture has conserved an important part of their traditions, notwithstanding of the cultural contact through the processes of hispanisation between the XVI to XX century and the gradual loss of their language: Kunza (Hidalgo & Grebe, 1988). This culture still maintains its basic cognitive-symbolic patterns of time, movement, myths, rituals as living elements of original cultural meaning (Gundermann & González, 2009). Atacameño culture is connected with what Nuñez and Dillehay (1995) call ‘rotating mobility’, which refers to the Andean mobility of collecting natural resources. One of the elements that keeps this mobile culture alive is water. In the Atacameño culture, water is a reflection of different powers and disputes, but also a symbol of participation and cooperation

(Núñez, 1992). Consequently, water is a physical and social representation of authority in connection with time and space, intertwined with its culture, origins and development (Barthel, 1986).

The structure of the Andean culture presents a complex system of organising daily life, whose primary objective is to obtain control of resources in the diversity of ecological zones that occur in the rugged geography of the territory (Chandia-Jaure, 2013). The control system influences all living space of the land occupied by the Andean communities, which includes spaces for housing as well as the productive and ceremonial areas (Trawick, 2001a). The collective vision of Andean communities acknowledges that the territorial dimensions of a community are extended beyond the boundaries of the residential area. They also integrate farming techniques and water systems that together determine the management of water as a scarce resource (Gelles, 2000). Water has always been an element that structures different communities and so they are organised around it. Walter Coward (1977) stated that social relationships are connected and related to the creation and the maintenance of the irrigation infrastructure. This relationship is reflected in the management of the canals, irrigation shifts and the respect in the use of the canals.

Territorial planning and manoeuvres of water at the community level, such as irrigation systems for agriculture and daily use, are associated with the organisational bases that represent the cultural and political heart of the community (Alegría & Valdés, 2000). Farmers in different villages of the Atacama Desert mostly use ancestral flood irrigation systems (Chandia-Jaure, 2013). Water distribution is close to the technology, practices, rules and sense of belonging (Rodríguez, 2006). Hence, water and power in this culture are inextricably linked (Cuadra, 2000). However, as the findings of this thesis show, the relationship between power and water does precisely not produce a balanced society.

The village of Toconao, as well as other villages of the desert, have developed a straightforward way to manage its scarce water resources. This water management system has been utilised for centuries and its accessibility characterises it to all members of the village. Many archaeologists and anthropologists interpret this

traditional water management system as the basis of communities' understanding of the economy and environment, as well as the foundation for the establishment of morals, rules, responsibilities and rights (Bustos & Blanco, 2004). The system can be considered self-organising, with robust self-regulation by the community that is enacted and enforced through their daily practices in the irrigation canals, as well as frequent rituals.

According to Bustos and Blanco (2004), traditional knowledge has enabled the communities occupying the Atacama Salt Lake to adapt and maximise the use of the natural resources that the salt lake provides. Moreover, locally specific knowledge of the territory has built a culture of movement between different ecological subsystems, where inhabitants of this desert continue to practice agricultural and pastoral activities that gave them food and shelter for centuries (Nuñez & Dillehay, 1995). This territorial knowledge is manifested in the understanding of agricultural products or food supports community practices and festivities. These activities can be understood as a moral reflection that is expressed in their participation in the different festivities (Nuñez, 1995). Festivities are part of a cycle of intergenerational teaching, passing on knowledge from the elderly to the young ones. Rodriguez (2006) highlighted that those activities are taking place in an environment of respect, where interactions between different generations and genders are stimulated.

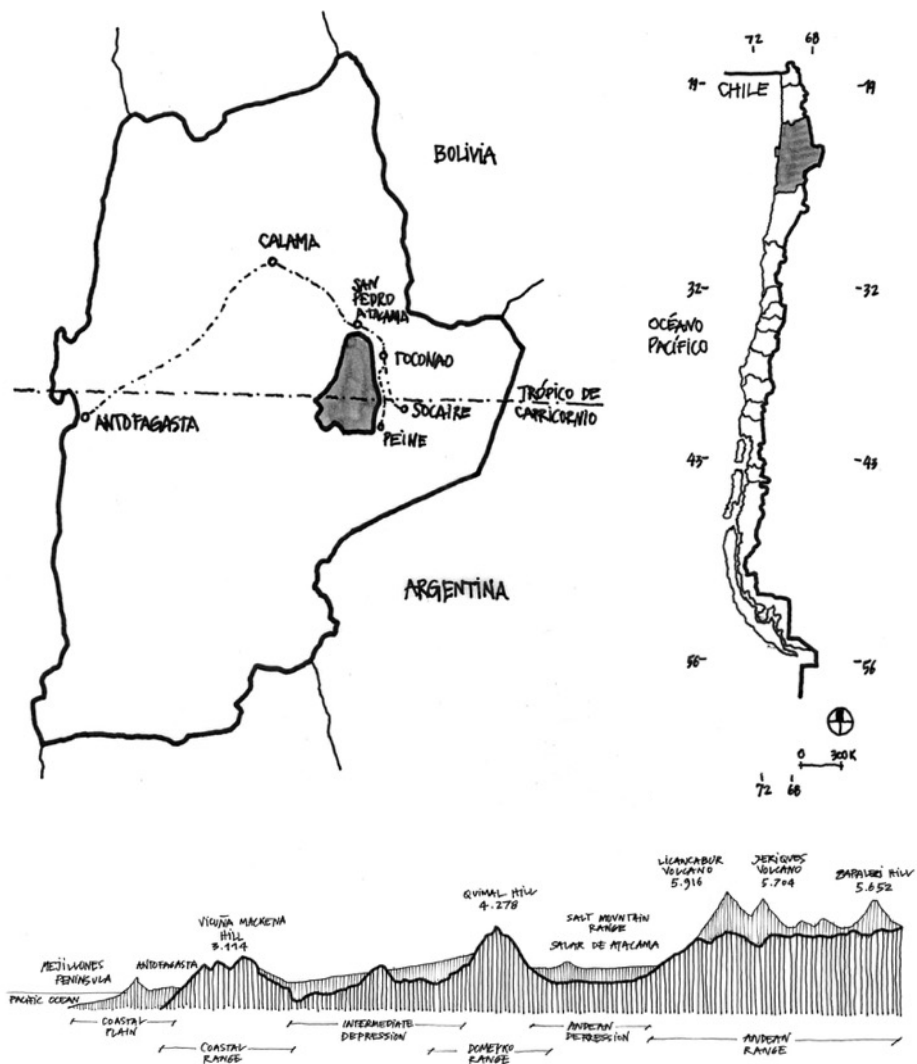
The canalisation of water forms part of the local knowledge and includes not only technical specificities, but also people's sense of belonging, responsibility and commitment to the town (Trawick, 2001a). In the Andes in general, this knowledge is a way of life called '*cosmovision*', which respects water, nature and other inhabitants that use this territory (Miranda, 2004). It is the fundamental principle that makes it possible to maintain life in the Andes. The systems of irrigation and water distribution form the base of community relationships, where water is the modeller of the territory, defining the limits and borders of the town (Perez de Arce, 1999). The use and management of the canals closely reflects the respect between the inhabitants as it reinforces family and community bonds. Irrigation times and agricultural land are distributed, respecting their individual shifts (Chandia-Jaure, 2013). This is connected

with the following statement by Sylvia Rodriguez (2006: 6): ‘Irrigation involves bodily skill learned through observation in the context of practice’.

4.2 Living in an uneven territory: The town of Toconao

The case study of this thesis is geographically located in the middle of the Atacama Desert in the north of Chile (Figure 4.2). Toconao means ‘the lost corner’ in Kunza (Vilte, 2004), the indigenous language of the Atacameño culture. The Atacama Desert is characterised by an enormous extension of land that is only sparsely populated in relation to its surface of 128.951 km².

Figure 4.2 | Area of study, II Region of Antofagasta

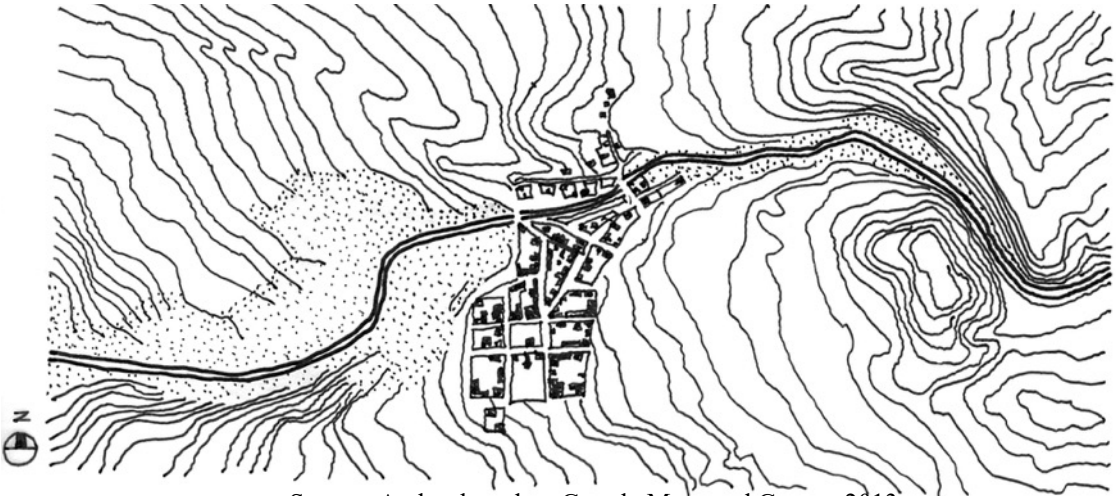


Source: Author based on Google Maps

According to the Chilean Meteorological Office (2018), there is no other region on the planet with less rainfall, which accumulates to less than 5 millimetres per year. The communities traditionally controlled and organised the natural resources such as water and land, but economic market forces have increasingly become an essential part of resource management (Bustos & Blanco, 2004).

The community of Toconao is located 33 kilometres south-east of San Pedro de Atacama, and was declared as an indigenous community by law on August 12, 1995 (Gobierno Regional Antofagasta, 2009). Toconao has currently 732 inhabitants, of which 76% declare themselves as indigenous and 70% are classified as elderly people. About 50% of the population lives from agriculture, while the other half works in jobs related to mining, services, tourism and crafts (Gobierno Regional Antofagasta, 2012). Figure 4.3 shows that the town of Toconao is located on the slopes of the Jere ravine, in which the water of the Toconao River descends from the Andean mountains (Hidalgo Lehuede, 1982). Water is distributed within the village using a complex system of canals with specific shifts where farmers get access to water for agriculture production (Games, 2013). Irrigation canals connect orchards with each other; they are constructed considering the heterogeneity, diversity and slope of the landscape. Social norms are based on concepts such as reciprocity and solidarity. Canals give a specific form of occupation in the territory (Trawick, 2002). The control of water on different levels guarantees the availability of resources for living in a vast and diverse territory. This control requires constant human work, especially in areas where communities are located with long distances between them (Boelens, 2015).

Figure 4.3 | Map of Toconao, II Region of Antofagasta

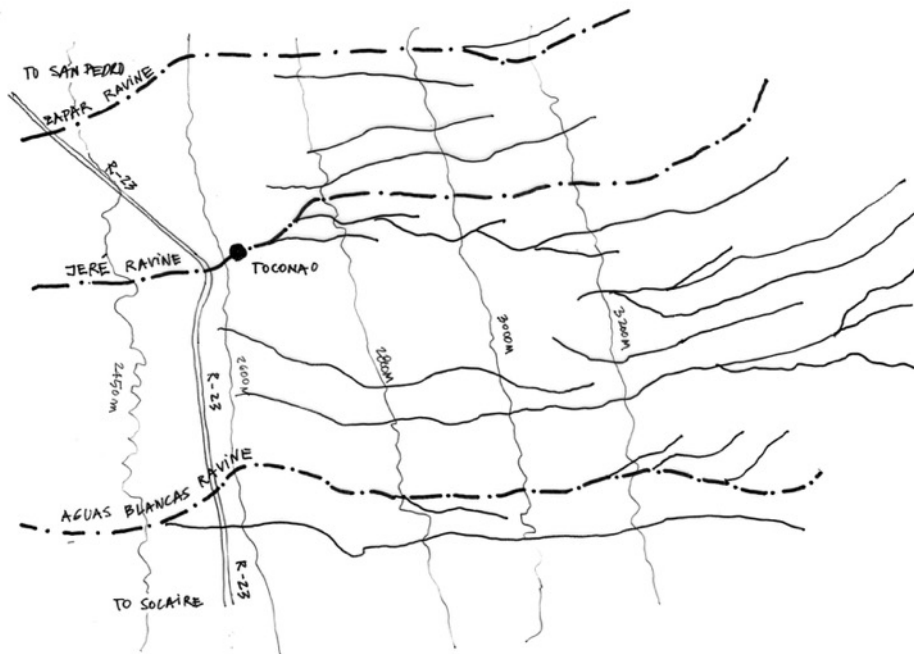


Source: Author based on Google Maps and Games, 2013

The cultivable area of the town is divided into many orchards that belong to different families, who live in the town. Farmers spend many hours a day working on the land and farming, of which some time is allocated to irrigation activities and the maintenance of the canals. The cultivated area is subdivided and managed according to family structures. This system was created by the first inhabitants, who were looking for a supply of drinking water and allowed the cultivation of different plant species, especially fruit trees (Gundermann & González, 1995). The formal institution for water management is the Irrigators' and Farmers' Association (Cuadra, 2000), in which 240 people were enrolled. However, only 49 members were active in the year 2014/15, which means that only one fifth paid their fees and participated in the activities of the association. The structure of cultivated areas includes so-called '*huertas*' (private spaces that are subdivided into '*melgas*'), outside corridors with public pedestrian access, off-farm canals (open canals), intra-farm canals (private canals), distribution areas (connections to various agricultural sectors) and a small dam (Chandia-Jaure, 2013). Each area has its specific name which is connected with corridors that are public streets of this hydric-rural system.

The main supply of potable water and water for agricultural purposes is owned by the community and administered by the Committee of Rural Potable Water and the Irrigators' and Farmers' Association of Toconao, respectively (Dirección General de Aguas, 2017). Figure 4.4 reveals the main three ravines – 'Zapar', 'Jere' and 'Aguas Blancas' – which geographically divide the area of the Indigenous Community of Toconao. They further represent the three Irrigators' and Farmers' Associations. Toconao's waters come from the streams Honar, Vilaco, Zapaques, Jere and Zilapeti, and their waters are distributed among all association's members. According to the Irrigators' and Farmers' Association of Toconao (1981), the main container of its water is the Jere Valley. The irrigation canal system of Toconao covers an area of 92 hectares and has an extension of 17,000 meters, which is considered an adequate capacity to be an independent community regarding water supply. The community is entitled to 581.3 litres per second from the rivers, canals and springs (Dirección General de Aguas, 2017).

Figure 4.4 | Map of ravines with potable and agricultural water, Toconao Sector



Source: Author based on Google Maps, 2015

Lautaro Núñez (1992) argues that there is a clear relationship between the inhabitants of the town of Toconao and the use of its irrigation canals. This is based on the way of inhabiting this particular space, changing and transforming its territory, moulded through its daily practices and mobility. He also mentions that the festivities around water and water cycles are activities that best reflect the Atacameño's spirit (Núñez, 2007). Roy Rappaport (1999) suggests that these rituals are the medium through which inhabitants communicate themselves with the environment. Through these activities, people develop practices that create bonds between their work, their ancestors, community members, friends of the community members, between the ancestral and contemporary water infrastructure, and the natural and divine world.

A clear example of this relationship is the annual community festivity of the cleaning of the canals, which reaffirms the forms of belonging, identity and culture in a social space. In this festivity, also it is possible to observe negotiation to control over water and territory (Bolados & Babidge, 2017). Beyond the physical and functional need to keep the canals in good condition for agricultural purposes, these activities are a form

of celebrating and being grateful for water resources (Lagos et al., 1988). However, in the case of Toconao, one interesting finding is that these practices have been weakened. This results mainly from incentives to work individually and the promotion of monoculture through technical irrigation systems, which are pushed by social responsibility programmes by the mining company. Additionally, there are constant pressures on the territory for the delivery of concessions of land to mining companies, generating conflicts over the use and distribution of water for their processes (Carrasco, 2014; Mundaca, 2014; Sepúlveda Rivera et al., 2015; Yáñez & Molina, 2011).

4.3 Mining and the Water Code

The Chilean economy has been depending on the mining sector for the last two centuries (Arias et al., 2014). Resource extraction activities were responsible for high levels of economic growth and wellbeing (Thorp, Battistelli, Guichaoua, Orihuela, & Paredes, 2012). Mining activities were firmly established on the base of economic relationships between multiple national and international businesses, which generated an improvement for the society as a whole. However, since the late 1980s, mining development became increasingly dissociated from the communities in the Atacama Desert (Feliú, O'Brien, & Cooper, 2010). This happened, because mining projects became less dependent on the local labour force and on collaborations with the inhabitants of the areas of extraction. The implementation of working in shifts contributed to a system, where mining companies do not communicate with local communities anymore, and their workforce is mainly from other parts of the country (Arias et al., 2014).

According to Carruthers (2001), Chile was the first Latin American country to introduce a neoliberal governance model for its natural resources. This model attracted foreign capital to the extractive exploitation (Bridge, 2004b), and had a huge impact on the societies and environments, where mining is implemented (Instituto Nacional de Derechos Humanos, 2015). The current mining model was created by the dictatorship and had profound consequences for the territory and the distribution of water, mainly due to the distribution of water rights and mining concessions (Prieto, 2015b).

According to the mining concessions registry of the National Geology and Mining Service, 70% of the Antofagasta region is currently granting concessions to mining companies (Sernageomin, 2018). This demonstrates that the mining sector is not only the primary pillar of the national economy but also the controller of the territory through its expansion (Meller, 2013). One important characteristic of the economic model established in the dictatorship and consolidated with the Chilean Constitution of 1980 (Ministerio del Interior, 2005), was the creation of the Water Code (Ministerio de Justicia, 1981), Law No. 19,253 and the Mining Code (Ministerio de Minería, 1983) of 1983, Law No. 18,248. These legal frameworks provide water rights and mining concessions to private hands through encouraging the commodification of natural resources (Rasmussen & Lund, 2018).

The regional economy rests exclusively on mining, which contributes 9.9% to the national GDP and 56.3% to the regional GDP (Banco Central de Chile, 2016). This contribution is due to the substantial foreign investment consolidated by the signing of numerous free trade agreements, which characterise today's extractivist model (Chile Sustentable, 2010). This economic development reflects the control over the use of the territory, especially the territory that has been claimed for decades by indigenous communities. In addition, it reflects the extraction of resources such as water that are necessary for the existence of the neighbouring communities (Yáñez & Molina, 2008). Therefore, economic development is contrary to the development of the Atacameño culture, where water and territory are understood as one unity, fundamental for their identity.

Consequently, the Atacama Desert is a place of high economic importance for the country and a place of large inequalities. Aboriginal communities constitute the poorest people of the country (Instituto Nacional de Estadísticas - Chile, 2013). In the Atacama Desert, it is possible to observe the different interests and how they are clashing: On the one hand, some people have been living there for many generations; they have settled, developed their traditions, practices, and identities and claims over the territory because of the historical legacy of their culture. On the other hand, there is the recent dominant claim over the territory based on a discourse of economic

growth of the country and its neoliberal politics that promote the interests of mining companies.

The Chilean economic model has promoted two processes for the Privatisation of resources. Firstly, through private extension of the mechanism of concessions on natural resources. Secondly, through the protection of these concessions through the right to private property (Mayol, 2012). This creates a conflict with the rights of indigenous people to these resources, which is a fundamental part of their process of social, political and economic life. According to the Chilean economic model, natural resources are consumer goods for income production. It becomes clear that the economic model does not relate to the communities that are living in this territory. However, little is known about the impact of the economic model on the territories, which can be reflected in the transformation of the way of life of indigenous communities, their economy, environment and landscape (Instituto Nacional de Estadísticas - Chile, 2013).

The mining boom started in the mid 1970s, it was consolidated in the 1980s due to new legislations imposed by the dictatorship and applied in the 1990s by the free trade agreements established in the new democratic era. These three stages have been the corner stones of a state of injustice and inequality that has accelerated social, cultural and environmental impacts mainly for local inhabitants of this territory, and indigenous communities (Barros, 1997b).

One of the primary mechanisms of this systematic legislative evolution has been to grant rights of access, exploration and extraction of resources to companies on land regardless of who the land belongs to. This allowed economic concentration only for some companies (Bolados García, 2014b). Mining companies do not necessarily have to be the owners of the land or water they use for their processes. The Chilean Constitution considers land and water as market goods (C. J. Bauer, 2015), which means that the demands on the territory are separated from the claims on its natural resources, such as water and minerals. Therefore, the current Constitution, established in 1980 under the dictatorship of Augusto Pinochet, represents the fundamental nucleus of an institutional framework that pushes the neoliberalisation of nature and

gives the Chilean State the role of an auditor for mining investments (Bolados García, 2014b).

The neoliberal economic model strengthens the exploitation of natural resources as a mechanism for the integration of the Atacama region into the global economy (Bustos et al., 2014). Moreover, the Chilean political model establishes administrative mechanisms of decision-making on these matters that exclude local communities in decision-making about the territory they inhabit (Bolados, 2009).

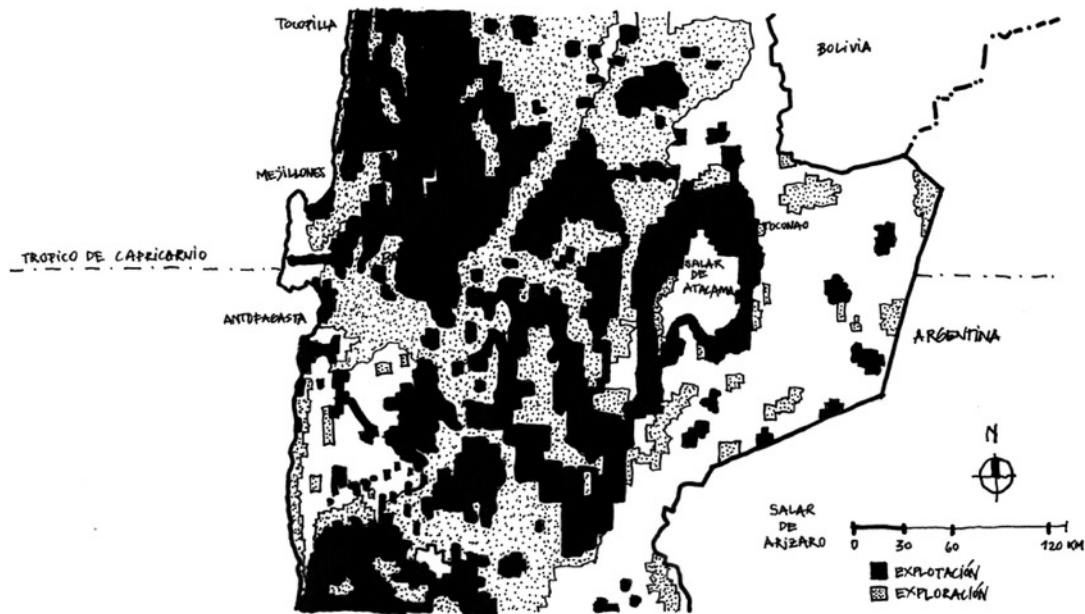
The black areas in Figure 4.5 display all concessions for the exploitation or extraction of resources in the territory of the Antofagasta region. The dotted areas are the rights assigned to the exploration. The Mining Code (Ministerio de Minería, 1983), in its article Number 14, paragraph 1, states that: *'Everyone has the ability to test and dig in lands of any domain, except those within the limits of a foreign mining concession, in order to find mineral substances'*. Hence, it gives everyone the permission to explore those areas to see what material exists in that place and to take control of the water that forms part of that particular concession. Yáñez and Molina (2008, 2011) argue that the legal foundation for the development of large-scale mining in Chile is linked to the creation of custom-made regulations during the military dictatorship, which protected the private sector. Regulations were based on principles of free competition and generated an ideal scenario for market interests.

It gives control to the owner over its concession and gives protection through the constitutional guarantee of use. Hence, the mechanism of extracting natural resources in Chile takes away community control and autonomy of decision-making over their resources. Therefore, it threatens the practices of communities in relation to water use, which are essential to survive and flourish in this desert.

This legal framework of mining concessions and their protection in the Constitution brings about the need for mining companies to obtain water, which is a fundamental element of copper and lithium mining processes in the Antofagasta region (Yáñez & Molina, 2008). The Water Code was created in 1981, hence, two years before the Mining Code (1983), under the same conception of property rights. The Water Code states in article number 5 that water is a public good. However, at the same time, it

declares it as an economic good: *'Waters are national goods for public use and are granted to private the right to use them'* (Ministerio de Justicia, 1981: 71). In this way, the separation of ownership of water from the ownership of the land turned water into a commodity, which is free to be marketed under precarious state monitoring (C. J. Bauer, 2015).

Figure 4.5 | Map of areas for exploration and exploitation, Antofagasta region



Source: Author based on IDE Chile, 2017

Water management, from the national perspective, does not consider the geographical, economic or local cultural specificity and treats all water resources as uniform. There is no connection to water practices corresponding to the desert context, so the neoliberal dynamics of the private rights of water and a free market are independent of the social reality of this territory (Prieto, 2015b). Therefore, the free market of water has played a fundamental role in the consolidation of the power structures that underpinned Augusto Pinochet's neoliberal programme (Budds, 2013).

4.3.1 The Water Code and water privatisation

It is essential for this research to understand the protection of privatisation through the right to property and how it reflects the transformation of local power relations and their systematic effects on communities (Yáñez & Molina, 2011). Manuel Cuadra (2000) argues that the fundamental cause of the loss of the waters of the Atacameño community has been the lack of legal protection in a context, where mining and the

supply of the cities near the productive centres have exponentially increased the demand on water resources. This situation has stripped communities of their water, generated severe environmental damage (Yáñez & Molina, 2008), and increased migration to urban areas, poverty and inequality (Imilan, 2007). The allocation of water rights to private actors has not only changed the relationship of Andean communities with water but also consolidated the neoliberal market model, whose main beneficiaries were collaborators of the military regime, government technocrats and the private sector (Budds, 2004, 2012, 2013).

At the institutional level, the state agency in charge of managing water is the National Water Directorate (DGA, Ministry of Public Works). This institution grants requests for water rights without any charge conditional to the physical and legal availability of water (Ministerio de Obras Públicas, n.d.). Once the right to use water is constituted, it is governed by private or civil law and not by public or administrative law. Therefore, the rights become subject to the registration of titles of real estate property, which are protected as private property under the Chilean Constitution of 1980 (Cuadra, 2000). Unfortunately, the DGA has little power and authority over the private use of water, leaving the decisions about water management in the hands of the private sector or associations of irrigators. In the specific case of Toconao, it is left to the Irrigators' and Farmers' Association, which independently distributes water rights among its participants (C. J. Bauer, 1997). Additionally, the DGA cannot cancel or restrict rights once they are granted unless they are amortised due to expropriation. Hence, the DGA does not have decision-making power in conflicts over water, leaving deliberations to the civil courts (Yáñez & Molina, 2008). As a representative institution of the state, the DGA is subordinated to technical and administrative functions, such as collecting hydrographic data, inspections of hydraulic works, enforcing the regulations governing the irrigation associations and developing studies or technical recommendations for public policies (Orrego, 2002).

At the local level, farmers and irrigators of the communities adhere to the common property statutes that their respective irrigation association establishes. This local institution emphasises in its statutes the values of preservation, solidarity and protection of its waters, thereby ensuring the development of the Atacameño culture

(Prieto, 2016b). These values share two essential characteristics. First, control and access to water resources from streams and tributaries located in its territory. Second, each farmer can use water on the basis of respecting the welfare of other users through respect and solidarity in the management of existing resources (Comunidad Atacameña de Toconao, 2015). This can be understood as the moral economy of water (Trawick, 2001b); a social order based on the fundamental principles of the right of everyone to have access to water and the obligation to assist in receiving the resource reciprocally (Wutich, 2011).

The National Indigenous Law 19253 was established in 1993 to recognise the existence of eight ethnic groups in the country and to acknowledge indigenous pluralism in Chile. The Law defines the ‘quality of being indigenous’ detached from the roots in indigenous lands and integrates cultural criteria of self-recognition and offspring in the definition setting standards on culture and indigenous education (Ministerio de Planificación y Cooperación, 1993). It established measures for the recognition, protection and development of indigenous lands and created the Fund for Indigenous Lands and Waters, which is managed by the National Development Organisation (CONADI). This Law created the legal conditions for the territorial management of specific geographic areas in which indigenous communities can live and build on the particular ways they have established in their cultures to relate to their ecological and social habitat (Ministerio de Planificación y Cooperación, 1993).

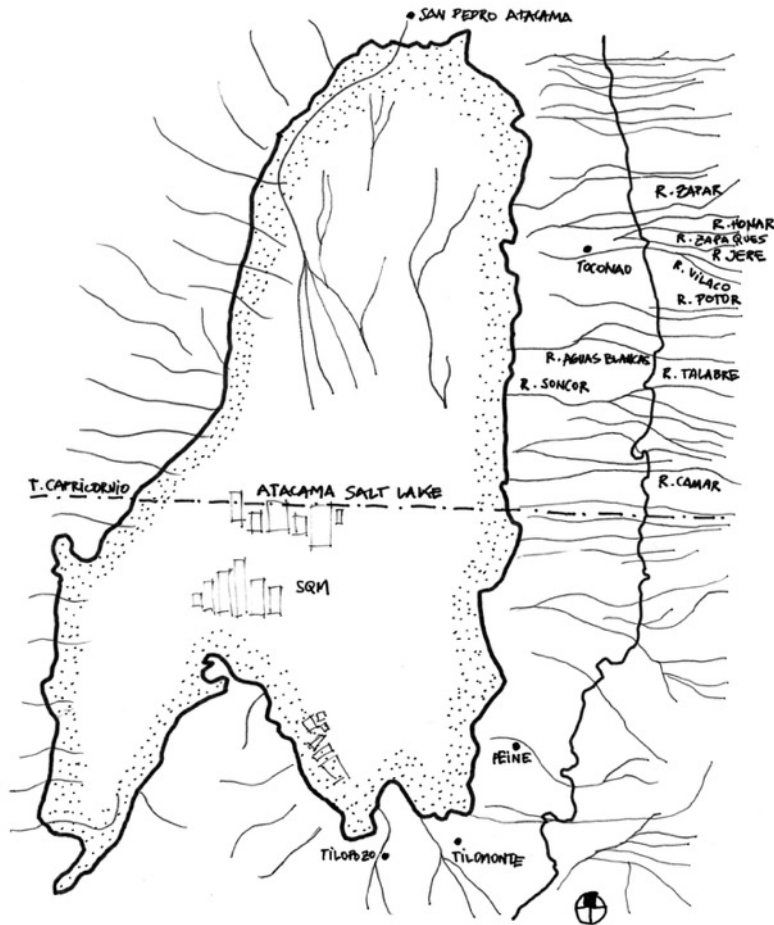
Figure 4.6 shows the distribution of different indigenous communities in the Antofagasta region. Through the enactment of Law 19,253 of 1993, the customary and collective right to water of ancestral property of the Atacameño communities is recognised. It allows communities, rather than individuals, to be owners of the waters (Prieto, 2017). However, the use of resources, especially land and water, has been controversial. This is because some leaders of the water associations have taken advantage of the rights that the Indigenous Law gives them. They have signed water supply agreements with the mining sector, changing the ancestral view of water to a perspective that sees the resource as an economic good, protected by the Water Code and the Constitution of 1980 (Cuadra, 2000).

Tecklin, Bauer and Prieto (2011) argue that Chile is considered successful by its neighbouring countries in Latin America for its development towards economic freedom. This is reflected by its neoliberal policies installed under the dictatorship, which encompass environmental governance. Throughout Latin America, the concept of development has been linked to discourses of modernisation and degradation of the environment (Ulloa, 2015). There is a lack of understanding development from the local point of view, to see the injustices of a given context and their relations with the economic policies of the Chilean State. In the context of the communities located in the Atacama Desert, inhabiting the territory and populating its landscape is a fundamental part of the local control of its resources such as water, land and soil (Barros, 1997b). That means that the local management of their resources as a collective has formal conditions in their management (Ostrom, 1990). However, this is not understood in the same way at the national level, where the control over these resources is assigned to external actors. This especially concerns to land and water rights, which are distributed through exploration and exploitation concessions, as well as the distribution of water rights known as consumptive or non-consumptive rights to waters (Mundaca, 2014). Moreover, mining concessions and water rights are concentrated in a few hands that manage the mining industry in the region.

4.3.2 Who owns the Atacama Desert?

According to the US Geological Survey (2018), SQM S.A is the biggest lithium mining enterprise in Chile and the second largest in the world. The company extracts one fifth of the worlds' known lithium resources and is located in the middle of the Atacama Salt Lake, and direct neighbour of Toconao (Figure 4.7). According to SQM's report of the results for the second quarter of 2017, SQM S.A produces 40,000 tonnes of lithium per year, which represents 42% of the national output, followed by the company SCL (Rockwood) with 25% (Comisión Chilena del Cobre, 2013). SQM S.A presents profits from the sale of lithium and its derivatives with a total value of US\$ 297.4 million during the first six months of 2017. This was an increase of 54.3% compared to the US\$ 192.8 million recorded in the first half of 2016. According to the world demand of lithium, its production will continue to increase (Sociedad Química y Minería, 2017).

Figure 4.7 | Map of the Atacama Salt Lake and its closeness to Indigenous communities of Atacama Desert.



Source: Author based on Google maps and Games, 2013

SQM S.A has developed extractive activities in the area for more than 50 years. According to the National Geology and Mining Service (Sernageomin, 2018) the company owns most of the mining concessions in the Antofagasta region (1,237,800 hectares) and water rights in the Atacama Salt Lake (344 litres per second) (Ministerio de Obras Públicas, n.d.). Mönckeberg (2015b, 2015a) states that beyond the importance of the company in the production and extraction of natural resources, its role has been fundamental in the privatisation of mining in Chile. Privatisation was driven and implemented by economists of the Chicago school and military officers, who relied on Augusto Pinochet during the dictatorship.

SQM S.A was led by Enrique Valenzuela Blanquier during the military coup in 1973. In 1983, it was handed over to Pinochet's son-in-law, Julio Ponce Lerou, who was in charge until 2015 and who built his fortune in the shadow of the dictator (Mönckeberg, 2015b). As general manager of the Corporation for the Promotion of Production (CORFO), Ponce Lerou marked his participation in the privatisation of SQM S.A with the creation of a sales contract that later made him the owner of the leading company in the extraction of lithium (Arellano & Figueroa, 2015).

With the support from the army, which included his father, brothers and friends, who were all protected by Pinochet, he created a framework of action within the government that was later transferred to the privatised SQM S.A, which concentrated its lithium monopoly (Osorio & Cabezas, 1995). Julio Ponce Lerou is considered one of the most powerful characters of the military regime and was not only in charge of the company that produces lithium and fertilisers, he was also leading different institutions that gave him a privileged platform of action to build his empire, including positions as Director of CONAF, President of Cellulose Constitution and manager of several state-owned companies. In addition to the economic power that Lerou has generated from managing the iodine and lithium market, he also heavily shaped political alliances in Chile, which have produced and reproduced support for the company to maintain its control and easy access to natural resources (Huneus, 2016).

4.3.3 An uneven relationship between SQM S.A and Toconao

The inhabitants of Toconao, as well as its social organisations, and the mining companies that exploit salt and lithium in the Atacama Salt Flat basin maintain relations since the beginning of lithium mining. A fundamental relationship exists between companies and the indigenous workforce of the area. Mining companies have developed different interactions with communities that are in the area of influence of their projects. These relationships are based on business and economic representations and therefore, they have a different understanding in the way of conceiving the links with the context where they are inserted.

Gundermann and Göbel (2018) argue that there are three ways in which mining companies approach communities. The first one is a voluntary, altruistic and

philanthropic relationship that does not depend on contractual commitments between the company and local communities. The second one is interested in structured action and longer-term relationships, demonstrating the efforts made by a company and making communities participate in local projects. This approach manifests in corporate social responsibility programme (CSR) that started in Chile as a framework for structuring business relations with communities in the 1990s. The third type of relations is focused on shared values, where relationships are not established through projects guided by the priorities of the company, but rather consider participation in the profits of the extraction of natural resources.

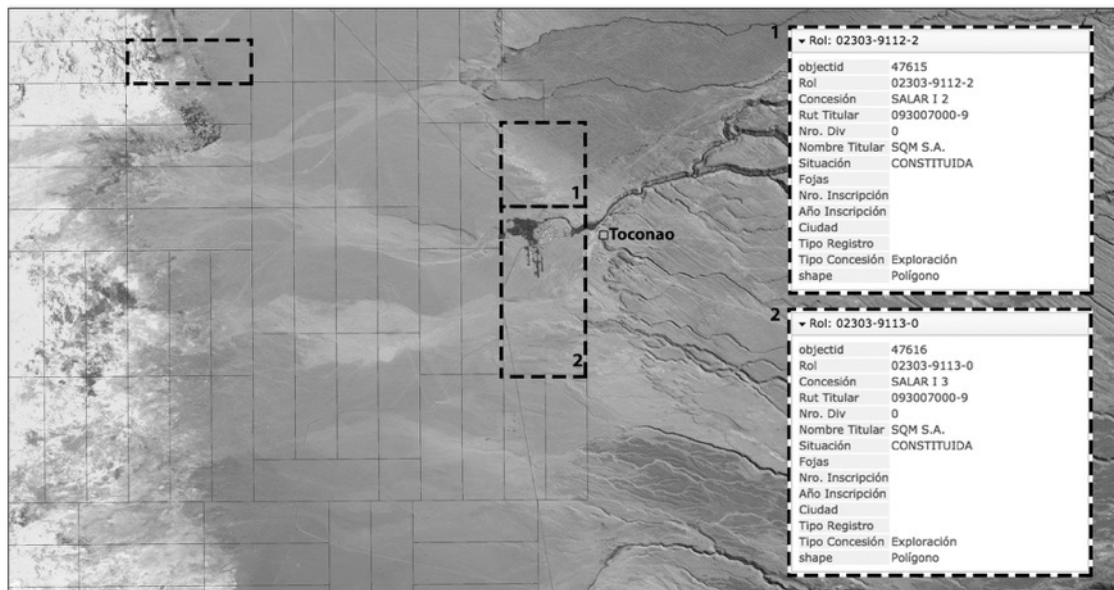
SQM S.A follows the second approach through corporate social responsibility programme at the local level. According to the sustainability report of the company, one of the key areas of SQM S.A in the area of corporate social responsibility is related to the economic and social development of nearby communities (Sociedad Química y Minería, 2015). SQM S.A has created a 'Competitive Fund of Micro-Entrepreneurship' in the municipalities of San Pedro de Atacama. This is an initiative that seeks to foster new business development and the formalisation and development of new skills for entrepreneurs. A project, which emerged from this field of corporate social responsibility has been developed in Toconao since 2008. It is called '*Ayllu* Wine Project' and forms part of the 'Atacama Tierra Fértil Programme'. The project aims to produce wine in the desert and to promote the development of the community together with the local farmers and a multidisciplinary team of professionals hired by the mining company. With this project, SQM S.A managed to make wine production attractive for the community. The company organises wine tasting activities, a yearly wine fair, and national awards that give recognition to the community's work. It creates a brand, and also generates an identity of farmers as wine producers. The 'Atacama Tierra Fértil Programme' currently works with 20 inhabitants of Toconao, of whom only 10 already benefit from selling wine or grapes.

4.4 Living in a community in an area of mining concessions

The concession map (Figure 4.8) shows how the location of Toconao is not considered in regional planning. Like many other communities, Toconao has to live with the pressures of extracting natural resources, as well as the utilisation of the sources of

water for the processes of exploration and subsequent extraction of mining resources. Figure 4.8 reveals that the community of Toconao is located adjacent to an exploration concession belonging to the company SQM S.A (SALAR I2-3). The rectangles adjacent to the town have an extraction concession, which is also belonging to SQM S.A, while the rectangles in segmented lines are exploration areas (areas 1 and 2).

Figure 4.8 | Map of mining concessions in the Toconao sector



Source: Author based on IDE Chile (Infraestructura de Datos Geoespaciales),
Ministry of National Goods, 2017

The mining companies - in the case of Toconao the company SQM S.A - obtain economic advantages at the expense of the welfare of the communities. Through the privatisation of the waters, SQM S.A has generated a scenario of injustice and inequity in this territory (Mundaca, 2014). In this area, the mining sector holds 93% of groundwater rights and 6.9% of surface water (Yáñez & Molina, 2008). As mentioned at the beginning of this chapter, for most indigenous communities in northern Chile, the right to water has been a constant struggle (Molina, 2016). The model created during the Pinochet dictatorship, which enriched the private sector to date, is characterised mainly by the privatisation and free transaction of water rights, led by the Chilean neoliberal system that clashes with the fundamental vision of the water as a human right (Prieto, 2016c). According to Smart (2018), this extractive model has been created to benefit the ruling classes that have remained in power. This happened

at the expense of local, indigenous and peasant communities that see how their rights are constantly violated and how the environment that surrounds them has deteriorated.

