

**POLLUTION, INTERESTS AND
EVERYDAY LIFE IN LAKE
TITICACA:**

NEGOTIATING CHANGE AND CONTINUITY IN
SOCIAL-ECOLOGICAL SYSTEMS

*Thesis submitted in partial fulfilment of the requirements for the degree of
Doctor of Philosophy in Development Studies*

by

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ABSTRACT

Environmental governance is a challenging topic in development contexts. On the one hand, the traditional development paradigm is based on economic growth through environmental exploitation; on the other, environmental degradation reduces vulnerable populations' options for development. In the last thirty years numerous attempts to integrate environmental concerns in development policies have proved unsuccessful, raising questions as to whether the current governance system can address the challenge. The literature on environmental management has focused on identifying rules for successful governance, leaving little space to explore the complexities of the interactions between actors and their environments, wherein the reasons for sustained degradation might lie. The questions that this thesis asks are: How do diverse groups of actors rationalize and interact with degraded ecosystems? And what role does the governance system play in codifying these interactions? To answer these questions, the thesis engages in an institutional study of Lake Titicaca, between Peru and Bolivia. The lake has witnessed a degradation of its bay in the last thirty years, as a result of urban and mining development in the region. A complex web of organizations that go from the bi-national to the community level manages Lake Titicaca. The investigation of the questions asked is particularly relevant in the current context, as the countries to which the lake belongs put forward significantly different visions of the environment. By drawing on the strengths of social-ecological systems frameworks proposed by the two main schools – the Resilience Alliance and Bloomington Workshop – and filling some of their deficiencies using insights from the sociological literatures on negotiation and justification, I hope to have created a composite framework with which to give an insightful account of the complexity and diversity at play in the field. The thesis adopts a broad range of qualitative methods (observation, interviews, document analysis) completed with descriptive statistics for budget analysis. The thesis argues that the actors' approaches to the ecosystem are complex, diverse and constitutive of social-ecological systems wherein relationships are negotiated between actors, between actors and the ecosystem and 'within' actors as they hold competing visions and strategies. Some of the variables shaping these negotiations are crafted through the interaction between social and ecological elements, which also influence the actors' understanding of the system. Others are determined by parameters crafted in the social sphere, and the ways in which social-ecological interactions fit with those. Policy interventions to improve the condition of Lake Titicaca need a more sophisticated understanding of these social-ecological systems.

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LIST OF ACRONYMS, ABBREVIATIONS AND SCIENTIFIC AND FOREIGN TERMS

- * AAA: Autoridad Administrativa del Agua – Basin Authority of Water (Peru)
- * AAPS: Autoridad de Fiscalización y Control Social de Agua Potable y Saneamiento – Authority for the Supervision and Social Control of Drinking Water and Sanitation
- * AISA: Aguas del Illimani. Company in charge of drinking water and sanitation services in La Paz and El Alto until 2007 (Bolivia)
- * ALT: Autoridad Bi-Nacional Autónoma del Sistema Hídrico Lago Titicaca, Río Desaguadero, Lago Poopó y Salar de Coipasa – Bi-National Autonomous Authority of the Water System Lake Titicaca, River Desaguadero, Lake Poopó and Pan Salt of Coipasa (Bi-national)
- * ALA: Autoridad Local del Agua – Local Authority of Water (Peru)
- * ANA: Autoridad Nacional del Agua – National Water Authority (Peru)
- * BOD: Biochemical Oxygen Demand
- * BW: Bloomington Workshop
- * BWSES: Bloomington Workshop Social-Ecological Systems framework
- * CAF: Corporación Andina de Fomento – Development Bank of Latin America
- * CAM: Comisión Ambiental Municipal – Environmental Municipal Commission (Peru)
- * CAN: Comunidad Andina de Naciones – Andean Community of Nations
- * CAOI: Coordinadora Andina de Organizaciones Indígenas – Andean Coordinator of Indigenous Organizations
- * CAR: Comisión Ambiental Regional – Environmental Regional Commission (Peru)
- * Conam: Consejo Nacional de Ambiente – National Environmental Council (1994 – 2008 Peru)
- * CONAMAQ: Consejo Nacional de Ayllus y Markas del Qullasuyu – National association grouping together the Ayllus and Markas (indigenous organizations) (Bolivia)

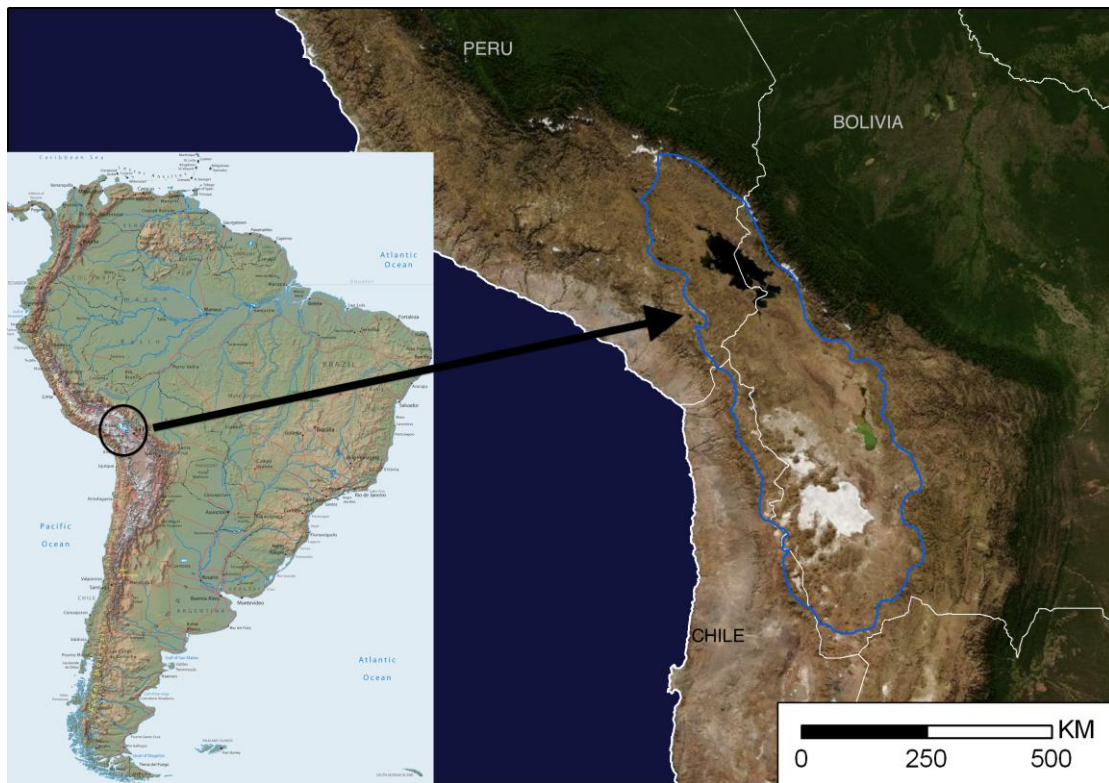
- * CPR: Common Pool Resources
- * CPE: Constitución Política del Estado – Political Constitution of the Bolivian State
- * DEGLP: Directorate of the Environment of the Gobernación (Regional Government) of La Paz (Bolivia)
- * DIRESA: Dirección General de Salud Ambiental – Office in Puno of the Ministry of Health: General Directorate of Environmental Health (Peru)
- * *Dirigente*: leader of a rural community or an association
- * EC: European Commission
- * EDRGP: Environmental Directorate of the Regional Government of Puno (Peru)
- * Emagua: Entidad Ejecutora de Medio Ambiente y Agua – Executing Agency of the Environment and Water (Bolivia)
- * EMSAPUNO: Empresa Municipal de Saneamiento y Agua de Puno – Municipal Company for Sewerage and Water, Puno (Peru)
- * EPSAS: Empresa Pública Social del Agua y Saneamiento – Public Social Company for Water and Sewerage, La Paz and El Alto (Bolivia)
- * Eutrophic: rich in nutrients and supporting a dense plant population the decomposition of which kills animal life by depriving it of oxygen
- * Fonabosque: Fondo Nacional de Desarrollo Forestal – National Fund of Forest Development (Bolivia)
- * FONAMA: Fondo Nacional para el Medio Ambiente – National Environmental Fund (1990 – 2004 Bolivia)
- * FPS: Fondo de Inversión Productiva y Social – Social and Productive Investment Fund (Bolivia)
- * GDP: Gross Domestic Product
- * GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit – German Agency for International Cooperation
- * GWP: Global Water Partnership
- * IAD: Institutional Analysis and Development
- * IMARPE: Instituto del Mar Peruano – Peruvian Sea Institute (Peru)

- * IMF: International Monetary Fund
- * INADE: Instituto Nacional de Desarrollo – National Institute of Development (Peru)
- * INE: Instituto Nacional de Estadística – National Institute of Statistics (Bolivia)
- * INESAD: Instituto de Estudios Avanzados en Desarrollo – Institute for Advanced Development Studies (Bolivia)
- * IWRM: Integrated Water Resource Management
- * JICA: Japan International Cooperation Agency
- * KfW: Kreditanstalt für Wiederaufbau – German Cooperation Bank
- * *Lemma (gibba)*: plant growing on the lake’s surface as a result of eutrophication
- * Lidema: Liga de Defensa del Medio Ambiente – Environmental Defence League (NGO Bolivia)
- * MA: Millennium Ecosystem Assessment
- * MAS: Movimiento Al Socialismo – Movement Towards Socialism (Bolivian President’s Morales Party)
- * MDG: Millennium Development Goals
- * MMAyA: Ministerio de Medio Ambiente y Agua – Ministry of Environment and Water (Bolivia)
- * Minam: Ministerio del Ambiente – Ministry of the Environment (Peru)
- * OEFA: Organismo de Evaluación y Fiscalización Ambiental – Organism for Environmental Evaluation and Supervision (Peru)
- * OSINFOR: Organismo de Supervisión de los Recursos Forestales y de Fauna Silvestre – Organism for the Supervision of Forest Resources and Wild Fauna. (Peru)
- * Oligotrophic: relatively poor in plant nutrients and containing abundant dissolved oxygen
- * *Pachamama*: Mother Earth
- * PDSLIT: Proyecto de Desarrollo Sostenible Lago Titicaca – Sustainable Development of Lake Titicaca Project. Project ran by the Vice-Ministry of Tourism and the World Bank in Bolivia at the time of fieldwork (Bolivia)

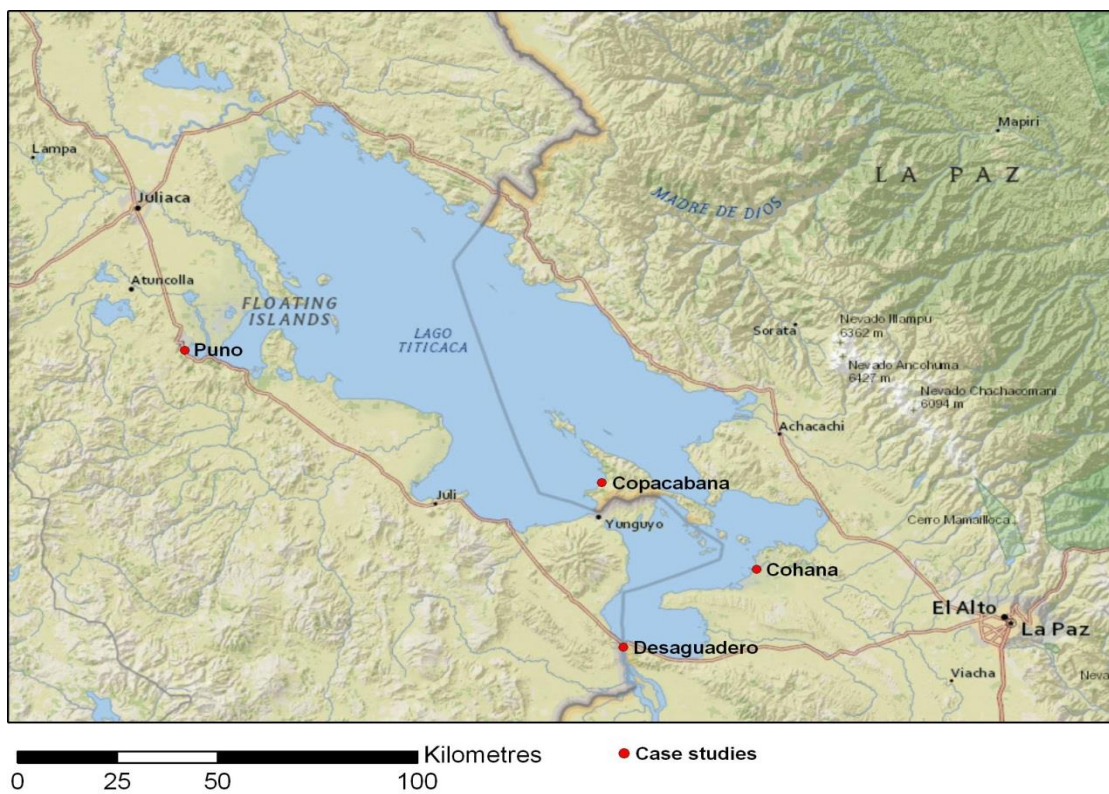
- * PELT: Proyecto Especial Lago Titicaca - Special Project Titicaca Lake (Peru)
- * PIGARS: Plan Integral de Gestión Ambiental de Residuos Sólidos – Integrated Plan for the Environmental Management of Solid Waste
- * PNUMA – acronym in Spanish: Programa de las Naciones Unidas para el Medio Ambiente (used for reports published in Spanish)
- * POA: Plan Operativo Anual – Operational Annual Plan
- * RA: Resilience Alliance
- * RASES: Resilience Alliance Social-Ecological System framework
- * RNT: Reserva Nacional del Titicaca – National Reserve of Titicaca (Peru)
- * SERNANP: Servicio Nacional de Áreas Naturales Protegidas por el Estado – National Service of Natural Areas Protected by the State (Peru)
- * SERNAP: Servicio Nacional de Áreas Protegidas – National Service of Protected Areas (Bolivia)
- * SES: Social-Ecological System
- * *Suma Qamaña*: Living Well
- * SUNASS: Súper Intendencia Nacional de Servicios de Saneamiento – National Sanitation Services Authority (Peru)
- * TDPS: Titicaca – Desaguadero – Poopó – Salar de Coipasa. Name of the water basin to which Lake Titicaca belongs
- * *Totoras*: Reed maces, native plant in Lake Titicaca
- * UMSA: Universidad Mayor de San Andrés – Public University of La Paz (Bolivia)
- * UN: United Nations
- * UNDP: United Nations Development Programme
- * UNEP: United Nations Environment Programme
- * UNESCO: United Nations Educational, Scientific and Cultural Organization
- * UOB: Unidad Operativa Boliviana – Bolivian Operational Unit
- * USAID: United States Agency for International Development

- * WWAP: World Water Assessment Programme
- * WB: World Bank
- * WCD: World Commission on Dams
- * WHO: World Health Organization

Water basin Titicaca Desaguadero Poopó Coipasa, to which the lake belongs.



Map of the lake and the main cities in its sub-basin.



Note on maps: These maps, reproduced in Chapter Three, situate Lake Titicaca, the focus of this study, in the Latin American region. All the maps contained in this document (except for the map of the South American Cone above) were composed for the purposes of the thesis. Maps were created at the Bodleian Library through the Geographic Information Systems software ArcGIS, with the help of Michael Athanson, Deputy Map Librarian and Geospatial Data Specialist. A variety of general sources was used (including National Geographic Data, Google Maps, Perry-Castañeda dataset and NASA maps) together with specific information compiled in the field; particularly, the information kindly provided by Bolivian NGO Lidema and by the Regional Government of Puno, as well as the information contained in the Development Plans of the Municipality of Puno (2008, 2011), the UNEP Report “Geo Titicaca” (2011) the World Bank Report “Informe del Estado del Lago” (2009), the study “Diagnóstico del Nivel de Contaminación de los Recursos Hídricos del Lago Titicaca” conducted by Tysa and Prointec for the CAF (2004) and the ALT website. The map of the South American Cone was retrieved from the website Geographic Guide, entry ‘Maps’.

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When I arrived in the city of Oxford some four years ago, I was excited with the novelty of the place. It felt fantastically different from my familiar Paris. I quickly realised, however, that I would need to find some reassuring landmarks. After doing some rudimentary research, I found myself entering Blackwells in the hope of finding a decent film section. I did find it. I acknowledged instantly that the compilation of movies was, what I considered, a serious one. Yet, it took me roughly five minutes to understand the rationale followed to classify them. Contrary to what I was used to, the movies were not ordered alphabetically by directors' names. I figured out, eventually, that they were indeed ordered alphabetically, but by titles. I remember I simultaneously felt amazed, amused and impatient at verifying the hypothesis that I then set as mine then: this would be a journey full of surprises.

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Last, but unequivocally not least, this thesis is dedicated to Mercedes Fernández Fernández, for teaching me surprise, complicity, respect and above all things, the timelessness of learning. For giving me the certainty that daring was worth the unsettlement. *Gracias Merce, por las fiestas secretas con vasitos de cokacola.*

CHAPTER 1. INTRODUCTION

Freshwater ecosystem degradation is currently one of the most urgent developmental concerns. The centrality of water in sustaining life explains why the problem of managing it adequately has made its way onto the public health, poverty alleviation and economic vitality agendas. Despite efforts at the global level to preserve the environmental quality of freshwater ecosystems, degradation continues. This raises the question of whether current governance structures are able to address environmental problems.

Fifty years ago, the environment¹ was the object of two types of public policy: conservation and natural resource exploitation. Conservation, the domain of natural scientists, was restricted to a few delimited ‘wild natural areas’, often exempt of human presence (Schwartzman et al. 2000). By contrast, the exploitation of natural resources, the realm of engineers and economists (Cutter and Renwick 1999), covered a much broader area of public intervention. Importantly, transforming natural resources was at the core of mainstream growth-oriented policies (Barbier 2011; Dryzek 1997).

Both conservationists and resource-based growth promoters had ‘the environment’ as their common object of intervention, but they approached it from radically different perspectives. The two groups clashed in countless disputes.² Conservationists fiercely defended ‘nature’ against what they denounced as a never-ending thirst for resources

¹ Numerous terms, such as environment, nature, natural resources, exploitation, conservation, used in these first pages are highly contested in the literature. I use them here uncritically as they allow me to set the context of the thesis.

² The website <http://www.environmentalhistory.org> provides a useful timeline wherein this can be appreciated.

promoted by the dominant paradigm. As environmental catastrophes continued to occur, the environmental issue gained a greater presence in public spaces around the world.³ Environmental defence movements advocated the ‘protection’ of nature, which they understood in diverse ways. Some of them refused the exploitation of resources altogether, while others demanded that its rate be moderated. I use the term ‘environmentalism’ to group together the ideologies⁴ with the protection of nature at their core, notwithstanding the differences between their positions.

In the second half on the twentieth century, the environmentalist movement grew stronger and raised public awareness of the importance of the planet’s natural resources in sustaining life (Commoner 1972; Walker 1977). Progressively, institutional reports echoed the environmentalists’ claims.⁵ Inspired by a Malthusian approach, the ‘survivalist’⁶ academic literature claimed that population and economic growth would cause stress to the qualitative (Carson 1962) and quantitative availability of natural resources (P. Ehrlich and A. Ehrlich 1972; Meadows and Club of Rome 1972). From this perspective, it followed that the development model aiming at economic growth through the exploitation of natural resources could not be replicated *ad eternum*.⁷

Moreover, the increasing qualitative degradation of natural resources became the focus of worry, over and above the issue of availability. In particular, the impact of

³ Bohlen (2001), Boime (2008), Guha (2000), Shiva and Bandyopadhyay (1986).

⁴ I define ideology as “a systematic scheme of ideas, usually relating to politics, economics, or society and forming the basis of action or policy; a set of beliefs governing conduct”, following the Oxford English Dictionary Online, entry “ideology”, definition 4 (2013).

⁵ Brundtland (1987), Tolba et al. (1992), United Nations (1972), United Nations General Assembly (1987).

⁶ In Environmental Studies, survivalism refers to the fear of environmental collapse. I do not go into further detail since discussions of survivalism are far from the central concern of this thesis.

⁷ This thesis does not discuss the moral reasons why sustainability is desirable in contrast to, for instance, maximization of the current state. That discussion is part of Environmental Ethics (Alexander 2007; Broome 2008). It is also important to clarify that by ‘sustainability research’ or ‘sustainability literature’ I refer to the academic discipline aiming to integrate knowledge from the natural and social sciences to promote sustainability (Kates et al. 2001).

environmental degradation on human life was brought to the fore. A growing body of grey and academic literature pointed out that degraded environments jeopardize people's health, as well as their opportunities for sustainable and prosperous livelihoods.⁸ Yet, despite the change in the discourse witnessed in the last fifty years, 'nature's crisis' is still ongoing.⁹

Environmental degradation is generally approached as a problem of deficient management. The deficiencies in management can take numerous forms, including 'technical' problems (for instance, the absence of the 'appropriate' technology) and 'market failures' (for example, the phenomena of externalities). Part of the environmental management scholarship addresses the problem from the perspective of power¹⁰ dynamics and explores the tensions between models of development and resource allocation. Different explanations have inspired managerial discourses¹¹ that dictate the 'best' approach to healthy ecosystem management. These constitute prescriptive positions, ignoring the interactions that residents and managers craft with 'degraded' ecosystems, and how these might influence managerial decisions. Moreover, a focus on *outcomes* does not fully explore the role of the managerial structure in the *processes* of

⁸ Alcántara (2004), Brack Egg (2000), de Coninck and UNDP (2009), Leff (1986), Martínez-Alier (2004), United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme (2009), World Health Organization, Prüss-Ustün and Corvalán (2006).

⁹ Bebbington and Humphreys Bebbington (2011), Bina and La Camera (2011), Inturias and Aragón (2005), Krech III (2009), Roberts and Thanos (2003).

¹⁰ This thesis does not engage in a discussion of the concept of 'power'. It is understood, inspired by Lukes (1974), as actions or discourses that influence behaviour.

¹¹ Following Dryzek (1997, 8) I understand discourse as "a shared way of apprehending the world. Embedded in language, it enables those who subscribe to it to interpret bits of information and put them together into coherent stories or accounts. Each discourse rests on assumptions, judgments, and contentions that provide the basic terms for analysis, debates, agreements, and disagreements, in the environmental area no less than elsewhere". I prefer, in this instance, the use of the word 'discourse' to that of paradigm. Even though both terms refer to coherent sets of ideas, the definition of 'paradigm' includes concrete expression of those ideas through organizations and infrastructure. The term discourse allows me to cover the visions that have not necessarily become concrete, but are discussed and considered.

interaction between social and environmental spheres, wherein the reasons for sustained degradation might lie.

In a context wherein global resource degradation continues, it seems crucial to understand how local actors¹² interact with their environments. In particular, it is critical to understand how local actors make ‘degraded’ ecosystems fit the strategies they follow to fulfil their goals. The questions that this thesis asks are: How do people interact with degraded ecosystems? How are ecosystem changes understood? Which roles do different actors assume in light of ecosystem changes? What roles does the governance system play in codifying these interactions? What determines the type of approach adopted?

To answer them, the thesis sets its scope on Lake Titicaca, a watershed on the border between Peru and Bolivia, which has presented signs of degradation in its bays for the last thirty years. In investigating the ways in which different groups of actors relate to the degradation of the ecosystem, the thesis hopes to shed some light on the reasons why the degradation has been sustained over time. I argue that the actors’ approaches to the ecosystem are complex and diverse, they are constitutive of a social-ecological system (SES) wherein relationships are negotiated. The thesis’s findings highlight that negotiations occur between actors, between actors and the ecosystem, and ‘within’ actors, as they have to hierarchize their interests and strategies. These negotiations are the arena wherein the ‘state’ of the social-ecological system is determined.

¹² ‘Actors’ is used generically to include all participants in the study, i.e. residents as well as ‘officers’. By ‘officers’ I refer to all actors holding a position, be it a public position, an NGO position or a position at a cooperation agency. ‘Officials’ is alternatively used. ‘Managers’, on the contrary, refers to both officers and residents, since the later are frequently the effective managers. ‘Organizations’ refer to all organizations, regardless of whether they are public, cooperation or NGOs.

The thesis explores how the different sets of actors integrate their relationships with the ecosystem in their daily lives and development strategies. This can take different forms, as some actors ‘use’ the ecosystem changes and others negotiate to modify the management system in light of those changes. The thesis analyses the structures that frame the interactions between human actors and the ecosystem. This reveals the specificities of the case, but also hopes to highlight the challenges that environmental management poses in contexts with the institutional weaknesses, low budgets and extractionist development models typical of developing countries.

The thesis therefore aims to fill a gap in the literature on environmental management in developing contexts, and particularly water management, by addressing the complexities of the interactions between social and ecological spheres. I argue that, contrary to mainstream approaches, environmental degradation is better analysed at the intersection of these spheres. To frame its investigation, the thesis follows the heuristic tools provided by a novel theoretical framework – the SES framework – that will be explored in Chapter Two. It mainly builds on qualitative methods as these appear well adapted to exploring the diversity and complexity at play in the field, and completes these with descriptive statistics for budget analysis. However, let us turn first to look at how ‘development’ and ‘environment’ came to be associated.

1.1. INCLUDING THE ENVIRONMENT IN DEVELOPMENT POLICIES

I. ENVIRONMENT AND DEVELOPMENT

In 1972, the United Nations (UN) held its first ‘Earth Summit’ in Stockholm, officially called ‘the United Nations Conference on the Human Environment’. The meeting was attended by delegates of the majority of the world’s countries and by a large number of NGO representatives. In the Summit’s conclusions, economic ‘under-development’ was attributed a significant role in environmental destruction. Crucially, the report argued that development promotion should be associated with environmental protection (United Nations Conference on the Human Environment 1972). The document, however, only timidly evoked the part of developing countries in the “need to safeguard and improve the environment”, suggesting the difficulties in reconciling development and environmental protection agendas (*ibid.*, 3).

In the decades that followed the Summit, the third world’s ‘development’ seemed to necessarily translate into a worrying contribution to climate change through deforestation and industrial carbon emissions (P. Collier 2010). Furthermore, biodiversity protection was widely seen as a luxury that only developed societies could afford (McShane et al. 2011). The “implicit assumption that if development (however defined) was successful, then conservation will follow” was widespread (Katrina Brown 2003, 480).

Through the concept of ‘sustainable development’, the global community tried to overcome the supposedly mutually exclusive choice between environmental conservation

and development. After the publication of the ‘Brundtland report’ (1987), wherein the concept is presented¹³, integrating environmental concerns into development policies was increasingly seen as an imperative (Cernea et al. 1994). Sustainable development rejected the pure maximization of economic benefits typical of neoliberal economics. Additionally, it introduced inter-generational concerns by considering the impact present actions could have on future generations (Dasgupta 2001; Kates, Parris, and Leiserowitz 2005).

Five years after the Brundtland report, the 1992 Rio ‘Earth Summit’ (United Nations Conference on Environment and Development) opened the way for a widespread institutionalization of sustainable development, particularly through the implementation of the ‘Plan for Action: Agenda 21’.¹⁴ Subsequently, numerous attempts have been made to translate ‘sustainable development’ into concrete interventions (Hamdouch and Zuindeau 2010). Since 1992, many and very diverse institutions have been designed to cope with diagnosed environmental challenges and their impact on people’s opportunities for development.¹⁵

However, the concept of ‘sustainable development’ has been criticized as vague and unclear¹⁶, if only because it has been used to cover significantly different positions over the acceptable levels of resource exploitation (Dobson 1996; Lélé 1991). In order to clarify the variety of positions, some scholars associated the adjectives ‘weak’ or ‘strong’

¹³ The phrase ‘sustainable development’ had been used before without significant impact, it became widespread only after the Brundtland report. For the history of the concept see Mebratu (1998).

¹⁴ United Nations Conference on Environment and Development (1992) and United Nations Department of Economic and Social Affairs (2012).

¹⁵ See the United Nations Environment Programme (UNEP) website, entry “Ministries of Environment” (2012) for the detail of those institutions.

¹⁶ Beckerman (1994), Larrère (2006), Mebratu (1998), Redclift (1987; 1992).

to ‘sustainability’, depending on the level of conservation encouraged.¹⁷ In addition, part of the literature focused on defining the ‘maximum sustainable yields’, i.e. the quantitative levels of extraction or the ‘maximum sustainable limits’ of qualitative degradation (Redclift 1992; United Nations and World Summit on Sustainable Development 2002).

Finding ways to align economic, social and environmental goals has proven difficult, both in developed and developing countries (Beckerman 1994; Haque 1999). Despite the popularity of the ‘sustainable development’ concept, the United Nations Environment Programme (UNEP) claims that “the state of the global and regional environment has not improved” (2012, 5). In this light, new ways to address the challenge continue to be explored.

Importantly, in their 2009 joint report, the United Nations Development Programme (UNDP) and the UNEP introduced the idea of ‘mainstreaming’ poverty and the environment. The idea of ‘environmental mainstreaming’ constitutes a new effort to define the concept of ‘sustainable development’ in the specific context of poverty alleviation. Rather than incorporating the environment within sectorial policies, the report argues that it should be put at the core of policy formulation. Moreover, environmental mainstreaming is less concerned with including environmental parameters within policy design than with the daily process of decision-making and implementation (de Coninck and UNDP/UNEP: Poverty-Environment Initiative 2009).

¹⁷ Daly (1997a; 1997b), Hamdouch and Zuideau (2010), Nilsen (2010), Solow (1997), Stiglitz (1997).

The idea of mainstreaming poverty and the environment appears in a context where issues of health and wellbeing are gaining importance in development discourses.¹⁸ ‘Poverty’ is redefined as a multi-dimensional concept, leaving aside simple income calculations. For instance, the World Health Organization’s (WHO) understanding of poverty takes into account the effects of environmentally induced diseases, which are considered one of the main causes of mortality and low life expectancy in the developing world (Marmot 2007; World Health Organization 2012a). Indeed, the WHO estimates that 25 per cent of the global burden of disease is directly produced by the environment, which is particularly acute in developing countries. That figure rises to 80 per cent of the global disease burden when indirect environmental causes are also taken into account. Additionally, the World Bank has argued that environmentally induced diseases are responsible for significant productivity losses (World Bank 2008).

THE CASE OF WATER

The United Nations Educational, Scientific and Cultural Organization (UNESCO) World Water Assessment Programme (WWAP) defines water as a “critical natural resource upon which all social and economic activities and ecosystem functions depend” (2012, 2). Yet, the Millennium Ecosystem Assessment (hereafter MA) pinpointed that wetland and aquatic ecosystem degradation is “more rapid than that of other ecosystems” (Millenium Ecosystem Assessment 2005, ii), suggesting the urgency of their ‘adequate’ management (Carpenter, Stanley, and Vander Zanden 2011; G. Castro and Parcells 1995; United Nations Development Programme 2006).

¹⁸ de Coninck and UNDP/UNEP: Poverty-Environment Initiative (2009), World Bank (2008), World Health Organization, Prüss-Ustün, and Corvalán (2006). As it follows from this logic, the association of poverty alleviation and biodiversity conservation programmes is becoming increasingly popular (Agrawal and Redford 2006; Sachs et al. 2009). See J. E. Castro (2007b) for the case of water.

Poor water management is held responsible for the spread of potentially fatal diseases, such as diarrhoeal diseases, malaria, trachoma, schistosomiasis, lymphatic filariasis, onchocerciasis and dengue (Prüss-Ustün and Corvalán 2007). WHO estimates that, each year, there are around 3.5 million deaths related to inadequate water supply, sanitation and hygiene, predominantly in developing countries (World Health Organization 2012a). Meanwhile, as the WWAP highlights, the investment in water and sanitation remains generally low in the developing world despite the highly advantageous return rate of investment in water management (1USD/4-12USD) (United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme 2012).

The WWAP report highlights the challenges in reaching some of the water management targets set by the international community in the year 2000 at the UN Millennium Summit.¹⁹ The Millennium Declaration, signed by all UN members at the Summit, included a commitment to achieving a set of Millennium Development Goals (MDG) by 2015 (United Nations General Assembly 2000). The seventh of the goals, “ensuring environmental sustainability”, included the objective of reducing by half the population without access to clean drinking water and sanitation.

At the global level, the MDG on increasing access to drinking water has already been achieved and was the first MDG to be met (World Health Organization 2012b).²⁰ By contrast, multilateral organizations’ forecasts on access to sanitation services estimated in 2012 that the MDG sanitation goal (halve by 2015 the proportion of the population without sustainable access to basic sanitation) was unlikely to be met, particularly in most

¹⁹ The commitment to these targets was renewed in 2010 with the UN Resolution on the Human Right to Water and Sanitation (United Nations General Assembly 2010).

²⁰ Despite this achievement, 180 million people still lack access to drinking water (UNICEF and World Health Organization 2012a).

of sub-Saharan Africa and large parts of Asia where there are deficient or nonexistent sanitation services. In South America, Bolivian figures for access to sanitation are the lowest (UNICEF and World Health Organization 2012; United Nations 2013).

The figures in these reports suggest that the poorest countries are also those with the lowest sanitation access rates. Poor sanitation is a cause of wetland and freshwater ecosystem degradation. In developing countries, up to 90 per cent of wastewater reaches coastal zones, rivers and lakes without treatment (Corcoran et al. 2010). Additionally, aquatic ecosystems suffer from other sources of stress, such as those brought by residues from mining activities. Through the food chain these constitute a significant threat for human health.²¹ Moreover, the degradation of freshwater ecosystems, which can translate into the disappearance of certain ecosystem elements such as fish, threatens livelihoods based on the use of ecosystem resources.

Clearly there are complex links between environmental degradation and the development agenda. While including environmental concerns seems at odds with development discourses based on environmental exploitation, the reduction in local people's opportunities for development and threats to their health brought about by environmental degradation, highlights the necessity of doing so through the questioning of the very definition of 'development'.

I turn now to discuss managerial discourses that have aimed at articulating the debates over what constitutes appropriate environmental management, taking water as a case of application. It is important to first discuss the underpinning theoretical inspirations of general environmental management discourses, in order to be able to analyse them

²¹ San Martin (2002), World Water Council and Comisión Nacional del Agua (2000), the website of UN-Water (2013).

critically. Then, focusing on the specific case of water is crucial to respond to the empirical questions asked. These discourses have nourished the conceptions at play in the field as to what the appropriate management should be and therefore have contributed to craft some of the interactions between the social and the ecological spheres.

II. MANAGING THE ENVIRONMENT

As part of environmental management, wetland ecosystems and water management have traditionally been approached through top-down management models (also called ‘command and control’), and the gaps between policy formulation and implementation have been extensively explored in academic literature.²² In parallel, numerous local communities all over the world managed their environment according to their traditional methods and mainly without state interference (Martínez-Alier 2009; United Nations Educational Scientific and Cultural Organization 2006; Van Cott 2008).

The question of whether the state of environmental resources²³ is dependent on the identity of the actors in charge of their management has received significant academic attention.²⁴ The literature focuses on determining which types of actors hold knowledge about the management of the resource and an interest in keeping it in a good state. This, in turn, has raised numerous questions, such as ‘whose knowledge is relevant?’, ‘who is

²² Implementation studies is one of the main literature subfields in political science. DeLeon and deLeon (2002) provide an extensive literature review on the topic, which starts with the seminal work by Pressman and Wildavsky, *Implementation* (1973). Specifically on environmental management see, for example, Jordan (1999) on the European Union, and the special issue of the Policy Studies Journal (1992) for analyses of developing countries.

²³ I understand here ‘environmental resources’ as referring to the natural systems that potentially provide services, such as water, air, food, etc.

²⁴ Berkes (2007), Haas, Keohane, and Levy (1993), E. Ostrom (2010b), E. Ostrom (1990).

more likely to maintain an interest in the conservation of the resource?', etc. Three main candidates – communities, the state and consumers – emerged as potential environmental managers. Over the years, with changing trends in the literature and policy, each group has been championed as the most suitable.

Traditionally, the state was seen as the most competent actor in resource management. Yet, literature trends emerging in the 1970s criticised the centrality of the state (Muradian, Walter, and Martínez-Alier 2012). In particular, state structures were pinpointed as systematically undermining the inclusion of powerless groups. In recent years, some scholars have brought the state back in as a worthy manager of natural resources. For example, political ecologist Robyn Eckersley has argued that the state is the collective actor least likely to be captured by vested interests. It has also been argued that it is the actor with the highest capacity to mobilize the necessary knowledge to face modern challenges (Barry and Eckersley 2005; Eckersley 2004).

However, as environmental management failures continuously occurred under state management, other possible actors were considered. Firstly, numerous scholars claimed that community management was a better managerial option. These scholars developed their reasoning along two main arguments. On the one hand, communities are dependent on environmental goods and therefore have a great interest in preserving their state. On the other hand, they are the holders of knowledge that has proven resilient over the centuries (Berkes 2010).

Meanwhile, neoliberal economists argued that, as with any other domain of public action, consumers through market mechanisms would ensure efficient management through the allocation of private property rights (Gustafsson 1998). More recently, research has also explored patterns of coordination between different levels of administration and a

combination of management types.²⁵ Of course, determining the main managerial actor is tightly linked to the kind of management proposed.

A. MANAGEMENT DISCOURSES

The problem of resource allocation lies at the very core of environmental management. In classical economic theory, well-defined property rights are the premise for allocating and exchanging any kind of good. From this perspective, managing environmental goods should respond to a process of defining the ‘shares’ of the environmental good in question: these might be plots of land in the case of a pasture, tons of wood in the case of a forest, or litres per second in the case of a river. The variables that determine which actors are entitled to which shares have been subject to extensive discussion in the literature.²⁶

The management of environmental goods, however, presents a challenge for classical economic theory since the development of all sorts of activities is not without ‘externalities’ or unintended outcomes that are not taken into account in market exchanges. For example, if a factory situated on a river releases its untreated water containing toxic material into the river and it reaches the pastures downstream, this would negatively affect the farmers’ activity. Put otherwise, the activity of the factory has an impact on the quality of the water the farmers use to irrigate their crops. Economic theory has addressed this issue by recommending that the externality be ‘internalized’. Internalizing an externality requires that the effects of the activity are ‘quantified’. Indeed,

²⁵ Armitage (2007), Berkes (2007; 2010), Dietz, Ostrom, and Stern (2003), Lebel et al. (2006), Ostrom (2010a), Pahl-Wostl (2009).

²⁶ For perspectives on this topic outside the discipline of economics (strictly speaking) see, for example, Agrawal (2001a), Andersson and Ostrom (2008), Ostrom and Gardner (1993) and, Schlager and Ostrom (1992). It is also worth noting that the discipline of political ecology extensively deals with that problem, focusing on the power differentials between actors claiming access to resources.

the idea that environmental assets need to be included in the market, through the attribution of quantifiable market value, underpins the concept of externality (Rival and Muradian 2012).

Property rights can also be used to indicate the *state* of the environmental goods, i.e., qualitative properties. The ownership of shares of environmental goods can be further refined to mean the ownership of a *clean* share of the goods in question. In that sense, quantity becomes a proxy for quality issues. Thus, an ‘externality’ becomes yet another use of the resource. For example, if the factory upstream *uses* the resource by polluting it, this *use* excludes other uses. Therefore, defining property rights on quality allows including in the market system what was *external* to it.

The founding work in this area is that of Ronald Coase, a Nobel Prize winning economist who argued that defining property rights on externalities would permit their trade. Through trade, as for any other market exchange, a Pareto efficient situation²⁷ would be reached, providing that there are no transaction costs. Coase defended that a Pareto efficient equilibrium would emerge regardless of who held the property rights (be it the polluter or the actor desiring a clean resource). In practice, this theorem is not verified. There are numerous obstacles to the existence of a market respecting all the conditions of the model, and particularly one functioning without transaction costs. The valuation of environmental goods that derives from Coase’s work has been subject to extensive debate on whether the commodification it entails is necessary.²⁸ Coase’s approach has also been criticised for disregarding the social embeddedness of market

²⁷ Refers to a situation in which no individual can be made better off without making others worse off.

²⁸ See for example Engel, Pagiola, and Wunder (2008), Farley and Costanza (2010) or Rival and Muradian (2012).

institutions, and the ways in which they fit within larger institutional systems (Van Hecken and Bastiaensen 2010a; 2010b).

The work of Garrett Hardin, a biologist, constitutes another seminal contribution to the debate on the kind of property rights appropriate for environmental goods. His famous article ‘The Tragedy of the Commons’ (1968) initiated the discussion about what type of goods environmental resources are. Hardin described a process resulting in the destruction of a pasture in an imaginary medieval village. In his tale, the pasture was originally used to feed the village cattle, until it reached its ‘maximum carrying capacity’. Summing up, the use of the resource was such that adding an extra animal would jeopardize the animals’ total food availability and, subsequently, the economic benefit of the villagers. Consequently, in the long run, adding an extra animal was detrimental for all users. However, in the short run, each individual user would gain from having an extra animal, as more animals would bring a higher immediate benefit.

Hardin claims that when collective interest is at odds with individual interest, people act in a self-interested way. In the case of the commons, which Hardin considers as public goods, this inevitably ends up with the overuse and subsequent destruction of the goods. The solution he gives is that each farmer “relinquish[es] the freedom to breed” (ibid., 1248) and that they accept “coercion” (ibid., 1247), which he understands as the involvement of a high-rank administrative authority such as a government or a multilateral organization.

Hardin’s thesis has been widely criticised. Economists pointed out that Hardin had erroneously classified environmental goods as public goods (Appell 1993; Dahlman 1991; Dasgupta 2001). Indeed, he assumed that the pasture was a *res nullius* when it was in fact

a *res communis omnium* (Ciriacy-Wantrup and Bishop 1975; Milun 2011).²⁹ In other words, Hardin presupposed that the kind of pasture he described was not owned by anyone, when in the real world such goods are generally owned by a group (McGinnis 2000).

The classification of goods depends on two parameters: excludability (whether it is possible to prevent people from having access to the goods) and rivalry (consumption by one prevents simultaneous consumption by others). There are four possible combinations of those parameters, and therefore four types of goods: public, private, club and common-pool resources (CPR), as Hardin's pasture seemed to be.³⁰ CPRs can be both natural or human-made resource systems (E. Ostrom et al. 1999). They are non-excludable, i.e., it is not possible to prevent new users from having access to their units. They are also rival, since the use of the resource (or resource units) does not allow simultaneous use. For example, fish stocks in international water are non-excludable (there is no restriction of access) and rival (capturing them prevents their use by others). In Hardin's pasture, the grass eaten by one cow cannot be eaten by another, the space occupied by one cow cannot simultaneously be occupied by two.

Anthropological and historical studies have also come to criticise Hardin's article by uncovering communities that have cooperated and successfully managed common resources. Based on empirical evidence, numerous studies concluded that users of common-pool resources frequently designed and implemented sustainable management systems (Agrawal 2001a; E. Ostrom 1990). Indeed, for the last thirty years,

²⁹ Daly and Farley, following historians, explain that the terms 'commons' and 'common pool resources' suggest the existence of a system of (common) property rights and therefore the existence of institutions. They explain that Hardin was referring instead to 'open access regimes' (Daly and Farley 2004).

³⁰ Private goods are both excludable and rival, public goods are neither, club goods are excludable but non-rival and CPR are rival but non-excludable.

environmental management research “has typically focused on locally situated small user groups and communities” (Agrawal 2001b, 1649).

Crucially, in 1990, Elinor Ostrom published her famous book *Governing the Commons*, in which she presents her findings on community-based management and lists a series of conditions for successful CPR governance. A new trend in the managerial literature translated these findings into recommendations for ‘devolution’ of management to the local and community levels (Berkes 1989; Brenner 2004; Doherty and De Geus 1996) that, in some cases, became a reality (Agrawal 2001a).

This tendency towards devolution was part of a larger trend, well beyond environmental management, in favour of decentralization. Yet, case studies on the decentralization of different functions, in diverse parts of the world, showed that these measures were not as successful or as homogeneous as expected.³¹ In particular, in environmental management, one of the main difficulties was that communities might be too small a unit to deal with large ecosystems.³²

B. *MANAGING WATER*

Let us now turn to see how the different discourses on environmental management were adapted to fit the management of a specific resource – water. The management of water has posed specific challenges, as water basins rarely fit administrative and political boundaries.^{33 34} We can distinguish five discourses on water management in the literature.

³¹ Gray-Molina (2004), Gurung (1992), Kauneckis and Andersson (2009), Klooster (2002), Pacheco (2004).

³² Cox (2011a), Meinzen-Dick (2007), Ostrom (2007b), Ostrom and Cox (2010).

³³ Bice (1995), Chereni (2007), the website of the Global Water Partnership (2013), Jeffrey and Gearey (2006), Lubell et al. (2002), Organisation for Economic Cooperation and Development (2003), Overseas Development Institute (2002), United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme (2003).

All of these have been used, directly or indirectly, as a source of public policy since the 1950s.^{35 36} In the table below I briefly present the five discourses in order to establish grounds for comparison³⁷, before going on to explore the vision of development that each discourse puts forward and the extent to which they deal with the problem of freshwater ecosystem degradation.

TABLE 1: WATER MANAGEMENT DISCOURSES (MY ELABORATION)

Discourse	Main Object	Main Manager	Main water expression
Technical Understanding	Protect society from nature and promote national development	State	Rivers controlled through technology (dams)
Marketization	Efficiency and expansion of network	Market	Drinking water and sewerage
People-centred vision	Protect local understandings of water (can take a variety of forms, and be associated with a variety of groups: indigenous populations, human rights activists, etc.)	Communities and grass-roots urban organizations	Drinking water and traditional direct accesses (rivers, lakes)/water-based ecosystems
Integrated Water Resource Management (hereafter IWRM)	Associate different interests	Diverse stakeholders	All
Trans-boundary water management	Reach international agreements	States	Rivers and lakes

³⁴ This does not mean that water basin boundaries are not the outcome of a choice. They are, as Blomquist and Schlager (2005) or Budds and Hinojosa (2012) argue. Blomquist and Schlager point to the problems associated with the hypothesis that water basins are ‘naturally’ given. Not only are there socially constructed aspects of defining water basin limits, but also human interventions can “connec[t] waters previously not regarded as parts of the same watershed” (ibid., 104).

³⁵ For a historical account of water management discourses, see Jaspers (2003).

³⁶ A segment of the literature on water management (see Pahl-Wostl et al. 2010) presents the emergence of IWRM as a change of ‘paradigm’, using this concept to convey a theoretical change that is deeper than a simple change of the discourse. From this perspective, two paradigms are generally considered, the ‘new’ paradigm (i.e. IWRM) and the ‘old’ paradigm (i.e. everything else). The main argument advanced to distinguish IWRM from other water management discourses informing public policy is that it abandoned the ‘command and control’ approach. Its appearance certainly marks a key moment for reasons that I discuss in this section. However, its uniqueness is highly debated (Molle 2008; Ward 1995).

³⁷ The discourses are not necessarily exclusive of each other, as I will explain later in this section.

The technical understanding of water describes water as an apolitical and merely technical issue that would ‘threaten’ society if unmanaged. If, on the contrary, it is managed adequately, it constitutes a source of economic growth. Specifically, rivers are put at the centre of the analysis: they are used as a source for drinking water, irrigation and electricity production. The technical discourse is structured through two axes: the devastating effects of floods and the faith in technology as the means for progress (Égré and Senécal 2003). The underpinning idea is that in order to manage, it is necessary to control. The expression of control has been rendered concrete through the building of dams and the canalization of rivers (Alhassan 2009). This type of policy, based on infrastructure development, was supported by the World Bank during the 1970s and 1980s. The hydroelectric potential of rivers held the promise of economic growth and their diversion was seen as the way to develop irrigation in dry areas (Marino 2012). The state was meant to assume the role of a technically capable and modern manager (Mitchell 2002).

The technical perspective pays no attention to the problem of freshwater ecosystem degradation nor to some of the unintended consequences of infrastructure development. Ecologists opposed the construction of large dams along rivers and denounced the apparent ‘development achievements’ brought by the technical understanding as unsustainable (Abramovitz 1996; Leroy 2006). Particularly, they pinpointed how local peoples’ livelihoods were destroyed by dam construction (Richter et al. 2010). Facing widespread contestation, the World Bank, together with the NGO International Union for the Conservation of Nature in 1999, founded the World Commission on Dams (hereafter WCD). The WCD aimed at addressing the two major criticisms of large dam building, i.e., environmental degradation and people’s displacement issues (Dore and Lebel 2010). Large dams have recently regained popularity. Indeed, assessing the

environmental and social repercussions of these projects has since appeared as a way to ‘mitigate’ the ‘unavoidable’ impacts, but it is a much-contested solution to the problem.³⁸

The debate on dams triggered the emergence of transnational networks of diverse kinds of actors fighting against dam construction globally (Conca 2006). These networks, allying international human rights advocacy groups, ecologists and indigenous peoples, defended a vision of water that was radically different from the vision promoted by developmental states. From their perspective, rivers and the services they provide are part of local people’s livelihoods, and it is those people’s right to manage them as they had traditionally done.

Crucially, networks defending local understandings of water management play a determinant role in conflicts around water quality. Indeed, social mobilization against the pollution of local freshwater and wetland ecosystems has found support in international environmental justice networks. The case of the Yanacocha mine in Cajamarca (Peru) is sadly famous for the violence of the conflict that saw the local population pitted against the mining company Minera Yanacocha. A joint venture between the American Newmont Mining and the Peruvian Buenaventura, Minera Yanacocha had to cancel its plans for expansion in 2004 after massive demonstrations against it. Several groups mobilized around issues of rural and urban water quality and supply, causing the mine to change its practices and the government to establish mechanisms for dialogue (Bebbington, Humphreys Bebbington, and Bury 2010; Langan 2008).

Comparable networks emerged to fight the privatization of drinking water, on which, together with sanitation services, the ‘water marketization’ discourse focuses. In the

³⁸ For a discussion see, for example, Alhassan (2009), Biswas (2004b), Biswas and Tortajada (2001) and D. Moore, Dore, and Gyawali (2010).

marketization discourse, rivers and other sources of water are mere inputs and outputs for these services. In opposition to this, activists rejected the commoditization of water, and focused on redefining access to drinking water as a human right.

The privatization of drinking water services occurred in the context of neoliberal policies of structural adjustment and trade liberalization, driven in by the Washington Consensus. Water marketization promoted the privatization of water rights as the best way to achieve efficient water management and expand drinking water and sewerage access (Dinar, Rosegrant, and Meinzen-Dick 1997). While the privatization of public goods started in the 1980s, sectors such as water, electricity or transportation had remained in public hands, as a result of their being natural monopolies (Tan 2012). Yet, from the neoliberal standpoint, water should be considered like any other sector of the economy, and its shares should be exchanged through property titles.³⁹ This perspective gained importance at a time of disenchantment with the national state as an effective promoter of development and of critical assessment of publicly managed enterprises.

The core of the water marketization approach was drinking water, but it is important to realise that it also included sanitation services, and therefore had some responsibility for ensuring the health of freshwater ecosystems. Whether or not privatization policies successfully delivered on their promises is debated.⁴⁰ These promises included an increase in investments for water infrastructure development, a reduction in service provision costs and, generally, the improved efficiency of management.⁴¹ Several scholars have

³⁹ Cummings and Nercissiantz (1992), Howe, Schurmeier, and Shaw (1986) World Bank (1997a).

⁴⁰ Budds and McGranahan (2003), J. E. Castro (2007a), Hailu, Osorio, and Tsukada (2012), Israel (2007), Mulreany et al. (2006).

⁴¹ Clarke, Kosec, and Wallsten (2009), McKenzie et al. (2003), Mulreany et al. (2006).

argued that the ability to keep up with these promises was, in certain cases, the result of public subsidies, especially in poor and risky areas.⁴²

Bolivia offers a particularly interesting case to analyse the effect of contextual elements in water privatization programmes. It is indeed a case that has been extensively studied because of the population's fierce opposition to privatization.⁴³ While the dispute revolved around access to drinking water, the effects impacted both drinking water and sanitation services.

As in many other Latin American countries, where struggles over water privatization have been widespread since the late 1990s, water contracts in Bolivia were terminated earlier than expected, suggesting a failure of privatization initiatives in the region.⁴⁴ Initially, water provision services were privatized in three of the most populous Bolivian cities: La Paz, El Alto and Cochabamba.⁴⁵ Privatization was presented as a solution for inefficient public finances and, in the case of Cochabamba, in order to fulfil the requirements of a World Bank debt relief agreement (Olivera and Lewis 2004).

Lyonnaise des Eaux (now Suez-Lyonnaise des Eaux) won the concession for water provision in La Paz and El Alto, while the Suez-Lyonnaise and Bechtel joint venture *Aguas del Tunari* was in charge of the city of Cochabamba. Cochabamba's water privatization lasted less than a year and ended with the so called 'water war' (Bebbington 2009). Two main elements led to the violent events of the year 2000. Firstly, water bills doubled. Secondly, people in suburban areas feared the loss of their source of water as

⁴² Bel and Warner (2008), Estache (2005), Foster and Yepes (2006), Tan (2012).

⁴³ Assies (2003), Clarke, Kosec, and Wallsten (2009), Mulreany et al. (2006), Olivera and Lewis (2004).

⁴⁴ Hailu, Osorio, and Tsukada (2012), Hall, Lobina, and Motte (2005).

⁴⁵ Santa Cruz, the second biggest city of the country after La Paz, had and still has its water managed by a cooperative.

the company, in an attempt to extend the drinking water network, announced it would close the wells that Cochabambinos had traditionally used. The protests occurred at a time of deep discontent with central government and soon came to incorporate more issues than just water provision (Assies 2003).

In the cities of La Paz and El Alto, the provider *Aguas del Illimani* (hereafter AISA) did not manage to fulfil the demands of the contract in terms of network expansion (Lobina and Hall 2007). Moreover, the company, similarly to what *Aguas del Tunari* had done in Cochabamba, closed the wells used by the population (Hailu, Osorio, and Tsukada 2012). People were subsequently forced to pay to join the AISA network. These concrete experiences, combined with a rise of indigenist policies and the revival of the indigenous understanding of water as a communitarian good (Achi 2010) explain the tremendous popular opposition to privatization policies.

Both water marketization and the technical understanding of water management approached water as an isolated, objective domain. Yet, it quickly appeared that in order to achieve successful management planning, it was necessary to take into account contextual realities in which the management was embedded (Chapin III 2009). This opened a window of opportunity for the appearance of Integrated Water Resource Management. IWRM departs from the 'basin' as a unit of management and seeks to bring together different stakeholders whose interests need to be accommodated.⁴⁶ Today, IWRM, drawing inspiration from sustainable development, is the most influential discourse in water management. The Global Water Partnership (GWP) was founded by the World Bank, UNDP and the Swedish International Development Cooperation

⁴⁶ Conca (2006), the website of the Global Water Partnership (2013), Molle (2008), Urteaga Crovetto (2010), Wiering and Crabbé (2006).

Agency in 1996 to foster its dissemination by providing managers with tools and best practices.

IWRM aims at providing a comprehensive management approach, supposedly acknowledging “the intrinsic relationship between water and human culture and behaviour” (Brugnach and Ingram 2012, 49). Civic engineers developed IWRM in the late 1940s, but it was only accepted as a tool for public policy in the 1990s (Biswas 2004a; Ward 1995). IWRM puts emphasis on the variety of interests around water and stresses the importance of recognizing multiple scales of action. It recommends that the stakeholders’ diverse demands be hierarchized and subject to negotiation.

This discourse directly addresses both quantity and quality issues, building on the interrelatedness of social, economic and ecological uses of water in different sectors (agriculture, industry, etc.). Therefore, it does not only consider sectors that traditionally are seen as water users, such as agriculture, but also sectors that typically contribute to water degradation, such as mining. Demand for water resources is also attributed to ecological agents, such as fish, which should be taken into account in planning. Indeed, several aspects until then the reserve of the conservation of freshwater ecosystems are integrated. Moreover, IWRM calls attention to the indirect impacts other sectors might have on water resources, such as the management of solid waste.⁴⁷

In its all-encompassing endeavour, IWRM aimed at addressing the different aspects of the ‘water crisis’, defined by UNESCO as a governance crisis.⁴⁸ Thus, it includes local sub-basin management as well as interstate relations. Particularly, it integrates the water

⁴⁷ Inadequate management of solid waste might produce chemicals that leach into groundwater ponds.

⁴⁸ United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme (2006).

management sub-field of trans-boundary water management. Shared water resources have received an impressive amount of attention from a geopolitical point of view as water scarcity has been presented as a future reason for worldwide conflicts.⁴⁹ Numerous scholars argue that, contrary to the commonly held assumption, water is a source of cooperation, as the multiple agreements signed over shared water resources prove (Barnaby 2009).⁵⁰ Legally speaking, the main question to address is that of allocation.⁵¹ Even though the literature on trans-boundary water focuses on issues of quantity, IWRM introduced concerns over the qualitative degradation of shared water resources, which cannot be addressed unilaterally (Shmueli 1999).

IWRM operates with a traditional model, i.e., with a ‘toolbox’ in which a series of conditions for good management are identified.⁵² The rationale stands that if these conditions are absent from the field, they should be created. However, stating that conditions are missing does not explain why any given situation has been reached, and therefore, does not address underlying problems.

This is not the only short-coming that IWRM presents. It also disregards path dependencies, and perhaps more importantly, it does not provide a framework with which to address structural conflicts or multidimensional interests. It has been criticized for being vacuous, building on an undefined, malleable and ambiguous language. Leaving empty spaces, it presents the risk of working as a façade to accommodate pre-existing dynamics (Mancilla-García 2008; Molle 2008). Moreover, IWRM departs from the

⁴⁹ Grey and Sadoff (2002), Kundzewicz and Kowalczak (2009), Serageldin (2009), Starr (1991), United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme (2009), Yoffe, Wolf, and Giordano (2003), Zeitoun (2007; 2009).

⁵⁰ For a critical discussion, see Kistin (2010).

⁵¹ Klot, Shmueli, and Shamir (2001), United Nations Educational Scientific and Cultural Organization - World Water Assessment Programme (2009).

⁵² See the website of the Global Water Partnership (2013).

watershed basin as the desirable unit of management because it presupposes that it is an objective reality that exists ‘out there’ and that therefore its relevance for management is self-evident (Peirera 1989 quoted in Blomquist and Schlager 2005, 103).

The water management discourses presented here differ in their perspectives on the role of the state, the market and organized users (Meinzen-Dick 2007). The role of the state (with its ‘experts’) and of market institutions is particularly important in the technical understanding of water, in the water marketization discourse and for IWRM. By contrast, organized users find a place in IWRM and in the people-centred vision of water management. In all of the discourses discussed, the categorization of the resource (economic good, national resource, CPR) determines who is responsible for its administration and orients its use.

These discourses are not mutually exclusive and can be combined in public policy. In particular, they are championed by different actors who might have relative success at different times, in such a way that their implementation might be overlapping. Besides, the implementation of public policies based on one discourse over a specific sector does not exclude the implementation of others in a different sector. Importantly, these discourses have been the object of specific developments depending on the kind of water expressions envisaged (rivers, lakes, wetlands) and the purpose of use (Pahl-Wostl et al. 2006). Typically, local governments have dealt with sanitation and drinking water and agriculture departments with fishing development, while departments of public works have controlled rivers and built dams for hydropower. Therefore, the impact of the different discourses has varied for different sets of actors.

The existence of these discourses suggests the amount of attention that the issue of water management for development has received from different perspectives. All these discourses (with the exception of some instances of the people-centred vision of water,

building on indigenous understandings) formulate the relationship between society and water as taking the form of interventions, disputes or negotiations *over* nature.⁵³ Nature is therefore objectified and turned into a commodity, a right, or more broadly, an object over which humans negotiate. This does not leave space to investigate the complex relationships between human actors and ecosystems. The next section discusses the origins of this vision of nature and its challenges as the first step towards filling the gap between nature and society.

III. CHALLENGING THE DICHOTOMY OF NATURE AND SOCIETY: THE CASE OF WATER

Environmental public policy has traditionally been informed by the natural sciences, which have long excluded human and social sciences from their studies. The case of water is typical of this. The study of freshwater ecosystems was the reserve of ecologists. Water management as a resource for societal needs was the object of models developed by engineers. Despite a vague awareness that water has both natural and social dimensions, these aspects were rarely integrated in traditional public policy, which has been pinpointed as relying on a simplified and objectified vision.⁵⁴

The dichotomy between the natural and the social imposes a particular view of the interactions between subjects (emerging from society) and objects (residing in nature). It

⁵³ The discipline of political ecology has been criticised for approaching ‘nature’ as a terrain for power struggles like any other. More recently, political ecology has built on a conceptualisation of ‘nature’ that challenges such vision and adopts a social-ecological perspective. See for example Castree and Braun (2001) for a general discussion and Budds (2008), Crifasi (2005) or Loftus (2007), for a focus on water. I do not thoroughly engage with these authors because they focus on power, whereas I choose a more open approach as I explain below.

⁵⁴ Budds (2009), Brugnach and Ingram (2012), Conca (2006), Strang (2006).

separates human beings from the rest of beings, contained by default in the category 'nature'. Nature becomes some sort of real, stable and equilibrated whole that can be studied and understood through 'science'.

From this point of view, science determines the laws that govern and organize the 'natural whole', or in the case of water, the laws that organize 'basins'. Therefore, scientific knowledge is considered neutral. It is posited as the basis for the 'appropriate' exploitation of water resources. The concept of 'sustainable development' opened the way for a debate on what should be the 'right' approach to exploitation. Yet, it did not lead to questioning the idea of nature as an object of intervention.

Ecologists have recently argued that approaching ecosystems as stable objects increases their vulnerability to shocks. Assuming that ecosystems are stable objects actually contributes to turning them into fragile objects. Indeed, interventions that reduce an ecosystem's complexity result in a reduction of its options for responding to shocks. As Gunderson, Peterson, and Holling explain:

this pattern of ecosystem modification has been described as the pathology of resources management – where simplifying and stabilizing ecosystems has the unintended consequence of increasing their vulnerability (2008, 223).

At the end of the twentieth century, several disciplines engaged in the debate over the complexity of the relationship between nature and society.⁵⁵ Studies such as Lansing's (1987; Lansing and Vet 2012) ethnography of Balinese temples as a system that is social and ecological nourished the work of a new generation of scholars. The analysis of

⁵⁵ This thesis is not the space to provide a thorough discussion about the appearance of these challenges in the different disciplines. It is worth mentioning, however, some of the works that discuss the topics that have deeply influenced the scholars that this thesis engages with. See for instance Carter (1999), Dobson and Eckersley (2006), Dobson (2000), Eckersley (1992), Hayward (1996), Plumwood (2006) and Fairhead and Leach (1996).

indigenous and traditional knowledge was approached as a source of insights for the crafting of sustainable management tools. These works shared the hypothesis that:

it is impossible to understand nature without society, and society without nature, as the German sociologist Ulrich Beck (1986, 1992) pointed out persuasively more than twenty years ago (Becker 2012, 40).

In the next chapter I will introduce the attempts made at translating this new conception of the links between nature and society into a theoretical approach to understand the interactions between ecological and social spheres. I will craft the tools that will allow me to understand the complexity of relationships at play in Lake Titicaca. But first, I set the scope of this study as it seeks to contribute to the research endeavour that motivates the discipline of development studies, i.e., to investigate the arrangements that lead people to fulfil their goals, while drawing inspiration from numerous other disciplines (political science, geography, sociology, etc.).

1.2. SCOPE OF THE STUDY

This thesis brings in the environmental question from the development perspective and it is from that perspective that it engages with different disciplines. Therefore, it is important to define, before continuing, the boundaries of this work. The thesis focuses on Lake Titicaca, shared by Peru and Bolivia, which is presented in Chapter Three. I provide here a brief description of the setting to establish the scope of the work.

Lake Titicaca, shared by Peru and Bolivia, presents a particularly interesting case for examining the relationships between different groups in society and ecosystem elements. Indeed, as a developing region, the different discourses championed by multilateral organizations have been implemented at diverse moments of its history. Such managerial attempts have had to confront local understandings of appropriate management based

on indigenous traditions that call into question the dichotomy between nature and society. This has happened against a backdrop of the development of urban centres and mining activities that have created a pollution crisis at the lake. Moreover, since the election of the Bolivian activist Evo Morales as President in 2005, Peru and Bolivia have endorsed a radically different approach to environmental management.

This thesis tries to understand the ways in which different groups of actors relate with the ecosystems of the lake bays, which have been ‘modified’ by ‘pollution’. In particular, it investigates how the different conceptions that actors hold of their environment have an impact on the managerial approaches actually implemented. In so doing, it explores why the numerous efforts put into stopping pollution have not borne the expected results. The case study, central to the analysis, is used to question and develop the core concepts of environmental management in development contexts.

Lakes are important providers of ecosystem services such as food (fishing and plants) and tourism (landscape and sports). They also occupy strategic places in their basins as reserves of freshwaters resources (World Bank 1997b). Moreover, they present stability patterns that make them slow in responding to managerial interventions (ILEC 2005). Indeed, they are complex systems in which causality patterns are difficult to determine and non-linearity can cause changes to be irreversible (Scheffer et al. 2001). Their complexity makes lakes particularly vulnerable ecosystems.

Lake Titicaca is situated at 3,800 metres above sea level in the Andean Altiplano. It has presented signs of eutrophication⁵⁶ on several of its bays for the last thirty years. Numerous actors have also raised concerns over the possible impact of mining activities

⁵⁶ A eutrophic lake is rich in organic or mineral nutrients and presents, as a result, an excessive growth of algae and other plants, with depletion of oxygen and consequent extinction of animal life.

on the ecosystem. A plethora of organizations has tried to address these problems from different perspectives. Indeed, the lake is under a multi-level governance system constituted by a complex web of organizations, from a bi-national organization to small communities, which are in charge of different aspects of its management.

The population living on the lakeshores amounts to 1.6 million people – 978,000 in Bolivia and 622,000 in Peru (World Bank et al. 2009). It is mainly an indigenous population, with a strong presence of Quechuas and Aymaras, but also of minority groups that only live in these parts of the countries, such as the Urus. The area presents a combination of rural and urban populations. The lake's resources are crucial for the residents' livelihoods, which include fishing, tourism services and agriculture. As national states neglected these areas, indigenous people managed them through their traditional organizations.

Bolivia and Peru are two significantly different countries in macroeconomic terms. However, the region presents similar socioeconomic characteristics regardless of the country. Indeed, in 2007 Puno's region HDI was 0.561 and La Paz's 0.682.⁵⁷ The region also shares a similar political economic history marked by the exploitation of natural resources.

In the second half of the 2000s, and for very different reasons, both Peru and Bolivia changed their approach to environmental management. On the one hand, Peru created a Ministry of the Environment. Bolivia, on the other hand, elected president Morales, its first indigenous president, whose political agenda was deeply shaped by indigenous peoples' understanding of the environment. The time frame for this study was chosen to

⁵⁷ Programa de las Naciones Unidas para el Desarrollo (2009, 149; 2010, 93).

investigate those opportunities. The indicative start date for the study is 2006, when the Ministries of Foreign Affairs of both countries mandated that two of the Lake Titicaca bays be ‘depolluted’ by the bi-national organization⁵⁸ responsible for the whole water system (Memorándum Binacional 2006). However, I take into account the effects of programmes initiated before that date when they have significantly framed the history of management. I set the end date for this study in 2011, with the reform of the bi-national organization.

So far, the most important study of management of Lake Titicaca focuses on a small portion of the basin territory, the area around Puno and its natural reserve.⁵⁹ There are no syntheses of the contemporary management of the area besides the very brief summaries provided in the grey literature (Programa de las Naciones Unidas para el Medio Ambiente 2011⁶⁰; World Bank et al. 2009).

Yet, an investigation of Lake Titicaca is urgent as it encompasses many of the contemporary water management challenges. Indeed, through the empirical study of Lake Titicaca, the complexity of the interaction between nature and society emerges. Several elements suggest the importance of these interactions in terms of their impact on the livelihoods of lake residents and their options for development. Firstly, the region uses the resources provided by the lake for the economic activities developed in it, and significant portions of the population interact with the ecosystem on a daily basis. Secondly, the complex web of institutional arrangements, including two rather distinct

⁵⁸ This organization is the Bi-National Autonomous Organization of the Lake Titicaca, River Desaguadero, Lake Poopó and Salt Lake of Coipasa System, the ALT.

⁵⁹ Kent (2006; 2008), Leveil and Orlove (1990), Orlove (1991; 2002).

⁶⁰ Hereafter, this report, written in Spanish, will be referred to as PNUMA 2011.

national contexts suggests a multiplicity of understandings of the environment. Thirdly, there are multiple public interventions and local initiatives to address the ‘problems’.