The dictatorship had a severe impact on Toconao through access to property titles for housing and agricultural plots, as well as through providing assistance to construct infrastructure, roads, and irrigation canals (Cuadra, 2000).

Currently, for the majority of the indigenous communities bordering the Atacama Desert, the scarcity of water, the lack of recognition of water rights, the lack of water infrastructure, and the low level of recognition of their voices in the Irrigators' and Farmers' Associations, offers little power in negotiating conflicts over water (Prieto, 2013). Moreover, many farmers adhered to the laws of the market and promoted the sale of their resources to mining companies. For example, the Irrigators' and Farmers' Associations of 'Aguas Blancas', belonging to the community of Toconao, began to supply water to the company SQM S.A in 2013. According to the water supply contract between the Irrigators' and Farmers' Associations of 'Aguas Blancas' and the mining company SQM S.A, the association sells, or as its members phrase it, 'supplies water' to SQM S.A. It transfers 4,752 m³ to 55 litres per second at a value of US \$ 1.05 per m³ (Sociedad Química y Minería, 2014). This case is examined in chapter 6 in more detail. It created fragmentation in the community of Toconao, because many members opposed the sale of water to a mining company, since it clashed with the fundamental values of their worldview. Moreover, this situation led to economic conflicts, because the sale only provided monetary benefits to the members of the Irrigators' and Farmers' Associations of 'Aguas Blancas' and not to the entire population of Toconao.

4.4.1 Atacama Desert and climate change

According to the president of the 'Consejo de Pueblos Atacameños' (the Council of Atacameño Villages), communities identify several environmental changes and hazards within their territory. These are mainly related to water shortage for human consumption induced by droughts, an overselling of water rights and the lack of regulation in the mining, energy, and tourism sectors.

The DGA declared a ban on the extraction of water in aquifers of ancestral and ecosystem importance. However, licenses for water use exceed six times the aquifers' recharge capacity (Dirección General de Aguas, 2019). Reports of the DGA show the severely unequal water distribution in the Atacama Desert, which brings about water extraction in areas that trigger severe environmental damage to the fragile ecosystem of the desert, and harm the communities.

At the national level, the territorial vision of the Ministry of the Environment acknowledges that variations in temperature and precipitation are detrimental for the Atacameño territory (Ministerio de Medio Ambiente, 2017). It focuses its attention on the effects of the mining business and the extraction of natural resources from the Salar de Atacama.

The regional Agency of Sustainability and Climate Change mentions that addressing climate change requires better policies as well as ethical change (Agencia de sustentabilidad y Cambio Climático, 2018). Their idea is to promote the inclusion of a climate change dimension and sustainable development in the region through voluntary agreements between the different actors that share the territory.

At the local level, farmers in Toconao noted that irrigation activities are negatively affected by the mining sector in terms of water availability and increased greenhouse gas emissions. The consequences of climate change are especially manifested in the foothills of the Andes where rainfall is decreasing in winter and increasing during the rainy season in summer. Older farmers mention that their crops are affected every winter by rain and snow, while snow was not usual decades ago. Further, irrigation canals were not designed for increasing thaws and rains during summertime. The change in the water caudal has modified the water and agricultural cycle.

The inhabitants and farmers of the community make several efforts to deal with these changes. They aim to anticipate climatic events through permanent monitoring of climatic conditions and through preparing operational protocols for emergency situations. Further, some farmers are changing their crops and seek species that are more resistant to heavy rains and droughts. In Toconao, inhabitants have repaired the

water accumulation dam mainly for times of drought. They also incorporated filters to protect the drainage canals in times of water abundance.

At the collective level, farmers have been working together with the Consejo de Pueblos Atacameños to disseminate information and raise awareness about the problems of water and climate change in the 18 communities of this territory. Moreover, they generated alliances with academic institutions to develop technological solutions in the medium and long term. For example, the Consejo de Pueblos Atacameños aims to create an environmental unit that implements a water monitoring network in the Atacama salt basin and the high mountain range. However, activities fail to tackle many of the root causes of changing water levels, which is manifested in the absence of legislation to control the high level of water consumption of mining projects.

4.5 Final comments

The evidence in this chapter demonstrates that mining is one of the most significant contributors to the water crisis in Chile. The current legislation supports the private sector and favours free market economics (C. J. Bauer, 1997). Mining companies enter indigenous territories through claiming their water rights, and often ignore local rules. Therefore, new patterns of exploration, extraction and commodification create new territories (Rasmussen & Lund, 2018). The manifestation of the current legislation and the introduction of new modes of agricultural production through new irrigation systems have produced changes in the water management, but also changes in the social and power relations around water. Jessica Budds (2004, 2009, 2012, 2013) argues that the relationship between water and power is central to understanding the economic actions implicit in Chile.

Since the dictatorship, water was considered a productive element subjected to a market logic. Water became a commodity that should be used efficiently (Henriquez, Kuper, Escobar, Chia, & Vasquez, 2017). The state and the mining sector have taken this premise of being productive and efficient through technological development. Therefore, new irrigation systems have been promoted by the CSR programme as

relationship-building approach, helping local farmers to produce efficiently and reduce the quantity of water in their agricultural production.

At the national scale, the company SQM S.A, led by Julio Ponce Lerou, has taken advantage of the legislative platform created in the dictatorship to dominate the lithium market and the territory through mining concessions and water rights. Understanding the current consequences of mining business models imposed by the dictatorship not only requires analysing the relationship between the privatisation of state enterprises and the privatisation of water and natural resources but also requires an understanding of the changes in water practices and relations of solidarity, access and autonomy in the distribution of resources in the Andean villages.

It is essential to understand the legislative platform generated by the dictatorship, the current Constitution, the Water Code and the Mining Code, which have generated an institutional base for protecting the private sector at the expense of the territory of the inhabitants of the Atacama Desert. Moreover, this platform helps to understand the conflicts in the everyday practices of the inhabitants of Toconao. It is causing a constant and systemic violation of human rights, not only through the extraction of mineral resources but also through the massive water demand. This loss of water rights has been the result of granting water rights to third parties through mining concessions (Yáñez & Molina, 2011).

This chapter highlighted the weakness of the state in protecting indigenous communities, which is reflected in the limited oversight by the DGA. On the other hand, the state is active and agile in its relation to the private sector, especially in the delivery of concessions and water rights. This situation is manifested through changes in the forms or practices related to water, responding to the neoliberal logic established by the power dynamics created in the dictatorship. It ignores a vision of the human scale (Max-Neef, 1991), which is sustained in the support of fundamental needs such as autonomy, solidarity, cooperation and local traditions, which are pillars of the Andean culture (Barros, 1997a).

Communities face challenges of being invisible in development models promoted by mining companies. Taking this into account, it is necessary to visualise the different

ways of understanding development and, above all, the various ways to manage water resources. However, as long as the Chilean State continues to provide water rights and mining concessions to private companies, SQM S.A will continue to take advantage of the market model established in the dictatorship and communities will continue to lose rights when captured by these dynamics. Therefore, a paradigm shift is imperative concerning the distribution of natural resources and the protection of communities close to the production centres.

SQM S.A forged its strength at the hands of a dictatorship and managed to accumulate a tremendous political and economic power in the democratic era. Its strength was reinforced by a strategy of legitimation based on its business success; a model to be followed by many of the community members, who benefit from corporate social responsibility programmes. SQM S.A increasingly emphasises assisting localities through its agro-productive development plans, whose primary aim is to promote economic development. However, it does not seriously consider the ancestral cultural heritage of local communities. Overall SQM S.A promotes social programmes, but continues to advance its territorial expansion and search for water resources through mining concessions with an extractivist vision (Gudynas, 2013), which commercialises ancestral water practices.

The chapter showed how the current legislation, established during the dictatorship has not changed over time. However, communities have changed their practices, following the free market laws imposed by the dictatorship, generating fragmentation among the inhabitants of the Atacama Desert. The next chapter, therefore, moves on to analyse the specific case of Toconao through the spatial, temporal and practical changes of its water practices. In so doing, it explores the implication of CSR programme from the mining sector beyond the borders of the hydrosocial territory, in which Toconao is based on solidarity, access and local autonomy.

Chapter 5 Implementation of the corporate social responsibility programme and its effects on solidarity and cooperation

Every story is a travel story – a spatial practice. For that reason, spatial practices concern everyday tactics (De Certeau, 1984: 115)

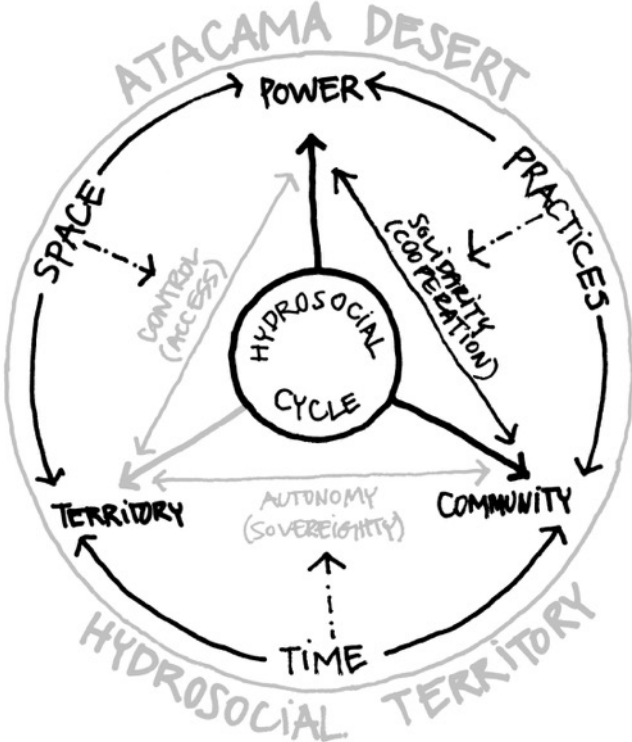
Introduction

In the previous chapter, I developed the data collection strategy that is connected with the frame of reference for my fieldwork. This chapter looks at different aspects of the lack of solidarity and cooperation around water. The objective of this first analytical chapter is to respond to the first research question: How do changes in water management since the implementation of the CSR programme manifest themselves in the use of the canals? This question will be answered through the understanding of the use of the territory and people's practices over time in the context of Toconao. The results are sustained by the observation and interpretation of the irrigation canals and the everyday practices in agricultural seasons. The chapter further analyses cultural and ancestral practices related to water. It starts with a description of lived experiences in the canals, followed by people's interpretations and their ways of relating their experiences to different social dynamics in the village. It finishes with an analysis of these interpretations and their spatial manifestations.

The analysis is structured - as outlined in the analytical framework - along three main elements: Territory, power, and community (Figure 5.1). Several cross-cutting themes emerged during the analysis: reciprocity, self-interest or individualism, engagement, productivity, control, respect and commons. These concepts help to answer the research question in relation to space, time and practices of water. Solidarity and cooperation as well as the respect of Lickanantay culture and its traditions, are the foundational base of the common property regimes of Toconao that are now threatened due to the rapid and profound forces of the external implementation of the CSR programme. This change not only manifested itself in the relationships of the irrigation association; it also extended to community activities that were not related to water.

However, the analysis in this chapter focuses on the use of the space of water, the time dedicated to the canals, and the practices of water.

Figure 5.1 | Structure of analysis - Solidarity



Source: Author based on theoretical framework

The spatial-temporal-practical analysis illustrates the different uses of water in daily, seasonal and annual routines and activities around canals, as well as the traditional activities and social interactions. It reveals how the life of Atacameño inhabitants works in different cycles and how this is manifested in the use of water, its infrastructure and management within the community. Through the process of coding, the concept of solidarity in water management emerged, which was triangulated and analysed by the use of space, time and practices (Figure 5.2). The spaces of analysis are the irrigation canals, orchards and corridors that criss-cross the town of Toconao.

Figure 5.2 | Spatial-temporal-practical analysis of solidarity

	SPACE	TIME	PRACTICES
SOLIDARITY	1. INDIVIDUAL WATER TANKS	1. IRRIGATION SHIFTS	1. TIME FOR MONOCULTURE
	2. NO DAM	2. TIME ON THE LAND	2. CLEANING OF THE CANALS
	3. POOR MAINTENANCE OF THE CANALS	3. DOUBLE WARDEN / DOUBLE CONTROL	3. MORE PROJECTS FOR INDIVIDUALS
	4. NEW MATERIALS	4. CHANGES IN THE REPARTO	

Source: Author

5.1 Solidarity in space

The Andean community is understood as a complex group of practices and social institutions, which belongs to a specific territory (Gundermann & Vergara, 2009). Through the use of spaces of water, it is possible to observe specific practices and activities, where solidarity is manifested in the Andean context. However, this chapter will show evidence of lack of solidarity manifested in the emergence of individual water tanks, the deterioration of a dam, and the lack of maintenance of the canals. This deficiency in spaces of solidarity or lack of spaces for cooperation relates to a lack of reciprocity, which is related to an increase of self-interest or individualism, as well as the importance of being productive. This manifests in little participation in communitarian works, no control in water management and disrespect for local practices or traditions. Together, these factors produce a deterioration of shared spaces. Further, the lack of solidarity materialises in the configuration of some spaces, as well as traditional and local practices.

5.1.1 The emergence of individual water tanks

At a quick glance, individual water tanks are impossible to detect in the territory. It is necessary to access the agricultural fields to find them and see their magnitude. The majority of the tanks emerged as individual initiatives financed through CSR programmes and, in Toconao, through the ATF programme of the mining company SQM S.A. As one Community Leader describes, the implementation of water tanks requires specific actions in their land:

The system is simple, I cleared everything. I do not irrigate anything with the flooding system and here many people do not want to change. Some do their pool and then continue flooding their old orchards, then they do not see that they are using more, twice as much water. The other thing is that if the old thing is not producing, throw it away! Do not waste time on that (David - Community Leader).

Only few farmers without external support also built this type of infrastructure, following the positive results of the ATF programme. They argue that those tanks are particularly useful supporting the early stages of crop cultivation, because they help to avoid the long waiting period of fifteen days between shifts of flood irrigation. These

cases are used to justify the need for more frequent irrigation in the process of plant growth.

The construction of the tanks is done individually, and most farmers externalise the construction work. All '*comuneros*' (farmers), who are part of the ATF programme are obliged to use this type of water accumulation infrastructure, because it is a fundamental part of the drip irrigation process for their grapes. At each irrigation shift, farmers fill their water tanks. However, some continue to irrigate their other crops in the old way through flooding. Those respondents who reported low levels of water in their shifts, also reported issues with the use of individual tanks. According to Daniel, this creates conflicts and misunderstandings especially with those who do not have water tanks, and interpret this action as a double use of water:

Here in Toconao I have water for an hour and a half. Every shift can vary between 15 and 20 days. There are many variables and sometimes it is difficult to calculate the amount of time that you have to irrigate your land. In summer time, people irrigate more, and it is complicated to tell other people that it is not necessary to irrigate more. There are others who irrigate double, can you imagine that? They accumulate water in their tanks, and then when they see the water flows through the canals, they divert the water to their '*melgas*' (Daniel).

The ATF programme is clear in its discourse about the justification of building these water tanks. The discourse is fundamentally framed around saving water, creating sustainability and leading to a better distribution of the water resource, especially in times of drought. However, the construction of water tanks is not simple, and their operation requires a new structure that produces energy to implement a drip irrigation system. In some cases, this is done by a gasoline engine and in others by solar panels. The lining of the water tank contains a layer of industrial PVC and a PVC hose, pipes and connectors of various sizes. A Mining Worker of SQM explains:

For example, with the wine project, as a company we saw that people here have a specific amount of time to use water. They have a shift of water and so on. Therefore, we saw the necessity to help them with the construction of water harvesting tanks, so they can optimise the use of water. They only had water for an hour every twenty days, and with that amount of water the grapes cannot grow in this desert. So, we had to support them with the construction of those tanks, and also with the

implementation of a drip irrigation system. I remember the first time we produced wine, we did not have grapes, so we had to buy grapes from another place. The second time, I remember we brought grapes from the Elqui valley (in central Chile) to produce better wine. And the third time, finally, we made wine with grapes produced here in Toconao. I remember we bought the wine production and we shared the profits of the production (Keng - SQM Mining Worker).

This irrigation structure creates a change in the use of the land and orchards. On the one hand, this happens through the distribution of water in an industrialised way, and on the other, it changes the type of agricultural production. Some farmers have a more commercial and production-oriented vision, and they implemented the drip irrigation system monitored by a computer via the internet. This system has been studied and imported from Israel, where it gives farmers greater autonomy and control over their products. David mentions that his physical presence in the agricultural land becomes less necessary, as his system is managed online.

I have automatic irrigation systems, so I do not have many problems. Also, I have a system that I can oversee on the web. I see online, if the plants are irrigated ... I brought this system from Israel. I bought it and I applied it here ... you are in the desert, and the sand is like a filter where the water goes down. Hence, what I did, I already had the system, I got the Israeli system, which controls you, which is computerised, and it controls when the plant needs water. Therefore, you should keep putting the water in the root that absorbs and feed them right there; it does not need water in the bottom part of the plant. Therefore, the system can still be used here (David - Community Leader).

The construction of water tanks can be understood as part of a political project, a CSR programme from the mining company. It is political because the implementation of tanks is related to the transformations of the territory, and its relation to the hydrological cycle at the local level (Swyngedouw, 2009). Further, there is a transformation of social, economic and cultural power relations. The argument behind the implementation of tanks is part of a whole discourse of development, and a fundamental part of agricultural production on a larger scale. Their construction and use are an individual act, which does not include the benefit of other farmers or the Irrigators' and Farmers' Association of Toconao.

Through daily conversations and interviews, many people argued that water tanks and drip irrigation infrastructure destroy the landscape. Further, those practices take away the centrality of the ancestral systems of irrigation, their distribution and their functioning for the administration of water resources in the village. Water tanks are not part of a larger structure and give benefits only to individual initiatives. According to the interviewees, this type of infrastructure generates a different social dynamic within the community. This social dynamic is possible to see in two ways: on the one hand, the water tanks are implemented with external and private financing, which is related to mining activities. On the other, from the agricultural perspective and related to the discourse of saving water, they are understood as appropriate examples to follow.

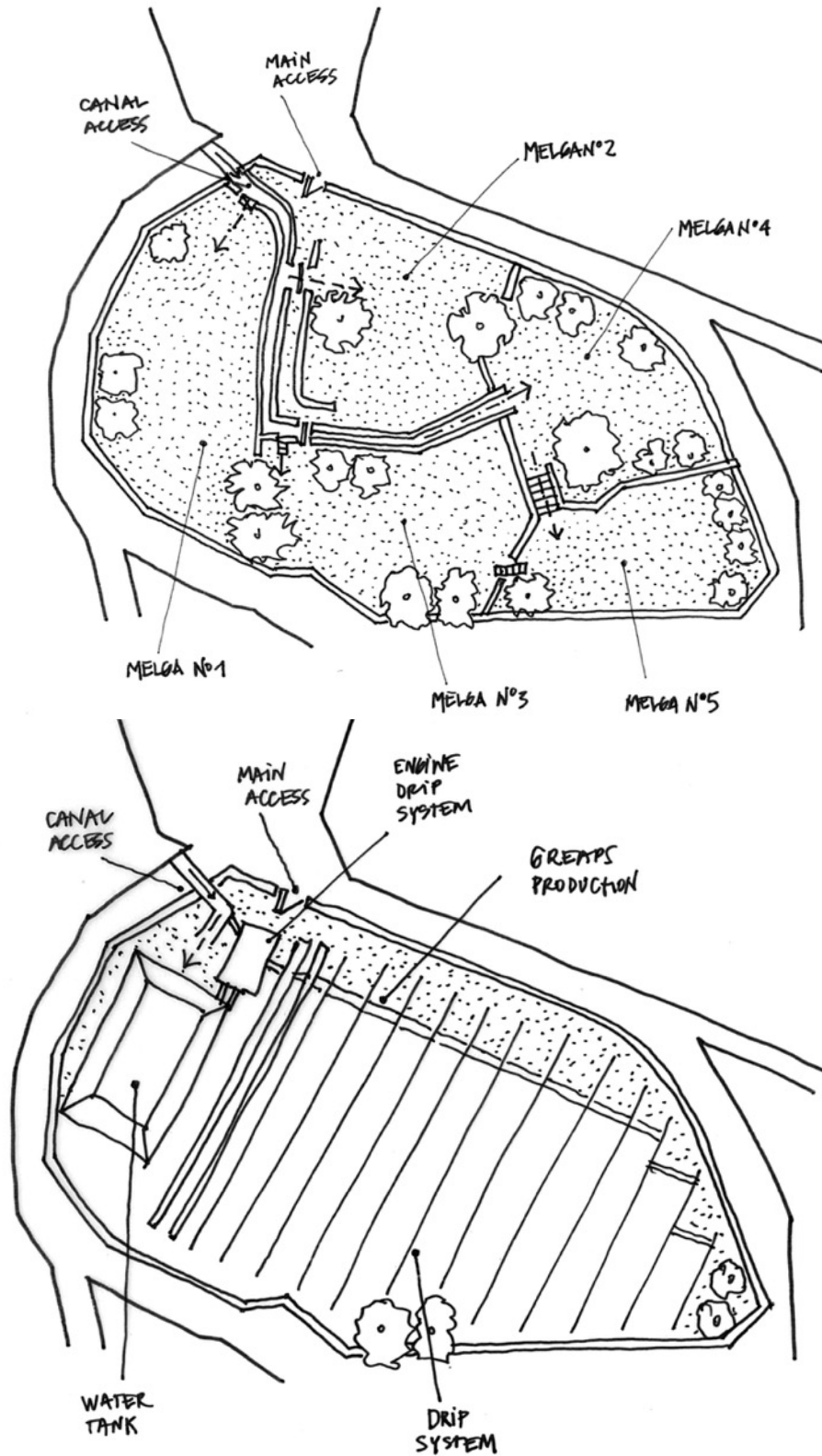
The following evidence shows how water tanks and the use of a new technology also bring about a distinct status for their owners, as most are seen as successful farmers and consequently acquire social power. Considering Foucault's (1980) understanding of power, the accumulation of water in tanks is a manifestation of power combined with knowledge through new technology, which is materialised in the construction of new spaces to develop new agriculture.

I think that there are good people here. People who have a lot to contribute to the town. There is a lot of local knowledge that is manifested in the use of the land, an ancestral knowledge. However, they don't put that knowledge in a collective manner, just in a political form. There are good people, I don't know if you know the Community Leader already? For example, he is like an aeroplane, he flies in terms of generating local development with a sense of identity. He uses new technology, hires people, promotes his products and tries to produce and then he sells it everywhere (Lucas - SQM Mining Worker).

As shown in Figure 5.3, the construction of these water tanks generates a considerable decrease in cultivable space and a re-distribution of the crops. This spatial action facilitates and promotes monoculture and reduces the variety of products that have traditionally been produced in this agricultural land for generations. The distribution and layout of the orchards has been transformed into a spatial circulation, which facilitates the movement and practices associated with the production of grapes. In many cases, I observed that the internal canals were destroyed and that ancestral crops

were eliminated to facilitate the operation of this new drip irrigation system inside the orchards.

Figure 5.3 | Water distribution (flooding versus drip irrigation)



Source: Author based on analysis in the field and Games, 2013

Yes, I did it myself. I use this water accumulation tank to have water when my plants are just starting to grow. At that time, you need to irrigate them more often and I cannot depend on the shift. I know that I lost some cultivable land, but this orchard is small, and I can use it to save water. Anyways, this tank is very small, and it gets full very quickly, it is just a few cubic meters, and I did it myself, I built it myself (Clara).

5.1.2 A malfunctional dam and relationship-building

Approximately 60 years ago, the local dam was built. The construction was funded by the government and promoted by the community leaders of those years. This development of local infrastructure is understood as an influence of the state on isolated localities (Göbel, 2014). However, the lack of maintenance of the dam and lack of engagement with other farmers to distribute water reflects its poor condition. Talking about this issue, an interviewee commented:

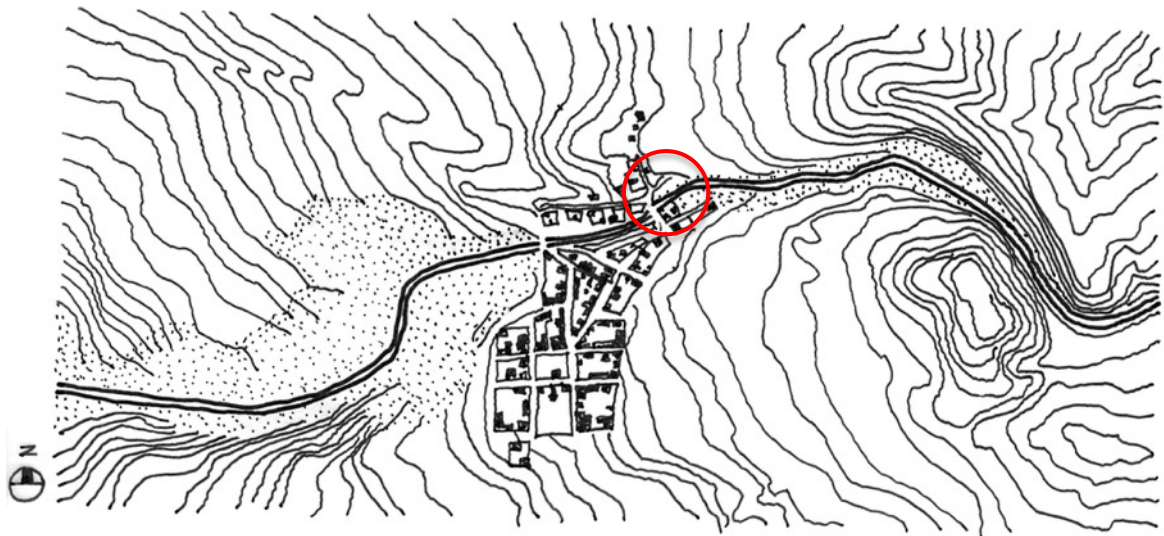
As I said, unfortunately there is no lock in the dam, because previously there was irrigation and it was closed every night and the next day it was opened again...it was used more, we even could go swimming there...the dam is damaged in the floodgates...People from the Head Office of Hydraulic Works (DOH) came, and they did not have funds to make the repairs and that is where we are at. That is also, because we wait for everything to be done for us, the authorities give us everything and we believe in that. Here in the community we could do the job and restore the dam, and then have the water as it was years ago (Karina).

As can be seen from the red circle in Figure 5.4, the dam is located in the middle of the town, separating it into a northern and southern part. The dam allowed to create a structure and it provided a satisfying distribution of water resources for decades. It is managed by the '*celador*', who has the authority to open and close the floodgates and to distribute the water to farmers in the western sector of the town. This distribution is done during the early morning hours, thereby allowing the water to accumulate in the evening hours.

I mentions that the construction of the dam was not only due to agrarian issues or improvements in the irrigation system. It also generated electricity through a turbine system, which is not in use anymore. This provided the town with energy, creating

water and energy autonomy in the village, in a time when the town was disconnected and isolated from the national electricity system.

Figure 5.4 | The location of the dam



Source: Author based on analysis in the field and Games, 2013

As I said the other day, that dam was not made to irrigate. It was made to make the turbines and generate electricity, and at the same time to have potable water. The job was done with the help of the Municipality of Calama. However, I was not there yet in that project, but I know the story because my father and my grandfather told me (Antonio).

The dam was built with local materials and labour coming from the area, funded by the Municipality of Calama. All 25 interviewed farmers feel proud of the effort made by many old members of the Irrigators' and Farmers' Association and their families. The dam was a huge achievement that gave the town the opportunity to control the water and distribute it fairly. However, during the entire year of my fieldwork (2014/15), the dam was not in use. The main reason was the flood in 2012 that partly destroyed it and separated the town physically into two areas.

The destruction of the dam also brought issues related to the lack of control and management of the flows of water, which meant that the irrigation shifts were not respected, and the water got lost at night when orchards were not irrigated. These issues are highly sensitive, especially considering the discourse of being in the most arid desert of the world, while *'botar el agua'*, throwing away the water at night happens. People who have individual water tanks sometimes take advantage of this

situation. Farmers who are part of the *'Atacama Tierra Fértil'* (ATF) programme fill their tanks at night, when there is no control or supervision over the use of water. Not having a working dam has created a space where there is no control. The Irrigators' and Farmers' association calls those actions 'bad practices', which generate conflicts about the equitable distribution of water.

Figure 5.5 | Participatory mapping exercise



Source: Author

The participatory mapping exercise shown in Figure 5.5 revealed that the dam played a fundamental role for the local identity. This was due to its capacity for accumulating water and its technical qualities, as well as its contribution to the local landscape and the identification of the inhabitants with this infrastructure. The participants mentioned that the dam is a local reference element. Its structure and design are a part and demonstration of local efforts, people's capacity of working together and the solidarity of the community.

Furthermore, there is a social component around the space of the dam. The structure was previously used as a recreational space. Many of the elderly adults who participated in the mapping exercise, told me that the dam is understood as a meeting place and for recreation, and is thus a fundamental part of the local culture. Notwithstanding, efforts to improve and maintain it have been scarce.

The exercise of mapping intended to identify habitual routes, points of pleasure (green post-its mean places that people enjoy), discomfort (pink refers to places they detest) and potential (orange refers to places with possibilities of improvement). Each post-it on the map contained only one answer per person in the meeting. There was a recognition of a strong importance of the dam as a connector of the town. The participants agreed that the dam is the spatial amalgam that generates social relations between both sides of the town.

Nevertheless, the deterioration of the dam is mainly due to poor maintenance and lack of cleanliness in the upper part of the Toconao river, where the water enters from the ravine. As mentioned before, this decay has been worsened by the floods in 2012 and increases in water flows, which with the accumulation of garbage and trees have destroyed the floodgates. This led to an accumulation of sand in the lower part of the dam, where water is distributed to the agricultural sectors within the town. Figure 5.6 shows that communitarian work is needed to take the sand off the floodgates. Farmers described this sand as a negative material for crop areas, not only because it blocks the passage of water, but also because it hinders the growth of agriculture. Since the last flooding, a more periodic cleaning through community works was necessary for the maintenance of the canals, as one interviewee said:

During the period when the cleaning is needed or after the flooding, we have to dedicate time to maintain that. If you want to irrigate, you have to help. Like the other day, when a wall fell down in the Toraza sector, and everyone in that sector needed to irrigate. We got together, and everyone from that sector helped to clean the area, someone had to do it (4).

Figure 5.6 | Communitarian works at the dam



Source: Author

Another participant of the mapping activity alluded to the notion of reciprocity, and the necessity of maintaining the dam to get water:

It will be up to all of us, because at the end of the day the canals belong to everyone, the dam belongs to everyone, this affects all of us...I mean, if I am not going to clean, and everything is dirty, I could not irrigate, it is simple. For example, last summer I was for longer than a month without getting water, and that was during the rainy season (Sebastian).

The activity also raised the issue of lack of reciprocity, not just with other farmers, but also with water as a resource for everyone in the town. Therefore, the question here is: what is really the importance of the dam, and what are the underlying reasons that have delayed its repair for so long, beyond the economic arguments? Why do people put more effort into the construction of smaller water tanks and individual work within the orchards compared to the typical labour and solidarity for improving the dam that would benefit all farmers and also the town?

The deterioration of the dam is a deterioration of spaces of cooperation and solidarity. This section has identified an increase of self-interest reflected in the lack of maintenance of the public and common areas, even though they are highly valued by the narratives about their historical, memory and social significance. These findings suggest that it may be useful to consider the relationships of the dam with power, equal distribution of water, and practices that allow it to be an element of local identity.

5.1.3 Poor maintenance and conservation of the canals

In addition to the dam, there is a lack of the maintenance of the irrigation canals and the canal lock gates. In most cases, this is associated with the accumulation of garbage and insufficient cleaning (the practices of cleaning the canals will be explained in a more extensive way in the section related to practices of solidarity). It is possible to observe this issue with the rains of the *'Invierno Boliviano'* (Bolivian winter). This event occurs mostly during the summer season in January and February, and produces is an increase in the water flow by the thaws that go down by the mountains with greater force. The flow brings with it the garbage that has been accumulated at the bottom of the ravines during the year. This garbage is composed of trunks, stones, plastic bags and trash, and it is deposited in the village. It stagnates in the canals and the canal lock gates and therefore inhibits a normal and clean passage of the water for the crops as Figure 5.7 shows. According to a participant in the photo workshop, the causes of these problems are the structural aspects of the canals. Moreover, they cause social conflict, because people with orchards in the higher part of the town get better quality and quantity of water than people in the lower sector. Therefore, only some farmers have access to a clean resource.

Figure 5.7 | Water and garbage



Source: Rodrigo

To solve these emergencies, the legal statutes of the Irrigators' and Farmers' Association of the town stipulated the establishment of community work, where members form working groups with specific tasks. In some cases, these groups were made up of farmers who were affected by the rains, or those who did not participate in the cleaning of the canals and who therefore must fulfil their responsibility in emergency activities. The association also handles an emergency budget, which is used to pay for construction material and to pay workers who support the cleaning and maintenance of the canals.

In addition to managing a budget, the association also develops various types of projects, and its committee is evaluated by the quantity and quality of acquired projects. These initiatives are technically monitored and sometimes financed by the Ministry of Agriculture, and more specifically by the CNR (National Irrigation Commission), CONADI (National Corporation for Indigenous Development) and the municipality. The community also has some funds, which might be used for maintenance initiatives.

All interviewed farmers agreed that the most significant activity in the area of the Atacameño culture concerning the maintenance and care of water is the *'limpieza de canales'* (the cleaning of the canals), which takes place once a year, usually between August and November. The date depends on the traditions of each village as well as people's time and availability. This activity is a tradition and a ritual of cleanliness, where all the members of the association take part. It is a festivity about water, which re-occurs with the annual cycle of water, and encloses the deepest Atacameño spirit before the Spanish colonisation (Nuñez, 2007).

Beyond its importance for the maintenance of the canals, cleaning is a fundamental activity for the social cohesion of the community and it forms part of the worldview. The collective work for the cleaning of irrigation canals is accompanied by ceremonial acts of offerings to the water, commonly called *'pagos'* (payments) (Prieto, 2016c). Bolados & Babidge (2017) argue that the cleaning of the canals is a communitarian activity which reaffirms the forms of belonging to the community, the politics and the identity of the town in a social space. Even in situations of subordination and asymmetry it is possible to negotiate the control of water and land (Bolados & Babidge, 2017). However, according to elderly farmers, the cleaning of the canals has lost its importance in social terms. Fewer people are participating in this activity and many delegate their responsibilities by paying external workers to carry out the maintenance works.

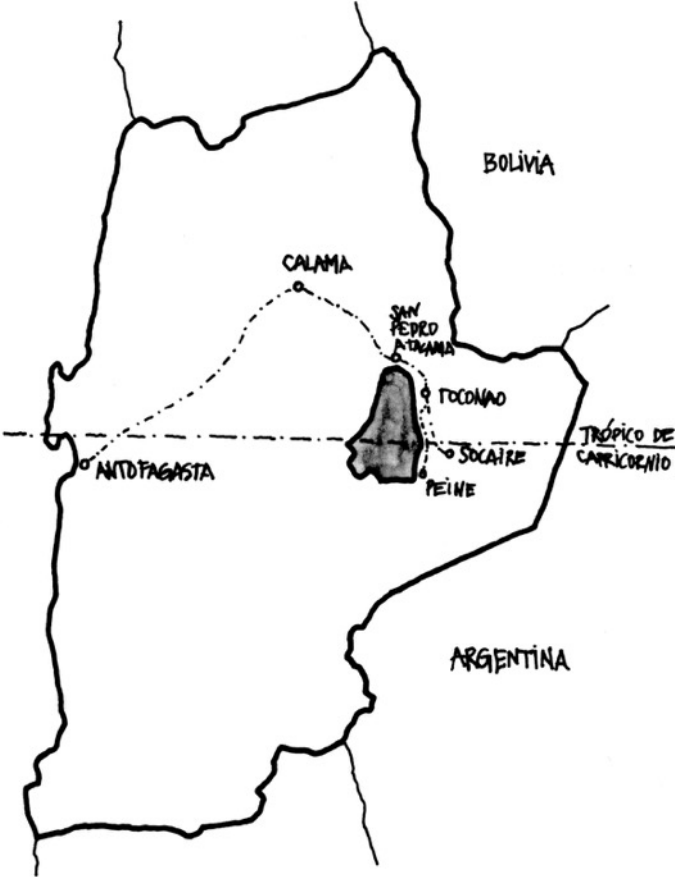
Nowadays we understand the cleaning of the canals as something more punctual, very simple and technical. I reckon we are not managing the topic as a real concept, as it was in its origins. I think when our ancestors cleaned the canals, the main objective was not just to clean them. It was more important to share, to enjoy, because there are other things apart from the cleaning itself. Instead we now just go there to clean our piece of land and then we leave as soon as we can. That is something that we can observe over time (Teresa).

The quote of the interview above illustrates that the lack of maintenance of the canals is associated with the low interest of farmers in collective issues and community work. Individual efforts for productive work are executed only inside each orchard, while deterioration occurs in public spaces and areas of community use. According to the president of the Irrigators' and Farmers' Association of Toconao, other communities

around the Atacama Salt Lake maintain these traditions more vividly. They emphasise the need to pass on and maintain local traditions. In the case of the communities of Peine and Socaire, which are marked with a red dot in Figure 5.8 in close proximity to Toconao, collective activities are part of a water cycle and represent a return to ‘Mother Earth’.

To me now, it is different to how it was before. There is a different objective. Now we have canals made of cement or PVC pipes, there are practically no canals. Before, traditionally, we had to really clean, cut and extract the moss and everything. We also had to channel the water, ok? Now, we take the sand off, and that’s it. It is alright, we keep the tradition, but the real tradition of cleaning the canals was to channel the river, and that is already lost. It is different in other communities like Peine or Socaire, they keep the tradition, it is a different story (David - Community Leader)

Figure 5.8 | Map of localities



Source: Author based on Google maps

According to the statutes of the Irrigators' and Farmers' Association of Toconao, the maintenance of the canals depends on the administration of its committee and relies on the priorities that their leaders give to these spaces. These priorities are reflected in public water spaces such as corridors or passageways. However, at the time of the fieldwork, the president of the association was very focused on the productive issue because he was part of the ATF programme and his interest was to promote it. This situation generated discussions within the association, because other farmers said that his personal interests were above those of the collective group.

To summarise, for many interviewees, the maintenance of the canals and the dam is not just an act of cleaning the spaces where water flows. It is also an activity that represents their culture and identity and creates spaces of solidarity and being together. However, farmers of ATF programme do not see these activities as an act of maintaining traditions, while the main objective for them is to keep the canals clean.

5.1.4 New materials and the encapsulation of water

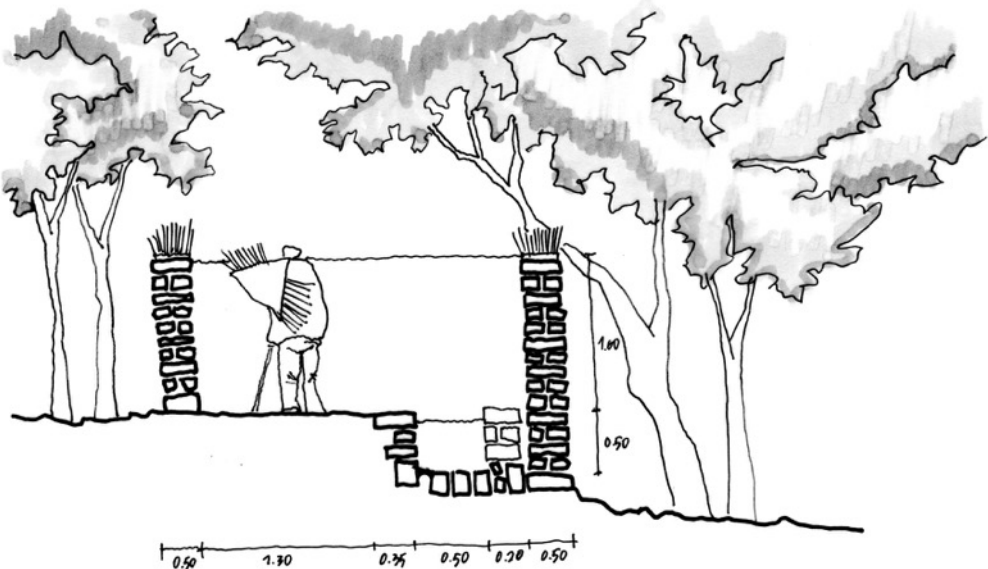
Like all architectural works, the construction and development of the canals is a process that is modified as it incorporates new technologies. Farmers, who work every day in the canal, stated that the design and construction of canals in Toconao was done by their ancestors. It followed their expertise and experience of the territory. They constructed ditches and borders of the canals with simple tools, which created a path for the river and waterways. This work evolved especially in regard to how water was contained and distributed through the use of rocks and stones that allowed people to stop or to change the course of the water.

This type of construction and the use of local materials created a quick way of providing solutions, especially because the materials were readily available. However, the maintenance of the quality of the material of the canals requires continuous work and large amounts of time allocated to them.

Traditional irrigation basically means flooding the land, and this type of irrigation does not require major changes in the mechanisms of channelling water. One significant change in the canal structures happened in the 1960s, when the central government

funded and technically supported the construction process that was implemented by the national army. This transformation involved the incorporation of concrete cement canals, which provided a more efficient use of the water because they avoided its evaporation and losses through infiltration in this arid territory. All interviewed farmers indicated that this innovation also allowed to accelerate irrigation times. Hence, the period between irrigation shifts was shortened, which in turn prevented the crops from drying and increased agricultural production.

Figure 5.9 | Configuration of the irrigation canals



Source: Author based on Games, 2013

The water canal system not only allows the water to be used for agricultural purposes, but also takes advantage of the ravines and the asymmetry of the geography of the territory. Thus, it is possible to channel the water directly from the rivers, which through gravity give speed to the water flow. The use of cement in the canals allowed to shape and improve the water intakes in terms of the point of arrival and reception of water, and to construct steel gates that would replace the use of stones. Figure 5.9 shows that the dimensions of the canals allow the use of a shovel, which is 30 to 50 centimetres wide and is needed when farmers take the sand off the canals to keep them

clean. The canal lock gates are made of steel, sometimes with recycled oil drums, which are cut into the sizes of the compartments and the distribution space. The canals are 50 by 50 centimetres, with a thickness of 20 to 35 centimetres. At the time of fieldwork, all were built with stone and concrete.

The incorporation of these materials improved the distribution and use of the water resource, as well as the maintenance and the organisation of the times of irrigation. When less maintenance is required, farmers need to spend less time in the irrigation canals, which translates into a longer time they can spend working in the orchards. Currently, PVC pipes are being incorporated as Figure 5.10 shows. Several interviewees mentioned that this action of channelling the water in a tube, mostly above or at the level of the terrain, has several contradictions. On the one hand, it avoids evaporation and improves times between shifts. Its implementation is simpler and provides savings in construction time. On the other hand, these tubes are not connected to the local landscape and represent structures of industrial construction and mining.

Figure 5.10 | Irrigation pipes



Source: Author

These structures were also used to provide quick and efficient solutions in times of emergency. Thus, they were appreciated especially after the big flood of 2012. This observation may support the hypothesis that the materiality pervades the local landscape, destroys the harmony and does not respect and promote the traditional forms of canal construction. Nevertheless, several farmers have been using these materials in their orchards as permanent solutions. The ATF programme has also promoted the use of these materials arguing that they increase efficiency in water use. When mining workers of the ATF programme were asked about these materials, they justified the implementation as a way of supporting the farmers' initiatives. Hence, these structures bring about a technical improvement, but at the cost of changing the local materials and connection with the environment.

Despite all changes in the materiality and construction of irrigation canals, water in some parts keeps its own trajectory (Figure 5.11).

Figure 5.11 | Different types of infrastructure



Source: Author

We have been supporting their initiatives. A few things we have done with the concept of '*minga*', which they call a kind of communitarian work. For example, with the grape plantation, cleaning of their orchards, etc. We have done it in that way. In some moments, where they have some issues with the canals, we have been collaborating with them. For example, after the flood in the Jere ravine. In other places as well, when it is difficult to get water, especially in the low part of the town. We helped them with the water delivery, with pipe installation, and so on. With our support, they can keep the irrigation, or they would lose everything, you know (Lucas - SQM Mining Worker).

As said, the use of PVC pipes covers water and protects it (Figure 5.12). Their implementation also reduces the sound of water coming from the mountains. This action reflects therefore a separation and isolation of people's sensory relationship with water. One interviewee argued that:

The sound is different, it changes in winter and summer time, but now it is different. When you are approaching your orchards, actually it does not sound the same as before, and that is because the canals were intervened through a project to improve this area after the flooding. Therefore, there is not the same sound anymore, it is reduced. However, being very pragmatic, the canal was fixed, and now the fruit trees have enough water to grow (Esteban).

Figure 5.12 | Pipe system



Source: Author

Observations confirmed that it is no longer possible to see how water flows in some parts of the canals. Water simply fulfils the productive function of providing the resource that farmers need for their products. This observation affirms the hypothesis that there is a loss of a sensory relationship and the core understanding of where the water comes from, and how it passes through the territory. The encapsulation of water

removes the sensorial and poetic connection of people with water, defining it as an object that is breaking with the local worldview of '*cosmovision*' and the spiritual interpretation. Repeatedly, interviewees said that 'water is life'. Strang (2004) argues that the image and meaning of water plays an important form in the construction of people's identity at the individual and community level. However, having water encapsulated and tubed does not allow for appreciating the development of life in this desert. Therefore, I argue that channelling water in pipes represents a way of encapsulating people's identity.

5.2 Solidarity over time

Territorial expression is represented by social relations constructed through mutual respect, cooperation, solidarity and equality (Delaney, 2009). These expressions of territoriality are connected with relations of hierarchy, cooperation and solidarity that reflect power. Gundermann and Gonzalez (1995) argue that there is a crisis of leadership not just regarding an individual figure, it also manifests in a break in the connection of the social relationships, especially in communitarian works. The majority of interviewees agreed with the statement that the lack of cooperation and solidarity reflect deficiency on territorial expression. Territorial expression relates to social elements such as music, dance, rituals, symbolic payments to the water and earth. These elements are expressions of maintenance of culture and demonstrate that heritage need not be related to productive activity, but to *cosmovision*. This section analyses solidarity and cooperation in relation to changes in the times of shifts, the reduction of time in the canals as well as the individual orchards. The ways of control over the use of water and changes in the distribution of water are one of the fundamental objectives of the Irrigators' and Farmers' Association.

In the following section, the focus is on the consequences of changes in solidarity in traditional activities, but also in everyday practices, and how those changes transform people's identity. The following examples focus on the use of the irrigation canals to illustrate how those changes manifest themselves.

5.2.1 Irrigation shifts

As mentioned in the previous section, the problems and deficiencies in water infrastructure – and specifically the damage of the dam – have caused several changes in the distribution of water. These changes are reflected in the times of irrigation and the constantly decreasing quantity and sometimes quality of the water to irrigate the orchards. According to farmers, there are differences in the irrigation shifts during different seasons:

For example, in winter time, you can irrigate whenever you wish to do so. At this time, not much water is required. However, now, when spring and summer are coming, it is getting hotter and warmer. There are fruits that require more water, and we irrigate with a system of shifts, every twelve or fifteen days, something like that (Karina).

Irrigation times are defined by the size of the orchard that each farmer owns. The distribution is based on a formula, which was discussed in the Irrigators' and Farmers' Association in order to organise their times to irrigate their orchards. According to the president of the Irrigators' and Farmers' Association, the amount of water that every farmer receives is related to the amount of land they own; two hours per quarter of a hectare. This amount of time is controlled by a water controller: the '*celador*'.

During shifts, the '*celador*' goes around, advising at certain times...I have almost an hour...I have an orchard down there that is part of my family, and my mum's is up there...one hour for both, but I don't have everything cultivated. Not everything is cultivated (Sabine)

The '*celador*' is responsible for the supervision and the delivery of water at the agreed times. The following section (5.2.3) will elaborate in more detail on the role, routines and the election of the '*celador*' in the Irrigators' and Farmers' Association. Sometimes this schedule is not respected, especially when the '*celador*' is not in the village. According to the secretary of the Irrigators' and Farmers' Association, some farmers take advantage and irrigate more or take more time than what corresponds to their allowance. The secretary stated that some farmers open the gates ahead of time, thereby delaying or reducing other farmers' times. This causes conflicts especially considering that the dam is not working.

It depended on the '*celador*'. Because if he is good at managing the water, we can irrigate every fifteen, eighteen days...there are orchards that have just a few minutes, some have half an hour, others twenty-eight minutes, it depends. But those times have to be exact. The biggest orchard, for example, the big one that we have, it got two hours twenty-four minutes, that is what we had... (Sabine).

During the fieldwork, the position of the '*celador*' changed twice and the leaders of the Committee of Rural Potable Water and the Irrigators' and Farmers' Association of Toconao changed as well. In many cases, the farmer's property was not fully formalised, and they were in the process of formalisation. This often happened due to the death of the owner and the long process for legal successors to deal with the property, which is a frequent problem not only in this town. All interviewed farmers reported that everyone respects the informal rights of inheritance. However, they require consent from their families to have access to these lands; hence, each heir has access to water and corresponding irrigation times according to the size of the land. Therefore, there are farmers who have access to water despite the fact that the land titles are not fully formalised. However, a considerable portion of the respondents, who are still in this process, may not have or opt for representative positions in the town's committees due to their lack of legal documentation.

I am still in a process, with both of my lands, since one thousand years (joking). Here is one that is still public land... and the other one is in process. The one that is at the top, the ancestral one, this one is in the name of my great-grandmother, and we are doing all the paperwork to have the titles. Supposedly, it is going to be in my mom's name, and then we will inherit it or at least we can buy it. However, as I said before, I do not have that yet. I do not feel that this is necessary while this is within my nuclear family, it is perfect...there is no problem (Francisco).

The overall response of the interviewees affirms that the process for obtaining land titles requires a lot of time, because of the old age of the documents and the large number of heirs and subdivisions of the orchards. Not all heirs are involved in agriculture, so it is very common to see people selling and renting their land to other family members without any existing documentation or contracts. According to elderly farmers, many people sell their land, because the plots are small and restricted to short irrigation times, which does not allow to make these orchards productive and economically interesting.

The relationship between the amount of land and irrigation times has generated an imbalance in the production and the economic development of orchards. There is a common vision of creating a business, which most of the social programmes and local financing programmes have. According to experienced and elderly farmers, there is a clash between the different views and the relationships that farmers have with their orchards. They observe a general loss in emotional value that previously existed in various sectors, a change in the meaning of owning land, and in the processes of how these spaces were obtained or inherited.

He inherited it, everything was inherited. This house as well. Over there, where my daughter lives, also. Everything was an inheritance, from their parents, for the help that they provided in the orchards, and they got it as a wedding gift. They said that they worked with '*mingas*', those rooms, with '*mingas*', but I do not remember, I came to live here when everything was done (Sabine).

The records of the Irrigators' and Farmers' Association of Toconao shows a cultivable area of 92 hectares in the town. At present, about 46.5 hectares are used by a total of 238 registered farmers. Although the number of registered farmers has grown over the last decade, the secretary of the Association argued that many of them are no longer actively engaged in agriculture, because they have died, moved away or sold their lands and the list of active farmers has not been updated.

The agricultural lands and orchards are of various sizes ranging from 63 m² to 13,435 m². Wine-producing farmers generally use larger orchards. The smallest orchards are subdivisions of family gardens, where arable space has been reduced due to inheritance. Many of these small orchards are sold or rented by their owners, as they are not economically productive. The owners of these small lands do not usually live in the village and are engaged in other activities. However, according to the statutes of the Irrigators' and Farmers' Association of Toconao, every farmer who sells, buys or rents, must belong to the indigenous community of Toconao and the Lickanantay culture.

The number of farmers on paper has grown, therefore the time between each shift has increased as well. According to David (Community Leader), in earlier days farmers

watered their orchards every 15 days and currently every 20-23 days. This motivates many farmers to build water tanks, so they are able to distribute the water of each shift in a more efficient way. This helps farmers to avoid losses or low-quality harvests for the subsequent sales.

I have water for 25 days, if it exceeds the 25th day, then I have problems with water. But now there is no problem, because the water is wasted. What is happening is that people are not very interested in agriculture, the point is that we are wasting water. Today you can see wasted orchards, or people just irrigating weed...why don't you try to plant trees, fruits trees and I can buy it, at least harvest quince (David - Community Leader)

Another element to consider are farmers who legally own agricultural land and have access to water, but have left their orchards because they are living outside the village. Sabine mentioned that it is common to see farmers buying or renting their shifts or irrigation times or taking advantage of those waters that are not used. They argue this use simply by having the right of living in the village and they are maintaining these traditional practices. This creates confusion and sometimes disputes about the wasted and unused water (*'agua botada'*), mainly because of a lack of clarity and regulation. Active farmers complain that some plots are irrigated without being productive. They debate about productivity and what should or should not be cultivated on the land.

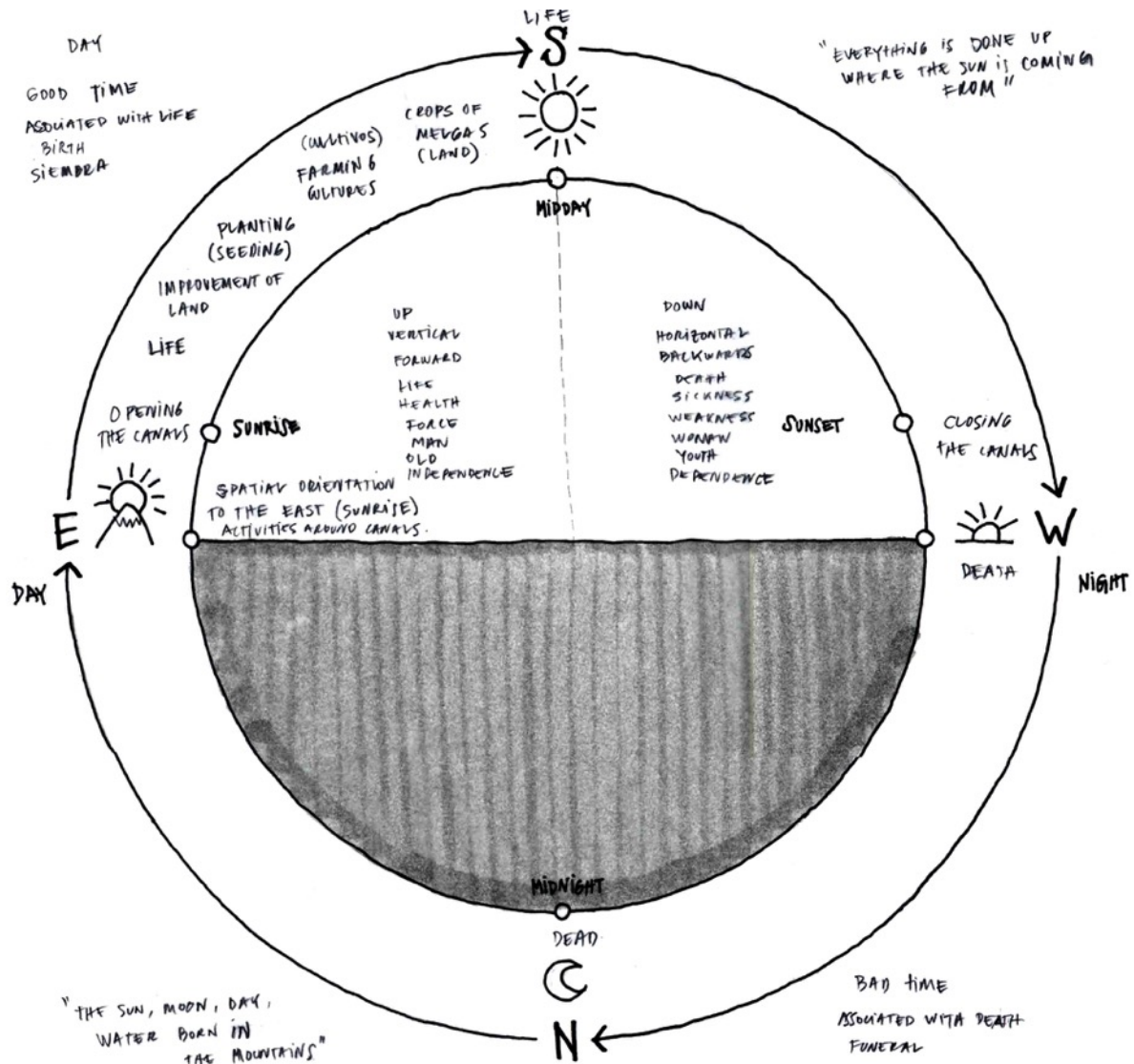
He was not a supporter of the quince tree. When we were in the 'Cali sector', in the land that has a lot of water, he had many grapevines, the good ones... and he saw me sowing quince, and he came and said to me: 'Why are you sowing that here?' and I reply: 'Because this tree gives me lots of fruits, and there is a lot of space to sow more over there as well. He said to me: 'That is the plant of lazy people' (Antonio).

5.2.2 Spending time on the land

In addition to the increasing time between irrigation shifts, there is also a reduction in the time farmers spend on their land. Normally, there is not much presence or constant exposure to the territory due to extreme climatic conditions. Radiation during the day in summer and cold nights in winter provoke farmers to create their own strategies for irrigating their land at specific times. As shown in Figure 5.13, irrigation begins very early in the morning when the sun rises, and water descends from the mountains. The

'celador' opens the flood gates early morning and shifts start in the orchards close to the beginning of the water intake. Hidalgo & Grebe (1988) argue that this practice, associated with the Atacameño culture, is part of its symbolism, relating the cycles of the day to the cycles of water.

Figure 5.13 | Everyday routines



Source: Author

According to the Andean symbolism of the cycle of water, its time represents a specific period of exposure to the territory. The beginning of the day is interpreted as the birth of water and nights as death or descent of it. This understanding implies that the farmer is not exposed to extreme conditions in his daily tasks. However, this tradition has been adapted in response to the new products that are growing and their different conditions.

Figure 5.14 reveals that the territory of Toconao has been marked by the movement of its inhabitants as well as their activities, following the idea of a cycle represented in the Figure 5.13. Figure 5.14 shows the route of people going up to the mountain to capture better foliage for the livestock, or going down to the mining centres; the movement of going down and up to the orchards for their agricultural practices, crossed horizontally by the irrigation canals that start from the mountain and finish in the Atacama Salt Lake, where mining activities take place. Interestingly, David argued that they move from one activity to another depending on the economic situation. Retired people from the mining sector come back to the town doing agricultural activities, and the young generation goes down to the mining sector for better opportunities.

I do a lot of things. I work in the orchards; agriculture is my passion...it is difficult to do agriculture here in the desert and I had to put a lot of money into it. I was the first one to bring the drip irrigation system to Toconao, and I brought it 92'-91', something like that. I came back to Toconao after working in the mining sector, and I decided to dedicate myself to agriculture (David - Community Leader).

The participants of the ATF programme argued that the required time in the territory decreased significantly when the drip irrigation systems were implemented. The system allows for a more exact control of the times and quantities of water, fertilisers and pest control. The traditional work of opening the floodgates, arranging the '*melgas*' and making an in-situ distribution of water notably decreased. The replacement of traditional practices with agricultural automation systems reduces the time spent in orchards. Some farmers even manage their irrigation shifts and crops through online applications. This creates a separation or division of traditional practices of water and a new pattern in the daily work around the orchards. According to Francisco, this change allows farmers, who are associated with wine production, to have more time for other activities with more flexibility and different dynamics in their daily life.

I am not around the canals every day, because I am not irrigating every day and I don't have to irrigate everything. I don't have enough time and water to do it. I reckon I spend about 25-30% of my time in the orchards, the rest of the time I am doing jam, and other things. Also, I like to spend time with my daughters. I have a small production of worms, so I do that

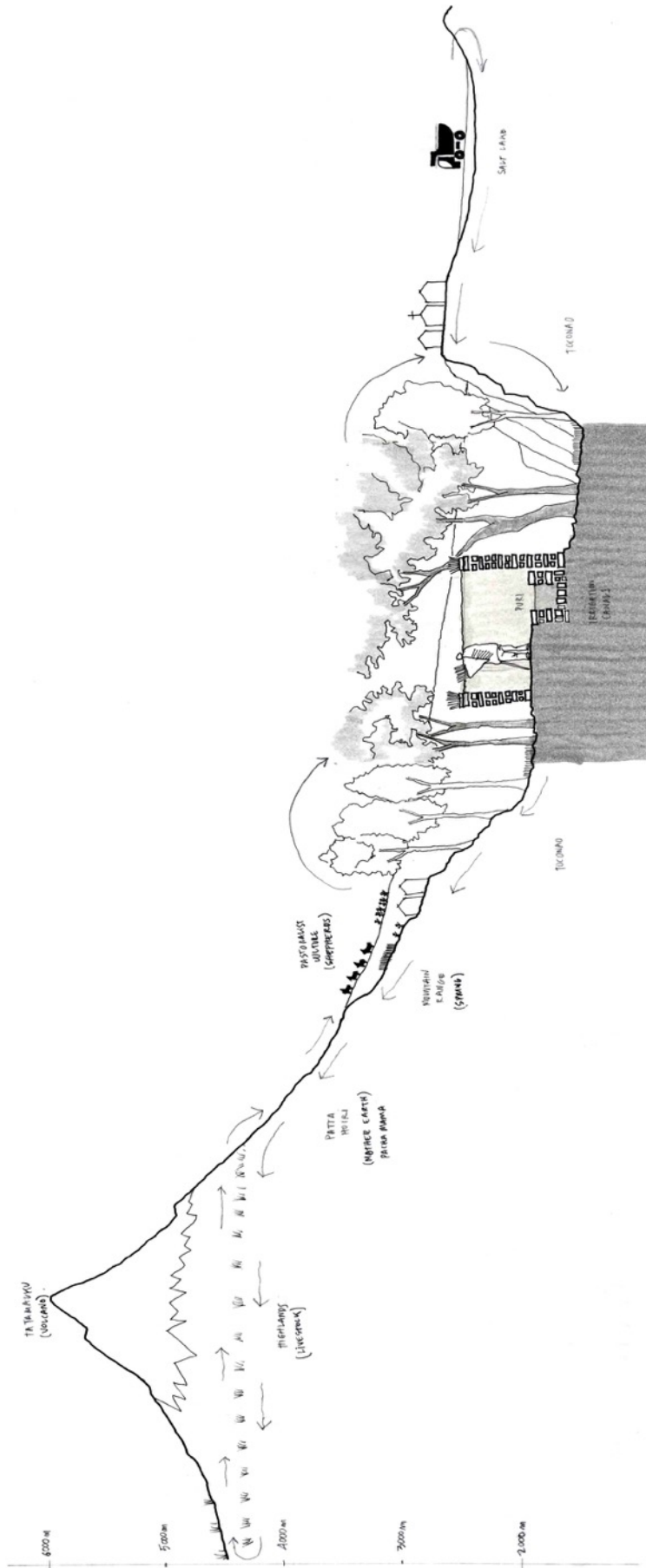
as well. I think, I basically spend my time in the orchard with the distribution of water and the irrigation system. I am implementing a drip irrigation system in the 'Zapar sector', and I have to go there every day to turn on the pump and check the pipes. So that is the time that I require now. I think that is the big amount of time in the orchards, more or less 30% of my time, something like that (Francisco).

ATF's farmers require more support, especially labour, in times of the implementation of the system or during the harvest. The majority of the workers or '*peones*' come from Bolivia, looking for new opportunities. Farmers who are not part of the ATF programme argued that farmers involved with the wine production take advantage of their situation, because foreign labour is cheaper than local workers, and many of them already have experience in farming. Bolivian immigrants are young workers, who arrive in Toconao during sowing and harvesting season. They usually live with the owners of the orchards as part of their payment. Even though these workers perform essential water-related practices, they remain excluded from the social structure of the town.

There are many young people, who have been lost to alcohol, and here the workforce is super expensive. So, last year I had to hire people from Bolivia. It is easy, you go with them to the orchards, and you create a small contract depending of what they have to do. I give them the instructions and they work alone, they are good workers, they know what to do. However, locals do not have an idea, they do not have experience, some have never worked in agriculture (Julia).

It is possible to observe this situation in the cleaning of the canals. The lack of farmers working on their land and the participation of landowners is very low. Therefore, this work is delegated to external workers are hired for this purpose. The external workers execute the job according to the responsibilities that all farmers of the irrigation association are committed to, organised by the association. Some farmers pay the agreed penalty fee for the absence and non-presence of their workers in communitarian works. There is no conflict resulting from the non-participation and non-compliance of rules. Nevertheless, the ways of executing the work and the lack of presence of farmers in the territory worries the association's leaders.

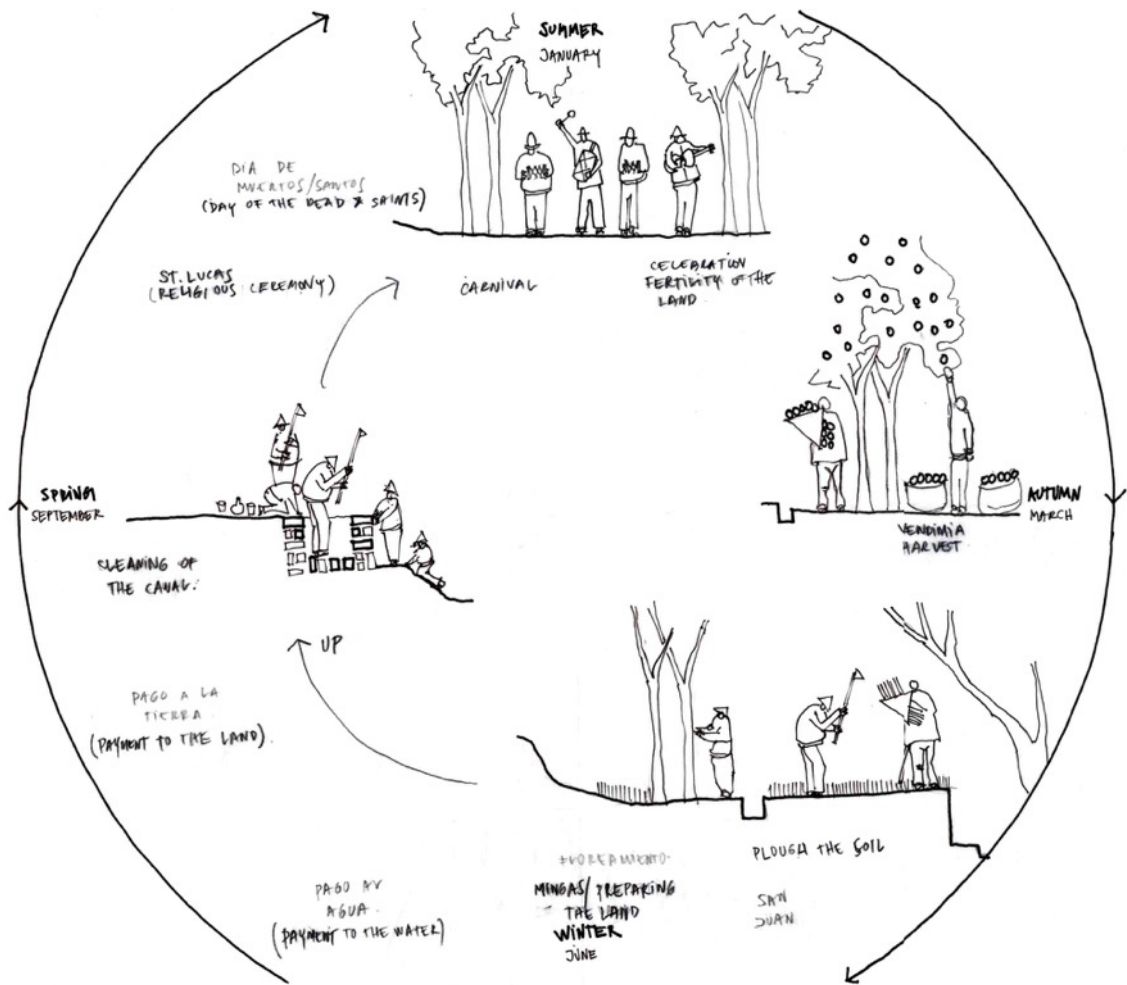
Figure 5.14 | Practices in the Atacama territory



Source: Author based on Hidalgo & Grebe (1988)

The period of time when farmers need external help is connected with the agricultural season shown in Figure 5.15. Activities start in winter time with the ritual of payment to water and to ‘Mother Earth’ and the ploughing of the soil. The cleaning of the canals happens in spring, which is connected to the celebration of the day of the dead and saints. Summer time sees the celebration of the fertility of the land through the carnival and finishes with the harvest at the end of March.

Figure 5.15 | Seasonal and annual routines



Source: Author based on fieldworks notes

The absence of workers and farmers is increasingly evident in spaces of community participation and the internalisation of individual works within the limits of the orchards. However, the presence of farmers in the decision-making spheres is increasing. This is manifested in their participation in steering committees of water

associations, rural drinking water committees, and the community association. This increases their power in the decision-making processes linked to water issues such as irrigation times, control, internal management, and solutions to internal problems or negotiations with the private sector.

I have not seen it on an everyday basis, only in the assembly you can see it... You know, and it is very important that people who criticise us do not live here, that is very important. It is clear that lots of people come from Calama, lots of them, and of course they have a vision of people that come from Calama (urban areas). And they always oppose without seeing the other side of the discussion, they do not listen, that is what I mean. So, they have never been here... of course, when they arrive and the assembly finishes, they stay until Sunday and then they leave on Monday, then you never see them again... for that reason there are more discussions and participation in the meetings and not in the everyday (Francisco)

5.2.3 Double warden, double control

In order to have more control over the use and distribution of water, especially in small scale canals in the Andes, the role of the '*celador*' is essential. As said, the '*celador*' is the person in charge and the representative of the community leaders in the field, who is controlling and observing that the statutes of the association are met. Moreover, every farmer has the same right of voice and vote in the assembly of Irrigators' and Farmers' Association independently of the amount of land and water, and the right to democratically elect leaders and '*celadores*', who are responsible for the management of different collective works: to distribute the water, to charge fees and to apply penalties (Cuadra, 2000).

The '*celador*' also schedules the irrigation times of the farmers in relation to the area they own. His daily routine is mostly a work on the ground, following the water downstream through the irrigation canals, opening the canal lock gates and distributing the water. Likewise, the '*celador*' must deal with the daily problems of distribution and control the times of water use. Additional to the important role of the '*celador*' in the territory, he is the worker whom the entire community trusts and whom they respect for his fundamental work with the water. Generally, the position is taken by people with experience in water management, who are deemed reliable.

In the fieldwork, it was possible to observe two different periods of '*celadores*'. During the first one, Fernanda was in charge of water distribution. He is an experienced farmer, who for almost 20 years fulfilled this role. He is about 80 years old and a representative of the customs and agricultural traditions of the town of Toconao. With two decades in charge of these functions, Fernanda fulfilled his role without major difficulties. These roles were previously unpaid, and the rotation of this function between different farmers was supposed to provide more participation and opportunities for an open democratic exercise of the members of the Irrigators' and Farmers' Association. Due to the low participation of people in these functions, the Irrigators' and Farmers' Association decided that this and other work should be paid. This decision was justified by the small number of farmers in the village and the constant migration of the population, as well as the little interest of younger generations in agricultural work. I participated in one meeting of the association, where I noticed that nobody wanted to be a '*celador*'. Hence, they had to pay someone to work in the canals, through creating an attractive position through the implementation of mining shifts.

There was a period of time without a '*celador*', which meant that it was necessary to call extraordinary meetings to manage this gap. Some interviewees argued that the poor conditions of the dam and insufficient control of the water increased 'bad practices' of water use of those farmers who do not respect the irrigation times. This concerned especially farmers accumulating water in private tanks located inside their orchards who irrigated their land twice through the flood system plus the drip irrigation. The majority of interviewees stated that 'bad practices' increased because farmers were irrigating their orchards during the day in their corresponding shifts, and additionally during the night, because there was not enough control. Farmers who irrigated during night time justified these actions by the lack of a working dam. This lack did not allow them to accumulate water, leaving the river flowing and wasting its flow. This action or 'bad practice' is commonly referred to as '*botar el agua*' (wasting the water).

There are many orchards that are abandoned. There are people that fight for their irrigation time. They say: 'I want my time, I want my time', but if you get inside the orchard of those people, they just have weed,

nothing productive, and they have an hour, maybe two hours of water, but at the end they are wasting the water irrigating weed. Some of them made the edges of their *'melgas'* higher, so they can put more water on them. But they irrigate at 2PM, and at that time it is very hot...I don't understand those people. Now, I don't care anymore, and I go to irrigate at night. I go to my orchards with a lantern and I can irrigate peacefully, nobody bothers me, and I can also irrigate more (Martin).

The *'celador'* is also the person who makes a large number of decisions about water in the canals. Those decisions range from counting the irrigation shifts, delivering more time for water use depending on water flows, maintenance and prohibition of the use of the canals for repairs. According to elderly farmers, who stay longer in the field have their voice more respected than those who are not around the canals. Day-to-day decisions can be discussed with the farmers in the orchards, but not necessarily in an assembly or the steering committee. Therefore, these everyday decisions can be seen as a sort of informal resolution with several consequences for the day-to-day use of water.

The absence of the *'celador'* and the constant demands of the farmers regarding a fair and equitable distribution of water led the Irrigators' and Farmers' Association to tender the position of *'celador'*. The invitation to apply for this position was even extended to people from other communities or towns and its economic conditions were improved. It became competitive with the salaries of the private sector, especially the mining sector, and allowed the *'celador'* to stay permanently in the locality.

A unique decision was made in the community and two *'celadores'* (who were also cousins) were hired. The working hours were distributed as shifts, which is similar to the way work in the mining projects is organised. *'7x7'* was the modality of the shift, which meant 7 days of continuous work and 7 days of resting. Some interviewees argued that this was an extraordinary idea, especially to control the distribution of water as well as the time of each shift.

To put two *'celadores'* in place, that is good, because we have not seen that in other places, at least here in the community. They are supposed to control the water. At least on paper this looks fine. However, we need more control throughout the entire year, the other six months, I mean the other six months the water is wasted (winter time), there is no control

there. Sometimes I got the water and suddenly they took the water from me. Now with the '*celadores*' we have, they should control that (Sebastian).

This decision implicated an increase in the monthly fees that every farmer has to pay. However, some interviewees argued that this decision should have a focus on the increment of shared responsibility instead of raising the participation fees.

There are people like that, who complain all the time. But also, some who do not talk much, especially in the assembly. Next time I will be very honest with them (referring to the directive). I know that I haven't been in the last meetings, however I am worried about the participation fees. Now we have to pay more, because we need money to pay for a '*celador*'. Last year we did not have a '*celador*', we didn't have one. However, we started to get coordinated and we were managing the water in the field like 'hey, today the water starts in this sector or today it is your turn'; we started to communicate with each other. In this sense, it was super good. Actually, some farmers liked the idea and they wanted to continue in the same form, we were ok, and we communicate with each other by mobile phone, we called each other or sometimes we went to the houses to give notice to the farmers. Now, the new directive is charging. For that reason, some farmers are irrigating during the night, because they do not want to pay extra charges (Julia).

The two '*celadores*' did not have experience and expertise in water management and both of them worked for the first time in this area. Their young age created some conflicts, but due to a lack of interest of other people in participating and becoming responsible for this role, they remained in this position. I would argue that the community and the way of living in town are in a transitional period, reflected in the use of water, but also in the condition of the water infrastructure. Wolf (2000) describes this process of water scarcity's negotiations within the Irrigators' and Farmers' Association as hydro-politics.

5.2.4 Changes in the '*reparto*' of water

As already mentioned, changes in the forms of irrigation became obvious and were largely driven by the poor maintenance of the canals and the lack of use of the dam due to the deterioration of the dams' floodgates caused by the last flood in 2012. The section below describes an additional form of changes in the shifts of the distribution of the resource. The irrigation times are distributed cyclically among the members of

the association through irrigation shifts, which allow for a balanced, fair and equal distribution of the resource among its members. For Andean communities in the north of Chile (Aymaras and Atacameños), the distribution of water is related to the times of water use and the speed of its flows from the mountains (Nuñez, 2007). The time is related to the area that each farmer owns and the ability to internally manage the received flow in their *'melgas'* or orchards.

All interviewed farmers complain that irrigation times and water distribution have changed in recent years. Shifts of the water cycles and the water delivery times are getting shorter. This is explained and justified by the scarcity of the resource and droughts. The non-accumulation of water in the dam, especially at night, makes it increasingly complex to supply water. As explained earlier, many farmers consider the action of irrigating at night to be illegal. They are making use of a bigger amount of water than the rest of the farmers, but this action is justified by the deterioration of the dam. Another justification is that at least they are productively using the water, which would otherwise be wasted and end up in the Atacama Salt Lake without a specific use.

The changes in the irrigation shifts are mainly due to the deterioration of the dam. However, according to some farmers, there is also a lack of will to fix the dam. Most of those who own private tanks are farmers who participate in the wine production programme. This means that the distribution of the resource is disparate, uneven and unfair. The president and the secretary of the Irrigators' and Farmers' Association are part of the ATF programme and therefore involved in the production of grapes and wine. This makes actions to repair the dam more complex and slower, because the leaders are benefitting from the malfunction through the uncontrolled use of water. I argue that this abandonment of water structures damages the collective, the community benefits, and the relationships between water users through emphasising personal use for productive purposes.

It is up to us to clean and fix the dam, because at the end this infrastructure belongs to all of us, the canals and the dam. I mean, if we are not going to clean, we cannot irrigate. The problem is that the dam is in a bad condition. Only few benefit from that, because they have something to accumulate water, but the rest of us don't do so (Sebastian).

According to elderly farmers, these practices contributed to the loss of a space for solidarity in irrigation, especially through the unequal access and distribution between the associations' members and the eliminated cooperative actions. Instead, these actions promote spaces of conflicts and competition, which are linked to agricultural production and economic profits that benefit only those farmers, who follow this type of practices.

Elderly farmers who are part of the association 'San Lucas', reflected during the focus group on the low participation of farmers in collective activities or those relating to social cohesion, such as the cleaning of canals, '*mingas*' and the harvests. One of the conclusions of this activity was that collective activities are detrimental to individual welfare and interests, especially when projects and their finances are focused on economic productivity. The majority of participants reported that there is no motivation and incentive for the young generation, and that they also show a lack of knowledge in agricultural issues. Focus group participants also argued that changes in the distribution show how water management over time follows individual interests and how it is possible to capitalise in this particular case on the deficiencies of infrastructure.

But also... there is no renewal of people. The ones that are around, are those that you can always see, the same old guys, the same old ladies, and there is nobody else there. The young guys are in another place... So, what changes? More of the same, and the same with the little forces that remain (Martin).

5.3 Practices of solidarity

McFarlane (2015) argues that changes in interventions of development are structured by practices of solidarity or values, which are influenced by specific modes of funding. In order to understand solidarity, I argue that it is not just necessary to recognise the differences, but also to understand the lack of practices that this specific context is experiencing (Frediani, 2016). Considering ethics and the specific context of the Atacama Desert, Trawick (2001) argues that equity in water sharing is the moral foundation of the village life. However, evidence in the fieldwork shows that the

tradition that supports the expansion of the practices of solidarity and cooperation has been decreasing.

The irrigation system in Toconao is an example of common pool resource management, and its sustainability is tied to the resolution of cooperation problems (Ostrom, 1990). Ostrom argues that effective monitoring and accountability, small group size and leadership are fundamental factors for sustaining cooperation and solidarity: Monitoring allows a balance of resource use, group size brings a space for coordination, and leaders can help to create agreements, rules and strategies. Villamayor-Tomas (2014: 482) claims that ‘the success of a common property regime can be partially judged on the basis of its ability to handle extreme events that stress its capacity for cooperation and solidarity’. In the case study of this thesis, the Irrigators’ and Farmers’ Association of Toconao manages the common right to use the water. The irrigation canal structures deliver water and delimit the boundaries of the corresponding irrigation system. The quantity of water that the Irrigators’ and Farmers’ Association of Toconao can manage is related to the extension of land to be irrigated within the system. CSR programs threaten some practices of water management. However, these threats are increased considering the underlying forms of the erosion of solidarity, such as a lack of trusted leaders and monitoring of the canals and water distribution.

5.3.1 Time for monoculture

Historically, the town of Toconao has been recognised for the great variety of its agricultural products, such as quince, oranges, pears, figs, and apricots. Toconao had an immense importance for the fruit supply in the region until the Pan-American Highway was opened and the arrival of fresh products from the south of Chile became possible (Gundermann & González, 1995). However, the self-perceived identity of being the agricultural support of the region is still part of the farmers’ memory.