1.3. STRUCTURE OF THE THESIS

This thesis tackles a key development issue: on the one hand, ecosystem degradation is tightly linked with certain understandings of development, on the other, it has been claimed that degraded ecosystems reduce local people’s opportunities. It is urgent to investigate the ways in which local peoples cope with the challenges and the roles of other actors, such as public officers.

In this introduction, I first explained the emergence of environmental issues in the developmental agenda and I briefly retraced the tensions and synergies between both the environmental and the developmental agendas. By focusing on water, I illustrated the attention the topic has received in the form of different discourses that have hoped to lead to successful management. Finally I presented a critique of the mainstream approach to ‘nature’ as disconnected from society, which provided insights into why the interactions between local actors and their environments have seldom received attention.

Chapter Two presents the Social-Ecological Systems framework as one of the approaches aiming to overcome the mainstream view of nature. The chapter discusses the core concepts and academic developments of the framework and shows in what ways it is adapted to analyse situations of environmental disturbances, such as water pollution. It explains how the framework intends to be used to frame policy processes and highlights caveats and gaps in its latest developments.

The chapter then discusses the concepts that will need clarification and modification to apply the framework to Lake Titicaca. In particular, it focuses on the ways in which

actors, and their reasons for action, are conceptualized. The chapter demonstrates that restricting the analytical framework to the Social-Ecological Systems literature leads to gaps in the analysis of interactions between societies and ecosystems. Those gaps are filled by borrowing concepts from sociology, and building on the findings of institutional studies on power allocation among Latin American organizations.

Chapter Three provides the necessary background to understand the specifics of the study and interpret the relevance of the data collection process. It situates Peru and Bolivia, giving details of their interventions over Lake Titicaca. It draws a socio-economic and environmental profile of the area and describes the vast web of organizational interventions taking place in the field. The chapter aims to give a sense of the institutional and environmental complexity of the case. It then proceeds to justify the methodology used. It shows awareness of the limitations necessarily encountered in this kind of study and concludes by discussing ethical considerations.

Chapter Four is the first of the empirical chapters. It makes a case for presenting ecosystem changes as the object of constructed and multiple visions that appear in actors' narratives. This chapter aims to answer the question: how do actors make sense of ecosystem changes? It distinguishes four main categories of interpretation and analyses the role of the associated actors: (i) the generation of 'scientific' facts to 'understand' the ecosystem and intervene in it, (ii) the inhabitants' daily interactions with ecosystem changes, (iii) the integration of the changes in larger discourses of development and (iv) the use of labels on the changes, which become relational concepts that construct narratives around oppression, victimization, denial, etc. The chapter concludes by showing that the understanding of these changes cannot be studied in isolation. It prepares the discussion for the three chapters that follow, which focus on the roles of actors and institutions in producing and shaping ecosystem changes.

After having discussed the competing understandings of ecosystem changes, Chapter Five analyses the roles the lake residents play in producing, maintaining and mitigating these changes. It investigates the elements that catalyse action, influence decisions to participate in collective arrangements and allow actors to define their relationships within the SES. In particular, the chapter discusses mobility, identity and place, traditional knowledge, dynamics of political participation and networks of trust.

The chapter shows how people use these elements to make decisions under uncertain circumstances and with competing values. The central aim of this chapter is to argue for a correlation between people's interaction with the ecosystem, their strategies for development and the processes of their everyday lives. Crucially, the chapter highlights that many of the residents' attitudes are defined by their relationships with organizations. It concludes by arguing that to fully understand the residents' attitudes and the rest of the structuring interactions in the system it is necessary to switch the focus to organizations, discussed in Chapters Six and Seven.

Chapters Six and Seven both focus on the officers and the organizations in which they work. Chapter Six investigates the role of different types of officers and of the governance system in the social-ecological system. It discusses the structures in which officers make decisions. Chapter Seven, the last of the empirical chapters, discusses the elements that lead to the establishment of cooperation networks, and those that foster competing relationships. It explores how these patterns of interaction provide different opportunities to capture spaces that serve the environmental agenda. The analysis conducted in these chapters identifies several variables in determining the kind of relationships officers enter into, the decisions they make and the way they justify their actions. The variables include prestige, trust, short-term time frames and perceived (and real) resource constraints. The chapter situates the discussion in the larger institutional

context of Peru and Bolivia (decentralization, clientelism, uneven reach of state, institutional instability), which sets the case for an expansion of the findings to other areas presenting similarities.

The last chapter of the thesis recaps the main findings and offers contributions to redefine the categories of ‘actor’ and ‘governance system’ for a better informed managerial design linking environment and development. The chapter indeed situates the findings in the broader discussion of development challenges and argues for a recontextualization of environmental questions, suggesting areas for future research. Finally the chapter discusses the implications of the findings for policy making: it argues that the conceptual contributions set the way for analyses that would reveal which actors are in the best position to defend the environmentally deprived and design a governance system adapted to giving more weight to those actors. The chapter advocates that negotiations within state structures are made visible.

Successes and failures of environmental management have been diagnosed so far under the management models that created them in the first place. This thesis argues that to solve management problems it is necessary first to understand the reasons underpinning their appearance. For that it is essential to investigate the ways in which different actors relate to environmental changes and explore the complex and interlinked ways in which “human and natural processes connect” (Agrawal and Chhatre 2011, 1).

CHAPTER 2. CONCEPTUAL AND ANALYTICAL FRAMEWORK: LOOKING FOR THE ‘SOCIAL’ IN SOCIAL-ECOLOGICAL SYSTEMS

INTRODUCTION: THE RELEVANCE OF THE SOCIAL-ECOLOGICAL SYSTEMS PERSPECTIVE TO DEVELOPMENT STUDIES

Diverse bodies of literature have argued that, contrary to what mainstream environmental management posits, the ‘ecosystem’, i.e., a community of living organisms and the non-living elements composing their environment (Matson, Chapin III, and Mooney 2002; Tansley 1935), is transformed by the rules that manage it. These rules are, in turn, influenced by the process of ecosystem transformation (Liu et al. 2007; Alberti et al. 2011). The Social-Ecological Systems perspective⁶¹, a new field in the sustainability literature, has focused on exploring the dynamism of the interactions between social and ecological spheres (Berkes and Folke 1998; Young et al. 2006). It contends that the environment is better conceived of as part of a system that also includes social components. SES research is indeed grounded in the now widespread conviction that

⁶¹ The question of whether or not research on ‘SES’ should be defined as a theory is addressed later on in this section. I will call the endeavour of investigating social-ecological systems, their behaviour and their options for sustainability ‘SES research’ and ‘SES perspective’.

human action has a formative impact on ecosystems and holds that the ecosystem orients the forms of human action.⁶²

This perspective seems well adapted to the case of Lake Titicaca. Firstly, because human action is deemed responsible for the ecosystem changes of the lake's bays. Secondly, because it will allow us to explore the ways in which some interactions change and others continue as a result of the changes. Finally, because the region is inhabited by indigenous populations whose understanding of the 'environment' challenges traditional understandings of nature.

The term 'social-ecological systems' refers to certain epistemic objects that have been given a series of names in sustainability research. They have been called 'coupled human-environment systems'⁶³, 'coupled natural and human systems' (Alberti et al. 2011; Liu et al. 2007), or 'socio-ecological systems' (Musters, de Graaf, and ter Keurs 1998).⁶⁴

I choose to focus on the scholarship grouped around the term 'social-ecological systems' because it has rallied a significant number of researchers, based in different research centres, generating vivid debates as well as an extensive body of literature.⁶⁵ Moreover, SES research has a prescriptive side that makes it particularly relevant for Development Studies. Indeed, it aims to translate research findings into practical policy and governance recommendations for sustainability.⁶⁶ The status of some of the scholars working on SES

⁶² For further justification see Becker (2012), Daily (1997) and Vitousek et al. (1997).

⁶³ The website of the Harvard Kennedy School: Sustainability Science Programme (2013).

⁶⁴ The mushrooming of terms illustrates both the lively state of the discipline and its current status as a 'work-in-progress', an academic area that is still defining its focus. Numerous scholars argue for adopting a common language, but new terms continuously appear.

⁶⁵ Berkes, Colding, and Folke (2003), Chapin III (2009), Gunderson, Peterson, and Holling (2008), McGinnis and Ostrom (2011).

⁶⁶ Agrawal and Chhatre (2011), Folke et al. (2002), E. Ostrom (2007b), E. Ostrom and Cox (2010), Walker et al. (2004). Specifically, the interest of ecologists in providing managerial tools can be traced back to the

suggests that this has indeed occurred in the past and that it is likely to continue.⁶⁷ Increasingly, concepts at the core of SES research, such as ‘resilience’⁶⁸, frame environmental and development policies worldwide.⁶⁹ Thus, it is urgent to investigate the validity of the framework in different contexts.

The SES perspective, a research field in progress, associates elements from diverse disciplines in the hope of building an interdisciplinary theory (Gunderson, Holling, and Ludwig 2002). As McGinnis (2010a, online) puts it, “building a common language takes time, and lots of collaboration ... the whole is very much a work-in-progress”. My thesis aims to contribute to the development of the framework by highlighting some of its shortcomings and putting forward suggestions to overcome them. This is done in this chapter through the association of different theoretical tools and in the rest of the thesis through the insights obtained from my empirical study. The framework composed in this chapter is used as a heuristic tool for the analysis of the field, as it allows us to engage in a thorough exploration of the complex interactions between human actors and the ecosystem.

SEEs are extremely complex objects of study, and the literature considers it impossible to provide a comprehensive account of all the dynamics and elements that constitute them. It is widely accepted that human cognitive capacity is restricted and that, therefore, complex systems present elements that we cannot identify (Hertwig and Todd 2003). The SES research is, by definition, partial. For that reason, scholars working on SEEs

1970s. See for instance the works of Clark, Jones, and Holling (1979), Walker (1977), Fiering and Holling (1974), and Holling and Chambers (1973).

⁶⁷ Agrawal (2001b), Earl and Potts (2011), Folke et al. (2002).

⁶⁸ The concept of ‘resilience’ in the SES context is thoroughly discussed in this chapter. In the interest of clarity, it suffices to say for now that ‘resilience’ refers to the system’s capacity to absorb disturbances without transforming its structure (Holling 1973; Carpenter et al. 2001). See Folke (2006) for the history of the concept. He situates its appearance in the 1960s and its consolidation as an analytical tool in the 1990s.

⁶⁹ The website of Dfid (2012), Newsham, Bene, and Davies (2013), the website of USAID (2013).

acknowledge that in strict terms it is not possible to speak of a *theory* (Cumming 2011).

As Anderies, Walker and Kinzig explain:

Any theory devised to understand SESs must thus account for the relationships between information processing, the actions of agents, and the effects of those actions on other agents and on the environment. Such a theory would span cognitive science, psychology, economics, ecology, biogeochemistry, mathematics, physics, etc. Clearly, such a theory does not exist today, and may well never exist (2006, online).

SES research aims to understand the interactions that determine the structure of the system, focusing on identifying the variables that encourage the system's resilience⁷⁰ and lead to sustainable outcomes. I focus here on the two main SES schools: the Resilience Alliance (RA) and the Bloomington⁷¹ Workshop (BW).⁷² These two schools are by no

⁷⁰ An important debate over the meaning of 'resilience' seeks to determine 'resilience of what to what?' (Carpenter et al. 2001; Newsham, Bene, and Davies 2013). Answering 'to what' identifies the changes that might affect the system structure. The question 'of what' requires determining whether resilience is being investigated at the system level or at one of its constitutive levels. The ways in which the different levels interrelate is explained in the section on 'Defining Complexity' in this chapter. It is important to mention that in the literature, the concept of 'robustness' competes with that of 'resilience' when referring to a specific level (Cox 2010). In this thesis, I systematically use the concept of 'resilience' for it is consistent with the theoretical roots of the literature I analyse. Indeed, 'robustness' originates in the engineering sciences, and therefore has a distinct conceptual history. Here is not the place to engage in a comparison of the advantages and disadvantages of each concept. For an analysis of the concept of robustness see Anderies, Janssen and E. Ostrom (2004) and Carlson and Doyle (2002). It is crucial to keep in mind that 'resilience' is concerned with structures. It refers to changes in the *system* or the *system levels* in contrast to changes in specific single variables. If one variable is conserved despite changes in the system structure that variable is irrelevant for the study of resilience.

⁷¹ I refer to the research undertaken as part of the workshop for Institutional Analysis and Development and the workshop in Political Theory and Policy Analysis as well as in the School of Public and Environmental Affairs at Indiana University dealing with SES as the 'Bloomington Workshop'. McGinnis argues that the group of scholars working on several research aspects developed at Indiana University (such as CPR management or SES) should be grouped under the name of the 'Ostrom Workshop' for the influence both Vincent and Elinor Ostrom had in shaping that research (McGinnis 2010b). As a matter of fact, the Workshop in Political Theory and Policy Analysis has been re-baptized the 'Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis' after the couple passed away in 2012. The research undertaken at the 'Ostrom Workshop' goes well beyond SES. Moreover, I think 'Bloomington Workshop' better conveys the multiplicity of backgrounds the researchers meeting in Bloomington have and avoids the risk of reducing the enterprise to political science, which was the original discipline of both Vincent and Elinor Ostrom.

⁷² Cox, in his doctoral dissertation (2010), distinguishes the frameworks developed by Anderies and Janssen from those of these schools. Anderies' and Janssen's work focuses on the concept of robustness in the SES and applies a network analysis to the study of the system (Janssen and Anderies 2007; Janssen et al. 2006). Janssen and Anderies are based at the Arizona State University and draw inspiration from both the RA and the BW schools, having worked with scholars from both institutions as we will see all through this chapter. I do not discuss the specificities of their work in detail, as robustness is not central to my analysis.

means impermeable. As I will show later in this chapter, scholars affiliated to both schools have occasionally worked together. Besides, scholars that are affiliated to none, and whose work is crucial for the development of the SES perspective, draw inspiration from both schools while retaining the core of one or the other. The fact of the matter is that each school proposes a distinct, specific framework and that they have not been fully integrated in the literature. I discuss both in search of the most appropriate heuristic tools to explore the complexity of human and ecosystem interactions.

2.1. SOCIAL-ECOLOGICAL SYSTEMS: THE RESILIENCE ALLIANCE

The RA was initially launched as the ‘Resilience Network’ in 1999, linking ecologists at the University of Florida (where Buzz Holling, a crucial scholar for the framework development, was based) and at the Swedish Beijer Institute (where Carl Folke, another important name, was based). The network became progressively more interdisciplinary.

The SES perspective dismisses the idea that “resources can be treated as discrete entities in isolation from the rest of the ecosystem and the social system” (Berkes and Folke 1998, 2). SESs are defined through the interactions that constitute them and the feedback mechanisms that provide for the repetition or the modification of subsequent interactions (Berkes, Colding, and Folke 2003). The outcomes of specific interactions between different components of the system can have an impact on both the components and the links between them (Folke 2006; Janssen and de Vries 1998). This occurs because SES are ‘systems’, i.e., “a conceptualization of a portion of reality” (Gallopín et al. 2001, 223) wherein the composing elements present significant degrees of cohesion (J. D. Collier and Hooker 1999). Additionally, internal cohesion is stronger than links with elements outside the system (Musters, de Graaf, and ter Keurs 1998).

Within a SES, the boundaries between human and ecological entities are highly contested (Berkes and Folke 1998). Nonetheless, the ‘social’ and ‘natural’ categories are often reproduced for analytical purposes in the SES studies. In practical terms, these are the categories that agents in the system have traditionally used. This means it is important to be able to operate with them in order to make the exploration of the field possible.⁷³ Furthermore, these categories are useful because they may constitute sub-systems within the system, with internal coordination patterns. For example, there are networks of interaction in the ecological sphere of the SES in which human actors do not play any significant role (Frantzeskaki et al. 2010). While sub-systems are connected, such connections can be more or less direct.

I. CORE CONCEPTS FOR THE STUDY OF SESS

SESSs are kinds of “complex adaptive systems”⁷⁴ (Glaser et al. 2012b; Norberg and Cumming 2008). The concepts of ‘complexity’ and ‘adaptability’ have been given diverse – and not always explicit – meanings in the academic and grey literatures on sustainability (Schoon 2005; Cumming 2011). Cumming (2011, 9) argues that the concept of complexity has become so generalized that it runs the risk of turning into “a catch-all phrase”. ‘Adaptability’ has known a similar fate (Schoon 2005).⁷⁵ While acknowledging

⁷³ I acknowledge that indigenous conceptualizations of ‘nature’ challenge this dichotomy, see for instance de la Cadena (2010) or Huanacuni Mamani (2010). I refer here to the mainstream positions emerging from broadly used management paradigms presented in the previous chapter.

⁷⁴ Several research programmes focus on the study of complex adaptive systems. Generally the acronym CAS refers to a research programme developed at the Santa Fe Institute. Findings from this research programme are an important element of the SES research (Glaser et al. 2012a). However, the SES research as such was principally developed outside the Santa Fe Institute, incorporating the idea of ‘adaptability’ (i.e., human intervention) as part of the definition of ‘resilience’.

⁷⁵ Some scholars have attempted to redefine and clarify the concept of ‘adaptability’ through the idea of ‘adaptive change’ (discussed later in this chapter) which refers to actors’ capacity to influence resilience through management (Gunderson et al. 2006; Walker et al. 2004). The idea of ‘adaptability’ also appears in Holling’s concept of ‘adaptive cycle’, which is part of the SES and was originally developed in Holling’s

that widespread, and sometimes uncritical, uses of these concepts might have led to confusion, I follow Holling in defending their usefulness (2001). Indeed, ‘complexity’ encapsulates the analysis of a series of phenomena at the core of the SES research, and its use is likely to continue.

A. DEFINING COMPLEXITY

The concept of complexity initially emerged in computer science and quickly made its way to the natural sciences (Norberg and Cumming 2008; Waldrop 1992). Research sub-fields around complexity have been developed in many of the social sciences as well, and particularly in economics, management and sociology.⁷⁶ While specific definitions and domains of interest change from one discipline to the other, the core idea is that systems evolve continuously in a changing environment (Chu, Strand, and Fjelland 2003).

The impossibility of identifying all behaviours in the complex system implies that its study focus upon “small sets of variables or critical processes” (Gunderson, Holling, and Ludwig 2002, 7). These typically include self-organization, non-linearity, the existence of thresholds, feedback mechanisms and the potentiality for different regimes.⁷⁷ The table below explains and summarizes the main properties of complex systems and contrasts them to simple systems.

analysis of ecosystems. Assimilating ‘adaptability’ to actors’ capacities can therefore be problematic since the ‘adaptive cycle’ does not necessarily include human actors.

⁷⁶ It is well beyond the scope of this thesis to engage with the definitions of complexity in these fields. For more details on the different theories of complexity, see for instance Byrne (1998) or Chu, Strand, and Fjelland (2003), or Arthur (1999) for Complexity Economics.

⁷⁷ As Daly and Farley (2004), Holling (2001) and Norberg and Cumming (2008) among others, explain.

TABLE 2: COMPLEX AND SIMPLE SYSTEMS⁷⁸

Complex Systems	Simple Systems
<ul style="list-style-type: none"> ▪ Dynamism: large numbers of interacting elements that themselves can change and lead to structural change ▪ Nonlinear cause-effect and thresholds: minor changes can produce disproportionately large consequences; simple rules can lead to complex behaviour ▪ Path dependency and connectedness of elements ▪ Self-organization: capacity to change structures after shocks ▪ Regimes and basins of attraction: set of variable levels towards which variables tend over time / Existence of several potential regimes ▪ Resilience: capacity to absorb shocks and learn from past experiences 	<ul style="list-style-type: none"> ▪ Stability⁷⁹ ▪ Linearity and discrete components ▪ Static equilibrium

As we can infer from the table above, ‘change’ is central in conceptualizing complexity. In ecology, integrating change into the definition of ecosystems revolutionized a field that was used to the concept of ‘equilibrium’ and regarded change as the exception between ‘stable states’.⁸⁰ With the arrival of Complexity Theory to ecology, ‘unpredictable changes’ were redefined as an integral, constitutive part of the ecosystem (Folke 2006; Levin et al. 1998). This pressed for a clarification of the concept of ‘state’, which had been used loosely until then.

The ‘state’ of a system, as Walker et al. (2002, 5) define it, refers to “the collection of values of state variables at [a particular instant in] time”. It follows from this definition

⁷⁸ My elaboration after Horvath and Soer (2011) and Norberg and Cumming (2008)

⁷⁹ ‘Stability’ has come to add up to the list of concepts that have been attributed multiple meanings within ecology. ‘Stability’ in this thesis is taken to describe a system that stays unchanged. For a critical investigation of the multiple meanings attributed to ‘stability’ see Grimm and Wissel (1997).

⁸⁰ Folke (2006), Grimm, Schmidt, and Wissel (1992), Holling (1987).

that a system is constituted of a certain number of variables. The combination of the values that each of those variables takes composes the specific ‘state’ of the system at any given time (Walker et al. 2002). This finds further precision in the idea of ‘basins of attraction’, which indicates the (state) region in which the system tends to stay. A system might occupy different basins of attraction, the range of which constitute its stability landscape. Some authors contend that, for the sake of clarity, the concept of ‘regime’ should substitute that of ‘state’, since it conveys more adequately the different phases social-ecological systems may enter into (Scheffer et al. 2001). The literature is however not consistent on this.

The centrality of the idea of ‘change’ for SES research can be retraced to the work of Holling on ‘panarchies’ (Gunderson and Holling 2002). Importantly, exploring the concept of ‘panarchy’ informs the different kinds of interactions that are constitutive of the SES. Panarchies are characterized by *hierarchical* patterns of organization (Allen 1982; Levin et al. 1998). Holling coined the word ‘panarchy’ in his search for a substitute to the word ‘hierarchy’, which he considered too tainted by “the rigid, top-down nature of its common meaning” (Holling 2001, 396). A panarchy “is a representation of a hierarchy as a nested set of adaptive cycles”, which the figure below illustrates (ibid). The model of the adaptive cycle focuses on “processes of destruction and reorganization, which are often neglected in favour of growth and conservation”.⁸¹ ‘Pan’ in pan-archy refers to the Greek god of wilderness and music, used to convey the idea of unpredictability in complex systems.

⁸¹ The website of the Resilience Alliance (2013), entry “Adaptive Cycle”.

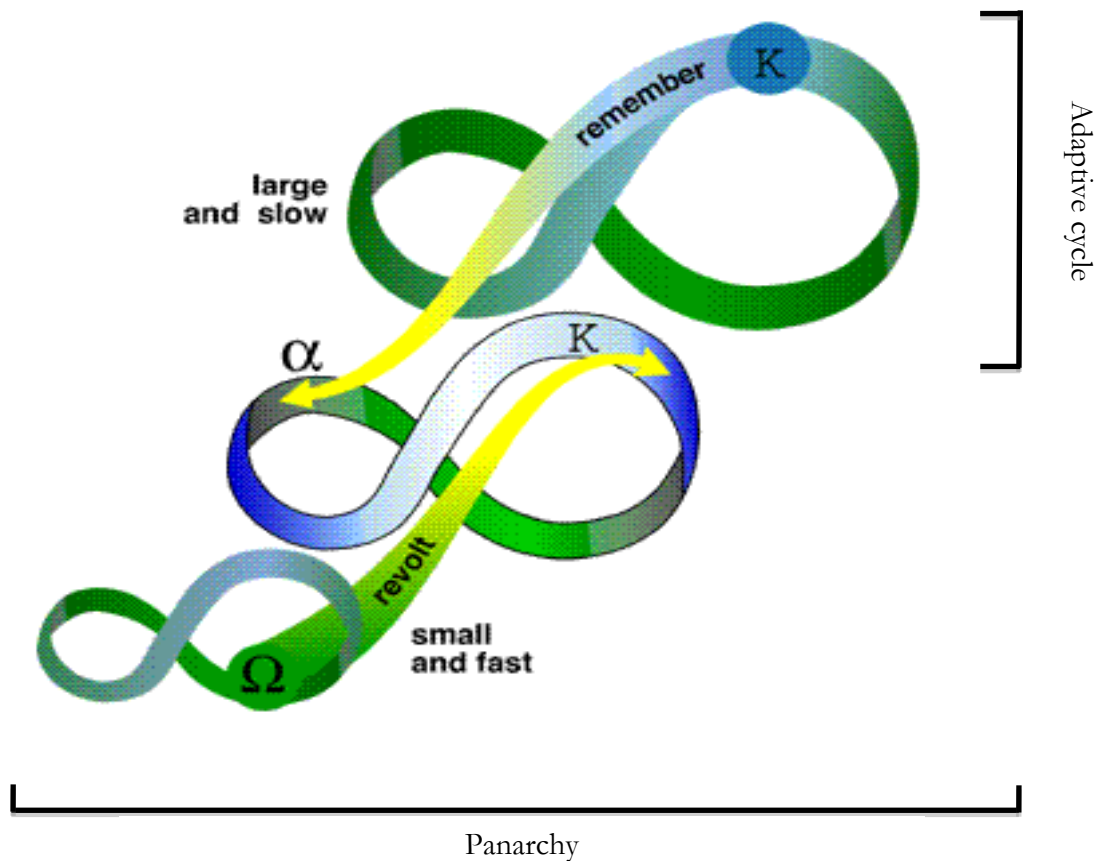


FIGURE 1 PANARCHY AND ADAPTIVE CYCLES (ADAPTED FROM FOLKE 2006, 258)

In the figure above we can observe three cycles, occurring at different scales. These cycles are dynamic: they present multiple elements (through the different colours) and several phases or ‘functions’ (the four letters) (Holling 1987). Each of the cycles contains interactions between elements that have the potential to lead to structural changes in the panarchy as a whole. For explanatory purposes, the panarchy has been reduced to three levels. The higher level of the hierarchy imposes organizational patterns on the intermediary level. This is in turn challenged by the lower level (Holling 1996).

Said otherwise, the upper scale provides structuring feedback to the intermediary scale; it makes it ‘remember’, creating a structure and triggering path-dependency mechanisms. The lower scale is a driver of change, here conceptualized as ‘revolt’. It can induce an alternative ‘regime’ for the system, i.e., drive it to a different basin of attraction. A

‘threshold’ is the boundary between two basins of attraction (Walker et al. 2002). The consequences of regime shifts are frequently unforeseeable, as they might result in a thorough reorganization of the system that can be irreversible (Brock, Carpenter, and Scheffer 2008).

Yet, not all changes provoke a regime shift.⁸² Changes might be small and gradual, and might not affect the organizing structures of the system. Then, in the Resilience Alliance SES (RASES) terms, the system displays resilience.⁸³ On the contrary, regime shifts occur when changes signify a modification of the organizing structures: the system then presents low resilience. The property of non-linearity explains that the changes in one (hierarchically low) level can have an impact on the whole system (Scheffer et al. 2001). Depending on the degree of resilience the system has when the interaction between upper and lower levels occurs, the system will ‘remember’ or ‘revolt’.

B. DETERMINING RESILIENCE

Given the complexity of SESs, resilience is used as an entry point to their study, focusing on the system’s attitude when facing change. Specifically, the RA’s endeavour is to understand abrupt changes and find the variables that foster or undermine the system’s components of resilience (Walker et al. 2006). Considering resilience when asking how actors interact with other SES elements leads us to explore which of the interactions identified can be reproduced, and therefore shape the system. Importantly, it allows us to

⁸² I use indistinctively ‘regime shift’ and ‘alternative basin of attraction’. However, I tend to use ‘regime shift’ more frequently as this expression is more widely used in the literature I discuss.

⁸³ Abel and Stepp (2003), Davidson-Hunt and Berkes (2003), Folke (2006) and Scoones (1999) provide reviews of the uses of the concept of resilience in ecology and beyond. There are, broadly speaking, two traditions in the study of resilience. The one this thesis investigates is the one that departs from the work of Holling. The other major tradition draws on the work of Pimm, who defines resilience as “the measure of the speed of a system’s return to equilibrium following a perturbation”, Pimm (1984) as quoted in (Schoon 2005, 2). This is what Holling calls ‘engineering resilience’, and it is not used in SES literature.

focus on whether the changes in elements of the system transform the possibilities of interaction and therefore the system structure.

Resilience is one of the properties of complex systems and as such, it is value-free. It does not necessarily imply a socially desired state, in contrast to ‘sustainability’ (Carpenter et al. 2001; Derissen, Quaas, and Baumgärtner 2011). Therefore, ‘resilience’ can refer to a system’s ability to conserve an undesired structure. Typical examples of undesired resilient systems are dictatorships or discriminatory class systems (Levin et al. 1998). Such systems present high institutional rigidity and strong path dependency, i.e., they are resistant to change (Hanna, Folke, and Mäler 1996).

To study resilience, change and continuity in the SES are taken as starting points. ‘Change’ is approached through the possibilities of reinvention and self-organization the system presents in times of transition (Berkes, Colding, and Folke 2003; Smit and Wandel 2006). In SES research, measuring resilience has involved defining threshold levels to determine the amount of change or ‘the magnitude of disturbance’ the system can cope with without transforming its structure, i.e., entering an alternative regime. ‘Continuity’ is tackled through the system’s capacity to ‘learn’ (Walker et al. 2002). Learning capacities are demonstrated in the reaction the system has when facing a situation that is similar to a situation previously faced. If the reaction has changed in light of an improved understanding of the situation brought about by experience, then the system displays “adaptive learning capacity” (Norberg and Cumming 2008, 2).

Human actors, because they display intent, have a particular role in shaping the system's capacity for learning.⁸⁴ Typically, environmental managers operate under a paradigm of stability and therefore, when change occurs, they aim to restore the system to what it was before – this undermines the system's learning capacities (Holling and Meffe 1996). Additionally, when a system is in the process of learning to integrate a particular disturbance, other shocks or changes that might undermine the system's overall capacity to learn can occur simultaneously. Hypothetically, fishers observing the consequences of over-exploiting their fisheries might 'learn' to limit their exploitation. However, they might not modify their behaviour as they might also react to global prices for fish. The literature has mainly focused on a single disturbance affecting one variable, and only recently has attention been paid to changes affecting multiple variables (Anderies, Walker, and Kinzig 2006; Schoon and Cox 2012).

The degree of resilience the system presents can be grasped through the study of four characteristics, three of which apply to each level of the panarchy and the fourth to the interrelatedness of scales. These need to be understood as framing the attitudes adopted when changes in the system elements occur, and consequently framing the possibilities of interaction constitutive of the system. The first three are: latitude (amount of change that can be endured without losing the ability to recover), resistance (ease or difficulty of change), precariousness (closeness of the system to a limit or threshold). The fourth is "panarchy"⁸⁵ (Walker et al. 2004) or sensitivity to other scales. The last property refers to

⁸⁴ This does not mean that all anthropogenic transformations of the SES are done with intent. Human actors also transform the social-ecological system through unintended dynamics (Berkes, Colding, and Folke 2003; Scheffer, Westley, and Brock 2003).

⁸⁵ Walker uses the term 'panarchy' to refer to one of the characteristics of resilience, and his choice is followed by many of the RASES scholars, including Holling himself. However, I argue that the idea of 'sensitivity to other scales' better conveys the variability of this property. As we have discussed, 'panarchy' originally described a system characterized by the interrelatedness of its scales and its tendency to

the fact that the effect of change in each of the constitutive cycles has a repercussion on the ways in which different levels connect, as we saw above. The figures below present two detailed views of one cycle level.

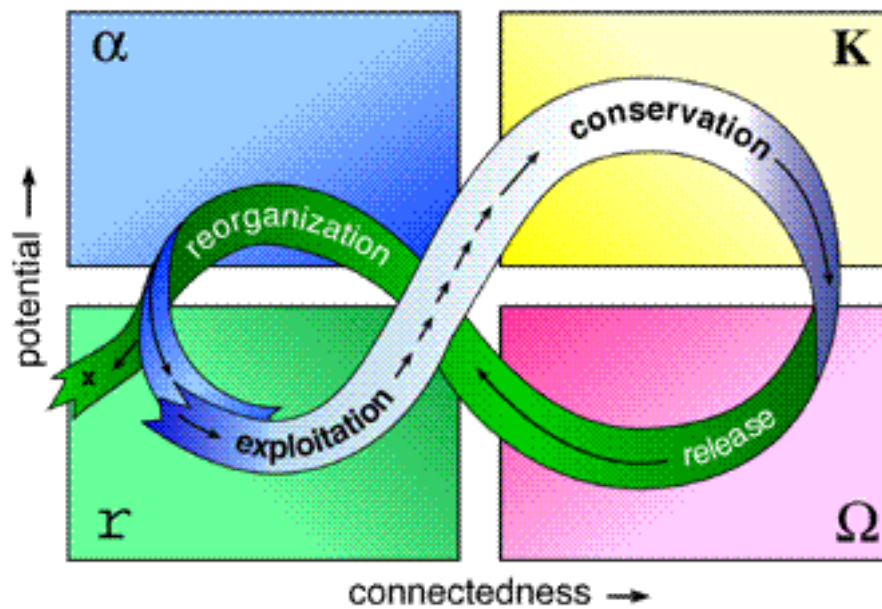


FIGURE 2 TWO-DIMENSIONAL VIEW OF AN ADAPTIVE CYCLE (HOLLING AND GUNDERSON 2002, 34)

unpredictable change. I contend that sticking to this definition of ‘panarchy’ provides greater consistency and clarity, and I prefer to use ‘scale sensitivity’ to refer to one of the characteristics of resilience.

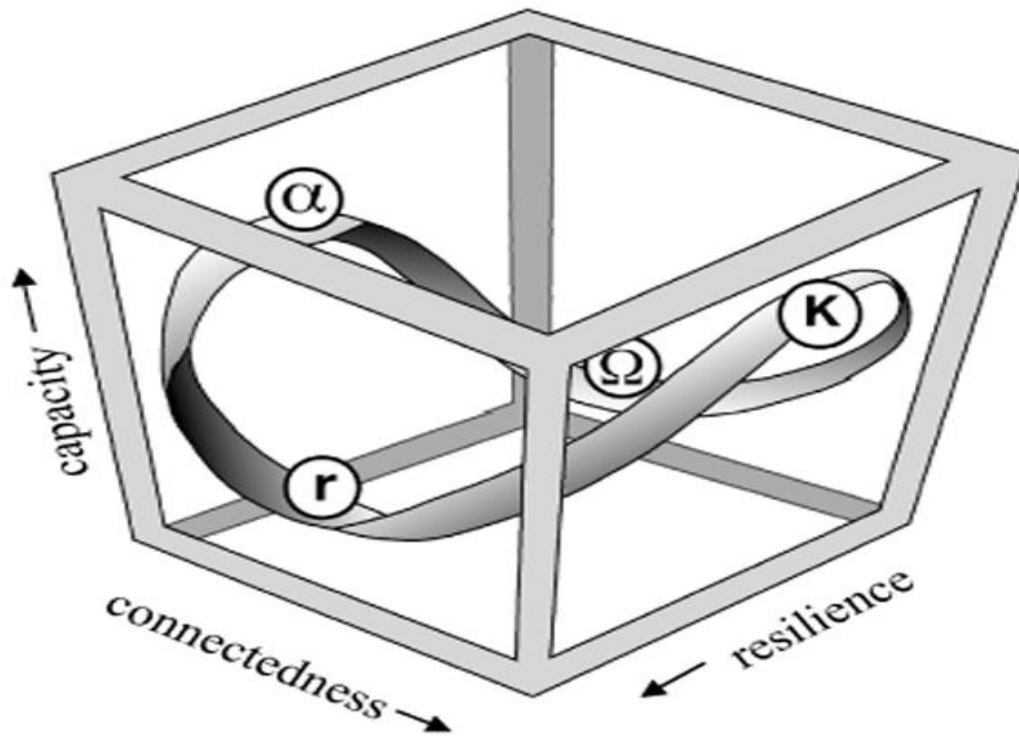


FIGURE 3 THREE-DIMENSIONAL VIEW OF AN ADAPTIVE CYCLE (ADAPTED FROM HOLLING AND GUNDERSON 2002, 41)

The representation of the adaptive cycle has three axes: connectedness, potential (or capacity) and resilience. Connectedness “between internal controlling variables and processes” refers to “a measure that reflects the degree of flexibility or rigidity of such controls [the controlling variables], such as their sensitivity or not to perturbation” (Holling 2001, 33). Potential, or capacity, refers to the possibilities of change and the future options available for the system (Gunderson and Holling 2002; Holling 2001). The combination of those two dimensions together affects the latitude, resistance, precariousness and scale sensitivity of the system, i.e., its resilience. In each of its phases, the system reaches different levels of these variables. For example, in an ‘omega’ moment the system displays low resilience. That is the result of one of the several sets of possible combinations the four components might create. Contrary to what happens between phases r (exploitation) and K (conservation) when system dynamics are ‘reasonably

predictable', during the omega phase, structuring changes might occur (Walker et al. 2004). The literature is still in search of the tools that will allow measurement of each of these variables in SES. I will use them as guiding tools for the analysis of what the different interactions I distinguish seem to lead the system to.

RASES research has categorized three types of 'changes' in SES: (i) gradual change, when the system preserves its functioning while integrating some modification, (ii) adaptive change, when the social components of the SES respond to a regime shift in the ecological components (such as an intervention on a eutrophic lake), and (iii) transformative change, when the whole system enters a new regime. As resilience refers to the ability the system has to conserve its structure in a particular basin of attraction, RASES research has mainly focused on 'adaptive' changes. 'Transformative' changes have, to a certain extent, also been studied insofar as they present opportunities to craft a new, resilient SES. Both analyses address the challenge of designing management structures that would protect the system from undesired regime shifts or collapse.

I turn now to discuss the variables that structure the SES, which are the object of focus of RASES scholars. Indeed, intervening on these variables is what allows the system's resilience to be influenced.

C. DRIVERS AND SLOW AND FAST VARIABLES

SESs regimes are determined by the interplay of internal variables and external drivers (also called exogenous controls), as the figure below illustrates. Those variables shape the interactions between elements of the system and affect the components of resilience. Yet, they are ontologically different from them: together with the interactions, they compose the system structure. The components of resilience, by contrast, target measurements about properties that the system might or might not have. Defining the

system variables is strongly correlated to the issues of scale and boundaries (Walker et al. 2002).

Identifying the system's scale and boundaries helps to define what elements are internal variables of the system and which are external drivers. The difference between internal variables and external drivers is that, while both contribute to defining what happens in the system, external drivers are not affected by it (Walker et al. 2012). The elements that are considered external drivers for a particular SES could be considered internal to a larger SES, which reinforces the importance of defining the scale of analysis (Carpenter et al. 2001).

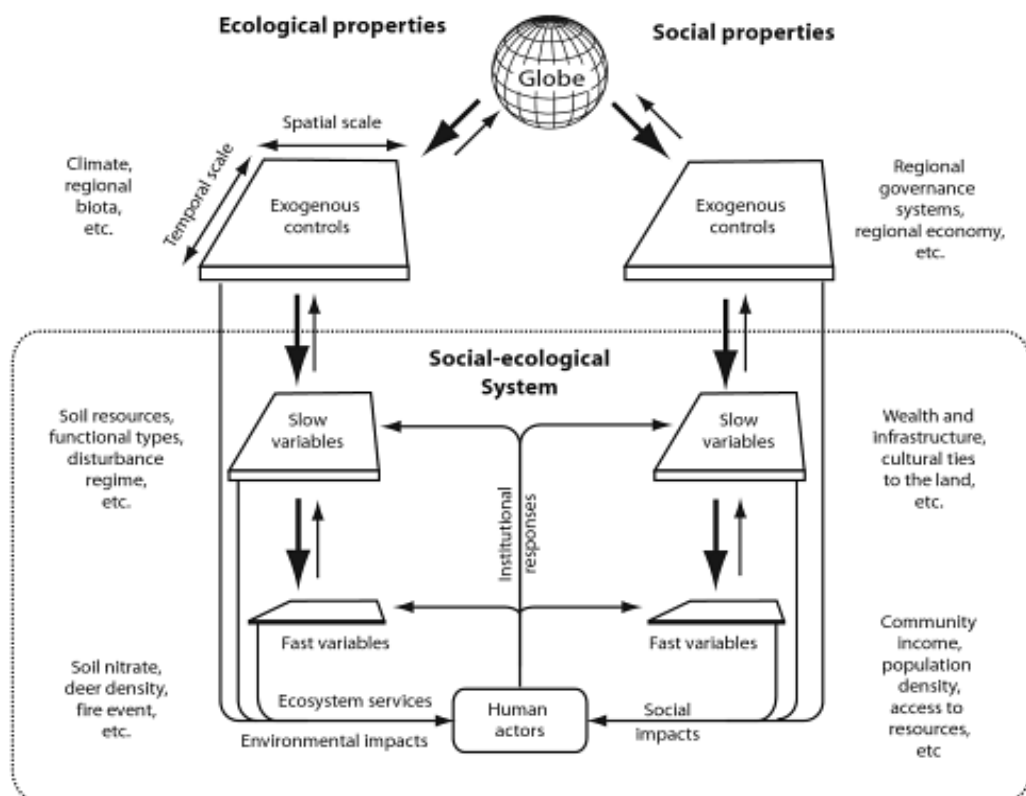


FIGURE 4 SOCIAL-ECOLOGICAL SYSTEM (CHAPIN III, FOLKE, AND KOFINAS 2009, 7)

Internal variables are in turn sub-classified into two kinds: slow and fast variables (Walker et al. 2006). As the figure above illustrates, slow variables refer to relatively stable elements in the system that tend to have an organizational effect. Said otherwise, those variables are the frame for the interactions and are key in fostering resilience. Fast variables refer to rapidly changing components. The association of certain slow and fast variables creates networks of interaction in the SES. Even though this is not entirely clear in the representation above, both types of variables relate to external drivers, which have an impact on the variables' levels by affecting the system's latitude, resistance, precariousness or scale sensitivity. External drivers can push fast variables towards threshold levels and lead the system into a regime shift (Walker et al. 2012).

The classification of each of the system elements into one type of variable is correlated to the classification of others and to the scale considered. Classifying the different components of the system into the kind of variable or driver they are certainly constitutes one of the most challenging and crucial parts of the analysis as it might lead to significantly different interpretations. The literature has identified certain elements as posing severe classification challenges – specifically, the role of human actors. I quote here Walker et al. (2012, online) at length for they explain clearly the problem of classifying human actors:

Failure to clarify the role of humans in the system is a common cause of confusion. They are viewed as exogenous factors (drivers) when interest is on ecological processes and as endogenous when the dynamics of interest are at the social–ecological interface; or, when the object of interest is the social dynamic, the ecosystem is then an exogenous constraint ... However, if people are considered part of the system, it is necessary to identify which rules people use to decide on the control variables (their strategies to achieve certain objectives) ... Each strategy with regard to how to choose the level of control variable will produce particular patterns of interaction with the rest of the system, which may then generate different outcomes. It needs to be clear whether people are just users of the system or whether the dynamics of people—changes in their numbers, welfare, distribution, choices, etc.—are also part of the study objectives (endogenous variables). If so, the ways in

which the people variables are influenced and modified through feedbacks from the states of the “natural” system variables need to be considered; and they can change, for example through emigration, thereby feeding back in unforeseen ways to changes in the controls.

It can be inferred from this quote that the SES perspective encourages focus on the reasons behind the rules ‘people use to decide’, i.e., the underpinning variables that explain the reasons supporting the ‘strategies to achieve certain objectives’. For that, we need to explore ‘the dynamics of people’ and their interaction with the ecosystem. These ought to be considered as endogenous variables that have an impact on the system and receive feedback from it.

To investigate actors’ behaviour, the literature borrowed several concepts from economics and psychology. Actors’ choices are determined by their interpretation of a given situation, by the way they position themselves in that situation and by what they want to obtain from it. Simplified perceptions feed “reasoning, judgment, and decisions making” that serve as a basis for “deliberate human actions” (Anderies and Norberg 2008, 171).

This dismisses the neo-classical economics hypothesis of people as holders of well-defined hierarchical preferences. Indeed, the SES research adopts a position on actors close to that of behavioural economics.⁸⁶ As Walker et al. (2012, online) summarize:

Decision makers in social-ecological systems must make decisions based on imperfect knowledge, with limited resources. Furthermore, decisions do not solely concern the consumption of goods and services. Agents often do not make income-maximizing decisions and the utility functions used to represent agent behaviour must be sufficiently rich to include this. Utility depends upon social context. In economics terminology, agents are boundedly rational. Agents hold preferences, not just over outcomes (consumption bundles), but over the social, economic, and political

⁸⁶ I refer to behavioural economics for it is the most widely known of the heterodox economics sub-disciplines, but it would also apply to others such as complexity economics.

processes that govern those outcomes (Pritchard et al. 2000). Most stakeholders are not content to be represented in the process by a mere abstract utility function. Expert solutions may maximize something, but they rarely maximize legitimacy.

Walker and his colleagues describe complex decision-makers; the actors they depict are not only interested in outcomes, they also care about processes. They embed their actions in their social reality and make decisions influenced by perceived and real limitations (imperfect knowledge and limited resources). Decisions and choices are never discrete. They are correlated to previous and planned decisions and choices. Moreover, as Anderies and Norberg (2008, 171) argue, drawing on Bettman et al. and on Slovic, “people often do not have well-formed preferences and construct apparent preferences in the act of choosing”.

From the analysis of the literature presented so far, we can infer that actors would assume two main roles depending on their scale position in the SES. On the ‘lower’ scale, the one that introduces challenges and revolutions, actors are a driving force in the transformation of social-ecological systems. On the ‘upper’ scale, i.e., the organizing level, actors and the institutions they craft are meant to conserve the existing organizational structures. Therefore, the role of actors and of institutions can be grasped through the idea of difference and reproduction. Actors’ attributes, such as their mobility or income, and the structures under which they operate, such as existing infrastructure, should be understood as slow or fast variables, similar to any other component of the social-ecological system. I will now explore to what extent the RASES framework allows us to effectively explore the role of human actors by looking at two empirical case studies.

II. HIGHLIGHTING SHORTCOMINGS

CASES OF APPLICATION

The two case studies I look at below, one by Herrfahrdt-Pähle and Pahl-Wostl (2012)⁸⁷ and the other by Gunderson, Carpenter, Folke, Olsson and Peterson (2006)⁸⁸, both share many common points with my own study. Firstly, both articles concentrate on the role of human actors and social dynamics in shaping the system's regime. Secondly, they both provide a comparative perspective that not only echoes mine, but also reveals the weight of contextual parameters in the SES. Thirdly, they deal with water management, Gunderson et al. focus on lake management cases while Herrfahrdt-Pähle and Pahl-Wostl follow a more general approach to discuss the organization of national water management in two countries. Fourthly, while they do not directly address water pollution, they focus on the phases of change, and 'pollution' can be considered as a change in the ecosystem state. The gradual, adaptive and transformative categories of change are used as a structuring axis for the analyses. To each of the types of change is associated a type of learning, and specific attention is given to the role of institutions in the process: incremental, episodic and transformational.⁸⁹ Finally, they present interesting differences in the framing of the analysis: while both essentially draw on the RA

⁸⁷ Neither Herrfahrdt-Pähle nor Pahl-Wostl belongs to the Resilience Alliance but a number of reasons make me use their article here. Firstly, their study was published in the journal *Ecology and Society*, which is the RA's journal. Moreover, they acknowledge Folke's and Schlüter's (both based at the Stockholm Resilience Centre) contributions. Mainly, they extensively draw on the RA literature. And yet, interestingly, it is notable that they use concepts at the core of the BW institutional analysis such as the categorization of rules into 'constitutional', 'collective choice' and 'operational'.

⁸⁸ The titles of these articles are respectively: 'Continuity and Change in Social-Ecological Systems: the Role of Institutional Resilience', published in *Ecology and Society*, 2012, 17 (2): 9, and 'Water RATs (Resilience, Adaptability, and Transformability) in Lake and Wetland Social-Ecological Systems', also published in *Ecology and Society*, 2006, 11 (1): 16.

⁸⁹ These classifications seem clear enough, but a discussion is provided in Argyris (1976; 1977) and Pahl-Wostl (2009).

literature, Herrfahrdt-Pähle and Pahl-Wostl were also influenced by other sources, and particularly Ostrom's work on institutions.

The Gunderson et al. article compares three cases of networks for lake management, two of them in the United States (Wisconsin and Florida) and the third in Sweden. The authors are interested in adaptability and transformability, i.e., the ways in which human actors 'react' to changes in the system. They investigate the kind of networks at play, the type of learning those networks display and the role of trust and leadership.

The three cases presented are situated at three different spots on the spectrum of network flexibility. The network in Florida is judged to be in a 'rigidity trap' because it is organized through a formal system of explicit rules that does not allow for flexibility but encourages resistance to change. In terms of resilience, the network presents low latitude and high resistance. The Wisconsin network is at the opposite end of the spectrum. It constitutes an open informal network that, the authors assert, may be close to a 'poverty trap', i.e., displaying very high latitude and no resistance. Finally, the Swedish network combines characteristics of both. The comparison of the three types of management networks, and of their learning capacities when responding to a series of challenges, brings the authors to conclude that the more open the system is, the higher its capacity for transformative learning, i.e., reinventing itself in cases of thorough change. By contrast, high rigidity undermines the system's learning capacities.

The authors claim that open networks allow transformational learning insofar as they "link ecosystem understanding across social and ecological scales" (2006, 7). Basing their claim on the differences arising from the comparative perspective, the authors argue that 'trust' and 'leadership' constitute two social variables essential for adaptability and transformability, since they feed social-ecological memory and the capacity to 'confront unknowns'. The kind of 'leadership' identified – and valued – is the one that "foster[s]

and maintain[s] trust in the social network” and “integrate[s] social and ecological understanding” (2006, 6). To sum up: an SES will resiliently react to change when social cohesion integrates the ecosystem in its learning process.

Yet, the framework does not seem to encourage the authors to explore what drives actors to establish the conditions leading to a resilient system. What encourages actors to create systems wherein open networks prevail or, on the contrary, to create systems presenting high rigidity? Certainly, the analysis pinpoints that social relations determine the kind of approach adopted towards the ecosystem, but it does not seem to pay enough attention to whether relations with the ecosystem affect social relations. The framework does not seem to guide an analysis that would explain what makes the actors behave in one way or the other. Perhaps more importantly, in systems presenting high rigidity – i.e., failure to adapt – the interactions that arise are not discussed. Said otherwise, we do not know (i) whether relations with the ecosystem affect social conditions, (ii) how actors interact with the ecosystem in an SES that does not integrate change and (iii) what is behind the social conditions identified and their maintenance. In judging a system unresilient, the kinds of interactions arising in such systems are silenced.

Herrfahrdt-Pähle and Pahl-Wostl’s article specifically “explore[s] the tension between continuity and change”. To do so, the authors compare the evolution of South Africa and Uzbekistan’s water legislation. Both countries have had to face changes in their recent history and have reformed their water regimes to include IWRM. The authors contrast South Africa’s decision to undertake thorough changes with Uzbekistan’s choice of continuity. They show that Uzbekistan’s decision failed to address major environmental disturbances produced by the overuse of water, which subsequently increased the precariousness of the system and put it at risk of collapse. South Africa’s attempt at comprehensive change turned out to be too ambitious and resulted in costly

and incomplete implementation. The authors conclude that a successfully adaptive system presents some degree of continuity while allowing for flexibility, which resonates with the Gunderson et al. article.

The authors explore the effects of the different choices made in each country and investigate the role of key actors. To do so, they distinguish between different levels of management (constitutional, collective choice and operational) and discuss the determinants of institutional stability, drawing inspiration from Ostrom's work on institutions (E. Ostrom 2005). Interestingly, they pay attention to the actors' motivations in decision-making. For example, they explain that a high-ranking senior official within the Ministry of Agriculture and Water Resources in Uzbekistan pushed for the implementation of hydrological boundaries in his desire to retain power within the Ministry. He proceeded to limit:

the influence of the agricultural sector and local and provincial governors on water distribution by unlinking the boundaries of water management organizations from administrative units (Herrfahrdt-Pähle and Pahl-Wostl 2012, 6).

The authors' use of conceptual tools from institutional analysis research encourages them to deepen their exploration of the actors' role in the SES, suggesting the relevance of integrating these conceptual developments in the RASES framework.

From the article, it appears insightful to conceptualize actors' motivations in general, and, in this particular case their will to retain power, as internal variables in the SES. To further investigate the interplay of actor-based variables, it seems relevant to explore how certain actors succeed in putting forward their visions while others do not. In this light, the idea of 'leadership' would gain by being problematized by including actors' motivations and the structures that encourage or downplay some of these motivations. Herrfahrdt-Pähle and Pahl-Wostl provide some answers as to what is behind the social

conditions identified and their maintenance (in this case, power). They partially inform on how actors understand the system and how their understanding is affected and affects social relations – in the example given above, the choice of basin boundaries is part of a strategy to retain power. However, they do not engage with the specific interactions that arise as a result of disturbances in the ecosystem.

To recap: both articles provide interesting insights into the variables at play in SESs. They investigate the roles of flexibility and openness on the one hand, and of rigidity and formality on the other, which in turn relates to two of the components of resilience: resistance and connectedness. Both studies explore the variables that encourage the system to learn and integrate change, which highlights the relevance of paying attention to social variables such as trust, leadership and actors' motivations.

However, the role of conceptions of and interactions with the ecosystem as well as the conditions leading to the occurrence of the identified variables are not systematically explored through the RASES framework. To address these issues, it seems necessary to analyse in depth the interests that different actors might have, how they negotiate spaces of action and, particularly, how they conceptualize 'environmentally unsustainable' arrangements. In order to understand the variables leading to and maintaining 'unsustainable' arrangements, it seems crucial to explore how the present-day regime was reached and the roles that actors play in defining and sustaining certain variables. In that sense, we observed in Herrfahrdt-Pähle and Pahl-Wostl's article that having recourse to other literatures helped to elucidate the reasons leading to particular arrangements, i.e., the 'conditions' wherein the SES relations occur.

It is important to contextualize the exchanges between schools working on SESs to highlight when different literatures came to nourish the framework. Particularly, the UN has played a key role in fostering the dialogue on sustainability research and practice, and

presumably, in accelerating the exchange between the BW and RASES schools. The central event of the first half of the decade was the UN organized Millennium Ecosystem Assessment (hereafter MA), a joint research effort that brought together more than 1,360 ‘experts’ worldwide from 2001 to 2005 to find common solutions for environmental problems (Millennium Ecosystem Assessment 2005). The publication of the MA 2005 reports was a significant effort to draw concrete tools from research, particularly in the face of climate change and biodiversity losses.

The point here is that it is likely that the MA platform facilitated the communication between scholars working on diverse aspects of environmental management. Indeed, the Bloomington Workshop scholars seem to have started working on SES during the MA period. Moreover, the road to the MA corresponded with the growing interest in governance aspects of the SES, which overlaps with the area of expertise of the BW.⁹⁰

2.2. SES: THE BLOOMINGTON WORKSHOP

The BW scholars have a significantly different disciplinary background than those of the RA. While the workshop now includes participants from the fields of ecology and biology, it was founded by political scientists and political economists. One of their main areas of work and interest was the study of the institutions organizing the management of CPRs.⁹¹ The BW’s research on the ‘social sphere’ is consequently more extensive and developed than that of the RA.

⁹⁰ As the works of Dietz, Ostrom, and Stern (2003), Kofinas (2009), Folke et al. (2005), Eckerberg and Joas (2004) and E. Ostrom (2005) demonstrate.

⁹¹ See for example Dolšák and Ostrom (2003)

The interest of the Bloomington Workshop in SES research is important for two reasons. Firstly, the theoretical contributions that the Bloomington scholars make give us concrete tools for tackling the interactions between actors and the ecosystem as well as the relevant interactions in the social sphere. Secondly, they have played a crucial role in strengthening the links between the academic community and policy-making, particularly in the years leading to the *Rio+20 Earth Summit* of 2012. With the intention of providing Rio+20 with the latest academic developments, the key figure of the BW, Elinor Ostrom, actively participated in the organization of the conference *Planet under Pressure* in London (Stafford-Smith et al. 2012). The core of the conference revolved around developing the concept of the ‘anthropocene’, which basically presents the planet as a large SES.⁹² Ostrom’s interest in the SES consolidated the framework’s vocation as a contributor to policy and management, and therefore as a potential source of inspiration for the rules governing the interaction between human actors and their environment. Ostrom’s capacity to rally the policy-making and research communities was significantly enhanced after she received the 2009 Nobel Prize in Economics.

Of direct concern for the present study is that the BWSES provides tools for the conceptualization of actors and governance systems, based on findings from previous research programmes around sustainability, such as CPR research. I turn now to the analysis of the governance system, actors and action situations as conceptualized by the BW. This will allow us to acquire the conceptual tools to capture the different variables of rule formation.

⁹² This thesis does not deal with the concept of the anthropocene or its critiques. For further reference see Biermann, Abbott, and Andresen (2012), Crutzen (2002), Glaser et al. (2012a), Löwbrand, Stripple, and Wiman (2009), Palsson et al. (2013), Ruddiman (2003).

I. FOCUS ON THE BW CONCEPTUAL DEVELOPMENTS

While the Bloomington Workshop follows the Research Alliance in defining SESs as complex systems, the ways in which SESs are understood and studied vary significantly between the two schools. The BW does not structure its analyses through the scope of resilience but directly uses the lens of sustainability (Ostrom 2009). Even though concerns on how to assimilate changes frequently appear in the BW scholars' analyses⁹³, they do not frame their approach around variables and external drivers as affecting the system's ability to deal with change. They adopt a perspective that leads them to focus on the attributes of what they classify as the categories constituting the system.

Indeed, the BW structures its analysis around five categories: Governance System, Resource System, Resource Units, Actors and Action Situations, as the figure below shows.

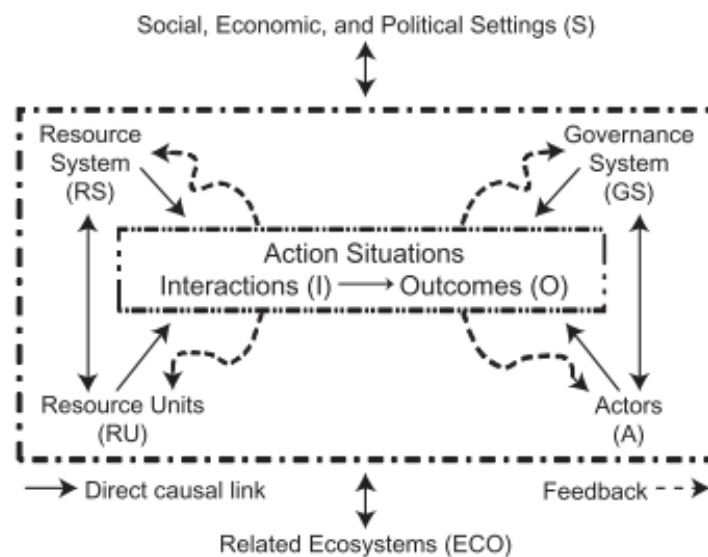


FIGURE 5: SES FRAMEWORK (OSTROM 2010A, 434)

⁹³ Such as those of E. Ostrom (2005), Cox (2010), and Schoon and Cox (2012).

Each of the five categories is defined as a ‘first-tier variable’. The table below illustrates the details of the ‘second-tier’ variables that compose each of the first-tier variables.



FIGURE 6 SECOND TIER VARIABLES (OSTROM AND COX 2010, 458)

The BWSES emerges as an attempt to translate previous findings on CPR management into a framework that is relevant for interdisciplinary sustainability studies. In an article from 2011, Ostrom declares that her decision to develop an SES framework came after she realized, through her work with Stockholm-based scholars, that ‘ecologists’ did not find the IAD⁹⁴ framework, arising from CPR research, relevant for their work (E. Ostrom 2011). The BWSES also responds to the BW’s need to go beyond institutions for the management of specific common-pool resources and include different levels in the analysis.

⁹⁴ See McGinnis (2011) for a synthesis of IAD.

A. GOVERNANCE SYSTEM AND ACTORS

A governance system is the web of organizations and institutions (strategies, rules and norms) that aim at organizing society, according to a chosen set of values. For the Bloomington scholars, institutions are the glue that holds together both the system and its internal components. Ostrom defines institutions as:

potentially linguistic entities ... that refer to prescriptions commonly known and used by a set of participants to order repetitive, interdependent relationships ... [and] prescriptions refer to which actions (or states of the world) are *required, prohibited, or permitted* (Ostrom 1986, 5 - emphasis in original).

Therefore, ‘institutions’ include the ‘rules’ that organize the different levels of management.⁹⁵ As the list of second-tier variables illustrates, the BW – integrating an IAD finding – distinguishes three types of rules: constitutional rules, collective choice rules and operational rules. The relation between rules is not strictly hierarchical, as rules defined at lower levels, such as operational rules, can challenge constitutional rules, which are, in general, crafted at higher levels.⁹⁶

Following Ostrom’s definition, SES institutions record the interactions between actors and ecosystem units. Rules are adapted and modified as a result of multi-level changes in the social-ecological system. For example, a law limiting the fishing harvest is likely to have an impact on operational rules around fishing, which might in turn have an effect on the reproduction rates of fish. Rules can also undergo modification as a result of

⁹⁵ McGinnis (2011), Norberg et al. (2008), E. Ostrom (2011, 2007a).

⁹⁶ In the list of second-tier SES variables, the governance system is sub-divided into three categories, ‘rules’, ‘property rights regime’ and ‘network structure’. I argue that the category ‘property rights regime’ should be considered a constitutional rule, since it determines a “parameter of ... social order, creating the foundation for the institutional arrangement and the rules to be used in crafting” the two other levels of rules, i.e., it fits the definition of constitutional rules (Boettke and Aliglica 2009, 86). I will offer hypotheses as to why the ‘property rights regime’ is presented as a separate category in the SES framework later in this chapter. I focus now on the study of rules and structure.

ecosystem changes, to which the system would ‘adapt’. A decrease in resource availability, for instance in the case of illness of fish, might result in a modification of the rules that regulate the exploitation of the resource (Janssen 2006).

Institutions emerge through the repetition of certain arrangements, which capture, for instance, the benefits of cooperation around a specific common interest (Hahn et al. 2008; Leftwich 2007). In social-ecological systems, institutions might capture the benefits of cooperation between the social and ecological sphere, such as certain agricultural systems (Lansing 1987). Other rules are designed to translate a specific vision of the desired society and actively encourage the interactions that are thought to lead to it (Frantzeskaki et al. 2010). However, an institution is never solely the product of a designed rule, as there is a gap between design and implementation. That gap opens spaces for resistance and negotiation. In the case of social-ecological systems, ecosystem unresponsiveness to institutional design can lead to unexpected outcomes.

In the past, scholars at the BW focused much of their work on community-level management. The role of communities in environmental management is indeed the subject of an extensive body of literature.⁹⁷ As a reaction to Hardin’s seminal article on ‘The Tragedy of the Commons’, scholars at the BW analysed numerous empirical cases of successful management. In particular, they showed that the challenges posed by the CPR properties of subtractability and high cost of exclusion could be overcome by

⁹⁷ For their tangential relevance to this work I give here a long but non-exhaustive list: Agrawal and Gibson (1999), Armitage (2007), Berkes (2007), Brosius, Lowenhaupt Tsing, and Zerner (1998), Dressler et al. (2010), Feldmann (1993), Kleymeyer (1993), Latour (2004), Little (1993), McGinnis (2000), Murphree (1993), Sikkink and Choque-Mamani (1999).

cooperation. Ostrom then proceeded to synthesize the findings of the workshop, developing an agent-based model of behaviour.⁹⁸

It is beyond the scope of this thesis to discuss in detail the conditions distinguished by the BW as necessary for sustainable collective management of CPR, since we are interested in interactions that arise when management is deemed ‘unsustainable’, i.e., the patterns that we distinguish when the identified conditions are missing. Yet, it is worth highlighting that in the BWSES framework, CPR variables appear grouped under a slightly modified form in the category ‘actors’ together with descriptive variables relating to population dynamics (such as group size or location).

What interests us, however, is the tool of the ‘action situation’, which refers to the arena wherein rules are crafted and repetitive interactions occur. I turn now to explain what this analytical tool entails and why it will be useful for my analysis.

B. ACTION SITUATION

The ‘action situation’ is a concept imported to the SES framework from IAD, wherein it was one of the components, together with ‘participants’, of the ‘action arena’. The ‘action arena’ is an analytical tool used to isolate and explore the creation, maintenance and modification of institutions. ‘Action situations’ allow investigation of the interactions

⁹⁸ See for instance Blanco (2011), E. Ostrom (2005; 2009; 2010b), Pahl-Wostl (2009) or Pretty (2011) and Aligica and Tarko (2012) for the specific discussion of the condition of polycentricity, which was originally defined in the works of V. Ostrom, Tiebout, and Warren (1961), and then further developed by McGinnis (1999), or E. Ostrom and V. Ostrom (1971). Polycentricity was added to the conditions for CPR management later on. It is important to note that the CPR literature particularly insists on ‘social capital’ as a crucial variable for institution building in collective arrangements (Berkes 2010; Pretty and Ward 2001). Social capital refers “to the value of trust generated by social networks to facilitate individual and group cooperation on shared interests and the organization of social institutions at different scales” (Brondizio, Ostrom and Young 2009, 255).

between actors. They refer to the ‘event’ of interaction. ‘Participants’ in the interaction are the actors who can represent their own interests or the position of a collective actor.

Action situations “can be utilized to describe, analyse, predict, and explain behaviour within institutional arrangements” (Ostrom 2011, 11). IAD scholars developed typologies based on the most common interactions they identified in different areas of study. For instance, to analyse socially embedded markets, action situations typically refer to: (i) exchanging goods and services, (ii) solving problems and (iii) competing with others (Ostrom 1998). For analysis of the SES, specific kinds of action situations have been developed. As the list of second-tier variables makes explicit, these are typical of environmental management: monitoring, sanctioning, conflict resolution, provision, appropriation and policy-making.

The concept of the ‘action situation’ appears under a slightly different form in the SES framework. Indeed, the umbrella concept of the ‘action arena’ disappears. In the new framework, the grouping function is fulfilled by the SES framework itself, which is more detailed than the IAD framework. To the initial categories of ‘actors’ (or participants) and ‘action situations’, are added ‘governance system’, ‘resource system’ and ‘resource units’. The SES framework also gives a different status to the ‘action situation’: it is no longer one of the two elements of the action arena, but the central element of the whole framework.

In the SES context, action situations capture the interplay between the different framework components. They lead to certain outcomes that might transform each, or some, of the SES components and might affect the system’s learning capacity (McGinnis 2010a). Within a complex action situation there are many other, simpler action situations taking place. These are called adjacent action situations, which:

occur when outcomes generated in one action situation affect a structural attribute or help determine the rules under which interactions occur within the other action situation (McGinnis and Ostrom 2011, 13).

If several action situations happen simultaneously or sequentially, there is a ‘network of adjacent action situations’. Focusing on the ‘action situation’ for the analysis allows determination of the kind of actors at play, the rules and the network structures mobilized in the interaction.

The conceptual developments of the BW seem to provide an analytical platform from which to investigate actors in more depth and a vocabulary for classifying social arrangements. In particular, the analysis of the interactions between actors as they create and maintain the sets of rules that structure human behaviour is a useful guiding tool for this analysis. However, some of the conceptual developments are useless for the analysis presented here as they focus on the conditions leading to sustainable arrangements. In the next section I discuss other issues arising from the extremely detailed framework that the BWSES provides us with.

II. HIGHLIGHTING SHORTCOMINGS: EXPLORING BIASES

One of the main contrasts between the BWSES and the RASES frameworks is that the BWSES provides a detailed specification of the variables, in contrast to the more open, subject-to-scale definition presented by the RASES. The BWSES creates a kind of ‘check-list’ against which to verify the presence (or absence) of the conditions listed as leading to sustainability.⁹⁹ This presents several problems. Firstly, the specificity of the framework runs the risk of hiding the existence of criteria not specified in it. Secondly, it

⁹⁹ For examples of that see Cox (2011b) and Ostrom (2007b).

leaves no guidance for situations when the criteria of the model are not fulfilled. Thirdly, it does not explore the underlying parameters that craft and modify those dynamics.

A CRITICAL ANALYSIS

The main base for the BWSES framework is that of CPR research, which had departed from game theory hypotheses involving actors. In game theory, actors' choices are the result of a series of rational decisions based on a cost-benefit analysis supported by a hierarchy of stable preferences. These hypotheses rapidly came to seem unsatisfactory in the light of CPR field findings. In particular, through the study of social dilemmas, it appeared that actors did not always follow their rational self-interest. Indeed, contrary to what Hardin, based on the self-interest hypotheses, had forecast in his 'Tragedy of the Commons', people often chose to cooperate. By introducing temporal parameters, what seemed irrational in the short run (i.e., entering into collective arrangements) became rational in the long run, as it allowed the sustainability of the exploitation. In game theory terms, the 'benefits' of cooperation outweighed the costs of it. Another finding of CPR theory (again as expressed in game theory terms) was that the outcomes of past interactions (i.e., the repetition of games), leading to the creation of social capital, had an influence on future decisions.