We still produce pomegranate, we produce the pear, well this is a permaculture, we have everything, all kinds of plants... we have the fig tree, it is just getting branches up... we have the pomegranate that always produces... this one produces. We have the quince tree, which is here every year, it produces every year, this one is the most loyal, it is the strongest one. We have the pear tree that is loyal as well...this one is the

apricot tree, over there we have a peach tree, but it is another kind of peach, this one...there we have some flowers, and this one is an '*albarillo*' tree, that produces '*albaricoque*', which is a kind of apricot, a smaller one and special for jams. Here we have more...this one is another apricot tree, there are different varieties... this one is cider tree, we use it to make cider and everything... and here we have an orange tree...no...a lemon tree, over here is the orange tree (Cristian).

This significant production of fruits and their varieties have contributed in economic and social terms. Before colonisation, the production has been a bargaining chip for barter or exchange with neighbouring communities as well as other countries such as Argentina and Bolivia. The diversity is mainly due to the exchange of seeds, techniques and agricultural processes such as the crafts or forms of cultivation that have developed products which are suitable and resistant to the extreme conditions of the desert. Furthermore, the strategic position of the village and its location close to the ravine provide water and create an oasis with a special micro-climate (Games, 2013). It creates fertile land and constant water flows for agricultural production as well as livestock. However, these exchange practices, both regarding the knowledge of the products and the expertise of cultivation as well as seed exchange, have been lost.

This change has been mainly driven by economic factors that encourage large-scale production and monoculture. It has enabled the introduction of new species of grapes and vines from central Chile. Through the ATF programme, according to David, it has been possible to import and experiment with them in the area. This new system of production is not only reducing the ability to have several fruits or products. According to elderly farmers, this situation is causing a lack of exchange and spaces to share knowledge about agriculture. Ancestral agricultural systems are being adapted and give way to more industrialised and mechanised systems, which focus on the production and efficient use of land and water. Furthermore, as mentioned in the previous sections, these changes in the form of doing agriculture have generated structural changes in the ways of doing irrigation and the distribution of water resources.

When I got back to Toconao, I did the grapevine project. I brought Pedro Ximenez' grapevines³, I put them right here where I am sitting. Here I had a piece of land and here I planted Pedro Ximenez' with the first drip irrigation system. There, where I have the swimming pool, I had the water tank where water accumulated as well (David - Community Leader).

According to young farmers with professional degrees, the monoculture associated with agricultural production has increased competition and created disinterest in the production of other farmers. Taking advantage of the wide variety of products, the previous system allowed for cooperation in the mechanisms of selling and distributing products. Hence, farmers had access to lease or use a truck that allowed them to transport their products to the city of Calama or other areas, and which enabled them to sell their fruits and vegetables in a cooperative manner.

I would say that our typical agriculture has suffered in the last years under a process of change. Well, here we have practiced traditional agriculture that we know is technically inefficient with water, from a technological point of view, because it is based on flooding as a way of irrigating the land, it has been done with terraces. There is no doubt that this is a form of ancestral agriculture. However, ultimately, we have adopted new methods of irrigation. The drip and sprinkling irrigation have entered very quickly. The drip irrigation has been adopted by farmers, but that implies an increase of monoculture plantations. The reason is that those irrigation systems are designed for this kind of production, those systems push us to generate extensive plantations. Therefore, from the technological aspect, I see that we are going backwards. It is assumed that the global view goes in a different direction than monoculture, it is more related to go back to the polyculture, because that brings us to a balance with the ecosystem. However, we are getting later to a monoculture system especially associated with the introduction of new technologies (Clara).

In addition, it is important to add that farmers now distribute their own products individually, intensifying the lack of solidarity and increasing competition as well as inequality through the lack of opportunities for smaller scale farmers to distribute and sell their products. Further, agricultural variety has always allowed to have larger capacity of production in relation to the times that each product requires. For example,

³ Pedro Ximénez is a white wine grape, brought by Toconao ATF farmers from central Chile.

the production of quince is possible all year, both in the agricultural processes and in the daily relationship with the fruit.

For example, that was an important thing, because previously people lived more from agriculture. They used to go and sell all fruits in Calama. There were trucks that were full of boxes, fruit boxes, with pears, figs, quinces, apricots. However, now there is no truck that travels with the fruits, because I believe the quantity has been reduced and young people are not interested in agriculture. Of course, mining is more convenient for them, because they have a salary every month. In contrast to this, in agriculture you can see money once a year (Karina).

Fresh fruit, which is harvested in February and March, is sold at the markets of Calama on March 13th. In addition, the production of '*orejón*' (dry quince), and its drying process is used for subsequent preparation of natural juices, as well as the use of its seeds for the preparation of jams and sweets. Quince leaves are processed as animal food, which then become part of the production of fertiliser that is needed to increase agricultural production. According to Antonio, it also demonstrates how inhabitants of the sector have optimised and exploited all products, following the cycles not only of water, but also the agrarian cycles and different seasons. In contrast, the production of wine does not allow this and does not allow to follow the cycle, thereby reducing it only to its sowing and subsequent harvest.

Well... we come almost every day, of course, one has to move around in any case here, always...I tell you for example: 'I will be here now, I irrigate and then I am leaving for a week to somewhere else'. Because, one has to be here, paying attention, taking care of... especially when there are fruits... we have to take care of it. You must harvest and collect it... because some are ripening very uneven, do you know what I mean? You have to wait until the fruit gets ripe, then you can put it into boxes. Sometimes, the fruit is on the ground, so you have to take it, and for example you have to take the stones out... in the case of quince, during the season of quince, you can do '*orejones*', well, all that. You have to do it the same way with the plums, figs... the figs are quick, they get ripe very quickly, so you have to take them...with the raisins as well...you have to prepare them, to preserve and to sell them (Antonio).

In relation to the automatisisation of monoculture, respondents agreed that there is a clear decrease in the cooperation among farmers, which is illustrated by the lack of '*mingas*' or activities to improve the processes of cultivating the orchards, the lack of

participation in community activities such as the cleaning and maintenance of the canals and dam. Additionally, there is a loss and lack of interest in traditional activities such as the payments to water and land.

Figure 5.16 | ‘Minga’ at one orchard



Source: Author

Last time I organised a '*minga*', a little '*minga*' in my mum's orchard, because she needed to do the pruning to clean the orchard and it was not done... they had to hire someone or we had to find a strategy to advance quickly, because we were running out of time, and we did not have enough time to clean and to prune. Hence, for example, I thought to do it with friends, and I invited some friends and so everyone was contributing with something. It was a working day, a weekend, and we were 5-6 guys, also my parents, 7 in total maybe working. Hence, this is a manner to do it quickly, without spending many days working on it. If two people would have been working on this alone, they should spend... I don't know how many days... For that reason the concept of '*minga*' emerged, where people get together and help each other, they support me, and then I pay them with a lunch, beers, and a party... I pay for the food of everyone, who helped me (Figure 5.16). They are friends, they don't live for these things, they don't need it. It is a hobby for them to have this kind of activity in the orchard (Clara)

5.3.2 Cleaning of the canals

A major activity that marks and characterises the Chilean Andes and its water cycles is the cleaning of the canals (Bolados & Babidge, 2017). This activity has been a fundamental mechanism for the maintenance, repair and construction of canals for centuries, and thereby improved the distribution of water. The cleaning of the canals is also a fundamental practice for social cohesion, unity and community building. This section of the text is dedicated to the scarcity of the water resource and the caretaking of water in the desert, and how this caretaking is understood as a mechanism of sharing culture, ancestral rituals and traditions. The cleaning of the canals is the central activity of the irrigation work, which is conducted once a year in the Andean communities (Bolados & Babidge, 2017). Most interviewees considered that the cleaning of the canals is constituted as a political activity and as a fundamental part of the identity of the town that reaffirms the belonging to the territory and to the social space.

...related to water and land, the cleaning of the canals is a huge tradition and a culture for us that is incommensurable... I think it is more, that all these traditions that we have are also getting lost, it is a worry that we have to highlight. They are the solution to all those big crises and internal conflicts that we have, and also to those external conflicts that are subjugating us, where they take advantage of us. And at the same time, we are trying our people understand that. I think that the formula is to preserve the traditions, to preserve our traditional authorities... it is not enough to have organisations, the council, the community... I believe we have to look back at our traditional authorities, like: at least for this

cleaning of the canals, these are the *'puricamanes'*, *'celadores'*, the old doctors, which we are still using. They are dying, yes, but they are respected in town, and I think that is important. So, if you ask me, this question for me is fundamental, together with other traditions like the *'minga'*, 'the cleaning', 'the *talatur*' (Carlos - Indigenous Community adviser).

The cleaning of the canals is a unifying element for Andean inhabitants and a fundamental ritual of their worldview (Ostrom, 1990). The tasks related to the ritual of the cleaning of the canals are integrated in the Andean *'cosmovision'* that shapes the property of water related with its use in this context (Cuadra, 2000; Yáñez & Molina, 2008, 2011).

According to the *'celador'*, the cleaning of the canals is structured in three parts. First, the preparation, organisation and distribution of the work. Second, the cleaning itself, which can happen over two or three days, depending on the communities and the amount of work. The last stage are the rituals of closing the activity. They represent an evaluation of the community and its members. However, the activity of the cleaning of the canals is not just a practice of irrigation. It is also part of the economic, social and political control in the desert (Bolados & Babidge, 2017).

As was mentioned in the methodological chapter, the decision to observe cleanings of the canals in three different communities that share the proximity to the Atacama Salt Lake, was made to obtain a comparative perspective. It allowed to contrast the comments from interviews with the community of Toconao, where participants described the importance of the cultural meaning of this activity. Through observations it was possible to see the low interest in this tradition from the practical point of view of water management in the community of Toconao. Interestingly, this does not correlate to the farmers' discourses. The majority of respondents felt that this activity is necessary for the solidarity and cooperation within the town. However, only a small percentage of the interviewees participated in the cleaning.

The cleaning of the canals is a community activity, an ancestral one... mmm... I am not sure if it is ancestral, I think it is a 'traditional' one. That is the word. Traditional, because it has always been a moment of getting together, of unification, of working. Thus, it is giving value to different things. I know that there are communities that have been losing

it, it has changed. I have seen communities that are very influenced by this new type of life, the new way of living, so... I don't know if neoliberalism and capitalism are to blame, I don't know, but it is something that is more oriented to an individualistic life. Therefore, it has clearly been lost in some communities. For example, in San Pedro, maybe there are some communities that don't do it. In Toconao, I was not able to go to the last one, I wasn't here, so I cannot have an opinion... I wasn't in the cleaning of the canals this year, because I was working, although it was during a weekend (Clara).

There was a significant difference between Toconao and the communities of Socaire and Peine, where all inhabitants of the two towns participated in the activity. As shown in Figure 5.17 and Figure 5.18, some of the main characteristics of the cleaning of the canals in Socaire and Peine was the necessity of re-construct the canal from the source of the river. Another element that marked the difference was the efforts that everyone had to make in order to participate in the activity.

Figure 5.17 | Cleaning of the canals in Socaire



Source: Author

The cleaning of the canal is a fundamental activity, and we have to work to keep them clean, free of garbage and also with no leaks. This activity is important because the water flows quicker, and also to take advantage of the water system. If we don't do it, we are going to get some leaks and water will end up in another place, and we have to take advantage of everything because we are in the desert where water is scarce. We depend on the snowfalls in the mountain range in winter and the rain in summer (Cristian)

Figure 5.18 | Cleaning of the canals in Socaire



Source: Author

The activity in these two communities remains very reserved and closed to the public, especially those who do not belong to the villages. The participants demonstrated that these activities are implemented with a high level of respect especially for the families and people, who are part of the traditions and rituals. Both communities are smaller in area and in population than Toconao and their members have a more direct relationship with the use, maintenance and distribution of water. I observed in both communities

that the implementation and spirit of the cleaning of the canals is festive; it is a celebration with its own songs, rituals and traditions.

In contrast, I observed differences between Toconao and the other communities, and a loss of traditions and activities related to water. It was possible to observe the fragmentation and little collaboration in the preparation of the tasks, which was then manifested in the execution of the cleaning. I had three different experiences in Toconao and in Peine and Socaire. On the one hand, in Peine and Socaire there was an emphasis on the importance of the relationship between people and their environment and landscape, which was not central in Toconao's activities. The cleaning in Toconao was more focused on productive issues and the optimisation of water canals and water distribution than spiritual and collaborative actions. The tasks were implemented in a fragmented way and farmers had a specific place to work, usually close to their orchards. This led to a lack of participation, exchange and collaboration between the members, and a decreasing importance of sharing the experience; reducing it to the technical and practical aspects. Figure 5.19 shows that the sectors where more cleaning was needed, were inside the town. It was not necessary to build new canals due to the new and resistant material of the canals.

During the processes of cleaning in Toconao, elderly farmers commented that over the years, the cultural understanding of the cleaning of the canals, its symbolism and the relevance for agricultural cycles has been lost. They argued that each year more people from outside the village conduct these practices. Subcontracting or payment of penalties associated with non-participation became more frequent. An interviewed farmer felt the necessity and importance of this activity to start the new water cycle. However, he did not have the opportunity of experiencing the old process of cleaning; he only knew about it through the stories of the elderly.

It is like starting again, like cleaning, like cleaning the veins, something like that... to start again with a clean irrigation system. Here we have lost it a lot, I have never experienced a '*talatur*', it is only like a joke. With my friends we go to a party, and they are from Socaire or Talabre, they know about it, but I did not have the opportunity to do it. Here, the cleaning of the canals is not like there, more about other things...but the cleaning of the canals is entertaining here, and they are not just once here, we have to do that always because the canals get blocked and when

they are blocked. We have to clean them. For that reason, we use the concept of ‘cleaning’, new, of starting again... (Rodrigo).

Figure 5.19 | Cleaning of the canals in Toconao



Source: Author

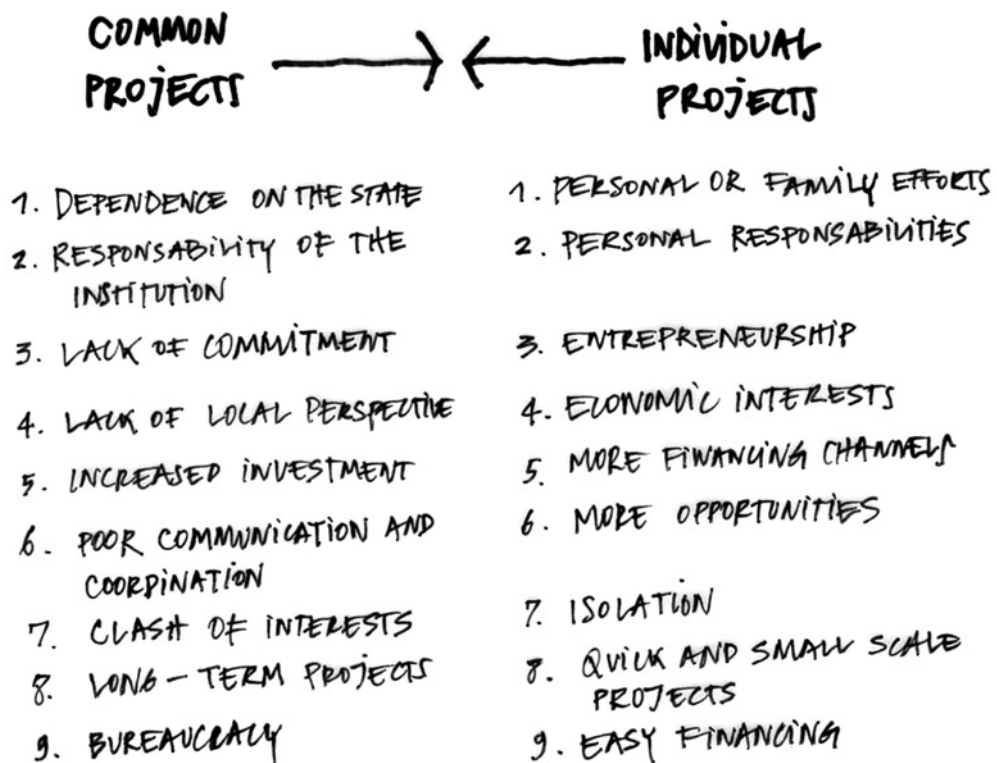
Strong evidence of a disconnection with the cleaning of the canals was found in Toconao. Many inhabitants excused themselves from participation, and there was no atmosphere of celebration compared to Socaire and Peine. According to elderly farmers and especially the organiser of the activity, who is a representative of the Indigenous Community of Toconao, there is a constant increase in ‘bad practices’, such as not participating, paying or hiring a worker, paying fines, lying or not doing the jobs, not working during the specified hours, lack of responsibilities, and basically the lack of interest and respect for the activity. Not only was the comparison with other communities fundamental to see the loss of customs and traditions. Moreover, the interviews with elderly farmers with more experience, who were concerned about losing their customs and identity, were important to understand the contrasts.

...For me, the objective is another one nowadays. The objective before was when you canalised or put some pipes in. The canal is not like this now, how it was made in the traditional way, where you had to clean, to cut the weed, and everything, to channel the river, right?... Now, it is about removing some sand and all that, ok, the tradition is maintained, but the tradition, the true tradition of the cleaning of the canals was that, to channel the river and this is lost now... (David - Community Leader).

5.3.3 More projects to individuals

As shown in the previous section, water practices, rituals and collective actions around water have been losing their communitarian aspects. This is due to the increase of competition and productivity associated with economic interests that produce social fragmentation and leave behind important elements such as traditions that encourage cooperation. Figure 5.20 shows that there has been a significant decrease in cooperation and solidarity in shared projects, collective traditions and social engagement in the participation in common projects. Therefore, there is a sharp change from the communitarian activities to the implementation of the concept of 'projects'.

Figure 5.20 | Collective vs Individual Projects



Source: Author

'Projects' is a term widely used by the farmers and it refers to initiatives that seek external financing for their implementation. These projects can be financed by the government or private institutions; even the community has funds that can be used to develop community-based initiatives. However, the latter are generally used for emergency projects. As Camila mentions, projects were assigned only to a few farmers.

When the projects started to arrive, they started to divide the people as well... because when the projects arrived, they were saying that people who have land, have therefore access to projects (Camila).

Farmers have a few financing routes for planning initiatives, but also a low level of interest in the community to carry out community projects of a more social nature. There are other initiatives that focused on catastrophes and solution of problems that provide a quick and effective response to this type of needs. As mentioned earlier, the term 'project' or 'implementation of project' is of high importance. Each community committee member is evaluated by the number of projects that he or she conducts or manages. Generally, these projects point to urgent issues and little to long-term planning. One interviewee from the mining sector argued that the private sector classifies independent farmers with high standards of developing projects and financial management as successful entrepreneurs. This happens even though their initiatives respond to productive and individualistic concerns.

We support those people who want to work, and those who have the courage and the availability to work. I cannot say that we haven't had problems with some communities in regard to their steering committees, like Peine or Toconao. Actually, the ATF programme, when we started it in Toconao, we didn't have the permission or authorisation of the community, they didn't want anything, particularly that committee. Therefore, we started working with some individual farmers, and only eight farmers approached us (Keng - SQM Mining Worker).

The ATF programme is focused on entrepreneurs and their business ideas and motivates particular farmers to get involved in the idea of business plans for the production of wine and grapes (Figure 5.21). Unfortunately, the narrow vision of the company and the lack of resources targeted to support the community development only allow to support and finance initiatives of twenty farmers. The interdisciplinary

team of the Atacama Tierra Fertil Programme (ATF) of SQM technically advised farmers who are interested in the production of wines. Participating farmers are entrepreneurs, community leaders, and farmers seeking productive and economic benefits through the production of grapes. Farmers must own land and water rights. Figure 5.21 reveals that there has been a slight increase in the number of participants. The programme started with twelve farmers in 2012 and the team of ATF programme included new farmers every year, who are interested in wine production. The grape yield depends on the size of land that every farmer has and the ATF programme encourages participants to expand their productive areas through the purchasing land.

Figure 5.21 | Farmers involved in ATF programme

GROWER	2012	2013	2014	2015	TOTAL
COMMUNITY LEADER 3	50	688	280	1.125	2.144
FARMER 18	100	324	446	935	1.815
FARMER 19	92	211	644	856	1.803
COMMUNITY LEADER 4	688	55	980	625	2.348
CELESTE FARMERS	334	0	1.235	1.058	2.627
FARMER 20	211	1.479	873	1.306	3.869
FARMER 21	55	0	194	121	370
FARMER 22	0	0	974	1.421	2.395
FARMER 23	0	0	335	1.070	1.405
FARMER 24	0	0	303	589	892
FARMER 2	0	0	0	138	138
FARMER 25	0	0	0	30	30
FARMER 26		In growing stage			0
FARMER 27					0
FARMER 16					0
FARMER 28					0
FARMER 29					0
FARMER 8					0
FARMER 30					0
FARMER 10					0
TOTAL KG PRODUCED	1.530	2.767	6.264	9.274	19.836
TOTAL LITERS	918	1.660	3.758	5.565	11.902
TOTAL 750cc BOTTLES	1.224	2.214	5.011	7.419	15.869

Source: Author based on SQM sustainability report 2016

With this support being focused on some people and not the village in general, the programme generates conflicts and different interests, which are reflected in the claims of farmers. There is no clarity about the selection systems that companies use to decide who will participate and receive support in their productive initiatives. For the company, it is easier to evaluate farmers' initiatives as individuals than to deal with the entire community. According to the managers of the ATF programme, they prefer to work with people who are willing to undertake and develop some business ideas, rather than people who simply want to get the benefits.

As explained earlier, this change from the collective to the individual is reflected in water structures, their spaces and the use of the resource. According to farmers who are not involved in the ATF programme, there is a manifestation of the changes in the agricultural production. This concerns the implementation of new irrigation systems, water tanks, new crops, different relationships with land and water, as well as the relationship with other farmers. Changes in agricultural language and the mechanisms that farmers develop were compared in the interviews. Generally, farmers participating in the ATF programme showed a different communication and coordination of their initiatives, noting the differences of their interests with the activities that other farmers had. In practical matters, this was reflected in the creation of particular activities like the '*vendimia*' or harvest, touristic guides, capacity building activities, and professional visits to control the production of grapes and wine.

Everything here is individual, and it is ok. However, for me it is extreme when people coming from the wine programme go to see their farmers, and they are worried whether they work well or not, they got their signature, and constantly they are checking if their products are good and if they are doing a good job. They are constantly monitoring what farmers are doing, and if they are following the instructions. To me, that kind of things is just 'paraphernalia'. They have the argument that they are producing a high-altitude wine, and that here is the only place where you can produce that. But that is not true. There are other places like Bolivia or even here, where we were producing wine before they arrived. Therefore, they want to get credit for this kind of discourse (Antonio).

5.4 Final comments

This chapter answered the first research question: How do changes in water management since the implementation of the CSR programme manifest themselves in the use of the canals? The analysis has shown how a lack of solidarity and cooperation manifests in irrigation space and practices of water management. The ATF programme supports individual farmers in the implementation of drip irrigation systems and monoculture. It thereby generates not only changes in water management, but also in the configuration of agricultural land, practices and traditions in Toconao.

The chapter presented a number of irrigation practices to understand the relationship between water, power and community in this specific hydrosocial territory. The complexity of the territory in which those water practices are immersed suggests that the hydrosocial territory is currently undergoing significant changes. These changes go beyond the water cycle and traditional agricultural temporalities; they provoke new temporalities and practices based on the implementation of drip irrigation systems.

The findings of this chapter raise intriguing questions regarding the use and maintenance of agricultural space. The new productive vision of water management is contradicting the values of 'Andean Cosmovision', thereby creating conflicts concerning people's identities, individual and collective interests. Additionally, community-based natural resource management has been challenged by changing visions of local development induced by private companies such as SQM and the tourism sector. These changes promote and empower entrepreneurial community members and have expressions, amongst others, in decreasing levels of reciprocity and engagement in communitarian works, low control over water, and decreasing respect for older generations.

The principal theoretical implication of this analytical chapter is that it suggests that understanding a hydrosocial territory requires to go beyond an emphasis on the social configuration of different tangible elements, such as people, institutions, water, environment and technology influencing the control of water. An understanding has to include social intangible elements such as solidarity and cooperation, and how these

elements are constantly shaping and changing the configuration of hydrosocial territories.

CSR programmes transform the hydrosocial territory of Toconao. This territory is built based on discourses of legitimisation, institutional networks and power relations around the management and control of water resources. Private actors redefine the productive territorial borders and establish territorial dominion through the access and control of water resources, which are key to their generation of capital (Damonte, 2015). Water control through drip irrigation creates a political and technological discourse that manifests the cooperation of SQM with the state and works in favour of the company's interest.

The chapter highlighted the continuous discursive importance of the 'cleaning of the canals' as the most central political activity of Toconao. The 'cleaning of the canals' is not just an irrigation activity or space for sharing responsibilities within the community. It is also considered to be part of the economic, social and political control of water in the territory. However, this discursive understanding does not translate any longer into practice, where the 'cleaning of the canals' in Toconao is reduced to a physical activity. Building on these findings, the next chapter discusses how everyday practices of water reflect the decision-making power of different actors in the community.

Chapter 6 Water practices and their implications for the access to decision-making

Interactions with water take place within a cultural landscape which is product of specific social, spatial, economic and political arrangements, cosmological and religious beliefs, knowledges and material culture, as well as ecological constraints and opportunities (Strang, 2004, 5).

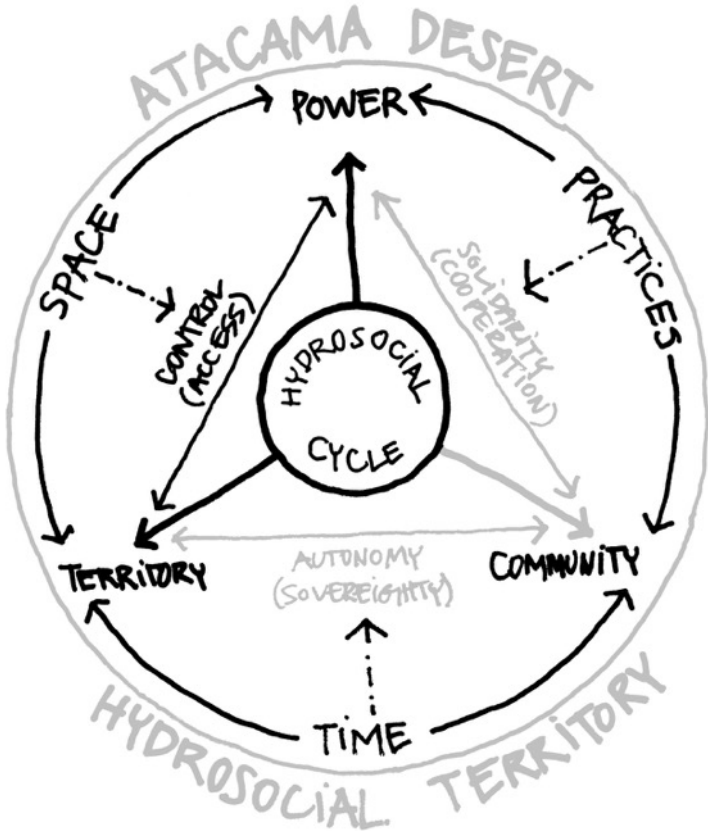
Introduction

The previous chapter examined different dimensions of solidarity, cooperation and practices of water since the implementation of the ATF programme. This chapter looks at decision-making processes, and how decisions are reflected in the access to space, access over time and access to practices of water. The main aim of this chapter is to understand how decisions impact the access and use of space, everyday practices, the decision-making power of different actors and its effects on different community members. For this analysis, it is crucial to understand the strong relationship between CSR programmes and the specific actors within the community that hold positions of power. Thus, the chapter will address the second research question: How do everyday water practices reflect the decision-making power of different actors in community decision-making processes? The main argument put forward in this chapter is that control over spaces and practices of water determines access to decision-making.

The analysis of the chapter highlights a decrease in traditional and collective practices, which people previously also used to organise and make decisions. I highlight micro spaces of cooperation in which new understandings of development and competition have trickled down from the way mining companies operate. This means that personal interests, a commodification of natural resources and the control over the territory have transformed the spaces of decision-making along with social relations and solidarity. The findings of this chapter reveal how decisions are reflected in the access of space and practices of water over time, how they shape access to water and give power to specific actors, who affect the entire community.

The chapter analyses how access is manifested in the space of decision-making over time, and how it is reflected in the access to practices of water (Figure 6.1). This chapter also connects with previous research about water management in the Andes, which frames the Andean model as a successful system of water governance based on the principal of social organisation. However, in the case of Toconao, this social organisation has changed through the implementation of neoliberal economic policies. The implementation of the CSR programme from SQM S.A created new rules that foster competition rather than cooperation.

Figure 6.1 | Structure of analysis - access



Source: Author

The analysis is structured into three sections: Access to space, access over time, and access to practices, all of them in relation to water and agricultural activities (Figure 6.2). It starts with a description of the use of specific spaces of water, followed by an interpretation of the changes in those spaces over time. Finally, I develop an argument of how access to practices has been changed in the last years.

Figure 6.2 | Spatial-temporal-practical analysis of access

	SPACE	TIME	PRACTICES
ACCESS	1. FENCES	1. MIGRATION & EXODUS	1. COMMUNITARIAN PRACTICES
	2. MEIGAS BOTADAS (ABANDONED ORCHARDS)	2. LACK OF TRADITIONAL KNOWLEDGE	2. LACK OF MINHAS, COSECHAS & LIMPIAS
	3. INSIDE V/S OUTSIDE	3. WATER AS OBJECT/NO PROCESS	3. BOUNDARIES OF COMMUNITY LEADERS
		4. TIME OF PLOUGH	4. SELLING & RENTING WATER

Source: Author

6.1 Access to space

In seeking to research and analyse the characteristics of the flows of water in space, it is useful to first consider notions of borders and limits of those places, and the establishment of control over the agricultural orchards. The scale of observation for this analysis is place at the level of the experience of the social actors that use the irrigation canals in their everyday practices. Aedo (2008) argues that having an understanding of Andean spaces require analysing the elements that are part of its social construction, as well as the movements of inhabitants from one place to another. Considering this argument, it is necessary to understand the experience of farmers, who create meaning and construct the irrigation canals. This section looks at this discussion in relation to control and power in the territory.

6.1.1 Fences

During the everyday walks through different agricultural sectors, I observed the spatial order that is created through corridors that are parallel to irrigation canals. The canal networks connect all the orchards and some principal canals also lead into private orchards, thereby crossing different sectors. However, even if the path is public, it takes a semi-private form. A strong relationship between corridors and canals has been revealed in the drawing analysis. It also showed the narrowness of the corridors, and the lack of people around them. For example, the drawings revealed that it is hard to see what is inside the orchards, and who is working on the land.

Figure 6.3 shows the corridor that goes to the sector 'Punta' in the 'Bosque Viejo' area. This area, as well as other agricultural sectors, have increased the use of protected agricultural land through the construction of a natural fence. Fences are an amalgam of different plants, trees and pieces of wood, especially trees with thorns, such as carob trees, 'chañar' trees and quince trees. Everything is protected, and it is possible to observe railing and metallic structures protecting the orchards. According to younger farmers, the purpose of the fences is to protect the cultivation from wild donkeys that come at night for food and destroy the land. However, farmers from the ATF programme claimed that the main source of concern is thieves that want fruits, tools and machinery.

Figure 6.3 | Fences of a farmer's orchards, in the 'Punta sector'



Source: Author

Elderly farmers claimed that they started using fences a few decades ago. The main reason for not having fences was to provide open access to other farmers to get to their orchards. When they needed to go through their orchards or down to the ravine to work on their land, farmers were allowed to walk the shortest possible route. One interviewee commented that farmers even used to leave their house doors open when they were not in town, so that other farmers can go through their houses to get quicker to their place of work. Today, this practice does not exist anymore. As Martin mentions, everyone is closing the paths and it is prohibited to cross private land.

This is when we can see the engagement of what I mean by something communitarian. If you think about it, nobody gives you his word now, nobody believes in what others say. Previously, nobody used to close

houses or orchards, because if you needed to go through, it was easy to walk along the orchards and reach your land. People did not even close their houses when they were not in town to let others use their path to go to their land. That is what it means to live in an open community (Martin).

Nowadays, getting access to water, or getting at least to the route to get water is complicated. According to elderly farmers, there is no access to some orchards because there is monetary value inside the orchard. One farmer reported that this relates to the large sums of money, which have been invested to implement the new irrigation system. Engines, pipes, control tables and solar panels are amongst the items needed to produce new species of grapes. The practice of fencing the orchards, creating semi-private spaces and making the access to water more difficult for other community members, suggests that water itself does not seem to be the most valued element anymore. Water seems to be an element of cooperation while water infrastructure inside the orchards seems to be an element of competition.

In addition, it is important to mention that there are people who do not own land, hence, have no access to water. Therefore, it is valid to question if water is a public good in Toconao or rather a resource for a specific group of people.

I don't have any relation with water or agriculture anymore. You know, Toconao is not producing the same as before. As I said, Toconao used to provide fruits to everyone, sustained this desert, we used to sell fruits to different towns and cities. We used to have three small trucks where we transport all the products. Every week we sent the trucks full of fruits to Calama. I used to work helping the women on their land. I don't have land, because I am from the mountain and not from the town. When the town was growing, they took all the water that we were using up there, and I had to move to a safer place. We ran out of water to provide potable water to Toconao, so I ran out of water and land. However, I used to help people, who have land. In those times, it was nice to go to their orchards, because they used to give me quinces, pears, everything in a big box, so that was good for my kids (Camila).

In sum, the analysis of the implementation of fences has extended beyond discourses of security to their roles as markers of belonging and land and infrastructure ownership. Especially those people, who do not live in town every day have fenced orchards to keep their land enclosed. However, they need to show to the rest of the

community that they are there (even if they are not in town) and work on the land to be considered part of this territory. Therefore, I argue that fences on the one hand demarcate private property, which people can access or not, and on the other hand they demarcate belonging to the community.

Some farmers also interpret the use of fences as a progress in their production. Depending on the material of those fences, they can be seen as an expression of social hierarchy, and distinguish those that work with the ATF programme. Some farmers imitate the material of the fences in order to be considered wealthy or prosperous, even if they are not part of the wine programme. Therefore, in agreement with Kellett (2013), fences are understood as a particular object that shows the farmers status. Hence, they are also essential elements in the construction of a new social and cultural identity.

6.1.2 ‘*Melgas botadas*’ (abandoned orchards)

As pointed out in the previous section, elderly farmers state that fewer people walk around the canals. Figure 6.4 shows that the irrigation canals were uninhabited and with little movement of farmers, especially during winter and the months of planting. According to Sebastian, the majority of farmers were in the processes of ploughing their land inside the orchards and not alert of the flows of water. However, the findings collected through daily drawing observation suggest that canals and corridors stayed mostly empty for months. Some people were working, moving and ploughing the soil, but a large number of orchards have not been worked on for years. This observation supports the hypothesis that some orchards were abandoned, because there is no motivation to work in agriculture.

According to 4, nobody is working in these ‘*melgas botadas*’ (abandoned orchards) and it is usual to observe farmers who only come to the village to irrigate the weed that has accumulated there over the years. Another interviewee also mentioned that it is difficult to see people during the week, because people from outside the town go back to their residential places like Antofagasta, Calama or San Pedro de Atacama, and leave the town on Sunday night. He also argued that they come to town during the weekend to irrigate their land and as a way of relaxing from their lives in the city.

Figure 6.4 | Lack of people around irrigation canals



Source: Author

What happens is that people are not interested in agriculture. The thing is that we are losing it, and today you can see that orchards are wasted. They just irrigate weeds, and that is more harmful because they use the water unconsciously. You can see it with your eyes, lots of orchards are wasted, and they even do not come to see them. There are a lot of people that come from Calama, and they remember their land when there is a festivity and a sacred activity, and like you have seen it, the town gets completely transformed, doesn't it? (Martin).

Anthropologist Sylvia Rodríguez (2006) in her research in New Mexico, argues that the basic activities in the canals are the irrigation of the orchards, '*melgas*', and '*huertillos*'. Those are the simplest irrigation activities that involve bodily skills, which are learned through observation in the context of practice. Irrigation is a '*kinaesthetic, visual, spatial, technical, and interactive practice, but it is not a verbal action*' (Rodríguez, 2006: 6). Despite this, little progress has been made in the development of these practices. As Rodríguez mentions, it is necessary to have knowledge, experience, patience, and control, as well as time to share these experiences with other farmers. Rodríguez' observations suggest that in general there is a state of competition between farmers, especially those that are involved in the ATF programme. This manifests in a lack of mutual lending of agricultural tools, time to share experiences, and tips to improve the land through new techniques or species. The consequence is a lack of social capital among farmers that is generated by conflicts and competition.

Surprisingly, the majority of interviewees, who are part of the ATF programme claimed that they are open to share their knowledge and help other farmers to improve their cultivation.

Look, I have told the people of the community lots of time. I feel that I am preaching in the desert. I am saying all the time: 'let's do this or do that'...I am not selfish with the knowledge that I have...It has been difficult, and it took me books, courses, and money. However, it is tough, many people don't care. And I think because they are selfish within the community, they do not want to see further than their noses. It is like speaking with a stone, and I cannot deal with that. However, if someone comes to me, I am more than happy to explain how things are (David - Community Leader).

However, that was not the perception of the rest of the farmers that are not involved in the ATF programme, who were very disappointed with the strategy of the CSR

programmes. Elderly farmers only perceive the separation and the division of the community through the lack of comradeship. This lack manifests, according to them, during the annual cleaning of canals, when everyone should clean, repair, maintain, and improve the ditches. Farmers no longer do this work collaboratively, which impedes the opportunity to share knowledge. Therefore, seeing the empty canals and their low levels of use reflects the lack of space for the public, and the lack of shared spaces for the community to get together.

6.1.3 Inside versus outside: corridors as in-between space

The orchards as well as canals play a role in the production of the social order and practices. The situation described in the last section will help to understand the difference of what happens inside and outside the orchards. Obviously, both spaces are designed for different purposes, but the connection and the space in between different orchards and different farmers is losing its function. On the one hand, the corridor is the communicating element between different orchards. It contains the irrigation canals in parallel to it, where water transits by gravity from the mountains.

Figure 6.5 reveals that the corridor is the public space in the farming structure and communicates different sectors. The corridor has a common area that allows people and water to transit around it. On the other hand, the back of the fences in Figure 6.5 shows that the orchards are productive areas with different cultivations throughout the year. One interesting fact documented by the Irrigators' and Farmers' Association is that 86% of the agricultural surface is allocated to grow fruits, with an average extension of 0,854 hectares of land. Those private properties belong to different families. They are closed properties with different dimensions. In contrast, however, the water system covers about 17000 meters of canals and corridors, which are responsible for irrigating an area of 92 ha (Cuadra, 2000).

These differences are examined through my personal experience of place, putting emphasis on the relation between different types of farmers and places. Kellett & Moore (2003) state that it is necessary not just to explore those spaces, but also to understand individual and collective goals, intentions and purposes in those spaces. Additionally, not only making connections between them but also investigating the

differences that they have. From a cultural geography perspective, Rendell (2002) argues that there is a notion of the ‘socio-spatial dialectic’, or an inter-active relation between places and people. Commenting on Edward Soja’s trialectic of space, time and social, Rendell (2003: 221) argues that: *‘A place between is spatial, it is a mapping of the topographies between here, there and elsewhere. A place between is temporal, it pays attention to time, to the ways in which we locate the then from the now, the now from the yet-to-come, for in our writings of history, our placing of the past in the present, we are already positioning possibilities for the future. A place between is social, it is an articulation of the place of dialogue, ongoing discussion, between one and another’*.

Figure 6.5 | Corridor sector ‘Campo Viejo’



Source: Author
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Another approach to understand this space between inside and outside the orchard is the notion of those spaces as ‘interstitial spaces’. Vidal (2002) argues that the ‘interstice’ is a place in which different identities can converge, a place of individual and collective significance, a dynamic place that can change its own condition in regards to its boundaries. This definition brings an understanding of the scale of proximity, and even smaller spatial configurations such as irrigation canals, their materiality and uses (Silva, 2016). Behind the edges that build up the corridors, there is a productive agricultural space. Figure 6.6 shows that those spaces are part of the farmers’ identity, her aspirations and dreams.

Figure 6.6 | Karina's orchard in the sector ‘Lavatorio’



Source: Author

...They are like the backyard of their houses, but also an extension of their life and activities (Karina).

According to the observation in the field, three different motivations that generate changes in the use of those spaces emerged: The first motivation as inhabitant that reflect activities as farmers. This motivation or capacity is related with owning a piece of land and having right or availability of water. This characteristic will be different between farmers and their capacities. Investments in the ‘*melgas*’ can be considered as a reflection of the cultural values expressed by each family (Kellett, Toro, & Haramoto, 1994). The second motivation concerns the specific space of agriculture, its typology, and the relation to its neighbouring orchards. The factors that are related with the orchards are also the option of introducing new technology, new irrigation systems, etc. The use of the new irrigation system is associated with the motivation of improving production and economic conditions. This depends on the possibilities that the spatial and topographical conditions of the land bring about, and its relationship

with other orchards. Finally, the third motivation is the relation to the desert, the factor of being in the most arid desert in the world, and at a high altitude.

Nevertheless, the intermediate spaces and the crop areas are spaces built by water which flows through the river, canals and finally arrives at the *'melgas'*. This is the result of the encounter between the natural configuration and the transformation of this structure by human action. I argue that the definition of public space through the water flows, and the result of the social organisation, knowledge, and practices of water allow the community to take advantage of the natural resources.

6.2 Access over time

In seeking to investigate and analyse the concept of access, it is useful to consider notions of time, and how discourses are being constructed within the farmer association. This section will look at this issue, discussing not just the importance of time in the practices and process of water, but it will also focus on the romantic and intriguing relationship of the concept of time. Time can be both an opportunity, as well as a difficulty (Kellett, 2014). How is it that time has a different meaning within the Atacameño culture than the Chilean society? How important is time on days of celebrations of Christianity, Catholic and indigenous believes? How is time related with this specific syncretism of the Atacama Desert? Time in Toconao is about agricultural stages, production of the land, cycles of water and movement of people. Changes in the land, irrigation systems, directives and decisions are connected with the passing of time. However, the question is: How can we use a temporal perspective to try to capsule these complexities?

A more detailed account of access of water over time is given in the following section. The examples that follow are mainly the consequences of the significant disparity in access to water as a resource, but also related to practices of water. In terms of access to and control over land and resources, this section will show changes in access, but also how access is related with the lack of knowledge, connection with other farmers, and the possibility to make changes in the way of relation with water.

6.2.1 Migration, a question of time?

One significant discussion in Toconao is the increasing migration of residents to urban areas. The main explanation among the elder farmers claims that young people leave Toconao because they want to go to the university, as they want to be professionals. As it was observed, the opportunities for young people are limited and, thus their aspirations are changing; these are different than previous generations. However, the migration process has been historically important for the communities of the Atacama Desert, from the exchange of resources in the pre-Colombian époque until the movement during the colony and the current movement of labour (Rivera, 2001). From a spatial point of view, migration goes beyond the current geo-political borders and natural boundaries like the mountains, lakes and in general the desert. All those elements have been connectors rather than limitations for migrants' mobility (Nuñez & Dillehay, 1995). The modern issue of migration has been present for decades in Andean communities, and the mining sector has always been strongly involved. Rivera (2001) argues that modern migration is based on the labour market and paid work, especially coming from the mining centres, education (secondary and university) and the informal service economy.

In my case, for example, we have been maintaining our things, our traditions. However, there are a lot of people that decided not to continue working their orchards because they are getting very old. Young generations do not want to work here, and they do not want to work in agriculture because there is no profitability. There is not enough profit to cover studies. For that reason, many of them decided to go to the mining sector (Teresa).

Throughout Chile's history, mining has always acted as a modernizing factor for the Chilean society, both from the point of view of entrepreneurship and the middle class, but also for the proletarian class and even peasants (Rivera, 2001: 171). At the beginning of the last century, the production of saltpetre by British corporations in the desert was an attractive adventure to leave Toconao and contribute to the economic subsistence of the household (Phelps et al., 2015). Mainly men have migrated to the mining centres. For many years, scholars defined migration as a fundamental element of the deterioration of the desert and its culture, where external agents damaged the original peasant life (Nuñez & Dillehay, 1995). Later, the copper boom arrived, and

the mineral was nationalised. Large waves of workers were required in mining activity. It was not only migration from the Andes to the mining centres, but also migration from different cities of the country and other parts of South America. Nowadays, there is another movement of people due to mining activities; this time related to lithium production. However, lithium production requires a more skilled workforce to produce the chemical. Hence, migration starts at a younger age, because young people want to specialize themselves and get better opportunities to work in the mining sector later on. Hence, they go to educational centres and universities to learn about mining processes (Bolados García, 2014a).

I was born and raised here in Toconao, and I left the town for a few years, like twenty years, two decades approximately. When I left, of course, you suffer and experience the uproot of being outside your place when you should study outside the town. I studied, I am an electrical technician, and then I worked in the big mining of Chile, I worked in different regions developing my profession. I know that mining is an area that takes all your resources, they get rich, and then they move to another place, leaving everything messy and abandoned. A good example is saltpetre mining. They left the entire town when the production was done. Another example is the mining camp in '*Chuquicamata*', a lot of people were working there, and then they got to retire, and now they are looking at Toconao as a place for retirement. There are a lot of people like them here, maybe you have spoken with them already. They worked for years in the mining sector, and then when they got retired, they came back to town, and they have the support to do something different, but at the end they are old, and there is not enough time (David - Community Leader).

Those waves of migration have decreased the population of Toconao and other Andean communities in the Antofagasta region, contributing to deserted or depopulated towns. Gundermann and González (1995) argue that the exodus of the inhabitants of the Atacameño towns decreases the demographic pressure on the land and weakens the agricultural dynamism. According to Esteban, the separation of people and their land is also a 'pressure valve' to the tension between land and water. It is provoked by the huge effects of the new economic structures that the mining sector has in the region. Temporary and definitive migration have a strong impact on the Atacameños peasant demographic structures (Gundermann & González, 1995). This situation has been shown in rural society, especially with communities of small landowners with a traditional form of agriculture that needs to rediscover a precarious balance in the

relationship between population and land. Without technological and productive changes, many inhabitants should find better sources of subsistence outside their local spaces. Some need to have a complementary economic income because the productive resources and the value of their productions would not allow them a decent subsistence.

For me, the mining sector is the means to an end, in terms of economy and my salary. It gives you advantages in relation to other economic activities. I mean, the style and the quality of life that I have could be different if I work in other activities. It could be different, it could be healthier if I work in other activities, but as I said, the mining industry is the means to an end. And what is the end? Economic stability for now, and quality of life for my daughters. However, this is not my North, it has never been my North to work in mining, I had that relation with the mining industry because all my family always has been related to it, and I reckon for that reason I am there, it is natural; don't you think? (Esteban).

In addition to the migration process, there is also an immigration of non-Andean population coming with the mining infrastructure and the return of local inhabitants after working in the mining sector for years. This new configuration generates a new Andean social space with new political and social relations. Those that are back in town want to recover lost time and are trying to work their land as they remember from the past. There is a special relationship between them and the ones that have not moved and have been in town all their life. Some do not share their knowledge and compete over the access to practices, especially related to water. Others spend time in town during the weekends and dedicate themselves to the land Monday to Friday, thereby missing all communitarian works such as maintenance, cleaning and rituals. Therefore, the lack of presence in town, particularly around the irrigation canals may cause in a weakening of the ability to develop water practices and sense of belonging.

6.2.2 Lack of traditional knowledge

According to the majority of the interviewees, the summer of 2012 is an important date for the inhabitants of Toconao. A huge flood destroyed several orchards, canals and the dam (Figure 6.7). Everything was buried underground and it required huge amounts of work to remove the tons of sand that came down that night. The main

bridge was severely damaged, dividing the town in two, the northern and the southern part. Furthermore, some houses close to the dam were destroyed. The central government and the army improvised an emergency camp south of the town close to the area called ‘sector campo’ to shelter affected people (Figure 6.8).

Figure 6.7 | Sector ‘Tranque’ after the flooding of 2012



Figure 6.8 | Emergency shelter in the sector ‘Campo’ in 2012



During my interviews, I got to know many stories about the lack of traditional knowledge to maintain the ravines to prevent possible floods and flash floods. The lack of care of the land and the territory is also reflected in the lack of interest in the community. This is what Fikret Berkes (2008) calls traditional ecological knowledge in his book *'Sacred Ecology'*. Berkes reflects on the knowledge about the relation between humans and their environment, which has been accumulated for centuries. This traditional ecological knowledge is about agricultural procedures, traditional medicine, water management, religious dimensions of the environment, and believes, among others (Berkes, 1993). For many indigenous communities in the north of Chile, the extensive cultural and social aspects of traditional knowledge are powerful and symbolic, which is one of the reasons that this discourse became more politically active. In other words, indigenous people started to enforce the control over their cultural knowledge and products.

Before, we did not have those problems, because people were living in that area. I was living there up to the mountains, and we kept the land very clean because we were living there. Now, nobody is there, everything is dry and full of dry trees and garbage, so when the water comes, it brings all these materials, and they destroy the canals. We need to work up there, clean it in the same way that we cleaned in the past (Camila).

However, during my fieldwork I found a lack of interest of the narratives of the community around people's relations with their environment, especially with the knowledge accumulated in their everyday practices. Ingol (2000) argues that practice is the essence of indigenous knowledge, in other words, practice is how knowledge is disseminated and received (Lejano, Tavares-Reager, & Berkes, 2013). A substantial number of interviewees argued that *'the past was better'*, or it was *'different'*. They were concerned that something was missing. The process of losing information was reflected in how people were using the space of production and even the tradition of cleaning the canals differently.

Now, the youth doesn't want to work...they want to work just for money, that's it. They don't want to work like we used to. Everyone is complaining, nobody is going. So, we cannot do it, we used to work together, everyone was having a good time, we didn't have problems. We used to do different activities, we sell stuff and share things. We didn't

have projects, so we couldn't ask for money, there were not need to ask for (Sabine).

Narratives of looking after water, land, and the importance of the *'pagos'* (payments) to the water emphasised the importance of the resources that the inhabitants own, and they are part of at the same time. The connection with these elements of the environment is similar to a relative or family connection: They talk about the *'Tatas o Abuelos'* (grandfathers) in relation to the volcanos or specific mountains as well sacred places or *'Pachamama'* (mother earth) or *'Pata-hoiri'* (water) when they start the process of sowing or harvest. Young people do not use those terms or traditions in their activities or everyday practices, but they remember the narratives when their grandfather or grandmother told them about these stories. The cycle of water, and the season of cultivation are narratives that are commonly used in the community to transfer knowledge, values and identity, especially about water management. However, the lack of interest of the younger generation in producing and living from agriculture or even having the option to live in Toconao has been a huge issue for transferring those everyday stories that allow local learning about the environment.

6.2.3 Caring about water as an object

A key concern in Toconao is the ways in which to save water. As such, it was important to look at water storage and water usage. That discourse of saving water was appropriated by farmers, who were working with ATF programmes. They put attention on sustainability issues through exchanging the traditional form of irrigation that has been developed for centuries in this area. One of the main objectives of the ATF programme is to promote drip irrigation systems. Some farmers have already absorbed and implemented this narrative, especially those who are involved in the wine production programme. Although there is a concern on how to save water, there seems to be less concern on how water is obtained.

We have done maybe not everything that we wanted. However, we understand that there is a lack of investment in terms of guaranteeing the availability of water. The water leaks, because there is no maintenance of the canals, and so on. So, we have tried, maybe not with a systematic plan, but we have found solutions like the accumulation tanks inside the private land, we came with the solution of drip irrigation systems. I

mean, today every initiative in agriculture is with drip irrigation (Lucas - SQM Mining Worker).

Saving water is understood by some farmers as a form of water accumulation because the ATF programme is promoting the use of individual accumulation tanks to redistribute the water in people's orchards through drip irrigation systems. However, this system is different to the cycle of water and the traditional irrigation form of flooding the land, which used to be every 15-20 days. Those different understandings of the use of water and the new system of working with water generates social conflicts about the control and use of water. Budds (2011) states that those clashes of different narratives or discourses about the use of water, affect the social mechanisms around water, resulting in technologies that are specific to water which produce a particular landscape. As is possible to see in the quotation of one of the farmers:

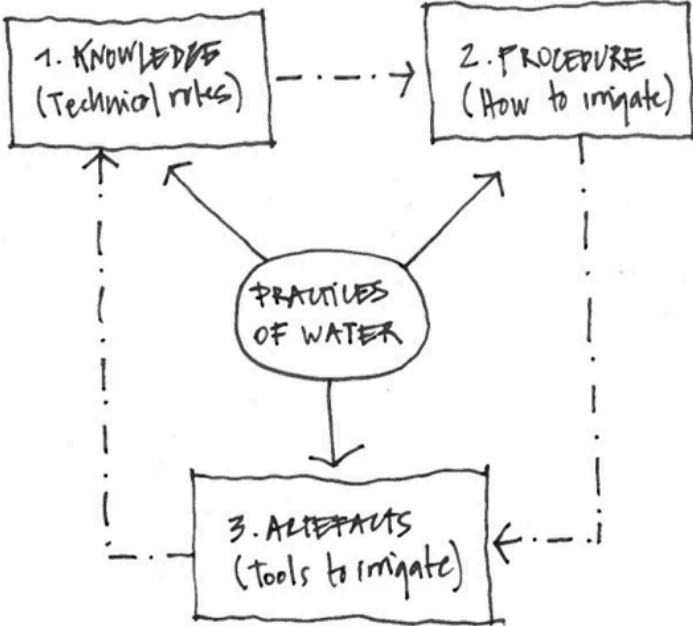
For example, some guys have a lot of land, first they have more land and they have the wine, they use an accumulation tank, and it is assumed that those tanks were calculated. They fill those tanks, and that is a lot of water, but they also use water to irrigate their orchards, do you know what I mean? So, there we are losing water. I mean, they are gaining water. They are not paying for that amount of water. Some farmers are doing the right thing. They fill their accumulation tanks and then use that accumulated water, and only that, they are not using more water. But there are others, who take advantage of no control to irrigate their land, and that should not be done, and it is not fair. It is a time of water that we are losing (Sebastian).

Cultural practices of water, its management, irrigation systems and the irrigation security, as well as how to keep the traditional agriculture, has been modified in the last seventy years (Sepúlveda Rivera et al., 2015). However, Figure 6.9 shows that the practices of water use are still based on the three same elements as before: a) *Knowledge*, or technical rules about the actions that have to be done in relation to the productivity of the land, such as irrigation times and quantity; b) *Procedure*, how to irrigate depending of the products and the quantity of water; and c) *Artefacts used* to irrigate (Castro Lucic, 2007).

Figure 6.10 shows four different sections or levels of analysis of the irrigation system: 1) *water catchment*: the place where the water is collected, and then channelled to the

main canal; 2) *water pipes*: the canal section where the main canals are diverting the water to secondary canals; 3) *distribution*: when secondary canals distribute the water to different private orchards, or are accumulated in the collective dam or in individual water accumulation tanks; 4) *application*: inside each orchard, the water is used to irrigate different ‘*melgas*’ depending on the type of cultivation people have (Games, 2013). This last segment has changed in the last decade, inserting new technologies like drip systems to bring water to the land.

Figure 6.9 | Elements of water practices

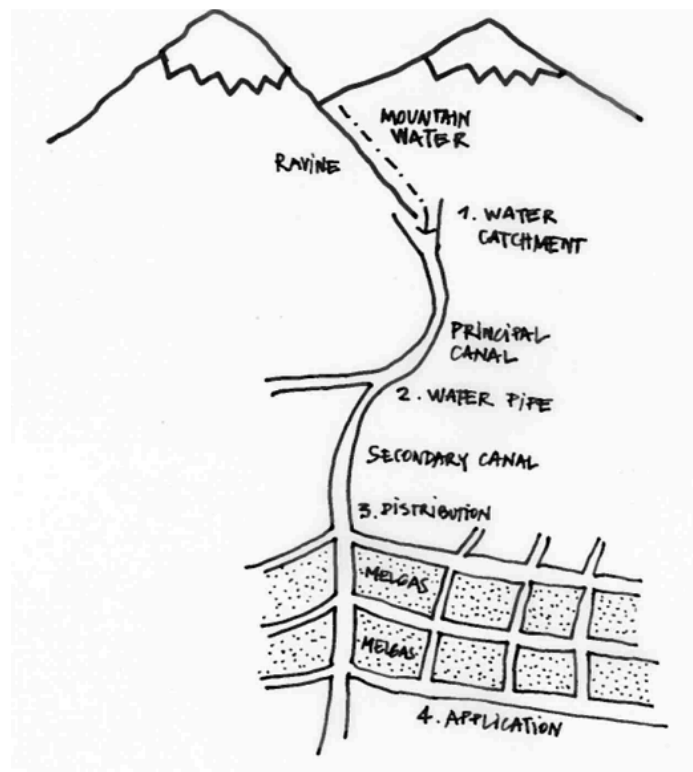


Source: Author based on Castro Lucic, 2007

This new system is quite different from before. The old way of irrigating the orchards or ‘*melgas*’ means flooding the cultivated land, separating the ‘*melgas*’ through a border of soil that was piled up. That action prevents of over-irrigate the plants and separates the crops, as some need more water than others. According to the farmer’s association, almost all main and secondary canals are covered by cement or made by cement, which decreases water loss due to infiltration and reduces maintenance needs. The essence of the management of the irrigation is related to the knowledge and sense of equity of the ‘*celador*’, who takes care of and distributes water to farmers. When the ‘*celador*’ is not around, farmers themselves divert the water to the next orchard after completing their irrigation time, or they call their neighbours by phone telling

them that it is their turn. This tradition, which Paul Trawick (2002) calls ‘moral economy of water’, is based on the principles of equity, solidarity and respect. However, some farmers are not respecting their shifts and they do not pass the water on to the other farms.

Figure 6.10 | Analysis of irrigation system



Source: Author based on observation in the field

6.2.4 Times of drought, as a possibility to make changes

All interviewees were worried about the increasing water scarcity, longer times of droughts, and the extraction of water by the mining companies. However, they also saw a positive side to this. Droughts in the desert, and especially in the community of Toconao, are also seen as an opportunity to improve agriculture, irrigation systems and the chance to transform practices of irrigation. David, the current president of the Committee of Potable Rural Water of Toconao, mentions in the interview that it is not possible to keep on wasting the water. Water is a fundamental element for life particularly in the desert, where the resource is scarce. For that reason, David says it is necessary to look at new technologies and mechanisms to save, deliver and manage better water resources.

I always say to my children that we have to optimize water, it is a resource that is running out quickly and we have to optimize it. If we can get it from other ways, like from the clouds, dew, from everywhere...it is welcome. The new generations must utilize it in the best possible way, optimize every drop. Every drop in the desert is a lot of money, and that is going to cost a lot in the future (David - Community Leader).

Elderly farmers also argue that not irrigating the land is part of the agricultural and water cycle. They argue that it is necessary for the land to ‘rest’ and ‘recover’ from previous crops, move, sift, clean and fertilise the land for the next cycle and new species. This agricultural practice is called *‘barbecho’*, and its main purpose is to avoid the exhaustion of the soil nutrients, save organic matter, reduce pests, and improve the quality of the soil for the following agricultural cycles (Prieto, 2017). Hence, there are opportunities to take advantages of drought and to improve the management of the agriculture and irrigation cycles. However, in extended periods of droughts, people have to create different coping strategies. For example, a water accumulation tank, as it is shown in (Figure 6.11).

Figure 6.11 | A farmer's accumulation tank in the sector ‘Punta’



Source: Author

Some farmers have tanks to accumulate water in winter time, when water is otherwise wasted, because there are no irrigation shifts and control. Farmers do not necessarily have new irrigation systems, where the water tank is a fundamental part of the drip system; rather, they accumulate water to irrigate through flooding. Other farmers justify the use of the new irrigation system as a way of saving water, which reflects the discourse acquired by the CSR programme and social initiatives coming from the local municipality. The CSR’s discourses around productivity and efficiency of water are absorbed particularly in summer time, when more water is required. The focus of

this discourse is about increased production yields with an appropriate way of irrigating the orchards and making production decisions (which product they prioritize).

What happens, if you have a land that is less than 500 m², and you use all the water in half an hour or one hour, and when you irrigate half a hectare with the same amount of water, then that is efficiency, efficiency. I use the same amount of irrigation times, I even use less. Here, this land, for example, I am not irrigating with its water. Why? Because I put all the water in the tank that I have up there, and I combine the waters. With this land I have an hour, and with the other one and a half hours. I put all the water in the tank, and with that amount I have enough time to irrigate everything. As I said before, you can irrigate two small orchards in one hour, or an hour and a half. But, if you change the system, you can irrigate half a hectare in half an hour. It is much more productive, and you get more production, and it is becoming more interesting even from an economic perspective. You can start living from that production (David - Community Leader).

Therefore, there is a clash of discourses between taking advantage of the lack of water, and accumulating water to distribute it in a more controlled way. The argument about giving a rest to the land or '*barbecho*' in the drought is losing importance. Hence, the possibility to reduce the resting time takes over the production of the land, and the capability of being more efficient. The conflict starts when the '*barbecho*' is seen as a lack of productivity and a way that people waste their land.

6.3 Access to practices

A third element, additional to access to space and access over time, is access to practices. Agricultural practices create a sense of control over both time and space (Rasmussen, 2015). Agriculture is linked to the cycle of water, and also deeply embedded in the landscape. All farmers (25), who do not work with a drip irrigation system, mentioned that the everyday tasks in the orchards are connected with the environment, with the movement of the water when it flows down, the movement of the clouds on the skies, the white on top of the mountains, amongst others. Therefore, water frames the engagement of people and place, as Ingold (2000) argues, the water of the Andes is never just water. Water becomes the materiality of social relationships,

as human actions or practices that are embedded in particular times and places (Bender, 2002).

This section begins by looking briefly at notions of access to agriculture and water in the Andean context. It then goes on to look at the practices in the field, identifying and focusing on the lack of agricultural practices in the territory like ‘mingas’, harvest, and cleaning of the canals. Then, the focus will be on the lack of communitarian practices or communitarian work, the role of the community leader in the decrease of the practices and how this action is reflected in the decision-making processes. Later, the emphasis goes to the concept of ‘bad practices’ and finally the action of owning some practices. The objective of this analysis is to recognise practices, but also understand why and who has access to those activities.

6.3.1 Decreases in communitarian practices

People from the desert are proud of their skills in water management under extreme conditions. Elderly people claim that cooperative and shared water practices are the only way of surviving and living in this extreme area. However, the narratives of younger generations, especially those working in the ATF programme emphasise different mechanisms of saving water and using less water, thereby avoiding the concept of cooperation. Carrasco (2016: 136) argues that there are two characteristics of Andean life: common control and reciprocity, suggesting that *‘among Atacameños, conflict is as much a part of community life as cooperation. Reciprocity is understood as a relationship that can be both symmetrical and asymmetrical between families and the community’*.

Cooperation can be proportional or unequal between families and communities. For example, when farmers work to clean the canals, they act as community and for the benefits of everyone who needs water for agricultural purposes. The Irrigators’ and Farmers’ Association has the power over the farmers and exercises it by giving them orders and sanctions depending on how they work. This practice of cooperation and solidarity is understood as community action, where the inhabitants of the town engage with a common benefit. From their cosmological vision, farmers receive water for a calendar year in compensation for their work, and the *‘Pachamama’* pays them back

all their efforts for the cleaning. However, the logic as a community is contrasting with the individual necessities, depending on people's demands and participation with water.

There is a separation within the community, and we can see it in the way people work now. The mining does not have the desire of working with all of us as a community. I think we should find a way to give opportunities to everyone, that is what we need, that is what we are looking for. We have been divided, and the clear example is the case of 'Aguas Blancas', when the mining company wanted to take the water, that is a good example. We cannot be naïve and deluded and think that the company will take our water. The problem is that they pay only a group of people and not the entire community. Therefore, that is not a community. That is not the collective good of the community, and as a Community Leader, I am fighting. I can understand that the association has the right to those waters, but we should think to get benefits for everyone and not just for some. We need projects with another vision for the entire community, and not only receive money for personal interests. At the end, those who had money have even more now, and I reckon that it is a transgression and violation of the rights of those, who have fewer opportunities in town (Alejandro - Community Leader).

The interests of the mining sector have provoked changes in communitarian practices. The current legislation gives the mining sector the power to change and reconstruct the economy through a different vision of development, not only in the local level, but also at the regional and national level (Babidge & Bolados, 2018). Further, mining processes have the power to transform geography and hydrological cycles, increasing the times of drought (Boelens, 2014). These actions are opportunities to change the way people observe water far from their 'Cosmovision' as a commodity, thereby replaying mining interests.

Practices of cooperation, sharing and being autonomous are part of the principles of the moral economy of water (Boelens, Hoogesteger, & Rodriguez de Francisco, 2014; Carrasco, 2016; Prieto, 2015a, 2016b; Rasmussen, 2016; Trawick, 2001a, 2002). Those principles are part of common water practices with internal and specific rules within the community. They emerge with intensity in ceremonial and agricultural practices like the '*mingas*', '*limpias*', '*harvest*' and '*payments to the water or Mother Earth*', which are also part of the water cycle. However, this cycle is broken by the pressure of mining enterprises that push individual necessities, and change the

understanding of water from a common good to a commodity that has an exchange value (Kopytoff, 1986).

6.3.2 Lack of '*mingas*', '*cosechas*' and '*limpias*'

Agricultural practices are connected with the use, protection and productivity of water, from the maintenance of the dam to the practices of fixing the irrigation canal. They impact the everyday life of the inhabitants of the communities in the desert (Sultana & Loftus, 2012). Those impacts can be reflected in the individual or collective practices, which are defined depending on the amount of work that it is required. In the case of Toconao, actions define the agricultural production at the harvest, the preparation of the soil and the sowing. Therefore, the agricultural and water cycles regulate the time of practices, but also the space, where those practices are produced.

According to some elderly farmers, the loss or deterioration of communitarian activities like '*mingas*', '*cosechas*' (harvest) and '*limpias*' (cleaning of the canals) is clearly a loss in the identity of the Atacameño culture. Gundermann and González (1995) argue that there is a crisis in the social organisation related to communitarian works. This crisis is not only manifested in the lack of leadership, but also in the loss of social responses like the lack of participation in social activities. One observation that comes from the community was the argument of a lack of leadership in relation to the structure of the communitarian works. Interestingly, the lack of leadership was observed in the loss of effectiveness of the social structure. However, individual leaders, especially those that were economically successful, were gaining support within the farmer's association.

'*Mingas*', harvest and cleaning of the canals are communitarian activities that depend on mutual work and require a significant workforce. Those activities in the Andean region allude to different types of communal farm work, sometime in exchange for food (Escobar, 2011). Farmers or members of the community of Toconao contribute to a specific task that requires a skilled workforce. To fulfil those specific functions, solidarity and rules (Gelles, 2000), as well as affectivity are required (S. Rodríguez, 2006), but this no longer occurs.

Before, for example, we used to build houses with *'mingas'*, where people gathered together, we helped each other, we used to say: 'Today for you, and tomorrow for me'. Unfortunately, today we do not use that system anymore, and I reckon we should go back to that system (Karina).

Especially young farmers, who have childhood memories of being part of those activities and who returned to town for different reasons, intend to become part of this communitarian work again. However, the lack of cooperation and the increase of working as individuals has caused a fracture between young and elderly farmers, especially those, who are working in the wine programme. As the extract of my field notes show:

I got an invitation to work at Clara's *'minga'*. However, she did not know exactly what to do in there, and everyone there were guessing the procedure. We were eight guys with not much experience in agriculture, even Clara, who has a title in agricultural engineering. Some were outsiders of the town, and some belong to Toconao, but had no experience what so ever. However, all of us were with energy and enthusiastic to participate, maybe because we knew that we were having a barbecue and beers afterwards. Clara's dad arrived later that morning and he was guiding us what to do, and [told us] the specific order that we needed to follow to clean the orchards. First, we had to pay Mother Earth with wine and toasted flour, in order to have a good and productive season. Second, we had to clean the surface of the land, taking off leaves and garbage that was accumulated. After that we accumulated it and threw it out into the river. Before, they used to burn the dry leaves, but after a few fires, the association prohibited it. Also, we had to prune and trim all trees. This step was very important, because it defines the quantity and quality of the next harvest. That was my first experience in practice. Fortunately, I had the opportunity to take a course when I arrived in town (part of the wine programme). After that, we had to move the soil, and prepare the boarder of the *'melga'*. That part was important, so they can define the amount of water they will need for specific crops. In this orchard, we did not sow new species, so the work was basically maintaining and cleaning the orchard. We had to clean the inner irrigation canals, and its gates also, taking out the sand that was accumulated in the last year. We were working for almost eight hours. Clara's dad mentioned that all the job that we had done, would have been easily a week of their normal work. Now, let's go to the barbecue! (Field notes, 16th August of 2015, Toconao)

As mentioned in the last paragraph, the participatory structure for the maintenance of the orchards responds to the existence of the traditional practices like *'mingas'*, *'cosechas'* and *'limpias'*, amongst other activities (Zambra-Alvarez, Álvarez-Abel,

Ther-Ríos, & Núñez-Maldonado, 2016). Those activities have been changing depending on production, lack of water, lack of workforce, weather and economic conditions (Sepúlveda Rivera et al., 2015). Further, the implementation of drip irrigation promoted by the CSR programmes has accelerated the disappearance of traditional practices and therefore the participation in those activities. According to Camila, those practices were relevant activities for the habitual organisation of Toconao, because they were part of the social and productive life of the majority of the orchards of Toconao.

In the past, when the flooding came, elderly people in the community fixed everything. They used to do '*mingas*' to fix everyone's land. They used to do it '*a pulso*' (by hand) and land by land, nobody was using machinery like now. Everything was made manually, and all of us were united, and everyone worked the same, and worked a lot. Now it is different. When they should go to clean the canal...they go there just to have a look, walk around and that's it. Lots of people hire a '*peón*' (temporal worker) and they do the job for them. Farmers pay them, and it is done. Before it was different; men and women of the town worked the same and a lot. Everyone was working with a shovel (Camila).

Furthermore, the loss of these activities is in practice the loss of access to some traditions and communitarian work. Fre (2018) argues that traditional practices are knowledge related to sovereignty. Therefore, the loss of those practices can be understood as loss of local autonomy. Further, there are some activities that cannot be executed by cheap and unskilled workforce. Farmers would need to pay large amounts of money to hire workers and equipment to do specific tasks. Antonio argues that a '*minga*' is unpaid and collective work for the benefit of the community livelihood, at least monetarily. Farmers, who need help in their orchards invite other farmers to be part of this task, and they offer them food like barbecues, drinks and seeds or support them with their own labour in return (reciprocity). These actions are strategies of subsistence, in particular for the group without sufficient financial means. They are also a form of collaboration to link cultural and economic livelihoods with the recreation of self-identity and territorial identity (Rodríguez-de-Francisco & Boelens, 2016). The following quotation expresses the meaning of '*mingas*', and the importance of working collaboratively:

When we had '*mingas*' here, people cooked a big common pot with '*pataska*' (a typical Andean meal), with lamb and corn, with everything that you can put into it. The first '*mingas*' that I remember, I remember a little bit, but I can remember something. They had small pots, nothing that we have now, like viands, and the owner who needs a '*minga*' knew already who a good worker was. They knew what they can do in their orchards. So, they prepared the pots with food and then they brought them to the workers' home early morning. That action was an invitation to work at the next day. That was a commitment or engagement, do you understand? So, they were looking for some good workers, who know how to clean well, who know how to fix canals, who know how to prune, and others who were good with the axe and cut and trim the trees or to plough the earth, so that was the '*minga*'. You had to go and collaborate with the host. Now it is different, the '*minga*' is like a fun activity, it is a joke. Now they do whatever they want to do, they start drinking and they speak nonsense. At the end, the meaning of the '*mingas*' has been lost. Personally, I think the reason for that is that those people are not Atacameños, they are not from here, they are people that do not know the culture (Antonio).

The lack of '*mingas*' does not mean that there is only a lack of cultural activities. There is also a lack of territorial identity, because this activity was a way to synthesize the thinking of territory through everyday actions (Muñoz & Rodríguez, 2011). The local identity is associated with the use of the space, as we can see in the '*mingas*' in Figure 6.12. Nevertheless, activities like '*mingas*' are the historical elements that shape solidarity and a more equitable water access, building the process of decision-making far more complex than traditional structures (Hidalgo, Boelens, & Vos, 2017). Also, Juan (Community Leader) mentions that '*mingas*' and traditional activities are part of the local identity.

I think, and I feel that there are two main elements that bind and reflect the Atacameño identity. One of them is the language. We are losing it, but if we can recover it, we can bring it here to our new vision. The second element is agriculture, and those two things are connected a hundred percent. There are a lot of meaning in agriculture and you can see it there, the '*vito vito*', the '*lavanti lavanti*', are exclamations that you can normally hear at the '*mingas*'. Therefore, the language is alive in the agriculture, the '*chacra*', '*laporcarki*' are indigenous concepts that are part of the agricultural process, so when you are growing the crops, and in relation to the land, water, and you are sowing, there is also the voice of the elderly people present in the orchard (Juan - Community Leader).

Figure 6.12 | Minga and cleaning of the canal in Socaire



Source: Author

6.3.3 Boundaries of committee practices: the role of community leaders

In the previous section the discussion outlined the crisis of social organisation, and one evidence presented was the lack of leadership. This section, in turn, is trying to understand the role of the community leader in Toconao: Who can be a leader, and leadership for what? What are the paths that the community leader is following? Are these individual or collective routes? Those were a few questions when I arrived at the community of Toconao. It was possible to observe that the community was divided in relation to its leaders, because every committee had its own directive and its own manager. Apart from the ‘community’ as an institution, there are several committees within the social institution. These include the Committee of Potable Rural Water of Toconao, the Irrigators’ and Farmers’ Association, the Electricity Committee, Social Housing Committee, and other small social organisations. These groups represent different sectors and actors within the town and distribute the participation of different members. For this section, I focus on two associations, the Indigenous Community of

Toconao and the directive of the Irrigators' and Farmers' Association of Toconao and how their power is affecting different decisions in relation to the use of water.

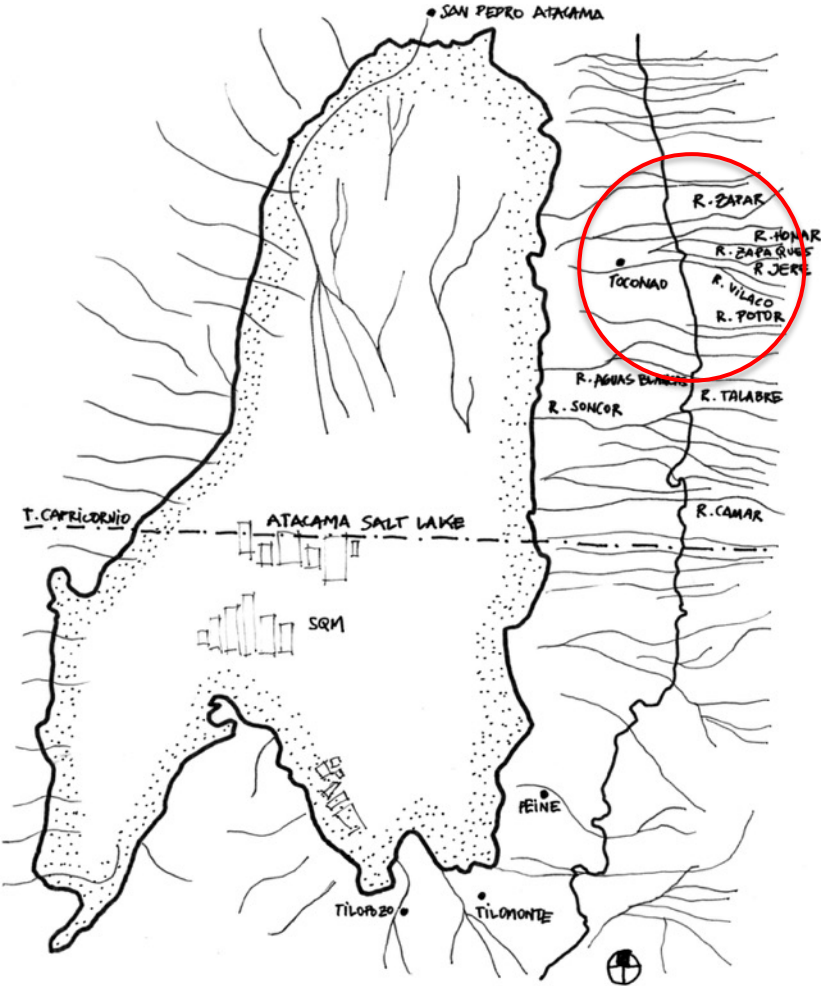
According to the statutes of the Indigenous Community of Toconao (2015), the community is composed of a board of seven people: the president, vice-president, secretary, treasurer and three advisors. All of them hold the position for a period of two years and can be re-elected. They also must be active members of the community. Their role as community leaders is to manage the community properties with all their facilities and act as legal representation of all members of the community. They should be able to agree and enter all kinds of acts, contracts and agreements. They further have to apply for projects with prior authorisation from the assembly, following the respective legislation of the statutes. The objective of the community is to promote material, economic and social progress for all registered community members, and to preserve and promote the development of the Atacameño culture, values and solidarity between its members and other indigenous communities around the area (Comunidad Atacameña de Toconao, 2015).

The Irrigators' and Farmers' Association of Toconao is an association within the Indigenous Community of Toconao that is composed of three members: the president, a secretary and a treasurer. Their roles and responsibilities are related to the conservation, cleaning, construction, and repair of canals, pipes, siphons, gates and aqueducts in order to deliver an adequate distribution of water. The objective of the committee is to promote and encourage agricultural production, thereby contributing to ensure an efficient commercialisation of products for the economic benefit of its members (Asociación Atacameña de Regantes y Agricultores de Toconao, 1981).

The community leaders are the legal representatives of the organisation in both cases. However, there are conflicts when community leaders make decisions, especially because the boundaries of each organisation are not very clear. The most important institution of the town is the Indigenous Community of Toconao, and all its members are declared indigenous people by law (Indigenous Law N°19,253), which states that they belong to the Atacameño or Atacameño culture. To be part of the community, inhabitants must apply to it, and a decision is made by registered community members

at the annual community meeting. The community is enrolled as an institution in the National Corporation of Indigenous Development (CONADI), which is under supervision of the Ministry of Planning and Cooperation (Ministerio de Planificación y Cooperación, 1993). Additionally, to be part of the Irrigators' and Farmers' Association of Toconao, inhabitants must prove and certify that they own land for agricultural purposes, where they can use the water that flows in the ravines Honar, Vilaco, Zapaques and Jere (Figure 6.13). The association also depends on CONADI and is governed by Indigenous Law N° 19,253.

Figure 6.13 | System of ravines in the area



Source: Author based on Google Earth and Games, 2013

The two spheres of power, represented by the two associations are complex and respond to different objectives, and follow individual and collective interests. Even though the committee depends on the community as an institution, these act as independent. The Irrigators' and Farmers' Association focuses on the productivity of the orchards and the water usage. The clash between the collective and individual interest of the association and its leaders is mediated by the incentives and the opportunities to apply for funding of different programmes. The ATF programme helps to develop individual initiatives as a way of avoiding collective's differences, conflicts of power and vision in relation to the development of the area, as its sustainability manager mentions. Since 2008, the company supports individual farmers with the production of wine and agriculture. It promotes an innovative and profitable agricultural plan, which aims to incentivize the development of communities. However, this plan is only implemented in individual cases, and most participants are part of the directives of different committees and community's organisations.

Due to communitarian relationships, we basically have been opening the doors to everyone, who wants to work with us, and not necessarily through the formal organisations, because we understand that the formal organisation has weaknesses, especially in relation to the assignment of power and the assignment of resources associated to power. Therefore, we have been worried to work with individuals who want to work with us, because there is a stigmatisation of people that work with mining companies, right? There is a condition in relation to their relationships, therefore, we do not want to force that, and we decided not to get involved in the weaknesses of the organisations and their directives. So, we decided to go there and work with who really wants to work with us. There are some communities that have developed this more. For example, the community of Camar has a clear collective definition, not so marked by power and the influences of its community leaders. On the other hand, in Toconao that is never going to happen. First, because the community leaders do not earn money, and a few of them live in Calama, so there is a conflict between those, who live in Toconao and those who reside in Calama. Therefore, the level of influence in the directive is marked and the level of decisions in this context is very complicated, and it is very difficult to create productive projects through the community (Lucas - SQM Mining Worker).

It is possible to observe that some interests of community leaders are not connected with the vision of the community. Some of them have been successful in their

production, and therefore became examples for other farmers in regard to implementing new irrigation systems and seeking new ways of understanding agriculture as a productive and profitable activity. According to these findings, I would argue that cooperation has been exchanged for competition. It is the new concept that is promoted and implemented by the mining programmes at the expense of communitarian practices, losing interest within the community. There is also an absence of community leaders who promote participation and cooperation. The Irrigators' and Farmers' Association of Toconao is losing power and influence on individual initiatives, which promote a new way of understanding agriculture. Social practices in relation to cooperation with other farmers have lost interest and the strategies of the mining are part of these discourses.