CPR scholars progressively transformed the self-interest hypothesis into 'self-interest with social inclinations and bounded rationality'. This was particularly useful in translating the changing positions actors might adopt when fulfilling different roles in crafting rules. As McGinnis explains:

operational choices routinely involve calculations of individual self-interest that might seem inappropriate for those participating in the self-conscious design of new institutions or constitutional frameworks. This is not to say that self-interest is totally absent in any of these settings, but we may still observe variation in the extent to which strategic calculations are expressed,

and in the patterns of behaviour exhibited in different settings (McGinnis 2010a, 9).

The economic hypotheses CPR research departed from have subsequently been modified in the light of empirical findings, to include social dynamics such as trust, reciprocity or leadership. Yet, I argue that this heritage has still significantly shaped the research hypotheses of the BW. Firstly, the CPR research never abandoned the perspective on shares, which is typical of the objectification of nature and does not leave much space to explore ‘conceptions’. For example, in the BWSES framework, the second-tier variable ‘economic value’ appears to be the only kind of ‘value’ taken into account as part of the ‘resource units’ variable. Yet, anthropological research has illuminated cases where religious or aesthetic values are as important as economic value, which suggests that these are context specific.

Additionally, the difference between descriptive variables and conditions for sustainability in the framework is unclear. Some of the variables used can indeed be easily agreed upon as descriptive. ‘Location’ of the resource system is an example of this. The *expression* of the location of a resource system can be done in different ways; it can be socially constructed in different fashions, but these are different descriptions of the same thing. On the contrary, ‘economic value’, as a characteristic of the resource units, is not entirely descriptive. It is rather a qualified description. Indeed, it necessarily orients the analysis in one direction, as opposed to ‘value’, which would be more of a descriptive category. The category ‘economic value’ selects one kind of value and posits it as the relevant kind of value, excluding others. Moreover, the same kind of value might differ across regions. Indeed, the economic value of the resource is relative to the economic value of other elements in the community.

Further, taking some categories as ‘descriptive’ effectively silences their politicization and the power struggles inherent in them. For example, the concept of ‘leadership’ does not

lead to an exploration of the differences in conceptions and issues around authority or power. Indeed, the idea of ‘leadership’ appears as uncontested and apolitical.

This is not to deny that some of the analytical tools that the BWSES provides are useful for the analysis of institutions. The question that arises is rather how to use the framework while freeing it from the hypotheses that hinder the exploration of the underlying social variables. Indeed, the BWSES tools would need to be adapted to serve better the purpose of investigating the interactions in the SES. Such a task might be achieved through the integration of the RASES and BWSES.

2.3. TAILORED FRAMEWORK TO EXPLORE LAKE TITICACA

I. LINKING THE RA AND THE BW FRAMEWORKS

Before the BWSES and RASES frameworks can be integrated, we need to address their fundamentally different conceptions of complexity. As the BWSES list of second-tier variables suggests, it appears that the Bloomington scholars have not entirely abandoned the ideas – or at least the vocabulary – typical of the ‘static’ view of ecosystems. Indeed, the sixth property of the ‘Resource Systems’ category is ‘Equilibrium Properties’, and the seventh ‘Predictability’. Presumably, the use of these terms is inherited from the disciplines of economics and game theory that understand the dynamics of a ‘regime’ as responding to a coherent set of rules.

Additionally, sometimes (although not systematically) the BWSES literature defines resource units as ‘inputs’ and resource systems as ‘conditions’ (McGinnis and Ostrom 2011, 16). The ideas of inputs and conditions suggest, yet again, a static view of the ecosystem as well as a separation between the ecosystem and the governance system.

Further, they seem to contradict the very idea of a ‘social-ecological system’. Indeed, if resource units are inputs and resource systems conditions, actors should consequently be considered ‘users’ of the system, i.e., external drivers, instead of an integral part of it. As a matter of fact, the category ‘actors’ used to be called ‘users’ and the term was only modified in an attempt to better translate the multiplicity of actors at play and the complexity of their relationships with the ecosystem (McGinnis and Ostrom 2011).

To be able to capture the role of actors in structuring SES dynamics, I suggest that we consider the system’s complexity from the RA perspective, i.e., taking actors’ dynamics of interaction with the ecological sphere as endogenous variables of the system. The slow variables emerging in the social sphere will appear through the analysis of behaviours and rules in place. In that light, the BWSES tool of the ‘action situation’ is particularly useful in that it allows a focus on specific events of interaction. This tool can be used to explore managerial ‘processes’ (such as monitoring, conflict resolution, policy-making, etc.) but also to investigate other ‘processes’ not taken into account in the BWSES. One category of such processes might be learning processes.

To sum up: from the RASES I will borrow the approach to complexity, the idea of drivers and slow and fast variables to make sense of the interactions, and the focus on change and continuity to understand the differences and repetitions, using the components of resilience as a heuristic tool. I follow the BWSES framework in considering that institutions and rules are key in framing the SES interactions, i.e., in determining slow variables, and I borrow the concept of ‘action situation’ to explore the interactions as they are constitutive of structures.

Notwithstanding the usefulness of associating the BWSES and RASES framework to explore the ways in which actors interact with the lake bays, the tools for investigating

the *reasons* leading actors to follow specific behaviours are still to be found. For that, we need further theoretical insights on actors¹⁰⁰.

II. COMPLETING THE FRAMEWORK AND DEFINING ITS BASES: REFLECTIONS ON ONTOLOGY, NEGOTIATION AND JUSTIFICATION

In its current state, the SES theory does not seem to address satisfactorily the underpinning elements determining actors' behaviours. Particularly, the ways in which they perceive and define the SES are not explored. Several reasons might explain this. For example, the will to find sustainable solutions might deviate the focus from understanding the ways in which people interact with the ecosystem and the reasons they have to do so. The lack of ontological definition of what SESs are might be another reason leading to the silence over actors' conceptions.

A. A WORD ON THE SES ONTOLOGY

Justifying a focus on actors' conceptions in the SES requires first a discussion on the kind of ontological objects that SESs are. Indeed, if SES were real objects it would be justifiable that the literature does not pay significant attention to actors' conceptions. Investigating these issues requires adopting a standpoint on ontological and epistemic

¹⁰⁰ In a 2008 book chapter on complexity and sustainability it was discussed whether the ADICO grammar developed by Ostrom and Crawford would be an appropriate candidate for exploring actors' complexity (Norberg et al. 2008). The ADICO grammar aims at tackling actors' decisions, for which it establishes five variables: the Attributes of the person involved, the Deontic operator ('may', 'must', 'must not', i.e. an operator that guides action respective of the rules), the aim of the action, the Conditions involved and the possible sanctions (Or else) (Crawford and E. Ostrom 1995). I do not discuss in length the ADICO grammar for it was not integrated to the SES framework and presents shortcomings similar to the CPR-inspired conditions, which means it would also need to be completed by having recourse to other literatures. It shall suffice to say here that it does not address situations where actors might have contradictory aims, or where sustainability and uncertainty concerns might produce confusing effects on the deontic operators. It presupposes predefined aims, which excludes the idea that actors craft aims and interests through their interaction with the ecosystem.

matters frequently understated in SES research. Scholars seem to proceed by silently adopting hypotheses inherent to their original disciplines. Unsolved epistemic and ontological debates or well acknowledged disagreements in original disciplines are therefore transported to the SES research. For instance, ecologists who work from a realistic ontological position, treat social-ecological systems as real spatial-temporal units. Yet, realism has been strongly criticized in the past thirty years, as the constructivist perspective gained importance. Nevertheless, Becker argues that because of the importance of empiricism in SES research:

the controversy is sharpened... leaving realistic positions de facto dominant, with epistemological discussions of alternatives being the exception (2012, 16).

The issue is made more complex by the fact that the SESs bring together countless components. On the one hand, some of the SES components are evidently real (like a tree). Even acknowledging that there is a framework to perceive the world it is still possible to argue that what is perceived is effectively the world, and not the framework (Rolston III 1996). On the other hand, some of the SES components are arguably constructed: if the organization of mining activities is defined by the belief that there is a god in the mine, the most relevant aspect of 'the mine' (the god) is a social construction. The classification of certain components is more complex. For instance, 'pollution' is a valuation of the state of the system that encompasses past and present perceptions as well as real phenomena, and both aspects are relevant in determining people's behaviour.

The ontological tension is present in any SES analysis, and it is likely to have an impact on the variables studied. For the investigation here exposed, it is necessary to maintain a focus on actors' perceptions as potentially influencing the kind of regime the SES enters into. Indeed, actors' perceptions of the system and of its components are crucial to understanding the reasons behind their actions.

B. INVESTIGATING ACTORS' CONCEPTIONS

Actors' understandings are revealed both through their actions and their discourses. The sociological theory of 'justification' argues that actors' justifications of actions are particularly revealing as to how they understand the world in which they operate. Driven by a will to explain conflicts and misunderstandings in the corporate and industrial worlds, French sociologists Boltanski and Thévenot investigated the ways in which people justify their positions and decisions (1991). Yet, their theory can be used well beyond the private-sector settings. Their main thesis is that people operate with different 'spheres of coherence' that they also call 'cities'. They contend that people appeal to those 'cities' to legitimate their behaviour.

Boltanski and Thévenot distinguish six such 'cities': the merchant city, the inspired city, the industrial city, the domestic city, the city of opinion and the civic city. A city is defined by the principles of reference, the attributes that are valued and those that are disregarded, the kind of people that are admired and the kind of activities at the core of social life. People can switch from one city to the other – depending on contextual parameters – to advance their case. For example, in an industrial setting, an employee might appeal to the 'domestic' side of her relationship with her boss to get leave during her children's vacation. Furthermore, Boltanski and Thévenot conceptualize actors as *evolving* individuals. Actors associate or fight as a result of values and conceptions of the heuristic system in which any given situation fits. This research is useful because it allows us to explore the potential multiplicity of actors' perceptions of the SESs and overcome potential contradictions in actors' narratives.

While I do not follow strictly the system of six closed 'cities', I borrow the rationale of the analysis, which allows me to introduce values and conceptions in the analysis of actors' interactions. I follow the idea of potentially competing 'cities' (or to put it more

bluntly, ‘logics’), i.e., internally coherent systems of interpretation and value production, within each actor. But, being internally coherent does not mean those systems are fixed. On the contrary, to explore the fluidity of these ‘cities’ – which distinguishes this analysis from that of Boltanski and Thévenot – I complete the framework with concepts developed in the theory of ‘negotiation’ to which I turn now.

Negotiations are processes bringing together actors in need of agreement to achieve something (Goldman and Rojot 2002). The idea of ‘negotiation’ is useful to approach the interactions between actors holding competing views, or operating with different ‘cities’ in mind. It is typically posited that actors entering a negotiation defend conflicting but not irreconcilable positions. The concept of ‘negotiation’ has been used as an analytical tool in different social sciences disciplines such as sociology, game theory and the interdisciplinary area of conflict resolution.

The first uses of the concept of ‘negotiation’ appear in the field of sociology. The French sociologist Michel Crozier worked on it as part of his research on bureaucracies (Crozier 1963). The work of Crozier and his colleagues was in the first place deeply influenced by several schools of American sociology. On the one hand, they built on the study of organizations, which brought together Alvin Gouldner, William Foot Whyte and Herbert Simon (Kuty 2008). On the other hand, they were inspired by the empirical research on actors conducted by Elton Mayo and theoretical sociologists such as Talcott Parsons.¹⁰¹ From the last two, Crozier borrowed the variables of autonomy and motivation, which allowed him to include feelings, values and strategies as elements determining actors’

¹⁰¹ The concept of negotiation has since then been used in several disciplines, and the hypotheses on actors have changed from one discipline to the other. For instance, in economics and game theory, actors participate in the negotiation with clearly defined preferences. In sociology, actors are believed to have complex and potentially contradictory interests.

behaviours. For Crozier and those who use his work, negotiations are visible processes, as concrete moments that bring actors together (Dupont 1994; Fisher, Ury, and Patton 2006).

From the environmental conflict resolution perspective, ‘negotiation’ is one of the alternatives to a ‘composition’, an umbrella term accounting for all kinds of interactions between actors. In environmental conflict studies, negotiations are a middle ground between ‘conflict’ and ‘cooperation’ (Mermet 2012, 71). From this perspective, negotiations can intervene at different steps of collective action and are in turn constituted by different phases. They are structured mainly through the propositions, the attempts at imposition, and the oppositions received in conducting action (Mermet 2009). Indeed, different actors come to the negotiation table with very different underlying power, influenced by external circumstances. It is through negotiations that different positions are redefined. This brings further complexity to the system, since changes in positions, in turn, make new negotiations possible. Furthermore, several negotiations can happen simultaneously upon the same subject. War and diplomacy are the typically given examples.

Negotiation resonates with the Habermasian concept of deliberative democracy. Habermas presents deliberation as a form – the desirable form, of decision making (Habermas 1998; Habermas and Rehg 1996). However, Habermas builds his theory on the liberal tradition’s belief that institutions can be neutral.¹⁰² By contrast, negotiation

¹⁰² Contrary to what the liberal tradition asserts, numerous schools in political science show that institutions are never neutral (Burns and Stöhr 2011; Eckersley 2004). As Leftwich, following Schattschneider, puts it, all rules rest on distributing “advantage to some and disadvantage to others, just as the rules of badminton favour the agile and the slim, whereas the rules of sumo wrestling manifestly do not. As Schattschneider (1960, 71) observed, all institutional arrangements express a ‘mobilization of bias’ in one particular way or another” (2007, 10).

theorists invite us to pay attention to the presence of power imbalances in institutions and to the weight of pre-existing structures. These can be contested, as they are themselves the outcome of previous negotiations. The values on which they are based can also change, depending on the ‘city’ that each actor is aligned with. Moreover, the concept of ‘negotiation’ when used to understand apparent contradictions in actors, will allow us to understand how actors try to accommodate and hierarchize the logics of different ‘cities’.

In sum, linking the RASES and BWSES frameworks has allowed me to refine my approach by bringing in elements from both frameworks. From the RASES framework I take the understanding of actors as part of the system and the conception of social variables as slow and fast variables and external drivers. The BWSES framework highlights the need to study existing rules and their crafting. By linking the two, the issues that none of the frameworks address have also emerged. The lack of ontological clarity over what SESs are seems to lead to the silencing of crucial aspects of actors and particularly the problem of integrating their complex perceptions and understandings. Actors’ interests can be ambivalent or even contradictory, and fit different spheres of coherence. Their interactions are approached as the interplay of those interests in contexts of negotiation. Indeed, the concepts of justification and negotiation provide me with analytical tools to identify the reasons actors might have for behaving in certain ways.

2.4. CONCLUSION

In this chapter I have discussed the theoretical pillars of the thesis, and I have offered analytical insights that will allow me to make sense of the complexities of the field. I have explained the two main approaches to SES, as SES research allows us to thoroughly

explore ‘change’ and ‘continuity’. I have shown an awareness of the theoretical shortcomings that emerge when focusing on the first ‘S’ of the SES and have borrowed concepts from sociology to overcome them and build a sound framework.

Adopting an SES perspective to investigate the research question allows environmental degradation to be conceived of as a dynamic process of interaction between social and ecological spheres. Indeed, environmental degradation should be understood as an evolving process that is explained by the interplay of certain social-ecological variables. Through the analysis of SES literature, it has emerged that SESs are complex systems and that it is therefore not possible to understand the totality of their functioning. To serve the purpose and scope of this thesis – and answer the question *‘how do actors interact with degraded ecosystems?’* – and to address what appears to be a gap in the literature, I have argued that it is necessary to focus on the variables determining actors’ behaviour and the interplay between different sets of actors in the SES. Actors are considered part of the SES as they are at the origin of certain slow and fast variables, under the effect of external drivers. Those variables have an impact on the latitude, resistance, precariousness and scale-sensitivity of the system, determining its resilience.

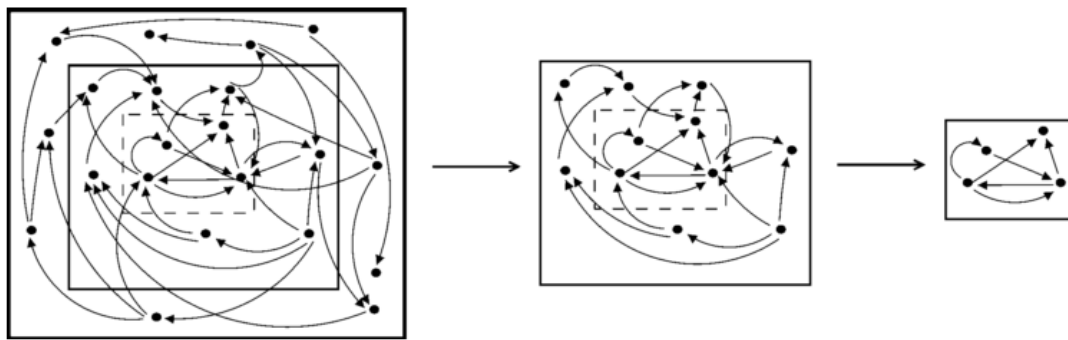
In order to explore the variables and external drivers determining actors’ conceptions and behaviour, I have built an analytical framework that combines tools from both SES schools and brings in concepts from sociology. Indeed, while the SES perspective structures my analysis, the concrete analytical tools provided by the schools discussed here need to be completed with other bodies of scholarship. I have tried to show that the SESs frameworks alone do not lead to a thorough exploration of the social slow variables at play in the system, and particularly do not encourage the analysis of the variables that have led to unsustainable situations. This does not mean that the RASES and BWSES analytical tools should be disregarded. On the contrary, the ‘action situation’ is an

analytical tool that allows us to isolate and deconstruct the interactions between the relevant elements of the system. The exploration of the variables that determine the outcomes of different ‘action situations’ is made possible through the conceptualization of actors and the nature of their interactions as explained through the inputs from ‘negotiation’ and ‘justification’ theories. This allows taking full account of the values and interests that actors hold, while understanding them as dynamic and partially redefined by interaction with others. Once SESs are understood as hybrid objects, the importance of actors’ perceptions logically follows. Indeed, at a time of theoretical development when SES research is paying further attention to changes driven and affecting multiple variables, it is paramount that a full account of actors be provided.

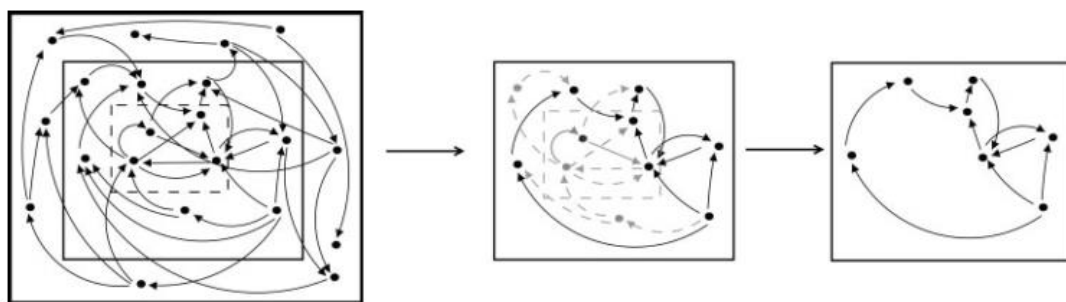
This chapter has introduced a significant amount of new vocabulary. The reader will be reminded of the meaning of key terms when necessary and these will be supported by the use of common terms that convey similar meanings when possible. For example, we will explore the ‘logics’ and ‘rationales’ behind the actors’ justifications of their actions and behaviour, without necessarily integrating these in the strict framework of the ‘cities’. This is possible because the framework is used to interpret the field. While the findings will allow to suggest the polishing of certain aspects of the framework, the thesis does not aim at testing it.

The logic of my research project is illustrated by the figures below.

FIGURE 5 RESEARCH PROJECT¹⁰³



PERSPECTIVE 1



PERSPECTIVE 2

These figures illustrate different aspects of the SES. The first stage, which is identical in the two figures, illustrates a complex SES at any given time. The dot on the top right corner of the larger square is taken to represent an external driver. As the arrows indicate, it has an impact on elements in the system but is not affected by it. The rest of the dots represent internal variables, disregarding distinctions between fast and slow variables. The first figure illustrates a lower scale set of structuring interactions in the SES while the second exposes a specific set of variables across several scales. The dots represent the action situations that determine and are determined by negotiations over different sets of rules, values and interests.

¹⁰³ These figures are adapted from Chu, Strand, and Fjelland (2003), who use them to illustrate the radical openness and contextuality of complex systems.

My study offers a combination of the two visions. On the one hand, it presents the patterns that lead to the eutrophication of the Titicaca bays and the subsequent modification of certain patterns of interaction with the ecosystem (Chapters Three and Four). On the other hand, it focuses on one kind of variables across scales: the social (Chapters Four, Five, Six and Seven). The next chapter fulfils a double role: it describes the case and explains the methodology used.

CHAPTER 3. SETTINGS AND METHODS

“Is it possible to reverse the tendency of a state that is made to exploit resources? It will be a very difficult process, Evo¹⁰⁴ himself says ‘we have the government, but not the power’, I think it depends on whether Evo – or rather, the government, let’s not personalize – whether it manages to make people part of the process.”

Officer at the NGO Andean Coordinator of Indigenous Organizations (NGOCAOI)

“[T]here are many unused resources that cannot be traded, that do not receive investment and do not create jobs. And all this because of the taboo of already past ideologies, idleness, laziness or the law of the dog in the manger that says, ‘If I do not do it, then let no one do it.’”

Alan García, President of Peru, *El Comercio*, 30 October 2007.¹⁰⁵

INTRODUCTION

There are numerous studies on the limnological and ecological properties of Lake Titicaca.¹⁰⁶ Studies on the complex management system in charge of the lake are, however, rare. The academic studies that exist only cover part of the system.¹⁰⁷ Institutional reports¹⁰⁸ adopt a broader scope, but do not investigate the underpinnings of the governance arrangements. Neither do they fully address the question of the interaction between diverse sets of actors and the ecosystem. This thesis hopes to go some way towards filling this gap.

¹⁰⁴ Evo Morales, Bolivian President.

¹⁰⁵ When references are not in English, translations are mine.

¹⁰⁶ See for example: Canales Gutiérrez (2010), Dejoux and Iltis (1991), Fontúrbel (2005), Maldonado and Calle (1998), Martínez Gonzales et al. (2003), Northcote (1989), Taborga and Campos (1995), Tyspa and Prointec (2004), Wagner (2009).

¹⁰⁷ Leaving aside the historical and archaeological studies over the ancient management of the system, those focusing on contemporary management are: Guevara Gil (2008), Kent (2006; 2008), Laba (1979), Levieil and Orlove (1990), Orlove (1991), Rieckermann et al. (2006), Vallas Gaona (2006).

¹⁰⁸ The most comprehensive study of Lake Titicaca to this date is the UNEP report *Geo Titicaca* (The report is in Spanish: PNUMA 2011). Also worth mentioning are the PDSLIT *Estado del Lago* (World Bank et al. 2009) and the *Diagnóstico Ambiental* of the ALT which includes an exposition of the management system of the time, written by the Comité Ad Hoc de Transición de la Autoridad Autónoma Bi-Nacional del Sistema TDPS, Programa de las Naciones Unidas para el Medioambiente, and Departamento de Desarrollo Regional y Medioambiente, Secretaría General de la Organización de los Estados Americanos 1996.

In order to initiate the investigation, it is necessary to provide some background on the unique context of Lake Titicaca's system changes. Peru and Bolivia are resource-abundant countries, ranking high in biodiversity, mineral and freshwater reserves, notwithstanding the contrasts within their territories (Baud, Castro, and Hogenboom 2011). Since colonial times and to this day, the countries' economies have been based on the exploitation and export of raw materials (E. Cárdenas, Ocampo, and Thorp 2000; Dancourt 1999).¹⁰⁹

Despite significant differences in terms of GDP per capita (6,806 USD in Peru and 2,625 USD in Bolivia)¹¹⁰, and also in terms of development policy approaches, Bolivia and Peru have performed similarly in recent years.¹¹¹ In both cases, this was the result of increased volumes of trade in non-renewable resources backed by neoliberal policies.¹¹² To give an indication: in 2011, 32 per cent of Bolivian exports was mining products and 42.3 per cent natural gas; 54 per cent of Peruvian exports was mining products.¹¹³ However, the dependence on resources has threatened environmental resources, which has not been fully addressed by legislation. This has had negative repercussions for the people whose livelihoods depend on environmental resources. The case of Lake Titicaca encompasses some of the environmental challenges linked to the models of development the countries have embarked upon.

¹⁰⁹ See also the website of the Inter-American Development Bank, entry "Environment in Latin America and the Caribbean" (2013).

¹¹⁰ The website of the Economic Commission of Latin America and the Caribbean (hereafter ECLAC), entry "Country Profiles" (2013).

¹¹¹ IMF "Survey Magazine" (22 February 2013) and the associated "Country Report" (2013) on Peru (13/45) and the IMF "Country Report" (2012) on Bolivia (12/149).

¹¹² On the whole region: Castro Diaz (2007). On Bolivia: World Bank (2000), Wiggins et al. (2006). On Peru: Castillo and Montoro (2006), specifically on mining: Bebbington et al. (2008), Bebbington and Bury (2009).

¹¹³ The website of ECLAC (2013).

3.1. FOCUS ON LAKE TITICACA

Lake Titicaca is located between the east and west Andean ridges, at 3,800 meters above the sea, which makes it the highest navigable lake in the world. Four-fifths of the lake's sources, situated in its northern part, are in Peruvian territory and flow from the rivers Ramis (31%), Ilave (15%), Coata (11%) Huancané (7%) and the bi-national river Suches (6%). The Bolivian river Katari (7%) completes the stream flow. Together, the rivers provide about 77% of the inflow. Precipitation provides the rest of Titicaca's water. Annual rainfall varies from 800 to 1,400 mm, with the rainy period running from December to March (Revollo, Liberman Cruz, and Lescano Rivero 2003). Floods might occur during this period. However, the lake is subject to strong solar radiation, which provokes intense water evaporation. The lake provides a climatic regulation service to the region.

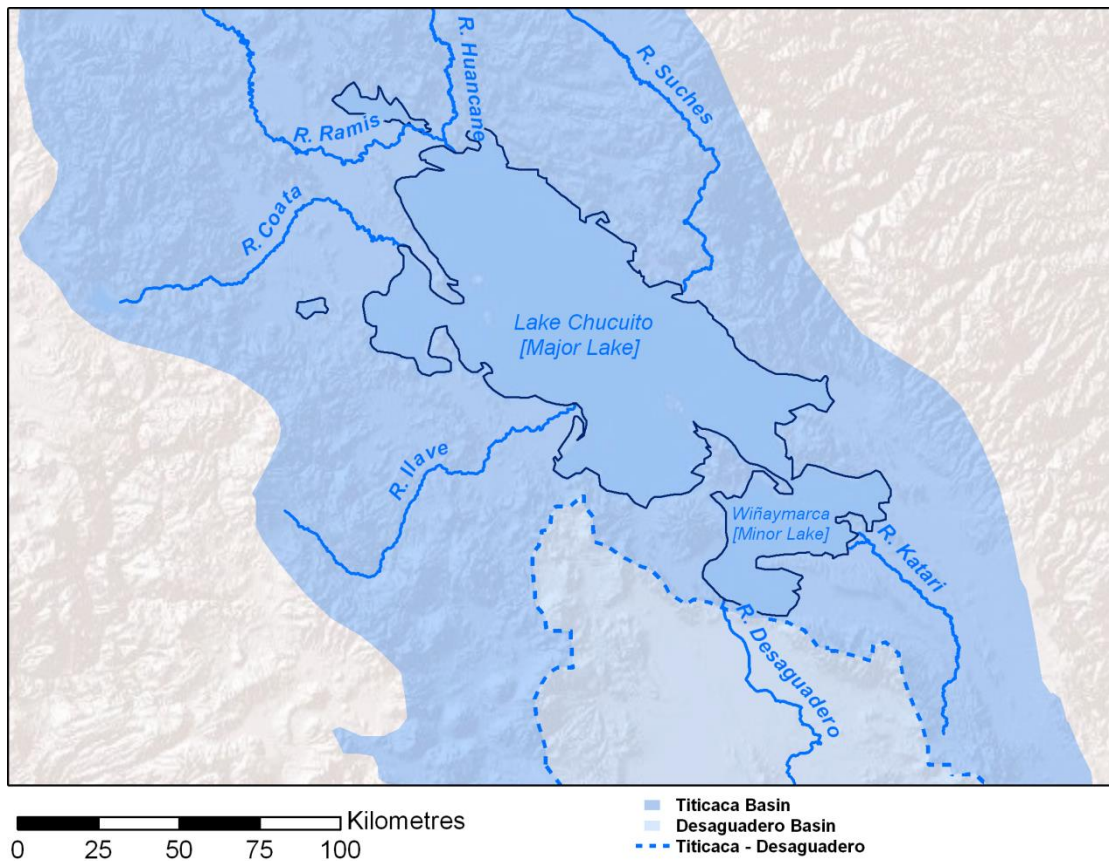


FIGURE 7 TITICACA BASIN (MY ELABORATION)

The lake belongs to the Titicaca – Desaguadero – Poopó – Salar de Coipasa (TDPS) basin that includes the lake’s basin, the basin of the bi-national Desaguadero River – which constitutes the only outflow of Lake Titicaca – the basin of Poopó Lake and the Salt Lake of Coipasa. The TDPS basin covers 143,900 square kilometres of mainly Bolivian territory, with a significant area in Peruvian territory and a small portion in Chilean territory. The Titicaca sub-basin is situated in the Altiplano region and contained within the administrative regions of La Paz in Bolivia and Puno in Peru.

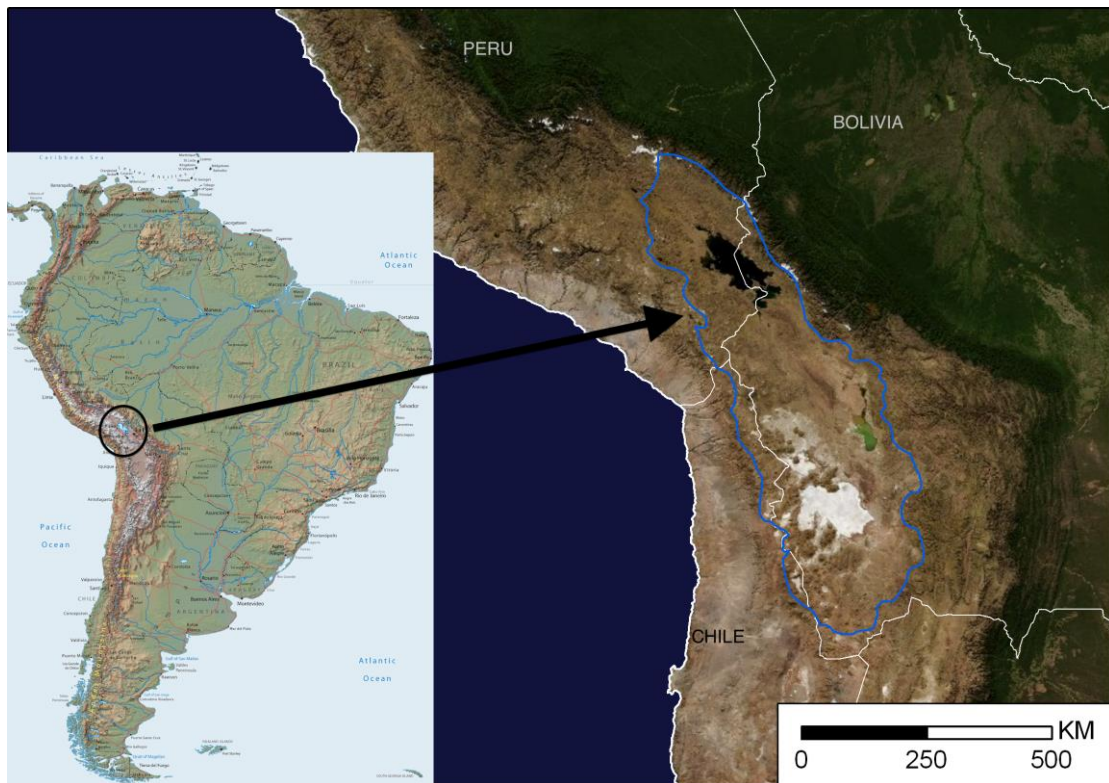


FIGURE 8 TDPS BASIN (MY ELABORATION)

The area around Lake Titicaca is mainly rural, even though it hosts the cities of Puno and Juliaca in Peru and those of Viacha and Laja in Bolivia. The inhabitants of the area have traditionally undertaken a mix of activities for their subsistence (Stanish 2005). These include fishing, agriculture, mining and commercial activities. More recently, the area has also become an important tourist destination. Additionally, as a frontier area, the commercial and personal transportation sectors have provided an important source of employment, in particular in the border cities of Desaguadero and the tourist cities of Copacabana (Bolivia) and Puno (Peru).

The lake has played a crucial role in sustaining the different activities undertaken by the lakeshore's populations. Indeed, fishing has been a source of income for lakeshore communities since pre-Incan times. While traditional fishing is still important in the

region, aquaculture now largely outweighs it. Fish is not the only resource that the inhabitants of the lakeshores have traditionally used. In particular, the lake reed maces (*totoras*) have been extensively used as a source of building material. For example, the Urus, one of the indigenous groups present in the area, live on human-made islands built with *totoras* reeds. More widely, *totoras* reeds are used for the building of boats¹¹⁴ and handicrafts. With the introduction of cattle to the area, they have also been used as a source of food for the animals.

Combining lake resources with agricultural activities is a long-term practice for the lake inhabitants. Typical crops include quinoa, potatoes and barley. Livestock raising has developed significantly in recent years, becoming particularly important in some of the lake areas. For example, as I discuss later, in Cohana, livestock replaced fish as a source of income when fish migrated to interior parts of the lake as a result of pollution.

Migration to the regional urban centres and mining areas provides an important source of income for the people of the region as pay is sent back to the family home. In Bolivia, migration is mainly from the rural areas to El Alto, a satellite city of the capital La Paz. The city emerged in the 1980s, receiving migrants from across the Bolivian Altiplano area and in particular from former mining regions. In Peru the migration patterns from the rural areas target the capital of the region, Puno, the commercial city of Juliaca and the gold mining regions of La Rinconada and Ananea. Even though there are no official

¹¹⁴ These boats are no longer used for transportation, but they are used for recreation and tourism.

figures, it is estimated that between 50,000 and 100,000 people participate in artisanal mining activities in the region.¹¹⁵

Finally, the lake has also become an important magnet for national and international tourism. The lake is a place of worship and has been a place of pilgrimage for both Bolivian and Peruvians, notably during the folkloric festivals in Puno (February) and the Virgin festival in Copacabana (also in February). Nowadays, the lake constitutes one of the main tourist destinations of each country for both foreigners and nationals.¹¹⁶

In this section, I discuss the history of the state presence in the region, focusing on the role this area played in the national project of each country. This will allow us to fully grasp the ways in which the current management system was established. We will also explore the interventions that had a lasting effect on the ecosystem. The history of state interventions and the attempts at developing the area inform about the interactions between the population and the state and highlight the low development the area still presents. Among the problems it faces, the pollution of the basin is crucial. I discuss the different causes of this problem. I finally present the institutional web that is competent over this problem in the different administrative divisions of the Titicaca basin.

¹¹⁵ My interviewees frequently referred to these estimates, which also appear in the regional press. An example is to be found in the article “11,000 Mineros Informales de Puno Iniciaron Formalización.” *Andina* (12 July 2012).

¹¹⁶ The website of MINCETUR (Ministry of Tourism – Peru), entry “Plan Estratégico Nacional de Turismo del Perú” (2013) and the “Encuesta Gasto del Turismo Receptor y Emisor 2010”, Instituto Nacional de Estadística, Bolivia (2013).

I. BRIEF HISTORY OF STATE INTERVENTIONS FOR DEVELOPMENT

Traditionally, the highlands, because of the poverty of their land and isolation, were neglected by national states and retained pre-colonial systems of management.¹¹⁷ However, starting in the 1930s, several bi-national management agreements were signed that targeted economic development and natural risk management. After the 1970s, both of the states implemented a series of policies aimed at promoting the area's development from a more comprehensive perspective. These had lasting effects on the management system of Lake Titicaca.

A. BI-NATIONAL INTERVENTIONS

The first state intervention over Lake Titicaca came in the 1930s when post-colonial Bolivia and Peru were searching for new opportunities to develop. It took the form of a joint initiative to develop commercial fishing by introducing rainbow trout to the lake.¹¹⁸

¹¹⁹ The 'scientific' basis of the initiative was to be found in the late nineteenth and early twentieth century literature, which had pointed to the 'poverty' of local fauna (Agassiz 1876; Bandelier 1905).

Trout production experienced a boom in the 1950s and 1960s, and was again supported by a joint agreement for the development of the fisheries in the lake.¹²⁰ When it became

¹¹⁷ J. D. Cameron (2010), M. Cameron (2011) and De Mesa, Gisbert and De Mesa Gisbert (2008), Van Cott (2008).

¹¹⁸ Convención Preliminar para la Explotación de Pesquerías en el Lago Titicaca, Ministerio de Estado en el Despacho de Relaciones Exteriores del Perú – Embajada de Bolivia en Perú, 17 July 1935.

¹¹⁹ The introduced species were *Salmo gairdneri*, *Salmo trutta*, *Salvelinus namaycush* and *Basilichthys bonaerensis*.

¹²⁰ Notas Reversales de 9 de noviembre de 1954 para el Fomento de la Reproducción Artificial de la Trucha y Otras Especies, Ministerio de Relaciones Exteriores de Bolivia y la Embajada de la República del Perú.

clear in the 1970s that the introduced species were eating the endogenous fish, the trout were held in floating cages. But the trout also brought new diseases and parasites to the lake that some endogenous species could not cope with; consequently some of them disappeared (Soruco 2010). Trout rearing has now stabilized and constitutes one of the main sources of income for local populations, especially on the Peruvian side of the lake where it has been further developed over the last three decades (PNUMA 2011).

In 1955 and 1957, several agreements established the necessity of conducting studies on the development of the railway in the region, economic and oil issues and the “exploitation (*aprovechamiento*) of the Lake Titicaca water”.¹²¹ In the years that followed these agreements, studies on diverse aspects of the development of the area were conducted.¹²²

The institutionalization of the joint management accelerated in the 1980s. The tremendous floods that hit the region in 1986, in particular, led the states to assess future risks. The European Union supported the ‘Joint Commission for the Development of the Integration Zone of Lake Titicaca’, composed of Peruvian and Bolivian sections.¹²³

Between October 1989 and June 1993, through a series of consulting sessions funded by

¹²¹ Convención Preliminar para el Estudio del Aprovechamiento de las Aguas del Lago Titicaca, Ministerio de Relaciones Exteriores y Culto de Bolivia – Ministerio de Relaciones Exteriores del Perú, 30 July 1955. Convenio para el Estudio Económico Preliminar del Aprovechamiento de las Aguas del Lago Titicaca, Embajador Extraordinario y Plenipotenciario del Perú en Bolivia – Ministro de Relaciones Exteriores y Culto de Bolivia, 19 February 1957. Ratified by the Peruvian Congress on the 31 October 1955 through Legislative Resolution 12857 and Legislative Resolution 12857 on the 21 November 1957. It was however, only ratified in Bolivia by Law 905 of 12 December 1986, i.e., thirty years later.

¹²² As detailed in the “Dictamen de la Comisión de relaciones exteriores recaído en el proyecto n°. 2905/97-CR, sobre el acuerdo que aprueba el estatuto y el reglamento de manejo económico y financiero de la autoridad binacional autónoma del sistema hídrico del lago Titicaca, río Desaguadero, lago Poopó y salar de Coipasa, suscrito por los gobiernos del Perú y Bolivia, el 29-mayo-1996”, accessible on the *Peruvian Congress* website.

¹²³ See the above mentioned Dictamen 2905 (1997) for Peru and the Supreme Decree 21846 (1988) for Bolivia.

the European Commission (hereafter EC), the ‘Bi-national General Master Plan for the Development of the Integrated Region of Lake Titicaca’ came to light.

The execution of the ‘Director Plan’ (as it was called and is widely known in the area), a twenty-year framework, was put under the responsibility of the newly founded ‘Autoridad Binacional Autónoma del Sistema TDPS’ (hereafter ALT). It reached its final form in 1995.¹²⁴ ALT was founded with a ‘technical’ approach to water management and its main mission was to control the outflow of Lake Titicaca. Its first task was the building of regulation floodgates at the outflow of the Desaguadero River. The work was meant to be completed by dredging the river itself, which, at the time of fieldwork (2010-2011), was around 75 per cent complete.

In the 1990s, the technical understanding of water management was the predominant approach to the basin as a whole. However, as far as the bays were concerned, it is important to note that the conservation agenda set a landmark at the very end of the 1990s. In January 1997, Peru declared its side of Lake Titicaca a wetland of international importance. Bolivia did the same for its side in August 1998. This means that both countries are signatories of the ‘Ramsar Treaty for the Conservation and Wise Use of Wetlands’, which provides a (loose) framework for national actions of protection and international cooperation.

B. NATIONAL INITIATIVES

Aside from the joint agreements passed between both countries, Peru seemed to pay more attention to the region from the 1950s. Numerous projects, such as irrigation and

¹²⁴ It is worth mentioning that at the end of my fieldwork (2011), the Director Plan was under revision and being updated.

hydro-electrical production were designed, building on the idea that the region's potential had been underestimated (Deustua Caravedo 1989). However, they did not receive the required funding to go forward (Guevara Gil 2008).

It is particularly important to note that, in 1978, the Peruvian military government implemented a top-down conservation initiative. It created the National Reserve of the Titicaca (hereafter RNT) to “rationalize the fauna and flora of the lake” (Guevara Gil 2008). The RNT faced conflicts with local populations, especially around the definition of property rights.¹²⁵ All sources agree that there was a conflict on territorial property rights between peasants and the state, represented by the RNT. The exact details of these conflicts are, however, unclear. In his founding work, *Mapping Reeds and Reading Maps*, anthropologist Benjamin Orlove argues that the Reserve's mandate to protect reed maces encroached upon the peasants' customary rights. According to Orlove, the peasants managed to obtain recognition of these 'rights' and therefore the Reserve operated with a reduced jurisdiction. Recent research, however, defends that the 'customary territories' were undefined before the Reserve's attempt to establish its borders (Kent 2008). According to Kent, it was in the negotiation process that peasants mobilized the 'customary rights banner' as a tool to secure access to the wetlands and to the totoras.¹²⁶

Additionally in the 1980s, Peru opened development offices in the majority of the country regions, including Puno. The Proyecto Especial of Lake Titicaca (hereafter PELT), designed in Lima and dependent, at the time of its foundation, on the National Institute of Development (hereafter INADE), was in charge of conducting a number of

¹²⁵ See Guevara Gil (2008), Kent (2008) and Orlove (1991).

¹²⁶ Nowadays the reserve has two areas, one close to the city of Puno and the other one further north. Its declared mission is protecting the lake biodiversity in cooperation with the local population. Its resources are indeed partly exploited by the local populations in coordination with the RNT officers.

irrigation projects in the early 1990s.¹²⁷ The institution came under the (at least formal) control of ALT when the later initiated its operations in 1996.

More recently, regional and local organizations have been given a bigger role in managing the area. Indeed, Peru initiated the decentralization process in the 2000s – after ten years of the centralized Fujimori rule – with limited success (Eaton 2010; Arellano-Yanguas 2011).

In Bolivia, the most significant effort to develop the area came only in the 1990s through the drive for decentralization, which brought a share of national resources to the region. The (first) government of Sánchez de Lozada (1993–1997) implemented a set of laws that aimed at decentralizing the state apparatus. The Law of Popular Participation (hereafter LPP) established a per capita decentralization of resources, which brought a relative increase in the national budget delegations received by the municipalities in the highlands. Some twenty years after the implementation of the law, research in the area has shown that its outcomes were not always the expected.¹²⁸ For example, resources were spent poorly in the Altiplano city of Viacha, resulting in no improvement to the local livelihoods (J. D. Cameron 2009; Faguet 2001).

As the table below summarizes, a significant proportion of the population of the area (both in Bolivia and Peru) still lives below the poverty line and lacks access to basic services such as sanitation.

¹²⁷ Supreme Decree 23-87-MIPRE (1987).

¹²⁸ See J. D. Cameron (2010) and Gray-Molina (2004).

TABLE 3 DEMOGRAPHIC AND SOCIOECONOMIC INDICATORS (BASED ON PNUMA 2011)

Indicator	Bolivian Sector	Peruvian Sector	TDPS Total
Total Population	1,894,245 (2009)	1,148,112 (2007)	3,042,357
Population Density	21.7	17.3	21.4
Rural Population (%)	53.3	48.6	51.5
Urban Population (%)	46.7	51.4	49.5
Indigenous Population	83.3 (2001)	64.9 (2007)	76.4
IDH (2009)	0.54	0.55	0.545
Pop. Below Poverty Line	82.7	79.2	81.4
Access to electricity (% of total households)	49.8	51.6	50.5
Access to Water Public Network (% of total households)	43.1	26.9	37.0
Access to Sewerage Public Network (% of total households)	20.9	12.5	17.7
Pop. Working Age	1,127,429	760,044	1,887,473
Active Population	573,240	488,103	1,061,343
GDP per capita (USD)	1,652	2,050	1,802

The population of the region frequently suffers gastro-intestinal illnesses, which are partly the result of deficient or non-existent sewerage networks, contact with dirty water and with waste as well as poor access to drinking water (Maydana Iturriaga et al. 2009; PNUMA 2011). UNEP also indicates that the landfills in the region do not comply with international sanitary standards. Moreover, delays in collection periods encourage the accumulation of waste within the cities' walls, which attracts animals such as rats and insects, typical vectors for the transmission of diseases.

Deficient sanitation services are also one of the main sources of degradation of the bays, and therefore represent a threat to the resources that local people use in their livelihoods.

II. POLLUTION

Different human activities play a role in the pollution of the lake. Particularly, urban expansion, and to a certain extent, agricultural activities, are held responsible for the eutrophication of the bays. Additionally, mining activities lead to high concentrations of heavy metals in the basin. The map below summarizes the situation as presented by the different organizations working in the area.

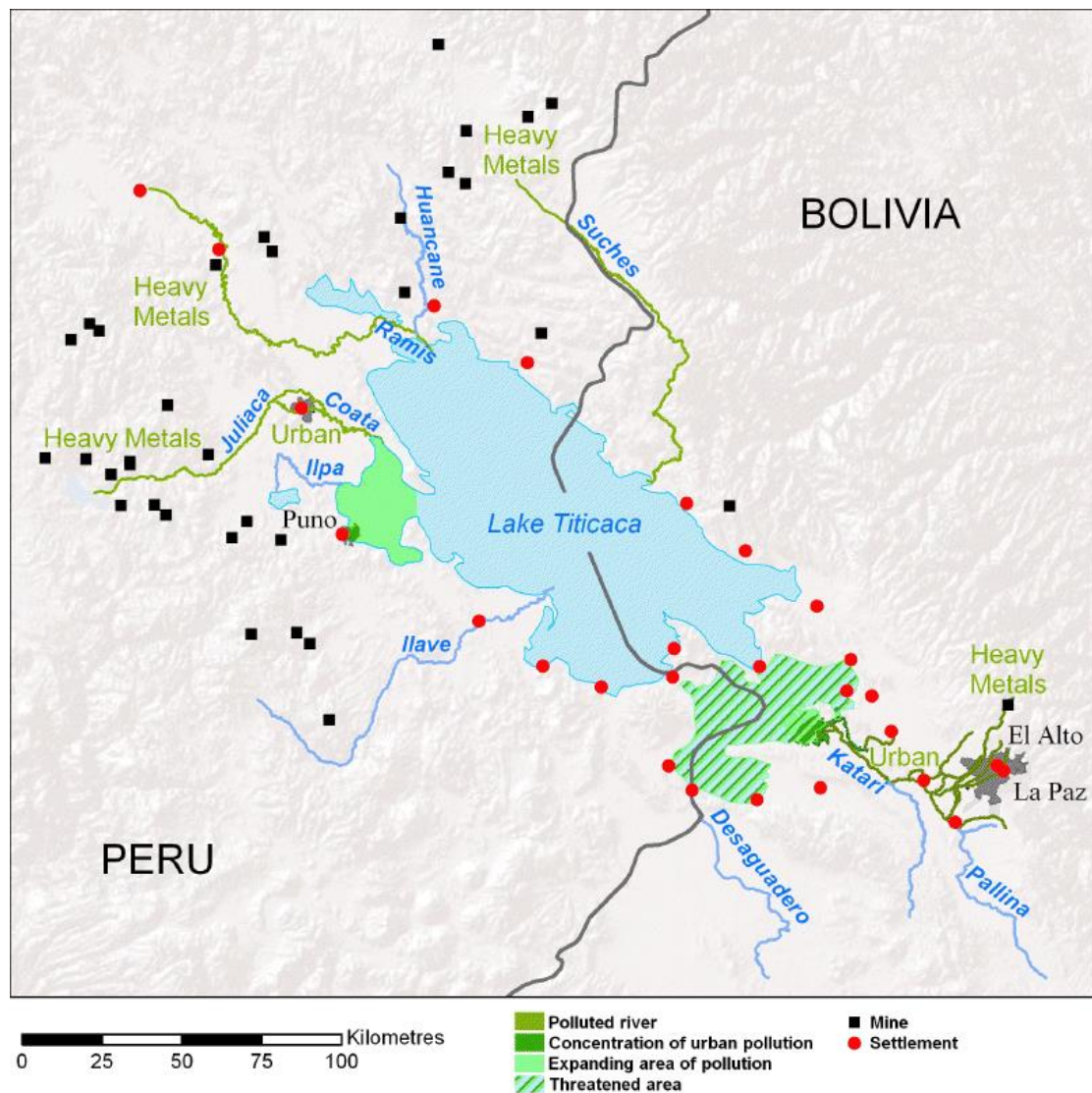


FIGURE 9 PRESSURES TO THE LAKE (MY ELABORATION)¹²⁹

The map situates the mining and urban settlements and indicates the state of the rivers. It also specifies the main cause of pollution in the rivers as well as the approximate area of the lake affected by it. As can be appreciated from the map, mining pollution originates upstream whereas urban pollution is produced both upstream and in settlements by the lake.

¹²⁹ The terminology used here, and particularly ‘polluted’ and ‘unpolluted’ is analysed in the next chapter. I use it as a tool to convey the reports on the state of the rivers.

A. URBAN WATER AND SOLID WASTE

For the last two decades, wastewater has been deemed responsible for altering the TDPS ecosystems (PNUMA 2011; Ribera Arismendi 2008). In particular, the bays of Cohana (Bolivia) and Puno (Peru) are considered ‘eutrophic’,¹³⁰ a state characterized by booms in plant production, the appearance of toxic cyanobacteria (also called blue-green algae), anoxic events and possibly fish kills.¹³¹

Lake Titicaca receives urban wastewater from several cities. Settlements by the lake, such as Copacabana (Bolivia) or Puno (Peru), have numerous informal sewerage pipes directly connected from houses or hotels to the lake (PNUMA 2011). The formal sewerage coverage in the region is generally low.¹³² The majority of cities only have stabilization ponds where partial treatment is provided: the water is stabilized and suspended solids are removed. This, however, does not ensure that water quality respects the defined chemical standards. Moreover, these ponds are functioning above their capacity, having been built in the 1990s when the population was significantly lower than today.

The treatment plant of the highly populated Bolivian city of El Alto (850,000¹³³), whose water flows into the Cohana bay, does not provide complete treatment of the city’s urban water. The plant, ‘Puchukollo’, was built in 1989 and began operating in 1991. When it

¹³⁰ A eutrophic state is considered reversible when “recovery is immediate and proportional to the reduction in P input” (where P stands for phosphorus), hysteretic when “recovery requires extreme reductions in P input for a period of time” and irreversible when “recovery cannot be accomplished by reducing P input alone” (Carpenter, Ludwig, and Brock 1999, 751).

¹³¹ Clear explanations of these phenomena are given in the EC and WHO report ‘Eutrophication and Health’ (2002). It suffices to say here that decay of algae consumes oxygen, and can thereby create anoxic episodes which suffocate living organisms. Rooted aquatic plants may be lost due to shading by algae suspended in the water. Fish species may be lost due to anoxic events. Loss of rooted plants also reduces food supply and habitat for fishes (Cooke et al. 1993; Olson et al. 1998).

¹³² For a general account see for example the website of the International Institute for Environment and Development, entry “Water and Sanitation” (2013) or the European External Action Service report ‘Regional Environmental Profile. Andean Countries’ (2005) and its updates on Bolivia and Peru, ‘Mid-Term Review and National Indicative Programme 2011–2013’ (2011).

¹³³ The annex to the Supreme Decree 1672 of July 31, 2013 exactly indicates 848,840.

first opened, it was composed of a series of 12 stabilization ponds, designed to provide water treatment services to 430,000 inhabitants.¹³⁴ Currently, the plant is managed by a public-private entity, EPSAS (Empresa Pública Social de Agua y Saneamiento¹³⁵), which replaced the private company, Aguas del Illimani, in 2005. A four-phase renovation of the plant began in 2010 but will not be completed until 2035.¹³⁶ Even then it is unclear if this will be enough to help Cohana since El Alto is characterized by high levels of commercial informality and uncontrolled urban expansion; sewerage is estimated to cover 60 per cent of the city only¹³⁷ and the rest of the population releases its wastewater into the city's internal rivers.

The following map focuses on the segment that includes the flow of El Alto water to the lake, i.e., to the bay of Cohana. It also situates the main cities of the area and the Milluni mine.

¹³⁴ See the report “Geo El Alto: Perspectivas del Medio Ambiente Urbano.” (2008).

¹³⁵ Public Social Company for Water and Sewerage.

¹³⁶ See Ministerio de Medio Ambiente y Agua (2009), Viceministerio de Medio Ambiente Biodiversidad y Cambios Climáticos (2009).

¹³⁷ The website of the Instituto Nacional de Estadística (National Statistical Institute), entry “Estadísticas Sociales” (2013).

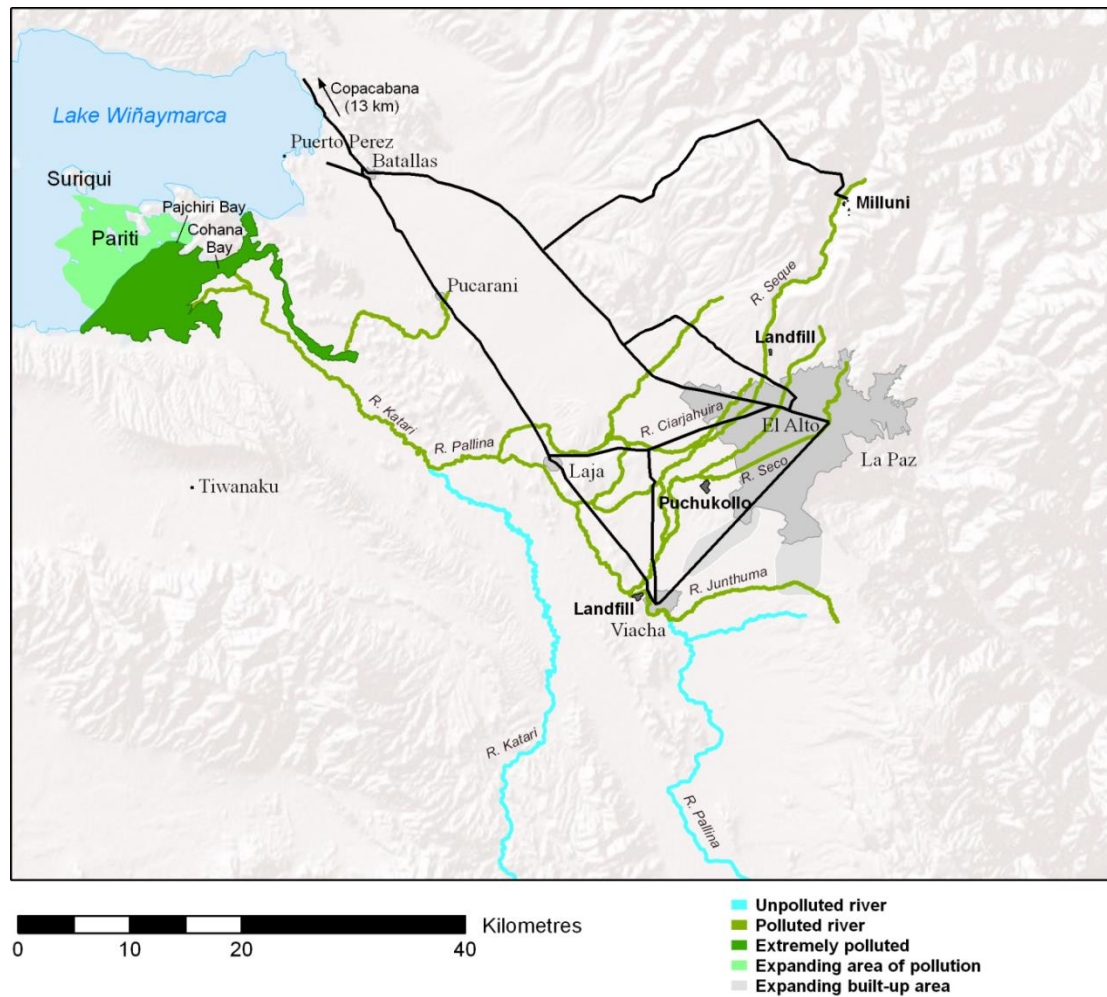


FIGURE 10 COHANA AREA (MY ELABORATION)

As we can see on the map, the river Seco, together with the rivers Ciarjahuirá, Seque and Juthuma join their streams in the river Pallina. This river first crosses the cities of Viacha and Laja, and, having joined the river Katari, they cross the pampas of Cohana. After 68 kilometres, the watercourse reaches the lake. The river Katari brings to the lake an average of 17,000 litres of water per second. This water contains high quantities of nitrogen and phosphorus that accumulate in the lake (Ribera Arismendi 2008). As typically happens in eutrophic lakes, the concentration of these two elements produces a plant, the *lemna gibba*, that covers up to 42 square kilometres of Cohana Bay (World Bank et al. 2009, 31).

The situation is similar in Peru. Only sixty per cent of sewerage connections in the city of Puno are ‘formal’, i.e., opened by the municipal services (Municipalidad Provincial de Puno 2011a). The rest of the city connects its water pipes to one of the 18 canals that make up the matrix of rainwater canals, which send pluvial water directly to the lake (Municipalidad Provincial de Puno 2011b). The *lemna gibba* covered up to 12 square kilometres of Puno Bay in 2008 (World Bank et al. 2009, 31). The presence of the *lemna* modifies ecosystem dynamics: by covering the surface, these plants prevent the sun from reaching the water below, jeopardizing the reproductive environment of fish. This consequently affects other trophic levels (PNUMA 2011).

The values of the Biological Oxygen Demand (BOD)¹³⁸ test in Puno’s wastewater when entering the city’s stabilization ponds are higher than 200 milligrams per litre, and reduce to between 110 and 40 milligrams per litre after treatment, while the permitted level is ten milligrams per litre. Each day the plant evacuates in the lake 4.026 kilograms of nitrogen and 98.3 kilograms phosphorus (Municipalidad Provincial de Puno 2011b, 144).

¹³⁸ Water treatment plants in the region use the biochemical oxygen demand (BOD) test as an indicator of performance in water treatment. BOD measures the quantity of organic ‘pollution’ in the water.

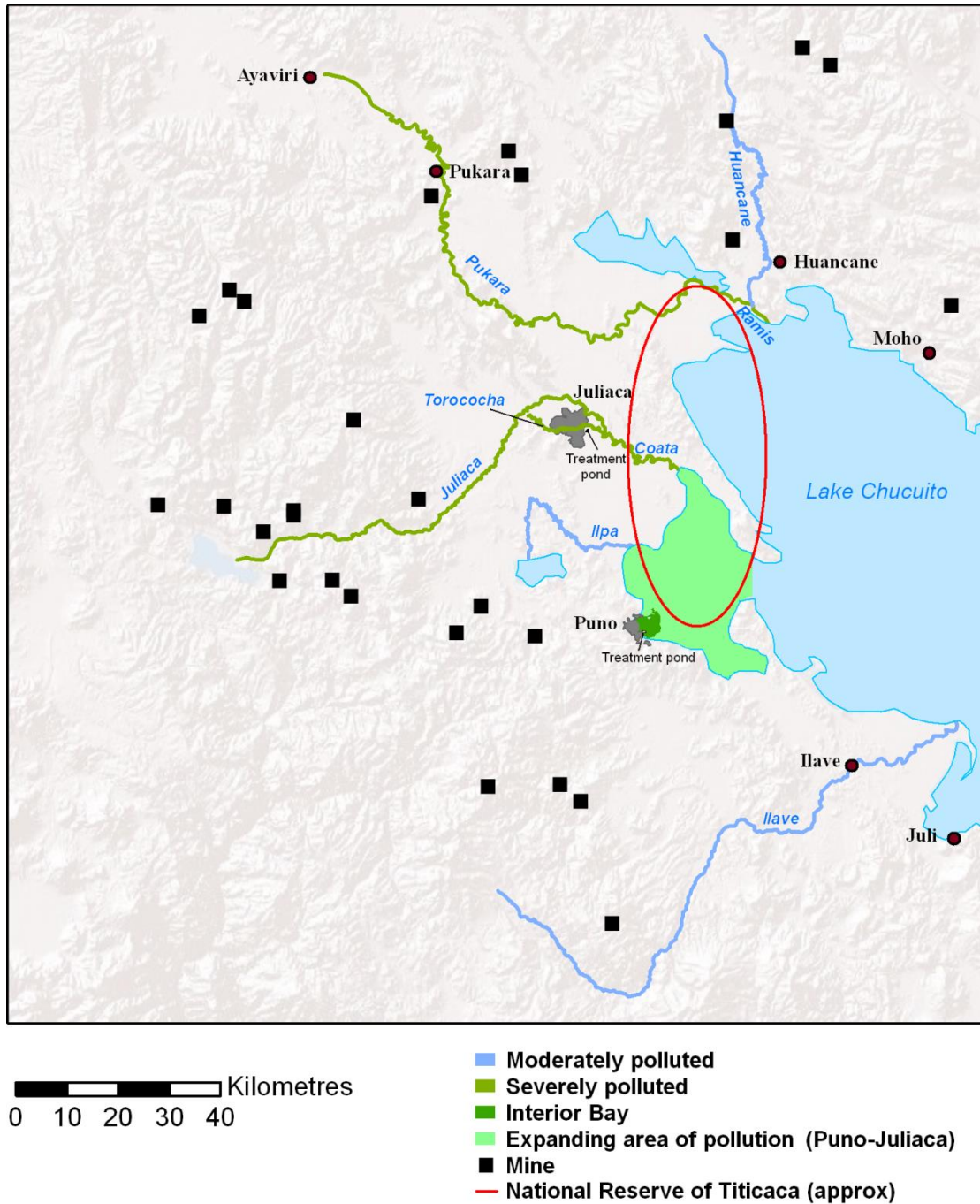


FIGURE 11 PUNO AREA (MY ELABORATION)

A significant cause of degradation of the basin’s groundwater is the large amount of solid waste inadequately managed in the region (World Bank et al. 2009). The majority of this waste is accumulated in landfills, none of which is sanitary. The waste produces leachates that infiltrate the ground and reach underground water ponds. Moreover, part of this waste is chaotically disposed near the rivers, which carry it to rural areas and to the lake.

Finally, dangerous and toxic waste poses problems in the basin area. For example, in their 2008 fieldwork inspection, Bolivian NGO Lidema pinpointed that high quantities of hospital waste accumulated alongside regular waste on the banks of the River Pallina in Laja (Ribera Arismendi 2008).

B. MINING

Mining – and its associated environmental repercussions – have a long history in the basin, both in Peru and Bolivia.¹³⁹ These activities are high consumers of water and also generators of waste which, frequently disposed in rivers, is highly polluting. In Peru alone:

even though almost all governmental sources indicate that the mining and metallurgic activity uses 2% of the water for consumptive use, in practice they dispose thirteen trillions of cubic meters of effluents each year in the bodies of water (Urteaga Crovetto 2010, 58).

Mining has resulted in significant environmental damage to the TDPS basin freshwater (Escobar Ramirez and Barg 1990), including to the reservoir that provides the capital city of La Paz with drinking water (Salvarredy-Aranguren et al. 2008). In the Puno region of Peru, it has led to recurrent social conflicts.¹⁴⁰

The bi-national river Suches is one of the most affected by mining activities (Ccopari 2010) together with the Mauri in Bolivia and the Ramis in Peru (Ccopari 2008). In the upper part of the Bolivian side of the basin, mining waste from the Milluni (tin, zinc and lead) and the Matilde (zinc, silver and lead) mines, which were improperly closed in 1985

¹³⁹ Bocángel Jerez (2007), Forno and Pauwels (2009), Galeano (2007), Kendall Brown (2012), Salvarredy-Aranguren et al. (2008).

¹⁴⁰ See for example the report of NGO SER published in their magazine *Cabildo Abierto*, “Río Suches: Minería Informal en la Frontera” (2010) or, for a recent case, the numerous press articles on the demonstrations against mining. For example “Realizarán Paro de 24horas en Protesta contra Minería Ilegal en Puno.” *La República* (26 February 2013).

and 1987, together with urban water and waste is transported via the rivers Seco, Seque, Suches and Pallina (World Bank et al. 2009). In Peru, the main mining sites are the gold mines of the zones of La Rinconada and Ananea, which have an impact on the rivers Ramis and Huancané. Mining waste is disposed in water ponds that are consequently polluted. These ponds are linked with the rest of the basin through surface and groundwater, with potentially widespread consequences. Mining pollution occurs when mining waste is disposed of in the rivers and combines with water to produce sulphuric acid (PNUMA 2011). Moreover, numerous small mining companies conduct their operations in the city of El Alto where water is used to separate the metals from other material such as mud. This water is then released in the basin without the appropriate treatment.

C. AGRICULTURE

It is important to indicate that the basin is not subject to agrochemical pressure since agrochemicals are used marginally in the region (Escobari 2003). However, agricultural activities constitute, in some areas, a significant source of pressure by bringing quantities of organic material to the lake. Some organizations contend that cow manure is an important local problem in Cohana Bay, a region that includes between 4,100 and 20,000 heads of livestock.¹⁴¹ Furthermore, cows drink and defecate in the same water, which is known to cause illnesses (Shanmugaratnam 1996). Moreover, cattle urine is a source of ammonia that volatilizes and then returns to the basin via precipitation, thus spreading the ammonia further (Chapin III, Kofinas, and Folke 2009).

¹⁴¹ Numbers are contested: Fontúrbel calculates 7,500 (Fontúrbel 2008), ALT and Prefectorate 4,100 (El Diario 2011; Rivera Diez de Medina 2008) and USAID 20,000 (Embajada Estados Unidos de América 2010). This high variance makes it difficult to determine how much cow manure contributes to the pollution of the area.

The description of the sources of pressure to the basin water is important for two main reasons. Firstly, it allows us to understand the bases upon which the ‘scientific’ discourses analysed in the next chapter are built. Secondly, it justifies the focus on environmental legislation and administration that this study adopts. Indeed, diverse aspects of water and bay management are distributed among numerous organizations, but the diagnosed pollution specifically triggers intervention from the ‘environmental’ area of public management. This area is tightly linked to the impact of human activities on the ecosystem, i.e., one of the main patterns of interaction between the social and ecological spheres of the SES. The logic underpinning this fact is that environmental laws and administration are meant to ensure that the management of resources is such that the current situation in the lake is not allowed to develop. In the next section, I explore the institutional framework.

III. INSTITUTIONAL FRAMEWORK OF THE REGION

There are five distinguishable levels of management at play in Lake Titicaca: the bi-national (represented by ALT), the national, the regional, the municipal and the community. Additionally, cooperation agencies might support each of these levels.

ALT was formally born through a treaty signed in December 1992. In May 1993, its statutes were approved. The organization started to function through an ad hoc committee in July 1993 (PNUMA 2011). Its mandate was to execute the Director Plan via its national branches, PELT Peru, which at the time depended on ALT for technical matters and for administrative matters on the National Institute of Development

(INADE) and the Unidad Operativa Boliviana (Bolivian Operational Unit or UOB) under the Ministry of Sustainable Development.¹⁴²

Significant restructuring followed the arrival of Evo Morales as President of Bolivia and the Ministry of Sustainable Development disappeared. The law¹⁴³ determining the new state structure did not mention the UOB although it reappears in a Supreme Decree in November 2006 as a unit of the Ministry of Water. In Peru, the PELT was placed under the authority of the Ministry of Agriculture in 2008 when INADE was merged with it.¹⁴⁴ ALT, in turn, depends on the Ministries of Foreign Affairs, which decide the organization's budget. According to its statutes, ALT is to be directed by a Peruvian national, and its headquarters are permanently in La Paz (with an office in Puno).

¹⁴² Art. 14 of the “Estatuto de la Autoridad Binacional Autónoma del Sistema Hídrico del Lago Titicaca, Río Desaguadero, Lago Poopó y Salar de Coipasa” (ALT 1996).

¹⁴³ Law 3351 (2006).

¹⁴⁴ Supreme Decree 30-2008-AG (2008).

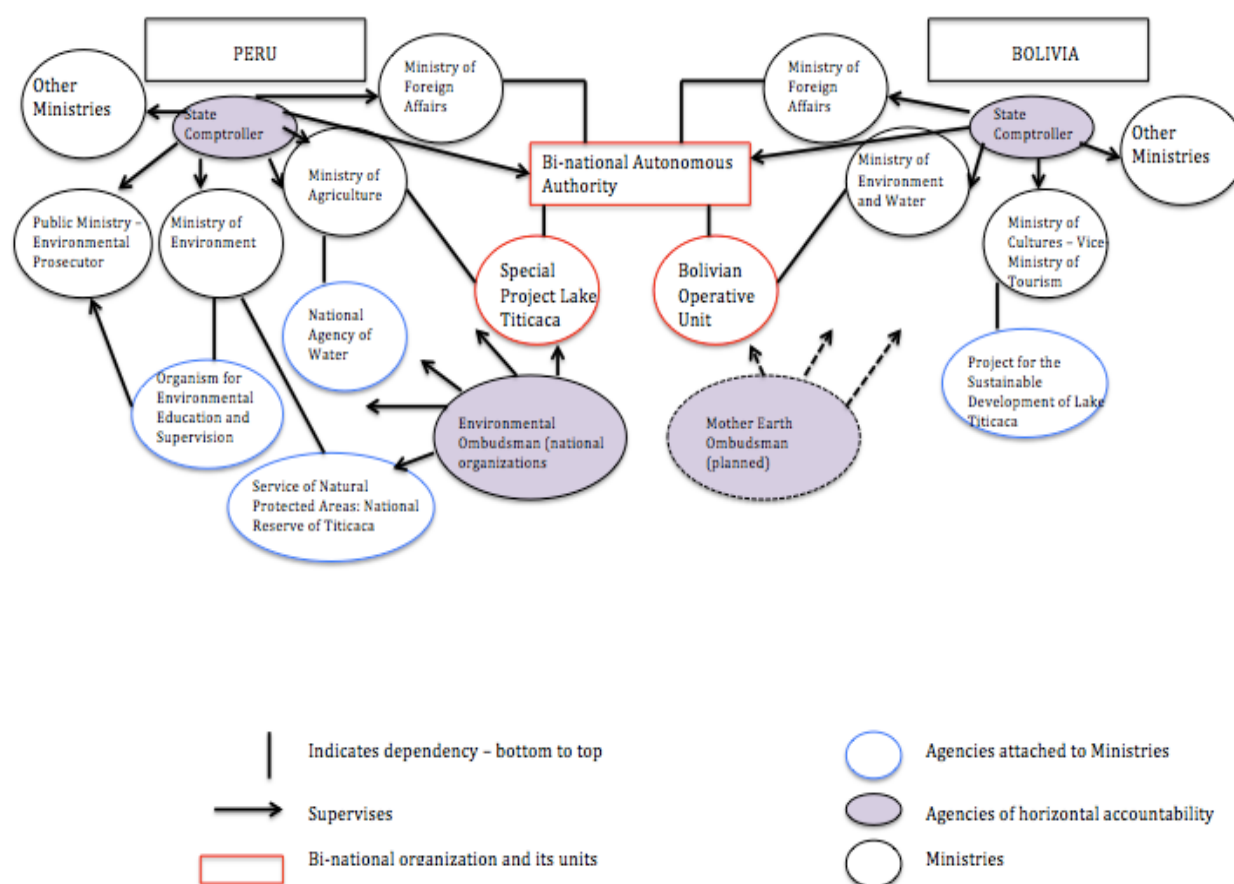


FIGURE 12 ADMINISTRATIVE STRUCTURE AT THE BI-NATIONAL AND NATIONAL LEVELS (2010-2011) (MY ELABORATION)

While ALT was founded following a technical understanding of water management, today it is meant to follow the Integrated Water Resource Management rationale. Progressively, the organization was given environmental management tasks. In the early 2000s, for instance, it conducted a study on the biodiversity of the lake. Crucially, in 2006, highlighting the fact that the lake bays were under the Ramsar Convention, the Ministries of Foreign Affairs of both countries gave ALT a mandate to intervene and mitigate the pollution of Puno and Cohana bays. As a result ALT withdrew 200 tons of *lemna gibba* from Cohana and 31,243 tons from Puno. PELT contributed to the programme by continuing to withdraw the duckweed from Puno bay after 2006. Moreover, the organization installed oxygenators in Puno bay with the aim of

“facilitating the activation of microbic fauna when minimizing the accumulation of organic matter”.¹⁴⁵ In Cohana, the project of depollution of the bay included a plan to produce humus soil from the removed duckweed. It was however interrupted by a lack of funding. Additionally, ALT was involved in coordinating a waste management project in the cities of Desaguadero, details of which are provided below.

Besides the bi-national level, numerous organizations in both Peru and Bolivia have responsibility to operate in Lake Titicaca. It is important to briefly present the main landmarks in the environmental institutionalisation at the national level to understand the frame that regulates the area. Particularly because Peru and Bolivia have institutionalized the environmental area in significantly different ways.¹⁴⁶

In Peru, the environmental area was institutionalized within each of the sectors through Environmental Offices in the different ministries (agriculture, mining, etc.). The National Council of the Environment (Conam) was in charge of coordinating activities. As far as water is concerned, Fujimori (1990-2000) promoted sector based water management to facilitate investments in the mining and energy sectors (Deutsch-Lynch 2012).

In 2008, Conam’s coordination functions were transferred to the newly created Ministry of the Environment (Minam)¹⁴⁷, which was also charged with overlooking the national system of environmental impact assessment.¹⁴⁸ Crucially, the Organism for Environmental Evaluation and Supervision (OEFA) was created, as part of Minam. OEFA monitors whether the legislation is respected and supervises the work of

¹⁴⁵ The ALT posted a ‘news’ release on this topic that does not seem to be available in the organization’s website presently. This is claimed, however, in an official video posted on YouTube ‘Instalación de Aireadores en la Bahía interior de Puno’, accessible on the channel ‘losperuanosenbolivia’ (2010).

¹⁴⁶ A brief history is provided in the annexes.

¹⁴⁷ Legislative Decree 1013 (2008).

¹⁴⁸ Legislative Decree 1078 (2008).

sanctioning agencies, such as the Environmental Prosecutor (part of the Public Ministry).¹⁴⁹ There are also two agencies of horizontal accountability particularly relevant to our case: the State Comptroller for Environmental Affairs and the Ombudsmen for Environmental Affairs.

Despite the changes introduced by the appearance of Minam, to this day environmental licenses are still given by Ministries in charge of promoting the different economic sectors (tourism, mining, etc.). Moreover, responsibility over water is only partially under Minam's control. Indeed, the National Authority of Water (ANA) is under the umbrella of the Ministry of Agriculture. However, at least formally, ANA is meant to promote IWRM¹⁵⁰ and to follow the environmental policy lines defined by Minam. This issue caused considerable controversy as analysed in Chapter Seven.

Importantly, competent sectorial ministries (the Ministries of Production, Tourism and Health) had regional offices in the region of Puno.¹⁵¹ The environmental responsibilities of these organizations, relevant to our case, were essentially over the monitoring of water quality standards.

In Bolivia, three major institutionalization steps marked the history of environmental area: (i) the regulation of environmental law (1992), including the definition of permissible limits for exploitation and polluting activities and the system of environmental impact licences, (ii) the creation of the link (in the first period of environmental policy) between the planning and environmental functions, i.e.,

¹⁴⁹ OEFA was opening its regional offices at the time of fieldwork. The office in Puno was not operational.

¹⁵⁰ As defined in the Water Resources Law 29338 (2009) that establishes water is the nation's property and that management should be 'integrated' and by basins. See Higa Eda and Chen (2010) for an overview of the country's implementation of IWRM.

¹⁵¹ At the time of fieldwork, the process of decentralization in Peru was still on-going, and regional offices of national organizations were to be found in the region alongside decentralized ones.

associating the environment with development planning¹⁵², and more recently (iii) the window of opportunity opened by the approval of the new Constitution of the State¹⁵³, which could lead to a relocation of the environmental area to the core of the redefinition of the development project.

Following the election of President Morales in 2005, the Ministry of Sustainable Development disappeared and environmental functions were transferred to the new Ministry of Water and the Ministry of Rural and Farming Development and Environment. It is important to note that the creation of the Ministry of Water was partly motivated by the need to satisfy the demands of social movements around water issues. Indeed, social movements demanding better management of water provision services had constituted a significant source of support for Morales' party, the Movement Towards Socialism (MAS) in its race for power (Lidema 2010).¹⁵⁴

However, the Ministry of Water was short-lived and a year after its creation its functions were grouped once more with the environmental area in the Ministry of Environment and Water (MMAyA).¹⁵⁵ The MMAyA has currently three Vice-Ministries: (i) Water Resources and Irrigation, (ii) Drinking Water and Sanitation Services and (iii) Environment, Biodiversity, Climate Changes, and Forest Management and Development. It is worth noting that the Vice-Ministry of Water Resources and Irrigation and the Vice-Ministry of Environment, Biodiversity, Climate Changes, and Forest Management and Development promote IWRM. Indeed, both the Law of the Environment and the Basins

¹⁵² Many of the environmentalists I interviewed pinpointed that such an approach, to a certain extent, raised awareness of environmental matters within exploitative sectors.

¹⁵³ It will be referred to as CPE for its acronym in Spanish: Constitución Política del Estado.

¹⁵⁴ Similarly to what occurred in other countries of the Latin American region, social movements over water played a significant role in the most recent rise of the left (J. E. Castro 2008; Terhorst, Olivera, and Dwinell 2013). Moreover, 'Sustainable Development' was criticised in Bolivia on the grounds that it was an 'imported' vision of development (Flores Bedregal 2009).

¹⁵⁵ Supreme Decree 29894 (2009).

National Plan¹⁵⁶, in force at the time of fieldwork, put forward integrated water management. The supervision of environmental affairs is under the responsibility of the Vice-Ministry of Environment. In Bolivia, the State Comptroller for Environmental Affairs constitutes the main agency of horizontal accountability relevant for our case.

The regional level in both countries essentially has a coordinator role, and is meant to provide support to municipal authorities in charge of waste and sanitation services. Moreover, the regional levels play an important role in the collection of information over the state of the basin water, which I discuss in the next chapter. Particularly, in Peru, the regional government is in charge of monitoring small and medium mining activities, which are precisely the ones developed in the Titicaca basin. Finally, municipalities might comply with their waste and water management responsibilities directly or through a public company. Regional and Municipal governments in both countries are in turn supervised by national level organisations.

¹⁵⁶ Viceministerio de Cuencas y Recursos Hídricos – Ministerio del Agua (2007).

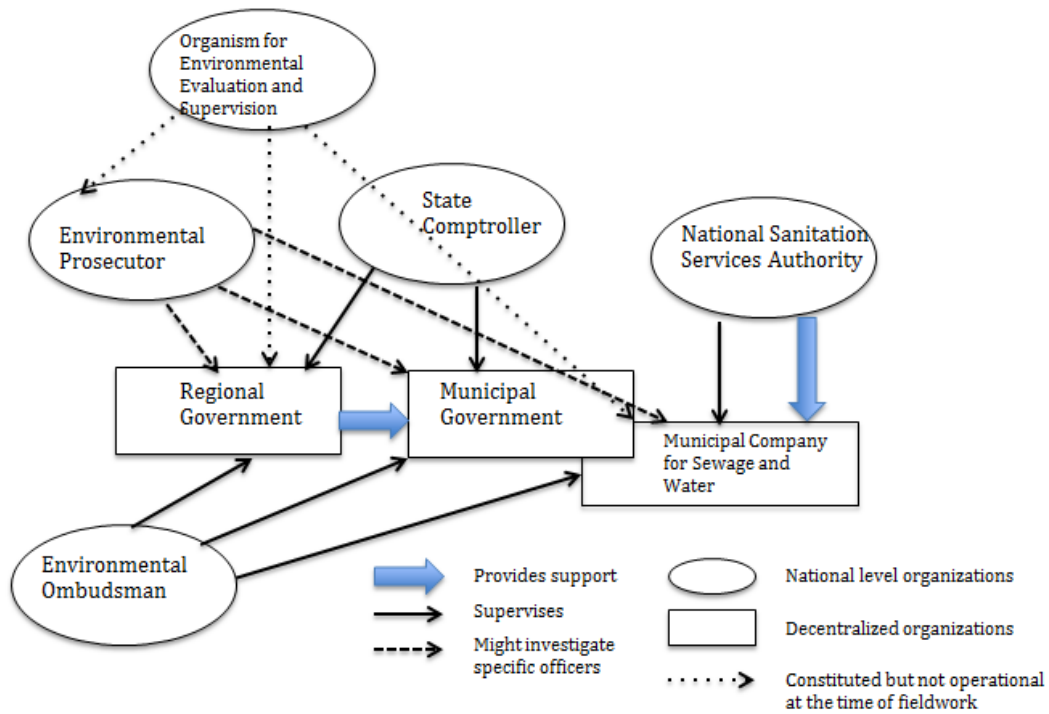


FIGURE 13 SUPERVISION OF COMPLIANCE WITH ENVIRONMENTAL REGULATION IN PERU (MY ELABORATION)

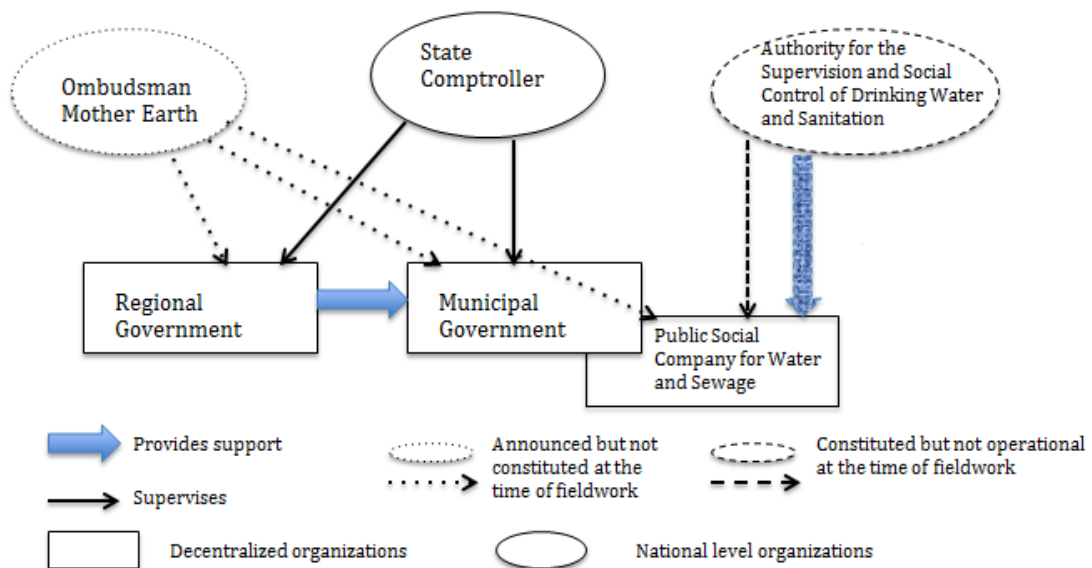


FIGURE 14 SUPERVISION OF COMPLIANCE WITH ENVIRONMENTAL REGULATION IN BOLIVIA (MY ELABORATION)

In the case of sanitation services, both countries had a specific supervisory agency. The Peruvian National Sanitation Services Authority (SUNASS) was founded in 1992 and had a regional office in Puno. In Bolivia, the former Superintendencia for Sanitation Services

was transformed into the Authority for the Supervision and Social Control of Drinking Water and Sanitation (AAPS) after the approval of the CPE.¹⁵⁷

I elaborated the tables below to summarize the responsibilities at play in the area and highlight the complexity of the managerial system. They aim more to illustrate the multiplicity and overlapping of management layers than to provide a detailed account of all functions. Indeed, specific details of the distribution of functions will be provided through the thesis when relevant for the argument. These tables are reproduced in the annexes with reference to the legal structure that defines the responsibilities. Such references are suppressed here to ease the reading.

I follow a coded system wherein: bold-underlined is used for **the bi-national level**; bold for the **national level**; bold italic for the ***regional offices of national organizations***; italics for the *regional level*; underlined is used for multi-lateral organizations and cooperation agencies; and regular font for the local level.

¹⁵⁷ The AAPS was not fully operational at the time of fieldwork.

TABLE 4: RESPONSIBILITIES PERU (1/2)

Responsibilities	Sewerage	Industrial Water Disposal	Small and Artisan Mining Water Disposal	Urban Solid Waste
Direct responsibility	Municipality– Municipal Company for Sewerage and Water (EMSAPUNO)	National Water Authority (ANA)	<i>Regional Government</i>	Municipality / Regional Directorate of Health (Diresa)
Secondary responsibility (supervision and monitoring)	Environmental Prosecutor / Organism for Environmental Evaluation and Supervision (OEFA) / National Sanitation Services Authority (SUNASS)	Environmental Prosecutor / OEFA	Environmental Prosecutor	Diresa / Environmental Prosecutor / OEFA
Defines national policy / coordinates	Ministry of Housing / Minam / ANA	Ministry of the Environment (Minam) / Ministry of Health / Ministry of Production (PRODUCE)	Minam / Ministry of Mining / Ministry of Health	Minam / Ministry of Health deals with the health and technical aspects of management
Additional interventions	<u>KfW loan for treatment plant – Puno Municipality</u> Ombudsman	Ombudsman	Ombudsman	<u>Japanese cooperation agency (JICA) funding supporting a nation-wide programme on sanitary landfills</u> ALT / CAN / European funding in Desaguadero Ombudsman

TABLE 5: RESPONSIBILITIES PERU (2/2)

Responsibilities	Environmental liability	Measuring Water Quality			
Direct responsibility	Minam	In bodies of water	After treatment	For human use	Impact of activities promoted by the Ministry of Production
	<u>Bi-National Autonomous Authority (ALT)</u>	Minam <i>National Reserve of Titicaca (RNT)</i>	Ministry of Housing, Construction and Sewerage	<i>Directorate of Ecology and Environmental Protection in Diresa</i>	<i>Environmental Department of the regional Delegation of the Ministry of Production in Puno (impact of productive activities)</i>
Second Responsibility		Environmental Prosecutor ANA and Administrative Authority of Water (sanctions at the basin level) Ministry of Health Peruvian Sea Institute (Imarpe)			
Defines policy / Coordinates	Minam	ANA at the national level, Regional Environmental Commission (CAR) at the regional level and Municipal Environmental Commission (CAM) at the municipal level			
Additional interventions	<u>PELT</u> Municipality Environmental Prosecutor				

The same code is followed for the description of responsibilities in Bolivia, except that the bold italic font is used to indicate that the intervention is handled by the ***national level with cooperation funding***. Regional offices of national organizations in Bolivia are irrelevant for this study.

TABLE 6: RESPONSIBILITIES BOLIVIA

Responsibilities	Sewerage	Waste	Mining	Environmental liability	Water quality
Direct responsibility	Autonomous Governments Municipal Governments	Municipal Governments <i>Departmental Governments</i>	Environmental authority according to exploitation level	<i>ALT</i>	Municipal Governments <i>Departmental Government</i>
Secondary responsibility	Authority for the Supervision and Social Control of Drinking Water and Sanitation (AAPS) <i>Departmental government</i>	<i>Departmental Government</i>	<i>Departmental Government</i>	<i>Departmental Government</i> Ministry of Environment and Water (MMAyA)	
Coordinates/defines national policy	MMAyA				
Additional interventions	<i>Project for the Sustainable Development of Lake Titicaca (PDSL T)</i> Public Social Company for Water and Sewerage (EPSAS) <u>United States Agency for International Development (USAID)</u>	<u>Andean Community (CAN)</u> - <i>ALT</i> <i>PDSL T</i> <u>USAID</u>		<u>USAID</u>	<i>MMAyA (Catalan Cooperation)</i>

Beyond the responsibilities attributed by law, national level organizations are occasionally given the prerogative to implement programmes to address specific gaps identified in any given area. Several of these projects have been undertaken with the support of cooperation agencies, as the table below summarizes.

TABLE 7 RELEVANT PROJECTS (1/2)

Project	Dependency	Funding	Executing Agency	Object
Pedagogic Basin of River Katari (Bolivia)	Ministry of Environment and Water	Catalan Cooperation Agency	Ministry of Environment and Water	Collecting information on the state of surface and groundwater to draft a basin management plan.
Project for the Sustainable Development of Lake Titicaca (Bolivia)	Vice-Ministry of Tourism	World Bank	Municipalities / Social and Productive Investment Fund (FPS) ¹⁵⁸	Building treatment plants and sanitary landfills across the basin. Promoting sustainable tourism.
ProLago (Bolivia)	United States Agency for International Development (USAID)	USAID	USAID	Multi-target project to mitigate the eutrophication of Cohana Bay. Included intervention in several cities over water and solid waste treatment and intervention in Cohana (production of humus soil and biofuel from cow manure). Facilities built by the families.
Restoration of Puno and Cohana bays (Bi-national)	Bi-national Autonomous Authority (ALT)	ALT	ALT	Extraction of the duckweed from the bays and placement of oxygenators. Conversion of the duckweed into humus compost. Collective facilities.

¹⁵⁸ This public organization executed the infrastructure works when the municipalities did not have the capacity to do so.

TABLE 8: RELEVANT PROJECTS (2/2)

Project	Dependency	Funding	Executing Agency	Object
PIGARS Desaguadero (Bi-national)	Municipalities	European Union through Andean Community (CAN)	ALT	Building of sanitary landfills.
UNEP Geo Titicaca	Multiplicity of actors across levels	United Nations Environment Programme	Multiplicity of actors across level	Strengthening the information network. Compilation of information and publication of the GeoTiticaca report.
Programme for the depollution of Puno Bay (Peru)	Municipality of Puno	Municipality	Municipality	Reducing the eutrophication of the interior bay of the city through the use of micro-organisms.
Building of Puno Treatment Plant	Municipal Company for Sewerage and Water (EMSAPUNO)	German Cooperation Bank (KfW)	Municipality	Building the city treatment plant.

Community-level institutions operate in the rural areas of both countries. These institutions establish obligations to cultivate the lands and attend community meetings for all community members. They follow a rotatory system of responsibilities, wherein leadership positions change every year, ensuring that all families reach a position of authority within a short period of time. The leader should serve as a guide for the implementation of collective arrangements. The focus on agricultural activities is partially the result of the transformation the state imposed on these communities in the 1960s when they were turned into agricultural unions, in an attempt to Westernize indigenous organizations (Van Cott 2005). Yet, the system also gives legitimacy to the representation of the community in the body of its leader in terms of communicating with other communities or with public organizations. Traditional governance systems are called ‘ayllus’ in the Andean region. An ayllu is the smallest level of communal organization. Ayllus might join together to form a community of ayllus, called ‘marka’ (J. D. Cameron 2010; Van Cott 2008).

In the next section I explain how the research methods were tailored to answer the research question and capture the complexity of interactions at play in the field.

3.2. RESEARCH METHODS

The thesis explores the multiplicity and complexity of interactions at play in the SES, paying attention to different categories of actors, facing diverse situations. In this way, multiple levels of comparison are established around a common problem: the degradation of Lake Titicaca bays.

The discussion of SES literature highlighted that it is crucial to define the scale of the system under analysis. However, the scale of an SES is not given, and neither is it tied to

a resource system. Indeed, the same SES might contain multiple resource systems (E. Ostrom and Cox 2010, 456). The scale can be defined following different sets of criteria depending on what is to be achieved. Some scholars recommend that the scale be defined with the population included in the research (Cumming 2011; Musters, de Graaf, and ter Keurs 1998).

Defining the scale with participants did not seem appropriate for my research project, which involves a wide number of actors with different conceptions of the SES scale. For example, we might expect officers at the municipal level to focus on the local aspects of the resource, while the bi-national organization might issue programmes taking the whole basin as a unit. Moreover, when participants in the study consciously define the scale of analysis, the existence of scales that might be used unconsciously is disregarded. For the purposes of my research, it was necessary to remain open to the potential existence of multiple and simultaneous scales of operation.

I. CASES

Four cases were selected for this study. The general criteria followed for the selection were (i) the interventions conducted in the area and (ii) the diversity of situations. The following table details the areas selected and the reasons for selection. It also explains how these areas were identified:

TABLE 9: CASE STUDIES (MY ELABORATION)

Area	Reason for selection	Identification
Copacabana, Bolivia	Main city on the Bolivian lakeshores. Tourist city living from the lake as a landscape. One of the cities of intervention of the PDSLIT.	Identified through preliminary work.
Puno, Peru	Main city on the Peruvian lakeshores. Has been the object of several cleaning interventions. Presents problems of urban and mining pollution.	Identified through preliminary work.
Desaguadero, bi-national	Waste management programme funded by CAN. Waste accumulation is significant due to intense commercial activity.	Identified through preliminary work.
Cohana bay, Bolivia	Main receptor of different sources of pollution. Area of intervention of numerous public programmes.	During preliminary work, Puerto Pérez was identified as the area receiving pollution. In the field, it became evident that Puerto Pérez was actually right behind the recipient area, Cohana Bay.



FIGURE 15 CASE STUDIES (MY ELABORATION)

Three out of the four cases studied are cities. Yet, it is important to take into account that the population of the area is highly mobile, which means that the frontier between urban and rural areas is sometimes blurred. I will now briefly present the case settings to highlight the differences in the residents' daily lives and the complexity of variables at play in structuring interactions with the bays.

Cohana is the name of the bay into which the river Katari flows. Around this bay live eight communities, six of which are in the municipal area of Pucarani (Takachi, San Pedro, Chojasivi, Pampa Cohana, Cohana Grande and Cohana) and two in that of Puerto Pérez (Cascachi and Pajchiri). In the remaining text, I use 'Cohana' to refer to all these communities generally. Cohana is an agricultural area where different crops, mainly quinoa and potatoes, are cultivated. Cattle are bred for cheese production and

occasionally meat, the majority of which is sold in the regional fairs. The table below summarizes the population figures as they appear in the 2001 census (the most recent at the time of writing).¹⁵⁹

Community	Population	Community	Population	Community	Population
Takachi	330	San Pedro	273	Chojasivi	246
Pampa Cohana	137	Cohana Grande	472	Cohana	45

TABLE 10 COMMUNITIES PUCARANI (BASED ON INE 2013)

Community	Population	Community	Population
Cascachi	279	Pajchiri	246

TABLE 11 COMMUNITIES PUERTO PEREZ (BASED ON INE 2013)

The city of Puno has a population of 125,600, mainly working in tourism and trade. This contrasts with Puno province as a whole, where agriculture accounts for 63.2 per cent of activity. In the city of Puno, agriculture is marginal, limited to the immediate suburban area.

The city of Copacabana has 15,300 residents. It is surrounded by a rural area where many of the city residents have small plots of land that they cultivate daily. Yet, as in Puno, tourism is an important occupation.¹⁶⁰

Finally, the frontier between Peru and Bolivia is set along the River Desaguadero, an outflow of the lake. Between the lakeshores and the rivershores we find the cities of Desaguadero (two municipalities), an urban agglomeration that continues without interruption from one side to the other over the Desaguadero bridge. The urban area, surrounded by agricultural lands, sprawled in an accelerated fashion as the market fair became more frequent (increasing from one day a month at the beginning of last century to two days a week today). The market fair largely doubles the population of the city. We will see in the next chapter that the waste generation of the fair is one of the most acute

¹⁵⁹ The website of the Instituto Nacional de Estadística, entry “Población” (2013).

¹⁶⁰ Information on the professional occupation of the population is retrieved from the UNEP report *Geo Titicaca* (the report is in Spanish: PNUMA 2011) and the Municipal Plans of the respective municipalities.

problems Desaguadero faces.¹⁶¹ The cities' stable populations have settled relatively far from the shores, which are subject to seasonal flooding. The transportation sector is significant to the city in its role as a frontier commercial area. Finally, the area is an arena for illegal trade.¹⁶²

Puno and Cohana bays are the objects of numerous interventions as they present widespread signs of eutrophication. Moreover, several organizations raise concerns about the impact of mining pollution on the bays. These two cases are the ones receiving the most attention from officers at all levels. Therefore, numerous categories of actors craft an interaction with the bays and try to influence the interactions of others.

In both Desaguadero and Copacabana, the bays present only minimal signs of eutrophication and are not affected by mining residues. However, the population of the cities complain about the accumulation of waste and the 'bad smells' arising from poor sanitation services. The interventions in Copacabana address the problem of waste as well as the problem of sewage treatment. They aim to allay the populations' concerns and prevent damage to the bays.

When designing my fieldwork, I had hoped to treat Desaguadero like the rest of the cases, i.e., interview members from the relevant organizations operating in the area and analyse institutional documents that would provide insights as to what the types of interaction were at play with the lake bays. However, circumstances in the field meant that I had to restrict my analysis to the problem of waste management. On my arrival in the field, I was systematically discouraged from going to Desaguadero and warned about the dangers that I would encounter if I decided to go there by myself. Desaguadero is

¹⁶¹ Comunidad Andina de Naciones and Autoridad Bi-Nacional Autónoma del Sistema TDPS (2009).

¹⁶² Ibid.

marked by illegal trade and drug trafficking. My one trip to Desaguadero by myself did indeed involve a series of unpleasant experiences, whereas when I was accompanied to the city by two research assistants all went well. We went there on a market fair day in order to conduct informal discussions with participants of the fair and observe waste disposal practices. Additionally, I travelled to Desaguadero with ALT officers twice and with a Minam officer once. When setting up interviews with the officers included in my sampling from Peruvian Desaguadero, they insisted that we meet in Puno because they were concerned for my security. I did not have the opportunity to talk with all the actors I had identified in the Bolivian municipality as they repeatedly cancelled our appointments. Finally, we will see in Chapter Six that municipal budgets were in general undetailed and incomplete, which was especially the case in Desaguadero. For all these reasons, I decided to restrict my treatment of Desaguadero to the population's perceptions over the situation and to the CAN-ALT intervention on waste management.

II. DATA COLLECTION AND INTERPRETATION

Fieldwork was conducted from August 2010 to April 2011. I used different qualitative research tools: observation, field-notes, interviews, questionnaires and document analysis (documents include: press articles, institutional documents and legal documents). I also conducted an analysis of the budgets allocated to the area, which I present through simple descriptive statistics. The mainly qualitative methodology allows in-depth investigation of the attitudes of residents and officers intervening in different but comparable contexts (Marshall 1999; Yin 1984).

Travelling from one field site to the other was either done independently or as part of the observation of organizations. Indeed, numerous organizations undertook field-trips in which I was invited to participate. This was an opportunity to observe the field sites from

two points of view: firstly, I could grasp the ways in which officers from different levels interacted with each other and with the population; secondly, I could compare the population's behaviour when I was alone and when I was accompanying officers.

Organizations' trips to the field sites were short compared to the visits I prepared independently. This allowed me to observe whether the time pressure imposed by the officers' short stays framed the population's attitudes. Additionally, all settings and organizations were visited several times at different stages of my fieldwork, in order to verify mid-stage conclusions and re-orientate adequately the research process. My recurrent presence in the field sites helped build trust with key actors.

Long-term relationships were essential to understand the ways in which different actors conceptualized the ecosystem changes and the associated economic and health impacts. Crucially, some participants presented different views depending on the occasion. Only through long-term relationships with them was it possible to decipher the logic behind apparently contradictory discourses. Investing in long-term relationships also gave me access to meetings and conferences to which my interviewees invited me. These events were an excellent opportunity to observe the interaction between organizations. Furthermore, some of the conceptualizations residents held were rarely spelled out but emerged, with time, from their behaviour.

The underpinning idea behind the combination of methodologies was to confront the institutional view as it appears in documents, with the views of officers and local populations. I turn now to present the methodologies that supported observation: interviews, questionnaires and document analysis.

A. INTERVIEWS

A first sample of interviewees was built prior to my departure for the field. It included officers from the different organizations identified as holding responsibilities in the area. Upon arrival in the field, new actors were added to the list through snowballing technique. Actors, from community leaders to former and current ministers, were in the main very helpful and ready to receive me. On the rare occasions when access to a specific actor was difficult, I tried to obtain help from one of the participants. If access to an identified actor was effectively impossible, I made up for it by including their administrative superiors, dependent officers and actors who had previously occupied the specific post. This excludes the case of Desaguadero, in which the fragmented information I had access to led me to focus on the waste management project and the participants in it, as opposed to the more open sample followed elsewhere. I conducted a total of 284 interviews.

Interviews were semi-structured. Key informants were interviewed a second time months after the first meeting. My informants were often met in different contexts besides the interview: I participated in several inter-institutional workshops, accompanied some of them on their fieldwork interventions and informally chatted with them when visiting their organization to interview one of their colleagues.

My interviews lasted between thirty minutes and three hours. A guide on the topics to investigate during the interviews was prepared before departure to fieldwork, drawing inspiration from the literature on qualitative research (Mason 2002). The topics discussed were consistent all through my fieldwork. However, the specific questions asked during the interviews were modified taking into account new information obtained (see annexes). Moreover, the deeper I went into my fieldwork, the more I was able to

confront my respondents with conflicting views held by other respondents. Indeed, each interview and document obtained nourished the others.

The interviews investigated actors' perceptions of the situation in the lake and the different roles they identified in terms of management. For that purpose, I discussed in detail the interventions that were taking place. I also explored my interviewees' perceptions of the patterns of interaction with the population and with other organizations (insisting on multi-level and bi-national aspects). Finally, I invited my interviewees to imagine the future(s) of the SES.

All interviews were conducted in Spanish, and all translations are mine. I found it useful to record my interviews and then transcribe them. Transcriptions are essential for faithful quoting, but I also believe that being free from notes allows the researcher to better concentrate on what is being said during the interview itself. I did take notes while conducting the discussion, which I used as guidelines. I started transcribing while still in fieldwork and finished on my return to Oxford. A dozen of my transcriptions were done by a research assistant in the field. However, I listened to those interviews and read her transcriptions myself to make sure the original speech was respected.

It is important to reiterate that the different groups of actors considered in this study perceived the lake differently. It should not be assumed that actors holding similar positions had the same approach to the lake. Crucially, the lake occupies a much more important place at the Bolivian national level than what it does in Peru, if only because it is a two hour drive from the capital city of La Paz, while it is 22 hours away from Lima.

B. DISCUSSIONS THROUGH QUESTIONNAIRES

When preparing for fieldwork I had determined that conducting focus groups was the most appropriate method to follow in order to capture the residents' perceptions over the issues investigated. However, upon arrival in the field, I discussed my project with local academics, who discouraged me from using such a method; they thought individual discussions were more appropriate. They argued that in the communities, it is mainly the person holding the authority position at any given time (*dirigente*) who talks in the presence of outsiders. I did conduct a focus group discussion in Cohana, and that was exactly what happened. After that experience, I decided to engage in individual discussions, for which I followed a short-questionnaire guide (provided in the annexes). I was equally discouraged from conducting focus groups in the urban areas selected for the study on the basis that individual discussions were less demanding of people's time, especially since I could adapt to the residents' activities (such as engaging in discussions in bus stops, at the entry of schools, etc.) instead of asking them to attend meetings.

I followed a short-questionnaire guide to initiate these discussions on which I took extensive notes. To try and balance any personal bias, I had four research assistants filling in questionnaires in parallel. Indeed, it is important to keep in mind that I could frequently be seen accompanying different organizations in the field settings, which certainly influenced the perceptions the residents had of me. I do not pretend that my research assistants were perceived as neutral by the participants in the study. Yet, the perceptions the residents might have had on them are likely to have been different to those they had on me, which allows to account for specific bias associated to my own identity. Moreover, I conducted discussions in Spanish whereas my research assistant in Cohana was able to fill in the questionnaires in Aymara. It is crucial to clarify that questionnaires were not intended for quantitative analysis but as a triangulation method.

C. DOCUMENTS

During interviews and sessions of observation in different organizations, my interviewees usually provided me with past and current institutional documents. Some of them also provided me with background press articles that they had kept. Moreover, I was given access to institutional archives when requested. These documents allowed me to compile information on several aspects of my research. Firstly, they were informative on the ‘scientific’ state of the lake, and on the ways in which information was collected and presented. They were also informative on the ways organizations approached the management of the lake, on how they presented their role vis-à-vis other organizations and on how it evolved with time.

The documents obtained were partially analysed during my time in the field, which was useful for interview preparation. The information contained in the institutional documents also led me to expand my sample of interviewees in order to include the authors of some of the analysed reports, as well as the actors who had pushed for certain legislation or national strategies. Working simultaneously both on documents and interviews allowed me to identify the gaps between the legal institutional structure and the effective interventions in the field. In particular, the budgets were analysed to confront my interviewees’ perceptions with real figures. A detailed account on how the analysis of budgets was tackled is provided in Chapter Six.

Academic studies on the lake mainly focused on the causes and effects of eutrophication and mining activities. For Peru, they were accessible through the ‘Documentation centre of the Region of Puno’, or via the Universidad Andina. In Bolivia, universities gave me access to master’s theses relevant to my work. These documents helped me to understand the ways in which ‘pollution’ was rationalized.

Finally, it is important to clarify that the quality of the press sources used in this thesis varies. These are in any case not taken at face value. They are approached as a supplementary instance for the expression of the different discourses at play in the field.

D. DATA INTERPRETATION

Transcribed interviews, questionnaires and fieldwork notes, as well as institutional and academic documents were entered in NVivo9 and coded following the same logic for all. Codes were inspired both by the theories mobilized for this thesis (used as a heuristic tool) and by the themes recurrently emerging from the field data. This allowed me to disentangle the rationales followed in the interactions with the ecosystem through comparing the discourses of diverse actors and those presented in the documents collected.

I proceeded by classifying the narratives describing the ‘bays’ and ‘pollution’ depending on whether they built on ‘expert’ discourses (which were competing) or on heuristic discourses (over what the ‘fact’ of pollution meant). I then identified the ways in which different sets of actors explained and justified their behaviours as well as the behaviours of others. I started noting concrete elements emerging recurrently in actors’ accounts and then traced the different logics attributed to such elements by different sets of actors.

This allowed me to explore some of the variables determining actors’ choices, which were classified into four categories: (i) variables directly related to the ecosystem, (ii) variables related to ‘frames’ (legislation, budget), (iii) variables related to the behaviour of other actors and (iv) variables related to strategies for development and values. To explore the logics underpinning these narratives, I identified causal links. These variables were in turn classified depending on whether they encouraged actors to sustain recurrent patterns of interaction in the system (slow variables) or whether they triggered change (fast variables).

3.3. ETHICAL REFLECTIONS

I observed the field as an outsider, in the sense that I was not part of any organization. I systematically clarified my identity as a researcher, which does not mean that I hold my observations as neutral or objective. On the contrary, I am aware that different elements of my identity, such as being a woman, being a Spanish national or doing my DPhil at Oxford, had an impact on the way people interacted with me. My presence was welcomed most of the time, and I was spontaneously invited by my informants to accompany them or to stay with them as long as I felt it was necessary for my research. Explaining the specifics of my research, the ways in which I hoped it could be useful for my participants and clarifying its limitations was crucial to demystifying my presence.

I gained access to many organizations with the help of a first informant. This, despite my initial concerns, did not seem to determine the way the rest of informants from the given organization perceived me. Indeed, I could not distinguish any difference between the treatment received by informants whom I contacted directly through formal institutional letters and those contacted through another informant. I was also introduced to Cohana communities through one of my informants, a cooperation officer. However, while I travelled to Cohana with cooperation agencies several times, I also visited the area with a public official from the municipality of Pucarani. Despite my concerns, the communities did not hesitate to share their complaints – perhaps because they thought I could influence cooperation programmes.

In order to preserve my informants' wellbeing, I treat all interviews anonymously. While some of my informants were vocal on their views in the local press, and accepted that their name be associated to their interviews in this work, others did not. It is important to keep in mind that the people participating in the management of the lake bays and

thus included in this study are a relatively small group. Therefore the identification of some would lead by default to the identification of others.

I am highly sympathetic to the concerns expressed by some of my respondents since the issues discussed in this thesis caused numerous tensions between and within organizations both in Peru and Bolivia. It is particularly important to indicate that the recent passing of the ‘Marcelo Quiroga’ law against corruption in Bolivia was a source of worry for many of my interviewees.¹⁶³ I use a coded system to refer to my interviews and discussions. As I am mindful of the necessity to ensure the reproducibility of this study, should other researchers wish to do so, I provide a detailed list of interview dates and relevant information about the participants in the annexes.

Finally, it is important to note that a significant sample of my respondents shared their frustration about the fact that past studies conducted around their communities or organizations were unavailable to them. I committed to write a summary of my research results in Spanish and make it available either personally to my respondents, or, in the case of residents for whom I had no contact information, make it available to the relevant municipality. The responsibility and gratitude I feel towards my respondents have encouraged me to stay in contact with many of them. Indeed, the timeframe of a DPhil thesis can be long, especially for those waiting for the research results.

¹⁶³ Here is not the place to discuss the reasons why this law was regarded as potentially leading to limitations of public officers’ freedom of expression.

3.4. CONCLUSION

This chapter has provided the reader with the necessary context for the study. It has given an overview of the geographical and institutional aspects that have crafted the SES around Lake Titicaca in contemporary times. Particularly, it has explained the activities in the basin that have led to the pollution of the Titicaca bays.

Through the elements highlighted in this chapter, Lake Titicaca has appeared as an interesting case to investigate the research question. First of all, a multiplicity of actors potentially holding different understandings of what constitutes adequate management is at play. Indeed, not only do the residents engage in diverse activities that could potentially influence their views on the appropriate management, but there is also a plethora of officers responding to different organizations' interests. The visions of these actors, as well as their weight in crafting the variables that would lead the SES towards one regime or another, need to be understood in the context of the countries' political economy and institutional changes.

This is especially relevant at a time when both countries have undertaken significant (and significantly different) modifications of their environmental institutional frame with the founding of the Ministry of the Environment in Peru (2008) and after the election of President Morales in Bolivia. It is therefore necessary to investigate how the different actors interact in light of those changes and how the possibilities of management evolve.

The exploration becomes particularly interesting in Lake Titicaca. Firstly, because it encompasses some of the challenges of freshwater ecosystem management in a region with mining activities and deficient solid and water waste treatment services. Secondly, because several attempts to address the effects of urban pollution have been put forward, apparently with no success.

How do actors engage with the ecosystem under such conditions? What explains why the current management system has been unable to address the identified pollution? This chapter has presented the methods used to answer such questions. Specifically, it has argued that interviews, discussions and observation are particularly well-suited to explore actors' perceptions and understandings. The analysis of documents together with observation inform on past and present negotiations over the institutionalization of the environmental area. The chapter has also claimed that through the comparative perspective the parameters that explain the specificities of each case and the categories that can be drawn, emerge more clearly.

Crucially, the chapter specifies the boundaries of this study. It is paramount to insist on the way in which 'comparative' is understood. The thesis does not aim at providing an artificially balanced account of each of the cases. Complex cases, i.e., cases that received particular attention by the organizations studied will be more thoroughly explored, having recourse to multiple examples. Moreover, it is important to highlight that the thesis is circumscribed by time and space. Therefore, the thesis does not include actors whose activities started after the end of fieldwork. Perhaps more importantly, in light of the specific time constraints imposed by the DPhil exercise, I determined the geographical area of the study in terms of its relevance for the specific research question. As I have argued in this chapter and in those that precede it, all boundaries (basin, administrative, etc.) *are* artificially determined. The boundaries chosen are therefore one of the possible boundaries of the SESs under inspection. I chose to focus on the lake bays because they provided a sound common-point for comparison and because they had been historically important for the livelihoods of the area. Therefore, while paying attention to the surrounding context, the actors studied have a direct effect, responsibility

or discourse over the bays, which necessarily excludes actors whose perceptions might enlighten other aspects of the case.

CHAPTER 4. UNDERSTANDINGS OF THE ECOSYSTEM CHANGES

INTRODUCTION

In this chapter I investigate the ways in which different sets of actors define and make sense of ‘pollution’. Understanding actors’ interpretations is crucial in determining how the changes witnessed influence the interactions in the system. I discuss whether there is a consensual diagnosis of the situation or whether there is disagreement. I then analyse the links between diagnoses and interventions in the SES. The logics of rationalization of the ecosystem and of information generation, as well as the interplay of different explanatory or interpretative discourses, will emerge as constitutive elements of the SES.

A number of questions need to be addressed in order to understand what ‘ecosystem changes’ means in the context of Lake Titicaca: what kind of information is produced to make sense of and explain the regime changes in the lake? What impacts do the meanings attributed to these changes have on the patterns of interaction in the system?

The investigation of these questions leads me to explore the ways in which actors define their positions and those of others in light of the ecosystem changes. How does the rationalization of ecosystem changes relate to other, more general, explanatory discourses? Are there competing explanations and interpretations of the ecosystem changes? Do these define different groups of actors?

The concepts of ‘ecosystem’ and ‘pollution’ are central to this chapter for my respondents systematically used them. However, these concepts have been highly

debated in literatures from different disciplines. In his original definition, Tansley considers ecosystems as “basic units of nature” that form a system composed of living organisms and of their “habitat factors in the widest sense” (1935, 299). He defines ecosystems as a category associating the ‘biome’ and ‘inorganic factors’. In his own words:

the fundamental concept appropriate to the biome considered together with all the effective inorganic factors of its environment is the ecosystem, which is a particular category among the physical systems that make up the universe (1935, 306).

The concept of ‘ecosystem’ has, since then, been used widely and not always consistently (Willis 1997). It has also been criticised for silencing human and social roles in shaping ‘natural’ categories, and the literature has explored its social constructedness.¹⁶⁴

Here, I use the term ‘ecosystem’ in a broad way that captures my respondents’ own use of it. The operational definition of ‘ecosystem’, followed in this chapter, refers to the lake as including living organisms (plants, animals, micro-organisms) and physical and chemical (i.e., abiotic) dynamics. It assumes that humans have certain roles in shaping the whole, such as the extraction of certain units (e.g., reed maces), or the introduction of others (e.g., new fish species). Moreover, it is important to keep in mind that, when talking about the ‘ecosystem’, my respondents referred to a more or less defined ‘regime’ of the lake. Indeed, they loosely referred to the lake’s oligotrophic regime.

Even though the concept of ‘pollution’ originally emerged in theology, in common language ‘pollution’ broadly refers to the introduction of harmful substances into the

¹⁶⁴ Burnham and Ellen (1979), Dove and Carpenter (2008), Pickett and Cadenasso (2002), Rolston III (1996).

environment.¹⁶⁵ The concept has however been analysed as a highly problematized social construct (Douglas 1966). My respondents used the word ‘pollution’ constantly and uncovering what they referred to is one of the purposes of this chapter.¹⁶⁶ In the interest of clarity, I will say for now that ‘pollution’ was perceived as a threat to a number of activities that were constitutive of my respondents’ livelihoods. In broad terms, ‘pollution’ referred to the degradation of (i.e., a loss of the value attributed to) the ‘ecosystem’ or its components, caused by certain changes. Such losses could be perceived, institutionally established or feared. The idea of ‘changes’ presupposes a comparison between two conditions and highlights their differences; this can take the form of new elements appearing, old elements disappearing, or old elements being modified.

The term ‘pollution’ implies that a negative value is attributed to such changes. From the SES research perspective, ‘pollution’ should be understood as a challenge to the latitude of a desired social-ecological system regime, reinforcing its precariousness. The use of the concept of ‘pollution’ further informs the meaning attributed to ‘ecosystem’ in the field: the changes associated with ‘pollution’ were ‘foreign’ to the ‘ecosystem’ and could even threaten its existence. The ‘ecosystem’ was therefore not an entirely fluid concept. Even though what exactly constituted the ‘ecosystem’ was not precisely defined, it was clear that it was perceived as an object with an ‘essence’. Additionally, ‘pollution’ was perceived as a persistent phenomenon, the product of a set of variables presenting high resistance.¹⁶⁷ In other words, we will see in this chapter how ‘pollution’ was linked to

¹⁶⁵ The Oxford English Dictionary Online, entry “pollution” (2013).

¹⁶⁶ The word used in Spanish was ‘contaminación’. Occasionally my respondents used ‘polución’ as an interchangeable substitute, and there was no distinction between the two.

¹⁶⁷ ‘Latitude’, ‘precariousness’ and ‘resistance’ are three of the four variables of resilience, as discussed in Chapter Two. The other variable is ‘scale sensitivity’. For ease of reading, I recap here the definitions of

structures that prevented the reproduction of certain interactions, desired by several groups of actors.

In the field, defining the changes to the ecosystem, what to do about them, who should take responsibility for this, who was affected by the changes, and how they affected relationships between actors, were all matters under discussion. This chapter first accounts for the descriptions and explanations the population around the lake built on ecosystem changes and compares them with ‘expert’ discourses. It explores the links between ‘expert’ and ‘non-expert’ discourse production. It also analyses the transformations ecosystem changes have induced in the livelihoods of people around the lake and in their interactions with others. Finally, it explores in which ways ‘pollution’ exists as a social construct that redefines relationships within the social sphere of the SES. To fulfil its purposes, the chapter combines general and specific uses of the data. On the one hand, numerous findings emerge from ethnographic observation, interviews and institutional documents collected across case settings. On the other hand, the richness of the empirical data is exploited by exploring in thorough detail specific elements. This contributes to showing that the general patterns identified are expressed in different ways depending on the context. The chapter pays particular attention to the cases of Cohana and Puno bays because the dynamics triggered by the changes occurring there provide an insightful account of the complexity of the situation.

these terms: latitude refers to the amount of change a system can experience without exiting a specific basin of attraction; resistance refers to the ease or difficulty of accepting change; precariousness refers to the system’s proximity to a threshold; scale sensitivity refers to the effects of high connectedness between the system’s scales.

4.1 EXPLAINING THE ‘ECOSYSTEM’

I. DESCRIBING ‘POLLUTION’

Across field sites, the residents of the lakeshores interviewed for this study defined ‘pollution’ as an unpleasant change that could be perceived, either seen or smelt. Visible manifestations of pollution pointed out by participants included the duckweed and the accumulation of waste. Some respondents specifically complained that the lake smelt bad and that “sometimes the smell [would be so strong that it] would give you a headache”.¹⁶⁸ Pollution was presented as a negative alteration of the ‘true’ regime of the lake, which was ‘pure blue’.

My respondents reported that pollution had a series of impacts on different aspects of their lives; in particular, on their well-being, health and productive activities, three categories which were at least partially defined through interactions with the ecosystem.

Numerous accounts from my data illustrate these perceptions:

It didn’t use to be like that, when I was young the lake did not smell (R0167).

There is waste everywhere including in the lake, now you can’t bathe anymore and now it is ugly (R0040).

Everything is dirty and the animals get ill (R0290).

As you can see on this picture [taken in Cohana in 2009], those boats cannot be used anymore. They are surrounded by the duckweed ... and even if you tried with all your strength, you couldn’t take them out. Those fishermen lost their boats (MAOFFPP).

¹⁶⁸ The press also reported on this. See for example “Titicaca, El Lago que Apesta.” by Liubomir Fernández, *La República* (5 August 2012).

In these accounts, the changes are presented as *transformative*, i.e., they affect the interaction between social and ecological spheres. Indeed, numerous activities were interrupted as a result of such changes. For example, in Puno some of my respondents indicated that they had stopped going to the lake bay, to avoid the ‘bad smells coming out of the lake’. In Cohana, the appearance of the *lemna gibba* was presented as the cause of the cessation of fishing.

Thus, pollution was described through sensual experiences (sight and smell) as well as through the effects of ecosystem changes in daily lives. Moreover, it was *explained* through causal chains: it was seen as a *result* of changes in human activities and deficiencies in public management. The changes induced by population dynamics and the development of economic activities were interpreted as revealing the shortcomings of the management system, which had failed to adapt to the disturbances and preserve the desired regime. Accounts from respondents in Copacabana and Desaguadero on waste are informative examples of this:

We used to be less people and the municipality used to take care of waste (R0003).

The lake is now polluted because of all the waste thrown by participants in the fair ... the fair didn't use to be like this ... and [there is a] lack of public cleanness and urban sanitation from both municipalities [he refers to the fact that Desaguadero is a bi-national city] (R0208).

The waste rots and causes bad smell. Especially on market days, because there is no cleaning (R0226).

From these accounts, we can infer that several variables are identified as causing pollution via waste accumulation. These are related to population dynamics – group size, population growth and temporary visits – which are considered a driver of change. They are thought to contribute to the precariousness of the system for three reasons: (i) the

effective impact of population growth, perceived as a fast¹⁶⁹ variable of change (“we used to be less people”), (ii) certain population groups’ lack of adaptive learning, as they do not modify their behaviour despite the visible changes (“all the waste thrown by participants”) and (iii) the lack of institutional adaptive learning when the system faces pressure from these types of variables (“there is no cleaning”, “the municipality used to take care of waste”).¹⁷⁰

Besides the accounts on waste, my respondents presented the arrival of untreated water to the lake and the absence of treatment plants and sewerage networks as resulting in pollution. The narratives on waste were based on the residents’ observation of day-to-day practices, completed with an evaluation of the institutional response to these. A similar logic was followed to account for wastewater: (i) population growth translated into higher quantities of untreated water reaching the lake, (ii) certain population groups adopted ‘irresponsible’ behaviours (such as the direct connection of their water pipes to the lake) and (iii) the relevant organizations failed to respond adequately by extending the sewerage network or building treatment plants.

In Puno, Desaguadero and Copacabana, the ‘untreated water’ and ‘waste’ that people had in mind were those of the cities themselves; the underlying scale of perception, in this context, was mainly local. In Cohana, my respondents referred to the water of the city of

¹⁶⁹ As explained in Chapter Two, slow variables have a structuring effect in the SES while fast variables are elements that can trigger changes in the SES structure. ‘Slow’ and ‘fast’ are not time measures. It is also relevant to remind the reader that external drivers are elements or patterns of interaction that affect the SES but are not affected by its changes. External drivers can become internal variables if the scale of analysis is changed.

¹⁷⁰ The Municipality of Copacabana continued, to a certain extent, to manage waste. At the time of fieldwork, it only effectively collected households’ waste regularly. Street waste was collected occasionally but not in a systematic fashion.

El Alto and occasionally included other cities upstream such as Viacha and Laja.¹⁷¹ The farmers explained that El Alto's water and waste travelled through Katari River to reach Cohana Bay. Therefore, the scale of the system for the farmers included basin dynamics and distant actors. These differences in scale represent an important parameter in the residents' understanding of the problem and of their position in the system.

In sum, across cases, my respondents described waste and wastewater as pollutants. The contact of these elements with the lake resulted in its pollution. While explanations on the role of waste could be built exclusively from observation, the fact that some respondents had recourse to a relatively 'expert' vocabulary (the idea of 'treatment', the building of 'plants' and the extension of the 'sewerage network') to explain the effects of wastewater, suggests that institutional accounts had been at least partially internalized as a source of rationalization of the situation. Pollution was presented as a series of undesired changes that should trigger technical responses, such as the improvement of sanitation facilities and waste collection schemes. Much of the institutional efforts to address the situation did indeed focus on building water treatment plants and sanitary landfills. But how did the residents relate to the information disseminated by the organizations managing the lake and use it to construct their own explanations for the changes?

II. DISSEMINATING INFORMATION

The organizations I studied all constructed explanations of the changes witnessed and their causes. Some of these explanations were communicated to the local populations. I

¹⁷¹ El Alto urban water receives partial treatment in Puchukollo treatment plant. Viacha and Laja do not have treatment plants. The residents of Cohana frequently referred to the Puchukollo plant as inefficient.

analyse, in this subsection, how several organizations presented the duckweed, which is particularly interesting, since the meanings of its presence were highly contested and triggered different sorts of behaviours. This choice leads me to focus on the cases of Puno and Cohana where the duckweed was recurrently present in widespread quantities and where several organizations were intervening to address the issue. Through the case of the duckweed I start uncovering the complexities of generating and exchanging information.

In Puno, the Municipality, the RNT, ALT and PELT had all, according to my interviewees, offered explanations on the presence of the duckweed to the population. Since 2006, following the mandate of the Foreign Affairs Ministry, both ALT and PELT had undertaken several actions to clean the lake by removing the duckweed and accumulated waste from Puno Bay.¹⁷² The PELT officers interviewed indicated that the organization had, more recently, complemented the cleaning of the lake bay with the distribution of a pedagogic flyer to the population of the city.¹⁷³

The flyer was entitled: “Duckweed, a reality that tells us we need to stop pollution now¹⁷⁴” (PELT 2010). The document serves several purposes: to explain what the duckweed is (and what it is not), to present possible uses of the duckweed and to publicize PELT actions. The ‘we’ in the title also seems to aim to give the population a sense of responsibility.

¹⁷² The local press reported on these interventions. See for example “Iniciarán Trabajos de Descontaminación en la Bahía de Puno.” *Los Andes* (3 July 2007) or “Proyectan Extraer 10 mil Metros Cúbicos de ‘lenteja verde’ de Bahía Interior del Titicaca.” *Andina* (25 August 2007).

¹⁷³ Reproduced in the annexes.

¹⁷⁴ “Lenteja de agua, una realidad que nos indica que ya... debemos de (sic) parar la contaminación”.

To achieve its purposes, the flyer presents the ecosystem as an agent that ‘communicates’ with the population. In this sense, the duckweed *is* a message sent by the ecosystem, a warning about the dangers of human activities and the need to take action. Therefore, the change witnessed is implicitly categorized as requiring an adaptive response: “We need to stop” i.e., change the management system in light of the ecosystem change. While the ‘we’ of the title sounds inclusive, PELT presents itself as doing as much as it can – while ‘knowing’ that extracting the duckweed is no solution against pollution, it is at least mitigating the effects of its presence on the bay. Inexplicitly, the ‘we’ seems to target the organizations holding responsibility over the untreated water that cause pollution. My interviewees from PELT claimed that it also targeted the population in general who “should adopt environmentally responsible attitudes”, such as avoiding illegal waste disposal and sewerage connections (PELTZ). Additionally, ‘now’ implies that the change might become irreversible, i.e., soon it will no longer be possible to adapt.

The flyer also provides basic scientific information on the duckweed. It explains that the presence of the duckweed reveals that high concentrations of nitrogen and phosphorus are brought into the lake through wastewater and waste. The document breaks down the effects that the duckweed, in turn, has on the rest of the ecosystem: by covering the water surface, the plant prevents the sunlight from reaching deep areas of the lake, resulting in the death of the aquatic plants where fish lay their eggs and the consequent migration of the fish to other areas.

Nonetheless, the booklet clarifies that the duckweed is not bad *per se*. In certain contexts, it explains, it can be used as a tool in the treatment of wastewater. Interestingly, the Municipality of Puno was running a ‘Programme for the Depollution of the Interior Bay’ of the city, which included the use of the duckweed. The programme aimed to suppress

the phosphorus and nitrogen surpluses accumulating in the interior bay through the inoculation of “efficient micro-organisms”. I quote at length, because the issue is complex, a municipal officer who explains the usefulness of the duckweed for one of the components of the programme:

By the bay, there is the small confined pond, which is polluted, when we started working it was worse. Now, it has the duckweed, but it is an effect of the process we are conducting. We apply efficient micro-organisms, which are a mix of yeasts and bacteria. When these come into contact with the mud, they metabolize ... the duckweed absorbs the nitrogen and phosphorus because they have enough food and that is why they [the duckweed] proliferate more quickly, there is an explosion of these populations as has happened in the past. For me it is a good thing that this happens because they [the duckweed] are helping the micro-organisms to take out nitrogen and phosphorus, which had accumulated on the bottom of the lake and caused the bad smell. I didn't want to extract them yet, because I want them to keep extracting nitrogen and phosphorus, because I work with bacteria, living organisms, they will remain there. In June [the interview took place on 30 September], I applied the bacteria for the first time. They are there, they have enough food, they will continue to diminish the nitrogen and phosphorus and now they have the duckweed as an ally. For the visual effect it's not good because it looks green, but technically, it's good, I know it is the case because I have analysed the issue in the lab and by all accounts, nitrogen diminishes enormously (MUNPNDBL1).

Numerous efforts had been recurrently undertaken to inform the population of the programme. Municipal officials had given interviews to the press to explain the details.¹⁷⁵ Moreover, the launch of the programme, supported by the presence of the city major, received the attention of the local press.¹⁷⁶ Additionally, the programme manager appeared on local television to present the programme's achievements. This prompted certain actors to contest the officer's claims. My interviewee at the Environmental Prosecutors' Office asserted that “he shouldn't say that the programme is a success

¹⁷⁵ An example of it can be found in the article “‘Bacterias Eficaces’ Limpian el Titicaca.” *La República* (17 March 2010).

¹⁷⁶ See for example “‘Bacterias Eficaces’ Son la Solución para Descontaminar el Lago Titicaca.” *El Comercio* (11 March 2010), or “Descontaminarán Lago con ‘Bacterias Salvadoras.’” *El Buho* (2009).

because that hasn't been proved" and was considering opening a case on the matter (FISAM). Additionally, in 2012 a citizen denounced the city mayor to the Environmental Prosecutors' Office for "allowing the introduction of harmful bacteria to the water of Lake Titicaca".¹⁷⁷ Here is not the place to analyse whether the citizen's motivations were solely to raise attention to what he considered the harm inflicted to the bays or whether he had strategic reasons for doing so. I simply draw attention to this example to illustrate that the programme was contested on the base of its scientific soundness.

This was not the only case wherein scientific hypotheses were controversial. In Cohana, my respondents attributed the presence of the duckweed to the inflow of untreated (or partially treated) water originating in the cities across the basin and particularly, in El Alto. Yet, the ProLago programme conducted by USAID in Cohana¹⁷⁸ contended that the manure produced by Cohana farmers' livestock constituted a significant contribution to the eutrophication of the lake.

USAID was the only organization working on the eutrophication of Cohana bay whose programme included a component on the farmers' contribution to the problem. For USAID officers, 'raising awareness' among the farmers was part of a strategy to encourage them to participate in the project. The farmers did participate in the project for a series of reasons that will be discussed later on. Yet some of them questioned the validity of USAID's 'scientific evidence' on the role of cow manure in the eutrophication of the lake. Some farmers indicated indeed that they needed 'definite proof' to believe

¹⁷⁷ A press note from Pachamama Radio reports on this. It is available at <http://www.pachamamaradio.org/24-06-2012/alcalde-de-puno-fue-denunciado-por-contaminar-el-lago-titicaca.html>

¹⁷⁸ This programme, funded by USAID, sought to protect the lake's biodiversity. It had several components including improving the management of the livestock among the rural communities of Cohana Bay (USAID 2009).

USAID's claims. In asking for 'definite proof', they seemed to accept the logic of the scientific discourse. They acknowledged that manure could be a source of pollution *in theory*, but challenged USAID's logic on three grounds: the number of cows in the region, the quantity of manure actually reaching the lake and the history of the duckweed's appearance.

The farmers asserted that the number of cows in Cohana was not high enough for the manure contribution to be significant. Organizations gave significantly different figures for livestock heads in the area, all of which were estimates: Fontúrbel calculated 7,500 (Fontúrbel 2008); ALT and La Paz Regional Government 4,100¹⁷⁹; and USAID 20,000 (Embajada Estados Unidos de América 2010). The number of livestock heads is indeed a crucial factor in determining the supposed pressure they exerted on the lake, as well as in determining potential thresholds. Ultimately, it influenced the kind of programmes that were formulated. Clearly there is a correlation between USAID's high estimate of the number of cattle and their inclusion of a cow manure component in their programme.

Moreover, the farmers reported that since the first appearance of the duckweed, several organizations had visited the area and inspected the situation. According to the residents, these organizations had explained that pollution came from El Alto and other cities around the basin. The inflow of urban wastewater and deficient waste management in the basin were also widely reported by the press as the main causes of pollution.¹⁸⁰

¹⁷⁹ See the information contained in the following articles: "ALT Exige a Autoridades Bolivianas Limpieza de la Bahía de Cohana." *El Diario* (16 August 2011), and "Las Aguas Turbias de Cohana dañan a Pajchiri y Cascachi." by Rivera Díez de Medina. Published in *La Prensa* (February 2008).

¹⁸⁰ See "Contaminación de Cohana tiene su Mayor Fuente en El Alto." *El Diario* (27 July 2011), "La Planta de Puchukollo Continúa Contaminando Río Seco y Bahía Cohana." *GAIA Noticias* (27 May 2011), or "Contaminación de los Ríos Alteños aumentó en los últimos 5 Años." by Lidema. Published in *El Diario* (27 July 2011). For earlier accounts see articles quoted in Ribera Arismendi (2008).

Additionally, Cohana farmers argued that regardless of the number of cows in the area, the bulk of manure did not reach the lake. The farmers explained that they collected the manure and used it as a source of cooking fuel. I observed these practices but it seemed improbable that the farmers would collect significant quantities of manure, let alone all of it. This argument was dismissed by USAID staff who considered that, in any case, such practices should stop. USAID officers argued that burning the manure as fuel was dangerous for the farmers' health (Kim et al. 2011; Rinne et al. 2006).¹⁸¹

Besides the dispute on figures and quantities, the farmers questioned USAID's explanations on a third ground: the 'historical' analysis of the duckweed's appearance. The farmers remembered that the duckweed appeared in Cohana before livestock raising became a productive activity in the area (Ribera Arismendi 2008). This reinforced the farmers' view that cow manure could not be responsible for pollution. They considered that, if anything, the presence of cow manure constituted a gradual change the system would be able to integrate.

In these examples, it seems that the population integrated into their understanding some elements most probably derived from institutional explanations (such as the causal links between the lack of water treatment and pollution), but this was a selective process. 'Scientific' evidence, hypotheses and causality chains were disputed: contextual parameters mattered. For example, the duckweed was presented as both a sign of eutrophication and a tool for water treatment, depending on the context. Additionally, explanations of ecosystem changes were linked to responsibilities. Indeed, determining the group responsible for pollution was a key structuring element in respondents'

¹⁸¹ USAID's programme addressed the need for alternative sources of fuel by including in their project formulation a component aimed at providing the farmers with biofuel produced through the transformation of cow manure.

accounts of the problem. This seems to contribute to the degree of resistance to change displayed by certain discourses of rationalization: new pieces of ‘evidence’, such as the contribution of cow manure to eutrophication, are not easily integrated into well-established explanations. As the examples here suggest, what certain actors present as facts are interpreted by others in the light of how they help to determine causes and responsibilities. In the next section, I further explore how the production of such facts was approached and investigate the role officers attributed to information in conducting their activities.

III. RATIONALIZING THE ‘ECOSYSTEM STATE’

Numerous organizations around the lake generated scientific information about the ecosystem. Both in Peru and Bolivia, the law acknowledges that human activities have an impact on the environment and that these impacts should be monitored.¹⁸² Formally, the tasks of measuring and monitoring water quality are organized through national legislation and internal organizational statutes. The generation of ‘scientific’ information on the ecosystems’ behaviour is conceived as preceding and permitting management (S. A. Moore et al. 2009). The reader might recall that ‘monitoring’, i.e., generating information, is also one of the ‘action situation processes’ considered by the BWSES as necessary for sustainable management (E. Ostrom and Cox 2010). In this subsection I examine what ‘monitoring’ means for the actors in the field, taking examples from both Peru and Bolivia at regional and national levels.

¹⁸² Law 1333 (1992) for Bolivia and Law 28611 (2005) for Peru.

The production of information on the ecosystem had two main manifestations and purposes. Firstly, it aimed to explain observable changes, such as the appearance of the duckweed. In SES research vocabulary, the duckweed constituted an opportunity for ‘episodic learning’, i.e., a change in the ecosystem that reveals the inadequacy of the managerial model and should trigger its modification. Secondly, the generation of information aimed to track hidden changes and forecast possible effects. In that sense, the managers’ rationale followed an ‘incremental learning’ approach wherein changes were addressed from a problem-solving perspective. As “models are assumed to be correct ... learning is characterized by collecting data” (Gunderson et al. 2006, 4).