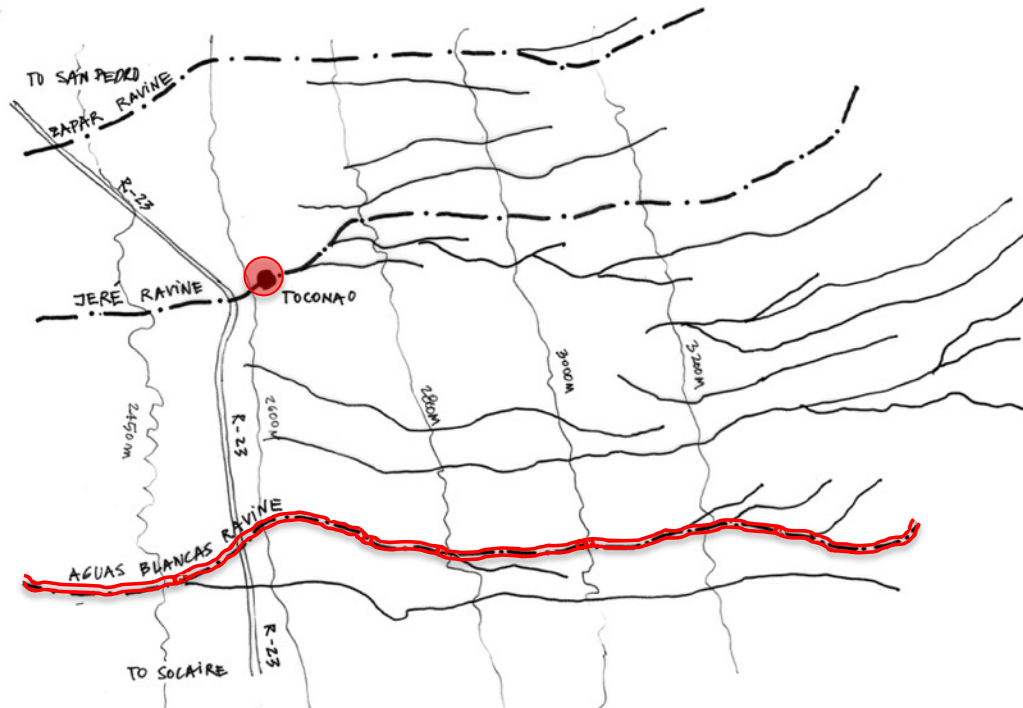
6.3.4 Selling or renting water to mining

Control over water and land ownership are the fundamental axes of power relationships within Toconao. Water and land are not just economic elements. They are also in a semantic sphere that combines traditions, religions and political aspects, amongst others. The case of the Irrigators' and Farmers' Association of 'Aguas Blancas' it is a clear example of how water has been managed and how everyone wanted to be involved in that discussion. This association is based 30 kilometres south east of Toconao, and all its members are also part of the community of Toconao (Figure 6.14).

Eight years ago, community leaders of the Irrigators' and Farmers' Association of 'Aguas Blancas' wanted to sell part of their water rights to the mining company SQM S.A, which extracts lithium from the Atacama Salt Lake and promotes the ATF programme. The arguments of the leaders of the association were that those waters have had high arsenic and boron levels, which makes them unsuitable for agricultural purposes. However, there was an important discussion about this action amongst farmers, and the directive of the community of Toconao opposed to selling the water. The key argument against it was the effect of the decision on the '*tradiciones y costumbres*' (traditions) of the Atacameño culture (Prieto, 2014: 288). Therefore, the association decided to use the concept of 'renting water'. Rather than selling their water rights, they gave the mining company a concession to use this water for

industrial production. Hence, they acted as a provider or supplier of water for mining activities.

Figure 6.14 | System of the irrigation association



Source: Author based on Google Earth

The leaders of this association, who made the decision, excluded the community of Toconao from all discussions. Their arguments were that not everyone was working in this specific area, and that economic benefits were created for all farmers who are part of this association. According to Francisco, Toconao is fragmented, which is possible to observe in its committees and associations. This specific association preferred to divide the benefits between the twenty families rather than sharing the benefits with the whole community. Nevertheless, the association is part of the community of Toconao.

Toconao was split in two. We were the ones of 'Aguas Blancas', who were the sellers, the traitors, the bad guys. On the other hand, those of Toconao, the good ones. However, people from Toconao never had the time to read, listen and see our arguments, working plan, our project in 'Aguas Blancas'; they never wanted to see it, they always saw the project with critical eyes, they always saw it with prejudice. There was even a congress of water organised by the Consejo de Pueblos Atacameños to treat this subject. Fortunately, they did not draw the conclusions they

wanted, because I was there, I was there for three days, defending my position (Francisco).

According to the legal contract between the Irrigators' and Farmers' Association of 'Aguas Blancas' and SQM S.A, the association sold 4,752 m³ per day with 55 litres per second to the mining company. This represents half of the amount of water that the association is entitled to for irrigating this area. The mining company paid US\$ 1.05 per cubic meter (Sociedad Química y Minería, 2014). The decision of selling the water co-opted the original use of the natural resource and generated enormous conflicts within the community: An economic conflict and a conflict due to selling water to a company with a history of violating indigenous and environmental rights and conflicts with the community of Toconao (Olmos, 2018).

What we did was to agree with the mining company directly (without interlocutors) to have an agreement of water supply. We are not going to rent water, or sell rights, we are providing water. This is the model that basically all private water companies have, because we are no fools, do you understand? We must take the best of both worlds. I saw it on the way, from the indigenous side and we have to take the European one, and that combination, and that dialogue of knowledge and wisdom is what validates our decision to keep going with the negotiations and carry on with the work (Francisco).

The community has the right to decide and be part of the negotiation, because this association is part of the Indigenous Community of Toconao. However, in this case, the decision was made within the community. Many members of the community were angry about this decision, because they were left out in terms of the benefit that this negotiation provides to the farmers of the association.

For the members of the association, this is a favourable profit, a really good one. For the indigenous cause, and the defence of our water, a permanent embarrassment. For any future negotiation or conflict, this is a nefarious precedent (Julia).

As a consequence of this conflict, the Community Leader of the community of Toconao at that time was removed from her role and expelled from the community of Toconao. According to some farmers, the main argument for that decision was her disrespect for the consent of the assembly and its negligence of caring for community

heritage. There are more stories of similar conflicts around water and how power is distributed within the community. Some farmers qualify them as errors. Generally, those mistakes ended up providing personal and individual benefits to the community leaders. Many inhabitants of the community find out about negotiations associated with water or other natural resources only when they are already agreed upon. Consequently, the responsibility of being informed and being part of what is happening within the community is turned into a member's right. Esteban argues that this situation is complex, because the community is very small and tangled up in family relations:

Everything is very complex, there are family relationships, friendships, tendencies to be isolated, secrecy in a pathological way, identity crises, and above all there is cultural vacuum in the indigenous concerns that allows practices to thrive that should be punished. If those conditions are not changing, we will see more unworthy negotiations. If we were suspicious, I would almost think that the state gives them some power to just have someone at the front who justifies a negotiation (Esteban).

According to the interviews carried out in the field, these conflicts are worrisome, not only because of the decrease in water flows, but also due to the modification of the water balances and of groundwater, which alter the water cycle of the Atacama basin. In addition, there is great concern about the lack of community commitment and the constant individual interest driven by the market model. Currently, the main threat to the community concerning water is not only the reduction of its availability and use. Fundamentally, it concerns the changes in its hydrological cycle and the availability of groundwater that is currently used by the mining industry.

6.4 Final comments

The purpose of this chapter was to analyse access to water practices as fundamental element for water management. This chapter answered the second research question: How do everyday water practices reflect the decision-making power of different actors in community decision-making processes? One of the most significant findings to emerge from this chapter is the implementation of fences on agricultural land, creating private spaces and blocking access for other community members. Access not only

relates to control over land, but also access to irrigation, practices, and spaces of decision-making.

Taking the analytical concepts of water, power and territory, this chapter focused on new agricultural practices imposed by the ATF programme that controls the access of the inhabitants of Toconao to spaces of irrigation. The chapter offered different narratives of water management based on ‘traditional’ (flooding) and ‘modern’ (drip irrigation) practices of irrigation that shape access to, and control over, water. As every narrative controls a specific form of irrigation, clashes of interests emerged. This chapter has shown that every institution puts its own interests first, which exacerbates especially because there is no clear boundary between different local associations and committees. Power relations and contestations among users and uses are most apparent in the use of water to irrigate orchards.

The chapter clearly highlighted that land ownership means power and brings about conflicts over water. I therefore argue that hydrosocial territories have to consider political relationships as a form of controlling access to water. That was exemplified the concept of *‘melgas botadas’*. Even though the orchard was not in use, the owner kept watering the land in order to reflect ownership and presence to take decisions. The extent to which these actions of decision-making are connected with the concept of autonomy and sovereignty will be discussed in the next chapter.

Chapter 7 **Autonomy, respect and identity as symbols of water practices**

Introduction

The previous chapters examined the concepts of solidarity and access to water resources. I analysed interpretations of solidarity related to lived experiences in the irrigation canals based on working with inhabitants of Toconao, interviewing them, drawings, pictures and observations. Further, I observed how decision-making processes reflect access to spaces of irrigation in Toconao, where not everyone has access to water.

This chapter analyses the impacts of changes in water practices induced by the implementation of the ATF programme in Toconao. It discusses the concept of autonomy through investigating how inhabitants of the community use different strategies of sovereignty and control to make decisions about water use, which is analysed through the dimensions of space, time and practices (Figure 7.1).

Figure 7.1 | Spatial-temporal-practical analysis of practices

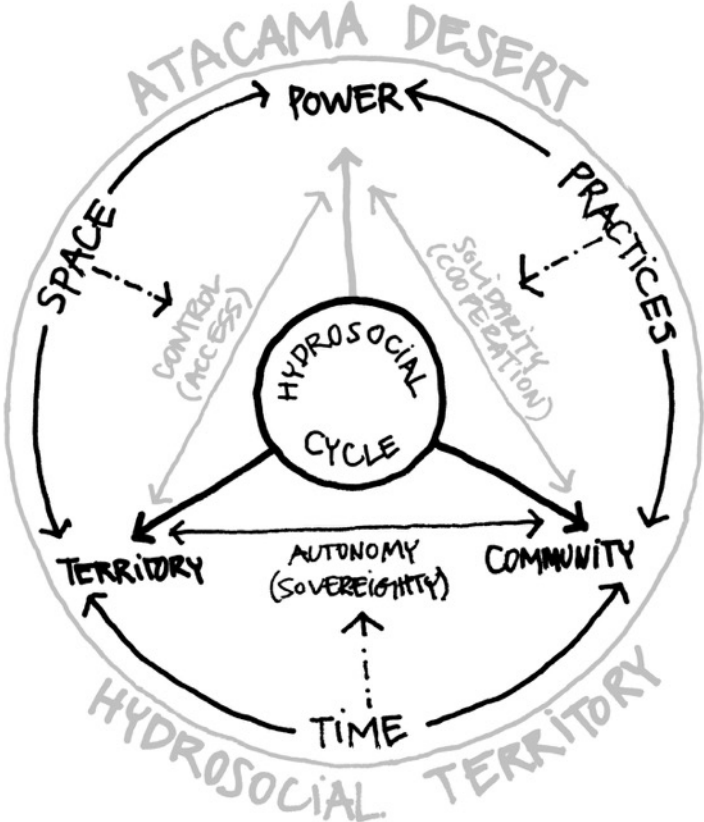
	SPACE	TIME	PRACTICES
AUTONOMY	1. DRIP IRRIGATION SYSTEMS	1. BEING AUTONOMOUS	1. KNOWING WHERE TO PLANT
	2. DEPENDENCY ON MINING CSR FUNDS	2. SOCIAL ORGANIZATION OF WATER	2. RESPETO AS AUTONOMOUS PRACTICE
	3. SHAPING LOCAL SPACES	3. BAD PRACTICES	3. PRACTICES OF FRAGMENTATION

Source: Author

Moreover, the chapter looks at the dependency on mining initiatives, and how this dependency is manifested in the use of space over time through new practices. Through this analysis, it seeks to identify the caveats and benefits of the ATF programme, pointing out the main challenges for new irrigation systems to become instruments for improving water use in the Atacama Desert. The chapter will therefore address the third research question: How have changes in water practices affected community autonomy since the start of the CSR programme? The main argument of this chapter is that autonomy is linked with practices of water. The implementation of the ATF programme has created a disconnection in this relationship.

The analysis is structured into three parts. Firstly, it looks at the inhabitants' interpretations of autonomy and how that relates to irrigation spaces and practices. One manifestation of this relation is the lack of using local materials for irrigation infrastructure, which leads to a dependency on standardised supplies for the maintenance of irrigation canals. Secondly, the chapter analyses temporal changes in autonomy reflected in water practices. This part draws on data from interviews and workshops with elderly farmers. It elicits their long-term perspective on new technologies promoted by the CSR programmes and their impacts on water practices. The chapter also focuses on how practices over time have changed with mining initiatives that encouraged productivity and competition, thereby losing the Andean perspective of cooperation and respect. Thirdly, the chapter describes practices of autonomy as main element for sovereign water governance in the Andes. Using various data sources, including secondary data, observations, drawings and interviews, each of these dimensions (space, time and practices) is analysed from a territorial and community perspective. The structure of the analysis of this chapter is summarised in Figure 7.2.

Figure 7.2 | Structure of analysis - Autonomy



Source: Author

7.1 Autonomy in space

In Toconao, as in many other communities of the Atacama Desert, irrigation is fundamental for ensuring potable water and increasing agricultural production. Bolin argues that an effective irrigation administration depends on the organisational skills and cooperative strategies of the people using the new technology (Bolin, 1994: 141). However, the impact of national decision making, social initiatives, and new form of irrigation interfere local irrigation institutions and therefore undermines local autonomy.

The following section analyses from a spatial perspective the effects of local autonomy, and local water practices.

7.1.1 Drip irrigation systems: It is not just a simple change

Technologies for drip irrigation systems are strongly connected to a discourse of 'modernity' and 'efficiency' and promise an increasing productivity of agricultural production in water-scarce regions (Vos & Marshall, 2017). In Chile, national government policies and the private sector have jointly promoted the expansion of drip irrigation systems over the last ten years (Henriquez et al., 2017). Changing from traditional forms of irrigation to drip irrigation, as Boelens (1998) mentions, can be a conflicting process. These conflicts go beyond the irrigation mechanism itself, and include disputes over changes of the meaning of water, practices and social relations in the Irrigators' and Farmers' Association.

The Chilean state and CSR programmes target so-called agricultural entrepreneurs as beneficiaries of drip irrigation systems. The quote below shows how a Community Leader feels proud of being one of the promoters of this irrigation system in Toconao. He has been part of the ATF programme since it started in 2008 and became a fundamental figure in the expansion of its use and the resulting change in understanding agricultural production in a rural area.

I always tell them (other farmers) that we have to optimise the water resource. It is a resource that is going to stop flowing, and for that reason we have to optimise it. If we can get water resources from condensation, from anywhere, it is always welcome...and the new generations, who use

it with the highest possible level of optimisation, to optimise every drop. Every drop of water in the desert is a lot of money, and that is what will be valued later on (David - Community Leader).

This interviewee holds several offices in Toconao and is creating controversies in executing them. His roles currently include being the president of the Committee of Rural Potable Water of Toconao and the president of the Irrigators' and Farmers' Association of 'Aguas Blancas', the latter managing the agricultural sector south of Toconao. Previously, he was the president of the Indigenous Community of Toconao. Due to his successful implementation of the new irrigation systems and subsequent grape production, David is said to be decisive in the distribution and management of the water basins.

At the time David started implementing the drip irrigation system, I had already seen it in Copiapo (another city), because I went for a holiday and we saw it. There, I saw the drip irrigation system for the first time. However, it did not convince me that it could work here. Now it convinces me, because now I see David's products (Ignacia).

However, there is concern about the implementation of drip irrigation systems due to the massive investments they require to be set up. Farmers that have done the implementation argued that after the investment the new irrigation system brings less maintenance, substantial water savings, and less capacity building. Furthermore, there are different narratives around the implementation of drip irrigation systems in Toconao. Some narratives question the relationship between wine-farmers and the dependency of mining support and are manifested in social, economic and cultural practices around water.

The traditional system for irrigating crops and orchards is called '*Sistema por tendido*' (flooding system), where the land is frequently flooded. Thereby, irrigation becomes a visible process, which is connected with traditions and sacred knowledge. This system and knowledge about water management have been transferred over generations, hence, most inhabitants of Toconao classify flood irrigation as traditional.

Flood irrigation is more productive, because we used to have vegetables, but not now, the only thing you see in the orchards is parsley, but nothing

else ... earlier, it was not like that. Earlier, people used to have coriander, oregano, and many other herbs...(Sabine).

Local decisions and debates about water scarcity in the desert, however, pushed for a new way of irrigating products to improve agricultural yields. Several farmers advocated for drip irrigation systems to use water more efficiently. The comment below illustrates the view of the ATF programme, and their objectives related to the production of agriculture.

Our goal is precise, our objective is related to the promotion of productive development capacities, so these initiatives are targeted to those farmers, who have the vocation to do business or have the elements to develop a business. Therefore, our initiatives are oriented to those, who are involved in the business of agriculture or want to do agriculture. They can have our support, and then they can transform this implementation as a communitarian concept of water efficiency, something good for them and better for us (Lucas - SQM Mining Worker).

However, there are several critiques to this position. First, access to this technology is severely inhibited, because all existing crops, including their roots, must be removed to install the irrigation pipes and connectors (see Figure 7.3). Further, interviewees argued that installing the new system as part of the ATF programme limits their decision-making autonomy and restricts freedom.

Figure 7.3 | A farmer's land



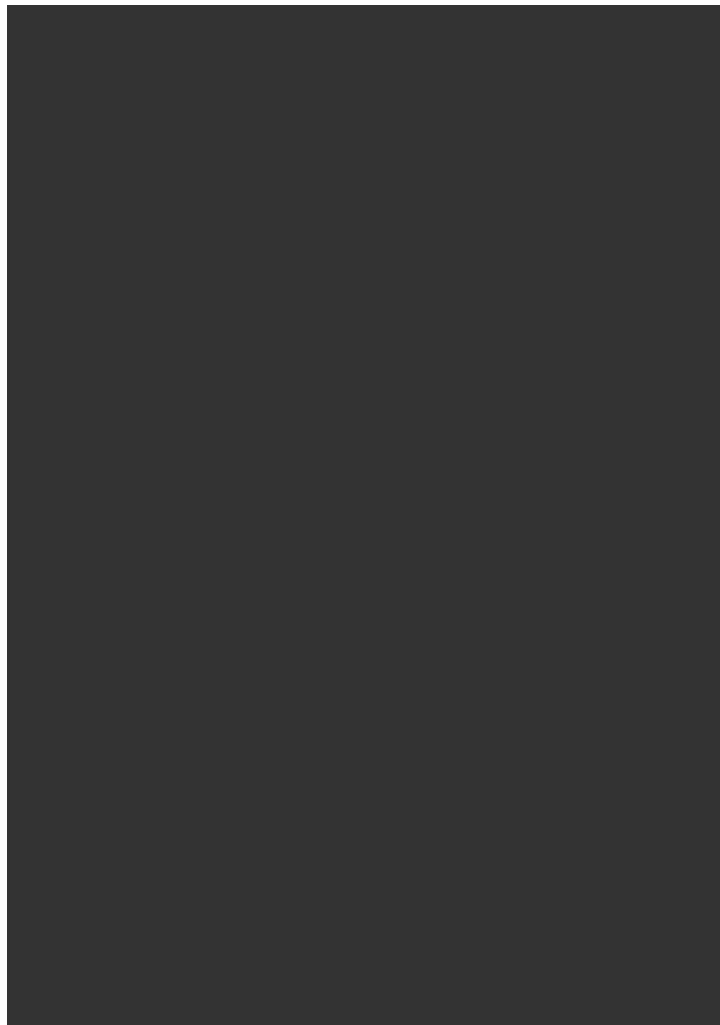
Source: Author

No, I rather do it myself independently. Because, I can get more ideas, it is not so narrow...if you apply for an ATF project, you have to have what they want. For example, I can have one idea, but they have another one, so the ideas crash. In this system, for example, that we have now, ATF programmes are dedicated to grapevines and grapes...they, for

example, if I want to implement another crop system, they will say no. I would have to change everything (Cristian).

Implementing these changes means not only eliminating crops that have been growing in the orchards for decades. It also signifies erasing part of the history of the village and its families. The quote above also indicates resulting changes farming practices, customs and traditions, thereby giving less importance to the worldview of 'Cosmovision' and the uniqueness of crops. Figure 7.4 is a manifestation that plants have a significance beyond agriculture products. It shows a tree, which is part of a family's history. Camila explained that the names on the trees were all the names of her family members. Being connected with the older generation of her family, who worked in the same orchards as her, motivated Camila to keep maintaining them.

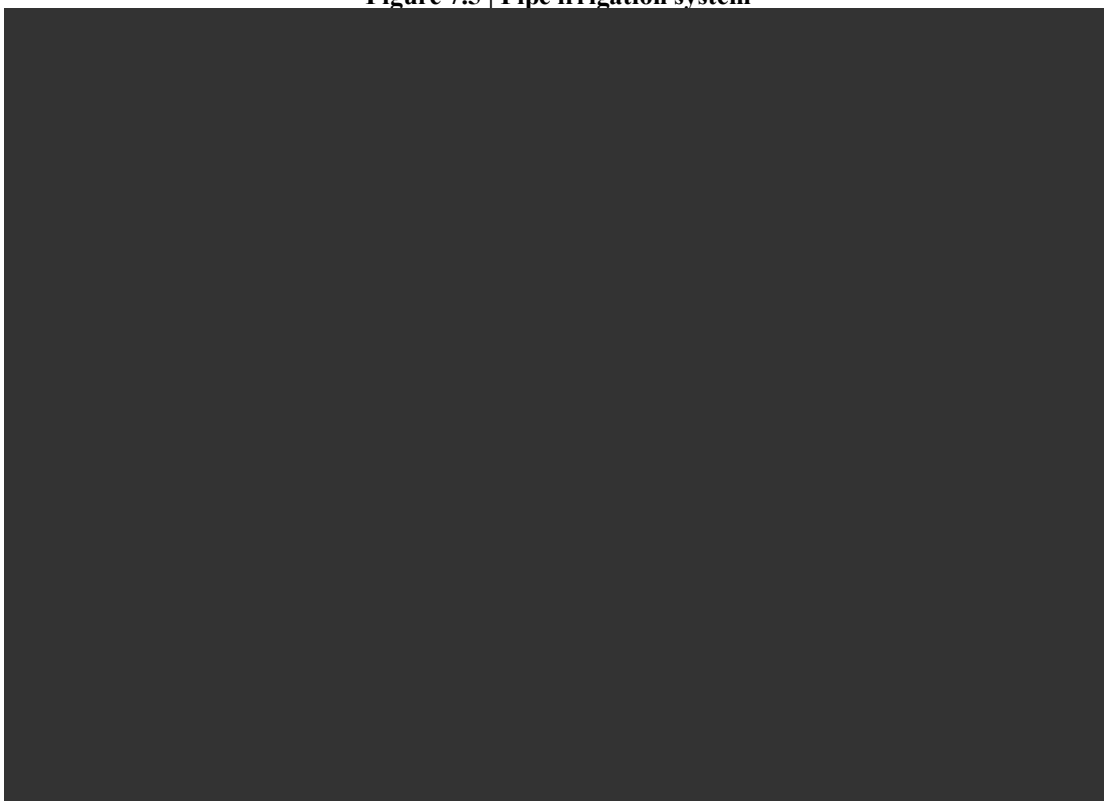
Figure 7.4 | A tree with the names of a farmer's family



Source: Author

In contrast, the new drip irrigation system follows a different set-up. It contains water dispensers every 50 centimetres, which provide the plants with water drops in a specific and localised way according to their growth and development. Figure 7.5 shows that these pipes generate a closed circuit of irrigation. They thereby prevent water loss and avoid the irrigation of products that are not considered economically productive, such as weeds.

Figure 7.5 | Pipe irrigation system



Source: Author

As mentioned in previous chapters, this irrigation system requires a water accumulation tank and an engine that generates enough energy to drive and transport the water from the tank to the plantations. Beneficiaries of the ATF programme said that pipes are exposed to the sun and require replacement and maintenance every five years.

There were different perceptions of the change in space due to the elimination of existing trees and crops for the implementation of the new system. One interviewee argued that shade, shelter and the natural protection against the sun in the orchards

were eliminated with the implementation of this new irrigation system, which reduced what he called ‘the safe space for farmers’.

Obviously, the flooding system is not the most efficient. However, in this activity, I am not looking for efficiency, I am looking for other experiences... to contemplate, to relax, where I can isolate myself a little bit from the urban context...It gives me peace (Ignacia).

Figure 7.6 illustrates some of the main characteristics of these spaces of contemplation that create shadow and wind protection in this arid area. Those places give farmers a space in the shade for resting, which is fundamental for working in the desert. This observation supports the work of Swyngedouw (2004) that water creates, shapes new spaces or landscapes through it flows. Decreasing the quality of space through the clearing of crops and trees therefore also had repercussions on the time of contemplation.

Figure 7.6 | Spaces of contemplation



Source: Author

Another interviewee mentioned that people used to bring food and cook in the orchards. The clearing of the land produces a lack of shade, lack of protection from the wind and sand and lack of grass, which inhibits farmers from staying in orchards for a long time. Hence, they reduce their interaction with the orchards to agricultural production.

We used to wake up very early morning, because at that time I was fine, and my husband could work in the orchards. So, we got up early and I prepared breakfast and then I fed the animals, and then we left to work

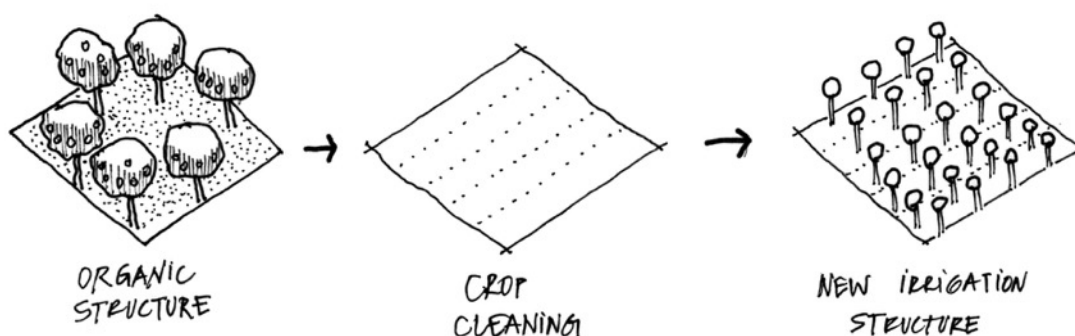
until very late. All day working there. My husband used to tell me to bring the pans, and we cooked over there, because we had wood, so I cooked there in the orchards (Sabine).

Another spatial change is related to the observation that farmers, who are involved in wine production, generally look for flatter land and land without previous plantations to accelerate the implementation of the system for the production of grapes.

Before the nice people (ironic tone) of SQM, the guys of INDAP arrived. They were fabulous, they offered modernisation in the orchards as a great product...that was when I was twenty years old (nineteen years ago). And my mom felt like she liked the idea... my aunt convinced her, and at the end they agreed, and they cleared all the trees, quince tree, pear trees, everything. They planted grapes, so they swept clean everything that was in there, in the sector '*la Punta*'. They put grapevines there and, of course, they said that they should buy them from the fourth region of the country, from there they got the grapevine. Obviously, they did not adapt, it was complicated, just a few started to grow, and in the end, they were wasting their time (Clara).

In sum, the implementation of the drip irrigation system spatially removed the organic structure of the orchards, which came from the different types of trees. This had several consequences beyond agricultural production, including the loss of ancestral connections and spaces for contemplation. Figure 7.7 illustrates how controlling water flows inevitably modifies the landscape.

Figure 7.7 | Sequence of the use of the land



Source: Author based on field observations

7.1.2 Dependence on CSR projects

At the time of fieldwork, the Atacama Tierra Fértil Programme worked with 20 inhabitants of Toconao. In addition to financially supporting the installation of the drip irrigation system, the programme provides training, education and fertilisers. It thereby created an economic and technical dependency of beneficiaries. Figure 7.8 shows the professional staff from the ATF programme setting-up of the grape production inside private orchards. However, staff engagement is limited to the orchards themselves and does not extend to common areas such as irrigation canals, corridors and the dam.

Figure 7.8 | Improvements as part of ATF Programme



Source: Author

At the time of fieldwork, only 10 farmers in Toconao already benefitted from selling wine or grapes. The selection of a small number of beneficiaries of the ATF programme created fragmentation and conflicts in the community, which is further aggravated by unclear selection criteria. Moreover, the high costs of installing the drip irrigation system makes it difficult for people outside the ATF programme to change to this new form of irrigation. As one farmer involved in the ATF programme said:

There are a few external institutions where we can get funding from. However, a lot of them are related with the wine project. We get help with the grapes, especially through training. An oenologist comes once a year, and also an agronomist. Basically, they come to train us. They also give us some petrol, they help us with that as well. Because, as you know we have to travel every day to irrigate our orchards. Therefore, we get training and diesel...and also some money to start the project; that is it. We got some part of the infrastructure at the beginning, but it was the irrigation system. That was, because it was part of the same project, and also because I knew the person in charge of the programme, and he told

me that I have to apply to that. Then I got something from INDAP, they also helped me with the infrastructure, and a small percentage for the construction of the water tank, the irrigation shed, the irrigation system, the vines, and so on...you know. The vines, I got them from SQM, and also the materials for the base of the water tank, and INDAP paid part of the irrigation system. We dug the hole and built the tank and we managed the local labour (Francisco).

The ATF programme argues for the high efficiency of this technology, which is essential to enable the production of grapes and wine. They contrast drip irrigation with traditional flood irrigation methods, which are presented as inefficient and using excessive amount of water (Van der Kooij, Zwarteveen, Boesveld, & Kuper, 2013). A World Bank report affirms that *'Drip irrigation uses 30–50% less water than surface irrigation, reduces salinization and waterlogging, and achieves up to 95% irrigation efficiency'* (World Bank, 2006: 163). References such as this World Bank report on agricultural water management, as well as successful experiences of drip irrigation in other arid countries are used to legitimise the discourse of the ATF programme in the Atacama Desert. As one ATF worker said:

We can help them to develop their agriculture. Our focus has always been to support them without making them dependent on our operation. This is because in the past, other companies created social programmes, which generated different levels of dependency. For example, some farmers are suppliers to the mining company, and sometimes the company buys people's products like lemons in the village of Pica. And in the end, it does not matter if the lemons are good or bad, the company buys them anyways, they don't really care about it. The important thing with that action is that they fulfil their commitments, so the community doesn't bother the company. However, we have a different relationship with the community. We want to give them opportunities of development, we want to see how they can improve their quality of life but with no dependency on us. Therefore, when they produce wine, they can sell it everywhere. I have to be honest. I have to say that we are the main buyer of their wine. I always get a few bottles of wine when I want to give a gift to my brothers and family. But I do it, because I want to give them something that is the fruit of my work (Keng - SQM Mining Worker).

Only a minority of interviewed farmers agreed with this quote. Their disagreement comes from the rejection to the change of the cultural form of irrigation, as well as from having a complex relation to the mining industry. The quote below aligns with

the work of Gelles (1996), who demonstrated in his research in the Peruvian Andes that productive implementation in the Andean sector, such as flooding systems and drip irrigation system, must be understood beyond the technical, economical or ecological concerns. Gelles (1996: 261) argues that *'these systems should be perceived in terms of the cultural model that encoded their implementation and the relationship of these models to political forces at the local, regional, national and international levels.*

Here, there is a cultural pattern, and changing that pattern is complicated. To introduce a new irrigation technique, or also introduce tourism and mining, is something complex. We are cattle ranchers, farmers, hunters, gatherers ... However, it is very difficult to change the mind of our people in such a short time. Therefore, the public service or private sector, who want to intervene in our territory should do it through indigenous consultation and with the indigenous people in an appropriate way and with respect. Now, when they are coming, nobody asks anything, and at the end those interventions hurt us, underestimate us and that it is because our people are not being asked (Carlos - Indigenous Community Adviser).

Some interviewees argued that Toconao has to take advantage of mining initiatives and stated that the CSR programmes create benefits for the inhabitants of the town, as long as they respect decisions of the communities.

I think the social projects of the mining company are beneficial, as long as they manifest respect to our conditions as indigenous communities. I think something stops being beneficial to us when they start imposing things that you do not want. There are conversations with a lithium company, with Rockwood, they are also manifesting goodwill, we know that they earn enough prestige so that CSR programmes are actually beneficial for them. They show abroad and nationally that they have good relations with the communities. Therefore, I believe that they need to seek contributions with us, with the communities (Clara).

One participant commented:

When mining is coming, and they start to offer giving you resources, there are two points of views: on the one hand, you are selling yourself as a traitor. On the other hand, you can consider their resources as an opportunity, and it doesn't necessarily implicate a functional dependency on them (Esteban).

Another interviewee, when asked about his relationship with the ATF programme, said:

Well, we have to take advantage of these resources, and all the benefits that we get are very clear. However, there are some prejudices when you get benefits coming from the mining. People say: 'this guy is with the mining company or something like that', but that is not true, at least from my perspective. What I want is to take advantage of the mining, because they are taking advantage of us, as a town, therefore that is my aim, at least (Francisco).

Previous research on small-scale, community based irrigation systems has shown their resilience when faced with shifts in the political economies and rapid technological changes (Coward, 1990). Mabry (1996) showed that local irrigation associations in Peru survived not only outside the relatively restricted zones of large-scale irrigation projects; but have adapted within the areas of these projects. Lees suggests that irrigation technology has as much to do with bureaucratic power as with water (Lees, 1994). She argues that governments should withdraw control of local water user's associations to support the local development of more effective and cost-efficient small-scale irrigation schemes This perspective is confirmed by a Community Leader, who indicated that:

Look, related to the topic of water management, we are trying to take maximum advantage of the resources. We have done projects of canalisation, adduction, conduit, HDP tanks (High Density Polyethylene), cement tanks, all that infrastructure funded by the CONADI (The National Corporation for Indigenous Development). So, we must value the water resource. Everything is the responsibility of our internal institutions. We presented some projects to the CONADI like the water treatment plant and the improvement of the canals. We become autonomous because we are creating all the administration within the community. We do not have support from the municipality, nobody is helping us. Therefore, we are autonomous, and that is the characteristic of being 'Toconar' (a person from Toconao) (Alejandro - Community Leader).

However, this quote does not address the bureaucracy, which is inherent when interest groups within the community represent corporate power. In the process of improving irrigation systems, some groups had the ability to align benefits of the irrigation

development with their own economic and political agendas such as get positions within the community organisation.

Another interviewee argues against any involvement of the state, because it uses irrigation to change and manipulate the community. The consequences of this manipulation might lead to environmental degradation, increased bureaucracy and less autonomy, and economic stagnation at the local level.

The last government wanted to install a big dam over there, at the foot of the mountain, where the water that we use is born. They also wanted to create a new '*junta de vigilancia*' (supervisory committee) to check how we are managing the water. This action will replace process of decision-making that we have with the Irrigators' and Farmers' Association through the Indigenous Law... What is the idea? To accumulate water, and then to negotiate with the mining companies. We were very strong in our discourse, and we said: NO! we don't want a dam and neither a '*junta de vigilancia*'. We know that there is a crisis of water. Therefore, the dam could be built, but in another place, because this is a strategic area for us (Carlos - Indigenous Community Adviser).

Despite this necessity to feel autonomous, interviewees also pragmatically acknowledge the dependency on government initiatives and the economic capital of the private sector:

We are a poor community, but not only from an economic perspective, (we are) also (poor) in our traditions. For example, we can see how we are losing our wealth such as our traditional fabric, our language '*cunza*', the tradition of the cleaning of the canals, our songs, our traditional education, the experience of our own territory, the knowledge of the species that exist in this territory, and so on. It is clear that we are in a process of losing many aspects. So, the question is: how are we preparing for this? I have been very criticised because many people say that I am bringing the economic market to the town. But we cannot be romantic, and we have to be realistic. If we want to keep and strengthen our culture, if we want to reinforce our traditions, if we want to improve the agriculture and irrigation systems, then we will need resources to do it (Tomas - President of Consejo de Pueblos Atacameños).

7.1.3 Relations between local spaces and transformations of the landscape

I have already shown before that the inhabitants of Toconao shape their orchards in relation to the social organisation of the village, family connections and characteristics

of the landscape. The subdivision of the orchards is significant as spatial subdivision of land as well as temporal history of the families. The spatial transformation refers to the ways in which inhabitants dwell in their territory. The temporal links connect narratives about the use of the land to the everyday belonging and identity. Therefore, the changes in irrigation and resulting challenges are reflected in and by the connections to a productive landscape that is both inhabited and a source of identity.

The inhabitants of Toconao are themselves constructing their houses and preparing their arable land. Kellett (2003) is one of several authors who argue that many low-income inhabitants in Latin America construct their homes and also use them as a place for generating livelihoods. Many inhabitants of Toconao extend this argument through their close relationship between homes and their agricultural lands. Orchards are not in the same plot as people's houses, however, there is a close connection between those two sites. Orchards are perceived to be extensions of people's houses. Moreover, all agricultural products harvested from the orchards are processed at home to produce marmalade, jams, jellies, dry fruits (*'orejones'*), wine and other products. Therefore, the precisely the connection between orchards and homes is paramount for inhabitants to generate financial income. Commenting on the agricultural production, one of the interviewees said:

We sell fruits and also jams. We sell them to the public in Calama (a nearby city). We always get invitations to participate in regional fairs, and markets, especially my son, he is the one that spends more time on this project. We have a small family business, and we produce sweets and jams in my home. My first commercial business was packaged herbs, but I haven't done it basically for lack of time. We sell in different markets in Calama, and now we are trying to deliver our products in restaurants and hotels in San Pedro de Atacama. Everything that we produce is organic, we have natural compost, and my son prepares compost with some particular worms here at home (Karina).

Changes in the landscape were also observed through walking interviews, where I followed the movement of farmers around their orchards. Despite the close relation between orchards and homes, Figure 7.9 shows how residential and agricultural spaces have traditionally been spatially separate in the town of Toconao. The GPS tracking illustrates how farmers make their daily journey to reach their workplace and generally follow the route of the irrigation canals to their orchards. This movement or circuit is

part of the daily activities and allows them to see and review the conditions of the water and who is using it. Along this route, farmers pass by meeting places in the shades of trees, which are essential for farmers to talk and exchange products, seeds and experiences.

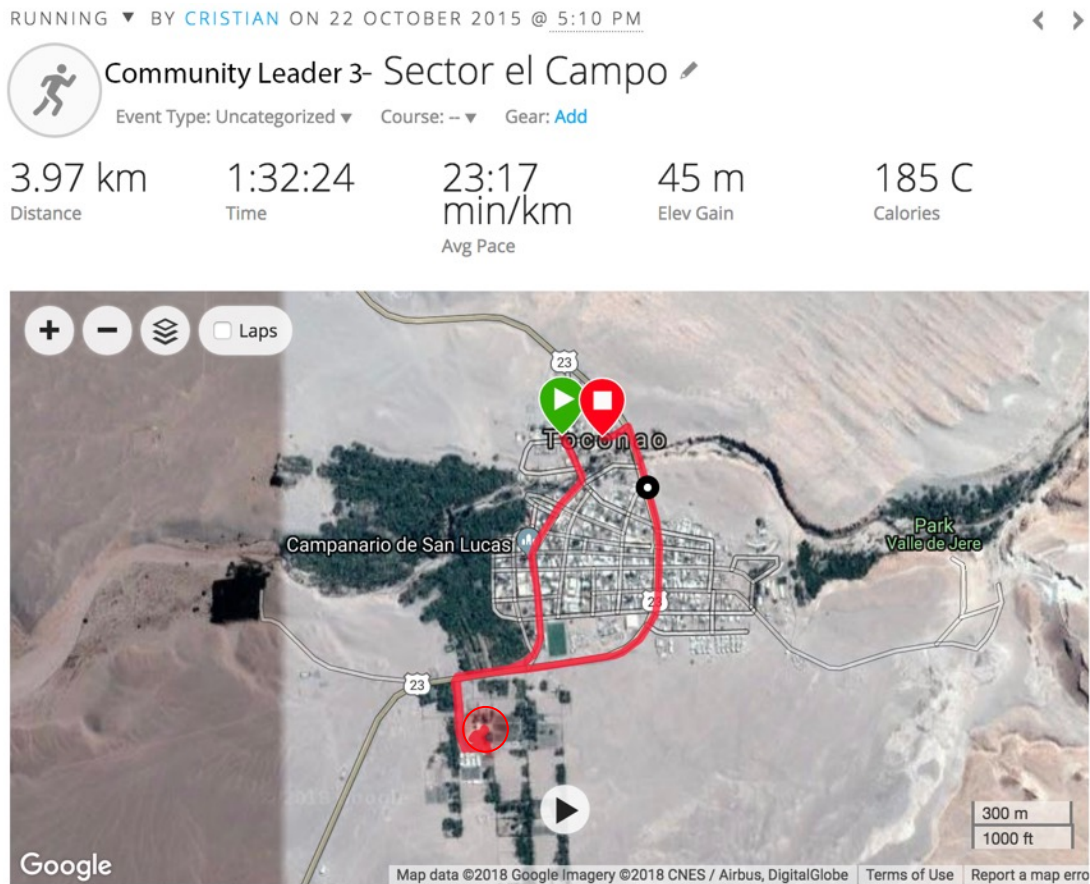
Figure 7.9 | Tracking the working day of Karina



Source: Author

In contrast to the traditional spatial separation, GPS tracking revealed that farmers, who implement drip irrigation systems, often had their homes adjacent to crop areas to be in close proximity to their products. From the perspective of the other farmers, this signifies a more individualised farming practice, whereby drip-irrigators miss out on the experience of water distribution and the everyday contact with other farmers. Figure 7.10 illustrates how David (Community Leader), who is supported by the ATF programme, picked me up from my house with his truck, and then we went to his house, where his agricultural land was located as well. The red circle at the bottom of the picture shows the position of his orchards, and as he mentioned in the interview, he was moving the agricultural land to get more production. These farmers usually get around by cars or other motorised vehicles.