The *lemna gibba* appeared as a result of an unintended increased amount of phosphorus and nitrogen in the water inflow caused by human activities.¹⁸³ Generally, my institutional interviewees interpreted the spread of the duckweed as a proof of the eutrophication crisis. Some actors considered this an established fact no longer in need of research. For example, since 2006 the environmental NGO Lidema¹⁸⁴ had monitored periodically the quantities of nitrogen and phosphorus in Cohana Bay. However, at the time of my fieldwork, Lidema officers explained that they had stopped taking measurements in Cohana, as it was “not worth it”, it was “evident” that Cohana was polluted. The NGO had switched to taking measurements in deeper and more central areas of the lake to investigate the spread of the problem (LIDOFF1). Detecting changes before they

¹⁸³ With the exception of the use of the duckweed in the municipal ‘Programme for the Depollution of the Interior Bay’ of Puno.

¹⁸⁴ Lidema (Environmental Defence League) is one of the oldest environmental NGOs in Bolivia. It was founded in 1980 as a consortium of environmentalists. It was the most active NGO in the area, and their main activity was the generation and diffusion of information on the quality of lake water. They also supported the local populations in bringing this to the authorities’ attention.

reached ‘crisis point’¹⁸⁵ was particularly valued among managers, as they believed such information would allow for better-planned interventions.

As explained in Chapter Three, environmental management in Peru had been subject to significant reform in the years immediately preceding my fieldwork. In 2008, a Ministry of the Environment had been created with the stated purpose of working closely with regional governments and supporting the decentralization of the environmental area.¹⁸⁶

Among the officers of the Environmental Directorate at the Regional Government in Puno (EDRGP), there was the sense of a new start, and obtaining data was seen as necessary to set up sound bases.

Indeed, EDRGP officers¹⁸⁷ presented the implementation of a regional system of environmental information as the main long-term project they were working on. The information system was built through a shared computer network installed in the majority of the region’s local governments. Local officers were asked to enter information on their local environment following the categories established by the EDRGP. The EDRGP officers were very enthusiastic about the future uses of this system as these accounts illustrate:

If municipalities all feed in all the information, we potentially can know everything about the ecosystem at any instant (EDRGP1).

If there is the slightest problem, we will know and be able to pay special attention to that (EDRGP3).

¹⁸⁵ A term used by my respondents which in SES terms can be defined as the process of an adaptive change threatening to turn into a transformative change, as a result of the system’s precariousness.

¹⁸⁶ “Gobiernos Regionales y Municipales Tendrán que Asumir Responsabilidades Ambientales, Advierte Brack.” *Andina* (27 June 2008).

¹⁸⁷ My fieldwork was coincidental with a change in the regional government, which brought changes in the regional administration. Both teams were interviewed. The data discussed here was collected in 2010, i.e., before the change.

From these quotes, it appears that the information system created through monitoring is conceived of as a dual communication system. Firstly, it enables communication among officers at regional and municipal levels, and secondly, between officers and the ecosystem. Theoretically, through this system, changes could be detected at what officers called 'early stages of change', which would make managerial interventions to protect the ecosystem state possible. From this perspective, information is seen as central for action.

In Bolivia, my interviewees frequently complained about the lack of information on different aspects of the Titicaca basin. At the time of fieldwork, the MMAyA was implementing a programme to monitor the quantity and quality of water in the Katari basin.¹⁸⁸ The managers of this programme believed that the information obtained would fill in what they saw as a gap in the management of the system. The account of one of the officers participating in this programme is telling:

The information system is urgently needed, right now we are operating blindly ... People in the lake are using water which quality we haven't always controlled ... (MMAyAKC1).

He also indicated that:

organizations are digging wells in the area as if we had an unlimited amount of groundwater. We have no idea of the state of groundwater (MMAyAKC1).

Similar to what I described for Puno, filling in these gaps was considered as particularly important because monitoring would permit intervention at early stages that would reverse changes without much cost. My interviewees reported that, by contrast, they were operating in reaction to crises, which was thought to be more costly than intervening at early stages.

¹⁸⁸ As indicated in Chapter Three, the Katari basin is a sub-basin of the Titicaca basin. The sub-basin includes the city of El Alto.

The Directorate of the Environment in the La Paz Regional Government (DEGLP) also found itself reacting to crises. The officers reported that they allocated the majority of their resources to deal with urgent matters. Neglecting monitoring tasks, they recounted, made planning more difficult. Indeed, without monitoring, it was impossible to determine early stages of change. This situation was presented as the result of limited financial resources. The DEGLP was responsible for monitoring the quality of water after it had been treated in urban treatment plants and on watercourses crossing municipal boundaries.¹⁸⁹ The DEGLP officers feared that municipalities were not able to comply with their own local monitoring tasks either.

Some organizations were in charge of monitoring the impacts of specific elements related to their area of expertise on water quality. An interesting case in Peru is that of the Environmental Department of the Regional Delegation of the Ministry of Production in Puno (EDRMP), which had to control the impact of pisciculture on the lake. One of the officers (EDRMP1) expressed anxiety about the next meeting of the Regional Environmental Commission (CAR for its acronym in Spanish), as he thought he did not have enough data on the impact of pisciculture, and on its contribution to eutrophication (specifically on the possible accumulation of trout food on the lake bed). He forecasted that the rest of the members of CAR would legitimately want to know about these issues. Similarly to DEGLP officials, the officer at the EDRMP attributed this problem to the directorate's limited resources and the need to attend to more urgent matters.

The officers in the examples analysed so far considered the lack of resources as a fundamental impediment to complying with monitoring tasks, which prevented gradual

¹⁸⁹Law 2066 (2000).

learning. Indeed, identifying the early stages of change was perceived as particularly challenging. The officers complained that they were dependent on random, episodic observations instead of systematic information. They considered that crafting interventions after episodic observations was problematic. For example, an officer at the RNT (National Reserve of Titicaca) in Puno reported having found fish presenting malformations that he claimed were typical of the effects of heavy metals. Institutional information about the impact of heavy metals on the lake is scarce. It is clear that the Titicaca basin is a mining area and the effect of mining activities in certain rivers has received attention.¹⁹⁰ As far as the lake itself is concerned, in its comprehensive study *Geo Titicaca*, UNEP indicates that mercury has been found in low but significant doses in fish stock (PNUMA 2011), which confirms the results of previous analyses (Tyspa and Prointec 2004; Treviño et al. 1989). Yet, my respondents felt that these studies were insufficient.

I shared the RNT officer's concern with several of my interviewees and none of them confirmed having encountered such phenomena. One of the officers I interviewed at the Peruvian Sea Institute (Imarpe), who participated in monitoring the lake water's quality, considered that the subject was delicate. He was concerned that organizations did not have enough figures to interpret facts such as the one the RNT officer was reporting on. The Imarpe officer worried that the population might encounter fish with malformations and be alarmed before public authorities had the opportunity to face the problem.

The population of the city of Puno had not mobilized against mining activities, which was in contrast to upstream areas in the region where riverside populations had made

¹⁹⁰ See for instance Ccopari (2010), Gammons et al. (2006) and Tudela (2010).

their voices heard.¹⁹¹ The city population's attitude was presumably explained by the fact that mining residues had not produced any widespread visible changes, contrary to what had happened in other areas of the basin. The Imarpe officer was concerned that conflicts similar to the ones witnessed elsewhere in the region would occur in the city if heavy metals had visible effects on the lake ecosystem.

To sum up: the lack of data was a source of concern for officers on several grounds. Indeed, it determined the kind of interventions organizations were able to undertake. Moreover, it was a cause of tension between organizations, as the concerns on the effects of pisciculture illustrate, and potentially a source of tension within the population. Furthermore, monitoring was particularly valued at early stages of change, and it was believed to be a conditioning factor for efficient interventions. However, the interviewed officers reported that financial constraints meant that they intervened mainly over crises. In situations of crisis, some actors contested the necessity of information, since the appropriate action seemed evident. As I will explain in the next section, determining the appropriate actions was rarely a straightforward process.

IV. CONCLUSION OF THE SECTION

In this section, I have explored the meanings of 'pollution', a word used across field-settings. This has revealed that actors hold several interests (over the state of the ecosystem, the definition of their responsibilities, the possibility of conflicts, etc.) that might be contradictory.

¹⁹¹ Among the numerous press reports, see for instance: "Walter Aduviri no Da Marcha Atrás: 'No Habrá Minería en el Sur de Puno.'" *El Comercio* (15 August 2011), "Realizarán Paro de 24horas en Protesta contra Minería Ilegal en Puno." *La República* (26 February 2013), and "En Puno 2009 fue el Año más Conflictivo según Defensoría del Pueblo." *Radio Onda Azul* (19 March 2010a).

I have tried to show that talking about ‘pollution’ allowed the residents of the lake to group together a series of unpleasant changes. The residents’ accounts of the appearance of these changes fitted into causal chains that derived from direct observation as well as from institutional explanations. These explanations were mobilized in selective ways, suggesting the existence of larger discourses of rationalization that not only identify causes but also distribute responsibilities. This topic will be further explored in the last section of this chapter where I investigate in what sense the distribution of responsibilities reveals social variables structuring the system.

The generation of information about the ecosystem state has appeared as crucial for two reasons. On the one hand, discourses were produced on the visible changes of the ecosystem, and on the other hand, on determining the early stages of invisible gradual changes. The visible changes were taken as indicating the possibility of a shift from one ecosystem regime to another. When the new regime was perceived as relatively stable, the need for detailed scientific information was contested. Some of the officers considered that in such cases the question of determining the ‘state of the ecosystem’, was the ‘wrong’ debate, hiding the ‘real’ issue: the necessity of action.

To explain the deficiencies they faced, the officers presented themselves as caught in a vicious circle wherein their inability to comply with their monitoring tasks led them to proceed by responding to crises. The situation was presented as originating in the financial shortfalls that dictated one of the sustained patterns of interaction with the ecosystem, i.e., through interventions in case of crisis. Therefore, the lack of resources was one of the variables that officers identified as constitutive of the system’s structure. It conditioned the system’s learning capacities as it hindered the gradual learning processes that the officers desired. Moreover, it revealed the managers’ frustration at the

lack of adaptive learning, since the system did not modify its structures to avoid crises from arising, but simply reacted to them without addressing their causes.

Underpinning the managers' perspectives on information seems to lie a rather stable vision of the ecosystem. Managers' desired approach to changes involved considering them as gradual phenomena that should be tracked, which is typical of gradual learning paradigms. Nonetheless, the idea of 'crisis' opens the way to the exploration of new possibilities of interaction in the SES. Firstly, the relatively stable presence of the duckweed in Puno and Cohana constitutes the appearance of a new agent: how do actors interact with it? Secondly, the frustration over the lack of action to address identified problems in traditional ways (such as the building of treatment plants or sanitary landfills) raises questions as to whether officers tried to find more creative solutions that would require a complex perspective over the social-ecological system. I explore these elements in the next section.

4.2. MODIFYING SES PATTERNS

The presence of the duckweed on the lake surface was a relatively stable element of the landscape in Puno and Cohana. While it is true that considerable amounts of *lemma* had been withdrawn from the bay of Puno in several occasions and that in Cohana the spread of the duckweed on the lake surface diminished in the dry season, the plant was still part of everyday life.¹⁹² The presence of the duckweed imposed the cessation of certain activities (such as fishing in Cohana), but it also made others possible. I study how the

¹⁹² As ALT and PELT had taken the duckweed out of the lake on repeated occasions since 2008, the quantity of duckweed in Puno Bay was reduced. During the dry season, some of the basin rivers are dry which reduces the amount of upstream untreated water making their way to Cohana.

new possibilities of interaction are viewed by different sets of actors. The existence of new types of interaction suggests that some of the elements contained in the category 'pollution' are transformed. In this section I address this tension and examine how the new interactions are perceived.

I. USING THE DUCKWEED

At the time of my fieldwork, the duckweed was present in widespread quantities in Cohana and in moderate quantities in Puno. My respondents reported that Puno Bay had been completely covered by the duckweed in the recent past. Inhabitants of the area were, or had been, using the duckweed for three main purposes: feeding livestock (be it cattle or small livestock such as chickens) fertilizing the soils and producing compost.

Livestock raising was a relatively recent activity in Cohana (Ribera Arismendi 2011). According to farmers, as fish disappeared, traditional fishing was progressively substituted with livestock raising. Cows had been present in the region since colonial times, but cattle raising had been turned into a commercial activity in the 1990s only (Ribera Arismendi 2008). Cows were usually kept in place by a long rope tied to their horns and nailed to the ground. Farmers walked the livestock every morning in search of vegetation, which usually consisted of *totoras* reed maces and the duckweed. As this farmer explains:

Cows eat everything, they sometimes even eat plastic if they are eating where plastic has arrived. So you need to select what they eat because if not they can be sick. So we give them the plants in the lake, we cut them and take them out so that they can eat (CFCMN2).

Officers at Puno Regional Government, PELT and at the RNT reported similar uses of the duckweed in their region. The duckweed had been given as food to small livestock,

such as chickens, and used as a soil fertilizer, since its high quantities of phosphorus triggered an accelerated growth of plants.

The fact that the duckweed was actively used suggests the existence of several perspectives on it. Through its use, the duckweed was detached from the general category of 'pollution' and was given a different meaning. The duckweed was used to feed the cattle because, as presented in the farmers' accounts, 'it was not bad for the cattle'.

The logic is complex: 'pollution' and the 'duckweed' were used interchangeably to explain the absence of fish. The 'duckweed' or 'pollution' was the cause of fish disappearance. The duckweed was therefore bad for the fish. Insofar as the fish were part of the lake, the duckweed was bad for the lake provided that the lake was understood as the place where fish live. However, the duckweed was also a plant, and as such, together with *totoras* reed maces, could be used to feed the livestock. Developing this same logic, the duckweed could also be used as a fertilizer. We can infer from this that the same object, the duckweed, was put into different categories and given very different values depending on the larger context in which it was used.

It is unclear whether the possibilities of using the duckweed were discovered by the local populations through experimentation or whether they were introduced by certain organizations in Puno and Cohana. My field data suggests it is likely that it was a mixture of both. Some of my respondents maintained they had used the duckweed after an organization¹⁹³ had recommended that they do so, and others claimed that no organization gave them advice on what to do with the duckweed. It seems perfectly

¹⁹³ The organizations mentioned included the National University of the Altiplano in Puno, ALT and 'NGOs'.

plausible that the residents decided to use the duckweed to feed their animals without receiving any instructions on it. Indeed, inhabitants of the lakeshores traditionally used *totoras* to feed the few animals they had. With the increase in the number of animals, it is likely that the duckweed appeared as a handy alternative. As for the use of the duckweed as a soil fertilizer, it seems that the nutrients contained in the plants indeed helped the growing of crops, which might have encouraged their use as a fertilizer.

Moreover, in Cohana the duckweed had been used as the main primary input for the production of compost, in the context of an ALT intervention seeking to address the “environmental liability caused by the arrival of untreated urban wastewater” (ALT3). As mentioned, ALT had been charged with ‘depolluting’ the bays of Puno and Cohana. The organization was not administratively competent to address the ‘roots’ of the problem, which would have involved the building of upstream treatment plants. In this context, together with the mechanical extraction of the duckweed in Puno and Cohana, ALT launched a pilot project using worms to produce soil humus out of a mixture of manure and duckweed in Cohana. The compost was destined to be used by local farmers, as well as sold in the market. I interviewed one of the ALT officers on the subject:

We identified that Cohana had strong potential to exploit it [the duckweed]. Imagine that! Out of misfortune we managed to find an alternative for economic exploitation! There [Cohana], what they have is plenty of manure. [Out of] the urea and vegetation that destroys the ecosystem, we started making compost and worm humus (ALT3).

This quote suggests that the officer perceived the presence of the duckweed in Cohana mainly in economic terms: it was a misfortune because the fish had left, i.e., a source of income had disappeared, but also an opportunity for economic development if correctly exploited. In that sense, one structuring social-ecological pattern (fishing) could be substituted by another (compost production), with the livelihoods of the residents continuing to build on the lake ‘resources’. From this perspective, the system would have

undertaken an adaptive change, i.e., the management system would have been modified to accept a change in the ecosystem. However, as we will see in the next subsection, this programme faced strong criticism over the ‘dangers’ of integrating the duckweed in production activities.¹⁹⁴ Indeed, some officers argued that the duckweed could not be taken in isolation from the rest of ecosystem changes, redefining the object ‘duckweed’ again.

II. UNCOVERING THE DUCKWEED

Scholars and public officers in diverse organizations expressed concern at the idea that the duckweed was being extracted from the lake and used by the population. At the time of my fieldwork there was a vigorous debate on whether or not the duckweed should be used, and if so, how and for what purposes. Even though the duckweed had been used by Peruvian and Bolivian residents, at the time of fieldwork, the debate was particularly vehement in Bolivia. One of the reasons for this is that in Bolivia the use of the duckweed was also part of an on-going ALT programme, which catalysed other organizations’ reactions. Indeed, the debate was framed within a more general contestation of the work of the bi-national organization.

The discussion on whether the use of the duckweed should be a source of concern focused on the plant’s potential to accumulate heavy metals.¹⁹⁵ Scholars at San Andrés University in La Paz considered that the duckweed should not be touched as, they

¹⁹⁴The project was short-lived for financial reasons, since the Bolivian Ministry of Foreign Affairs stopped its funding to ALT, as we will see in Chapter Six.

¹⁹⁵As mentioned previously, the information on the presence of heavy metals was scarce. In the case of Cohana, besides the heavy metals derived from mining exploitations upstream, mining companies operating in the city of El Alto, many of them informal, roughly separated metals from mud using water, which they then disposed into the urban sewerage network without further treatment.

contended, it had the capacity to accumulate significant amounts of heavy metals and other pollutants. These, they argued, would circulate and be spread by being incorporated in the different crops fertilized with the duckweed or its derivatives, and would be transmitted to the animals fed with it. The World Bank, which was running a project in the basin, echoed those concerns. In the Bank's report on 'the state of the lake', we read that:

the evaluated hydrophytes show capacity to accumulate heavy metals ... having a risk of toxicity for the animals that eat these aquatic plants since the accumulated metals are transported (bioaccumulation) through the trophic chain and can even reach men, in whom it would generate equally toxic effects (2009, 35).

On the opposite side of the debate, ALT had conducted its own analyses with data from their project. Their results pointed to the safety of using the duckweed as a source in the production of compost. As an ALT officer explains:

I conducted a small study with 16 experimental units, we tried different levels of mixture, manure 75, duckweed 25, etc. We developed four treatments [experiments] with four repetitions and we reached the conclusion that we could use 50-50, and still obtain traces of heavy metals way under the permitted limits (ALT6).

Peruvian studies supported the argument that the accumulation of heavy metals through the trophic chain was not significant (Canales Gutiérrez 2010; Ccopa Balvina and Aruquipa Mamani 1996). Opponents in the debate argued that the results were context dependent and that what was valid in Puno was not necessarily valid in Cohana. One of the difficulties in communication rested on the fact that each side was working with its own data, which was contradictory. The opponents to ALT complained that the bi-national organization would not share the details of their studies, which they interpreted as proof of the fallacy of their arguments. ALT officials denied that they had refused to share their data. They claimed that requests to access their studies needed to follow the appropriate procedure, notwithstanding how burdensome that might feel for other

actors.¹⁹⁶ In an attempt to try and calm the tension, however, ALT decided to use the compost obtained exclusively for flower production (ALT1).¹⁹⁷

Determining whether the duckweed accumulated heavy metals or not was particularly important because it impacted policy-making. The actors opposing the use of the duckweed believed that if they could prove that the ALT project was dangerous, it would have to stop. This dispute was one among the numerous criticisms that the bi-national organization had to face and that led the Bolivian Ministry of Foreign Affairs to stop funding the organization, which constrained its action. This decision ultimately triggered a general debate on the work the organization was doing and a proposal for its restructuring.

The contestation of the ALT programme should certainly be understood in the context of the tensions surrounding the bi-national organization. However, it was simultaneously a scientific debate on whether the duckweed could be isolated from other parameters, namely, the presence of heavy metals. The debate can be understood as an attempt to define whether the ALT intervention was fostering the system's resilience (by adapting the management to the changes) or reinforcing its precariousness (by spreading heavy metals). In the next section, I explore other attempts to address the 'problem of pollution' through intervening on complex variables and I explore the debates that surrounded them.

¹⁹⁶ ALT enshrined in its legal status as dependent of the Ministries of Foreign Affairs of both countries and argued that authorization should be requested to the Ministries, which considerably delayed the procedure.

¹⁹⁷ There were many reasons why ALT would benefit from calming the tension and notably the fact that the general contestation was such that some actors considered the suppression of the organization altogether. I discuss these issues in Chapters Six and Seven, I put them aside for the moment as it allows me to unfold my argument here.

III. INTERVENTION ATTEMPTS

The straightforward response to the challenges the system was facing seemed clear for the majority of environmental officers: industrial parks should have special water treatment services, mining regulations should be enforced strictly and all cities should have sanitary landfills, comprehensive sewerage networks and water treatment plants. The lake might then need some time to recover, but will ultimately go back to its previous state. This view presents the lake as displaying high latitude and the changes witnessed as needing response, but not as having transformed the system. Put otherwise: the system was getting increasingly precarious, i.e., closer to a threshold, but there was still space for intervention. It was also clear that these solutions had not been implemented in the thirty years that the problem had lasted, be it for financial or other reasons. In this context, several officers considered the situation from a different perspective: they aimed to foster the system's ability to cope with the pressures it received, i.e., in SES terms, to foster its latitude.

Earlier in this chapter I discussed the case of the municipal 'Programme for the Depollution of the Interior Bay' in Puno. This programme, while contested, proposed an innovative approach to the problem: the introduction of bacteria in the city's confined pond, i.e., its water treatment pond. The hypothesis was that the bacteria would help the pond system cope with the change that the concentration of nitrogen and phosphorus supposed, i.e., it would increase the pond system's latitude. In this section I discuss two other projects designed to foster Puno Bay's resilience through intervening on variables that would increase the system's latitude and decrease the precariousness of the bay

subsystem. These initiatives are the placement of oxygenators on the bay beds¹⁹⁸ and the displacement of *totoras* reeds to help water circulate. The first was implemented by ALT, as part of its programme to clean Puno Bay; the second was designed (but not implemented) by an officer at a different organization¹⁹⁹. The latter project sought to reinforce the connectedness of the bay with the rest of the lake. I choose to focus on Puno Bay for this section because it presents a unique case of officers designing interventions that targeted interlinked components of resilience.

The lake bays' shape (closed in on themselves) and their reduced depth result in the stability of the water and facilitate the accumulation of sediments on the lake beds (Dejoux and Iltis 1991). The placement of oxygenators in Puno Bay aimed precisely at “impeding sedimentation” by “inject[ing] oxygen in the water” (ALT 2010). According to ALT, this method:

ensures water quality by maintaining a good level of oxygen which consumes the nutrients [phosphorus and nitrogen]²⁰⁰ that the duckweed needs to develop and grow (2010).

At the time of my fieldwork, four oxygenators were operating. The ALT intervention aimed to increase the quantity of oxygen in the water. In SES terms, this can be conceptualized as an attempt to introduce a fast variable that would foster the system's latitude. The hypothesis was that the more oxygen there was, the easiest it would be for the bay to assimilate the concentration of phosphorus and nitrogen in its system (ALT3). The organization presented the intervention as a success, maintaining that the

¹⁹⁸ This was done in a different area than the one targeted by the Municipality through its 'depollution' programme.

¹⁹⁹ I do not give details on which one to preserve my interviewee anonymity, who is identified as TOTORPN.

²⁰⁰ Contained in urban wastewater.

oxygenators had managed to reduce the level of pollution in the bay by 70%.²⁰¹ Yet, the veracity of that information was contested by several of my interviewees in Puno.

Indeed, three of my interviewees (a municipal officer, an officer at the regional government and an environmental consultant who had worked for several organizations) raised suspicions about the efficiency of the oxygenators and questioned whether ALT had sound data to make such claims. As in the case of the duckweed, the organizations were not operating with the same data and tensions around the access ALT gave to its data were also present in Puno. The oxygenators, those who opposed them argued, were an appropriate solution in conditions of low concentrations of phosphorus and nitrogen, but not for those of the bay. They believed that the oxygen injected had no effect on the eutrophication process. The intervention was criticised on the grounds of economic irrationality: the oxygenators constituted too big an investment for an intervention that had no guarantee of success. Additionally, they were concerned with its sustainability because the oxygenators would be expensive to repair if they broke down.

ALT had managed to implement the first phase of the programme, and it intended to place more oxygenators in other areas of the bay. However, ALT officers were concerned that the suspicions voiced by some organizations in Puno would prevent them from continuing to the second phase. Moreover, they feared that their plan to implement a similar programme in Bolivia, once the tensions had passed, would be frustrated as a result of the tensions raised by the experience in Puno.

I turn now to discuss the project designed by the officer TOTORPN, working at a regional organization in Puno. He identified the shape of the lake bays as an element of

²⁰¹ As declared to the press. See “Contaminación de la Bahía del Lago Titicaca Bajó en 70% Sostienen.” Onda Azul (6 September 2010b).

resistance in the bays' ability to cope with pressure. He argued that the closeness of the bays was accentuated by a 'barrier' of reed maces that separated the interior bay from the rest of the lake. He contended that displacing this barrier would facilitate the mix of the bay water with those of the rest of the lake, and he was confident that the lake as a whole would be able to integrate the pressures the interior bay alone could not cope with. He calculated that his would be much cheaper than any other option. However, he had not managed to convince the organization's directors to put it forward as they doubted that it would be accepted by other organizations. He expressed disappointment at the idea that "getting things done takes so long", which he attributed to "bureaucratic issues" and to the tension between organizations that did not allow for a cooperative environment where "what counts are the ideas".

It was not the first time that this manager had proposed a "radical solution" that failed to be applied. Indeed, he had worked in the region from 1992 to 1999 and came back in 2008, after living abroad for eight years. As he recalls:

In my first time here there was a small area on the environment, it was initiated in 97, and there was an area on depollution of the bay, projects were done ... mainly studies. In 99 we had a definitive study to eradicate completely the current water treatment pond and transport it elsewhere. What we recommended in that study was technically viable and it was the most technical and healthy alternative to the harm that was being done to the interior bay because the water pond was [and still is] very close to the lake. But there were social conflicts, because it [the building of the new treatment pond] would have generated a cost, that the population would have had to pay for, something like 6 soles (2 USD), and some organizations, more because of personal interests, and political, were opposed to it.

The manager felt that his new proposal was encountering the same kind of obstacles, this time coming from within his organization. The experience of this manager illustrates that projects are not only embedded in struggles between organizations but also within them. Scientific debates and conceptions of the ecosystem cannot be separated from the social

dynamics that contribute to determining which projects see light as well as which are effectively implemented.

The initiatives discussed here as well as the inoculation of bacteria discussed earlier, were not targeted directly at amending human action, but rather at helping the lake cope with stress by intervening over the system variables. This reveals a complex vision of the ecosystem that was subject to debate; a debate that cannot be separated from the dynamics within and between organizations.

From each of the cases, different sets of actors emerge as they play crucial roles in the fabric of the tensions within and between organizations: TOTORPN identified “personal interests” as downplaying innovative initiatives; the suspicions concerning the ALT oxygenators suggested that the bi-national organization was viewed with mistrust by organizations in Peru, similarly to that reported in the Bolivian case. The logics that these tensions responded to are further explored in Chapters Six and Seven.

IV. CONCLUSION OF THE SECTION

We have seen in this section that two elements facilitate the emergence of new interactions with the ecosystem: first, the relatively stable presence of the duckweed and, second, the ascertainment that ‘straight-forward’ interventions to counter the impacts of human actions on the ecosystem had not been implemented. In the face of these, certain officers tried to implement alternative solutions.

The first of these attempts is the widely contested use of the duckweed in productive activities. The outspoken core of the debate revolves around the capacity the duckweed has to accumulate heavy metals. In conceptual terms, the debate hinges on whether the use of the duckweed constitutes an adaptive change (as those who promote it would

argue) or a transformative change (as those criticizing it would defend it). An adaptive change would signify that the changes “do not alter the prevailing system logic” (Wilson et al. 2013, 1). Indeed, the officers promoting the use of the duckweed defend that the SES would still be structured through the ‘extraction’ of ‘ecosystem units’ (in this case, the duckweed) to develop economic activities. A transformative change, by contrast, would mean that the system enters a different regime. In such a case, critics argue, the system is precipitated into an unsustainable regime, spreading heavy metals, threatening the system units’ health (notably, humans’ health) and preventing the reproduction of its structuring interactions.

The analysis of this debate and those that arose when officers implemented or designed projects that would promote the system’s scale sensitivity or its latitude, highlighted that the disputes over the validity of scientific information, including the hypotheses about the ecosystem the projects lay on, cannot be separated from wider inter-organizational and social contexts (Latour 2004; Rose 1997). As emerges from the data presented so far, the knowledge generated on the SES can be used as a tool to promote or impede interventions. Officers use data and scientific hypotheses not only to frame their own actions but also to negotiate on the acceptability of the interventions of others. When the availability of data is reduced, the hypotheses elaborated were strongly influenced by the actors’ perception of organizations.

From the two first sections of this chapter, it appears useful to conceive of ‘knowledge’ as an adjustable joint in the SES: the way the system is understood is the outcome of diverse interactions between social and ecological spheres producing a range of results. The validity of these results is negotiated, conditioned partly by differences in scientific understandings and partly by social structures, which re-shape the possibilities of interaction in the system. In turn, defining what ‘scientific knowledge’ is valid determines

the possibilities for sustainability of the actions undertaken. In the next section I further explore the social dynamics that simultaneously emerge from discourses about pollution and are crafted by them.

4.3. 'POLLUTION' AS A RELATIONAL DISCOURSE

In the first section of this chapter, we saw that rationalizing the ecosystem changes forges discourses on why changes occur, as their causes are exposed. The logic of such discourses associates causes with responsibilities. Depending on how these are distributed, interventions are demanded and actions justified. While the establishment of causal factors might identify duties, the recognition of effects can simultaneously trigger responsibilities involving different sets of actors. To better make sense of this, it is necessary to pay further attention to the role of scales in the SES. Indeed, in this section I investigate the structures in the social sphere that, while they do not seem to directly include elements of the ecological sphere, frame the possibilities of interaction. This section seeks to answer the following questions: how do residents and officers relate to the responsibilities derived from the discourses on the changes witnessed? How does this affect their understanding of the positions they assume and those of others?

I. DEFINING RESPONSIBILITIES

As I showed in the first section of this chapter, both the experts' accounts of pollution and the inhabitants' narratives presented the changes in the system as anthropogenic. In this section, I investigate the different groups that residents compose through the distribution of responsibilities in contributing to these changes. I first focus on the case of Cohana and the residents' description of El Alto as holding the main responsibility for

the situation in the lake. Cohana is unique in attributing responsibility to a singularized ‘outsider’ group, as opposed to the rest of cases wherein distinctions in respondents’ accounts were less clear-cut.

A. THE CASE OF COHANA AND EL ALTO

In Cohana, my respondents were reluctant to accept that they had any responsibility in generating the situation ‘they were suffering from’. Their accounts systematically targeted El Alto as mainly responsible for it. Many of them distinguished El Alto from all other cities upstream (such as Viacha and Laja) because of its ‘monstrous size’. Indeed, they extrapolated from the basis that bigger concentrations of people produced more waste and untreated water than smaller ones. Logically, it follows that the 850.000 people living in El Alto pollute the lake more than any others and that, by comparison, other contributions are trivial. Moreover, the press and NGOs had insisted on the deficiencies of the Puchukollo treatment plant in El Alto to explain why ‘pollution continued’.²⁰²

The farmers complained that El Alto inhabitants disposed of their waste directly into the rivers that transported it to Cohana. According to my respondents, *Alteños* proceeded that way so that ‘they didn’t see the rubbish anymore’, and that they did not wonder ‘about where it went’. In their narratives, the industries of the city disposed of their water equally irresponsibly. In particular, they described how illegal slaughterhouses would dispose of blood and animal remains in the rivers.²⁰³

The farmers’ accounts constructed a dichotomous boundary between them and El Alto. This dichotomy, however, did not correspond to Cohana residents’ reality. Indeed, the

²⁰² See for example, “La Planta de Puchukollo Continúa Contaminando Río Seco y Bahía Cohana.” GAIA Noticias (27 May 2011).

²⁰³ I observed these practices myself.

farmers' daily lives included selling their products in El Alto markets, visiting the city at least once per week. Moreover, one or several members of the Cohana families worked in the city of El Alto for extended periods. These practices blurred the frontiers that had been drawn in the farmers' narratives. This should be understood as the product of at least two factors. Firstly, the farmers compared the overwhelming size of El Alto to that of their communities, which made them appear as powerless. Secondly, El Alto was stigmatized in the collective imaginary as a tough city where people adopt survival strategies regardless of their impact on others or on the environment. Whether or not the farmers spent time in El Alto, they did not present themselves as part of it in these narratives.

El Alto, in fact, encompasses multiple realities (Albó 2006). In the concrete case of wastewater, some of the city districts, with the help of the NGO Sumaj Huasi, were using ecological toilets to avoid polluting the basin water.²⁰⁴ At the time of fieldwork, the Neighbourhood Association of El Alto was negotiating with the city municipal government the extension of ecological toilets to several of the city districts (AJVMA). Additionally, ice-cream makers were collaborating with an NGO (the Centre for the Promotion of Sustainable Technologies) to improve their wastewater management. This NGO was trying to establish working links with mining companies as well (NGOCPTSUEA). My fieldwork data suggests that Cohana farmers disregarded these initiatives. When they were told about them, my respondents reacted by minimizing the importance of these actions, which they presented as exceptions.

²⁰⁴ See the website of Sumaj Huasi (2012).

From the farmers' narratives, El Alto emerged as a thoughtless, careless collective actor of which Cohana was a 'victim'. The farmers felt that they 'were forgotten' and 'unimportant'. Crucially, many of them indicated that the waste transported by the rivers arrived to 'Cohana' or to 'us', using the words interchangeably. This suggests that the 'aggression to the lake' was, by extension, an aggression to their livelihoods and therefore, to them. In the farmers' narratives 'the lake' was not an element isolated from the rest of the elements composing their livelihoods. In order to fully grasp what this means, it is necessary to go beyond the farmers' view of El Alto and explore the interactions between the farmers and the organizations present in the field.

VIEW OF ORGANIZATIONS AND PUBLIC AUTHORITIES

Both ALT and USAID officials working in Cohana reported that the population of the area had asked them for help to improve different aspects of their lives. Frequently, the officials in particular, and the organizations to which they belonged in general, did not have responsibilities for the problems raised, such as health-related issues. My interviewees reported that they tried to direct the farmers to seek help elsewhere or to help them where possible. For example, at the time of my first visit to Cohana, the farmers wanted to build ecological toilets in their communities and asked USAID officials for support, which they were willing to provide. However, the USAID programme was funded through the agency's biodiversity protection scheme and, therefore, the officers were struggling to justify integrating ecological toilets into the project. The farmers considered such categorizations as senseless. It was an attitude partially explained by the fact that accepting them would mean giving up on the building of the toilets, and partially by the fact that the USAID project targeted cow manure and the farmers could not see any difference between dealing with bovine waste and human

waste. Interestingly, those of my respondents who contested that manure effectively polluted the lake, based their argumentation on the ‘logic’ of their request.

My interviewees from ALT reported on other requests made by some of the farmers, such as the extension of the drinking water network. The farmers made demands to a specific organization firstly because it was present in the field, regardless of its specific functions. Secondly, the organizations to which they made their requests had displayed, through previous interventions, significant capacities in terms of funding or infrastructure. In the farmers’ rationale, presence and previous performance were the most relevant elements of the organization’s capacity to help them, rather than the formal ‘function’ as such. Yet, this does not mean that the organizations present in the field were the only ones considered ‘responsible’ for the situation. A plethora of organizations including cooperation agencies, the central government, municipalities from the cities upstream and a combination of these were presented as needing to assume responsibility. The farmers judged that both cooperation agencies and the central government were ‘capable of helping them’, i.e., had the financial means to do so.

B. OTHER CASES

In the rest of the cases, as with the farmers in Cohana, my respondents generally did not assume responsibility for producing ‘pollution’. Yet, the frontier they drew seemed to separate them from all other actors (‘the people’), as opposed to distinguishing a specific group or place, like El Alto.

Copacabana presented an exception in that respect as numerous residents acknowledged that they threw waste away too. These very same respondents then justified this behaviour as the result of a lack of choice. They argued that the municipality should provide public bins and recycling facilities but did not. In this way, they introduced a

hierarchy of responsibility in their narratives, which allowed them to clarify that they were not guilty in the situation, while acknowledging their role in producing it.

The awareness of waste management processes that my respondents from Copacabana displayed was probably due to the fact that the population had been recurrently exposed to institutional discourses on the issue. Indeed, my respondents reported that local NGOs had conducted waste collection and waste recycling programmes in the past. Additionally, during my time in the city, the MMAyA (Ministry of Environment and Water), together with La Paz Regional Government and the Municipality of Copacabana, organized a waste collection event. The staff from the Ministry and the Regional Government travelled from La Paz, and together with the municipal staff and the population of the city, cleaned the beach. My respondents reported that such events had already taken place in the past. One of the reasons why this kind of event targeted Copacabana was because the city constitutes the main tourist destination in the area.

It is also interesting to note that, while in Puno and the cities of Desaguadero my respondents indicated that a combination of organizations (the three levels of government, ALT, PELT) should take responsibility for the situation, in Copacabana, the majority of my respondents considered that it was exclusively a municipal duty. Waste and sewage management are, as a matter of fact, municipal responsibilities. Rather than an awareness of the administrative divisions at play, this most probably suggests that the problem in Copacabana was perceived as a local problem. In the rest of cases, by contrast, the problem might appear to have been caused by outsiders or by the incapacity of the local authorities, which may explain why my respondents felt that several organizations needed to get involved. The region of Puno (which includes the city of Puno and Desaguadero) throws some light on this hypothesis.

First of all, the fact that ALT and PELT had intervened in Puno Bay might have conveyed the message that local capacities were insufficient to manage problems related to environmental health. The logic generally held contended that if the municipality had built a water treatment plant and a sanitary landfill, the bay would not have presented the eutrophication problems ALT and PELT tried to address (ALT5).

Moreover, ALT was providing technical support to the municipality of Desaguadero for the building of a sanitary landfill – a project, in turn, funded by the European Commission through the Andean Community (CAN). The local authorities had neither the technical nor the financial capacity to do it themselves, notwithstanding their institutional responsibility. Some of my respondents from Desaguadero (all of them participants in the fair and not residents of the city) considered that the municipality should be able to provide public cleaning since it made them pay a tax for that purpose. If they acknowledged that the municipality did not have the capacity, they believed this was because many participants were illegal (i.e., did not pay the tax).²⁰⁵

Additionally, my respondents did not seem to trust local authorities' will to address the problem. Indeed, my fieldwork was coincidental with electoral campaigns at the local and regional levels in Peru, which provided me with a unique opportunity to observe the residents' perception of the candidates. The 'depollution of the lake' was a recurrent campaign theme. Yet, my respondents seemed to mistrust the candidates' commitment to protecting the lake, based on their past experiences. They explained that once in office nobody did anything for the lake and forgot about these promises. My respondents received promises with cynicism as this account highlights:

²⁰⁵ My interviewees in the municipalities of Desaguadero ensured that the tax was used to contribute to the cleaning of the city after the fair. I could not verify this since the budget documents obtained do not go into that level of detail.

They have been so concerned about the lake for thirty years and they have said for thirty years they will solve it [the problem of pollution] (R0161).

This quote illustrates the general tendency I observed among my respondents to put all candidates in the same bag when discussing the issue of pollution.²⁰⁶ The candidates' promises to restore the lake were presented as just words. As a proof, my respondents frequently indicated that the candidates did not have a plan. The director of a small NGO working on environmental issues in the region of Puno organized a debate for the different candidates to express their ideas on 'sustainable development'. He reported the proceedings of the debate:

We invited the candidates to present their views on sustainable development. You see, it would make sense as they talk so much about it and say so little. Well, can you believe that none of them said anything about the subject? They talked about all sorts of different things but not about the subject (NGOneu).

From my own observation during the campaign meetings, the candidates generally committed to find solutions to the problem of pollution or take the problem of the lake seriously. In the city of Puno, the candidate in office reported on the 'Programme for the Depollution of the Interior Bay' as a proof of his reliability and gave details on the building of a water treatment plant. However, the promise to build a treatment plant had been renewed for ten years (since 2000 when the city obtained a German loan to do so), and yet the project had not even started.²⁰⁷ As a result, the population was sceptical about these commitments, which provides some insight as to why they might have thought that a combination of organizations was more likely to provide a solution to the problem. I turn now to analyse how the mistrust vis-à-vis local and regional level administrations was echoed at the national level by certain groups of actors. From the cases analysed, it

²⁰⁶ The candidates were of course distinguished on other grounds, such as their plans on tourism development, improvements of the municipal hospital, the roads, etc.

²⁰⁷ Supreme Decree 114-2000-EF (2000). The analysis of this is provided in Chapter Six.

emerges that criticism did not only aim to encourage action; it also served as a discourse to denounce larger social dynamics.

II. 'POLLUTION' AS AN ELEMENT OF BROADER DISCOURSES

Both in Bolivia and Peru, different groups of actors took the pollution of the lake as revealing the 'real' position of the central government on three topics: environmental management, decentralization and inclusiveness of indigenous peoples and peasants. In this section I explore these narratives, focusing on two groups of actors according to the nature of their criticism: national environmental and indigenous associations in Bolivia, and decentralized public organizations in the region of Puno.

Before I start the analysis, it is important to clarify the reasons why criticism emerges from different groups in each country. First of all, decentralized public organizations in the Bolivian case studies did not voice such antagonisms to the national government partly because of their affiliation to the party in office or its allies. On the other hand, indigenous organizations in Peru were not as strong as they were in Bolivia (Paredes 2011). Moreover, the inclusion of peasants and indigenous people²⁰⁸, and their understandings of the 'environment' in the national project were not a central goal of the Peruvian government, contrary to what was claimed to be the case in Bolivia since the election of the MAS.

The positioning of President Morales as the 'World Hero of Mother Earth', as the President of the United Nations General Assembly called him, raised internal

²⁰⁸ As Cameron (2012) points out, the Constitutional Assembly tried to craft a term to encompass the different identities meaningful for 'indigenous' peoples. The term is 'indígena originario campesino'. Yet, it is still highly contested as some people reject the term 'indígena'.

expectations in Bolivia (D'Escoto Brockmann 2009). However, numerous environmental NGOs denounced the existence of a double discourse, and pointed to internal contradictions. They pinpointed that the claims made at the international level did not match the actions undertaken at home. Environmental NGOs were not the only ones accusing the government of endorsing a double discourse. Certain indigenous organizations, such as CONAMAQ²⁰⁹, were also very critical of the MAS, as this account from one of their officers illustrates:

Until now the government hasn't done much ... He [President Morales] is our brother, he knows, but in these times that he is working as the head of state of the Plurinational State ... he has given good speeches and that needs to be clear, his discourse is about caring for *Pachamama*, caring for the environment, caring for the water, but in fact is he really taking care [of these]? It's only a discourse ... The [economic] activities are polluting the environment, the water, they are slaughtering Mother Earth ... there is no loyalty to what he says in what he does (NGOCNQ2).

The association of indigenous and environmentalist agendas was precisely one of the constitutive bases of Morales' party, the MAS. From the point of view of indigenous organizations, 'Mother Earth' is a defining element in their identity. Neglecting Mother Earth represented not just the neglect of environmental campaign promises, but an unsettling challenge to the place indigenous people and peasants were given in the MAS project.

In Peru, the place of the environment in the national project was very different to that it was supposed to have been in Bolivia under the MAS. Importantly, environmental management was not subject to any sort of redefinition based on identity politics or a new national project. As we saw in Chapter Three, the Peruvian Ministry of the Environment had opened in 2008, replacing the National Council on the Environment.

²⁰⁹ Consejo Nacional de Ayllus y Markas del Qullasuyu – National association grouping together the Ayllus and Markas (indigenous organizations) of Bolivia.

This was, at least partly, the result of the signing of a Free Trade Agreement with the United States in which it was requested that Peru strengthen its institutionalization²¹⁰ of environmental management. The country, following international trends, had integrated ‘sustainable development’ into national planning (Centro Nacional de Planeamiento Estratégico 2012). In broad terms, sustainable development was understood as the need to minimize the impact of productive activities on natural assets.

The implementation of sustainable development policies was associated with the country’s decentralization project. Several laws guided the commitment to delegate responsibilities in environmental management to the regional and local levels. These included small and medium mining regulation, as well as sewage and drinking water management. With decentralization, the role of the central government was modified, at least formally, from a position of manager to that of guide, supporter and controller.²¹¹

At all administrative levels in Peru, my interviewees acknowledged that the process of decentralization was difficult and slow. The local and regional officers both before and after the election of 2010, complained that the delegation of responsibilities had not been accompanied by the transfer of the necessary means to deliver them. Moreover, officers felt that there was a gap between the support that the Ministry of the Environment promised to give and what it actually gave. This account from a local officer in Puno working on the depollution of the bay illustrates well that tension:

I don’t fully understand the Ministry... I don’t know if it is because they just started, that it takes time to get to the regions... in the meeting we had in May 2009 they said that they would provide their support. We always ask them for resources but they can’t give us any because it’s not their function.

²¹⁰ Understood as the approval of environmental protection laws, the delegation of funds to environmental management, and the design of a state structure wherein the environmental area is visible.

²¹¹ See Law 27314 (2000), Law 27972 (2003) and Law 28611 (2005).

They can give us professionals or training. So we tell them we need a professional for date X, but the professional can't come unless we pay for their trip... well, thanks, but it's cheaper to hire someone from here... (MUNPNDBL1).

Only two officers among my interviewees in Puno were understanding of these difficulties and felt that the process was moving in the right direction. It is worth mentioning that both officers had personally benefitted from programmes run by the Ministry to develop managerial capacity at the local level. The officers had attended a series of workshops on environmental public management that they considered very helpful and felt grateful towards the Ministry.

The majority of my interviewees in Puno, by contrast, did not have any personal experience of the Ministry. They considered that the difficulties they had complying with their tasks were illustrative of Lima's lack of commitment to decentralization since, "if Lima wanted to give up its power, it would send professionals and money" (EDRGP1). Importantly, these complaints were echoed together with the idea that Lima was far away and that it did not really understand local dynamics or care for the lake, which made its power unjustified.

While the criticisms against the central government reveal different logics in Peru and Bolivia, in both cases these were presented as revealing the underlying reasons for the situation in the lake, which is thought to be an example of wider dynamics. In both countries, the national government was considered ultimately responsible for the situation insofar as it did not make management possible: either by not providing the material means to do so (Peru) or by not prioritizing environmental and indigenous

matters (Bolivia).²¹² The criticism was linked to disappointment since those facts contradicted the governments' commitment to redefining a new place for indigenous peoples in the national project (Bolivia) or effectively promoting the development of the country regions through decentralization (Peru).

III. 'POLLUTION' AS DETERMINING RELATIONSHIPS

The message 'pollution' might convey to others was a source of concern in Puno, Copacabana and Cohana. In Desaguadero my respondents did not voice such concerns. In the tourist cities of Puno and Copacabana, residents and officers were concerned about their city's 'image'. In Cohana, some of the farmers worried about the effect the news on pollution had on the reputation of the region's dairy products. My respondents in Desaguadero, however, did not seem to believe that the image of the city was affected by pollution. It is worth insisting on the fact that Desaguadero was not a tourist city and people only visited it briefly, for its market or to cross the border.

In Puno and Copacabana, officers in charge of promoting tourism at the local and regional levels, as well as those among my respondents who worked in the tourism industry, were concerned about pollution on two grounds: they worried about the image of the lake that current tourists formed and about the possible effects pollution could have in the future. The accumulation of plastic, the appearance of the duckweed and the bad smells were presented as the first impression tourists received and it was believed

²¹² Interestingly, neither in Bolivia nor in Peru did any of the respondents mention the fact that the countries had declared the lake bays under the Ramsar Treaty (1971) for the protection of wetland ecosystems in the 1990s, which seem to have had no effect.

that the quality of the tourist experience would be judged on that. This was worrying because of what tourists might tell others, i.e., they were concerned about the area's reputation.

In both Puno and Copacabana my respondents considered it common knowledge that some hotels directly piped their wastewater into the lake. They feared that the current state of the lake would worsen with time and that tourists would simply cease to come. This was a direct source of concern as tourism constituted an important and stable source of income in those cities. In other tourist areas of the lake, such as the community of Puerto Pérez, close to Cohana, the spread of the duckweed was also a source of concern.

Cohana, by contrast, was not a tourist area. Concerns about the effect the stigma of pollution might have on outsiders focused on the customers for the region's dairies. My fieldwork notes after a conversation with one of the farmers are informative of their fear of negative publicity:

... they talk a lot on television, 'this livestock doesn't have value' [they say on television], so it is a problem for us, then, 'where is it from?' they [potential consumers] ask, 'Cohana? Cohana is polluted' [consumers say] (CFOALL).

As this illustrates, raising awareness about the situation in Cohana ran the risk of making consumers suspicious of the effects pollution might have on their own health. The farmers operated with two seemingly contradictory discourses. On the one hand, they were forgotten victims who needed help; on the other hand, informing on their 'condition' could undermine their reputation as capable producers. Taking a step backwards reveals that the farmers' rationale might have been incomplete, but not contradictory. Indeed, the farmers associated pollution with its perceptible signs: the smells, the duckweed and the plastic. The duckweed and the plastic were 'bad' in some

respects; the plastic was bad insofar as the livestock might eat it and die, and the duckweed was bad insofar as the fish disappeared. Nevertheless, the duckweed, as explained in the last section, was not bad for the cattle. Therefore, as long as the cattle did not eat any plastic, the cattle were healthy. However, the farmers feared that informing on ‘pollution’ (i.e., on the arrival of plastic and the disappearance of the fish) would erase these distinctions in consumers’ minds, and suspected that they would then jump to the wrong conclusions.

The problem was, however, that the logic of the farmers excluded the ‘invisible’ variable – heavy metals. Yet, this was precisely the ‘pollution’ that consumers feared: if the cattle ate the duckweed and the duckweed contained heavy metals, consumers feared that these would reach them through trophic accumulation. As we saw in the previous section, the scientific debate on heavy metals’ trophic accumulation was far from being set. During one of my stays in Cohana, I accompanied an officer working for the USAID ProLago programme in his visit to one of the families. At the end of our visit, the officer bought two cheeses. When we left, I asked him if he was not concerned about the safety of the produce.

I am somehow. In fact, one [cheese] is to be sent to the laboratory, to see what we find. But farmers don’t like that we investigate their produces, they think that if the word spreads about pollution, they won’t be able to sell them²¹³ (field-notes Nov 2010 - COOPLUS).

During my fieldwork, the farmers disregarded the possibility that their produce contain any heavy metals. This is partly because their understanding of ‘pollution’ relied on perceptible changes and they attributed none to heavy metals. Additionally, they showed no interest in having studies conducted on their produce. Their position seemed also to

²¹³ The result of this analysis was confidential.

be driven by their fear that the produce might actually be affected. Indeed, this was a source of great concern for the farmers as it would translate into them losing what had come to be their main source of income.

Paradoxically, even though the farmers systematically maintained that stigmatizing²¹⁴ their produce was unjustified, they used the stigma as yet another argument that action against pollution was needed urgently. They presented the stigma as an example of the social unfairness towards them: the presence of pollution unfairly undermined the value of their produce. It was perceived as unfair that consumers did not make a distinction between the effects pollution had on the residents (the disappearance of fish or the bad smells), and the lack of effects it had on the cattle. They feared being portrayed as unhealthy and irresponsible producers and considered that people's prejudices could only be stopped with the disappearance of pollution altogether.

Interestingly, the farmers were not worried that the disappearance of the duckweed, which they associated with 'putting an end to pollution', would deprive them of a source of food for their cattle. They were confident that there would be enough reed maces to feed the livestock. Since the quantity of maces was believed to have diminished as a result of the presence of the duckweed – a belief supported by institutional reports based on observation (Andrade 2009; Ribera Arismendi 2008) – the farmers trusted that if the duckweed disappeared, the reed maces would regrow. Thus, the farmers had no sense of dependency on the duckweed.

²¹⁴ I follow here the classic definition by Goffman of stigma as “the situation of the individual who is disqualified from full social acceptance” (Goffman in Bush, Moffatt, and Dunn 2001), a definition that I extend to the group.

From this section, it emerges that pollution was perceived as a threat to the commercial relation between the collective actors represented by three of the case settings, and various groups of outsiders. My respondents considered that the message ‘pollution’ sent to consumers (either tourists or dairy consumers) was a threat to their economic activities. Specifically in the case of Cohana, the farmers believed that the image that pollution gave of their produce was revelatory of the social unfairness they felt they were the victims of. Therefore, the meanings attributed by others to ‘pollution’ were also mobilized as an argument to demand an urgent intervention.

IV. CONCLUSION OF THE SECTION

This section has aimed to show that ‘pollution’ is turned into a social construction mobilized by residents and officers in several ways. It is used to define the responsibilities of others, who are described as either careless, especially when referring to other social groups, or inefficient, mainly when referring to organizations. Through the definition of the responsibilities of others, pollution also contributes to the legitimization of demands. In the case of the residents of Copacabana, Puno and Cohana, the legitimacy of these demands is reinforced by the stigma residents feel pollution puts on their commercial activities, threatening the sustainability of these.

As far as officers are concerned, it emerges from this section that ‘pollution’ is used by lower levels of management in Peru as an element of diverse disputes. In Bolivia, where social movements play an important role in holding the government accountable for its commitments, the lake is used to denounce the contradictions in the discourse.

Moreover, the elements explored in this section are informative of different participants’ roles in negotiating the meanings of the SES changes. In such negotiations, what can be

considered social variables, such as previous experiences between residents and administrations or regional/national tensions, are paramount. This confirms the necessity to consider diverse scales in the analysis. Therefore, the idea that ‘pollution continues’ appears from a different light. Indeed, it emerges from this section that several groups perceived certain structures as constituting long-term patterns that presented high resistance to change (e.g., false commitment to environmental protection), while changes in the governance system (e.g., decentralization) were perceived as highly precarious.

4.4. CONCLUSION

In this chapter, I have explored the ways in which residents and officers make sense of the changes in Lake Titicaca. I have argued that the respondents’ understandings of these changes need to be put in the context of wider dynamics and that the interrelatedness of scales in the SES is crucial to understanding them. This chapter provides several clues as to what it means to say that ‘pollution continues’ for the constitutive interactions in the SES, which I recap in this conclusion and put into perspective in light of the rest of the thesis.

I started the chapter by uncovering the multiplicity of elements that the term ‘pollution’ encompasses. Indeed, I showed that my respondents across field sites presented pollution as a series of observable changes that persisted (such as the duckweed in Cohana and Puno, or the accumulation of plastic in Desaguadero and Copacabana). When describing the lake, and its pollution, the residents departed from their own local SESs. The changes they observed are the products of variables that modify the social-ecological systems and could transform them completely, therefore threatening the resilience of the regime actors have in mind as being the ‘true state of the lake’.

Through the empirical material exposed in this chapter, I have analysed some of the variables to which actors directly or indirectly attribute the current state of the social-ecological system. For example, the residents presented pollution as the product of changing population and social dynamics i.e., fast variables in the SES.

Additionally, it appears that officers perceived 'monitoring' as crucial for sound management. The officers interviewed presented deficient monitoring as a root cause of mismanagement: the lack of relevant information at key moments imposes a kind of environmental management that relies on responding to crises. While the officers would have preferred to operate with an incremental learning approach, they were confronted with episodic learning, i.e., with responding to changes in the system that revealed the inadequacies of the management model. Yet, they did not have the capacity to adapt to face these changes.

As the officers perceived the situation, the first of the structural variables impeding gradual learning was the lack of resources to obtain scientific information on the ecosystem state. This lack was not necessarily seen as absolute, it was at times presented as the result of a distribution of resources, decided at the central level, that did not fit what officers at the local level believed was relevant. The lack of resources constituted an external driver in the SES, as it affected the system but was not affected by it.²¹⁵ The officers felt that there was a gap between the scientific information they needed and the information they generated under resource constraint. They perceived this gap as

²¹⁵ The lack of resources could also be considered an internal variable if the scope of analysis was different: it could be explored whether the changes in the SES caused by the lack of intervention that restricted resources have an impact on the general allocation of resources. The hypothesis could be that in the long run they would and that this could lead to further resources having to be driven to address the crisis, which might in turn further deprive the resources accessible for monitoring. In that case, the 'lack of resources' would be affected by the changes in the SES and would therefore be an internal variable.

particularly problematic because they believed information should shape intervention design; lacking information, therefore, undermined the possibilities for efficient action.

Moreover, the frustration the officers expressed about the information gap suggested complex inter-organizational dynamics. Reasoning in counter-factual terms allows imagining that the lack of financial resources did not necessarily have to result in the situation described. It could indeed have led to establishing patterns of strong coordination and dependency between organizations pooling together their resources.

Yet, the tensions within and among certain organizations suggest hypotheses on why the lack of resources did not produce coordination patterns. In particular, we saw that the work of ALT was subject to widespread contestation. Additionally, the national level received strong criticisms for lack of support to the lower levels of administration in Peru and for the ambiguities in the implementation of the national project in Bolivia. Finally, in certain organizations, officers felt bureaucratic issues and personal interest determined the kind of projects put forward – as the example of officer TOTORPN showed. These elements call for the exploration of the variables in the social-ecological system that underpin and nourish these tensions.

This chapter has also discussed that once ‘crises’ arise in the system monitoring is seen as a less crucial task. Indeed, the officers believed that the dynamics of the crises, such as the appearance of the duckweed, were well understood. Eutrophication is a widely studied phenomenon and Lake Titicaca seems to respond to the typically identified criteria (Cooke et al. 1993). In that light, officers believed that the building of treatment plants and sanitary landfills would be the appropriate technical solutions, but these had not been implemented (we will see the reasons underlying why in Chapters Six and Seven).

The actions actually implemented constituted new patterns of interaction in the SES, some of which directly aimed to foster the system's components of resilience. For example, introducing oxygenators in the interior bay of Puno was an attempt to increase the system's latitude. These new patterns of interaction were highly disputed. They raised the question of whether the interventions were part of an adaptation process or whether they increased the precariousness of the SES regime. The main outspoken sources of disagreement in those disputes were 'scientific' and revealed the existence of different hypotheses on how the system behaved: the installation of oxygenators on Puno Bay grounds was questioned on the grounds of efficiency; the use of the duckweed raised concerns over the interplay between eutrophication and the presence of heavy metals in Cohana Bay. These struggles were heightened by the fact that organizations operated with limited information and did not share all the data they had.

When opposing a project, officers might be genuine about their concerns, based on their scientific understandings, but they were also deeply influenced by other parameters and, importantly, by their view of the organization implementing the project. Indeed, reactions of contestation confirm that SES dynamics need to be understood in the context of broader social dynamics.²¹⁶ It is also from that perspective that we can grasp how to make sense of the situation the population selected elements of the information disseminated by organizations. This selection depended on the kind of discourses people were exposed to but also on what these discourses said about their own roles and those of others.

²¹⁶ This resonates with the literature on the social constructiveness of science. See, for instance, Budds (2009), Castree (2001), Demeritt (2001) or Escobar (1999).

My respondents across case-settings tended to put the responsibility for the ecosystem changes on other actors. In the case of Cohana, ‘others’ referred specifically to the collective actor constituted by the upstream city of El Alto. Across settings, my respondents considered that public authorities should take responsibility for the situation, but mistrusted that they would do so. In Copacabana, for example, while certain respondents acknowledged they could modify their waste disposal practices, they considered the ultimate responsibility was in the hands of the municipal government who should provide public bins. The question of responsibility was articulated at different levels and by different sets of actors. For example, in Cohana, discourses that put the responsibility for pollution on the residents were contested. Indeed, arguing that the residents might have a role in producing the ecosystem changes challenged the residents’ own understanding of themselves as victims.

By revealing the connectedness between scales, several groups of actors have emerged as fulfilling key roles: residents of the case-settings, officers and outsiders, a category that can in turn be subdivided depending on which function outsiders fulfil. It appears from the material discussed in this chapter that the variables undermining the system’s resilience originate in different scales, putting several of those groups at the centre.

In the next three chapters I focus on the slow variables and external drivers inducing the dynamics identified by the actors and the ones emerging from their positions: I analyse the changes in population dynamics, such as urbanism, and in social dynamics, such as lack of trust, or resignation. In this light, the rest of the dissertation focuses on the variables organizing the social sphere of the SES. Chapter Five concentrates on the variables determining the residents’ choices in terms of activities undertaken and of decisions made to participate (or not) in collective arrangements. Chapters Six and Seven

deal with the variables determining officers' decision-making processes as well as the origins of and rationales behind inter-organizational dynamics.

CHAPTER 5: NEGOTIATING IDENTITIES AND POSITIONS IN THE SES: FOCUS ON THE LAKESHORE'S RESIDENTS

*Aymara communities are harmonious – this is what you believe, isn't it? [smiles] You should know that 'small village, big hell'²¹⁷.
Dirigente in Cohana (FCHA)*

*You think that communities are interested in protecting the environment? What they want is a hummer.
Environmental consultant in Bolivia (COPOIR)*

INTRODUCTION

In this chapter, I focus on one of the actor categories with a distinct role in shaping the SES structure, namely, the residents of the case study areas. My analysis builds on the residents' narratives, their behaviour and the discourses that diverse sets of actors consciously and unconsciously imposed on the residents. I explore the residents' logics, i.e., the interests and structures behind their choices, which will help disentangle seemingly contradictory positions. I pay particular attention to the place the residents attribute to ecosystem elements in the rationales they follow and how these fit in the interplay of wider social structures. This leads me to focus on the residents' expression of their identity and their interpretation of past experiences. I complement this with the analysis of discourses on the residents developed by different groups of actors and I explore how the residents relate to these.

²¹⁷ This is a literal translation of a Spanish proverb, "pueblo chico, infierno grande".

This chapter contributes in three ways to uncovering the variables that shape, directly and indirectly, the residents' interactions with ecosystem elements. Firstly, it tries to identify the daily-life patterns that were presented as explanatory (by the residents and by other actors) of why specific positions were (and were not) assumed by the residents in the SES. Secondly, it suggests some explanations as to why the choices made were effectively made. Thirdly, the chapter seeks to disentangle the logics of the normative discourses over the choices that the residents should make.

We saw in the last chapter that the residents attributed a negative value to the phenomena grouped under the label 'pollution', notwithstanding the complexities of the category. In that light, they were faced with choices as to how to proceed: exert pressure on the competent organizations so that management is adapted; participate in public management; organize to achieve self-management; or ignore the situation altogether.

Self-organized collective management, participation in public management and lobbying through social mobilization, are categories very close in meaning. I have separated them to facilitate the analysis. In order to unfold my argument, it is necessary to define the four main concepts of this chapter: identity, collective management, mobilization and participation, and to clarify how they relate to my analytical framework.

Understanding the reasons why residents take part (or do not) in one form of management or another demands that we pay attention to their 'identity'. The concept of identity is widely used in the social sciences to refer to the different aspects that individuals establish as constitutive of their 'self'.²¹⁸ For example, 'political identity' refers to identification with a group that the individual feels represents her interests. Another

²¹⁸ I do not discuss here all definitions of identity, such as those developed in psychology. For a review of definitions see for example (Aranda et al. 2012).

example is that of ‘social identity’, which is defined as the feeling of belonging to a particular social group. The individual revises the knowledge transmitted as legitimate by the social groups in which she evolves in light of her own specific circumstances – defined by history, personal life trajectories, etc. Crucially, the “internalization of social norms depends on the degree to which individuals identify with a group” (Thorp, Stewart, and Heyer 2005, 9), i.e., the degree to which individuals consider that the group has shared their experiences and interpreted them satisfactorily.

Constructivists and post-constructivists, following Foucault, link the concept of identity to that of discourse. Through language, identity categories are created and appropriated, rejected or redefined by the subject. These categories might focus on different aspects of the subject, such as ethnic origin, gender, place of residence, etc. Daily lives are considered as constitutive of identities from an existentialist or behaviouralist point of view. Typically, ‘occupation’ (fishers, peasants, etc.) is a source of identity building since those categories enclose much more than simply the activity to which they refer.

In light of my analytical framework, it is crucial to highlight that actors hold several identities *simultaneously* and that these might be contradictory. Identity categories need to be understood as multiple and overlapping discursive objects with meanings that evolve in time. They are fluid but not completely so. Indeed, they fit in internally coherent systems of interpretation and value production, as described in Chapter Two through the theory of ‘cities’.

In the field, numerous and diverse actors built discourses on the identity of the lakeshore’s residents as potential *environmental* managers. These discourses were founded on: (i) the fact that the area is fundamentally inhabited by indigenous people and the belief that the ‘environment’ has a central place in their conception of the world and of themselves and (ii) the history of the area as host to a structured civil society with

significant management capacity, which sometimes even works outside the governments' agendas. The theory of 'cities' in my analytical framework is helpful to make sense of this; we will see that these facts are interpreted as 'signs' of specific logics that the residents are expected to follow.

Discourses developed by others, together with self-defined identities, shaped the rationales that people followed to justify their behaviour and negotiate it with others. This chapter pays specific attention to how different aspects of the residents' identities were negotiated and redefined through the opportunities they had to engage in environmental management. These were the action-situations wherein multiple rules of interaction were crafted, decided and applied.

The argument draws attention to the context, i.e., the socio-historical circumstances in which actors evolve. As Grimble, Cardoso and Omar-Chowdhury explain, these circumstances include:

... access to resources, the specific opportunities available to them [poor people], and the incentives and disincentives associated with these. Decisions are also greatly influenced by their perceptions of risk and security associated with each opportunity, and more generally an understanding of, and confidence in, what the future holds (Grimble, Cardoso, and Omar-Chowdhury 2002, 23).

The last step before I start the analysis requires clarification of the definitions I follow for each of the options of management, i.e., the planned and direct interactions with the ecosystem considered. I understand 'collective management' as the collaboration of individuals sharing a place of residence to obtain a desired outcome, such as the collective cultivation of lands. What I call 'mobilization' is a type of action that also requires collaboration, but its purposes are different to those of 'collective management'. Indeed, mobilization aims to bring a particular topic to the attention of decision-makers. In the words of our framework, it aims to trigger an event of episodic learning to bring

about an adaptive change to the system. Mobilization is a form of participation in public life, but I distinguish it here from the category ‘participation’, through which I refer to individuals’ involvement in programmes conducted by formal organizations. The actions considered in each of these categories might be related. For example, the object of a mobilization might be to obtain participation in a given organization. Participation, in turn, can be crafted by taking into account pre-existing mechanisms of collective management.²¹⁹

5.1. DAILY LIVES, PLACE AND IDENTITY

As described in Chapter Three, the lake encompasses different sorts of livelihoods organized around a series of occupations, the most important being agriculture and tourism. These were often combined with each other or with other, less time-consuming, commercial activities. However, some urbanites had a single occupation, such as a full-time job in a company, an administration or the university. Yet, it was common for the city residents to keep small plots of land in rural areas. While the region experienced a sustained trend towards urbanization, the rise in prices of primary products translated into a revalorization of rural areas, i.e., a reuse of agricultural lands (PNUMA 2011). Residents of the rural lakeshores typically grew quinoa and potatoes, which they combined with the raising of livestock and frequently also with commercial activities in a neighbouring city. The breeding of trout in floating cages was also an important occupation, particularly on the Peruvian side. Changes in occupations, most significantly involving a move into tourism, have been pervasive throughout the whole area. Cohana,

²¹⁹ The anthropological and sociological literatures on identity, collective action and participation are used here to support the understanding of the variables at play in the SES. It is not the intention of this chapter to engage in a critique of those literatures.

however, presents a particular case wherein ‘pollution’ resulted in the cessation of fishing, formerly one of the main activities of the communities.

The combination of rural and urban activities led my respondents to commute frequently, some of them on a daily basis. I group such trips under the banner ‘mobility’, defined as the movement between at least two places where different activities contributing to the families’ livelihoods were undertaken. Mobility is therefore an effect of the development strategies followed by the residents. It is to be distinguished from two other types of travel common in the area: firstly, visits to the lake for tourism or religious purposes, in particular to the cities of Copacabana and Puno; secondly, long-term migration to other areas of the countries or abroad. These three categories of movement emerge as consistently distinct in my respondents’ accounts. It is useful to keep in mind such categorization in order to understand the different meanings attributed to them and the role of these in residents’ perception of their identity. This section explores in which ways mobility constitutes a variable shaping the possibilities of interaction between residents and the ecosystem.

I. MOBILE DAILY LIVES

While each of the case study areas presented different patterns of mobility, across all of them the family²²⁰ emerged as a critical unit for analysis. Each family member undertook different economic activities, which shaped patterns of mobility, and the resources gained from these activities were then pooled together. I use this first sub-section to briefly portray these activities because it is necessary to describe the ways in which people

²²⁰ Understood as three-generational, i.e., including parents, children and the children of those until the death of the first generation.

organize their daily lives to understand how they consider the SES and their own position in it.

In Copacabana, my respondents reported that the youngest adult members of their families worked in the city in activities supporting tourism, such as transportation or the hotel trade. Yet, these members also supported older members in their agricultural activities, with plots frequently located at walking distance from the urban centre. The products obtained from agricultural exploitation were regularly sold in neighbouring cities or at El Alto's market, an activity that was typically undertaken by a mid-generation woman of the family. Copacabana presents a fairly typical 'model' of the patterns of activity and mobility around the lakeshore. Indeed, similar patterns were reproduced, to some degree, in Desaguadero, Puno and Cohana.

The residents of the cities of Desaguadero frequently combined agriculture and trade. Located on the border of Peru and Bolivia, Desaguadero is a regional commercial hub. This has allowed the emergence of numerous commercial activities – many of which are informal – and of a significant transportation industry of both passengers and goods. Of particular relevance for my analysis is the fact that the floating population participating in the Desaguadero market constituted a significantly large group that took over the city every Friday. As we saw in the last chapter, this population played an important role in the crafting of the SES, by producing significant amounts of waste. My respondents among this transitory population stated that they did not feel that any aspect of their

identity was related to the time they spent in Desaguadero and reported little contact with other participants in the market.²²¹

In Cohana, crop farming and large livestock raising constituted the main source of income for local families. The produce from these activities was usually sold in El Alto. Furthermore, Cohana residents frequently had professional occupations in El Alto – working in an array of industries – unrelated to the selling of their agricultural products. They could move to El Alto for up to several weeks at a time. Yet, regardless of the amount of time spent in El Alto, the farmers insisted that their place of residence was Cohana. They did not consider that they ‘migrated’ to El Alto. When talking about migration they referred to members of their family or neighbours who had moved further away (such as Santa Cruz, in eastern Bolivia) or abroad. Distance seemed a more relevant parameter in their discourses than quantity of time spent. This is partly explained because, while practically living in El Alto, my respondents could still go and take care of the family’s lands when necessary and assume their community responsibilities when the time came. By contrast, those who ‘migrated’ to areas further away were expropriated of their lands. The land could be exploited by the community itself or, if the absence went over two years, could be attributed to a particular member. If the migrants wished to return to the community and have their lands back, they had to pay a fee for land abandonment. In their absence, the migrants were not considered members of the community since, for instance, they did not participate in the weekly meetings. Working in El Alto allowed residents of Cohana to engage in collective management

²²¹ As specified in Chapter Three, the treatment of the Desaguadero case is different to that of the rest of cases, for its complexities make it comparable to the others only to a certain extent. One of the reasons for this is precisely that, in order to give a full account of the Desaguadero case beyond the CAN-ALT waste management project on which this thesis focuses, it would have been necessary to distinguish and study thoroughly the different population groups and how they relate to the fair. This task is beyond the purpose of this thesis, which is why the analysis of Desaguadero is left aside in this chapter.

arrangements, which would not be possible had they lived further away, for example, in Santa Cruz.

In contrast to the bi-national city of Desguadero and Cohana, Puno presents what can be considered a prototypical urban organizational pattern. Indeed, the majority of the population had stable full-time 'urban' occupations including commercial and service-provision activities. Some of the inhabitants did have small plots of land, frequently in the immediate suburbs of the city. As far as mobility patterns were concerned, Puno, as the administrative capital of the region, was the destination of many of the mobility patterns.

ATTRIBUTING RESPONSIBILITY TO 'MOBILITY'

In urban areas, neighbourhood associations fulfilled a similar organizational role as the ayllus in rural communities.²²² This is not to say that both structures were identical. Importantly, while rural communities' organizations ensured the farming of the land, neighbourhood associations were not in charge of sustaining a specific activity. Moreover, neighbourhood associations' leaders (*dirigentes*) were elected, contrary to what happened in rural areas. It was therefore their choice to assume such positions.

Yet, several elements are comparable: firstly, both rural and urban associations aimed to organize the collective. Also, like rural organizations, neighbourhood associations established responsibilities for its members, such as attending the meetings.²²³ In light of the mobility between rural and urban areas, it seems likely that communal organization

²²² See Chapter Three (Section 3.1., III, p.122).

²²³ In Puno, there weren't any sanction mechanisms forecasted. In Copacabana, members of the association reported that coercion mechanisms had been used in the past, such as the interruption of gas provision services to the families failing to attend the meetings.

structures have been at least partly transposed from rural to urban areas. Yet, several actors held the mobility of the residents responsible for weakening social cohesion in communities.

Rural community leaders in Cohana²²⁴ usually lived in their community in order to attend the weekly meetings with other community members. However, no requirement was explicitly formulated in that regard. Some of my respondents in Cohana, who usually lived in El Alto, had decided to move back to the community for the year that their responsibility lasted. Some others preferred to keep their permanent residence in El Alto and commute in order to attend the meetings.

There were three types of discourses on the effects of these practices. Firstly, those engaging in them considered that these practices allowed them to pursue complementary development strategies while keeping a foot in their communities, i.e., remaining part of the community-based SES. The two other discourses reveal a fear that the variables crafting the interaction with the ecosystem were at risk of being modified. Within the communities, several of the elderly members indicated that the exposure of the younger generation to city life could make them ‘forget’ rural knowledge, which I discuss later in this section. Among the institutional actors, several officers (NGO and public environmental officers) considered that exposure to the cities had a detrimental effect on community members’ interest in rural affairs. For example, an NGO officer working in rural areas of the La Paz region shares his vision on the matter:

I call it [moving away from the community] cultural erosion, because of the urbanization, the urban conglomerates of El Alto originate mediums of subsistence so competitive that they transform the individual in a very rough manner (NGOASG).

²²⁴ The area included eight communities as explained in Chapter Three (section 3.2., I, pp. 125–126).

My interviewee here pinpoints two phenomena occurring simultaneously. On the one hand, people change because they abandon their community practices. The logic is as follows: as people are less exposed to the kind of problems that arise in their communities, they care less; as they are less exposed to the knowledge and values transmitted in their communities, they lose their 'community culture'. On the other hand, people change because they gain new urban customs.

The 'urban' variable was identified by different categories of respondents as having detrimental effects on the residents' valuation of their environment and of the mechanisms of collective action. This did not only affect rural residents commuting to the cities, but also urbanites.

II. MYSTIFICATION (AND DEMYSTIFICATION) OF RURAL AND URBAN REALITIES

The narratives of the neighbourhood associations' leaders in Puno and Copacabana are illustrative of the effects attributed to the 'urban' reality. Failure to communicate with others and self-interested tendencies were seen as characteristics of urban life.

One of the leaders of the neighbourhood association of Copacabana claimed that in his city people were "dedicated to their jobs" which did not "allow them to participate in meetings" (COPNBAS). He considered that people were too 'self-centred' to spare time for collective activities, or even to talk to each other. He attributed a lack of communication among neighbours to the size of the city. Even though the city of Copacabana has less than 6,000 inhabitants, he considered it too big to maintain strong ties between people.

Similarly, one of the neighbourhood association leaders in the city of Puno (125,000 inhabitants) considered that it was difficult to mobilize the population in the ‘big’ city of Puno. He recalled however that the neighbourhood association had been able to influence local politics in the past. He attributed the decline of the organization to the fact that ‘personal interests’ had captured it.²²⁵ Yet, he also was concerned that in cities, as opposed to rural areas, “people don’t always have time to attend [the meetings of the association]” (PNASVS).

Contrary to what these respondents believed, the time issue and the difficulties in communicating with other actors involved in any given issue were also problematic in rural areas. For example, two local NGOs working in the rural areas of Puno reported difficulties in convincing the residents to find time for the activities they wanted to promote. One of the NGOs worked on participatory water quality monitoring (NGOuo) and the other on climate change and rural development programmes (NGOneu). Projects, and more generally new activities, were proposed by NGO officers with the intention of influencing the interaction of the residents with their environment. As an officer from NGOuo puts it, the main difficulty they faced was “how to make them [rural residents] interested, because people don’t have time”. According to the officer, rural communities would not participate if the outcome of the programme did not lead to a concrete benefit that was not “a waste of time”. An NGOneu representative similarly explained that, in his experience:

If you want people to attend the meeting, it’s safer if you organize a lunch, that way they make sure they lose less time and, if the project is uninteresting for them, at least they would have saved a meal (NGOneu).

²²⁵ He gave as an example of this the disputes between district leaders who, he claimed, used the association to establish themselves in local politics.

Regarding the supposed ease of communication in rural areas, the experience of officers from the Bolivian NGO Lidema suggests that communicating could be as challenging in rural areas as it was in urban areas. Communities were frequently spread over vast territories in which travel was difficult, so when a problem affected several of them they did not necessarily find it easy to coordinate. Lidema officer NGOim considered that the lack of communication among those affected by pollution throughout the Katari sub-basin was the reason why communities did not mobilize to demand governmental intervention. To counter this, NGOim was preparing a project to “strengthen social organization” in the Katari sub-basin. His report on the situation illustrates the difficulties in communication:

We have visited the zone through the rivers, walking, in trucks, on boats ... All these communities from River Katari express all through the journey, unease, difficulty, they get sick ... ‘And tell me, Mr Feliciano Quispe²²⁶, have you talked about this to people from the community downstream? – No, we haven’t – ah... and do you have a relationship with people from Cohana? Because they worry as well – No, we don’t, it’s difficult for us to leave here, we don’t go there, we haven’t agreed [to work together] on this’, when they have the same problems. So we want to run this project to prevent conflicts from happening as a first step toward building social organizations... (NGOim).

Finally, residents of rural areas pinpointed ‘self-interest’ as a ‘cultural’ characteristic instead of an ‘urban’ one. Examples from Cohana allow us to understand this discourse. At the time of my 2010 fieldwork, community members’ opinions were divided over the developments of a convoluted corruption case that had hit (in 2007) the municipality of Pucarani, to which Cohana belonged. A community member had been accused and found guilty in court of stealing public money while holding a public position. However,

²²⁶ Name invented by the interviewee.

the fairness of that trial and the soundness of the charges were contested. Indeed, some community members considered that the real guilty people had falsely accused the man.

The point of the matter is that some of the farmers presented these tensions as a 'cultural' characteristic of 'their people', the Aymara people, together with 'mistrust' and 'suspicion'. Culturalist explanations are very problematic for they create a causal link between a given identity (urban or Aymara) and an attitude (self-interest) disregarding all contextual elements. Even though this example is seemingly far from our case, it allows us to illustrate that people held 'self-interest' as a variable undermining collective arrangements in rural and urban areas.²²⁷

To finish uncovering the idea of detrimental 'urban' effects, I briefly discuss an example from El Alto, whose wastewater, as we saw in Chapter Three, flowed to Cohana. During my fieldwork, NGO Lidema organized a conference on Cohana.²²⁸ This meeting was attended by representatives of several municipalities located in the Katari sub-basin, representatives of organizations intervening in the area, academics and leaders from several rural communities. A representative of El Alto's neighbourhood association (the only neighbourhood association in the country with an environmental officer) narrates how wastewater are dealt with in some of El Alto districts:

Many districts do not have sewerage, so people go to the rivers, and we know River Sekhe [outflows into Katari river] is polluted by the neighbours that do not have basic services [such as sewerage – he is giving an example of an area in El Alto that is not connected to the municipal sewerage network]. In the 7th district, we do not have sewerage. Last Thursday we had a meeting with MMAyA and an association that builds ecological toilets in the 7th

²²⁷ The literature on community-based development has extensively analysed the effects of elite capture of funds, information distortion and group heterogeneity. See for example Conning and Kevane (2002), Kwaja (2009), Platteau and Abraham (2002), and especially Platteau (2009). I do not cover these issues for they would drive us away from the questions here asked.

²²⁸ On 30 October 2010.

district. Sumaj Huase [this is the name of the association], they take [human] faeces and urine [collected from the ecological toilets], and use it [to produce humus soil], maybe the compost can be used by people in communities affected by El Alto's pollution (EJVMA).

As we can infer from this quote, the officer wanted to make visible an initiative that aimed at mitigating pollution. He believed that this sort of initiative could be expanded to other districts in the city with the help of public authorities. It is interesting that not only did he present a socially-organized solution to control human waste pollution from El Alto, but he also seemed to suggest that El Alto's inhabitants could *compensate* people in communities that had been affected by pollution, by offering them the compost produced. The officer included in his discourse a sense of responsibility over the city's environmental impact. It is far from the scope of this thesis to analyse the social dynamics at play in El Alto, but this example supports my refuting of the idea that urban identities were unsuited to collaborative action.

This section has intended to show that organizing collaborative action is as challenging in rural areas as it is in urban areas. In both rural and urban areas, groupings are the result of a concerted effort. Moreover, the region has the added challenge of population mobility, which has a definite impact on the available time people have to engage in collaborative practices. We saw in this section that besides its supposed effects on the possibility of collaborative practices, some respondents believed that mobility had effects on the transmission of knowledge.

DISPUTES OVER LEGITIMATE KNOWLEDGE

Several of the lakeshore's residents, both in Peru and Bolivia, accused the 'younger generation' of undertaking certain agricultural tasks in an inappropriate fashion. The phrase 'younger generation' particularly targeted those (younger) community members who did not live in their communities on a permanent basis. Therefore, mobility was

blamed for the erosion of one of the variables that codified the relationship between human actors and the ecosystem: indigenous knowledge.

The case of *totoras* management in the communities around the city of Puno is highly informative in that regard, since several actors dispute what constitutes indigenous knowledge as part of a debate over the ‘appropriate’ management of the reeds. In this context, the National Reserve of Titicaca (RNT) was tasked to prepare plans for the community management of *totoras*. Importantly, in terms of the whole region, it is worth noting that in its Geo Titicaca report, UNEP claims that “there is little interest from community members to manage and take care of reed maces” (PNUMA 2011, 65).

Totoras were generally used in the region as food for livestock and as a building material – be it for handicrafts, or in the case of certain population groups such as the Urus, for their housing. Livestock was either fed cut reeds or taken to the lake to feed. Moreover, *totoras* burning – thought to allow the plant’s regrowth and facilitate the collection of birds’ eggs – was part of the traditional management of the plant. The RNT had incorporated the controlled burning of *totoras* in some of its community management plans.

However, there was much disagreement about the desirability of *totoras* burning and the best time to do so. The peasants with whom I discussed the matter agreed that the plant should be burnt between June and September only. They claimed that ‘younger generations’ burned *totoras* indiscriminately, a claim that was echoed by officers at the RNT. During a conference on the management of the Lake organized in La Paz by the Naval Forces²²⁹, an RNT officer gave a presentation during which he explained that

²²⁹ On 12 October 2010.

burning practices could be “dangerous for the ecosystem if uncontrolled”. Interestingly, he pinpointed that when explaining this to the residents:

People say that burning *totoras* is an ancestral practice and that as such it should be respected, but our ancestors did not burn *totoras* indiscriminately, they followed a calendar, they knew what to do... burning *totoras* like this is not ancestral (RNTAR).

As we can infer from the officer’s statement, ‘traditional’ seems to be mobilized as a legitimizing banner. In the officer’s narrative, his interlocutors express the legitimacy of the practice by insisting on one aspect of their identity (belonging to a given ethnic group who has ancestrally inhabited and managed the land). In insisting that they are following traditional knowledge they imply that the officer does not know that this is the case. The officer reports that when he tries to interfere in the burning (by demanding that it be controlled) he is *told* that it is a traditional practice. Therefore, his interlocutors suppose that they know how to manage *totoras* and the officer doesn’t. Other officers from numerous organizations operating in the area, both in Peru and Bolivia, reported similar experiences. The distinction that the residents draw between themselves (hosts of traditional knowledge) and the officers, seems to build on the idea that the officers, as representatives of the state do not know traditional knowledge. This is best understood as a political claim that fits in a larger discussion about the state and its relation to indigenous peoples. Indeed, the residents sometimes implicitly and sometimes explicitly regard the state as trying to impose on them a specific kind of knowledge, the relevance of which they contest. The RNT officer, on the contrary, knew and valued traditional knowledge but disputed that all residents were reproducing it soundly.

Moreover, it might well be the case that the actors undertaking the burning were convinced that they were following an ancestral practice and wanted to identify with it. It is also possible that, as elderly members argued, the younger generation did not listen and could not be persuaded of the importance of the calendar. In any case, it seems that the

idea according to which burning *totoras* would trigger its regrowth had been ‘essentialized’, i.e., contextual parameters (such as the calendar) had been left aside.

Establishing who was a legitimate holder of traditional knowledge was even more important in Bolivia. Indeed, the status of traditional knowledge and ancestral practices, as well as the state’s role in preserving them, was a central topic of debate in Bolivia following the election of Morales. One of the main planks of his campaign was the inclusion and valorization of indigenous peoples in the national project. In that light, the state appeared as the guardian and protector of indigenous knowledge and its transmission. In the words of a high-ranking leader of the MAS:

what we need to do is raise awareness in people, descend to La Paz, to social organizations, and to communities who are also forgetting, because our teachers that go to the village, don’t bring that (MASSV).

This officer argued that the “Western view on knowledge” – analytical and transmitted through outspoken elements rather than through practice – was still deeply implanted in the Bolivian state apparatus. From the interview, it emerged that the sort of knowledge transmitted was crucial on two grounds. Firstly, because knowledge constituted a set of rules that shaped the interaction with the ecosystem. Secondly, because knowledge was intrinsically linked to the creation of values.²³⁰ Therefore, defining what constitutes traditional knowledge and what represents a ‘loss’ were essential to defining the most valuable approach to managing the environment. In the discourse of the MAS leader, losing the knowledge was equated with engaging on a path of further environmental degradation.

²³⁰ See Latour (2004) for a discussion of the links between knowledge and value generation.

In real terms, this was far from being systematically the case since ‘traditional knowledge’ was not always adapted to present needs. Some of the community members I interviewed in Cohana felt that they did not always have the knowledge necessary to face the changes occurring in their lives. As one of the residents put it:

we are aware [of the lake’s pollution] but we are missing the skills [capacitación], we don’t see in which ways we can depollute our lake, take care of it (CFMCV).

The case of waste management in Cohana provides an example. Some of the Cohana farmers reported that they sometimes “burned and then buried” waste, including plastic, “at night and on the lake bays, so that it is not dangerous” (CFSCITL). Burning plastic in open spaces is forbidden by the Bolivian regulation on waste management because it creates toxins dangerous for human health. Waste can only be safely burned in high temperature ovens that are absent in Bolivia. Yet, burning other kinds of waste, such as *totoras*, is a common practice among communities.²³¹ This suggests that plastic was treated as the rest of waste: it did not constitute a new category of management for communities.

III. CONCLUSION OF THE SECTION

In this section, I have discussed the different discourses identifying variables that supposedly shape a specific approach to the interactions between the residents and the ecosystem. By uncovering these discourses, I have tried to show which elements build on the reality of the practices pinpointed and which respond to social constructions that are not necessarily verified in practical terms. The practices highlighted in these discourses

²³¹ What constitutes waste and what does not is socially constructed. It is not my intention here to discuss that, I simply refer to ‘waste’ as elements that in their form at the moment *t* are not given use.

are held to have an impact on the identity of the residents. The presumed changes in identity, in turn, are conceived of as causes that modify the residents' position in the system.

For this section, I have disentangled the effects attributed to the patterns of mobility that the residents engage in as part of their development strategies. For one thing, mobility patterns impose time constraints on the residents. The effects of mobility tied to identity discourses, such as the erosion of group cohesion or the sensitivity to local problems, are complex and disputed.

This section has also critiqued the essentializing discourses that several actors hold over 'urban' or 'rural' effects. For that purpose, it has contrasted the discourses attributing the same effects either to urban or to rural variables. This has established that it is misleading to essentialize relationships with the ecosystem on the basis of urbanity or rurality. Different groups put forward interests and visions that are context dependent and politicized. Indeed, neither mobility nor urbanity act to prevent people from mobilizing or from working collaboratively.

I have situated the disputes over these discourses as constitutive of larger debates on what constitutes the appropriate or legitimate approach to management. Particularly, I have argued that the discussion over what constitutes ancestral knowledge codifies and legitimates some of the interactions in the SES. The debate on ancestral knowledge does not simply oppose two perspectives. On the contrary, it needs to be understood in its political context, as it augments and resonates with other patterns of interaction between actors. The residents *use* the political status of ancestral knowledge revealing the complexities of the discourses held on them, over which they negotiate the meanings.

Through the examples discussed in this section, the ‘collective’ has emerged as a positive variable for several groups of actors, but not for all. Some actors departed from the idea that ‘collective’ action encouraged possibilities of interaction with the ecosystem that lead to valued outcomes. In the next section, I explore in which contexts and for which actors the constitutions of groups collectively defending a specific agenda for the SES occurred.

5.2. COLLECTIVE ORGANIZATION

The region surrounding Lake Titicaca has been widely studied for the strength of its civil society, and its capacity to mobilize over regional and national issues.²³² In this section, I explore cases of mobilization over the issue of pollution. In the theoretical framework followed here, mobilization needs to be understood as the attempt to bring the situation to the attention of those actors with a critical power to influence the kind of interactions structuring the SES. In order to fulfil my goal, I analyse two types of phenomena: protest groups that have been institutionalized into arenas of collaboration and protest groups that have triggered public interventions.

I. FROM PROTEST TO INSTITUTIONALIZATION

The region of Puno has witnessed numerous mobilizations against the mining pollution of the basin’s rivers. While some actors within these movements were vocal about the impacts this phenomenon could have on the bays where the rivers empty, the population

²³² See, for example, Colloredo-Mansfield (2009), Dunkerley (1984), Llosa (2003), Perreault (2006), Rivera Cusicanqui (1987) or Van Cott (1994). In the Peruvian case it is also worth pinpointing the Ombudsman reports on social conflicts, particularly over environmental degradation. The region of Puno was, according to the Ombudsman office, the second in the number of conflicts registered in 2010. The information can be accessed on the website of the *Defensoría del Pueblo*, entry ‘Temas – Conflictos Sociales’ (2013).

of the city of Puno did not seem to feel directly concerned by this problem, as we saw in Chapter Four. Yet, these mobilizations are interesting because they provide us with grounds for comparison to explore why the issue of mining triggered mobilizations in the region of Puno but not the issue of eutrophication of the lake bays.

In the year 2008, the different groups mobilizing against the local impacts of mining pollution found a door to institutionalization in the creation of an ‘environmental thematic group’ as part of the Regional Dialogue Group against Poverty (*Mesas de Concertación para la Lucha contra la Pobreza*).²³³ These *mesas* (round tables discussions) exist at national, regional and local levels around the country. They are constituted by public organizations, private partners, individual members of society, organized social groups and NGOs. The *mesas* provide a discussion space for all stakeholders and each of them decides on its thematic groups.

The first aim of the environmental thematic group in Puno was to work on the enforcement of mining regulations. Indeed, officers at the Ombudsman Office, the Regional Directorate of Mining and the Environmental Prosecutor confirmed the role the group played in sustaining pressure on the authorities over the need to ‘formalize’ the miners of the region.²³⁴

According to the interviewed participants, up until the time of fieldwork the group did not discuss anything other than mining pollution. While, theoretically, the group provided an arena in which to discuss the eutrophication of the lake bays, in practice it did not do so. It is beyond the scope of this thesis to provide a detailed account of the

²³³ Details can be accessed through their website of the Mesas de Concertación (2013).

²³⁴ In the Titicaca basin mining activities are conducted by small and medium size mining exploitations. These, by contrast to large mining exploitations, are supervised by the regional governments.

functioning and history of the *mesas* but a caveat on the representativeness of the *mesas* needs to be raised. Indeed, several of my interviewees in small NGOs, while acknowledging the usefulness of the space, contested that the *mesas* effectively managed to include all sectors of civil society in the process.²³⁵ In this light, the fact that social movements against mining were particularly active in the *mesas* does not necessarily mean that this was the sole concern of civil society in the region, but rather that the *mesas* were *one* of the tools available to influence the structuring interactions in the SES, and that social movements against mining were in a particularly good place to make use of it.

It is important to understand that, in Peru, the issue of mining polarizes people's positions. Mining is the main contributor to Peruvian exports, representing around 58 % in the last four years (Banco Central de Reserva del Perú 2014). It is also one of the main triggers of social conflicts, as the Ombudsman reports indicate.²³⁶ In this context, mobilization against mining fits within a particular history.²³⁷ In broad terms, it is a history of tensions between the state (as promoter of macroeconomic growth) and local rural communities suffering from mining pollution. Thus, the violence of past conflicts around mining sets a precedent for public authorities to monitor them in order to maintain social order.

Urban waste, be it wastewater or solid waste, presents a very different case. For one thing, the responsibility was shared collectively. Moreover, local and regional authorities in Puno had committed to act on the lake's eutrophication. The population was aware that programmes were developed (with the problems that we will see) and funds had

²³⁵ The findings of a case study on the Participatory Budget at the Municipal Level in Puno claim that the same issue occurs with the municipal *mesas* (Kilimani and Salhuana 2009).

²³⁶ See the website of the Defensoría del Pueblo, entry 'Temas – Conflictos Sociales' (2013).

²³⁷ See Arellano-Yanguas (2011), Bebbington et al. (2008), De Echave et al. (2009) and Palacín Quispe (2008).

been received to address the roots of the problem. Finally, the perceived danger of mining pollution might have been higher than that of urban pollution. All these reasons seem to explain why Puno's population had mobilized and institutionalized the discussion over mining; it did not reproduce the same structure over eutrophication. This was in contrast to Bolivia, where the population of Cohana did mobilize to demand the authorities' attention over the situation of the bay.

II. OCCASIONAL PROTEST GROUPS

In 2006, the population of the Bolivian section of the Titicaca basin demonstrated to demand that the state intervene over the problem of pollution. Farmers reported that they had demonstrated to bring the impact of ecosystem changes on their livelihoods to the authorities' attention. Fishermen from Cohana mounted road blocks and gained press coverage.²³⁸ Some of the farmers interviewed remembered that, in response to their protests, the then Minister of Water (Abel Mamani) visited the area and so did a group of international experts.

The demonstration occurred at the very beginning of Morales' first mandate. Protests are a recurrent political recourse in the area and frame the conflictive relationship between communities and the state (Van Cott 2008). Yet, the election of Evo Morales opened up a window of opportunity to transform the nature of that pattern of interaction. Farmers reported that they felt a sense of achievement at the outcome of their mobilization,

²³⁸ For articles available online see "Denuncian Contaminación del Lago Titicaca con Heces Fecales." Bolpress (31 May 2006a) or "Más de Cien Camiones Varados por el Bloqueo de la Ruta a Desaguadero." Bolpress (14 July 2006b). Other press references can be found in Ribera-Arismendi (2008b).

followed by disappointment, as the interventions did not seem to bear the expected results.

The demonstrations, however, brought the situation to the attention of the authorities at the national and international levels. A World Bank mission was sent to the area and agreed a 20 million USD project with the Vice-Ministry of Tourism. The demonstrations also brought about a more precise definition of the ALT mandate. Finally, according to officers at the MMAyA, the Bolivian government planned a set of actions that addressed the situation in Cohana. The amplification of Puchukollo treatment plant was one of them, the replacement of the El Alto landfill with a sanitary landfill was another.²³⁹

Yet, finding a place for the sanitary landfill was a challenging task.²⁴⁰ The population living adjacent to the areas where the landfill might have been located demonstrated to oppose the project. An international expert participating in the closing of the landfill expressed concern at the government's 'reactivity' to social movements. He claimed that as it had reacted to the mobilization in Cohana, it reacted to the demonstrations against the landfill. In his own words:

when the closure of the [El Alto] landfill was decided it was because of strong popular protest, [they argued] that the [Titicaca] communities were polluted, that pollution arrived to the lake... it was defined as an environmental emergency and a provisional cell²⁴¹ was there for six months until they had the new [sanitary] landfill. In fact what happened is that a new place for the landfill was not found. They thought of a metropolitan landfill for La Paz, El Alto and other municipalities like Viacha, but that caused many political

²³⁹ The original landfill did not prevent the infiltration of waste leachates to the groundwater. This contributed to the degradation of the Titicaca basin water. At the time of fieldwork, the sanitary landfill was still not built.

²⁴⁰ This was a problem across the area, as we will see later in this chapter.

²⁴¹ Sanitary landfills are constituted in 'cells' where the garbage is compressed and sealed.

problems because communities don't want the landfill close by (COOPLNS).²⁴²

The rationale that appears from this account is that the first decision (closing the landfill) was made after popular protest. Then, another group protested against the building of a sanitary landfill and the project was suspended (second decision). Therefore, protest groups appear able to trigger reaction but not sustain the pressure. To put it in the terms of our framework: protest groups were an option to influence certain critical patterns of interaction in the SES but were only activated under certain conditions, which could not be sustained over time.

We can distinguish three reasons for this. Firstly, other groups were constituted for their competing interests, which had an effect on the actor to be influenced (here public organizations). Secondly, sustaining pressure had high opportunity costs, if only because demonstrating and blocking roads imposed a significant time demand. Thus, the groups were unlikely to assume these costs in the long run. Thirdly, maintaining enough group cohesion to organize the protests was challenging.

III. CONCLUSION OF THE SECTION

In this section, I have discussed the circumstances in which the residents of the area decided to mobilize and the forms that these mobilizations took. The differences that we observe between the cases suggest that the historical and political context significantly

²⁴² The negotiations over the closing of the landfill continue. It is important to note that Cohana residents were not the only group to mobilize against the old landfill. The residents of the El Alto district in which the landfill is located have taken over the task of demanding its closure. The evolution of the dispute can be retraced through the press reports on the matter. See for instance "Relleno Sanitario de Villa Ingenio a punto de Colapsar." *El Diario* (28 January 2010), "Hace Tres Días que el Botadero de Villa Ingenio está Bloqueado." *La Razón* (5 March 2012b) and more recently, "El Distrito 13 Bloquea Relleno Sanitario; Pide Límites Definidos." (14 August 2013).

shapes the likelihood of mobilization as well as the forms it takes. In Cohana the fishers had mobilized at a key moment (2006, the year of Morales' election) when their identity as 'fishermen', i.e., rural people, was a particularly strong discursive tool and when their vision of the state, with Morales at its head, opened up their hopes that the situation could be resolved. Yet, it was difficult for the claim groups to sustain the mobilization over time because of the opportunity cost it constituted and the partial relief felt following the promises obtained. With time, also, new activities appeared and the impression of 'dependence' on the resource diminished as actors got used to living without it.

The example of the mobilizations against mining pollution in the region of Puno provided us with a different case, as the movement became part of the institutionalized management scheme. The political context is tantamount in this case as well: mobilizations against mining pollution have a particularly polarizing effect in light of the history of these Peruvian conflicts. In both cases, however, the 'problem' against which to mobilize was deemed exterior to the group. This contrasts with the rest of cases studied, where both group members and outsiders shared the responsibility for urban pollution.

The findings presented in this section resonate with some of the insights advanced by the literature on environmental social movements, such as their ability to influence the environmental governance agenda.²⁴³ They also resonate with Melucci's thesis on the difficulty of maintaining group cohesion. Indeed, as Melucci argues, the unity of a group

²⁴³ See for example Bebbington, Abramovay and Chiriboga (2008) or Peet and Watts (2004). For a specific focus on social movements against mining, see Bebbington (2007) and for an analysis of indigenous movements, crucial in Bolivia as defenders of the environmental cause, see Lucero (2007). Interesting comparisons can be drawn with the Ecuadorian case (Pallares 2007).

undertaking collective action does not lay on a pre-existing collective identity that holds the group together. The unity of a group, on the contrary, is constructed through the movement itself and is therefore unstable (1995; 1999).

Recent research has analysed these movements as they challenge and redefine the concept of citizenship.²⁴⁴ Environmental protest movements in Lake Titicaca articulate numerous parameters and need to be understood in all their complexity. This section builds on such insights to understand these movements as a tool that actors use to influence a critical interaction in the SES. The figure below presents a schematized version of the section findings.

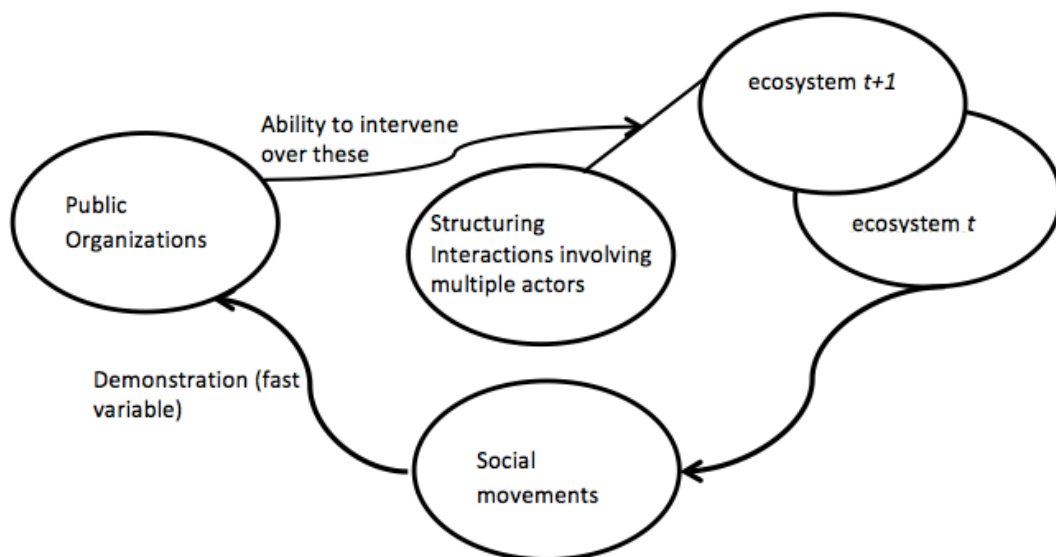


FIGURE 16 MOBILIZATIONS IN SES TERMS (MY ELABORATION)

It is useful to conceptualize mobilizations and collective action as a fast variable in the SES. For example, as the fishermen demonstrated, funds were allocated so that their demands were satisfied (notwithstanding the fact that the programmes put in place did

²⁴⁴ See Latta and Wittman (2012). It is necessary to specify that the treatment of Peru focuses on the Amazonia but insists on concepts of exclusion and marginality that resonate with the context of Puno.

not necessarily meet their objectives). Protests aim to trigger an episode of learning and obtain an adaptation in the management system. When these are institutionalized, the point of view of the protesters and their experiences are integrated as tools in the adaptive learning processes.

Yet, it is also the case that demonstrations are part of the political structure of the area, and therefore could be considered as a slow structuring variable in the relationship between society and state. For example, the historical experience over certain mobilizations (such as mining) 'ensures' the state's attention.

Finally, this section informs two aspects of the discussion: it contributes to the idea that identities and interests are negotiated as they relate to the opportunities for consolidating one agenda rather than another. For example, the fact that the fishermen mobilized in 2006 and not later does not mean that their 'interest' in the ecosystem disappeared, but that their perception of the suitability of its expression changed. It changed as a result of the new opportunities that arose, the weakening of group cohesion and the outcome of the negotiation brought about by mobilization, i.e., the authorities' commitment to intervene. To further explore this it is necessary to pay attention to the relationship between the residents and the state.

5.3. RELATING TO ORGANIZATIONS

In this section I analyse the options people had to take part in environmental management through formal structures. I aim to determine whether 'participation', i.e., taking part in a programme designed and implemented by a formal organization, seems an option for the residents of the lake. I use public and NGO officers' accounts and contrast them with the residents' behaviour and accounts. I then advance the reasons

that allow us to explain the discrepancies between the expectations held by officers and the reality of the field.

I. DIRECT PARTICIPATION

The evaluation of participatory mechanisms in development projects and public organizations in developing states has been the object of extensive research, producing mitigated results.²⁴⁵ I present two cases of participation in order to provide an insight into the variables that encourage the residents to use participation as a tool to influence one of the structuring relationships in the SES. The first one, from Copacabana, analyses the negotiations over the building of a sanitary landfill outside of the city. The second, from Puno, explores the complexities of the participatory mechanisms included in the Peruvian decentralization process.

A. AD HOC PARTICIPATION IN PROJECTS

Some of the projects being developed during my time in the field incorporated inclusion and participatory mechanisms that directly aimed to advance the implementation of the project. This was the case for projects to build waste treatment facilities (water and solid waste).

The PDSL²⁴⁶, CAN²⁴⁷ and EMSAPUNO²⁴⁸ all needed to find spaces to place sanitary landfills or to build treatment plants. As indicated in Chapter Three (section 3.1., III, p.

²⁴⁵ Participation has been promoted as part of the ‘good governance’ agenda, as a mechanism fostering accountability, responsiveness, deliberative democracy, empowerment, etc. For an account of the history of participation in development, see Hickey and Mohan (2004), particularly their own chapter and Gaventa’s. For an analysis of the different approaches in the literature, see Speer (2012).

²⁴⁶ Sustainable Development of Lake Titicaca Project, ran by the Vice-Ministry of Tourism and the World Bank in Bolivia.

121), CAN operated in both cities of Desaguadero where it managed a European fund for the building of a sanitary landfill. EMSAPUNO had, among its long-term projects, the building of a new water treatment plant for the city. The PDSLIT had to find spaces for both treatment plants and sanitary landfills in the cities where it intervened, which included Copacabana. The case of Copacabana encompasses characteristics shared by the rest of projects. My analysis builds on conversations with the project officers, municipal officers, community members and direct observation of one of the meetings between community leaders and municipal and PDSLIT officers.

The officers working on the Copacabana projects reported that agreeing on a place for the environmental facilities was systematically controversial since residents were reluctant to accept facilities near their living areas. The project experts took several considerations into account when selecting an area for the facilities. The geographical and geological characteristics of the area were one of the factors; budget constraints were another. The acceptability of the project for the local communities was a challenging constraint.

From the officers' point of view, communities' reticence was mainly explained by the fact that, quite understandably, they did not want to have the waste close by. This, the officers believed, was due to the communities' fear of the dangers associated with regular landfills such as the appearance of animals acting as vectors of diseases and the inconveniences brought about by waste transportation, such as the occurrence of bad

²⁴⁷ Andean Community.

²⁴⁸ Municipal Company for Sewerage and Water of Puno.

smells. To demystify the communities' 'prejudices', the officers explained the differences between sanitary and regular landfills.²⁴⁹

However, community members had, in fact, an array of reasons why they did not want the landfill close by. These included disputes over why one of the communities had to host the landfill (and not the others).²⁵⁰ Additionally, a crucial element of the debate over waste was the residents' willingness to pay for waste management services. The World Bank PDSLIT project officers reported on numerous conversations with residents in their area of intervention over the issue of payment for waste management services. In one of the officers' words:

They say they don't want to pay the fee to sustain the landfill, that it will be a further stress in their finances. In fact, it is important to make them see that they already pay for the management of the waste. It is important to show them [the communities] that they already pay a fee on waste: I make them add up the 50 cents coins that they give to kids to take the waste away once per week... (PDSLTAU).

From the officer's point of view paying a tax on waste management rendered visible a cost that already existed: community members did pay for waste management, only not to the municipality. The PDSLIT officers considered that it was crucial to explain to the communities what a sanitary landfill entailed and the risks associated with not managing waste adequately. Yet, it was also important to show that this change would not translate into further costs for the community but into a transposition of payment from one actor (the kids) to another (the municipality).

²⁴⁹ There were numerous technical differences. The most relevant from the communities' point of view seemed to be the sealing of the cells in sanitary landfills, which prevented leachates and bad smells. Further, according to the long-term plan, sanitary landfills' cells were ultimately covered by a garden.

²⁵⁰ The NGO CARE has issued a number of reports on its experiences over sanitation projects in the last 25 years, notably in Peru. Even though our case here is a waste management project in Bolivia, some of the reports findings are insightful, such as the reported resistance from communities over projects that were not directly demanded by them or that were imposed through a top-down approach. See the website of CARE Peru, entry "Programas y Proyectos – Gestión Integrada de Recursos Hídricos" (2013) as well as Guerrero and Z. Cárdenas (2002).

A second difficulty in the negotiation over the implementation of the project was that the residents did not completely trust the officers' capacity to achieve their goals, as these accounts illustrate:

As they [the officers] imagine, all is well. But then how many times have we been told that something would be marvellous and then it is never finished, or when it is, it doesn't work? (COPNBAS).

Their landfill can very well be paid by them, but what happens with all that the municipality needs to pay? How are they going to pay for the truck? (MNC PWR).

In the first account, the officers' word is interpreted in light of previous experiences with public organizations. In the second, the intervention is contextualized in terms of the capacity of local institutions to sustain the expensive infrastructure built through cooperation projects. Community members did not systematically suspect the officers of lying, but they regarded them as naïve. From the point of view of community members, there was a high chance that the project would fail and that they would have to live with the consequences of an unfinished landfill.

Thus, for communities, letting the project go forward constituted a risk. Subsequently, for the negotiation to succeed, the terms of the negotiation needed to be changed: communities would have to obtain something in exchange for letting the project – which they²⁵¹ did not demand – go forward.

The officers reported that when the possibility of offering compensation was presented, several communities volunteered to host the landfill. The negotiations continued and monetary compensations were turned into infrastructure building, which seemed more

²⁵¹ This project emerged as a partial 'response' to the degradation of the lake bays. The response consisted in providing waste and sanitation services to the cities of the area in order to minimize their environmental impact on the lake. The communities with which the negotiation over the landfill occurred were not directly affected by this problem.

satisfactory for all actors involved. Indeed, a community volunteered to host the landfill in exchange for the completion of a road that linked their living area to the bigger provincial road, which had been left unfinished years earlier due to a lack of funding. This was, in any case, necessary for the trucks to access the landfill and thus appeared as a satisfactory outcome for all.

Besides the elements revealed through the negotiation between the actors, unspoken dynamics were also at play. Indeed, it is important to take into account the context of relationships between formal organizations and civil society, for these framed the negotiations. The area's populations had historically been used to little interference from the state, and were used to being the managers of their lands. In this light, participation might be understood as bi-directional: communities seemed to be participating in public structures as much as the state was participating in community life.

In order to grasp the weight of this parameter, it is important to understand that this kind of dynamic between the state and civil society was not only true in the area of this study. Morales' government had tasked itself with integrating traditional community management with state structures. Therefore, the challenges percolated all through the management structure, from the implementation of programmes to the drafting of laws. Among Bolivian decision-makers, including representatives of civil society in rule-crafting seemed a *sine qua non* condition for implementation.²⁵² The views of a MAS senator involved in the elaboration of the Law of Mother Earth prove illustrative:

We have always included them [social groups], because for whom do we elaborate this law? It must be for all, otherwise it won't be applicable (DPTMASSL).

²⁵² The political science literature presents numerous other reasons why implementation was challenging in Latin America, some of which are discussed in the next chapter.

This senator had a history as a social leader, which was a rather common feature of MAS senators. He believed that his role was to ensure that social organizations were heard, but he also knew “from experience” that “there was no other option”. In his view, it was not only a matter of principle; it was also a matter of efficiency.²⁵³ It is also important to note that while the senator used general and inclusive terms to refer to social groups, he had in mind the groups that supported the MAS. Satisfying the demands of those groups was a challenge since they were heterogenous and often held competing visions.²⁵⁴

B. THE PERUVIAN CASE: INSTITUTIONALIZED PARTICIPATION

I turn now to Peru. I discuss the issues at stake in participatory budgeting (PB) and I investigate whether this mechanism was used as a tool to influence the structuring interactions of the SES. Participatory budgeting has received significant attention in the literature, and the case of Peru confirms the general findings, which point to mitigated successes.²⁵⁵ In particular, the World Bank issued a report in 2011 in which it concluded that while a ‘pro-poor’ orientation emerges from the Peruvian PB experience, the

²⁵³ I do not engage in a deeper discussion of this type on ‘participation’ because it is beyond the scope of this chapter, but it is worth mentioning that several bureaucrats among my interviewees raised concerns about the danger of approving laws that were contradictory and made of a ‘collage’ of different groups’ demands.

²⁵⁴ Several of my interviewees from environmental NGOs complained that the ‘government’ excluded them and would only work with its ‘allies’. Yet, these NGOs seemed to refer, in fact, to limited opportunities to participate in law-drafting rather than to establish partnerships with the executive, which they continued to do. The key role of civil society organizations in supporting the MAS makes this topic particularly complex. Yet, it should be noted that this was not exclusive of Bolivia. Some of my respondents from NGOs in Puno equally complained that the relations with the Regional Government were difficult (2010), which in their case, drove them to focus on working with local governments.

²⁵⁵ See Goldfrank (2006) for a general account of PB mechanisms in Latin America, and Hordijk (2009) for insights on Peru. More generally on participation in local governance see Andersson, Gordillo de Anda and van Laerhoven (2009) on Latin America and Brinkerhoff, D. W., Brinkerhoff, J. M. and McNulty (2007) on Peru.

implementation of the PB projects was slower than that of other projects (World Bank 2011b).²⁵⁶

The PB is an interesting arena as it provides an insight into the population's will to participate in public affairs. A majority of the officers interviewed in both the municipal and regional governments considered that the population's general involvement in public affairs was low. This is echoed in the regional development plan where a series of "weaknesses in social capital" are identified. These include weak "social leadership", weak "involvement of the population in decision-making" and "weak citizen presence in social organizations with deficient control mechanisms".²⁵⁷

Some of the officers interviewed at the municipality of Puno believed that the PB programmes constituted a good opportunity to reverse the trend of what they considered low social involvement in public affairs with, they argued, people showing more interest each year. Yet, several elements need to be exposed to both raise some caveats on the enthusiasm of these officers and to suggest some explanations as to why the population's involvement in public affairs was considered low. Besides my own data, I use the analysis of the Kilimani and Salhuana study "Results-based Participatory Budgeting: A Case Study of Puno Municipality in Peru" (2009). This study provides a comprehensive account of the process of PB in Puno from 2007 to 2009. It indicates that there was a disconnection between the concerns the participants expressed and the kind of projects given priority.

As they explain:

²⁵⁶ For the soundness of our analysis, it should be noted that links exist between the *mesas* and the PB groups, even though these respond to slightly different logics. The *mesas* are spaces of dialogue to provide joint solutions for problems that affect stakeholders from the public sphere, the private sphere and civil society. The participation of the actors is constitutive of the *mesa* itself. By contrast, the PB is a mechanism to participate *in* an organization that is able to function without this scheme. Yet, the *mesas* are involved in the PB process that they monitor. Moreover, the associations participating in the *mesas* generally also participate in the PB process.

²⁵⁷ Municipalidad Provincial de Puno (2011, 60).

the projects put forward are not linked with the main necessities pinpointed by the participants, who express their worry vis-à-vis the satisfaction of basic necessities such as ‘the installation of basic services’ and the environmental problems of their localities, such as ‘the pollution of the bay of Lake Titicaca’ or the ‘urban disorder’ (2009, 54).

The report insists on the leading role of the Planning Directorate of the Municipality and illustrates how the process is organized in such a way that the directorate maintains its decision-making power. For example, the information about the dates of the workshop is reported to be erratic, and the workshops do not “prepare the population to prioritize sustainable projects that address basic needs”. Perhaps more importantly, the ‘Technical Team’, which is supposed to be composed of officers and representatives of civil society, is exclusively made up of public officers, on the grounds that civil partners do not have the required domains of expertise. In the words of the report:

The fact that the call for participants has been limited, or in some ways directed by the authorities creates a lot of suspicion among the population who considers that the participation of civil society is limited to the sectors that are politically coincidental with the government (2009, 39).

In terms of the identity of participants it indicates that participants in one session tend to renew their participation but new participants fail to be included. Importantly, the participants in the study reported they lacked time to participate in the workshops, which is consistent with my own data. Moreover, of the list of forty-eight projects prioritized in 2008 less than half were actually initiated by the municipality. This might constitute an element discouraging participation.

An officer from the NGO SER, who worked on institutional strengthening in the region of Puno, advanced an interesting hypothesis for why the population’s participation had been timid. He considered that, while the population was eager to participate, their experience with public organizations did not encourage them to do so (NGOSERLA). An international consultant on water management who had worked extensively with

public administrations echoed this claim. He narrated that, in his experience, decision-makers often approached participation simply as a legal requirement (CIWRMPN).

II. EXPERIENCING ORGANIZATIONS

We saw earlier in this chapter that the residents of Copacabana mistrusted that the officers could effectively fulfil their commitment to build a sanitary landfill. We also discussed in the last chapter that, during election time in Puno, the candidates' promises to 'clean' the lake were not taken seriously. In this section, I continue the investigation by examining the effect of public organizations' inconsistent discourses on the residents. I then investigate which mechanisms of accountability were valued. These are structuring variables determining the likelihood of the residents' use of public organizations to mediate their relationship with the ecosystem.

A. INCONSISTENCIES

Both in Puno and Copacabana the residents reported that the municipalities had organized several 'campaigns' over waste management in the past. According to my respondents, the purpose of these campaigns was to raise awareness among the population on how they could contribute to improving waste management.

In Puno, one of my interviewees narrated how his children had learnt to separate waste and had been convinced of the importance of doing so. The children, he reported, had explained at home what they learnt at school and demanded that the household implement waste classification arrangements. The children took up the responsibility until "they realised the waste truck mixed the waste, so they stopped doing it"

(NGOuo).²⁵⁸ My respondent interpreted that this experience had a detrimental effect on his children who, he thought, would lose trust.

Waste classification campaigns built on the supposition that a change in individual behaviour was the missing piece in a puzzle that was otherwise complete. To put it differently, asking residents to classify waste supposed that the other elements to allow recycling, such as the existence of separate trucks and of a waste treatment facility, were in place. An example from Sun Island in Copacabana further informs this issue.

One of my interviewees from Copacabana explained that classifying bins had been installed on Sun Island approximately a year before my arrival in the field. However, shortly after installation, the municipality sealed them off to prevent their use. They did so because the island did not have any sort of waste management system. During the time that the bins had been in operation, they were widely used by the tourists, who assumed that the necessary facilities to support them were in place. According to one of the officers intervening in the area through the PDSLIT project, the placement of the bins might have created more damage than their absence. In his words: “in the absence of bins, the tourists kept their waste with them until back on the mainland [Copacabana]” where waste treatment facilities existed (PDSLITAU).

The existence of municipal plans for integrated waste management in both Peru and Bolivia was meant to prevent these kinds of inconsistencies from arising. However, the ordered implementation of the plans was challenging. One of the reasons explaining this was the availability of funds for a specific component of the plan but not for all of it. Yet, these inconsistencies had an impact on the residents’ view of public organizations.

²⁵⁸ Theoretically, this does not prevent the subsequent separation of waste in a waste treatment facility. Such a facility was however non-existent in Puno.

They contributed to the mistrust they felt vis-à-vis the state, nourishing an experience of disappointment. While this feeling was different from those engendered by the lack of fulfilment of promises that we saw earlier, both contribute to crafting a slow variable of mistrust.

B. ACCOUNTABILITY

As we have seen repeatedly, the residents of all cases complained that public organizations did not fulfil their promises or were unable to meet their commitments. Yet, several mechanisms were available for citizens to hold organizations accountable.²⁵⁹

At the time of fieldwork, Bolivia was in the process of drafting a transparency law that would address diverse accountability issues. In the specific case of environmental governance, it is worth noting that article thirty-four of the CPE created a new legal recourse: it makes it possible to claim that one's right to a clean environment has been violated. On top of that, the debates over the law of 'Mother Earth' envisioned the creation of a specific court, as well as an Ombudsman's office for Mother Earth affairs. As we will see, the Peruvian experience with the Environmental Ombudsman suggests that these institutions can make a real difference.

In Peru, a transparency law had been approved in 2002. It demanded that municipalities justify their spending and explain the level of execution of their projects publicly on an annual basis. Moreover, the participatory budget scheme that I discussed earlier provided another space for citizens to 'supervise' municipal execution. Indeed, within the

²⁵⁹ It is beyond the scope of this thesis to provide a thorough analysis of all the mechanisms of accountability formally available to citizens. The debate on public accountability in the Latin American context is very rich as the extensive literature on the subject attests. One can start, for instance, with Mainwaring and Welna's *Democratic Accountability in Latin America* (2003) or with O'Donnell's work on horizontal accountability in polyarchies (1998). On social accountability see Smulovitz and Peruzzotti (2000).

participatory budget scheme, committees were created to supervise the actual execution of the projects.

Yet, both in Bolivia and Peru, my respondents were unconvinced of the efficiency of these schemes as tools for accountability. They seem to function more as mechanisms for obtaining information that might be used to activate mechanisms of accountability judged efficient such as, in Peru, having recourse to the Environmental Prosecutor, which could be approached by individual citizens. The account from one of my respondents in Copacabana is informative of how formal mechanisms of accountability did not necessarily bear the expected results:

Unfortunately our municipality is used to not having detailed accountability [*rendir cuentas*], only when the administration is ending is when they do that. In general terms. It's approved because people are tired. In this case we are trying to have reports as the state guarantees us the right to, at any time. ... here the habit is to spend in whatever and then when the State Comptroller comes, they find justifications of all sorts. The one entering needs to cover that because others will cover for them, it's a chain (COPNBAS).

This respondent makes reference to two mechanisms of accountability. On the one hand he speaks of vertical accountability, i.e., end of term information to the city residents on the achievements of the administration. On the other hand, he comments on horizontal administrative (here specifically fiscal) accountability, i.e., inspections by the State Comptroller. He finds both of them empty of meaning. He believes that the administration's past experience of not being held accountable ("is used to") is determinant. Equally, the supposed existence of a 'pact' between officials who cover each other allows the lack of accountability to persist. Interestingly, he presents this as the culture of the administration and makes no distinction based on who is in office. This culture, he believes, is stronger than the formal mechanisms it is required to follow.

Crucially, my respondents in Puno and Desaguadero expressed trust vis-à-vis the Ombudsman²⁶⁰. The reasons given for this were consistent with the Ombudsman officers' (both at the regional and national levels) own explanations: they considered that they were trusted thanks to the consistency their institution displayed. It is also worth noting that, in Peru, individual citizens could approach the Environmental Prosecutor at the Public Ministry and that they did.

My respondents in environmental NGOs in the region of Puno presented the trust in the Prosecutor as a new trend, which they attributed to the personality of the new Environmental Prosecutor (who arrived at the end of 2010), who “had made the office visible” (NGOHHU). The Environmental Prosecutor had been active in pinpointing responsibilities over the quality of the regional water and had been particularly active over mining issues and the supervision of the interventions on Puno bay.²⁶¹

From the elements presented here, it appears that formal mechanisms of vertical accountability are not sufficient to reverse the patterns of mistrust the residents generally feel towards public organizations. Yet, we have seen that in the case of Puno, the residents use the Environmental Prosecutor and the Ombudsman to pursue vertical accountability.

²⁶⁰ For a general discussion on the role fulfilled by the Ombudsman in Peru see Pegram (2011).

²⁶¹ I observed this myself and it is confirmed by the numerous press reports on the Prosecutors' activities.

III. THE CHALLENGE OF INCORPORATING COMMUNITIES' VIEWS

I disentangle here the misunderstandings between communities and officers in defining what constitutes the communities' interests. For this purpose, I focus on Cohana and discuss the rationale followed by the USAID ProLago project of biofuel and humus production and the ALT programme for compost production from the *lemma*, to approach their 'target' groups. This then leads me to highlighting some general difficulties the officers faced when determining what constituted the area residents' interests.

THE GAP BETWEEN COMMUNITY LOGIC AND INSTITUTIONAL LOGIC

The USAID programme ProLago functioned on a voluntary basis. USAID worked with Cohana families through 'promoters', i.e., farmers who were trained in the different areas covered by the programme (humus compost production, biofuel production, etc.). These actors then explained the different components of the programme to the families in their community who could decide whether or not to participate in the project. The ProLago project had four engineers permanently on site in two different areas of Cohana, and a veterinarian working over the whole area. The ground staff was all Bolivian and some of them were natives of the region, which certainly facilitated their contact with the farmers who declared they had very frequent contact with the staff.

During my time in the field, the communities requested a meeting with the programme director (based in La Paz) to share their views on the project. Approximately twenty members from different communities (only some of whom were participants in ProLago) attended this meeting. Several issues were discussed, including the possibility of extending the project to all families in the area. Limiting the project to only some

families, some of the community members argued, could lead to jealousies and tensions between individuals within communities and between different communities. The project officers claimed that they had always wanted to work with every interested family, which is what happened ultimately.

From my discussions with the project staff and with the communities it seems that there was a difference in the logic and value put on the concept of a ‘voluntary’ project. Indeed, my field-data suggests that the voluntary aspect of the project was seen as potentially leading to differences in communities. The anthropological literature on Aymara communities is useful to investigate this issue.²⁶² Indeed, it would seem that maintaining equality between community members with respect to the ‘benefits’ obtained from outsiders was an important incentive in the Aymara context. This must not be equated to a sense of collectivism. In our case, it’s important to notice that communities were indeed asking for the project to be extended to all families, not for them to share any of the facilities²⁶³. With that point in mind, I turn now to briefly present the mismatch observable in the second project.

As mentioned in Chapter Three, ALT opted to build shared facilities for its *lemma* compost production plant. ALT officers presented this as an aspect that incorporated communitarian understandings, such as collective property, and that allowed economies of scale. The intervention was short-lived due to an interruption in the funding to ALT from the Bolivian state. Yet, ALT officers claimed that communities had independently continued with the project, using the facility that had been built. The project, in their eyes, had triggered the development of a new activity that had been integrated into

²⁶² Notably, the work of Albó (1977; 1985; 1990).

²⁶³ These included cowsheds, compost and biofuel production units.

community life. The farmers reported that they had indeed continued to exploit the *lemma* for a few months. Yet, they explained that they had stopped doing so because the collective aspect of the exploitation had turned into a problem. In the words of one of the community leaders: “there wasn’t understanding [among community members], it’s best each [of us has] his own [facilities]” (FCHA).

From this experience, it can be inferred that communities might have at first participated in the ALT project as a group because the project ‘demanded’ that from them, i.e., because the project was rationalized in those terms. This seems to differ from what was targeted by those designing the project, who claimed to incorporate pre-existing communal institutions.

This needs to be interpreted in light of the officers’ desire to influence communities’ interactions with the ecosystem. For that purpose, they crafted projects in ways that, they believed, matched with communities’ interests and logics. The mismatches between the officers’ and the communities’ understandings of these can have an impact on the sustainability of projects. Moreover, they can nourish mistrust vis-à-vis the organizations with which there are misunderstandings. Finally, they might catalyse internal tensions between communities.

The debate on how to craft institutions respectful of communities’ understandings was paramount in the Bolivian political context. Indeed, since the election of President Morales, the government was set on a discourse over the necessity to design public policies that would contribute to ‘preserving’ community life. The words of a former officer of the MMAyA, who was working on water and sanitation for a cooperation agency at the time of fieldwork, give an account of the tensions around the debate over what constitutes community life:

Working with water, we constantly deal with the issue of ‘customs and usages’, which is something that appears in the new [Bolivian] constitution. When you go to the communities they don’t want anymore their usages and customs, sometimes what they want is pipes, dams... so sometimes you are strongly defending things that they don’t want to conserve anymore (MAOFFPP).

There are indeed numerous challenges in trying to preserve community life. The idea of preserving concrete and specific practices carried out in the communities ran the risk of ‘essentializing’ them. While these debates were framed in terms of the communities’ ‘interests’, they are also part of a dynamic of interaction with public organizations influenced by the question of whether or not public organizations can be trusted in their claims and whether their agenda is compatible with the residents’ own development strategies.²⁶⁴

IV. CONCLUSION OF THE SECTION

We have seen above how the residents might or might not use public organizations to achieve their purposes and how public organizations try to shape the residents’ interactions with them and with the ecosystem. The discourses built around participation serve several purposes, including the utilitarian purpose of securing implementation of a project or fulfilling legal requirements. It appears that participation mechanisms create action situations for negotiation. Negotiations brought about by participatory mechanisms not only allowed consideration of the different positions held by various actors, but also revealed the existence of different logics.

²⁶⁴ It is interesting to note that, at the national level, the *latinobarómetro* indicates that in 2010, Peruvians’ mistrust of the state was 69.9% and Bolivians 60% (answers ‘none’ and ‘little’ to the question ‘How much confidence do you have in the state?’). See latinobarometro.org

The example of the PDSLT in Copacabana illustrated this complexity. On the one hand, there was a negotiation over what it meant to have a sanitary landfill, and on the other over what it meant to trust public organizations. The case of projects implemented in Cohana served to highlight that the differences in logics and the consequent misunderstandings could have an impact on the implementation of programmes.

Participation has emerged as a complex and contested issue that responds to different logics for different actors. It is particularly important, in order to understand the residents' point of view, to consider whether the will for participation firstly emerges from civil society or from organizations. Moreover, it is crucial to understand that, from the residents' point of view, organizations had been shown in the past to have specific agendas, but also to be unable to fulfil their commitments. In this light, participation might or might not be an interesting option for the residents. When participation is something that organizations *want* (with reservations, as it might be a façade to satisfy a legal requirement), it gives the residents relative bargaining power.

The issue of accountability also shaped residents' perceptions of public organizations. Formal accountability was not enough since past experience again played a crucial role in shaping the residents' approach to public organizations. But mistrust did not only result from unfulfilled promises, but also from discourse inconsistencies and previous misunderstandings. The Ombudsman and the Environmental Prosecutor in Peru provided an exception. The existence of these organizations and the trust that they receive from the residents might be expressed as a fast variable, i.e., an element in the system that introduces a change in a structuring relationship, in this case, the patterns of mistrust vis-à-vis public organizations.

In such a context, participating in certain programmes opens up possibilities for directly targeting the management of the ecosystem, but not only. Indeed, the negotiations

occurring in the action situations here discussed inform on other aspects. The relationships between the ecosystem and the residents, as well as the relationships between the residents and the state, are long-term relationships constitutive of the kind of system in place.

5.4. CONCLUSION

This chapter has explored some of the variables underpinning the residents' choices over their positioning as potential managers of the social-ecological system. It has discussed the effects that the interlinked variables of time, mobility, knowledge and perception of public organizations had in defining the residents' positions. What emerges is that political and social dynamics are a constitutive part of the interactions developed between residents and the ecosystem and cannot be separated. In that sense, the findings of this chapter resonate with recent developments of the idea of 'environmentality' (Agrawal 2005). Indeed, approaches to the 'environment' not only translate specific links between actors' subjectivities and different instances of public rule, but also relate to a larger series of negotiations on identity and participation.²⁶⁵

We tackled identity through the metaphor of the 'cities' explained in Chapter Two, i.e., as different logical sets of values, interests and strategies of development. Each of these sets might become crucial in determining behaviour when they meet the appropriate structure. Yet, these sets are fluid and the hierarchy that orders them is affected by the system's structures. A crucial structure is the one set by daily practices, as it appears that the lack of time is a consistent parameter influencing the residents' choices of behaviour.

²⁶⁵ See Bridge and Perrault (2009), Nadasdy (2005) or Zimmerer (2013).

The chapter tied the investigation of the residents' daily lives with the options they consider (or not) to take part in the management of the system. This revealed that the residents' actual positions are often in contrast with what officers expect and this can create tension. The officers develop their own conception of the residents' evolving identities and interests. We saw that some of them attribute detrimental effects, such as lack of care for the ecosystem or group erosion, to patterns of mobility or urbanity. These are, in the officers' views, directly related to the residents' diminished will to defend the ecosystem as well as to their diminished possibilities for adopting its management through group action.

In discussing these, the chapter highlighted the logical problems inherent to the essentialization of identities. In terms of our framework, it would seem that these officers considered the presence of an element (for example, mobility) as symptomatic of a whole system of coherence, or 'city'. Indeed, a specific set of values and interests (the lack of care for the environment or rural life) was believed to be behind an identified pattern of behaviour (for instance, urbanity). As we saw through the example of 'ancestral knowledge', the beliefs and values of officers might be, in parallel, appropriated by the residents to defend their own positions.

The chapter tried to uncover the links that certain actors establish between identity and types of management by highlighting that values and interests covered not only objects (the environment) but also forms of management. We saw, for example, that the collective was only valued in certain contexts.

The discussion on the preconditions for mobilizations was informative in that sense. Mobilizations emerge when the context is seen as providing an opportunity to advance a specific agenda (Gamson and Meyer 1996). These mobilizations build on a characteristic of identity that constitutes a tool for the advancement of that agenda (victims of mining

pollution, fishermen). Furthermore, we saw that mobilizations seem to occur when the responsibility for the problem is situated outside of the group that mobilizes; this provides an insight as to why we do not witness mobilizations over the problem of urban waste and water treatment. From the SES framework perspective, social mobilizations occur when actors judge that such mobilization is likely to succeed in influencing a critical set of interactions in the SES, namely those mediated by public organizations. Therefore, the mobilizations are a fast variable, which aims at triggering a change.

Yet, when considering the structuring variables of the social sphere, in the context of Peru and Bolivia, mobilizations are also a 'stable' (in the sense of reoccurring) dynamic between public organizations and civil society and therefore can be considered as constituting a slow variable, i.e., one of the elements that structures the system. Moreover, some of them are integrated in the system leading only to gradual changes.

The outcomes of mobilizations depend on contextual parameters: some groups were institutionalized, such as the social movements against mining in Peru, and others, such as the fishermen in Cohana, stepped back in part because people adapted to living without the resource, and in part because promises were obtained. This might seem paradoxical in the context of widespread mistrust vis-à-vis the state. In fact, it illustrates the specific opportunities that arise in history for certain groups. In Bolivia, the election of Evo Morales created an opportunity for the mistrust to be reversed. In both cases, the fast variables aiming to trigger an adaptive change in the system that would modify the structures leading to the bays' degradation, were integrated in the system, which seems to have been only marginally modified.

The patterns of mistrust were explained by the residents' previous experience with public organizations. These included the limited possibilities for holding organizations accountable. Accountability seemed indeed to be an important parameter in determining

the relationships between the population and organizations, particularly as it opened up possibilities to revisit the feelings of mistrust. The distinction between formal and effective options for accountability explains why some organizations such as the Ombudsmen and the Environmental Prosecutor seemed to be excluded from that pattern.

More generally, previous experience with organizations framed the residents' will to participate in programmes and/or to be included in formal institutional structures. Crucially, while mechanisms of participation might not always fulfil the intended purposes, they create action situations for negotiation wherein the differences in logics and positions arise. Each specific negotiation is an opportunity to revise the dynamics between residents and organizations. Negotiations, in turn, influenced by previously crafted patterns of trust, definitions of interests and the meanings attributed to the attitudes the participants in the negotiation adopt.

To sum up, we can say that the place the residents' attribute to their interactions with the ecosystem and how they present it to other actors is fluidly defined as a result of their daily lives but also, precisely, as a result of the interaction with other actors and the specific context in which these interactions occur.

CHAPTER 6. THE POLITICS OF UNSTABLE ARRANGEMENTS: FOCUS ON THE OFFICERS (PART I)

I follow a model that conceives of environmental policy as a complex process in which different actors generate alliances, try to find consensus, and wherein conflict does not constitute a negative element but an unavoidable reality that needs to be canalized (not ruled out) through democratically institutionalized pathways. (Lanegra Quispe 2008, 83).

INTRODUCTION

This chapter and the next investigate the officers' role in shaping the SES regime. The two chapters follow a similar rationale to that of the previous chapter; they focus on the logics actors mobilize to make and justify their choices. As the analysis is long, I have divided it into two chapters to ease the reading. The elements discussed in both chapters help to uncover the variables that determine the officers' decisions. Their conclusions are presented jointly at the end of the next chapter. In this chapter I concentrate on the variables that structure and constrain the officers' decisions, i.e., what are the organizational structures that frame their behaviour? How are their interests accommodated in these? In the next chapter, I discuss the ways in which they negotiate to advance their respective agendas.

I discuss here the place of structural elements, individual interests and networks in encouraging different patterns of choice, and I explore how these relate to the overall

structure of the SES. The hypothesis is made that the policy processes²⁶⁶ relevant for the Titicaca SES might occur at the levels of administrative design, policy formulation, and implementation. The chapter investigates the role of different ‘officers’ – including elected officials, bureaucrats (who might hold a career post or be dependent on the elected officials), and external experts (NGOs officials, consultants and cooperation officials).