Figure 7.10 | Tracking the working day of David



Source: Author

The following quote demonstrates how David started his agricultural innovation and entrepreneurship. His agricultural activities were transformed into individual and purely productive practices.

When I came back to Toconao, and I did the grapevine project, I brought different types of grapes, and I put them right here where we are sitting in the living room of my house. Before I built the house, this was agricultural land, and I installed the first modern irrigation system in town. Where the swimming pool is now, I had a water tank, where I used to accumulate water for the drip irrigation system. Where I have the restaurant, this was a greenhouse. There, I was harvesting tomatoes for six months, then melons, watermelons, cucumbers, and so on. I got such a huge amount of vegetables and fruits those years that I couldn't sell them, so I had to give them away (David - Community Leader).

Figure 7.11 illustrates that agricultural plots in Toconao, and especially those located in the middle of the 'Bosque Viejo' sector within the town, are small due to the

subdivision of land over generations. Some farmers argue that these small plots have a romantic rather than productive significance.

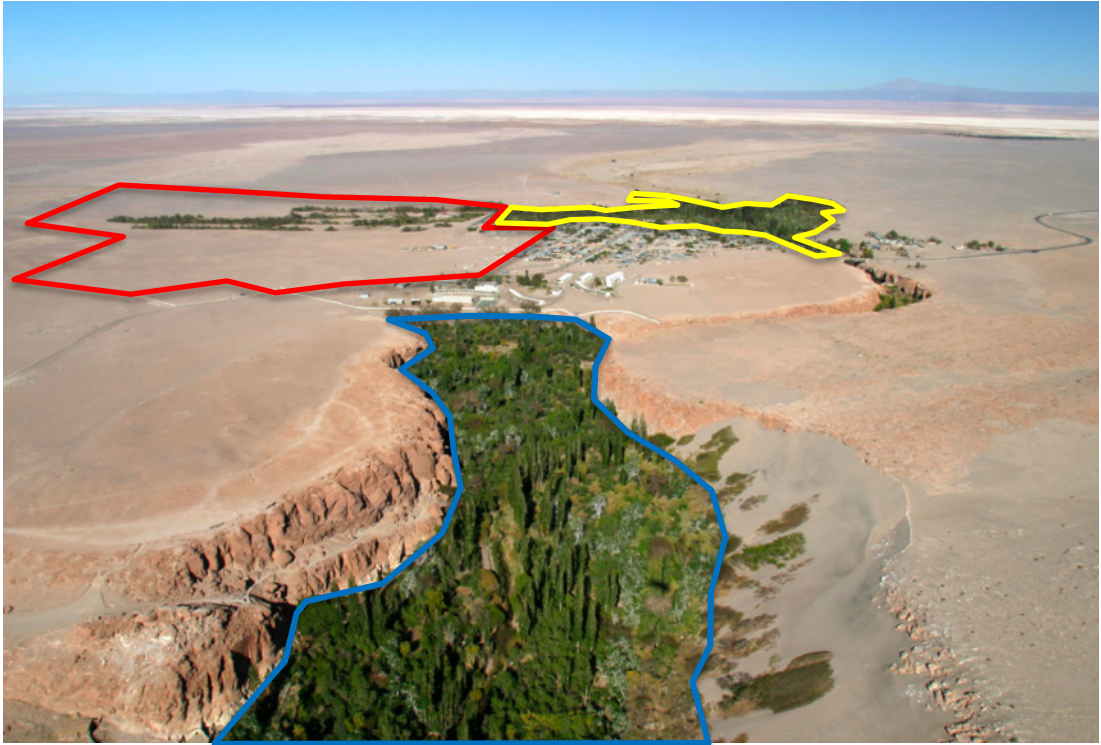
Figure 7.11 | A small agricultural plots in the sector ‘Bosque Viejo’



Source: Author

Figure 7.12 shows the ‘Campo Sector’ in red, ‘Jere Sector’ in blue and ‘Bosque Viejo’ sector in yellow. The ‘Campo Sector’ is located in the southern area of Toconao. It is a relatively new agricultural area, which was created in the 1960s as an extension for agriculture purposes. Today, it is known as a place for wine producers. According to the Irrigators’ and Farmers’ Association, the agricultural area in ‘Campo Sector’ is about 25 hectares, hosting 50 orchards. According to the president of the Community of Toconao, the ‘Campo Sector’ has potential for expanding agricultural production. This is due to its geographical condition, which allows this sector to have better water distribution due to its horizontality and extension for grape production. However, as Julia argues, conflicts around non-compliance of some agreements, and land invasion for some farmers that already have wine production, have generated mistrust in some actions and decisions of their leaders.

Figure 7.12 | Areas of agricultural sectors in Toconao



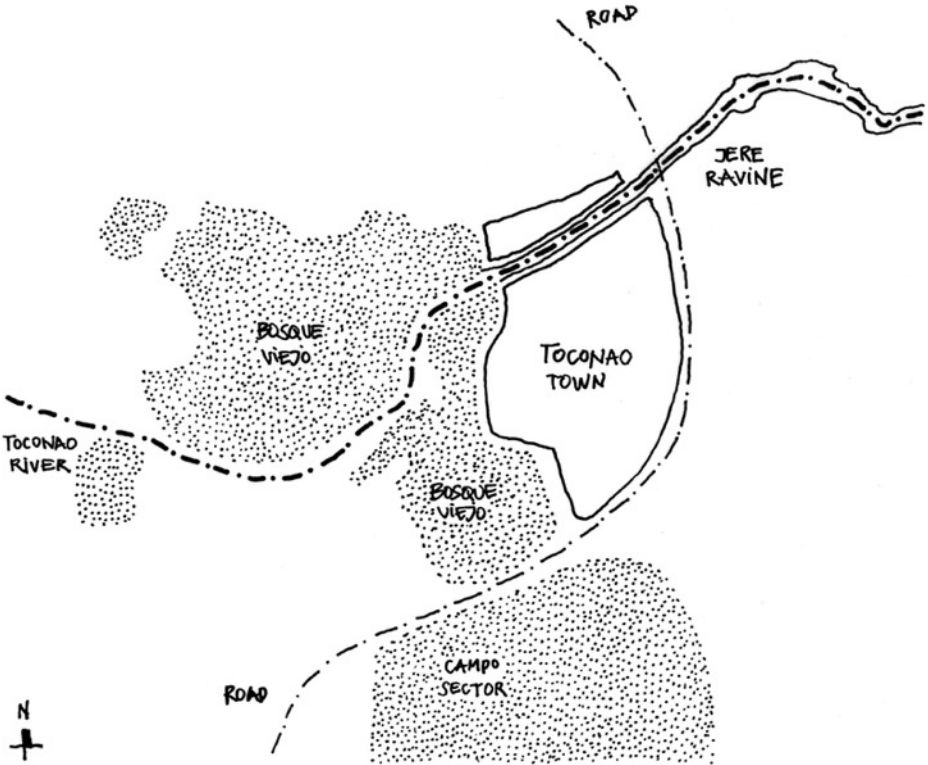
Source: Horta, 2015

When the ATF programme started, a big debate emerged related to the extension of flat and high-value plots in the Campo sector. Some farmers appropriate land in this sector through invasion, which is attributed to combined attractiveness of the plots and lack of control. Additionally, many farmers with very small pieces of land sell their plots, because their agricultural production does not generate sufficient income for them. These spatial transformations are connected with the focus on production by the institutions that finance some of the agricultural programmes, which are mainly focused on production and efficiency. Also, elderly people transferred much of their land to their children, subdividing the plots and decreasing the size of their cultivation areas, and consequently the times of irrigation. For example, one interviewee said:

In general, I feel that surfaces of our arable land have changed, because some people are using the 'Campo Sector'. There was an agreement with the older farmers long ago that there is a specific amount of land for everyone in town. However, some people started to cultivate in that sector. The deal was simple, for example, every family should have a quarter of a hectare, and nobody could farm more than that, so everyone can get a piece of land. But there was no respect for this agreement and people started to get more and more land. That means that there is also a need for more water (Julia).

While interviewees observed visible changes in the ‘Campo Sector’ and ‘Jere Sector’, the sector ‘Bosque Viejo’ showed less changes. Figure 7.13 shows that the fragmentation between the three sectors is also created by geographical conditions of the Toconao river and the International Route Number 23. The ‘Jere Sector’ is piece of land located at the east of the town (Jere ravine) and it is the first one in getting the water that comes from the Jere ravine, and then the water goes to ‘Bosque Viejo’. The canalisation of the water is divided into two different sectors, ‘Bosque Viejo’ and ‘Campo Sector’. The geographical condition of the ‘Bosque Viejo’ sector allows for a larger variety of fruits and vegetables, but it is also susceptible to flood risk increasing the physical division of ‘Bosque Viejo’ and ‘Campo Sector’.

Figure 7.13 | Geographical fragmentation of agricultural sectors



Source: Author based on Google Maps and Games (2013)

For example, an interviewee observed spatial changes as follows:

It is possible to see some changes here in the 'Jere Sector' after the last flooding (2012). The other way to see changes is through the succession and subdivision of land. For example, the property of my grandmother was a vast land, and then it was divided by her children when she died (Sandino).

Understanding the succession and subdivision of land is another entry point to understand the shape of local spaces. Sabine remembers that she got a piece of land as a wedding gift. This action was a common mechanism to support the young couples in obtaining agricultural land.

I didn't have land, I never had one. My husband had. His family had a big piece of land, and we got one when we got married. His sister also got one when she got married. So my in-laws divided their land between my husband and my sister in law. Therefore, all that we have, we got as heritage, everything. We also got this house and the house, where my daughter lives. That house was our heritage to her (Sabine).

Additionally to extensions of agricultural plots, some inhabitants deploy strategies such as the creation of *'huertillos'* (see Figure 7.14). These are small orchards inside their houses that allow for the production of herbs, small fruit trees and some vegetables.

Figure 7.14 | Example of a *'huertillo'*



Source: Author

Well...I am thanking God we still have water, that I have, and I can have this *'huertillo'* here. It is the only thing that I can look at, but at least there are a few existing here, because there are parts where there are none... (Sabine).

'Huertillos' are particularly important for disabled and elderly inhabitants to cultivate herbs and vegetables and to maintain some of the traditional agricultural practices despite having difficulties to walk and work in the orchards and outside their homes.

I am hardly going to the orchards, because I cannot walk alone, I have to go with some help. I feel inhibited to do it, almost. So, I am not (Ignacia).

To sum up, the transformation of agricultural space is not just connected with the subdivision of land through inheritance. Moreover, there is a transformation linked with the different uses and different interests that farmers have for the development of their orchards. Other create huertillos in their houses to cultivate and extend their places transforming the space of their homes. It is, therefore, a transformation that is connected with agricultural practices and the use of water.

7.2 Autonomy of time

The evidence of people's management of the territory and water in their everyday life plays a vital role in the narrative of autonomy. Rasmussen (2015: 49) argues that *'the challenges of the everyday are reflected in and by the very connections to a productive landscape that is both inhabited and a source of identity'*. In Toconao, some places belong to a specific time, and according to Rasmussen (2015), those places are tense places or a place-tense. Those places are related to traditions, rituals and practices. Therefore, a critical aspect of autonomy is the time, in which social space is produced through discourses and practices that create numerous stories and temporalities as part of the landscape.

This section starts by understanding people's autonomy, analysing the new temporalities produced by engagements with the mining sector and their impacts on irrigation times and people's everyday activities. Then, this section will focus on the changing autonomy of local institutions manifested in the relationships between the community and different committees and associations within the community.

7.2.1 Interpretations of autonomy and its limitations

Autonomy is defined by Bolin (1994: 141) as a *'group's ability to make decisions without the involvement of other local and extra-local institutions'*. This concept has been defined by multiple authors at the scale of Latin America, the Andes and the Atacameño culture. According to Gilberto López y Rivas (2013) the concept of autonomy in Latin America refers to a process of resistance through which ethnic groups strengthen and recover their identity through the claim of their culture, rights and political-administrative structures. Moreover, autonomy means governing oneself by ones' own laws. Therefore, it can also be defined as the capacity of individuals, governments, nationalities, and other entities to assume their interests and actions through their own regulations and powers (López y Rivas, 2013). Perreault and Green (2013) suggest that the concept of autonomy in the discourses of regional elites constitutes a rejection of the growing influence of Andean indigenous social movements. They further mention that traditional practices (*'usos y costumbres'*) and the political and cultural autonomy are the centrepiece of the Andean way of living.

For indigenous communities, autonomy or self-governance is linked with the territory they have occupied for centuries (Barros, 2000). Similar to other indigenous communities, the Atacameño culture shares the local political institutions by taking on a set of public responsibilities, thus maintaining community cohesion as well as political autonomy (Ekern, 2011).

Alfonso Barros (2004) states that the concept of 'autonomy' was introduced to the everyday vocabulary of the Atacameño inhabitants only 25 years ago with the Indigenous Law. Barros argues that using autonomy as a concept strongly relates to discourses around the indigenous identity of the Atacameño. Despite numerous existing definitions of autonomy, it is important to ask how the inhabitants of Toconao understand this concept. Clara argues, for example, that autonomy is connected with territorial decisions:

Autonomy is related to the concept of economic governance and territorial planning. We - as a community - want to establish our protocols in relation to what we want for our territory. We want to be involved in the decisions about our territory. However, now everyone is

trying to get involved in how much money we are going to get in every agreement with the mining sector, and nobody is talking about the cultural aspect (Clara).

The understanding of autonomy is closely linked to a perception of having control over decisions of water management and livelihoods. For example, the analysis of a conversation with Camila elucidates some of the work that goes into living at the mountain, and the decisions she made when Toconao needed more water for its population. As shown in Figure 7.15, the case of Camila was crucial to understand how autonomy is linked with the perception of having control over decisions of water management and livelihood. Camila was born in the Vilaco sector, a place located in the high mountains east of Toconao. She was living there all her youth, in the same place where her parents and grandparents were from, and no titles for land were needed. Camila repeatedly said that she was from a place where she was the owner of her life, where water is born, working freely at her family's orchards and dedicating herself to crop production and livestock agriculture. She was working for her family's livelihood and for personal consumption. She had ten children worked very hard to give them food and enable them to pursue their education. She always wanted a better life for her kids, and education was one of the elements that pushed her to move to Toconao. Figure 7.15 reveals that Camila constantly moved from the mountain to Toconao and back (red dotted line). Many people at that time started to migrate to town to get a better job in agriculture, earn some money and access better education for their children. The consequences of this population growth created a necessity for more water for human consumption.

Camila remembered that in those years, Toconao was the town which supported all communities in the desert with fruits and vegetables. However, local farmers needed more water for their agricultural production on top of increasing demands for human consumption due to the increase in Toconao's population. The figure shows that during the 1960s and 1970s, the community leaders of Toconao decided to add more water to the Toconao river flow, connecting other watersheds such as Vilaco and Amurto in order to supply more water for local production. The consequences of this decision were that Camila and other people, who were living in those areas, could not live there anymore had to permanently move to Toconao. Community leaders of Toconao

promised people from Vilaco and Amurto to provide them with a place to live in Toconao, however, they did not give them a piece of land to work in agriculture. Camila argued that the reason she took the decision to move to Toconao was basically a decision for the common good, and for living not just for herself but to help others, such as the community of Toconao which needed the water to be able to accommodate the increase of its population.

Camila's movement to Toconao demonstrates the multifaceted nature of changing relationships with her territory and the individual and collective use of water. The changing process of moving to Toconao also had implications for the ways Camila relates to the community in the present. Today, she is disconnected from services, and has to pay for the use of potable water, among other services. But what really changed Camila's perception was her idea of community and her role in it, especially when social projects appeared. She argued that these projects divided Toconao because they are individual initiatives. Camila is excluded from the opportunity to participate in these projects because she does not own agricultural land. What is striking in Figure 7.15 is the rapid decrease in Camila's sense of autonomy, and this action is connected with Barros (2000) arguments. The author claims that autonomy is inseparable from the territory which gives a particular sense of belonging to its inhabitants. This means that autonomy is not only related to a territory's resources, but also to the maintenance of the relationships that those resources give to people's values, and beliefs.

Of course, I worked here doing that (harvesting and collecting fruits), helping those ladies, who have orchards, I don't have one, because I was not from here (Camila was from the mountains) ...and then when they got the water from where I was from ... we were left without water and agricultural land...I helped them in the 60s, but now I don't have any piece of land in Toconao. In those times, it was a pleasure to help people with land in town, because they were in a good situation. I went to their orchards every day to work, I was collecting quince, pears, and everything, and then they gave me a box of fruits for my children and family... (Camila).

The level of autonomy that some indigenous communities in Chile aspire strongly relates to the Indigenous and Tribal Peoples Convention N° 169 of the International Labour Organisation (1989).

‘The rights of ownership and possession of the peoples concerned over the lands which they traditionally occupy shall be recognised. In addition, measures shall be taken in appropriate cases to safeguard the right of the peoples concerned to use lands not exclusively occupied by them, but to which they have traditionally had access for their subsistence and traditional activities. Particular attention shall be paid to the situation of nomadic peoples and shifting cultivators in this respect. Governments shall take steps as necessary to identify the lands which the peoples concerned traditionally occupy, and to guarantee effective protection of their rights of ownership and possession. Adequate procedures shall be established within the national legal system to resolve land claims by the peoples concerned’ (ILO 1989, Article 14).

Also, in the article 23, it reflects on the practices related to those territories:

‘Crafts, rural and community-based industries, and subsistence economy and traditional activities of the peoples concerned, such as hunting, fishing, trapping and gathering, shall be recognised as important factors in the maintenance of their cultures and in their economic self-reliance and development. Governments shall, with the participation of these people and whenever appropriate, ensure that these activities are strengthened and promoted. Upon the request of the peoples concerned, appropriate technical and financial assistance shall be provided wherever possible, taking into account the traditional technologies and cultural characteristics of these peoples, as well as the importance of sustainable and equitable development’.

However, contextual chapter 4 has already shown that the Chilean government does not recognise the right of indigenous communities to determine the management of their own territories. The Chilean government has been looking for the consolidation of indigenous communities to the national territory through official institutions. Therefore, indigenous communities in Chile do not have control over the management of their territories.

The process of decentralizing the control over indigenous water resources has developed very slowly in Latin America and especially in Chile; it has effects on autonomy, especially because the normative system has historically marginalised

indigenous communities from participating in water regulation (Castro Lucic, 1997). On the one hand, this is manifest in communities not having formal land titles and rights to water before the Indigenous Law was established in 1993. On the other hand, the communities distanced themselves from the legal procedure of registering their rights, because they did not trust any bureaucratic system of water rights other than their ancestral customs and practices (Cuadra, 2000). In Toconao, the legal recognition installed by the Water Code and the Indigenous Law did not materialise. A large part of the area is currently covered by mining concessions without regarding the habitat of the communities. Clara therefore argues that being autonomous means protecting the territory in these circumstances.

Our strategy always has been trying to find mechanisms to protect our territory and give solutions for the economic situation of our communities, giving them facilities with the need for economic growth with more autonomy and more independency. We cannot always depend on the state or what the private sector wants to give us or thinks is useful for us (Clara).

7.2.2 Social organisation of water

Local irrigator associations are grassroots organisations developed by local groups of farmers who are confronted with limited and variable water supplies, challenges to allocate them equitably and efficiently, and decisions of investing labour and capital in infrastructure for water control (Mabry, 1996: 8). Through collective decision-making processes, these associations agree on rules that assign rights and responsibilities to their members, means to enforce the rules, and mechanisms to resolve internal disputes. These are the basic structural arrangements that enable participants to commit to long-term, cooperative relations of production with each other (Ostrom & Gardner, 1993).

The Irrigators' and Farmers' Association of Toconao is one of the most important local institutions in town, and more than half of the inhabitants are members. It was formally acknowledged through the Indigenous Law N° 19.253 in 1993, but the community has recognised it as a legitimate institution since the first settlements were established close to the river. Although the majority of farmers in my research have been part of

this association, some remain separated and disconnected from this institution, because membership depends on land titles, and consequently, water rights and access.

The association is an organised and operational institution and the majority of farmers have been part of this local institution for decades. However, some farmers reflect disagreement over how decisions have been made, mainly when some arrangements are not defined as moral actions. Struggles around access to water in Toconao have been controversial. A common view amongst interviewees in Toconao was that the association represents two discourses: The first relates to water access, and the second to obtaining benefits through participating in the Irrigators' and Farmer's Association. Most inhabitants of Toconao have access to water, because they have land to cultivate.

The chapter already highlighted how CSR programmes contributed to tensions within the Irrigators' and Farmer's Association. There is a contradiction between the Atacameño cultural values which includes perceptions of themselves as autonomous agents, and the link to the power of mining corporations as a way of patronage on the other. Interviewees expressed their concerns about emerging notions of development in the Atacameño culture. They argued that the use of the territory and landscape is increasingly disconnected from the discourse of '*Pachamama*' and nature-based practices. However, the quote below shows that farmers see possibilities of working with the mining sector without losing autonomy:

I reckon that it is possible to do a job together (mining and community), but with clear limits depending on different topics ... I think that the funds do not have to come from the mining sector. I mean, we should have the autonomy of working with the complete tranquillity of not having resources involved in the mining sector that later oblige us to maintain positions or to change positions because there is an economic commitment in between (Daniel).

The ATF programme is a demonstration of these challenges CSR programmes pose to community autonomy. An interviewee from the mining company argued that the programme supports farmers to increase their productivity. However, it supports them as individuals, rather than as community or as the Irrigators' and Farmers' Association. Keng, another mining worker, emphasised that the company wanted to understand how mining resources are designated, used and administrated within local associations, and

therefore requested to become a member. According to Alejandro, a Community Leader, the ATF programme hindered the association from having a good relationship with the entire community. Due to these contestations within the association, the company decided to work with individual farmers rather than a collective organisation.

In general terms, we work with people who have the title of their land and have the condition to develop an agricultural initiative. They must have a property, and they must be the owner or inherit a piece of land. They also must have the paper or certificate that formally states that they are the property owners. Moreover, the property must have water resources. I mean, the owner of the land must have a right to use water (Keng - SQM Mining Worker).

The SQM employees working in the ATF programme and the 20 farmers of the project call each other '*socios*' or 'partners' to demonstrate their agreement about social and economic development. Babidge (2013) sees these kinds of partnerships as a form of social contract between farmers and the corporate interest, where both sides agree to enter a relationship through a CSR programme.

The two groups of farmers within the association - the traditional farmers and the beneficiaries of the ATF programme - have different objectives and interests. Conflicts appear when they use water, spaces of water and their practices. The different forms of their orchards and how they move around the land, give them a unique form that defines the farmers practices. It is possible to see a tension between those two types of spaces: one structured by the action of the lines of the pipes in the land with a specific type of grapes, controlled by irrigation times of the drip system. The other consisting of orchards that grow more freely through water that traditionally floods '*melgas*' every 15 days.

Control over land is assigned to specific actors within the Irrigators' and Farmers' Association, which gives them a special authority to make decisions and impose sanctions in regard to the management of common water resources. The concentration of water is divided in fewer hands. The enclosure of water and other resources has also generated scarcity and conflict. Local control plays a fundamental role, especially in this area, where people depend directly on their natural surroundings for their livelihood. The benefits and cost of use common pool resources are spread relatively

equitably within a clearly bounded community of users (Mabry, 1996: 7). Bolin (1994: 142) argues that *‘although autonomy is essential to the organisation of irrigation at the local level, irrigation management does not necessarily improve in proportion to increasing autonomy’*.

As described in the previous section, interests within the association of irrigators and farmers have changed. Many traditions are replaced by *‘new traditions’* or adopted *‘external traditions’*. This includes the *‘vendimia’*, a harvest festival which demonstrates the outcomes of the wine production. Figure 7.16 indicates that this new activity is an opportunity to celebrate the harvest of the grape and to promote the products of the ATF farmers. The celebration, which I observed during fieldwork, included two days of intense activities. The town was busy with regional and international tourists and visitors, because travel agencies sold entrance tickets and good quality wine to widely promote the event. However, some of the interviewed farmers did not feel part of this celebration or were excluded from participating, due to the high entrance fee.

Figure 7.16 | Vendimia - Harvest celebration



Source: Author

This is not a community activity! This is just a business! They are selling the harvest as a community event while it is only an activity for some. Why don't we have access? (Antonio).

The conflict extended to the assemblies of the Irrigators' and Farmers' Association, where some of the members argued over injustices in the distribution of water as a Community Leader mentions:

Here, water is not seen as collective anymore, because as I said before, the Irrigators' and Farmers' Association has associated water titles in its name. Therefore, they lock themselves and they do not see it as a collective resource anymore. I believe that we can do a lot with the wasted water. We also have projects; however, there is a huge division among the farmers. I think the problem started when the community gave the water titles to the Irrigators' and Farmers' Association, and they were just a group of people and not the entire community. Now, they do not want to open the association and do not want to give opportunities to those who do not have access to water (Alejandro - Community Leader).

At one of the meetings, the conflict escalated, and the president of the Irrigators' and Farmers' Association was removed and replaced by a farmer, who was part of the ATF programme. The main argument was that the previous president did not have the basic requirements to be in charge of the association, because he did not have a formalised land title. The new president restricted access to information about the activities of the association and did not want to be interviewed, either.

To me, it is just a family dispute. There is something that is coming from years, and it is about who has the power and who does not. We can see that in the directorate (of the association) that it is a power dispute and that's it. For that reason, I have been saying that we need a good leader. Now there are opposite sides, and each one is totally different and closed. The problem is that nobody understands it or does not want to see it. People know that there are problems, but they do not want to speak or comment on this in the assemblies (Martin).

As mentioned in previous chapters, the use of '*bad practices*' is another element of division and conflict. These '*bad practices*' manifest in a lack of solidarity, engagement and cooperation among members of the Irrigators' and Farmers' Association. They can be clustered into three categories: Use and control over water, irrigation times and uses of canals and cleanings (Figure 7.17). Bad practices stand in

opposition to the interdependent relationship between people and water, in which both take care of one another. The inhabitant cleans and maintains the fresh water coming from the mountain and provides the necessary nutrients to keep the desert alive. In many of my interviews, the phrase '*Water is life*' came up to signal awareness that survival in the desert without this resource is impossible.

In the past, water was part of life. Water is part of life, like the land. In the past, the culture sanctified the water, land and sun, because they are part of life. The human body is composed of water by almost 70% ...73% is water. Therefore, it should be the most important thing to us, it is neither a commodity nor a right, nor a resource (Sebastian).

'Bad practices' include wasting water, hence, leaving the canals open even though water is not used for irrigation; Irrigating weeds; Irrigating during hot hours of the day, which implies water losses through evaporation; Not diverting water to other farmers after the farmers' own shift has ended.

In relation to the irrigation times, 'bad practices' include a shortening of irrigation times through opening or closing the canal lock gates; Disrespecting irrigation shifts and taking more time than agricultural areas would require.

Finally, there are bad practices in relation to the use and maintenance of the irrigation canals. The action of hiding or stealing the metal gates that guide the water flows means that farmers gain extra time and cut the irrigation times of the downstream farmers. Further, some do not clean or maintain internal canals that connect with other sectors of the village. They burn dry grass and garbage in the orchards, do not participate in maintenance activities and do not take care of the borders of their '*melgas*'.

Considering the number of bad practices as well as the tensions and struggles within the Irrigator's and Farmers' Association, several interviewees acknowledged the need for new approaches for the social organisation of water management.

Further, the binary relation between members and non-members of the association, which is defined by the territorial context and social structures, requires a new

approach to deal with differences in decision-making power, autonomy and control.

Commenting on new approaches, one of the interviewees said:

We need more empathy. We need to work as a unit. We need more possibilities of holding talks in order to reach an agreement. I mean, today we are not able to accept and agree on basic stuff. For example, if somebody tells you that you are doing a great job, the rest will say that you are taking advantage of something. So this kind of things damages our environment, our life and in the end, everyone is choosing not to get involved into anything. That is what is happening with the Community Leader. He was trying to work with people, and to do the best he can. However, people do not believe in his intentions, and everyone was thinking that if you want to be in the directorate of the community, it is because you are looking for personal benefits. But it is not always like that (Teresa).

Another interviewee alluded to the notion of working as community with a clear focus on agreements and obligations:

I think we should have clear duties and responsibilities in the community. Now, we do something when we need it out of personal interest and not as a group. We do not have a community understanding of some things, and we need to change our statutes. There are bad practices that are the result of the violation of those rules. Therefore, in the end, we are destroying more than what we build as a community (Alejandro - Community Leader).

7.3 Practices of autonomy

The following section will glance at the notion of local autonomy from a practical perspective. It analyses the ability to make agricultural decisions without external social initiatives as well as the concept of '*respeto*' (respect) and its implication regarding the fragmentation of the community.

7.3.1 Knowing where and how to plant

Andean knowledge about agricultural practices and skills has been orally transmitted over generations (Catalán, 2013). It has been built through everyday practices forms an important part of the collective memory of Andean communities. In Toconao, unlike other towns in the Chilean Andes, the quality of the water, microclimate and

geography allow growing a large diversity of fruits. Hence, the inhabitants developed agricultural knowledge, which is distinct from other areas. Fruits include quince, pears, figs, apricots, oranges, plums, peach and grapes. Quince is the most common and representative fruit of the town, not only for its production but also for its ease of adapting to the climatic conditions of the desert (Figure 7.18). According to the president of the Irrigators' and Farmers' Association of Toconao, quinces represent more than 50% of the total number of fruits trees in the town.

Figure 7.18 | A quince flower, participatory photography workshop



Source: Julia

The main fruit here is quince ...I don't need to say that. I remember, my husband used to say: '*quince is a dogs' meat*' (which means, it is resistant and durable). We used to harvest lot of quince, we used to fill 400 boxes each season. Every box is between 15 to 18 kilos depending on the type of box. We used the banana boxes, 20 every day more or less until the fruit was finished (Sabine).

Decisions on the type of fruit or crops that each farmer grows depend on the amount of water, the size of the orchard, and the type of irrigation.

Well, here in Toconao, the arable lands are tiny. Therefore, we cannot cultivate to sell. The production is minimal and for personal and family consumption, at least in my case. What I do with the production is to

make jams, and sweets. I also have roses (Figure 7.19), and as you can see I produce a special jam of rose petals (Karina).

The farmer's understanding of the particular qualities of the soil and water is manifested in the practice and experience of working in different sectors. The contextualised nature of knowledge and the practice-based way of learning has also been articulated by Fre (2018). He argues that indigenous knowledge generally displays five characteristics: it is culturally and regionally embedded; it does not claim to be universal; it is interwoven with the labour process; it is negotiated and pluralist; it is dynamic rather than static; and, it embodies and employs a number of scientific principles (Fre, 2018: 2). These characteristics were empirically observed in the field, and are exemplified in the following quote.

On the one hand, in the *'Zapar sector'*, this one is very old land, and it is ancestral land, so we irrigate it with the flooding system, because it has a different kind of soil, it is very clayey. So you can irrigate it once a week, once every fifteen days and nothing happens, it retains lots of water. Instead, this other land, its soil is very sandy, the soil is lighter than the previous one. So here we had to innovate the irrigation system through the drip irrigation system. Because the soil needs more water than the other one, and the plants cannot resist (the droughts) with the regular shifts (Francisco).

Figure 7.19 | Rose petals, participatory photographic workshop



Source: Karina

However, the decrease in collective practices such as '*mingas*', where different members of the community contribute their expertise and practices to a particular task such as planting and harvesting, means that knowledge is being lost. This is additionally problematic considering that these collective events were important mechanisms for transmitting knowledge as well as social values, rules and norms.

7.3.2 '*Respeto*' as an autonomous practice

Elderly farmers voiced two main concerns regarding the welfare of the community. On the one hand, they critiqued how life in Toconao has become more individualistic, because people increasingly concerned with gaining benefits for themselves ('*mata su toro*'). Elderly interviewees frequently complained about the way in which monetary resources affected the social cohesion of the community (Molina, 2014).

On the other hand, many people said '*that life is very different compared to how it was before*'. As analysed before, this related to collaborative farming practices in the orchards and the vision of Toconao's development linked to its territory. This narrative of being a better community in the past is locally constructed through stories of experiences of the past that gain a new sense in the present. For example, elderly farmers remembered the respect to some practices, and the collaboration within the Irrigators' and Farmers' Association.

One elderly farmer gave an example of the good life, which she remembered. In the 1960s, she helped fetching water from the Cilapeti river when there was not enough water for everyone in town. Every inhabitant had an assigned task and got involved in collective action to get more water for the community without any economic compensation for this work. For example, the interviewees' task was to cook for the farmer's association. She said of that experience that '*we were a community, we were taking care of everyone in town*'. The current understanding of community is inextricably linked to her comparison with the past situation, as the following quote shows.

My understanding of community is something that should be more united and be like it was before. Before, we were more linked and connected. We used to say: Everyone is going! Therefore, everyone went to work.

For example, if we had to go for a *'minga'*, everyone had to contribute with their tools and plants to seed the orchards that people were working on. It was the same when we had to build a house. People were also saying: *'we are going to minguear'* (do *'mingas'*) (Sabine).

Managing irrigation requires the cooperation of all members of the Irrigators' and Farmers' Association, because water flows are owned by the association rather than the individuals. Rodriguez (2006) states that cooperation is supported through *'respeto'* (respect), especially in reference to the elders of the community, community leaders and managers of different committees and associations. Walsh-Dilley (2013b: 659) states that *'the capacity for cooperation and reciprocity is one of the most outstanding features of Andean peasants, but also raises concerns that these traditional strategies necessarily wither and fade as Andean people and places are increasingly incorporated into capitalist markets and processes'*.

We need to change the way in which we were relating to each other (communicating) in the last time. I mean...I think everything happens because we do not have a unified discourse, we need 'education', we need to re-educate us; we need to improve that. We need to use other channels to communicate our ideas and visions. For example, we were using the local radio, and I was participating there with a programme where the intention was to give information to everyone. I think when we transmit the information, and people get informed, they can take better decisions or have a more complete and precise opinion about any concern or issue that affects us. For example, we have been talking about issues in the territory all the time, our problems that we have here. We talk about the relationships between the local economic activities and the new ones that have entered in this area like tourism and mining, that people cannot visualise but that are important and that have generated real changes in the communities (Clara).

Rodriguez connects notions of *'respeto'* and the moral practices of sharing water. She defines this connection as *'the system of principles and values that supports and guides cooperative, interdependent economic practice'* (Rodríguez, 2006: 75). Farmers frequently mentioned in the interviews that respect is a fundamental part of their everyday work with water. In his extensive studies on life in the Andes, Trawick (2002) emphasises the mechanisms of inhabitants for sharing and exchanging water in the mountains, which is practiced based on respect for each other and the resource. *'Respeto'* is a product of the interactions between nature and culture over time.

'*Respeto*' is the result of a process of the interdependent social construction of territory and culture. In the Andes, it is part of the worldview, where respect for water and nature in general makes it possible to maintain life in extreme environmental conditions.

I would change the way we relate in our community meetings. There is disengagement that are rooted in town, and I did not think that is super strong. In practice, when we have to work every day in the orchards, there is a different relationship. It is like everyone forgets everything and all of us work together. For example, when the dam broke down, and everything got buried and flooded, many people came to work, even from other towns and cities like Calama. It was amazing to see the capabilities, effort and hard work that we did. Everyone was working with energy and humour. Lots of ideas came out of that situation, and it was a good experience (Francisco).

In Toconao, the central mechanism of managing the water resource, which is built on '*respeto*', is '*el reparto*' (sharing). The sharing system establishes the rules, duties and rights to share the scarce water resource and has been used for centuries. It is considered transparent and accessible to all its members or the Irrigators' and Farmers' Association and has been described as a form of self-organisation, where rules are reinforced by the community itself through the daily practice of the '*reparto*' (Boelens, 2015; Bolin, 1994; Gelles, 2000; Nuñez, 2007; Trawick, 2002). Hence, many archaeologists and anthropologists consider this sharing system as the fundamental basis of Atacameño communities from economic, environmental and moral perspectives.

7.3.3 Practices of fragmentation

Assembly meetings of the Irrigators' and Farmers' Association as well as observations in the field made visible the lack of young farmers and the overall low number of farmers in Toconao. Many farmers are tempted to change their livelihoods due to the high salaries in the mining sector, as well as the possibility of leaving the village and finding other professional opportunities. Many young people have access to university education and secondary studies in the city of Calama, which is located two hours away by bus. Many students, however, did not return to Toconao after graduation. Of those who return, a small percentage is dedicated to agricultural activities and others

seek opportunities in the mining sector. Therefore, most farmers are elderly and retired people, whose livelihoods depend on agriculture. Most of them are part of an association of elderly people called '*San Lucas*', which at the time of fieldwork had 37 members aged over 65 years. Some returned home to Toconao after many years of working elsewhere, while others have lived all their life in the village and dedicated themselves exclusively to farming activities.

Hence, people involved in water management are mostly older and experienced in the distribution of resources. However, observations revealed low levels of participation in assemblies of the Irrigators' and Farmers' Association and in community activities. The few participants therefore often assume roles and responsibilities in more than one association such as the Committee of Rural Potable Water of Toconao, the Irrigators' and Farmers' Association, the Committee of Housing and Community Leaders.

Participation is limited to farmers with irrigation rights and those, who own agricultural land to make use of these rights. This situation generates a division between those, who have access and those who do not. Thus, farmers who are part of the association, have obtained their water rights through inheritance and formalised them or in some cases, they have purchased these rights from people who do not use them. This makes the farmer association a closed and independent entity within the community, governed by its own statutes and rules.

Different associations emerged to frame different interests. Those different groups do not necessarily respond to community problems, but rather represent their members' interests. In addition to the Irrigators' and Farmers' Association, there are others like: The Committee of Housing, the Committee of Public Spaces, the Committee of Electricity and the Committee of Rural Potable Water. There are four Irrigators' and Farmers' Associations depending on the location of the sector: the irrigators association of '*Aguas Blancas*', '*Zapar*', '*Celeste*' and '*Toconao*'. All of them are part of the Indigenous Community of Toconao, but they are independent of each other, although in some cases its members participate in several or all associations. These associations inhibit participation of the entire community, fragmenting the form of

decision making depending on the particular problem or interests of the respective groups.

Nevertheless, there are examples when participation in assemblies sharply increased, because decisions were made with effects on the productivity of individual farmers. Further, tensions and problems with mining companies activated participation and united communities from different villages in a struggle and resistance on a larger scale. An emblematic case was the discussion about the extraction of lithium and the possibilities of obtaining direct benefits from the Rock Wood mining company. In this case, committee members held discussions - beyond the environmental struggle and the protection of their territory – concerning the levels of participation and direct economic benefits.

...we saw that the state was in need: *'Let's exploit lithium'*...So, we got involved in the commission of lithium, we got involved and we got into it, we saw everything, and we were all present in the commission, and we had the opportunity to say that if lithium is exploited, well...it must be with the communities. In the same way, the first inhabitants of this desert obtained maize, we are talking about our ancestors, they achieved to domesticate maize, and then to improve it, and the quinoa, and all that...They were getting their hands onto certain resources, water resources, soil resources, and genetic resources. Nowadays, we can get our hands on the same resources, but we can go a little bit further, not too much, but a little bit further... (Tomas - President of the Consejo de Pueblos Atacameños).

Interviewees expressed their concerns about the lack of a commonplace to see differences between people' opinions, which they attribute to the fact that the community does not function as a unified institution. It manifests, for example, in many discussions being repeated several times in different associations and committees. Dealing with the same issues in multiple associations generated fatigue of many members, and decreased their participation, because they started seeing assemblies as a waste of time.