The chapter is organized around the parameters that frame the officers’ decisions and their interests. Officers have objectives and options to implement these objectives, which are framed within structures. Choices are made at the interaction of these three elements (objectives, options to secure them and structures). These three elements are far from being distinct categories. On the contrary, they nourish each other.

The literature on Latin American states has distinguished several characteristics that frame management in weak or inefficient states.²⁶⁷ Weak states display low capacity on a number of issues, the most prominent being: fiscal (the capacity to raise taxes), military (the capacity to defend borders), bureaucratic (the capacity to implement policies) and legal (the capacity to enforce the law universally).²⁶⁸ These categories are mutually reinforcing. For instance, low bureaucratic capacity typically undermines the capacity to raise taxes. Some of the parameters that usually lead to weak state capacity are: institutional weakness, personalization of institutions and low administrative continuity, which this chapter discusses.

²⁶⁶ For a recent account on the state of the art on policy processes, particularly where environmental management is concerned, see Schlager and Weible (2013). I do not discuss here the differences between policy implementation, public administration and policy processes. I prefer the latter term because it conveys flexibility and does not focus on top-down implementation.

²⁶⁷ Mainwaring and Scully (2008), Migdal (1988), O’Donnell (1993; 1994; 1999).

²⁶⁸ It is not here the place to engage in the discussion over what exactly ‘state capacity’ involves. For such discussion see for instance Hendrix (2010), and M. Cárdenas (2010) for details on Latin America.

To sum up: the chapter explores the variables that encourage (or discourage) officers to put forward environmental programmes and that, therefore, critically shape the kind of governance structure that organizes the system. It aims to disentangle the logics behind ‘inefficient’ patterns of environmental management. It investigates these patterns as they emerge from officers’ accounts (such as the limited available resources and the institutional instability) and from observation (such as the preference for short-term programmes).

6.1. LIMITED RESOURCES: CONSTRAINTS AND CHOICES

In Chapter Four we saw that officers held financial shortages responsible for the difficulties in complying with monitoring tasks. Resource shortage was attributed responsibility for many other shortfalls. This section first discusses the narratives officers constructed around the impacts generated by financial and staff shortages. It gives information on the budget allocations of the area and then turns to explore the reasons officers advanced to explain the shortages.

I. EXPLORING THE ‘RESOURCE SHORTAGE’

In his book, *The Absent Environmental State*, former Deputy Minister of Intercultural Affairs (2011–2013) and former Deputy for Environmental Affairs, Public Service and Indigenous Peoples at the Ombudsman Office (2008–2011), Ivan Lanegra, argues that failure to ensure environmental protection has a high cost for Peru. He contends that:

Peru loses 8,200 million nuevos soles each year as a result of the environmental damages generated by human activities, while preliminary studies show that the public and private spending to face this challenge barely ascends to some 1,300 million nuevos soles per year ... the public and

private spending would barely reach 0.61% of GDP (ABUGATTÁS 2005). On the other hand, the cost that the country suffers as a consequence of the environmental damage is approximately 3.9% of the GDP, as a World Bank report on the environmental performance of Peru reveals (BANCO MUNDIAL 2006) (Lanegra Quispe 2008, 47).

Lanegra's argument rests on the transposition of environmental resources into financial resources. This exercise leads to numerical estimates, which are dependent on the valuation *attributed* to environmental resources. The main challenge in expressing environmental resources in financial terms is that this 'value', contrary to the majority of financial values, does not arise from market prices. What Lanegra denounces in his book is precisely that the Peruvian state ignores environmental capital (i.e., non-market capital). This makes the state blind to the capital losses that, he claims, environmental destruction engender.

Several environmental NGOs identified the same issue in Bolivia. While in 1994 there was a project to include environmental capital in the general accounting of the nation, it did not succeed (Lidema 2008, 6). As in Peru, the use of environmental resources is not integrated in national accounting in Bolivia.

In its research report on environmental accounting, the Institute for Advanced Development Studies (INESAD) calculates the proportion of environmental resources in Bolivian GDP. It claims that in 2008 the contribution of natural resources²⁶⁹ to the GDP was 18% while in 1990 it was 8.2%. This was explained by the boom in the mining and hydrocarbons sectors (non-renewable) since 2004 (Jemio Mollinedo 2011, 23). In terms of losses, INESAD calculates that the Bolivian GDP would be approximately 10% lower if environmental degradation was considered. The difference between the GDP and the

²⁶⁹ In terms of the return of natural capital against its destruction.

environmentally-adjusted GDP has been sustained since 1990, with a slight amplification in recent years (INESAD 2012, 5).

The officers I interviewed in environmental NGOs both in Peru and Bolivia estimated that the losses in natural capital were due both to the exploitation of resources for economic growth and to inefficient environmental management. Both issues were presented as interlinked. As the quote by Lanegra attests, numerous environmentalists in the field considered that low public spending in the area was directly correlated with the quality of management. But what did the limited availability of resources for environmental management mean in concrete terms and how were resources allocated?

A. SUMMARY OF RESOURCES ATTRIBUTED

There are three sources of funding for organizations with environmental responsibilities: service payment, cooperation agencies' projects and delegations from general budgets at the relevant administrative level. Service payment refers to the funding obtained through the collection of taxes, in our case, those for waste and sanitation services. Cooperation agencies' projects could take a variety of forms and be obtained at different administrative levels. Delegations originated either from the central authority at the same administrative level (for example, from the regional government budget of the regional directorate of the environment) or from the higher sectorial authority (for example, the Ministry of the Environment for a regional directorate).

In preparation for the budget allocations²⁷⁰, organizations submit their annual plans to the Ministries of Economy and Finances (Public Finances in Bolivia). In decentralized

²⁷⁰ When real figures are given these are in nuevos soles (Peru) and bolivianos (Bolivia) respectively. The conversion to dollars is based on the historical exchange rate provided by the World Bank (2014a). These

governments, the different directorates and units submit their plans to the planning unit within the given government that then submits it to the Ministries of Economy and Finances. Decentralized instances benefit from national delegations and from their own resources, obtained through their specific taxes or royalties.

Budgets are agreed by vote in December for the following year. Consequently, incoming administrations operate with budget allocations decided by the outgoing administration. Moreover, together with their budget plans, organizations submit their budget execution for the past year. My interviewees across administrations considered the annual reviews a (small) opportunity to negotiate over budgets by highlighting their achievements in the area.

Both Bolivian and Peruvian officers working in the public sector frequently complained that resources were insufficient to comply with the functions they were legally bound to fulfil, from basic needs to infrastructure building. Analysis of the actual budget figures confirms that the budget allocated to the environmental area is generally low in relation to the general budget at the relevant administrative level. For example, the Peruvian state had allocated 76,410,000 nuevos soles (27,785,454 USD) to the Ministry of the Environment in 2011, i.e., 0.09% of the general budget of the state, and the Bolivian 439,182,453 bolivianos (63,282,774 USD) to the Ministry of Environment and Water, i.e., 0.27% of the general budget.²⁷¹ My interviewees took the budget allocations as a sign of the level of commitment to the area on the part of the budget decision-makers.

figures were calculated on the basis of the information retrieved from the databases and annexes to the budget laws ('Ley de Presupuesto') of the relevant years. In Peru, notwithstanding the creation of the Ministry of the Environment, the environmental area was sectorialized, which renders the comparison difficult.

²⁷¹ Laws 29812 and 211 respectively.

It is not my intention here to engage in a deep analysis of the budget allocations to the environmental area. These are extremely complex and a thorough analysis would stand as a full chapter in itself. My analysis of the budget aims to fulfil three main purposes: (i) give a sense of the ‘evolution’ of the environmental area and put forward a hypothesis explaining it; (ii) give a sense of the weight of cooperation funding in the area; and (iii) compare the situation in Peru and Bolivia. Purposes (i) and (ii) were set in order to confront interviewees’ perceptions of the budgets with real figures, and objective (iii) responds to the general approach followed in this thesis.²⁷²

The time frame selected for each administrative level varies following what my interviewees distinguished as a significant ‘change’. These were usually tied to elections at different administrative levels (i.e., 2006 for the national level and 2010 for the regional and municipal levels). However, the most significant change at the national level in Peru was the founding of Minam in 2008. Yet, I analyse national budgets from 2005 (set in 2004) onwards to allow for comparison with Bolivia.

The tables below provide a summary of the budget allocations in real terms and as percentages of the budget and of the Gross Domestic Product. A more detailed analysis is provided in the annexes.

²⁷² This is why I focus on approved budgets. The analysis of budget execution would inform on other aspects, such as bureaucratic abilities, which would drive us away from officers’ perceptions. Minam conducted an analysis of such figures in 2009, ‘Diagnóstico y Estimación del Gasto Público en Patrimonio Natural y Ambiente a Nivel Nacional y Regional’.

TABLE 12: BUDGET OF THE ENVIRONMENTAL AREA²⁷³ AT THE NATIONAL LEVEL BOLIVIA (BASED ON BUDGET LAWS 2005-2011 AND WORLD BANK 2014C)

	2005	2006	2007	2008	2009	2010	2011
Real terms (bolivianos)	217,679,614	191,261,546	143,685,125	144,594,771	259,102,224	332,010,539	486,329,125
Real terms (dollars)	26,973,929	23,877,845	45,905,790	19,971,653	86,080,473	47,294,948	70,076,242
Percentage of general budget of the state	0.54	0.41	0.24	0.18	0.25	0.31	0.41
General Budget of the State (bolivianos)	40,543,350,623	46,159,641,834	58,917,733,732	80,554,139,517	103,137,982,636	105,964,336,473	119,471,340,251
General Budget (dollars)	5,023,959,185	5,762,751,789	7,505,443,787	11,126,262,364	14,692,020,318	15,094,634,825	17,214,890,526
Percentage of GDP	0.28	0.21	0.35	0.12	0.50	0.24	0.29
GDP (dollars)	9,549,196,255	11,451,845,341	13,120,107,687	16,674,276,951	17,339,992,165	19,649,724,655	23,948,670,617

TABLE 13 BUDGET OF THE ENVIRONMENTAL AREA²⁷⁴ AT THE NATIONAL LEVEL PERU (BASED ON BUDGET LAWS 2005-2011 AND WORLD BANK 2014B)

	2005	2006	2007	2008	2009	2010	2011
Real terms (nuevos soles)	88,588,547	59,465,627	110,512,492	115,531,597	108,845,824	213,516,976	281,534,419
Real terms (dollars)	26,845,014	18,185,207	35,307,505	39,565,615	36,161,403	75,447,694	102,376,152
Percentage of general budget of the state	0.18	0.12	0.18	0.16	0.15	0.26	0.32
General Budget of the State (nuevos soles)	49,117,162,238	50,862,269,691	61,626,985,652	71,049,786,794	72,355,497,884	81,857,278,697	88,460,619,913
General Budget (dollars)	14,883,988,556	16,249,926,418	19,689,132,796	24,332,118,765	24,038,371,390	28,924,833,461	32,167,498,150
Percentage of GDP	0.03	0.02	0.03	0.03	0.03	0.05	0.06
GDP (dollars)	79,385,073,422	92,432,757,798	107,492,226,613	129,537,265,753	130,064,300,617	157,609,814,184	181,011,064,727

As we can see in these tables the figures vary significantly and it seems risky to speak of trends. It is worth noting that the environmental budget has risen since 2009 in both countries, i.e., after the opening of Minam in Peru and the establishment of the MMAyA

²⁷³ Besides the MMAyA, I include as part of the 'environmental area' the following budget entries: 'Emagua', 'Fonabosque', 'Sustainability of Basic Sanitation Services', and the 'Authority for the Supervision and Social Control of Drinking Water and Sanitation'. See Annex 5 for further details.

²⁷⁴ Besides the Minam I include as part of the 'environmental area' the following budget entries: 'Superintendence of Sanitation Services', 'Osinfor', 'Sernanp', 'Ana' and 'Oefa'. See Annex 5 for further details.

in Bolivia. Yet, there are caveats. For example, while the Bolivian budget in real terms for the environmental area in 2011 is higher than ever before in the period, in percentage terms it is not as high as in 2005. Moreover, while cooperation funding for the area contributed 65% in 2005, it contributed 80% in 2011. Through the years, ‘project funding’ has had a significant influence on the budget.

In real terms, we cannot say that one of the two countries consistently allocates more money than the other. Indeed, while the figures are very similar in 2005 and 2009, they are higher for Bolivia in 2006 and 2008, and higher for Peru in 2007, 2010 and 2011. As a percentage of the budget, while the average remains low, it is higher in Bolivia (around 0.19% of the budget in Peru and 0.33% in Bolivia). This seems particularly significant when considering that the budget of the Bolivian state is lower than that of Peru.

Yet, it is worth clarifying that the part played by cooperation money has been considerably reduced in Peru, particularly since 2008, i.e., the year in which Minam appeared. Indeed, in 2005, 22% of the environmental area resources came from donations²⁷⁵. In 2006, donations dropped to 12% of the budget.²⁷⁶ In 2007 and 2008 cooperation donations dropped again to around 5% and cooperation credits appeared as a new source of income contributing around 10%. Since 2009, both credits (which need to be reimbursed) and donations (which don’t) have been consistently low, accounting for around 1% of income in all organizations. This low dependency on donors challenges the idea of an environmental agenda determined outside Peru.

²⁷⁵ Up to 23% of the National Institute of Natural Resources (INRENA) were made of donations. For the National Council of Environment (Conam) the figure raises to 32%.

²⁷⁶ This is 10% of INRENA and 33% of Conam resources.

By contrast, the dependency on donors is significant through the period in Bolivia. There was a decrease in 2007 and 2008 but then it went up again to more than 50% of the area budget. My interviewees pinpointed a reduction of cooperation funding for the ‘environment’, which is not verified in the figures. Their perception seems to respond to the evolution of the budget of the National Service of Protected Areas (SERNAP), in which the part of cooperation funding has indeed been reduced.

In analysing the regional budgets, I investigated whether the changes brought by regional elections (in Puno and La Paz, 2010–2011) were significant. I present the figures from 2009 to 2012.

TABLE 14 BUDGET OF THE ENVIRONMENTAL AREA AT THE REGIONAL LEVEL (BASED ON GOBIERNO REGIONAL DE PUNO 2013)

Puno	2009	2010	2011	2012
Real terms	1,663,014	10,383,957	1,676,457	4,751,892
In dollars	552,496	3,669,242	609,620	1,799,959
Percentage of budget	0.24	1.43	0.21	0.55
Budget total	702,922,689	727,976,034	780,188,046	858,691,731
Total dollars	233,529,132	257,235,347	283,704,744	325,262,019

TABLE 15 BUDGET OF THE ENVIRONMENTAL AREA AT THE REGIONAL LEVEL (BUDGET LAWS 2009-2012)

La Paz	2009	2010	2011	2012
Real terms	16,290,193	13,951,258	23,873,977	32,565,357
Dollars	2,320,540	1,987,358	3,440,054	4,712,786
Percentage of budget	0.75	0.56	0.89	2.79
Budget total	2,167,875,330	2,473,836,138	2,679,657,130	1,165,509,894
Total dollars	308,814,149	325,398,310	386,117,742	168,670,028

At the regional levels, direct funding from cooperation agencies is today generally low both in Bolivia and in Peru. Peru did not receive any credits or donations from cooperation agencies in the years discussed here. Bolivia did receive some funding but it did not surpass 20% (2011 – 18%; 2012 – 12%), which represents a change from its past high dependency (2009 – 53%; 2010 – 61%). This might, however, be linked to the time

needed for the new regional governments to settle in, as my interviewees reported that they intended to negotiate with donors in the future.

This decrease in cooperation funding has not led to a decrease in the real terms budget of the La Paz regional government, which in fact increased its budget in 2011 and 2012. To fully understand what is behind this type of budget increase it is necessary to deconstruct the budget of the area. From 2011 to 2012, the budget entry ‘spatial planning’ appears, and the budgets for sanitation and natural hazard management increase, these counter a small decrease in the entry for ‘management of natural resources’. Moreover, the appearance of an ‘eco-tourism’ project also partly explains the rise. It is also important to note that in 2012 the environmental area represents a higher percentage of the general budget of the regional government than in previous years. This is due to both the rise in the budget of the area, but also the significant decrease of the regional government’s general budget.

Besides national and decentralized organizations, Peru had the administrative particularity of ministerial offices operating in the region. My interviewees in charge of environmental aspects in regional offices of ministries (the Environmental Office of the Production Ministry in the Region of Puno and the Environmental Office of the Health Ministry in the Region of Puno) considered that theirs was a particularly precarious position.²⁷⁷ They argued that they accumulated the ‘variables’ for neglect. Firstly, they were away from the centre; secondly, they were environmental managers in a sectorial administration. This account from one of the officials working for the Ministry of Health’s regional delegation for environmental quality is illustrative:

²⁷⁷ The specificity of their budget allocation was not available.

This area [environmental health] is not a priority. The budget is extremely low, it comes from the Ministry of Health to the regional bit ‘Puno’, which is an ‘executive unit’, together with Lampa. In the region there are several executive units, and ours has an extremely low budget, it is almost useless. We need equipment, clothes, inputs, stationery, everything (DIRESUP).

At the municipal level, analysis of budget parts would need an extremely detailed account to be meaningful. This is why I present here briefly only the budget parts for 2010 and 2011 for Pucarani, Copacabana and Puno.²⁷⁸ Municipal budget documents are chaotic and do not present consistently the expenditure over the years. This might be explained in several ways, for example, by changes in government, a will to dilute information, etc. Detailed budget items appearing one year might very well get lost in general categories the following year.

With this in mind, it appears that Puno gives the highest percentage of its budget to the environmental area, reaching 16.07% in 2010 and 15.74% in 2011. In both years public cleaning (including waste collection) receives the highest budget part, 72% of the environmental budget in 2010 and 63% in 2011. Public cleaning (particularly street cleaning) is one of the traditional responsibilities of the municipalities. Resources in 2010 originate equally from the Municipal Compensation Fund, Directly Collected Resources and Canon Tax, Bonuses and Customs²⁷⁹. In 2011, no resources originate from the Canon Tax, Bonuses and Customs.

TABLE 16 BUDGET OF THE ENVIRONMENTAL AREA AT THE LOCAL LEVEL IN PUNO (BASED ON MUNICIPALIDAD PROVINCIAL DE PUNO 2013)

	Puno 2010	Puno 2011
Total area in soles	5,540,713	5,982,129
Percentage of budget	15.74	16.07
Area in dollars	1,957,849	2,175,319

²⁷⁸ The budget documents of the municipalities of Desaguadero do not give any level of detail that would make the analysis possible.

²⁷⁹ Canon, Regalías y Aduanas.

It is particularly important to mention that the programme for the depollution of the bay received 300,000 soles in 2009 and 2010 and 200,000 in 2011, which represents 5% and 4% of the area budget respectively.

The analysis of the budgets in Pucarani and Copacabana presents a very different picture to that in Puno. In Pucarani, the only appearance of an environmentally related budget category in 2010 is a 414,177 bolivianos (58,999 USD) donation to improve part of the sewerage system, which represents 2% of the municipal budget. In 2011, the 'environmental management' category first appeared and accounted for 0.4% of the municipal budget. The 74,411 bolivianos (10,722 USD) in it came from the decentralization budget of the General National Treasury (hereafter TGN LPP).²⁸⁰

Finally, in Copacabana in 2010 the only relevant project is one for the improvement of the sanitation network, funded by a 50% donation, a 37% loan and the rest by TGN resources. In 2011, besides the category 'sewerage', three other relevant categories appear, which are cleaning, management of natural risks and, importantly, the PDSLIT programme, which constitutes 79% of the area budget. This reaches 2,197,062 bolivianos (316,579 USD), i.e., 15.6% of the municipal budget. This constitutes a 14 percentage point increase in the budget attributed to the environment compared to the previous year.

B. PRACTICAL IMPLICATIONS

What the reported 'lack of resources' meant in practical terms varied from one organization to the other. The difficulty in accessing the large financial investments

²⁸⁰ The mentioned LPP, Ley de Participación Popular, established a per capita based budget delegation from the central government to municipalities.

required for infrastructure development was a challenge across the cases. And yet, for administrations to be able to comply with their responsibilities in the management of waste and water, the building of new infrastructure was considered necessary. Particularly relevant for this study is the case of the city of El Alto treatment plant, Puchukollo. As the reader might recall, after treatment, the Puchukollo water joined the stream that reached Cohana. Increasing the capacity of Puchukollo was one of Morales' administration's commitments. This task was the prerogative of the transitory company in charge of drinking water and sanitation for La Paz and El Alto, EPSAS.²⁸¹ One of the officers in charge of managing the expansion of the plant explains that finding the budget for the reform was particularly challenging:

... it was impossible to obtain the 35 million dollars [that were budgeted for the execution of the project]. We managed to obtain five million dollars that the president [i.e., the executive] delegated to us ... We have fractioned the general project into four parts, we have defined four new horizons, the first in 2013, then 2017, 2026 and the fourth 2035...(EPSASPKIO).

Besides the contribution from central government, the officer indicated that the municipal government of El Alto would provide EPSAS with up to 8% of the total project funding.²⁸² Crucially, while EPSAS collected its own resources through a tax on

²⁸¹ Empresa Pública Social del Agua y Saneamiento – Public Social Company for Water and Sewerage. EPSAS was a public-private entity, which replaced the private company AISA and was supposed to manage the drinking water and sanitation network until 2008, when the managerial model to follow would be decided upon. This debate had not been settled at the time of fieldwork. The issue was complex: it brought together an array of actors (among which the Municipalities of La Paz and El Alto) and interests.

²⁸² The Annexes of the Budget Law of 2010 indicate that the Municipality of El Alto would allocate to the amplification of the plant 13,523,441 Bolivianos, i.e., 1,926,416 USD which is in fact 5.5% of 35 million USD. It is likely that the officer referred to the total budget the municipality committed to provide, i.e., until the end of the project. It is worth noting that the 'Puchukollo' budget entry does not appear in the 2011 municipal budget.

drinking water and sanitation, these were insufficient to ensure the company's functioning, let alone to cover investment projects entirely.²⁸³

Officers at EPSAS, the Municipal Company for Sewerage and Water of Puno (EMSAPUNO) and the municipal sewerage service of Copacabana pinpointed that new infrastructure implied numerous additional costs besides those incurred for its building. Indeed, any infrastructure had functioning and maintenance costs. These needed be forecasted and included in the company's regular collection of resources, which would inevitably create difficulties in making the users accept the rise in tariffs.

Not only were large financial investments difficult to obtain. Officers at the municipal level reported that the lack of resources could affect the covering of basic, low-budget needs. In Desaguadero and Copacabana the cleaning staff complained that they did not have the appropriate cleaning material to conduct their daily tasks. In Desaguadero, for example, this brought the staff to improvise their own brooms.²⁸⁴ In both cities resource shortages caused delays to the collection of waste, which accumulated in the urban centre.

C. STAFF SHORTAGES

Many of my interviewees claimed that staff shortages were strongly correlated to the lack of financial resources, as supplementary resources would have allowed them to hire more staff. The limitation of staff, they argued, further prevented organizations from complying with their responsibilities.

²⁸³ The World Bank, in its report 65746, "Servicios Municipales y Finanzas en Bolivia: Hacia el Acceso Universal en Agua y Saneamiento" (sic), indicates the figures of external funding the company receives (2011a, 86).

²⁸⁴ This was observed, and it is also reported in the study of ALT and CAN on the waste management project in Desaguadero, "Proyecto Integral de Gestión Ambiental de Residuos Sólidos en la Ciudad Binacional de Desaguadero Bolivia-Perú PIGARSD" (2009).

In Bolivia, failure to comply with responsibilities at the municipal level had consequences across public administration since the law established interlocked functions. In the particular case of sanitation services, the regional level has the responsibility to step in when the municipal level fails to comply with its responsibilities.²⁸⁵ Thus, shortages in financial or staff resources at the municipal level were not only a municipal problem. Nonetheless, the regional level faced its own staff shortages, which rendered it difficult for its staff to provide the municipalities with the necessary support.

In Peru, the environmental liability for Puno Bay was under the shared responsibility of the Municipality, the Region and the Ministry of the Environment.²⁸⁶ One of the officers participating in the Programme for the Depollution of the Bay run by the Municipality felt that:

The municipality cannot solve the problem of pollution alone, for reasons of budget, maybe the region... but the Ministry of Environment is the one who should (MUNPNDBL1).

From this quote we can infer that the manager viewed his sectorial hierarchy as capable of intervening. Yet, my interviewees at regional and national levels of administration in Peru also complained about the shortage of staff. Indeed, Minam had only one person working on the Puno region. It is worth noting that, since its founding, Minam had hoped to collaborate with regional and local governments, which would be in charge of the actual management. Yet, the regional government, with five officers, could not find the means to conduct projects for the depollution of the bay either.²⁸⁷

²⁸⁵ Law 2066 (2000).

²⁸⁶ Law 27783 (2002) and Law 28245 (2004).

²⁸⁷ In light of this and given the responsibilities of ALT which included ensuring the environmental health of the system, the Ministries of Foreign Affairs gave the organization the task of cleaning the bay in 2006 (Memorandum Binacional 2006).

Both in Bolivia and Peru, national administrations had trouble fulfilling their own functions. For example, my interviewee MAOFFPP, former director of the environmental quality directorate at the Vice-Ministry of Environment in Bolivia, remembered that the directorate was over-loaded with work, as a result of the shortages in staff. MAOFFPP considered herself “lucky to have had a professional and committed team” that was ready to work regardless of office hours.

Peruvian officers in national organisations similarly complained about staff shortages. For example, the Puno regional office of the Organism for Environmental Evaluation and Supervision, OEFA, had, at its opening, only four people in its Puno office. The officers thought it would be challenging to supervise the whole region with such a small team.

Additionally, some of my interviewees in team-management positions attributed the unavailability of highly qualified staff to the lack of resources. They distinguished two side-effects of the lack of resources over this issue: first, it did not allow them to fund complementary training courses for their existing staff and, second, public wages were considered unattractive to highly qualified staff. An officer at Minam indicated that:

[The Ministry] work[s] a lot with private companies through consulting because there aren't yet specialized people [within it]. The specialized people want to work for a better remuneration, but the state is not going to remunerate them as they desire, so they provide consulting through private companies (MINAM12).

This, he argued, was more costly to the public organizations than having their own staff responding to their managerial needs.²⁸⁸ Moreover, an exterior company could not fulfil

²⁸⁸ I am aware that several other reasons might explain the failure the area faced to attract highly qualified staff. I do not take my interviewees' explanations at face value, but I am here analysing their perceptions over how the lack of resources prevented them from complying with their responsibilities.

all requirements since some of them were tied to structural needs. At the time of fieldwork, the General Directorate of Environmental Quality at Minam could not find any candidate with the appropriate qualification for one of the positions they had opened to the public. This meant they would have to re-advertise the position creating more delays for the programmes relying on the position being filled.

Finding the appropriate staff was particularly acute when de-concentrating staff to the regions. An officer at the Environmental Office of the Aquaculture Directorate in the Ministry of Production argues that:

There is a scarcity of professionals at the [general] level of Peru, even at the level of Lima, [there are few] people who know about environmental issues, and about fishing, even less. Here, on fishing there is staff that is qualified, in this direction, highly qualified staff, but there is also a staff that is not as qualified and if you look for [better qualified staff] you don't find much. Out of this direction there is a lack of capacities in environmental issues, there are a lot of professionals on fishing topics but not on environmental topics, there are, they exist, but they are very few, and there are even less who would like to go to work in Puno (MAAQP).

As this quote suggests, Minam was not the only organization affected by shortages, which were widespread across the environmental area. While acknowledging that resources were limited, several of my interviewees at high-ranking levels questioned that street-level bureaucrats and particularly, local officers, were using resources efficiently. In the words of a Bolivian Vice-Minister: “nobody has enough resources, but one needs to be creative” (VCAIB).

Similarly, in their case study of the situation in Desaguadero, officials from CAN and ALT defended that:

Many local authorities complain about the lack of resources; however, there *are*²⁸⁹ resources, these are not sufficient but if adequately managed under a vision oriented towards the promotion of sustainable development, the techno-social and administrative bases can be consolidated, to contribute to the achievement of this objective ... (CAN & ALT, 2009; II: 33).

In this quote the word ‘consolidation’ bridges the lack of institutionalization of environmental management and the limited available resources. The quote criticizes both the inadequacy of management and of ‘vision’ at the local level. It suggests that the complaints over the lack of resources were an excuse for poor management.

The street-level bureaucrats I interviewed argued that being ‘creative’, however, required flexibility. The frame under which officers had to operate wasn’t always flexible. Officers from across administrations claimed that complying with bureaucracy sometimes prevented them from fulfilling their responsibilities. For example, officials at the municipality of Puno considered that some of the justifications they needed to give to access the budget were excessive. As one of the officers put it: “I have to wait three months to be authorized to buy a pen” (MUNPNOFFDI). Moreover, several municipal officers reported that they had not received his salary on time on several occasions. They presented that fact in contrast to the excessive zeal with which certain procedures were followed, while others, such as paying the officials, were not.

We have seen in this section that officers across administrative levels in both Peru and Bolivia attributed to resource shortages a number of inefficiencies, such as the inability to comply with responsibilities or attract highly qualified staff. In the next sub-section, I explore the explanations given to explain resource shortages.

²⁸⁹ My emphasis.

II. REASONS FOR RESOURCE SHORTAGE

Bureaucrats gave different reasons as to why their resources were limited. Some expressed an empathic understanding of the financial difficulties the public system faced. However, many claimed that the resources were *particularly* reduced in the environmental area, which they took as indicative of the weight the area was given at the country level. As an officer working on environmental issues at the Bolivian State Comptroller explains:

We couldn't hire two people for two years, and we don't know why. We contemplated all sort of things. But we didn't obtain clear answers, only nonsense (CTRMA).

Numerous officers considered the budgets were proof of the weak political support the area received, despite the government(s) claims. Later in this chapter I analyse the historical steps that marked the institutionalization of environmental management in both Peru and Bolivia in light of the deep institutional changes that were taking place at the time of fieldwork. Indeed, in Peru, the recent opening of the Ministry of the Environment bore the promise of a significant change. As did, in Bolivia, the election of President Morales and his discourse on *Pachamama*. In light of this, some of my interviewees hoped that the environmental area would receive further support in the near future.

In the case of ALT, the lack of resources allocated by the Bolivian state was taken to constitute a clear statement of lack of support for the organization. As discussed in Chapter Four, ALT was surrounded by numerous tensions. In particular, Bolivian actors felt antagonistic about the fact that ALT was headed by a Peruvian national, which they presented as a proof that the organization had a Peruvian bias. This complaint was voiced by actors at the Ministry of Environment and Water, at the Ministry of Foreign

Affairs and by actors from civil society who provided advice and support to public organizations and communities in the area.

Crucially, this occurred in a context of deep tension between Presidents Morales and García.²⁹⁰ After a series of disputes on the depollution of Cohana bay²⁹¹ that started in 2009, Bolivia took the radical decision of interrupting its budget allocations to ALT. The government intended, through this action, to question the organization's functioning and call for a debate on its restructuring. Indeed, the cessation of Bolivian funding prevented the organization from continuing with its projects in the country. Negotiations between Peru and Bolivia over the reform of the organization started in 2011. Peruvians agreed that the organization was not working efficiently and they shared Bolivians' concerns that it was not participatory, that it did not sufficiently work on the environmental health of the system and that its coordination mechanisms with the rest of the organizations were inefficient. The nationality of the organization's director was also one of the items under discussion. Despite the tensions between Peruvians and Bolivians prior to the start of the negotiations, the officers interviewed reported that once they started they all 'made an effort to be constructive' and that it was 'working well'.²⁹²

The funding of the UOB presents another interesting case. As seen in Chapter Three (Section 3.1., III, pp. 108–109), ALT had two national operative units, PELT in Peru and the UOB in Bolivia. These were technically part of ALT but administratively attached to national ministries. PELT, under the umbrella of the Ministry of Agriculture, was

²⁹⁰ See for instance "Más Tensión entre Bolivia y Perú." By Mery Vaca, BBC Mundo (9 June 2009).

²⁹¹ As explained in Chapter Four (section 4.2., II, pp. 166-168), the extraction of the duckweed was contested by some actors who argued that such actions would only contribute to spread the heavy metals contained in the plant.

²⁹² Several meetings were scheduled for these negotiations that started at the very end of my fieldwork (March 2011).

significantly independent of ALT in practical terms. It conducted its own programmes and operated as a full-right organization. In Bolivia, the UOB belonged to the Ministry of Environment and Water (MMAyA), but the UOB director was delegated from the naval forces and was therefore a career military officer. Except for the director's salary, the organization received its budget from the MMAyA.

PELT and UOB's budgets were significantly different, which resulted in very different executive capacities for each agency. As one of ALT officers explained:

PELT has a budget of 120 million soles, which means we are talking about 40 million dollars. The UOB has 19,000 dollars, so we can't delegate [projects to the UOB for their execution], we have some approaches and we always coordinate on some aspects, but a common work, to assume responsibilities, no. There are no resources for that (ALT1).

Budget differences translated into significant differences in the activities that each agency could undertake. PELT had several programmes on irrigation and pisciculture in the region, besides their participation in the cleaning of Puno bay. The UOB, by contrast, had been unable to develop any activity at all in the Titicaca sub-basin. At the time of fieldwork, UOB officers were negotiating an agreement with the Oruro Gobernación (southern part of the TDPS basin) to develop a programme to monitor water quality in one of the Oruro region sub-basins.

The two officials who occupied the position of UOB director consecutively at the time of my fieldwork confirmed that they used their budget exclusively for functioning expenses. Some of my interviewees suspected the Bolivian Ministry of Environment and Water of consciously weakening the UOB as part of its strategy to challenge and restructure ALT. In practical terms, this translated into ALT focusing its operations in Peru, which further nourished Bolivian fears that the organization had a Peruvian bias. In these two examples, the lack, or withdrawal, of funding aimed to convey a message of

disaffection vis-à-vis the organizations. This was used as a tool to force a negotiation over the reform of ALT.

III. CONCLUSION OF THE SECTION

In this section I have provided an overview of the budgets allocated to the area and I have discussed the effects the officers attributed to the lack of resources: an inability to comply with their tasks, and an inability to hire the necessary staff. Both were linked, and were seen as depriving the area of a solid base for management. We have seen that the lack of resources triggers three main reactions in officers: (i) they might accept the shortages of the state as a contextual parameter; but one group (of street-level bureaucrats and bureaucrats in managerial positions) (ii) considers that the shortages reveal a weak commitment to the environmental area or to particular organizations, and another (iii) claims that the resources should be used creatively to overcome the shortage. In the next section, I analyse a second parameter that was presented as a cause of inefficient management: the instability of the institutional and administrative systems.

6.2. THE PARADOXES OF INSTITUTIONAL INSTABILITY

The structure of environmental administration in both Bolivia and Peru was subject to significant uncertainty. High staff turnover rates and frequent modifications of the administrative structure were seen as causing delays in the implementation of programmes. As we will see, both issues had an impact on the daily functioning of organizations since, for instance, documents needed to be in coherence with the relevant state structure of the moment and signed by the competent authority.

I. HIGH STAFF TURNOVER

High staff turnover was a recurrent source of complaints among my interviewees, who considered it to be one of the main obstacles for the implementation of ‘efficient’ environmental management. The phenomena here discussed are not exclusive to the environmental area, but it is necessary to understand these in order to grasp the conditions of environmental management.

Officials could gain their posts either as career civil servants or under short-term contracts. Career civil servants held permanent positions, which meant that their managers could displace them from one position to another, but not dismiss them from public administration.²⁹³ The analysis presented in this section builds on my interviewees’ accounts, which were triangulated with the partial information made available.

A. CYCLES OF CHANGE

There were four main causes of high turnover: the first was a change in the elected officials²⁹⁴, which might have a domino effect on appointed officials; the second was the direct change of appointed officials; the third, the departure of officials at the end of projects or programmes; and the last, uncertainty over the renewal of short-term

²⁹³ Public organizations do not have a legal obligation to share information on the kind of contract their officers are under, but they may choose to do so. Bolivia is working on a Law of Transparency. Peru has one since 2002, Law 27806. In its article 22, entry 3, specifies the obligations in terms of information about public organizations’ staff. Information on wages should be provided of both permanent and contractual staff but there is no requirement to specify which officers are under which category. Both the Peruvian law and the Bolivian transparency policy are centred on financial information. This fragmentary information does not affect, however, the purpose of the section, which is to explore the effects of the *perceived* high turnover.

²⁹⁴ Generally as a result of elections but it also occurred that elected officers had to resign after corruption scandals.

contracts subject to budget availability determined by the approval of the organizations' yearly plans.

Both in Bolivia and Peru, officers across levels complained that permanent staff needs were often covered with short-term contracts.²⁹⁵ Moreover, they reported that officers under such contracts were highly dependent on their manager, whether the position had been reached through a standard application procedure or through networking. Networking was a double-edged sword for officers: on the one hand, they might have obtained their position through it; on the other, the duration of their appointment was strongly dependent on the manager.

Elections at the municipal and regional levels take place every four years in Peru and every five in Bolivia. Several interviewees working in cooperation agencies and national-level administrations complained that the first and the last six months of a regional or local administration were 'lost'. As they explained, and was later confirmed by officers working in the relevant organizations, at the beginning of each administration there was a period during which the new officers got acquainted with their tasks. Moreover, what was perceived as a significant sample of the technical staff changed along with the elected officials. Therefore, as an electoral term approached, there was a variable degree of

²⁹⁵ From the analysis of my first hand data, the organization where the officer was based seems to have relative impact on the perception of this phenomenon. Agencies of horizontal accountability (Ombudsman and State Comptroller) perceived themselves as 'stable' institutions in both countries and so did the officers at the national level in Peru and officers in PELT and ALT. Respondents in the rest of organizations studied all considered their organization was unstable. The few available figures suggest some difference in the reality of each organization. In the year 2010, of the 612 officers working in the Municipality of Puno, 373 were under short-term contracts. In the year 2011, the total number of officers raises to 801, of which 562 were under short-term contracts. Figures are unavailable for the Regional Government in those years. The Regional Government provides monthly figures for the year 2012. In January 2012 the ratio is 65 contractual against 172 permanent, for February 112/172 and for March 118/172. Figures are unavailable for Desaguadero and all of Bolivian organizations. Figures specifically indicating the contractual status of environmental officers are unavailable for all organizations of relevance for this study. The figures here given were retrieved from the websites of the Regional Government and the Municipality of Puno, entry "Transparencia – Documentos de Gestión", for the Municipality (2013) and entry "Transparencia Regional" for the Regional Government (2013).

uncertainty as to what would happen after the election. An effect of this uncertainty, according to officers in regional and municipal administrations, was that projects were put on standby six months before the end of an administrative term.

Even though not all organizations were subject to election cycles, all were affected by them. For example, multilateral cooperation officers seemed to share a fear that incoming administrations would not want to continue projects initiated by the previous administration. Thus, they conjectured that it would be a waste of time and money to start a project in the year before an election. Similarly, for officers in the organizations under election regimes, the prospect of starting a project that could not be finished within the term was seen as highly risky as it might hand the benefits of their hard work to electoral rivals.

Additionally, appointed officers could be dismissed by their superiors over personal disagreements, which added an unpredictable layer in the turnover cycle. I further explore this phenomenon in the next subsection as part of what appears as a personalization of institutions and organizations. Finally, the ending of programmes with specific funding (such as cooperation funding) and the removal of the officers appointed for the execution of these programmes imposed other, more frequent, cycles of rotation. All officers operated with these cycles constantly in mind.

B. EFFECTS

The departure of officials was regarded as bringing significant losses and imposing delays on the organizations' agendas. Indeed, high turnover was held responsible for losses in technical expertise, particularly when the departing officer had benefitted from training courses. If the training course had been paid by the public organization, the resources

were seen as ‘wasted’. If the training had been paid by cooperation agencies, they could require that the officers remain in their positions.²⁹⁶

The frequent changes need to be understood in a context of institutional weakness. This meant that when the officials changed, the processes changed with them. In the words of an EPSAS officer, sharing his views on the difficulties of inter-organizational coordination on the management of pollution in Cohana:

Processes are not institutionalized... there were defined projects but people change and the processes change, from the standard agreements [with other institutions] that were operating, and that now they want to modify (EPSASPKIO).

As it emerges from this quote, coordination initiatives were jeopardized by the high turnover of officials. Take, for example, the State Comptrollers of Peru and Bolivia’s joint audit of ALT in 2007. Shortly after the first meetings, the general State Comptroller in Bolivia was changed. The new appointee, in turn, changed the section administrators. While the street-level bureaucrats in charge of the audit did not change, managerial-level changes translated into a delay of all the procedures initiated before the change, and, indeed, all coordination procedures.

II. PERSONALIZATION OF INSTITUTIONS

In the field, the identity of the officers in place seemed to matter in determining how the system worked. This section explores the contrasting views that different groups of actors had on the ‘personalization’ of institutions.

²⁹⁶ Bolivian MMAyA officers reported that JICA was doing so. However, JICA’s office in Bolivia was not operating in our area.

A. TENSIONS WITH COOPERATION AGENCIES

The personal networks that percolated through the institutional system were a source of tension between multilateral agencies and national officers at the municipal level, as illustrated by the PIGARS project in Desaguadero Peru. The project required the hiring of a project coordinator in charge of liaising between the municipality, the donors²⁹⁷ and the officers in charge of the fund management at the local level (ALT). CAN considered that in order to fill the vacancy, qualified members of the public should be invited to apply. The mayor, on the contrary, would have preferred to work with one of his collaborators – a suggestion which the agency refused because of a perceived lack of transparency. Besides the necessity to comply with regulations, the agency officers viewed the mayor's idea as being grounded in a personal approach, which dismissed efficiency criteria, and therefore would have harmed the implementation of the project.

In order to secure the PIGARS project, the CAN officers also tried to integrate elements into it that would mitigate the possible effects of the 'personalization' of organizations. They feared that, after the municipal election, the project would be stopped or delayed if the new mayor did not consider the project 'his'. Their strategy was to invite the future mayor (in the period between election and office assumption) to the project meetings even though "the project is institutional and surpasses the mayor himself" (CAN1).

At the local level, the 'personalization' of organizations was attributed very different meanings. For example, the mayor of Copacabana explained that choosing officials among well-known collaborators allowed him to create the necessary synergies within a team. This is how he justified, for instance, the change of the two officials in charge of

²⁹⁷ The donor was the European Union but the funds were canalized through the Andean Community (CAN).

the area of tourism. The officials had been hired with the funds obtained from a cooperation scheme and were changed when the contract finished in December 2010. The two officials did not fit in the team, he argued, and changing them to create the “appropriate synergies” was necessary (COPALE). However, the PDSLTT officers who worked in the area were disappointed with this decision. Indeed, they had established cooperation mechanisms with the previous officers on the implementation of rural tourism programmes, and the decision of the mayor interrupted the flow of coordination.²⁹⁸

B. PERSONAL COMMITMENT

The PDSLTT project itself offers a good example of how specific individuals could play a determining role in the implementation of projects. The PDSLTT had been launched in 2006, after a commission from the World Bank (WB) visited the area in response to a fisherman’s protest against pollution. According to my interviewees, who had worked on the project since its early days, the commission estimated that 60 million dollars were needed to address the situation in a sustainable way. The WB finally offered a 20 million dollar loan. Importantly, the project was always meant to have a drinking water and

²⁹⁸ This phenomenon was not exclusive of the municipal level. Indeed, in Bolivia, the change of the Vice-Minister of Environment, Juan Pablo Ramos, occurred under polemic circumstances. Many of my interviewees presented it as the product of an irreconcilable disagreement in the vision of development. They presented the MAS as torn between two tendencies (the ‘socialist-developmental’ and the ‘indigenist-environmentalist’), and considered that the ‘developmentalist’ tendency, embodied by the Vice-President Álvaro García Linera and the Ministry of Economics and Public Finances, Luis Arce, was stronger. The details over which this disagreement crystallized are far from the object of this thesis, so it will suffice to say that the Vice-Minister refused to approve the building of a road across a national park, for which the government was pushing. Two interesting articles on the meanings the TIPNIS crisis has for the MAS and the indigenous peoples’ support of the movement have been published on the subject: Perrier Bruslé (2012) and Morales (2013). For more details it is possible to consult online numerous press articles. To name but a few: Ferrera (2012), Aguilar (2012), La Razón (2012a), Página Siete (2012), Portocarrero Valdo (2012), SENA and fobomade (2012).

sanitation component together with a 'tourism development' component, which was identified as the main economic potential of the region.

The loan was on stand-by for almost a year, until Vice-Minister Cox (of Tourism) developed a concrete project in 2007. In the words of one of the senior officials of the project:

When the new Minister [of Production, on which Tourism depended at the time] entered, she says 'there is a project of the World Bank, I don't know what it is, but you should go see, Vice-Minister (of Tourism) because it has something to do with tourism' so he went, and he saw people from the Ministry of Sanitation were there and people from Planning, but he liked the idea and he went to see the people at the Bank and they agreed and at that instant it was decided that this Ministry would execute the project, but it was more because of that person, because that person moved and moved and moved more than other Vice-Ministers (PDSLTOFF3).

As Vice-Minister Cox had seized the opportunity, the project passed under the umbrella of tourism. With the restructuring of the state, the Vice-Ministry of Tourism passed from the Ministry of Production to the Ministry of Cultures, and the project was transferred with the rest of the Vice-Ministry. Yet, after Cox left, the Vice-Ministry was without a head for more than six months, which significantly delayed all initiatives. On top of this, once the new Vice-Minister of Tourism was finally in post, the staff did not feel supported. They found themselves in a climate of uncertainty at several stages, not knowing whether the project would be executed or if the funding would be reoriented (which ultimately happened). They attributed this to the fact that someone else had started the project and that, therefore, the new Vice-Minister did not feel any sense of 'ownership'.

Even though the course of the PDSLTT project was interrupted, it illustrates that the so-called personalization of organizations allowed certain agendas to advance. I briefly mentioned earlier (section 6.1., III, p. 264) the example given by a former director of the Environmental Directorate at the Vice-Ministry of Environment (MAOFFPP), who

attributed the achievements in reviewing environmental licenses to the personal commitment of the team of officers. As MAOFFPP recalls, the officers were ready to stay for long hours to examine the environmental licenses and comply with the regulation delays. MAOFFPP explained that they felt they had no choice because “with licenses, there are dates and if you don’t respect them, the license is automatically given”.

C. UNCERTAINTY

Although some officers believed that the identity of the decision-makers in place made a difference, some others considered that a mode of operation based on personal connections and the personal will of officers to carry projects forward could not be sustained and only produced random results. It was a mode of operation that rendered design or planning difficult. As an officer at the Bolivian Vice-Presidency in charge of supporting the drafting of the Law on Mother Earth puts it:

it [the process of change] shouldn’t be dependent on a director or another one putting the subject on the table. It’s about how things are integrated in the agenda of the process (OFFVCAA).

In order to better grasp the ambivalent value that the personalization of institutions seems to hold, it is useful to conceptualize the institutional frame simultaneously as a guiding structure and a set of possibilities that officers use to fulfil their goals. From the accounts above, the ‘actualization’ of any given possibility seems to be dependent on the officers in place and their networks. This was regarded as effective in countering the effects of shortages by some officers and as creating uncertainty by others. In particular, it seemed to raise problems in terms of the constitution of institutional memories, as I explore now.

D. INSTITUTIONAL MEMORY

Arguably, the memory of an organization is constituted by its regulations and their amendments, agreements with other organizations, projects conducted and their deadlines, the internal rules within the organization and its history of administrative changes. These norms can be more or less institutionalized (i.e., integrated, accepted and automatically repeated) becoming a constitutive part of the organizations. Yet when organizations are weak and frequently change their structure, much of their memory lies with individual officials. Subsequently, the institutional memory remains unrecorded and is lost as the officials leave.²⁹⁹ In the words of a Bolivian high-ranking officer, this puts organizations in a place of perpetual restarting:

many times it's about restarting all over again, the new municipalities have to start all over again, unless there is a city councillor, someone who already has the experience, but it's about people, not about a system (VCAIB).

A concrete example of this 'restarting' is given by the changes that occurred in the National Reserve of Titicaca in Puno at the time of fieldwork. The director of the reserve quit and so did some of the staff.³⁰⁰ This endangered the necessary transmission of information for the functioning of the organization. The interim director pinpointed an example:

We participate in the CAR, but I can't give you more information on that because the person in charge of this quit and I don't have the information to tell you how they advanced in the commission (RNTAR).

²⁹⁹ In general terms and from a long-term perspective, it could be argued that the loss is relative if the officers pullulate in the region, only changing posts to other municipalities or regions. This thesis does not deal with this issue that could be investigated in a future project through network analysis.

³⁰⁰ They explained they had quit for personal reasons, because they had been working in the Reserve for numerous years and wanted to start new projects.

My interviewees at different levels of administration reported difficulties in transmitting information from one administration team to the next. Only in rare cases, was the transmission of information regulated. For example, outgoing administration of the Regional Government of Puno was meant to work with the incoming one before the official start of the new term. However, both the outgoing and incoming officials (in the environmental area) reported that the transition period had been too short to be effective. The transmission procedures could only be organized after the results of the second election round, which was less than a month before the new administration started. Interviewees from both administrations reported that the ‘transition’ consisted simply of a transmission of information on logistics.

Incoming administrations usually did not have the opportunity to communicate with their predecessors, and therefore relied on the organization of information as officers had left it. Interestingly, officers at both the Bolivian and the Peruvian State Comptrollers considered that the ‘lack of order’ in certain administrations severely undermined the transmission of information when changes of officials occurred. The officers advanced numerous reasons to explain this, including culturalist explanations, lack of resources to do otherwise, unawareness of procedures and discretionary decisions. Moreover, both in Peru and Bolivia, the officers at the State Comptroller indicated that the lack of order was also part of the personalization of institutions. Indeed, the lack of order sometimes simply hid an order that was not apparent, and that therefore was inaccessible to the incoming officers. This, according to the officers, was reflective of a more or less outspoken strategy to deprive the incoming administration of the capacity to manage.

The personalization of organizations was tightly linked to weak institutional memory, but it was not seen as the only element causing it. Institutional memory, as it emerges from

my interviewees' accounts, could also be lost as a result of changes in the structures of management.

III. INSTABILITY IN INSTITUTIONAL DESIGN

The changes in the administrative structures in place were also a cause of uncertainty for officers. These changes occurred as a result of new laws and regulations and the modification of existing ones. Administrative changes impacted on the procedures and the coordination patterns of organizations and their effects were interlinked with high turnover of officials. They might interrupt institutional memory and percolate through the management system.

Changes in rules and procedures could lead to administrative incoherence. For example, ALT officers reported that the procedure to acquire goods as described in the organization's manual of organization and functions had been crafted following the laws in Peru and Bolivia in force at the time of the manual's drafting (ALT 2004). These had, since then, changed, but ALT's procedures had not been updated, which led to administrative inconsistencies.

In Peru, the creation of the Ministry of the Environment was a significant institutional change. At its creation, Minam was given the former National Environmental Council (Consejo Nacional de Ambiente, Conam) responsibilities and a seat at the Council of Ministers.³⁰¹ As environmental responsibilities had been compartmentalized until then, the creation of Minam and its desire to group together the scattered responsibilities

³⁰¹ Legislative Decree 1013 (2008).

potentially affected all sectors. At the time of fieldwork (and to this day), environmental licenses were still approved by the sectors, which conserved environmental offices.

In this light, Minam, and its capacity to formulate environmental policy, constituted a new piece in a compartmentalized puzzle. To further complicate matters, the policy formulation and the management responsibility over certain environmental areas were either dependent on other ministries or constituted as independent agencies. This was the case of water and of forests and wild fauna, as a Peruvian officer participating in the UNEP Programme on the Geo Titicaca summarizes:

In Peru what is striking is that Minam does not control the three main elements of the environment, water, forest and what has to do with the environmental impact studies, it doesn't control it either (PNUMAGC).

Indeed, the responsibility over forest management was in the hands of an independent agency, the Organism for the Supervision of Forest Resources and Wild Fauna (hereafter OSINFOR), directly under the Presidency of the Council of Ministers. Moreover, the newly created National Agency of Water, ANA, was part of the Ministry of Agriculture. For numerous environmental officials in other organizations, the fact that the management of water was under the umbrella of the Ministry of Agriculture was problematic. The account of a municipal officer from Puno is illustrative of this:

The policy of Minam is not something we digest well yet, we don't understand it well, because there are many organizations that should have been included in Minam and weren't, such as ANA, fauna ... they should have been in the Ministry (MUNPNOFFDI).

Even though the officer attributed the puzzle of functions to the “policy of Minam”, it is doubtful that such an outcome was actually the product of Minam's choice. In fact, the officers at Minam interviewed for this study were themselves uneasy with this state of affairs.

Particularly worrying was the dependence of ANA on the Ministry of Agriculture, i.e., a ministry promoting a potentially water-consuming activity. Moreover, ANA officers were mainly irrigation engineers, who would typically neglect other dimensions of water management (Deutsch-Lynch 2012). This was explained as the result of the power of agro-exporting lobbies, against which Minam was weak in terms of bargaining power. The history of the creation of the water agency and of Minam seems to support this view. When Minam was opened, Peru had had an agency for the management of water for only two months. Numerous of my interviewees indicated that they had found the creation of the agency as part of the Ministry of Agriculture surprising. They expected that the agency be directly attached to the Presidency of the Council of Ministers, as had been the case for OSINFOR, and then that both would be transferred to the Ministry of the Environment once it was created.

As many of my interviewees presented it, Minam seemingly had lost the ‘war’ over the water responsibility as a whole. However, wars are made of small battles. Two important elements allowed Minam to keep some control over the management of water. First, ANA was subject to the National Environmental System, implemented by Minam.³⁰² Secondly, water responsibilities were meticulously divided, and some tasks were under the direct control of Minam.

The example of water quality is illustrative of the degree of detail in the division of tasks. Each of the ministries in charge of water-consuming activities had the responsibility of monitoring the potential effect of the promoted activity on the quality of a body of water. For example, the Ministry of Housing dealt with water in the sewerage network,

³⁰² Law 28245 (2004).

while the Ministry of the Environment dealt with the quality of water in ‘natural’ bodies of water. Each of the competent Ministries was required to define the permitted values of the components monitored in the body of water under its responsibility, with Minam giving its opinion on the limits set. This example illustrates both the weakness of Minam and its ability to gain some space – a topic which is further developed in the next chapter.

IV. CONCLUSION OF THE SECTION

In this section I have discussed the variables that officers at different levels identified as causing institutional instability: high staff turnover, personalization of institutions and changes in the administrative design. The section has aimed to show that these variables are complex, some actors regard them as undermining the efficiency of environmental governance and others as allowing progress in management. Furthermore, some actors consider them as both negative in general terms and positive in specific contexts such as the personal commitment of key officers. In this sense, they are both a constraint and a tool, when other constraints (such as the lack of budget) are considered. These differences in views and the importance of the context also led to tensions between officers defending different positions.

Additionally, the instability of institutional design might allow for flexibility and provide opportunities to conquer administrative spaces. In this fashion ‘weak’ organizations might find tools to consolidate their relative power vis-à-vis others. Moreover, the frequency of change in administrative design also responds to a reactivity in conveying visions of management. Yet, while a given vision might have enough strength at a given time to determine administrative design, it does not necessarily have enough strength to cruise through the difficulties of implementation.

CHAPTER 7. PATTERNS OF COORDINATION AND COMPETITION: FOCUS ON THE OFFICERS (PART II)

INTRODUCTION

This chapter pursues the analysis initiated in the previous one and discusses the officers' role in shaping the SES regime. I focus now on the action-situations of coordination and competition, which are the tools that officers mobilize to advance in their agendas. These action situations define some of the officers' possible interactions with ecosystem elements. Indeed, we will see that by crafting some of the rules of interaction between actors, they partially codify the position adopted vis-à-vis ecosystem elements.

As in the last chapter, the analysis is here conducted at the levels of administrative design, policy formulation and implementation. This chapter builds on Chapter Four's hypothesis that the investigation of the policy processes through which the officers make their choices informs on the slow variables that structure the SES. The chapter pays attention to the interaction between officers in different organizations and at different administrative levels. Its main purpose is to investigate the choices that officers make to secure an approach to ecosystem management consistent with their interests.

7.1. COORDINATION

As explored in Chapter Three, numerous entities worked on the management of the lake bays. Several initiatives, both in Peru and in Bolivia, aimed to coordinate these interventions. Cooperation was highly valued by bureaucrats in the field, as it

theoretically provided them with the opportunity to pool efforts, which they saw as a tool to increase efficiency in their interventions over the ecosystem.

In the following, I analyse the coordination arrangements that became institutionalized on a permanent basis, i.e., became part of the management system. Within the section I examine the cases wherein commissions were constituted to respond to problems touching upon different organizations' responsibilities, I then turn to explore temporary arrangements between organizations, the role of personal networks in setting up bilateral partnerships and the difficulties officers faced when trying to institute arrangements involving multiple organizations.

I. PERU

Two cases of permanent institutionalization – the Environmental Commissions at Regional and Local levels – and the establishment of 'special committees' made in response to specific issues provide the basis for my analysis of coordination arrangements between organizations.

A. PERMANENT ARRANGEMENTS: SPACES FOR CONTACT AND ACCOUNTABILITY

In Peru, the Comisión Ambiental Regional (hereafter CAR) and the Comisión Ambiental Municipal (hereafter CAM) were designed to provide an inclusive space for coordination on environmental matters. These commissions brought together actors from the public

sector, the private sector and civil society who were meant to support the implementation of environmental policy at the regional and municipal levels.³⁰³

CAR Puno was originally founded in 2002³⁰⁴ and CAM in 2006.³⁰⁵ The commissions were scheduled to meet every month but, at the time of fieldwork, this was not the case. CAR did not meet in the two months following the change of government (January 2011). At the municipal level, while the mayor had been re-elected, the Director of Natural Resources and Environment had changed and the new team had cancelled the first CAM (January) to 'prepare adequately' for it. However, the following month, the celebrations of the Candelaria³⁰⁶ imposed a heavy work-load on street cleaning, on which the officers had to concentrate their efforts, and the CAM meeting was once again cancelled.

Beyond the challenges of just holding the meetings, some of the participants also reported difficulties in getting the members to work together. For example, the status of the ALT representative was problematic. An ALT officer specified that he attended CAR meetings as an observer, since "our bi-national status puts us above the regional level" (ALTDM). This created tensions with other members, which can be appreciated in the following statement from a regional officer:

They send us employees who cannot make decisions to support or participate in any joint initiative, so why do they even attend? (EDRGP1)

³⁰³ Law 28245 and Legislative Decree 1013.

³⁰⁴ The law in force at the time established that Conam approved Regional Environmental Commissions (Law 28245). With the creation of Minam these are created by Regional Ordinance (Ordenanza Regional N002-2009. Puno). For details see the report "Comisión Ambiental Regional Puno - Plan de Acción Ambiental." (2003), published by the Consejo Nacional del Ambiente.

³⁰⁵ Dirección General de Políticas Normas e Instrumentos de Gestión Ambiental - Viceministerio de Gestión Ambiental - Ministerio del Ambiente (2010). This document also confirms that the city of Desaguadero does not count with a CAM.

³⁰⁶ Celebrations in the city of Puno in honour of the Candelaria virgin, patron saint of the city. The festival is held annually in the first fortnight of February.

Even though participants in CAR expressed frustration at this and other shortcomings, the fact remains that the commission provided a space for contact that did not exist before its founding. In some cases, CAR was the only space for communication between organizations working on environmental management. For instance, the relations between the Municipality and the Regional Government of Puno had been tense for a while, a result of animosity between the mayor and the regional president before the 2010 regional election. A municipal officer stated that the environmental directorates in each organization “rarely worked together, *except for CAR*”³⁰⁷ (MNPNREA). This indicates that, at the very least, CAR constituted a space for each of the organizations to express their positions and make them known to the other organizations.

Moreover, CAR was also used as a space in which to exercise some sort of horizontal accountability. We saw in Chapter Four how the Director of Environmental Matters at the Puno regional office of the Ministry of Production was worried that CAR participants would ask him to provide information on the effects of trout food on the lake beds and that he would be unable to do so.³⁰⁸ CAR, as such, did not have any coercive power to obtain the information requested for its members. However, a representative of the Environmental Prosecutor was a member of CAR and the Environmental Prosecutor *could* take legal action. CAR constituted, for him, a source of information. Conversely, for the other members, CAR provided a space to negotiate with the Environmental Prosecutor, explain their case, and try to avoid any legal or administrative actions.

³⁰⁷ My emphasis.

³⁰⁸ Chapter Four, Section 4.1., III, p. 158.

The Ombudsman also participated in CAR, which provided another tool for securing organizations' compliance with its recommendations. While the Ombudsman had no sanctioning power, a battery of tools, including public exposure and insistence, allowed it to exert pressure on the entities they inspected.³⁰⁹ Through CAR, the Ombudsman could highlight problems with particular organizations and urge them to find synergies with others. An officer at Puno's Ombudsman in charge of environmental affairs summarizes the point, "we make them part of an alliance" (OMBPNMA). In the Ombudsman's experience, the technique reinforced the member organizations' commitment to comply with their responsibilities. Moreover, the Ombudsman officers, because of the stability of their organization (for example, the officer in charge of environmental affairs had been in post for eleven years) viewed their task as one of ensuring the institutional memory of the area. CAR gave them an opportunity to help new officers stay on message.

At the municipal level, CAM constituted a very similar space. As a municipal officer highlighted, CAM provided a useful platform for bringing together "professionals who could help" to implement the environmental policy by bridging their areas of expertise (MNPNRE).

While some of the participants in both commissions expressed frustration with the idea that these were not spaces wherein actual decisions were made, the contact they provided the officers with was crucial. Indeed, through these commissions, it was possible for organizations to confront each other.

Additionally, the existence of these commissions did not exclude other coordination arrangements. Peruvian law established a hierarchy of responsibilities, which therefore

³⁰⁹ This is very similar to what Smulovitz and Peruzzotti describe for societal control (2000).

required that organizations coordinate across administrative levels. For example, both regional and local governments had a responsibility for providing sanitation services, which led the two levels to coordinate.³¹⁰ Indeed, the public company EMSAPUNO, in charge of the sanitation services in four cities, had integrated coordination patterns in its structure. The directorate of the company included representatives from the municipalities and regional government, while the shareholders' committee board was formed by the mayors of all four cities where the company operated (EMSAPUNO 2011).

B. TEMPORARY ARRANGEMENTS: A RESOURCE FOR MANAGEMENT

The Municipality of Puno had established a multi-sectorial commission to work on the project of building a water treatment plant. An officer from EMSAPUNO involved in the management of the project considered the establishment of the commission as an important initiative to progress on the building of the plant:

26 organizations did an evaluation study for the best alternative and that was informed upon and it is the most important thing, we have seen the technical, economic and operational aspects ... (EMSAIE).

While establishing a committee was a relatively easy procedure, keeping it functioning constituted a more difficult task. Keeping coordination mechanisms active demanded significant effort and time. Furthermore, constituting a committee did not necessarily translate into that committee actually addressing the problem for which it was constituted. As one of my interviewees from Minam put it, "organizations constitute committees when there is a problem, as if that resolved something" (MINAMLI). Crucially, the formation of a committee also seemed designed to send out a message by

³¹⁰Ministerio de Vivienda Construcción y Saneamiento (2010).

providing a response to social demands and showing that efforts were being made to fulfil promises. In that context, it is interesting to note that commissions were periodically reactivated to address unresolved problems.

Besides the existence of committees bringing together several organizations, there were numerous coordination mechanisms involving two-partner organizations. As long as they were aligned with the National Environmental Policy, the organizations were free to establish partnerships among each other. These occurred frequently, as this statement from a PELT officer attests:

the municipality is responsible for ensuring the environmental health of the city, so we send them proposals, and if they can't do it, through an agreement we can do it bilaterally (PELTEZ).

The officers interviewed for this study reported that bilateral partnerships were usually on very concrete issues. For example, PELT had worked in partnership with the National Reserve of Titicaca to organize an event on environmental education, explaining to the population the importance of waste management. The Reserve provided the bins for solid waste and some user guides for the event.

The officers interviewed in the different organizations operating in Puno considered that binary partnerships were easy to establish and maintain. They saw them as a tool for overcoming shortages or problems that delayed the implementation of programmes. This kind of partnership might build on personal synergies. For example, in the above-mentioned example, the officer at PELT indicated that he had known his partners at the Municipality “forever”. Numerous other examples highlight the relationship between officers at different Puno-based organizations. Indeed, one officer at the Municipality of Puno indicated that he had contacted his “friends” at the Reserve and persuaded them to lend him the machines he needed (MUNPNDE2). Officers at the Reserve confirmed this. While the officers indicated that these partnerships were framed with all the

necessary legal documents, they also suggested that they had been easier to establish because the officers were ‘friends’, who could trust each other.

Beyond these personal relationships, some organizations appeared more prone to working in partnership with others. This was the case for the Environmental Prosecutor who, because of his ability to initiate legal action against a person or organization, was both seen as a support and a threat by officers in other organizations. For example, one of the officers at the new administration of the Regional Directorate of Energy and Mines in Puno explained that they “needed some time to put coordination patterns into place with the rest of organizations” (after the election). While this might have been true, the fact remains that since the very first week of their arrival, they had been actively working with the Environmental Prosecutor on formalizing and controlling informal mining. Working with the Prosecutor held a promise of efficiency: the ‘threat’ of prosecution made the miners more likely to comply with the need to formalize their activities. Indeed, public organizations were in charge of implementing the programmes that the Prosecutor supervised – coordination was a necessity.

The evidence presented so far points to the fact that cooperation arrangements bringing together numerous organizations provided spaces for negotiation, supervision and information exchange. Binary partnerships, by contrast, helped progress concrete agendas by pooling means and resources. My respondents, at least abstractly, valued coordination highly and frequently shared projections of the improvements that could be made if organizations established strong coordination patterns. An Imarpe officer, for instance, extrapolating from the assertion that several organizations took samples to control the lake’s water quality, imagined that these activities could be coordinated to obtain a yearlong evolution. He imagined that the sampling spots could be agreed by all organizations and that each could be in charge of one collection per month. An officer

from EMSAPUNO also shared this same idea but pointed out that, first, the harmonization of criteria and methodologies on the measurement of water quality needed to be agreed at the regional level. In Peru, CAR provided these officers with a space in which to present these ideas and potentially find coordination arrangements.

II. BOLIVIA

I turn now to discuss the situation in Bolivia where personal synergies played a role as important (if not more so) as in Peru but where it proved more difficult to bring several organizations together.

A. PERSONAL NETWORKS FOR BILATERAL PARTNERSHIPS

In Bolivia, personal arrangements were crucial in setting and maintaining coordination mechanisms. As a Vice-Minister put it:

What I see is very little coordination even among ministries, even if it is formulated in public policies, I don't know if it is for bad or for good, but it depends also on the personal attitudes of public servants that work in the Ministries. It mainly lies on personal relationships, inter-subjective relationships, that is what allows coordination. For example, we have clicked well with the Ministry of Transparency, we have organized several activities together, in the nine departments, and we did not contribute to the funding of the events, they did but we were still able to work together (VCAIB).

The case of the UOB provides us with a good example to help understand the complexities and ambivalences of the personalization of coordination arrangements. As we have seen, the UOB had recurrently faced budget difficulties. One of its directors decided to directly contact the Minister of the Environment and Water at the time to resolve the issue:

Thanks to some conversations that I personally had with the Minister, I explained the situation to him and how I needed him to support me, as he was the head of the environmental sector. I told him what was going on and

he gave me a solution: he could give me a share of his own budget as a loan, and that is what we did (UOBEE).

In this case, the problem of the lack of budget was solved through a temporary arrangement that was not renewed after both the UOB director and the Minister left their posts.

As numerous coordination arrangements grew from informal bases, they were strongly dependent on the specific officials present in organizations at any given time, which caused problems in terms of continuity. In the UOB example, coordination arose out of necessity, as a tool for the organization to access funds. Other coordination arrangements sought to establish links based on potential synergies between organizations that could strengthen efficiency.

The example of the PDSLIT provides another insight into the possibilities of binary coordination patterns in Bolivia. The PDSLIT had established links with the La Paz Regional Government. The fact that the project's activities were all developed in the La Paz region drove the officers of the PDSLIT to keep their partners at the Regional Government informed on a regular basis. The 2010 elections³¹¹ brought a change in the regional team; the PDSLIT organized a meeting to introduce the project to the new team, hoping to re-establish the links that were functioning well with the former team. Several directorates from the new Regional Government were invited to the meeting. Indeed, the invitations targeted the different project components, including tourism, territorial ordering and environment. A week after the workshop, the officers working on territorial ordering both at the regional government and at the PDSLIT reported that they had

³¹¹ The change of administration took place in May 2010, this was also the moment when the regional government, which had been, until then a 'Prefecture' was transformed into a 'Gobernación', with significant administrative changes.

agreed to exchange information and share machinery and were in the process of doing so. The other staff explained that, theoretically, finding synergies would have been beneficial to the project, but that at that stage of the project, such synergies might have to be limited to the exchange of information. Moreover, the La Paz Prefecture (now a Gobernación) staff did not find time to set up further partnerships, since, as we saw, they were extremely busy with their daily businesses.