7.4 Final comments

This chapter analysed water management of individual farmers and the Irrigators' and Farmers' Association of Toconao in regard to the third research question: How have

changes in water practices affected community autonomy since the start of the CSR programme? The ATF programme imposed new agricultural practices, which generated a division within the community. This division is exacerbated by the constant conflict and competition over CSR funding, as well as tensions within the Irrigators' and Farmers' Association which arise from clashes in cultural values and the modification of traditional forms of irrigation and water management.

In practice, autonomy relates to the relationship between water, territory and community. The chapter showed that autonomy is an increasingly important discourse in Toconao, which goes beyond environmental impacts created by extractive activities of mining companies. Additionally, autonomy links to the growing interdependence between corporate social responsibility initiatives and local development, as programme like ATF provide funding, capacity building, training and infrastructure which create impacts beyond the scope of wine production.

The principal theoretical implication of this chapter is that autonomy and respect are useful analytical concepts to get a more nuanced understanding of changes hydrosocial cycles, and therefore should be included as element of the social network that define the hydrosocial territory. This chapter identified essential challenges for contesting ongoing decreases in local autonomy in the context of territorial, water and indigenous struggles. These include addressing the lack of community participation in local decision-making which is currently obstructing collective capacities to intervene in the territory in respect of traditional values and local practices. The following chapter presents and discusses the findings of chapters 5, 6 and 7 together to synthesise the conceptual contribution of this research.

Chapter 8 Solidarity, access and autonomy in hydrosocial territories

Introduction

This research was motivated by the need to better understand the strategies used by the inhabitants of the Atacama Desert to manage scarce water resources. I was interested in irrigation structures and their spatial organisation as well as analysing changes in the seemingly healthy relationship between the Atacameño society and its environment. Moreover, my fieldwork showed me the need to better understand power relations around water as a scarce and vital resource in the territory, where mining companies are key actors in decision-making processes. The combined analysis of spatial and socio-practical elements has been the guiding thread of this thesis. It leads to the conclusion that it is fundamental to complement the definition of hydrosocial territories by incorporating the concepts of solidarity, access and autonomy. After summarising research findings in the following paragraphs, these three elements are discussed in this final chapter in terms of space, time and practices.

This thesis provides an analysis of hydrosocial territories from a political ecology perspective. The literature review has highlighted the importance of differentiating between the concepts of space, territory and place: space focuses on influence, territory on politics and place on affective values (Duarte, 2017). Throughout the thesis, these definitions have been used to emphasise the unequal conditions of water access and conflicts in the decision-making process around the use and management of water in Toconao. Moreover, I have empirically discussed territorial conflicts over water, with a focus on the power relationships that shape water as a social construct. This aimed not only to understand human interaction with nature and changes in the territory, but also to examine changes in water management through the implementation of the ATF programme. Therefore, an in-depth analysis of the concept of water in relation to power, territory and community has been foundational to this thesis (see Figure 8.1).

I initially assumed water to be more apparent in shaping and producing physical space rather than contributing to conflict in decision-making. The findings, however, go against my initial premise. The political ecology perspective on conflicts around the

use of water, which has been adopted in this thesis, emphasises the necessity to go beyond an understanding of such disputes as those concerning water as a commodity, which is the most prevalent discourse in conflicts between mining companies and rural communities. Rather, the political ecology perspective brings to the forefront an in-depth understanding of water as a social element that produces community. The data gathered in this thesis has enabled an analysis of different uses of water spaces, such as irrigation canals, their maintenance and practices. This has been fundamental to create a conceptual framework for exploring hydrosocial territories.

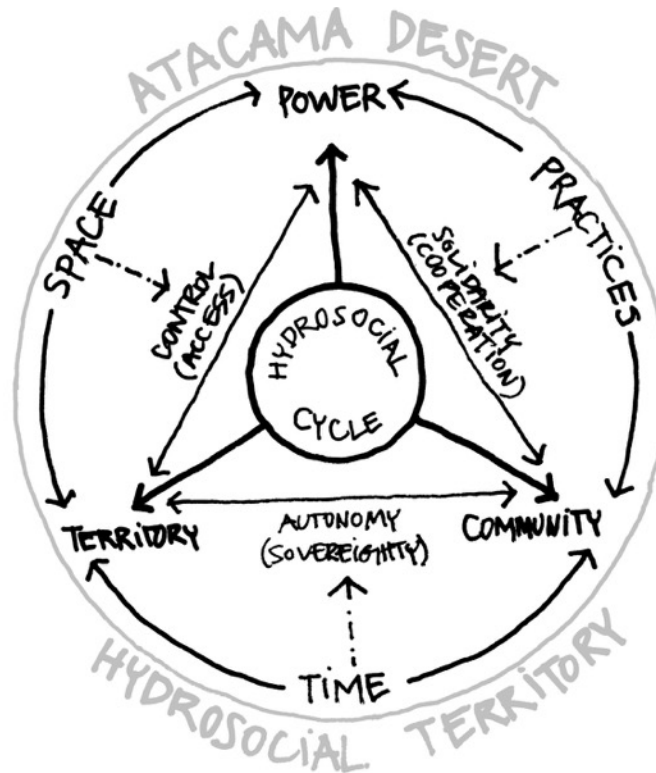
This study explores these hydrosocial territories through the lenses of space, time and practice (Figure 8.2). The data collected in the field suggests that the concept of hydrosocial territories is not just understood based on the concepts of hydropower (power based on local actors), hydrosocial cycles (the connection between water and society) and territory (territory of Toconao). Additionally, the thesis suggests that hydrosocial territories can be defined through in-depth exploration of the themes of solidarity, access and autonomy in the construction of water spaces such as irrigation canals. The different elements of the literature review are connected with the findings from the field as shown in Figure 8.3. This figure represents elements which have to be considered when analysing hydrosocial territories of the Atacama Desert.

Figure 8.2 | Summary of spatial, temporal and practical analytical elements

	SPACE	TIME	PRACTICES
SOLIDARITY	1. INDIVIDUAL WATER TANKS	1. IRRIGATION SHIFTS	1. TIME FOR MONOCULTURE
	2. NO DAM	2. TIME ON THE LAND	2. CLEANING OF THE CANALS
	3. POOR MAINTENANCE OF THE CANALS	3. DOUBLE WARDEN / DOUBLE CONTROL	3. MORE PROJECTS FOR INDIVIDUALS
	4. NEW MATERIALS	4. CHANGES IN THE REPARTO	
ACCESS	1. FENCES	1. MIGRATION & EXODUS	1. COMMUNITARIAN PRACTICES
	2. MELIGAS BOTADAS (ABANDONED ORCHARDS)	2. LACK OF TRADITIONAL KNOWLEDGE	2. LACK OF MINGAS, COSECHAS & LIMPIAS
	3. INSIDE V/S OUTSIDE	3. WATER AS OBJECT / NO PROCESS	3. BOUNDARIES OF COMMUNITY LEADERS
		4. TIME OF PLOUGH	4. SELLING & RENTING WATER
AUTONOMY	1. DRIP IRRIGATION SYSTEMS	1. BEING AUTONOMOUS	1. KNOWING WHERE TO PLANT
	2. DEPENDENCY ON MINING CRS FUNDS	2. SOCIAL ORGANIZATION OF WATER	2. RESPETO AS AUTONOMOUS PRACTICE
	3. SHAPING LOCAL SPACES	3. BAD PRACTICES	3. PRACTICES OF FRAGMENTATION

Source: Author

Figure 8.3 | Adapted analytical framework



Source: Author

The remaining part of the chapter is structured into five parts. The first part looks at the implications of a lack of solidarity for hydrosocial territories. The second part examines control related to water access. The third part elaborates on the importance of autonomy in the configuration of hydrosocial territories. Then, the practical, methodological and conceptual implications of this research are discussed before concluding with potential future directions for research arising from this thesis.

8.1 Solidarity in hydrosocial territories

As mentioned in the literature review, water is socially produced over time through social practices, attitudes and relationships in a specific territory. Taking this premise into consideration, the contextual chapter (chapter 4) contrasted the demands for water in the mining sector to the seasonal water demands of agricultural cycles. Both mining and agricultural activities are water-intensive and water-dependent and therefore highly sensitive to water availability (Perreault, 2013). Additionally, several publications have shown that the management of water flows and hydrological cycles is shaped by governance structures; the territory and social interactions interlink with

politics, technology and inhabitants (Boelens et al., 2017; Hommes et al., 2018; Rodríguez-de-Francisco & Boelens, 2016; Vos & Hinojosa, 2016).

Hydrosocial territories therefore refer not only to a physical context, but to specific functions, values and meanings that create processes of the inclusion, exclusion, distribution, development and marginalisation of the inhabitants of those spaces (Boelens et al., 2016). The current study found that at the local political level, the construction of hydrosocial territories is related to the intrinsic relationship between water and power, and to the spatial network (irrigation system) which determines who controls access to water and decision-making around water management. In the specific context of the community of Toconao, the Irrigators' and Farmers' Association plays a fundamental role in making decisions about the future of irrigation systems and the distribution of common property resources.

The findings of this research also show the definition of hydrosocial territories is contested and in a constant process of transformation, for example, through changes in solidarity and cooperation in Toconao, which manifest in space, time and practices that define the hydrosocial territory. These changes are expressed through characteristics such as decreasing levels of reciprocity and engagement, the importance of being economically productive, low control over water, and decreasing respect for older generations.

According to Trawick (2001), solidarity and cooperation are the pillars of the ethnic identity of Andean communities and formal institutions around water management. The empirical evidence collected in this research has shown the decreasing significance of these pillars in Toconao, which manifests in the poor condition of the canals, water gates, the dam and public areas. In the statutes of the Irrigators' and Farmers' Association, there is a specific article dedicated to communitarian works. Such works are supposed to improve public areas and participation in collective activities. However, only few people engage in these supposedly mandatory activities. People who do not permanently live in the town but are part of the Association often externalise their work by paying someone else to do it. Furthermore, only a small proportion of the community regularly participates in traditional activities and rituals.

They comprise mainly elderly inhabitants of the town, who are members in all associations and committees.

However, the decrease in solidarity is not abrupt, but a slow process. While a preliminary finding only, the suggestion is that the farmers' lack of engagement began to be expressed after the implementation of the new irrigation system. The rationale is that this is because the corporate social initiatives promised farmers less workload and costs to maintain the irrigation system as well as water savings. The lack of solidarity and cooperation is consistent with the findings of some authors who argue that the introduction of technology and external interventions are linked to changes in power relations. Different forms of technologies connected with water and social relations constitute uneven waterscapes and produce different water–society relations across sites and scales, by which water access is controlled (Linton & Budds, 2014b; Sultana, 2013). This individualism stands in conflict with the Andean vision of community as a complex collection of collective practices and social institutions that belong to a specific territory (Boelens, 2015). However, despite these struggles and the decreasing solidarity amongst farmers, it still remains an important value within families. For example, the case of the two sisters – one participating in the ATF programme while the other continued traditional farming – showed that mutual agricultural support such as exchanging seeds or sharing irrigation shifts takes place despite following different agricultural strategies.

The research has also shown how the materiality of irrigation systems has induced spatial transformation in the hydrosocial territory. For example, fast and cheap ways of maintaining canals with low-cost materials are taking priority in Toconao. Most of them are industrial materials that are surplus from the lithium mining industry, such as pipes and PVC. Their use creates economic savings for the farmers and companies that provide the material. The empirical chapters have shown that the encapsulation of water through the use of PVC pipes has changed the relationship between inhabitants and water. For example, during the irrigation shifts, farmers do not know when the water is coming to their plots and lose time of their allocated shifts. However, keeping the water encapsulated hinders evaporation. This result supports Linton's findings that

the use of new technologies and materials can engender completely new forms of social relations due to changing social practices (2014).

Another interesting finding in relation to the use of space emerged from examining ‘*melgas*’ and ‘*melgas botadas*’ in Toconao. Their frequent irrigation despite not having any productive function reflects land ownership, where owners are absent most of the time but remain in power over their land. Some farmers see the misuse of ‘*melgas*’ as running contrary to agricultural production, water scarcity and collective activities of everyday life. This suggests a clash between land ownership without engagement in everyday, collective, water-related activities as an indicator of a loss of presence of farmers in the landscape and thus a loss of local identity of some land owners.

8.2 Access in hydrosocial territories

The temporal analysis considered the concept of time in Toconao in relation to agricultural and water cycles. In this section, the focus was on changes in irrigation shifts, the time that farmers spend in the canals, control and access over irrigation times and changes in the distribution of water among the farmers.

Walking along the canals that criss-cross Toconao, it became evident that water connects not only agricultural spaces, but also areas where social interactions take place and the hydrosocial territory is constructed over time. It is necessary to grasp the evolutionary dimension of hydrosocial territories and how time shapes different spaces of water and their uses. In addressing the dimension of time, this thesis elicited narratives around the social space of the irrigation canals in stories and chronicles about water. Time in the village is understood in relation to agricultural processes, that is, as cyclical periods over a year or a day. The majority of Toconao’s farmers uses traditional agricultural techniques based on flooding the land, while few use drip irrigation systems and sprinklers. Each irrigation technique is related to time in a different way, depending on the kind of technology that farmers apply.

The literature on hydrosocial cycles reports strong relationships between water and society throughout time and space (Boelens, 2014; Budds et al., 2014; Linton & Budds,

2014a; Schmidt, 2014). Multiple stories and temporalities, which are sometimes conflicting, are embedded in the hydrosocial cycle. These include the timing of irrigation as well as conflicts about the prolongation or lack of control over irrigation shifts and double wardens. The thesis analysed, amongst others, how the times of irrigation shifts are defined by the amount of land that every farmer owns. Farmers describe irrigation shifts in relation to the concept of '*reparto*', which refers to the 'equal' distribution of water. Every farmer, who is a member of the Irrigators' and Farmers' Association has the right to use water in proportion to the surface of cultivated land she or he owns. In Toconao, 0.25 hectares of land correspond to two hours of irrigation. Hence, farmers with large areas of agricultural land are given more time to irrigate. Some of the larger farmers have decided to build water harvesting tanks to save water for distribution on their land. The '*celador*' controls the water supply by opening and closing the gates that are located at different points in the canal network. Farmers participating in the ATF programme have the largest amounts of land and are therefore allocated the most time to irrigate, while also possessing water accumulation tanks. Some participants of the ATF programme bought additional land from other farmers or applied to the Ministry of National Assets to obtain more land. Furthermore, some took others' land without permission or used more water than was allocated to them. This generates conflicts within the community over the use of water, as well as with those who do not own any land. A similar argument was presented by Swyngedouw (2004b, 2004a; 2016), who found that social, political, economic and power-related actions control flows of water, which create new spaces. In the case of Toconao, control over land today clearly defines control over water spaces and water practices. This stands in contrast to accounts of elderly inhabitants, who said that power was previously held by those farmers, who spend higher amounts of time in their land and actively used it for agricultural production.

The temporal analysis also revealed that cyclical activities and annual festivities around water are opportunities for everyone in Toconao to use the spaces of the canals and appreciate different seasons. These activities provide a connection with traditions and promote solidarity and cooperation. The spaces provide links between practices and rituals, time and space, and the water connecting farmers and non-farmers. Activities such as the 'cleaning of the canals', '*mingas*' and '*pagos*' not only express

the essence of indigenous knowledge and traditional ways of doing agriculture, but also reaffirm forms of belonging to the community through providing moments of collective reflections.

8.3 Autonomy in hydrosocial territories

The concept of autonomy in the Atacama Desert has grown in importance in light of the recent participation of mining companies in the development of local communities. Several studies have addressed the different levels of autonomy emerging from forms of water administration in the Andes (Armijos, 2013; Barros, 2000; Bolin, 1994; Gelles, 2000; Prieto, 2016a). However, previous research has not addressed the effects of CSR programmes on local autonomy. The thesis emphasised that autonomy manifests spatially and is linked to the practices of the hydrosocial territory of Toconao. It is not only referring to the autonomous management of resources, but also to the social relationships that are generated with other communities through territorial values and beliefs.

The autonomy of inhabitants of Toconao, especially those who belong to the Irrigators' and Farmers' Association of Toconao, can be observed in the irrigation system and local practices of water use. In the first section of chapter 7, I discussed spaces of autonomy as well as the capacities of farmers to make decisions and how these decisions, in turn, relate to conflicts around water management. I focused in particular on decisions, which were positively or negatively influenced by the CSR programme and its implicit development strategy for the area. Furthermore, this thesis has focused its attention on different discourses of autonomy, revealed in local everyday water practices.

Practices and discourses related to autonomy over water and land ownership frame the power relations between farmers with different agricultural practices and related water demands. One example is the discourse of 'saving water', which has been enforced by the ATF programme and is manifested in the use of the drip irrigation system. This system exercises control over the use of water, which is justified as the promotion of sustainable and eco-friendly behaviour. However, this sustainability discourse is contradictory to the ATF programme's simultaneous promotion of monocultures.

Additionally, this discourse takes away power from formal community-based institutions such as the Irrigators' and Farmers' Association and the Potable Water Committee, which at the time of fieldwork followed the opposing discourse of encouraging the use of flood irrigation systems and promoting autonomy from SQM.

This research also showed a relationship between autonomy and identity. Traditional practices are fundamental to the production of local identity and autonomy, and are in the Andes commonly dependant on people's perceived harmonious relationship with nature (Hames, 2007). The Andean identity is often described as a moral identity that is always changing and being affected by social and historical events that alter social prejudices and the labels that are imposed on individuals, groups or institutions (Molina, 2012). In Toconao, the relationship between these concepts is manifested in the use of space through traditions and rituals around water. Farmers, who are not involved in the ATF programme, perpetuate a discourse about maintaining traditional practices, sometimes romanticising them to secure autonomy as a community. Practising customs, traditions and romantic discourses about the hydrosocial territory are mechanisms for gaining empowerment and control over water. Agricultural activities carried out by ancestors, such as artisanal wine production, are taken up by traditional farmers in discourses that help to re-build an identity around wine production. It is interesting to observe that SQM employs a very similar discourse of revitalising traditional practices to create an identity of Toconao as wine producing town, which justifies its CSR initiative.

Previous research on hydrosocial territories has not studied the relationship between autonomy and respect. However, the empirical results of this thesis confirm that it is important to understand this connection. The concept of respect came up frequently when talking with inhabitants about family issues, traditions and activities of the past. Moreover, it tended to be associated with religious and environmental perspectives and was reflected in stories about grandparents and ancestors, and the immense efforts which were required to manage water for the entire community and survive in the desert. Respect is also an important aspect in relation to different roles within the community, such as the '*celador*', Community Leader and '*alférez*' (a holder of a religious office). Their actions are critical for the production of a moral identity, for

example, when leaders promote and defend communitarian and collective values for the good of the entire town. It can therefore be said that the moral identity and respect are connected to the concept of the moral economy of water, understood and defined by Sylvia Rodriguez (2006) as a system of principles and values that support and guide cooperative, interdependent autonomous practices.

The findings further reveal changing levels of respect which manifest, for example, in a perceived lack of respect for 'Mother Earth' or '*Pachamama*' in the negotiations with the mining sector over the sale of the water. Relations between local farmers have deteriorated, which became apparent in the association's meetings. Younger generations were often accused of not listening to the elderly farmers' advice and compliance with the committee's rules and the association's statutes has fallen. This is shown, for example, in 'bad practices' such as not respecting the irrigation shifts, using more water than allocated, irrigating at night and closing the gates to deny water to those who are farming downstream. On the other hand, traditional activities such as '*mingas*' and the cleaning of the canals are typical examples of continuous relationships of respect.

This thesis also suggests changes in the relationship between material infrastructure, farmers' capacities and autonomy. Some farmers in Toconao depend on the use of new infrastructure to get involved in the production of wine such as accumulation tanks, pipes and engines. Such dependency also determines the adoption of new practices that are required for the new approach to agriculture. The ATF programme has additionally introduced training, capacity building and professional advice opportunities for farmers implementing the new mode of agriculture. The cultivation is fully controlled by the ATF programme, which gives farmers only very limited space for innovation, agricultural diversity and crop rotation. Moreover, the top-down implementation of the programme does not respond to the local cultural and political considerations which affect rural villages like Toconao. The top-down state promotion of drip irrigation is a precise reproduction of the dominant neoliberal model implemented during the dictatorship, when farmers have not been involved in processes of innovation such as plant breeding. These findings align with literature

that highlights the defining role of water practices and opportunities to make claims on the production of an autonomous territory (Boelens, 2015).

The fieldwork also revealed the significance of the local radio station (Radio Toconao) in connecting associations and being a local element to promote and communicate the different discourses and issues affecting local autonomy, amongst other topics. It produces a bond between local institutions, providing a space for sharing important information about their activities, interests and initiatives in different thematic areas. The people and institutions that Radio Toconao brings together include the '*Consejo de Pueblos Atacameños*', the community of Toconao, different associations within the community, and individual farmers. The radio further provides inhabitants of small communities with a bigger picture about ongoing activities of the government administration. Additionally, it opens up an opportunity to talk about issues that are affecting the area, such as mining, migration, tourism and other themes. The radio therefore empowers inhabitants to access information and to form an opinion that can influence decision-making and support discourses of autonomy. The latter happens, for example, through allowing people to access information from different perspectives and across all the indigenous communities of the Atacama Salt Lake area as well as the nearby medium-sized city of Calama. All decisions taken by the community and its different associations are broadcasted to everyone concerned, which promotes transparency. The radio turned into the medium for information which was previously transmitted by word-of-mouth while working in the irrigation canals.

8.4 Contribution to theory, methodology and practices

This thesis calls for a local understanding of hydrosocial territories and local conflicts generated through external initiatives, especially those from the mining sector. This understanding of local necessities can help to improve the impact of CSR programmes on indigenous communities. This will be no easy task, particularly in a neoliberal context, where the extraction of natural resources is naturalised. There is also an emphasis on the protection of private initiatives as opposed to the development of local communities.

The spatial, temporal and practical aspects analysed in chapters 5, 6 and 7 reveal not only changes in agricultural practices, but also the physical transformation over time of the space in which those practices unfold. Notwithstanding, mining companies face new environmental challenges to their operations and social interactions with communities (Dolan & Rajak, 2016). The findings of this research have shown that the private sector is not operating responsibly with respect to the local autonomy of rural communities. Mining discourses articulated through social initiatives promote improving productivity and efficiency at the cost of generating competition. This runs contrary to understandings of the Andean territory as a configuration of spatial organisation which depends on the natural environment, values, traditions, beliefs and relationships. According to such understandings, Andean communities depend on relationships that are interconnected through capacities for cooperation, reciprocity and autonomy (Walsh-Dilley, 2013).

Solidarity, access and autonomy are constitutive of hydrosocial territories, and research needs to recognise this. The findings of this thesis shed new light on the role of CSR programmes as an essential component of mining strategies, and as an instrument of mining companies to minimise conflicts with stakeholders (Becchetti, Ciciretti, Hasan, & Kobeissi, 2012). Additionally, the findings confirm an evident necessity for critical awareness of the processes by which CSR programmes legitimise specific notions of development. They achieve this through shaping everyday water practices and territories, and by modifying the community's decision-making processes. Additionally, CSR programmes increase and intensify local conflicts affecting the community and its environment, thereby transforming the hydrosocial territory.

The present research aligns with previous Andean research in political ecology. It emphasises the role of physical and symbolic dimensions of water in the construction of social relationships of power, incorporating an understanding of social and environmental changes (Boelens et al., 2018b; Budds, 2011). The research updates previous Andean research from the 1990s (C. J. Bauer, 1997; Berkes, 1993; Bolin, 1994; Gelles, 1996; Matus de la Parra, 1993) by looking at new approaches such as mobile ethnography to enable a better understanding of hydrosocial territories.

Moreover, this thesis reaffirms research on water and its importance not only in the building of a community's identity, but also in deconstructing social relations (Kalaora, 2001; Linton, 2010, 2014; Strang, 2004; Worster, 1985). Weaving together these different visions, the present study builds on the large body of literature on water and territory by including the concepts of solidarity, access and autonomy in its approach to hydrosocial territories (Boelens, 2014; Boelens et al., 2017, 2016; Budds, 2011; Hommes et al., 2018; Perramond, 2016; Seemann, 2016; Swyngedouw & Boelens, 2018). This expanded understanding can contribute to ameliorate the impact of CSR programmes and improve water-related social relations within communities, allowing space for solidarity.

One important methodological innovation of the thesis to promote an understanding of spatial changes, as well as temporal and practical modification of practices related to water, has been the implementation of mobile ethnography. Mobility gave me the opportunity to understand changes in water flows over time as well as the movement of farmers in their everyday activities. Building on Büscher and Urry (2009), mobile ethnography provided a practical approach to understand social realities. Interviews through walking to farmers' orchards and working together in agricultural activities were among the mobile tools that allowed me to engage with people's practices and observe their relationships with each other and their environment.

The mobile methods required me to spend long periods of time doing explorative research, making observations and building trust in my interactions with the community. Activities such as participatory mapping and participatory photography, which I carried out with a group of elderly inhabitants, were fundamental to understand not only the value of specific spaces, but also the dimension of time in the transformation of the hydrosocial territory. As an ethnographic exercise, the collection of farmers' narratives and memories through pictures helped me to recognise the meaning of power relations and social processes.

Another important methodological contribution lies in the transcription and analysis of interviews through drawing, in which I was supported by a GPS map generated in the field. This method added another dimension to the hydrosocial territory and

provided a better understanding of people's histories and everyday practices around the irrigation canals.

The drawing approach was useful in expanding my understanding of how hydrosocial territories are changing and transforming social interactions. Understanding that practices are mobile, this research developed different forms of exploration in order to understand that movement also involves making different decisions. Such modes of exploration shaped my approach to the field, ensuring that I spent a significant time around the irrigation canals, and that I get familiar with the farmers' timeframes and the nature of agricultural cycles.

Another methodological contribution is in the use of drawings as a language, which allowed me to transmit my ideas in the field as well as in London. This approach expanded the ideas of Cook (2013: 80), who argues that '*a drawing should be an investigative device, a voyage of discovery, a series of glances into the future*'. The lines of my sketches not only formed images of the irrigation canals. Rather, they were graphical representations of collected information and analysed data. They became an instrument of reflection and intuitive action. Overall, the research methods used in this thesis address the need to document hydrosocial territories and their relationships by using drawings as a mode of representation. On the one hand, drawing can express different conflicts, but it also allows hidden injustices to be made visible. Drawings can become tools for collecting information, performing analysis or generating a hypothesis. Drawings therefore have great potential to be integrated into research and developed as a productive tool.

8.5 Final comments and the implications and avenues for further research

To conclude, the discussion now turns to the extent to which the studied hydrosocial territories follow principles of political ecology (Boelens et al., 2017). So far, examinations of hydrosocial territories sought to understand the spatial network of people, institutions, water flows and technology around the control of water. Yet, there is evidence that hydrosocial territories may also be created by values and meanings with particular implications for their management, shaping different users' rights (Hommes et al., 2018). Irrigation canals are not only physical ditches, they are also

institutions (Perramond, 2016). Canals make and shape hydrosocial territories and are a source of constant struggle and negotiation among multiple actors regarding territorial values, imaginaries and projects. This discussion illustrated the tensions that can arise between indigenous and CSR influences in the production of hydrosocial territories in the Chilean Andes.

In this research I have shown the importance of incorporating the concepts of solidarity, access and autonomy into knowledge production and decision-making around water management when approaching the concept of hydrosocial territories. This is not only justified on moral grounds; it is also necessary to bring about a better understanding of the concepts of water, power and territory.

The results of this study indicate that in the process of ‘territorialisation’ around water, the relationship between communities, territory and power plays an essential role. In contrast to earlier research, however, small-scale evidence has been found incorporating concepts of solidarity, access and autonomy into the hydrosocial territory. The specific context of the Andean community of Toconao reveals themes such as individualism, maintenance, ‘*reparto*’ and dependency as being inseparable from the concepts of solidarity, access and autonomy. One possible explanation may be the special geographical condition of this community, which has made it possible to implement the ATF programme. Alternatively, the agricultural quality of Toconao’s land is different to some of the surrounding communities. The town’s geography and its direct relationship with the Toconao River, but also the excellent quality of its soil ensures it is more fertile than other local areas, and therefore more open to exploring different types of farming.

This research took an exploratory approach, and there were problems in the data collection process. My presence during fieldwork created expectations and conflicts that limited my interpretations. On the one hand, some people thought that I was working on solving their disputes and problems and took the opportunity to raise some issues regarding the ‘*reparto*’ of water. Other farmers, especially those involved in the ATF programme, were concerned that I would create new problems by comparing and analysing their cases.

Looking at the implementation of CSR programmes in the indigenous community of Toconao and using the lenses proposed in the previous chapters – space, time and practices of water – the discussion has centred on spatial and social changes in water practices in the community. The observed installation of new irrigation systems and water harvesting tanks, for example, supports the conceptual premise that hydrosocial territories are territories of inequality. This thesis has found that access to, and distribution of, water should form a fundamental part of hydro-territorial planning. However, it is necessary to go beyond those findings and explore how the hydrosocial territories of the Atacama Desert are changing water practices in Toconao. While the concept of the hydrosocial territory provides a lens to analyse water flows, it is also a useful device to examine levels of solidarity, autonomy and access to water in a context of mining expansion.

The study has implications for the Water Code from the Andean perspective and for the definition of the hydrosocial cycle. It provides empirical evidence that water cannot be separated from its territory, especially in the hydrosocial territory of the desert. The notion of water as an economic good and the privatisation of water stands in conflict with local values of solidarity, cooperation and autonomy. Therefore, the thesis suggests that emphasis should be placed on tradition and the local culture of communities in the Andes, whose relationship with water is as an element that shapes their identity. This perspective can be adopted by local government and policymakers to better support CSR initiatives through an improved understanding of their spatial, temporal and practical dimensions.

This work has placed an emphasis on small-scale spaces of water management that have been affected by the growing influence of the mining companies. However, the focus has not been on the environmental conflicts emerging from the extraction of natural resources in rural areas, which have already been widely researched. Rather, this research was concerned with the extraction of local autonomy.

The findings of this research have shown that irrigation canals are not just physical containers of water; they are also local institutions. Irrigation canals are the physical expression of the rules and responsibilities of water governance. However, canals and

mechanisms of irrigation are transformed in the hydrosocial territory, creating a new landscape. This means that the effects of CSR programmes are reflected in new hydrosocial institutions, such as water associations or committees that shape local behaviour and rules as well as acts of sharing water and local solidarity, access and respect.

This research has shown how CSR programmes help the government and the private sector to push indigenous communities to be actively entrepreneurial and grasp development ‘opportunities’. Corporate social responsibility programmes in the context of neoliberal water policies redefine local and external ideas of development, thereby increasing fragmentation, injustices and vulnerabilities within rural communities.

The findings of this study have a number of important implications for future water management practice. On the one hand, the findings can be used to develop targeted interventions aimed at CSR programmes and to inform initiatives being enacted by indigenous communities as autonomous entities. On the other hand, they can help communities to define their own agendas, understanding the effects that trigger economic, social and political dependencies. In these ways, this research can contribute to a more balanced, inclusive transition towards a modern and developed society.

Further research might explore the economic and social dependency of Atacameño communities on mining initiatives, not only in the sense that many inhabitants work in the mining sector, but also because they depend on social initiatives such as the ATF programme. Noting the different discourses around development, this thesis sought new approaches to rethink the concept from a political ecology perspective. It took into consideration local hydrosocial territories, the power relations at work in them and the ways they are divided, and the traditions that have emerged from Andean history and the community’s relationship with the territory. Appearing in different discourses, these approaches have many common themes. Greater efforts are needed to ensure that local institutions are understood as providing spaces for collective political action, creating a unique structure of connections between a community’s

environment, its water and social relations. Hence, I argue that the creation of spaces of solidarity, access and cooperation can only emerge from political, territorial and environmental autonomy.

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Appendix 1

Interviews with farmers

Introduction:

To start the conversation, can you tell me your name and age? To which sector are we going? Since when do you live in Toconao? Apart from working in the orchards, what is your occupation?

What do you understand as mining company? What is for you a mining company? What is community for you?

1. General information/history

What and how has been your experience with agriculture in the past years?

How did you obtain your land/orchard? (inherited, bought, subdivision)

What is your family relation to the orchard? Since when are you coming to this orchards? How many times a week/month/daily hours? Did you work for other people

Do you have a land title for this orchard? Or do you work for someone else (if working for another person: what is your working relationship (formal contract, oral agreement, etc.)?)

Who is the owner and what are his forms of payment? Through money or goods for consumption?

If you cannot work in your orchard either for your shifts or for work, who is looking after it? How much do you pay? And how? (money, lunch, fruits, other goods)

2. Water

What does water mean for you in your daily routine? (in the winter, summer, festivities, rituals-water not as a daily routine, etc.)

Is the relation different during different hours of the day, months, seasons?

How is your relation with water in terms of rituals? By ritual, I mean those that are not ordinary, and not everyday. How is it changing?

3. Water management

What do you produce in your orchard?

Did you modify the products in the last years? What quantity of fruits are you producing? How many boxes/kilos?

Do you production for sale or for your own consumption? If for your own consumption: did you sell agricultural products before? Why did you stop? To whom did you sell? If for sale: what is your motivation to sell? To whom do you sell? How much do you sell vs produce for your own consumption (estimated percentage).

How much time do you dedicate to work in your orchard?

What type of irrigation to you use? Do you consider it more economic? More productive? Efficient? Creating savings? Did you change your form of irrigation? How/why?

Do you use the water for other purposes?

How much time do you dedicate in relation to water? (per week, month, weekend, seasons)

How many hours of irrigation do you have daily/weekly etc?

Did the hours of irrigation change?

What is the area of land you irrigate and own? And did the surface of your land change and why?

Do you have water rights?

Do you work collectively with other people in relation to water? What are the community works? Or do you work individually? Why?

4. Water and territory

What is your relation to water and territory?

How could you describe your relation in terms of culture, economy, production, community life, everyday activities?

What does the cleaning of the canals mean to you?

Did you participate in the last one or did you send someone to do the work? Why? If you did not go, how much did you pay and how?

5. Relations to mining

Is there someone (a person/institution), which supports you individually or as part of your community in your work related to water?

What kind of support do you have (money, capacity building, infrastructure etc.)? Where does it come from? Since when/until when, how does it work, who is the beneficiary? How has support been in the past?

Have you been beneficiary of the project by mining, the state, a private company or the community? What kind of support did you receive?

What was the name of the project? Whom is it related to? What do you consider benefits or problems with support from the mining, in relation to you (as individual) as well as the community?

Do you know of other institutions or ways of obtaining support for the same purpose? What do you consider challenges/opportunities of this?

6. Changes in the territory or irrigation

Was there a necessity to improve the use and management of water/irrigation in your orchard? If yes, why? Was it necessary to improve work for the community in general? If so, why? Where there any changes in your way of working in the territory? Why?

How do you see the future of your community in relation to mining? What are the spaces to resist to mining or spaces to recover?

What is your opinion in regard to the sale and renting of water to mining companies or other non-communitarian purposes? Do you see a separation in the community in relation to water resources? How come? How does it manifest in daily life?

7. Closing the conversation

What would you recommend to new generations in the village in regards to water use and their relation with water (cultural, social, economic etc.)

Interviews with professionals

Introduction:

How do you understand community? How do you understand mining?

1. General information

Can you tell me about your experience of working with the community in the past years?

When did you start working in Toconao/with communities of the Atacama?

Do you have any relations to the village? (family, orchard, land, projects, businesses, water rights)

2. Water

From your professional perspective: what does water mean to you?

What are the different roles that water has in the mining business and in your projects? (programmes, projects, initiatives, environment etc.)

3. Water management

What is your experience in relation to managing water in the community?

What problems do you think communities have with water? What are the values of managing water? Were there incentives for the communities to improve their management? Who is incentivising them? (state, the community itself, INDAP)

How does the vision of the company relate to water use? (production, resource use)?

Do you have initiatives to improve water management? If so, what is the motivation of the company to implement them? What kind of initiatives? What are the criteria for beneficiaries to participate and/or support projects?

In relation to irrigation: What type of irrigation do you promote? Why?

Are there other water uses you could incentivise?

*Did the form of irrigation change since you started working with the community?
How/why?*

Your work in the Atacama is a collective work or do you work individually with different inhabitants/community leaders of the community? Why?

4. Water and territory

From your profesional perspective: how do you see the relation of the company with water and its territory?

How do you see it in terms of economy, production, community life, everyday activities etc

What does the cleaning of the canals mean to you?

As company, did you participate in the cleaning of the canals? Why/not?

5. Programmes

How does the Company support the community and its inhabitants in the everyday work in relation to water?

Is there any corporate social responsibility programme, Project, or initiative in relation to water?

How did you support communities or inhabitants in the past years?

What kind of support do you offer (capacity building, money, infrastructure)? Who do you focus on? Since when/until when? Who is beneficiary and how are they selected?

What are the current projects in the community? What requirements/conditions were necessary to start these projects?

How do you see the relation between the community and your company or with mining in general?

What do you consider beneficial or disadvantegous in the relation mining-community?

As a company, do you work together with other institutions to obtain more benefits for the community or its inhabitants? If so, what do you see as the challenges and opportunities of this joint work?

6. Changes in the territory

As a company, what do you think are the initiatives to improve the relation with the community and its inhabitants?

What are the capacities and/or skills you see in the community and its inhabitants?

How do you see the future of the community? What do you think are the spaces to improve communication with your company?

Do you see any separation within the community in relation to the beneficiaries of the initiatives of your company?

What is your relation with the ‘Consejo de Pueblos Atacameños’?

7. Concluding the conversation

What would you personally recommend your company in relation to water use?

Appendix 2

Informed Consent Form for Interview participants

[A copy of this consent form was handed out in Spanish]

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of the Study: **Understanding the Andean territory from a community perspective.**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): **6173/001**

Research will be conducted by **Cristian Olmos Herrera** [REDACTED]

Thank you for your interest in taking part in this research. Before you agree to take part, Cristian Olmos must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask him before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Participant's Statement

- I have read the notes written above and the Information Sheet, and understand what the study involves.
- I understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researchers involved and withdraw immediately.
- I consent to the processing of my personal information for the purposes of this research study.
- I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
- I understand that my participation will be audio-recorded unless I request otherwise. I consent to the use of this material as part of the project.
- I understand that the information I have submitted will be published as a report. Confidentiality and anonymity will be maintained and it will not be possible to identify me from any publications, unless explicitly agreed to use personal identity.
- I agree that my non-personal research data may be used by others for future research. I am assured that the confidentiality of my personal data will be upheld through the removal of identifiers.
- I acknowledge that the contact information of the researcher has been made available to me and that I receive a duplicate copy of this consent form.
- I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.

Please mark what corresponds to your personal option:

I agree to use my full name in the research: Yes ___ No ___

I agree with my interview being audio-recorded: Yes ___ No ___

Participant's Full Name: _____

Participant's Signature: _____ Date signed: _____

Information Sheet for Interview Participants

[A copy of this information sheet was handed out in Spanish]

Title of Project: **Understanding the Andean territory from a community perspective.**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): **6173/001**

Name: Cristian Olmos Herrera

Work Address: Development Planning Unit, The Bartlett, UCL 34 Tavistock Square London, WC1H 9EZ, UK

Contact Details: [REDACTED]

I would like to invite _____ to participate in this research project.

Purpose of the Study:

The aim of this interview is to find out how community activities relate to current mining activities and the use of water. For this purpose, I am interviewing inhabitants from Toconao, who are engaged with or have a relation to these activities, such as farmers, representatives of local committees, mining workers, professionals, academics and community leaders. Participation in this study means that you will be interviewed at an agreed date and location and for an agreed duration (about 30 minutes). The interview data will be processed confidentially and anonymized, so that no risks for you are created. The interview will provide you with an opportunity to express your views and to get them transmitted to the municipality and the universities, with whom Cristian Olmos is collaborating in this project. Broadly, the interview will cover topics such as water demand and right to the water, migration, mining activities, environmental issues, community life.

- If you agree to take part in this study, the procedure for conducting interviews will be clarified and discussed – that is, details such as the date, place and duration of the interview will be agreed.
- It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time and without giving a reason.
- Only the researcher contacting you will have access to this information and will secure the confidentiality of it. Recorded interviews will be transcribed and the recording will be deleted. Transcripts will be anonymised immediately, unless you explicitly agree to use your full name for the research.
- If at any point the interview raises topics leading to discomfort or distress, it will be interrupted and you will decide if you wish to continue at another time or to finally withdraw your participation.
- At the end of the data collection process you will receive a report stating the main outcomes obtained.
- Please discuss the information above with others if you wish or ask me if there is anything that is not clear or if you would like more information.

If you decide to take part you will be given this information sheet to keep and be asked to sign a consent form.

All data will be collected and stored in accordance with the Data Protection Act 1998 (legislation for data protection in the United Kingdom, country in which the information will be processed).