B. DIFFICULTIES OF MULTI-ORGANIZATION PARTNERSHIPS

Despite cooperation being highly valued by my respondents, organizations frequently operated in isolation, without necessarily being aware of any overlap between their actions. The following statement from a Lidema report summarizes the situation in Cohana:

[the meeting] confirmed the existence of diverse and concurrent initiatives, aiming to find a solution for the problem (without awareness of each other), concluding on the urgent necessity to coordinate efforts and actions until now dispersed (Ribera Arismendi 2010, 34).

The meeting aimed to bring together all the organizations working on the area. It was supposed to follow up on the group constituted in 2009 after a meeting organized by EPSAS to strengthen coordination of activities in Cohana. The groups' participants were the MMAyA (through its vice-ministries of Biodiversity, Environment and Climate Change, and of Water Resources), the La Paz Prefecture, the UNEP project on Titicaca, the ProLago Project (USAID), the Project of Catalan Cooperation (Pedagogic Basin of River Katari), the University (Universidad Mayor de San Andrés), the Bolivian Institute of Nuclear Science and Technology, ALT and Lidema. The purpose of the group was not only to keep all involved organizations informed on the activities of each of them, but also to agree on a common language and objectives.

The urgency, highlighted in the Lidema quote, of the need to coordinate efforts rested on the hypothesis that the absence of coordination imposed costs, led to potential redundancy of actions and therefore constituted a loss in efficiency. While this feeling was shared by many of the interviewed officers, the group still lost impetus. Several elements explain why. From the very beginning of the formation of the group, coordination between the organizations involved was highlighted as deficient. As Lidema notices in its report, the group's leadership "[wa]s under the Vice-Ministry of Environment and Biodiversity (Dec. 2009), but without the active participation of the Vice-Ministry of Basins, which in the first place, seemed to lead the process" (ibid). The observations of Lidema on this issue are sustained through time and cut across organizations:

Months later (after Dec. 2009), a seminar of institutional presentations was organized in the city of El Alto, putting special emphasis on the Project of Pedagogic Basin funded by Catalan cooperation and under the coordination of the Vice-Ministry of Basins. On that occasion, we observe the absence of the Vice-Ministry of Environment and Biodiversity, and no reference was made to the inter-institutional committee constituted in May 2009. We perceived that coordination between the two Vice-Ministries of MMAA was scarce (Ribera Arismendi 2010, 35).

The busy calendar of the year 2010 also helps explain the difficulties in keeping the group alive as many participants had to prepare for the local and regional elections (May 2010). In October 2010 Lidema took up the task of reactivating the group and organized a daylong conference with that purpose.³¹² This group was not the only common initiative facing difficulties in holding its members together. Indeed, some of the lakeshores municipalities had constituted a *mancomunidad*³¹³ in 2007 that was inactive at the time of

³¹² I refer here to the conference that took place on 30 October 2010.

³¹³ In Bolivia a 'mancomunidad' is a legal figure defined in the Supreme Decree 26142 (art. 3. II) and the Law 2028 (Art. 155) as the "voluntary association of two or more Municipalities aiming at their

fieldwork. The new Law of Autonomies, and the new possibilities of organization at the local level it offered, were some of the reasons why inter-municipal coordination had been interrupted. Indeed, some of the communities were in the process of changing their municipal attachment, which rendered inter-municipal coordination more difficult. Again, the electoral calendar impacted on the possibilities of maintaining coordination mechanisms.

III. CONCLUSION OF THE SECTION

Coordination patterns, at least in abstract terms, were highly valued across organizations as a tool for reducing costs and increasing efficiency. Numerous cooperation arrangements, many of them including a large number of organizations, were established to face common problems. However, they appeared difficult to sustain. Cooperation arrangements based on personal relations, frequently involving only two organizations and targeting specific objectives, seemed easier to maintain than large committees. They were also valued because they could overcome specific, small obstacles to project implementation. Sustaining formal and large cooperation arrangements based on potential synergies was a challenging process. Crucially, cooperation arrangements could take up a significant amount of officers' time. However, the institutionalization of these, as we saw through the example of the Peruvian CAR, brought important benefits, such as giving organizations a space for confrontation.

development building on the undertaking of common plans, programmes and projects, within a specified period and frame and requiring the composition of a board and an organizational structure.”

7.2. PATTERNS OF COMPETITION

In this section I examine interactions between organizations that were framed as disputes. These could be over responsibilities (to obtain them or avoid complying with them) or arise as a result of personal tensions. I also discuss the ‘tools’ used by officers to ‘win’ these disputes. This leads me to analyse what the environmental area conveyed for these actors and explore the last of the social sphere variables identified as significant in shaping the prime interactions in the SES.

I. TENSIONS AMONG ORGANIZATIONS

The last section discussed patterns of cooperation, an interaction that presupposes that all actors working on a given topic are legitimate to do so. I examine now in which cases that assumption was contested. The tensions that surrounded organizations competent over the lake constitute some of the variables that influence management, if only because they undermined the organizations will to cooperate, which subsequently had an impact on the kind of management at play. I focus first on a case of dispute over functions between national organizations and the ALT.

ALT, because of its bi-national status, is a unique organization in the area. Defining its position vis-à-vis other organizations has been, through its history, particularly challenging. We saw in the last section that ALT officers participated in CAR as observers, which the rest of organizations disliked. ALT was seen as refusing to play by the rules all other organizations were working under. The account of an officer working at the Peruvian State Comptroller provides us with an example of how ALT was viewed. He comments on the experience of auditing the organization and reports that the

director at the time of the auditing hid behind ALT's bi-national status to avoid providing the information requested:

when we asked him for information on his management, the gentleman closed up and did not want to give us the info ... 'you can't ask me, I am autonomous, international, with diplomatic immunity' ... so there was a struggle (STCPAL).

Several of my interviewees at the MMAyA presented ALT as a 'Peruvian agent' in Bolivian territory. The fact that epitomized this tension was that the presidency of the organization was in Peruvian hands. Considering that the personalization of organizations was taken as an unavoidable reality, the fact that a Peruvian directed the organization was 'proof' that Peruvians were benefitting from ALT's work more than Bolivians. For example, the organization was accused of covering up a transfer of water from the River Desaguadero to the southern regions of the country, without the approval of Bolivia. This and numerous other tensions, fuelled by the animosity between Presidents Morales and García, caused the Bolivian government to withdraw its support of ALT. Consequently, Bolivian organizations also stopped their coordination until the statutes of the organization were re-written. Ultimately, the Bolivian committee in charge of restructuring ALT ensured that changing the nationality of the president was put on the agenda for discussion.

ALT also had to face tensions on the Peruvian side, albeit of a different nature. The tensions catalysed around the identity of the specific president in place at the time of fieldwork, who was a member of an 'aprist' family.³¹⁴ Some of my interviewees in the regional government (2010) considered that ALT had been hijacked by APRA to keep

³¹⁴ APRA is Alan García's party, which was in office at the time. The brother of the ALT's president was a candidate to the Puno Regional Government for the APRA party. According to my interviewees, their family had always expressed support for APRA.

control over the management of part of the region. This needs to be understood in the context of Peruvian politics (which adds a layer of complexity to the case) and particularly in the context of the tensions between the central government and the regions, Puno being one of the most conflictive regions from this perspective. Indeed, such comments are part of a discourse that ‘denounced’ Lima’s ‘hidden agenda’. On the one hand, Peru’s central government *seemingly* created tools for decentralization; on the other, it kept *hidden* control over key organizations to maintain its power in the regions. APRA was a national party as opposed to the regional party in office at the regional level. The tensions between administrative divisions (national-regional) resonated with party divisions (national parties vs regional parties).³¹⁵

ALT’s attempt to secure its presence in the area needs to be understood in this tense context. These attempts, the ALT officers claimed, were simply the implementation of the Director Plan, which outlined the duties of the organization.³¹⁶ Yet, national organizations on both sides of the border kept a close eye on the bi-national organization’s interpretations of that plan. The case of the organization’s attempt to draft ‘basin statuses’ is a good example of the challenges ALT faced in defining the concrete terms for exercise of its functions. As indicated previously³¹⁷, at the time of fieldwork, UNEP was conducting a programme that aimed to strengthen the information network in the basin and that led, among other things, to the publication of the Geo Titicaca report (PNUMA 2011). Within this programme, ALT received funding that it used to

³¹⁵ While both regional administrations (before and after the 2010 election) were critical of the central government, the relationship between the regional administration prior to election and the central government in Lima was extremely tense. The Regional President, Hernán Fuentes, recurrently called for a federal model that would give greater independence to the regions (EFE 2009).

³¹⁶ See Chapter Three, section 3.1., I, A, p. 95.

³¹⁷ Chapter Three, section 3.1., III, p. 121.

prepare a document on the basin management statuses. Other organizations contested that this was the intended purpose of the funding.

The ALT officers who prepared the document presented it as the product of a highly participatory initiative:

We are currently developing a project with the help of UNEP to draft a bi-national status for water resources, in which the actors [residents] are the main expressers of what they want and what is their view of the TDPS system from now to ten and fifteen years (ALTUNEP).

Yet the project was stopped at the request of the Bolivian Ministry of Foreign Affairs on the basis that the Bolivian organizations that had approved the document were not representative (CONVMUT). As a matter of fact, no national public organization was represented in the process. On the Peruvian side, the initiative was equally contested, as an officer of Minam narrates:

ALT had a small component of the project on the internal statutes and they transformed it into statutes to manage the whole basin. The colleague in Panama [UNEP office in charge of the programme] had to cancel it (MINAMLI).

Again, the reasons given against the initiative were different in Peru and Bolivia. In Bolivia it was presented as an example of ALT's attempt to bypass the national state. In Peru, the timing of the ALT initiative was unfortunate as the country was in the process of institutionalizing the National System of Water Management and had little time to address the issue at the bi-national level. Indeed, the function of defining basin management plans was partially disputed among national organizations. On the one hand, ANA was working on consolidating its presence in the field. Importantly, the Local Agencies of Water (hereafter ALA) and the Administrative Authorities of Water (hereafter AAA) at the basin level were in the process of being constituted. On the other hand, the regional government was competent over the formulation of basin management plans in the region. Moreover, the Water Basin Councils, which would

bring together all relevant stakeholders at the basin level and implement the future ‘Basin Plans for the Management of Water Resources’, were also in the process of being formed.

Therefore, as the director of one of the area ALAs put it, the ALT attempt to define bi-national basin statuses was “precipitate” (ALAU2). Officers in the ALAs and officers in the regional government considered that ALT should have waited until the division of responsibilities among national organizations was settled. Indeed, national designs are paramount in setting the negotiation arena.

In this concrete example, the appearance of ANA highlights how changes in administrative design can trigger disputes over the redistribution of responsibilities. Indeed, a change in administrative design signifies that a function, or at least part of it, is taken from an organization and given to another one. Therefore, administrative rearrangements could be a source of tension, as they determine the actors that are legitimate to directly interact with the ecosystem. In the particular case of ANA and the regional governments a significant difficulty was the difference in the vision of the appropriate management scale that each organization held. Indeed, ANA operated with basin boundaries, which cut across administrative boundaries. As a Minam officer anticipated:

Establishing the basin vision... what is the problem? Well that if you want to work with a basin vision you will come up against the fact that the regional and local authorities have different kinds of boundaries, if you want to integrate that to the development plans at the local and regional levels, there you will have the beginning of the problems, the conflicts (MINAM7).

Underpinning the dichotomy basin/administrative boundaries was another divergence: was the ‘resource’ (water) considered from an ‘environmental’ perspective or from a ‘using sector’ (agriculture) perspective? Indeed, the officers at the Regional Government were suspicious of the ANA’s dependence on the Agriculture Ministry, which they

presented as yet another tool to keep control over water under the central authority. One of the officers shares his view on the matter:

Unfortunately, the Ministry of Agriculture, as long as they are in Lima, they will protect interests of some companies, transnational, what have you, more than the population itself, that's why they approve usages of water for mining investments and they restrict it for agriculture (EDRGP1).

ANA officers in Lima, on the contrary, argued that nothing in the organization of water management prevented them from coordinating with regional and local governments. They presented their role as one of support to the decentralized governments, as the law established. This innovation in the management of water occurred in a context where decentralization was still an unfinished process. Indeed, new administrative designs could occur and needed to fit in contexts where previous ones were unfinished and overlapped. This constituted processes wherein spaces of power were negotiated. The following statement from a veteran Minam officer summarizes well the tensions the administrations faced in the context of decentralization:

Regional governments are a real promise as long as the central government continues in a process of regionalization and decentralization that is sincere and not politically interested, not about power, but totally real decentralization, to give power to the regions. But at the same time the regions need a lot of support in strengthening their capacities. They still look to the centre (MINAMLU).

The dispute over functions can be read as a power struggle: organizations competed to have the power to manage. The competition over functions affected, to a certain extent, the possibilities of coordination, since coordinating with an organization involved acknowledging, at least partially, its legitimacy as one of the managers. Moreover, competing over functions did not just involve fighting for the power to manage, but also to decide the vision implemented, as the ANA case suggests. The next section further explores the obstacles environmental bureaucrats faced within organizations, particularly as decision-makers did not always promote environmental projects.

II. FOCUS ON THE LOCAL LEVEL: FUNDING, 'AWARENESS' AND PRESTIGE

The responsibilities over sanitation and waste management services, as we have seen, lay at the municipal level. In the field, numerous actors from different categories (local bureaucrats, national bureaucrats and decision-makers, NGO officers, cooperation officers) complained that these areas did not receive enough support from local decision-makers. This translated into one of the institutionalized interactions (the public management of waste and water) being deficient or missing. Decision-makers systematically argued that theirs was a default position imposed by the lack of resources they faced. However, the experiences of cases wherein funding was available suggest otherwise.

This section focuses on the alternative and additional explanations given to explain local decision-makers' positions. These included the lack of awareness over the 'importance' of the area or over their own responsibilities, and the reticence to assume environmental projects' typical technicalities and costs. While these reasons were interlinked, different categories of actors insisted on different aspects.

Discussing this issue is important because actors based their interactions with local decision-makers on the hypotheses they held as explanatory of decision-makers' behaviour. Particularly, they targeted the modification of the hypothesized elements so that they could advance their agenda. Said otherwise, their beliefs determined approaches that directly aimed to shape the decision-makers interactions with the system, since these interactions were held as critical in shaping the system structure. This section explores the ways in which different groups of actors tried to modify what they identified as the causes of decision-makers' lack of support of the environmental area, so that the effects

would be the opposite: i.e., decision-makers would care. The section also discusses on what these beliefs were based.

A. 'RAISING AWARENESS'

In Puno, a number of NGOs and the Ombudsmen had on their agendas to get municipalities to comply with their waste management and sanitation functions. To fulfil this objective, they tried to 'raise awareness' among local decision-makers. For example, the Ombudsmen in Peru issued recommendations to the municipalities of the kind of changes they could introduce in their waste management services or the organizations they could approach to help them do so. NGOs in the region also worked on this topic, either as part of the strengthening of environmental management, as part of the strengthening of public organizations or both. An officer from one of those NGOs (SER, Rural Educational Services) considered that the lack of municipal compliance on these topics was partially explained by lack of knowledge about what the area entailed. In his own words:

It [environmental management] was a new topic for them [the mayors], [that appeared] through climate change and waste management, it was like speaking Chinese, now there is a bit more awareness, also because of mining, which has created environmental impacts [at the local level] (NGOSERLA).³¹⁸

The idea that it was a new topic might seem surprising in light of the history of regulation. Indeed, the distribution of some components of solid and wastewater management functions precede the process of decentralization.³¹⁹ The law on waste management, older than the decentralization law, already attributed responsibilities to

³¹⁸ Municipalities had no mining regulation responsibilities. My interviewee refers to the elements that raised awareness among the mayors that the area was an area of intervention of public policy in general.

³¹⁹ Law 27783 (2002).

municipalities.³²⁰ Before that, waste management at the municipal level was limited, but existed in the form of public cleaning.³²¹ Sanitation responsibilities were attributed to municipalities before waste management services. Traditionally highly centralized, sanitation responsibilities were transferred to the municipal level in 1990.³²² Therefore, strictly speaking, it was not exactly that recent a topic for discussion. However, these responsibilities were framed in ‘environmental’ terms alone in 2002 with the introduction of the decentralization law, i.e., a time frame that covered only two full administration periods at the local level. According to my interviewees in environmental offices, the appearance of phrases such as ‘sanitary landfills’ and ‘modern treatment plants’ in the discourse was even more recent.

In Bolivia, officials at the regional and national levels also reported that local decision-makers “[did] not always realize they [had] environmental responsibilities” (GRMAAR). The Ministry of Environment and Water, together with the Catalan Cooperation Agency, had developed a programme to create an information network on the state of the Katari sub-basin and raise awareness among stakeholders of the importance of obtaining adequate sanitation and water services.³²³ An officer of the groundwater component of the programme shared the difficulties they had to motivate mayors to participate. As he explains:

We have tried to involve the municipalities, making them understand that it is not a technical project, that it is a project about the problems they have (KPRKRO).

³²⁰ Law 27314 (2000) and Dirección Ejecutiva de Saneamiento Básico (2004).

³²¹ Dirección General de Salud Ambiental – Ministerio de Salud, Organización Panamericana de la Salud and División Salud y Ambiente – Organización Mundial de la Salud (1998).

³²² Legislative Decree 601 (1990) and Legislative Decree 574 (1990).

³²³ Generalitat de Catalunya Departament de Medi Ambient i Habitatge Direcció General de Polítiques Ambientals i Sostenibilitat (2008) and Viceministerio de Cuencas y Recursos Hídricos - Ministerio del Agua (2008).

By ‘technical’ the officer referred to a project that was led by ‘experts’ with criteria that the mayors did not necessarily understand and that were therefore outside their control. Moreover, technical projects were seen as involving high costs, which further discouraged the mayors from supporting them.

B. BEYOND FUNDING

Evidence from Puno suggests that resource availability cannot be considered the only reason explaining the mayors’ reticence towards sanitation and waste management. Indeed, the city of Puno had obtained, in the year 2000, funding from the German Cooperation Bank KfW for the building of a new water treatment plant.³²⁴ Ten years later, the plant was still not built. My interviewees from the Municipality, from EMSAPUNO as well as those from the German development bank, explained that in the past ten years there had been a series of disagreements on where to build the plant and on what kind of plant was the most appropriate.³²⁵ As we saw earlier, the area for the building of the plant had been selected by a multi-sectorial commission that the Municipality was leading.

Of particular relevance to this case is the fact that the mayor and his collaborators were working on a project for the revamping of the lake bay in the area where the plant would also be built. This project consisted mainly in the building of a breakwater esplanade with the aim of developing the city’s leisure and tourist infrastructure. The esplanade would contain several different areas (family, sporting, viewing) along with a water park and

³²⁴ Concurso Público de Méritos N03-2007-CG (2007) and Supreme Decree 114-2000-EF (2000).

³²⁵ A meticulous analysis of the local press reveals the numerous disagreements within the Municipality (between mayors and councillors), and between the Municipality and other organizations. These have been continuous to this day as at the time of writing the plant is still not built. I give reference here of a selection of articles Herrera Rivera (2010), La República Edición Sur (2011), Los Andes (2013), Pachamama Radio (2011a), Pachamama Radio (2011b), Pachamama Radio (2011c), Valencia Untama (2011).

numerous fountains. The plant needed to fit into the new 'landscape' of the bay. Therefore, municipal officers confirmed, the physical appearance of the treatment plant mattered. One of the international experts who had been involved in the project in the past also reported that the physical appearance of the plant was a source of concern. In his account, the mayor wanted a small, compact plant, while the experts judged that the kind of plant that would satisfy the mayor's requirement would be too expensive.

Clearly, saying that funding was a problem might in fact cover numerous variables. Aesthetic concerns are amongst those variables, because investing in leisure brought decision-makers prestige. The aesthetic parameters introduced by the example of Puno open the way for the exploration of another alternative explanation of why the environmental area (broadly speaking) did not receive municipal support: it was deemed unattractive by decision-makers. As a Bolivian environmentalist put it, "go tell a mayor that you are going to take his picture in front of a treatment plant and see what he says" (LAchai). While this might seem counter-intuitive, promises around provision of basic services did not traditionally generate high electoral returns (Marangos 2009).

C. ATTRACTIVENESS OF THE AREA

Several reasons explain why the responsibilities associated with the environmental area were not among those creating high electoral returns. Firstly, the building of sporting facilities and other infrastructure projects traditionally brought high electoral returns in the region since these areas were associated with modernity, progress, wealth, etc.³²⁶ Moreover, the maintenance of environmental facilities generally imposed a financial

³²⁶ A thorough exploration of the reasons why this is so is beyond the scope of this thesis, an interesting reference is J. D. Cameron (2009).

burden on the population, which was unlikely to create an electoral benefit.³²⁷ Finally, projects on sanitation facilities took particularly long to execute and even longer to bear fruit. Had the projects proved to be a source of recognition, it is unlikely that the mayor who initiated them would gain the benefit electorally. In such context, there were few reasons why a mayor would promote environmental projects.

Environmentalists in NGOs and street-level bureaucrats distinguished three options that could lead to a change in the mayors' attitude: demand from the population, persuasion from other organizations and sanctions. This last option was in the hands of the Environmental Prosecutor in Peru, who, as we saw, was a source of concern for organizations in the field. In Bolivia, there was not such a figure at the time of fieldwork. In both countries, as far as administrative procedures were concerned, the State Comptrollers played a role. Officers in the supervised organizations viewed the State Comptroller as a potential source of problems, but the Comptroller was perceived as less threatening than the Prosecutor. An officer at the Regional Office of the Ministry of Tourism in Peru reported that the State Comptroller inspected their office and indicated that environmental concerns should be included in their management. The officer then asked for support to comply with the recommendations to the Ministry. As the officer reports "the Ministry told me they [State Comptroller officers] had been too demanding" as the Ministry itself was still in the process of including environmental concerns in tourism policies (PNRGUL).

As we can infer from this account, the officer's hierarchical superiors reassured him as to how worried he should be about the State Comptroller's recommendations. A possible

³²⁷ This is by no means a logical necessity, as one could imagine many other possibilities, the most common probably being that the state subsidizes basic services. It is however the tendency in the region.

explanation for this is that horizontal or administrative controls remained within the executive branch, which provided with different spaces for negotiation. By contrast, the Environmental Prosecutor translated the supervision in legal terms. As far as the Environmental Ombudsman is concerned, its links with civil society allowed it to introduce an element of vertical accountability that gave it strength.

Moreover, the officers interviewed at the State Comptrollers of both Bolivia and Peru frequently indicated that the difficulties faced at the regional and municipal levels were such that they chose to focus on recommendations for basic administrative procedures rather than evaluating legal compliance. It is also worth noting that officers at the SUNASS in Peru, an organization in charge of supervising the provision of sanitation services and drinking water, indicated that they put more emphasis on their role as a source of support for the entities in charge of sanitation and drinking water provision services than as a controlling agency.³²⁸

This is not to say that institutionalizing rules of management through laws was useless. On the contrary, numerous environmental officers saw formally institutionalized laws as useful in legitimizing certain types of interactions with the ecosystem. Those laws, therefore, constituted a tool by which to hold actors accountable on environmental terms. Indeed, even when the regulation was not strongly enforced, as is typical in weak states, the fact that the regulation existed gave actors a tool for accountability. Thus, the institutionalization of the area constituted a source of relative power, which the next section explores.

³²⁸ In Bolivia, the Authority for the Supervision and Social Control of Drinking Water and Sanitation (AAPS), an equivalent agency, had been opened to substitute the former Superintendence of Sanitation Services and was in the process of becoming operational at the time of fieldwork.

III. THE ENVIRONMENTAL RESPONSIBILITY: WHOSE VISION IS INSTITUTIONALIZED?

The degree of institutionalization of environmental management was perceived as correlated to two main elements: the weight given to the responsibility in laws and administrative design, on the one hand, and the budget shares attributed to the area, on the other. The institutionalization of environmental management occurred principally in the 1990s in both countries. Yet, at the time of fieldwork each country seemed to be entering a redefinition of its public environmental management. In Bolivia the approval of the CPE opened up the possibility of a redefinition of the ‘environment’ in light of indigenous understandings of ‘Mother Earth’. In Peru, Minam had been founded in 2008. In both countries, the weight of cooperation funding, traditionally important for the area, was under debate.

A. BOLIVIA: A REDEFINITION OF THE APPROACH TO THE ENVIRONMENT?

The place of the environment in public policy was the object of animated debates in Bolivia. Indeed, it is crucial to bear in mind the specificity of the Bolivian political context. First of all, MAS rallied environmentalists and indigenous groups with a particular understanding of what environmental management should aim for. Notwithstanding the differences in the positions of environmentalists and indigenous groups, as well as among environmentalists and among indigenous groups, the government was somehow accountable to them. Crucially, the Bolivian Constitution (CPE) gave the State the role of promoting *Suma Qamaña*.³²⁹ The road to that target was

³²⁹ *Suma Qamaña* is a phrase in Aymara that literally means ‘living well’. The Bolivian Constitution, inspired in indigenous understandings of community life, sets the *Suma Qamaña* as the country’s model of

the ‘process of change’. What exactly *Suma Qamaña* entailed and which relations with *Pachamama* (Mother Earth) it established were subject to debate, but it built on an indigenous understanding of the relationship to nature as one of respect and care.³³⁰

My interviewees holding public positions admitted that the ‘process of change’ was very much a process. The implementation of the *Suma Qamaña* was mainly a work in progress. It relied on the inclusion of previously excluded indigenous populations (Aguirre 2011; Anria 2009; Harten 2011). However, how indigenous people and their (multiple) understandings of society could be included in a modern state apparatus was subject to multiple negotiations. Some of the social organizations that had supported MAS on its road to power were sceptical of the government’s actual commitment to protecting *Pachamama*.

At the time of fieldwork, several groups among social movements and in the executive and the legislature were working on a law of Mother Earth. Several associations organized a demonstration to demand that their views on the matter be heard and included in the legislation. The statement of one of the CONAMAQ demonstrators is telling of the mistrust with which they approached the government:

Laws have already been approved without including us³³¹, it needs to be clear, because we are saying that we need to be very careful with the actions of our brothers through politics, some of the changes do not fit with the indigenous people that is why we say that the process of change has not been sufficient for us, which we cannot accept (CNQD).

development, in contrast with the ‘extractivist’ model of development that always seeks for ‘better’ (as opposed to ‘well’).

³³⁰ See Albó (2009), De la Barra Aliaga (2009), Delgado, Rist and Escobar (2010), Huanacuni Mamani (2010), Medina (2006), Palacín Quispe and CAOI (2010) and Stefanoni (2012). For a similar discussion on the Ecuadorian case see Radcliffe (2012).

³³¹ Crucial to understand this quote is the fact that the government had committed to draft and approve five laws for the refunding of the State within six months of approval of the Constitution. These laws were supposed to include the input received from social movements. These were the ‘framework’ laws, such as the Framework Law of Autonomies.

Some actors accused the government of using the *Suma Qamaña* as a banner to conserve the electoral support of indigenous people and to obtain legitimacy at the international level, while it had no intention of implementing it at home.³³² Others, however, pinpointed that whether it was a banner or not, the fact of the matter was the CPE was already a significant step for the institutionalization of environmental matters. Indeed, as an environmentalist illustratively pointed: “people can now demonstrate with the Constitution in hand” (AAOFFXER). Institutionalizing the *Suma Qamaña* as guiding the country’s development model gave further legitimacy to the social movements holding the government accountable.³³³

B. THE CASE OF MINAM

The transformation of Conam into the Ministry of the Environment (Minam) gave those responsible for the environmental area access to the Council of Ministers, and with it an opportunity to directly negotiate with the ministries promoting activities with high environmental impact.

While numerous environmental officers perceived the founding of Minam as an important step, it was only so within a given context. We saw earlier how officers pinpointed the weakness constituted by the atomization of environmental management. This weakness was also acknowledged by Minam as an institution in its official

³³² The debate was particularly animated at the time of fieldwork over the drafting of the Law of Mother Earth and the approval of a road project that would cut across a national park (TIPNIS) which was also an indigenous reserve (Morales 2013; Perrier Bruslé 2012; Portocarrero Valdo 2012; SENA and fobomade 2012). Many of my interviewees presented the government’s endorsement of the road project as the proof that the ‘developmentalist’ tendency within the MAS government (represented by Vice-President Álvaro García Linera) had taken over the ‘indigenist’ tendency.

³³³ In the future, with the creation of the Agrarian High Court and the approval of the Law of Rights of Mother Earth, the legal system can be a resource to exercise mechanisms of accountability.

documents (Dirección General de Evaluación Valoración y Financiamiento del Patrimonio Natural 2009, 1).

The accounts of two officers at Minam illustrate the caution with which they witnessed the evolution of environmental public management in the country. In the words of one of them who had previously worked in Conam:

It's true that the Ministry has access to the Council of Ministers, which allows the Minister to undertake a pedagogic task. But it's a young ministry that doesn't have the necessary credibility vis-à-vis other ministries with traditional and financial weight in decisions such as Energy, Mining, Agriculture or Transport (MINAMIAM).

Another officer summarizes the political economy context in which the institutionalization of environmental management was taking place:

The country model is a model of macroeconomic stability and growth, with investments to reduce poverty and boost employment, a conventional type of growth. Of course, as it could only be, because of the international context, there is a development of political, legal and institutional instruments to incorporate environmental management... but I believe it is still a challenge to consolidate a better relationship between economic, social environmental and cultural policies (MINAMDM).

The officers I interviewed in the environmental offices within the sectors agreed that the opening of the Ministry had been an important symbolic step. Yet, they pinpointed that during its first year the Ministry had seemed risk-averse and did not dare to oppose traditionally powerful sectors.³³⁴

It is important to remind the reader that Minam was opened during the Presidency of Alan García, who was not known for his sensitivity to the environmental cause. Indeed, the President, in a polemic article published in the newspaper *El Comercio*, regretted that

³³⁴ Equally, the environmentalists (working in diverse NGOs in Peru) interviewed for this study considered that the Ministry was too cautious and were disappointed with the Minister himself, who, they considered, preferred to avoid controversial positions.

forests, rivers and other natural resources were unexploited. He identified several groups that, he argued, prevented Peru's development by opposing the exploitation of resources. Even though the article does not explicitly mention them, it clearly accuses indigenous peoples and environmentalists who are compared to the "dog in the manger" (García Pérez 2007).³³⁵ On top of that, one of the reasons for the founding of Minam was the government's will to satisfy the conditions of a Free Trade Agreement with the United States³³⁶ that required strengthening of environmental institutionalization.

Moreover, there were administrative structures at the general level of the State that led to the exclusion of environmental matters. The example of the Public Investment System is telling. Regional and local governments needed to register their projects in the system in order to obtain public funding. This system did not encourage environmental projects as an official of Minam explains:

All the regional governments have agreed to work on it but the problem is when you want to practically work with it, because the system asks for a number of things, such as an economic benefit, which is difficult for environmental projects since the gains are long-term gains in terms of health ... and precisely the area of policies (the directorate of norms and policies in Minam) is working on guides so that the MEF³³⁷ can orientate the formulators of environmental projects (MINAMIAM).

Despite these weaknesses, environmental institutionalization cannot simply be dismissed as a façade for the sake of the Free Trade Agreement with the United States. Three important elements suggest otherwise. Firstly, the first Minister of the Environment, Antonio Brack Egg, was a reputed environmentalist, well known for his work in the field

³³⁵ "The dog in the manger, who does not eat or let others eat' is a metaphor derived from one of Aesop's Fables. It builds on the image of the dog in the manger, who, not being a herbivore, does not eat the hay, but, 'owning' the space, does not let other animals eat it either.

³³⁶ "Alan García Propone la Creación de un Ministerio de Medio Ambiente." *El Comercio*. (20 December 2007).

³³⁷ Ministry of Economy and Finances.

of biodiversity in Peru. Had the organization merely been a façade, it's likely that the Minister chosen would have been a less prominent figure.

Secondly, the Organism for Environmental Evaluation and Supervision, OEFA, an agency in charge of supervising respect for environmental law, was created to support the work of Minam. OEFA also provided support to those organizations sharing the supervisory function. For example, the regional governments were in charge of monitoring small and medium mining companies' compliance with the regulations and OEFA ensured that that the tasks were done in accordance with the law.³³⁸ Crucially, OEFA was in charge of supervising large mining activities, a responsibility that had previously been held by an independent agency, the Superior Organism for the Investment in Energy and Mining.

Thirdly, the reader might recall that the attachment of ANA to the Ministry of Agriculture was controversial. Yet again, while some actors interpreted ANA's attachment to the Ministry of Agriculture as a sign of Minam's weakness, the organization was bound to follow the policy defined by Minam. Indeed, it was part of the National System of Environmental Management, led by Minam.

The institutionalization of environmental management in Peru was torn by the tensions between agendas that tried to push the system in one direction (an economic development that excluded environmental concerns) or the other (environmental protection). The creation of Minam and OEFA, and the bounding of all entities under the National System of Environmental Management might be seen as examples of

³³⁸ Law 29325 (2009).

‘conquests’ that the environmental cause had obtained in recent years.³³⁹ These were the product of negotiations with those actors who pushed for a growth-oriented development. In these ‘fights’, the actors pushing for an environmentalist agenda found occasional allies in international actors. However, these actors had their own agendas, creating other patterns of negotiation.

C. INTERNATIONAL FUNDING

As I discussed above, the founding of Minam was influenced, to a certain extent, by the context of the Free Trade Agreement with the United States. As one of my interviewees working in an environmental NGO put it, “whatever the process, the outcome [having a Ministry] was better than nothing” (NGOBCI). However, other actors were more critical about the apparent coincidence between the agendas of international and national actors.

The majority of cooperation agencies³⁴⁰ were subject to the Paris Declaration on Aid Effectiveness, which tied them “to increase alignment with partner countries’ priorities”.³⁴¹ Yet, the fact remains that cooperation agencies chose which areas of public action they supported, and therefore played a role in the definition of the agenda.

An officer at Minam gave the concrete example of the money available for the country’s ‘future’ REDD³⁴² strategy. I quote him here at length for his narrative illustrates the tensions and challenges bound up with the acceptance of cooperation funds:

³³⁹ As I have specified in several occasions, the ‘environmental cause’ groups together actors with different agendas, I use the expression as a discursive tool since it allows me to present my argument more clearly.

³⁴⁰ For an up to date list of signatories of the Paris Declaration see <http://www.oecd.org/dac/effectiveness/countriesterritoriesandorganisationsadheringtotheparisdeclarationandaaa.htm>

³⁴¹ The Paris Declaration on Aid Effectiveness (2005).

³⁴² REDD is a UN programme that focuses on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.

There is an agenda that is being defined by cooperation, which can be seen as a canal for the model of development, it's not that there are resources only for one thing or the other, it is that you are being oriented towards something that you can conceptualize as your own development, like it happened with the Washington Consensus. ... But we shouldn't be cynical either and think that cooperation induces you to do or not do, at the end of the day, there are national capabilities. ... In Peru, the percentage of cooperation in the GDP and the budget is increasingly reduced. On environmental issues, it is clear that some of them have been brought on the table by the cooperation. For example, this year ... suddenly there were resources for REDD and a cooperation agency wanted to give us 5 million for a national strategy on REDD. And it's not that we don't want a national strategy on REDD, but first we need to understand what is REDD and what are our possibilities within REDD, before being able to design a strategy. ... it is not that us, contrary to other countries, close the door to cooperation, but we need to be aware (MINAMON).

I found similar tensions in Bolivia around the acceptability of cooperation money. Some officers considered that whatever the commitment of the state towards the environmental area, it did not necessarily have the resources to protect its natural capital. The statement of an officer occupying a high-ranking position in the Ministry of Foreign Affairs illustrates the issue:

The state does not have the necessary resources to face environmental projects, the cooperation has seen the weakness and is making efforts to mitigate the impact, which I think is good, even though we must not neglect these issues, for instance in terms of promoting environmental education (CANCUE).

As this quote suggests, for some officers, cooperation funding constituted an opportunity. Indeed, not only was it seen as an opportunity to obtain funding for a specific programme, but also it could be mobilized as an opportunity to attract decision-makers' attention to the environmental area. We saw earlier that regional and national officers expressed difficulties in getting local officers interested in the environmental area. Officers intervening at the local level believed that if mayors were convinced that the area was a potential source of resources it would obtain further attention. These initiatives, however, ran the risk of not being given continuity or the necessary support in terms of staff availability or time at the local level. In light of this, cooperation agencies

usually demanded that national organizations pay part of the project, so that such projects were institutionalized and received the necessary back-up.

This positive view of the opportunities presented by cooperation funding contrasts with the statement of an officer at the MMAyA:

We must insist that sometimes we avoid cooperation funding because we have witnessed a negative behaviour from cooperation agencies, with a strong connotation to try and interfere in the political processes of the country, trying to orient social organizations to adopt an unreal perspective for work, organizing workshops and encouraging them to imagine options that the state cannot financially assume. It's easy for cooperation agencies to come and organize very interesting workshops that then translate into an impossibility for the government to work with civil society (MMAyAOEA).

This needs to be understood in the larger context of the MAS government commitment to 'decolonization'.³⁴³ The government's relationships with cooperation agencies were sometimes tense, and particularly so with USAID, as President Morales accused the agency of supporting his opponents to deliberately weaken his government. The USAID officers interviewed reported that after the first threats to expel the agency were not executed, they decided to work assuming that nothing would happen.³⁴⁴

Other environmental officers in Bolivia argued that cooperation funding could have long-term detrimental effects over the funding of environmental projects by creating dependency patterns that would discourage the state from investing in them. A cooperation officer expressed his worry that there was, since the declaration of Paris, a feeling that cooperation would potentially fund any national initiative, which could result

³⁴³ This thesis is not the space to engage in a discussion of the use of the concept of 'decolonization' by the MAS government. See Vicepresidencia del Estado Plurinacional de Bolivia and Fundación Boliviana para la Democracia Multipartidaria (2011).

³⁴⁴ The agency was ultimately expelled from the country (BBC News 1 May 2013).

in unrealistic administrative designs, creating organizations without considering the internal capacity for funding them.

As a matter of fact, cooperation funding has historically been significant in the environmental area. Importantly, in Bolivia, some of my interviewees considered it was changing under the Presidency of Evo Morales. As a Bolivian officer working in an international environmental NGO narrates:

I believe that the Bolivian State had never [had] among its priorities the environmental topic. It was never reflected in the budget allocations, and something in favour of this government must be said, it raised the public spending on the SERNAP³⁴⁵ to the highest in its history, which covers 30% of its cost. Before it was 1%, so it is a gesture highly valued in politics (NGODO).

The account of a cooperation officer working in an agency that had traditionally provided Bolivia with significant funding for the environmental area also points in this direction:

Lately, the dependency from donors has been reduced. Still, the Vice-Ministry of the environment has a strong dependency on donors. But in the past my country decided to support the Vice-Minsitry strongly and even with functioning expenses, even with wages (COOPIE).

Despite the officer's perception, budget attributed to the environmental area remained low. As summarized in the previous chapter, no radical rise was seen in environmental expenses at the national level as part of the latest general budget.

³⁴⁵ National Service of Protected Areas.

IV. CONCLUSION OF THE SECTION

This section has examined the last of the identified set of variables that critically shape the options of interaction in the system, which I have grouped under the category ‘competition’ for they arise after action situations of dispute. The evidence presented in this section leads us to conclude that competing could either strengthen the environmental area or prevent organizations from functioning.

The first part of the section explored the tensions existing among organizations and explained in which ways these tensions undermined their will to cooperate. Through the example of ALT, we saw how some actors at the national level in Bolivia accused the organization of being at the service of Peru, and how actors at the regional level in Peru accused it of being an ‘agent’ of the government in Lima. This example illustrated how the tensions are inserted in a specific history of relationships, underpinned by power struggles. In so doing it highlighted how the objective of weakening an organization could be, for certain actors, more important than ensuring that the organization’s functions were fulfilled. This has a direct effect on the patterns of interaction between certain organizations and the ecosystem.

The section then turned to explain that changes in the administrative design respond to the need of satisfying demands and integrate understandings that are brought to the fore of public debate at different times. It pinpointed that several administrative changes can overlap. Indeed, we saw through the example of the process of decentralization in Peru and the establishment of ANA that these were initiated at different, overlapping stages. This creates an arena for competition where only certain actors are allowed.

Then the section focused on the local level and explored the ways in which several sets of actors tried to influence the interactions with the ecosystem of local decision-makers –

a kind of actor with a critical effect on determining the social-ecological system structure. The section discussed the reasons beyond the idea of a resource shortage as the main variable crafting the possible interactions with the ecosystem. It discussed what actors meant when they referred to a 'lack of awareness' and the low 'attractiveness' of the area.

Finally, the section discussed the question of which set of actors defines what is put under the institutionalization of the environment. Through the study of the recent creation of Minam in Peru, the discussion revealed the tensions and complexities of the institutionalization, and how it is pushed towards a 'façade' on the one hand, and a valued institutionalization on the other. In this, it uncovered the roles played by international agendas, which question who is leading the process. Cooperation actors were themselves aware of these tensions but read them as revealing the degree of commitment to the cause that the national governments actually had.

The group of actors pushing for the institutionalization of environmental management appear in a more complex light: some actors want to institutionalize, to capture more spaces in public policy, create institutions, while others advocate first defining and owning the space that is taken. In Bolivia, the dispute was particularly framed in terms of whether or not the government of Morales could institutionalize the understanding of the environment put forward in the CPE.

7.3. CONCLUSION

Chapters Six and Seven have focused on the officers, setting out from Chapter Four's conclusion that the officers' choices were constitutive of the SES structures and investigating what determined those choices. Chapter Six analysed the structures under which the officers operated, observing the structures institutionally defined and those

perceived by the managers. It showed that the analysis of the effects of the lack of resources and of institutional instability over the managerial structure could not be disconnected from the analysis of the causes underpinning these phenomena. Chapter Seven highlighted the opportunities that arose for officers to secure their agendas in the interaction with other managers, by focusing on two types of action situations: coordination and competition.

As Chapter Six explains, both financial and human resources are limited in the area. Even though there are nominal differences between Peru and Bolivia, officers in both countries felt that their budgets were insufficient to comply with their responsibilities. This was identified as one of the structures imposing institutional weakness. The rest of the identified structures resonate with the typical characteristics of weak states. Indeed, officers complained that numerous procedures were not institutionalized, which imposed a continuous repetition of the same tasks. The high turnover of officials was also pinpointed as posing significant losses in efficiency.

In this light, we saw that numerous actors imagine cooperative arrangements as *the* response to the weaknesses. Pooling efforts together would allow them to overcome financial and expertise shortages and counter the losses in institutional memory imposed by instability. However, in real terms, cooperation patterns are short-lived being time-consuming and highly dependent on the officials in place. Crucially, officers presented coordination as a neutral tool, when in fact, as their own practices highlighted, effective coordination only occurred in specific circumstances, frequently tied to the officers' personal networks.

The chapters highlighted two reasons underpinning the reproduction of patterns that led to the institutional weakness of the environmental area: firstly, some actors considered that key decision-makers lacked interest in the area, which was perceived as a

characteristic specific to the environmental domain; secondly, weakening certain actors was part of a deliberate strategy to conserve power, which responded to a typical dynamic of public administration in the countries.

The 'lack of interest' in the area was identified as underpinning key decision-makers' choices in different ways. Indeed, we saw that officers explained the reduced resources available to them as a product of the specific lack of interest of the actors in charge of defining the budget. Some officers hoped that the recent changes in the administrative structures would give more weight to the environment and that such weight would be translated into an increase in budget. However, some actors were sceptical that the recent institutional changes would bring an actual change in procedures.³⁴⁶

Additionally, other officers believed that the possibility of obtaining cooperation funding for the environmental area would transform it into an interesting one in the eyes of local managers. However, the role and effects of cooperation funding were highly contested in the field. Some actors believed that cooperation funding constituted an opportunity that must be seized and others feared that (i) cooperation agencies had their own agendas, the availability of funding for specific aspects being an element revealing their own internal logics and (ii) the state would not make the necessary efforts to support the environmental area because of the inertia linked to the availability of cooperation funding.

Moreover, the analysis of the case of the Puno treatment plant suggested that funding is not a sufficient condition for promoting environmental projects. This led us to explore other variables leading to a dismissal of the environmental area: the little prestige and the

³⁴⁶ This resonates with the institutionalist literature concept of 'parchment rules', i.e. rules that are approved but will probably not be applied (Carey 2000).

low electoral return it brought. Indeed, environmental projects have time frames that frequently go beyond electoral terms and that do not produce immediate benefits. Crucially, they seem to bring little recognition in comparison to infrastructure development projects. Furthermore, they are framed as requiring an effort from the population in financial terms, and, therefore, are seen as unpopular.

We next discussed certain cases wherein institutional weakness was the product of a deliberate strategy rather than of a general lack of interest. For example, the deficiencies in institutional memory, the lack of continuity given to certain projects or the weak support received by decentralized organizations were seen by some as conscious strategies to retain power. The case of ALT illustrated well how the contestation of the organization led to its funding being stopped. Thus, as is typical of weak states, decision-makers had little incentive to strengthen state capacity by institutionalizing procedures. Indeed they feared they would lose power and contribute to providing the opposition with increased executive capacity (M. Cárdenas 2010). In the particular case of environmental management, this resonates with what the sociological institutionalist literature calls 'isomorphism', i.e., the creation of institutions with the sole purpose of satisfying (internal or foreign) demands, but with no intention of actually enforcing them (DiMaggio and Powell 1991; Levitsky and Murillo 2009). Yet, the chapter findings highlight that once institutions are created, even though weak, they can trigger procedures, such as those undertaken by oversight agencies, consolidate the legitimacy of social movements and capture legislative spaces (Smulovitz and Peruzzotti 2000).

Through the exploration of the role of elected officials in creating the structures that give shape to the SES, the chapters highlighted that these structures, on the one hand, undermine the SES capacity to adapt to changes, while, on the other, they facilitate the reproduction of a system in which certain actors have a vested interest. While the SES

does not seem able to learn and adapt in light of ecosystem changes, this occurs precisely because the dynamics of interaction between officers and organizations present high resistance. Said otherwise, the logics and values of key actors prevail and these are not supportive of changes that would lead to creating a healthy environment.

This is not to say that the system completely excludes change. On the contrary, it integrates it in its structures in such a way that the precariousness of the system is somehow reduced. For example, the use of personal networks allowed certain officers to set cooperation mechanisms that allowed them to advance in their projects. Perhaps more importantly, by including formal changes in its administrative structures, the system opened up new possibilities for triggering changes.

The analysis of the environmental commissions in Peru was useful in understanding this. As these commissions had the task of deciding the concrete plans for the implementation of the environmental policy, actors had strong incentives to attend them in order to stay informed and included. The commissions created what we can classify as slow variables, as they led to a type of interactions between actors that had a structuring effect over the system. Indeed, the commissions provided: (i) a space for the Ombudsmen to ensure the maintenance of institutional memory; (ii) a space for all actors to communicate, notwithstanding tensions among organizations; (iii) a space for some sort of accountability; and (iv) a space where synergies could be renewed.

However, the changes introduced in the administrative structure only translated into effective changes in management under certain conditions. Firstly, as we saw with the example of the Environmental Prosecutor, the effective use of the tools provided by administrative design were dependent on the personality of the officers in place. Secondly, the changes in administrative design might be too ambitious and disregard the strength of the overreaching external drivers in place. This was feared by some Bolivian

actors who believed the state did not have the means to implement the 'process of change' as set up in the Constitution.

These two chapters have tried to show that the relationships between officers and organizations are continuously transformed, as they constitute a complex subsystem in the SES. Competition and cooperation patterns contribute to depicting a system that is never in equilibrium, that is constantly negotiated. The creation of new organizations contributes to the renewal of the challenges to the system as they institutionalize and put forward different visions. Structuring variables are reproduced but with differences as actors and organizations try to capture more space for their agendas. In terms of our framework, actors compete to define the rules that craft the system's slow variables.

Finally, it is important to insist on the fact that the elements discussed in this chapter are not exclusive to the environmental area. They are faced by officers in many other areas of public administration and are revealed in the literature on weak states. Yet, it has been essential to understand these elements in order to grasp the challenges for environmental management. Indeed, we have seen that the ways these are associated is specific to the environmental area, a domain that presents particular weaknesses and that is currently subject to changes in administrative design that open new spaces for the pursuit of different objectives.

CHAPTER 8. CONCLUSION: INSTITUTIONS ACCOUNTING FOR ACTORS' COMPLEXITY

“Action must be undertaken with the actors at stake, legitimacy comes in many ways, effort, knowledge, permanence, identity, history.” Prominent Bolivian environmentalist (MSHNBD)

This thesis has tried to understand the choices different sets of actors face in situations of sustained environmental degradation. The investigation has provided insights into the complexity and fluidity of interactions in the social-ecological systems examined. We have seen that these interactions are determined by the ecosystem and its ‘state’, as well as by the social relationships at play in the system. This has uncovered some of the reasons why environmental degradation continues in the bays of Lake Titicaca, despite numerous efforts to reverse it.

The review of the literature on environmental management highlighted the threats to poor peoples’ opportunities for development imposed by freshwater ecosystem degradation (pp. 9–11). It appeared that the mainstream environmental studies literature did not provide the tools to explore the ways in which actors interacted with their environments (p. 28). I pinpointed that a static approach to ‘nature’ focusing on the definition of ‘shares’ was one of the reasons for this (pp. 28–30) and adopted the novel SES approach with the aim of filling those gaps in the literature (pp. 39–42).

In crafting the framework for my study, I combined two trends in the SES scholarship: the Resilience Alliance and the Bloomington School. Yet, while the SES approach provided an interesting framework with which to approach the problems in Titicaca, it appeared insufficient to explore the complexity of actors’ actions and interactions. The framework tends to be used as a tool for identifying mechanisms leading to resilience and

sustainability rather than to explore the richness of the interaction between human actors and ecosystem elements (pp. 75–76). By bringing in two key insights from sociology – the theory of negotiation and that of the ‘cities’ (pp. 78–82) – I addressed this shortcoming and contributed fundamentally to the framework’s ability to grasp actors’ complexity.

The composition of the analytical framework made sense under the hypothesis that in situations of environmental degradation actors, both individually and in groups, have choices and agency. The visions they have of the SES and of its changes, i.e., how they understand and interpret them, partly shape the kind of choices that become available. Several categories of actors emerged from the empirical material, each with a different vision of the SES and each with different reasons for the choices they made (Chapter Four). These reasons were then investigated and conceptualized as variables of the SES (Chapters Five to Seven).

A recent issue of the *Policy Studies Journal* (PSJ, August 2013) on the complexity of actors’ behaviour in environmental management policy processes confirms the relevance of the topic discussed in this thesis for contemporary environmental studies. As the PSJ issue testifies, numerous scholars are developing frameworks that attempt to grasp actors’ decision-making processes in institutionally complex cases. In this conclusion, I propose some conceptual reflections that aim to nourish the debate by highlighting the specificities of developing contexts. In particular, I intend to call attention to the necessity of including actors’ complexity in theoretical developments that address institutional design in developing contexts.

This dissertation also echoes current research developments in the field of Latin American Studies. Indeed, the debate on the links between environmental issues and the development model is vivid in Bolivia and gaining ground in Peru. Particularly, the thesis

has discussed the tensions inherent in the Bolivian attempt to implement public policies inspired by the indigenous understandings of *Suma Qamaña* (Living Well) and *Pachamama* (Mother Earth) (pp. 313–315). Its findings resonate with recent studies on Bolivia that explore the links between implementing a new approach to environmental management and crafting an indigenous citizenship (Zimmerer 2013). In the Peruvian case, the material here presented suggests that the opening of the Minam did not constitute a radical change in environmental management (pp. 315–318).

My research aims to participate in discussions on the region by bringing concrete cases, such as Lake Titicaca's, to the table and helps to tackle the issue of how context-dependent tensions can be fully explored. At the same time, the findings presented might be expanded beyond the case of Lake Titicaca to other areas where institutional weakness significantly affects the structure of the system.

This conclusion recapitulates some of the findings presented in previous chapters, as they give ground to theoretical revisions. The aim of this process is three-fold: firstly, to contribute to the development of a sound theoretical conceptualization of how actors' approaches to environmental questions are included in SES theory; secondly, to advance hypotheses as to what kind of institutional design could support actors' efforts to adapt the system to address unsustainable changes; thirdly, to suggest the ways in which the insights presented here can be useful for other cases wherein there is a social context of poverty and an administrative context of institutional weakness and budget constraints.

I organize this conclusion in three parts: suggestions to account for the complexity of the concept of actors; reflections on the elements that could lead to a sounder institutional design; and suggestions for future research.

ACTORS

Adopting a complex conceptualization of actors is crucial if SES theory is to have the necessary tools to address situations of environmental degradation for two main reasons. Firstly, actors, either through their daily lives or by failing to address the system changes, are responsible for sustaining degradation. Secondly, as they display intent and are able to design managerial systems, the promise of different regimes for the SES rests with them.

The patterns of interaction between actors and degraded ecosystems are better understood as the product of negotiations between several actors, between actors and the ecosystem and ‘within’ actors as they establish the coherence of their own logics and choose between different options. Indeed, there are numerous fluid and often invisible negotiations underpinning ecosystem changes. In addition, ecosystem changes trigger reactions among the actors affected that are accommodated in their daily lives, their agendas and their development strategies.

The methodological approach adopted (pp. 122–135) has allowed me to conduct an in-depth investigation and identify the variables that lead actors, in different but comparable contexts, to make specific behavioural choices. Actors appear as alternating between several, sometimes competing, logics (pp. 160–162; pp. 173–175; pp. 207–215; p. 285). While acknowledging that the specific manifestations of the variables guiding actors’ behaviour are context dependent, it emerges from this study that it is possible and useful to distinguish categories. These include structuring elements (and their contestation) (pp. 251–270), identities (pp. 201–217) and personal interests (pp. 310–312), as well as opportunities for the strategic capture of spaces in the interest of a specific agenda (pp. 322–324). The combination of these categories reveals the power struggles and cooperation patterns behind the arrangements at play (Chapter Seven).

Interactions between actors are shaped by what each actor (or group) sees as its best development option, but also by each actor's vision of other actors, which is at least partially determined by the history of their interactions (pp. 226–244). Actors might simultaneously have several competing interests, which are hierarchized when opportunities to secure any of them arise (pp. 217–226; p. 285). For example, a resident might want to continue with the traditional agricultural activity of his family, but might *also* want to obtain a higher income (pp. 203–217). Similarly, a decision-maker will put forward the environmental interest only under certain conditions. For instance, a mayor might want to build a treatment plant, but *only if* it is finished during his term in office so that his opponent does not benefit politically from his initiative (p. 276).

The variables that this thesis has distinguished as guiding actors' behaviour can be classified according to the scale in which they arise. The first set of variables emerges in the scale of direct interaction between actors and the ecosystem. The second set of variables belongs to a scale in which direct interactions are between actors. Both scales are related and the elements of one are present in the other (as social constructions or structures constraining behaviour): they are not distinct entities. Yet, it is useful to separate them in order to understand the elements that define them. The figure below represents this.

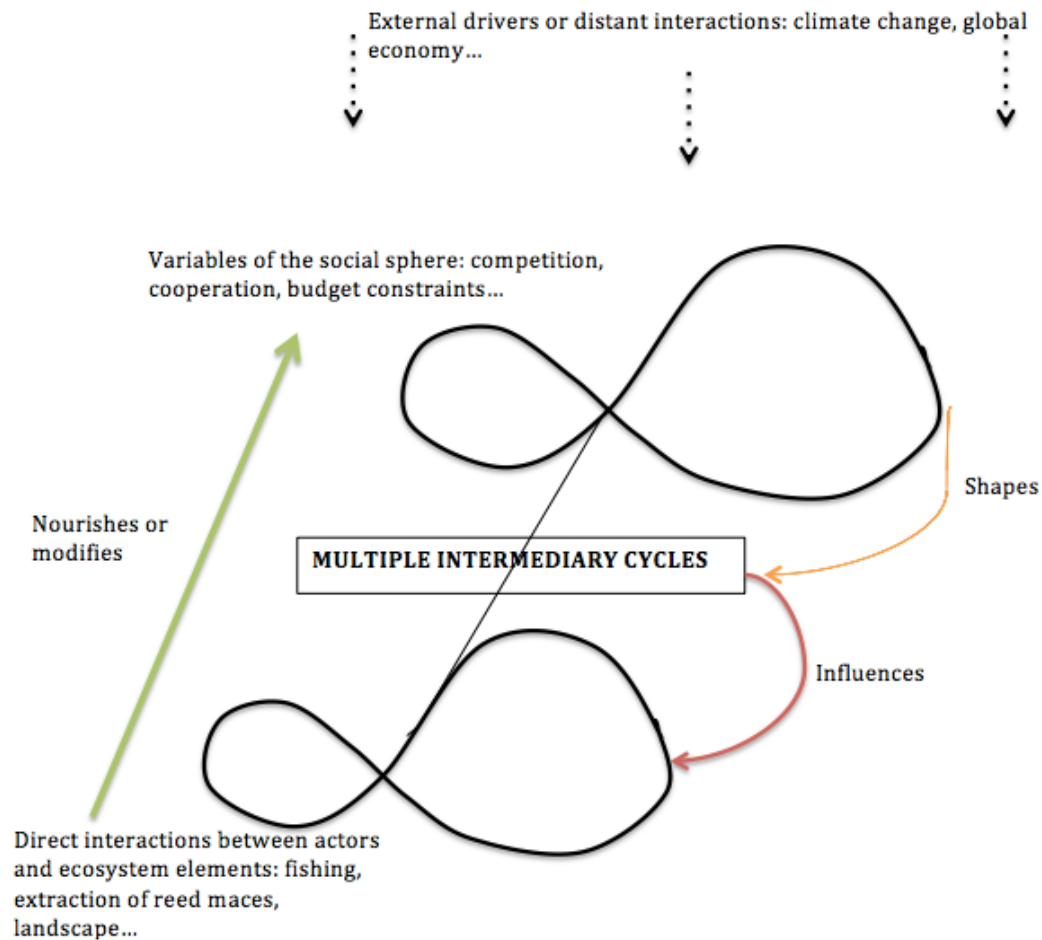


FIGURE 17 VARIABLES GUIDING ACTORS' BEHAVIOUR (MY ELABORATION)

The *importance* given to interaction with elements of the ecosystem in actors' daily lives is one of the variables that determines the kind of direct interaction that actors have with the ecosystem. Direct interactions constitute the processes that allow actors to sustain their livelihoods (such as the extraction of reed maces) (p. 163) or that prevent actors from reproducing past processes (such as the bad smells and the subsequent avoidance of the bay for recreation purposes) (pp. 144–146). Moreover, actors interpret the behaviour and changes of ecosystem elements, which then opens up possibilities to adopt a number of behaviours (pp. 154–160). For instance, actors might 'use' the new elements of the system (such as the *lemma*) (pp. 163–166) or craft relationships in the social sphere that aim to trigger an adaptive change in the management system (such as demonstrations) (pp. 217–224).

Moreover, actors do not only give meaning to the processes inclusive of the ecosystem in which they engage, but also to the ‘ecosystem’ itself as they might perceive it (pp. 188–190). Indeed, actors’ conceptions of the ecosystem as an entity (or several entities) help determine their own position in the system. It is impossible to disentangle the two, for conceptions are also nourished by the interactions in which actors engage.

The point of the matter is that direct interactions are not the only element shaping actors’ conceptions of the ecosystem. ‘Scientific’ and ‘expert’ discourses have a specific weight in crafting the interactions as they rationalize the ecosystem in certain ways and allow interventions and ecosystem reactions to these to be imagined (pp. 169–173). Different actors may define and interpret the same element as an integral part of their specific view of the system, as we saw in the case of the *lemna*. These differences in interpretations of what the elements in the system mean and how they relate to other elements, determines the behaviour recommended or followed (pp. 173–175).

The variables defined mainly by social interactions change according to actors’ positions in the managerial system. Yet, two of these variables seem to be shared by all actors: firstly, the constraint of time and, secondly, the importance of any given action’s meanings for the relationships between actors.

Time is crucial for residents because they don’t have any to spare (pp. 208–209); their strategies for development involve time-consuming mobility patterns. For decision-makers, the constraint of time is linked to that of electoral return, and for bureaucrats, besides the workload imposed by limited staff resources, time constraints are equally felt as a result of the pressures of high turnover and institutional instability (pp. 272–275).

Crucially, all decisions affecting directly or indirectly the management of the system need to be understood respective of what they mean for the relationship between actors: how

they fit in the history of that relationship, what the different options would mean for the future of that relationship and the specific context in which the relationship is being updated, are crucial.³⁴⁷

Importantly for SES theory, the relationships between actors are one of the critical structuring slow variables in the system. These relationships may be actualized in action-situations wherein fast variables can be introduced and trigger a change. In this sense, the negotiations to institutionalize an agenda provide opportunities to create or modify a slow variable.

Additionally, different types of actors have their own concerns. Essentially, decision-makers are concerned with prestige and electoral return, bureaucrats with putting forward their understanding of good management and residents with securing their options for development. The findings on decision-makers are consistent with the literature on the region (Andersson 2003; J. D. Cameron 2009). By contrast, the literature on bureaucrats frequently focuses on their (low) capacity to implement specific decisions (Huber and McCarty 2004) and disregards the bureaucrats' possible commitment to general policy goals that emerges from my findings. This difference might be explained by the specificity of environmental bureaucracies – a topic, I suggest, which needs further exploration.

In sum, it is crucial for SES theory to conceptualize actors as negotiators and analyse how their interests, values and strategies are defined through their interaction with other elements in the system in order to explore what in the system changes and what continues. In the case of Lake Titicaca, the continuing environmental degradation is

³⁴⁷ This finding contributes to the important tradition of literature on the relationship between citizens and the state in Latin America (Mayer 2002; 2009).

linked to the perpetuation of structures (slow variables) that do not allow for environmental interests to be promoted. The changes introduced are small changes (such as the institutionalization of movements against mining) that trigger certain effects but are not enough for the system to engage in an adaptive change to obtain a sustainable set of interactions in the SES.

Actors use the governance system that frames their choices and behaviour to accommodate the variables that matter in their strategies. The system seems to offer certain doors to better integrate the variables that trigger adaptive changes in the SES.

INSTITUTIONAL DESIGN

The general strategies of development that people follow are linked to a set of external drivers, such as the global economic context. For obvious reasons, this thesis does not suggest modifications to those drivers. As indicated above, the findings of the thesis are better understood through two interrelated analytical scales in the system, as they allow us to understand actors' behaviours: the scale of direct interactions between human actors and ecosystem elements and the scale(s) wherein the social and governance system is crafted. Further, the governance system constitutes a set of components (in which analytical scales might also be distinguished) wherein officers evolve and craft rules that constitute formal and informal institutions (Helmke and Levitsky 2006; North 1990; O'Donnell 1996). Below, I centre on formal institutions, i.e., the elements in the system that are the product of design, focusing on their possibility to be stable and enforceable (Levitsky and Murillo 2009). The changes discussed here are modest changes in the design of the governance system. It is however necessary to keep in mind that in social-ecological systems, changes might be unexpected and unintended (pp. 44–46).

The governance system provides actors with a frame and a set of tools with which to craft their decisions and choices. On the one hand, actors face constraints (such as budget or time constraints); on the other hand, they use the system to institutionalize their views (through laws or programme implementation). These views are influenced by the discourses of what constitutes the best management option, which are created and evolve in different spheres.

The real and perceived constraints actors had to face and the effect these had over the general management of the bays highlight the relevance of mechanisms addressing (at least partially) these issues. 'Constraints' are not only important as they limit the possibilities for action that actors have, but also for the meanings they are attributed. These nourish actors' perceptions of the agendas of others. The effects of the two cannot be separated.

The multiple meanings attributed to 'constraints' can be appreciated through the discussion of resource availability (pp. 251–270). Budget constraint was a very real structure of management, as the funds available were limited. Moreover, the perceived evolution of fund availability did not strictly follow the actual allocation. Respondents created categories and subcategories to justify their perceptions of the evolution of budget allocations. The budget was indeed taken to reveal the amount of political support that the environmental area received (pp. 268–270).

Importantly, budget constraints were not taken in isolation but as part of the structural elements aggravating institutional inefficiency. Inflexible procedures (p. 266), frequent changes in the administrative structure design (pp. 282–285) and high turnover of officials (pp. 271–275) were the main elements identified by the bureaucrats as rendering management more difficult. Budget allocations, bureaucratic procedures, changes in administrative design and high turnover were also heavily loaded with meaning.

Moreover, these constraints had repercussions for the institutional memory of the system, the lack of which, in turn, deepened the deficiencies of management (pp. 280–282).

The institutionalist literature on developing countries, and specifically on the Latin American region, has pointed to the institutional weaknesses engendered by frequent changes in administrative design together with multiple cycles of turnover of bureaucrats and decision-makers (Huntington 1968; O'Donnell 1993; 1994). In the case of Titicaca, initiatives that did not have short time-frames were frequently frustrated. As we saw, programme funding could be interrupted (as at the Puno treatment plant) (p. 309) or re-allocated (as in the case of the PDSLIT) (p. 278). This encouraged one-off actions and informal arrangements between bureaucrats to advance their agendas. Personal networks appeared as a resource for establishing solidarity patterns between organizations (pp. 291–296).

The variables leading to short time-frames are resilient 'informal institutions'³⁴⁸ that are reproduced despite the changes in the system. Said otherwise, the changes in the lake bays, together with the threats of further changes and the reactions they triggered, managed to introduce gradual changes in the system but did not transform the structures that defined the system itself. While it is impossible to know what would have happened had these gradual changes not occurred, it is likely that they also contributed to maintaining the system, as they prevented it from collapsing all together. In terms of the RASES framework, the changes introduced constitute fast variables that could potentially trigger a modification of the system structures. They haven't so far, because the system

³⁴⁸ Rules that the actors share but that are not formally institutionalized, see for example O'Donnell (1996).

presents high latitude, i.e., it can integrate changes without being modified in its structure.

These findings appear equally relevant for the literature on institutionalism, especially as interest in informal institutions has revived and institutional strength becomes a promising area of research (Levitsky and Murillo 2009). Focusing the study of both formal and informal institutions' 'behaviour' when facing change will help clarify what kind of institution persists and integrates change, and what kind rejects it (Streck and Thelen 2005). This in turn opens up new possibilities for comparison between contexts in which the degree of formal institutionalization varies, i.e., between developed and developing contexts.

Furthermore, if we follow the SES hypothesis that the social-ecological system is non-linear, small modifications in any aspect of the system could lead to its thorough restructure at a time of low resilience. Therefore, it is crucial that we pay attention to these modifications, especially as actors use the institutional system to support their strategies. I turn now to the changes that might be introduced in the design of the governance system, for these are the direct product of human intent and therefore more accessible than changes perceived by actors as beneficial for their development strategies, such as those leading to a change in activities.

I first comment on the ways in which the challenges posed by short time-frames and personal prestige have been dealt with in the field. Firstly, bureaucrats' use of their personal networks showed that projects and tasks might be subdivided into smaller components that could be achieved in shorter time-frames. Indeed, such agreements allowed the exchange of machines or expertise. Maintaining these agreements not only prevented the system from collapsing all together, but also allowed the creation of potentially stable networks that might sustain a parallel system in which officers might

change organizations but maintain their network. It was not possible to explore this issue in the thesis, for which network analysis research would be required in order to map the officers' moves and their connections.

One of the main thesis findings is that both large and bilateral mechanisms of cooperation are useful, but for different reasons. Bilateral cooperation arrangements usually aimed to achieve a concrete managerial task. We saw, for instance, that an agreement between the Municipality of Puno and the National Reserve of Titicaca gave municipal officers access to the machinery they needed for their work (p. 293). This kind of cooperation mechanism had the advantage of keeping cooperation gains under control and allowing officers to build reciprocal arrangements. By contrast, formal cooperation settings provided an arena in which to exchange information, construct a shared understanding of the problems at stake, find potential synergies for the future and, to a certain extent, hold organizations accountable. For these reasons, multiplying the spaces for contact would seem like an interesting option for actors hoping to advance their agendas. While coordination mechanisms arising from personal networks seemed relatively easy to establish, it is important that larger coordination mechanisms be integrated in institutional design. Indeed, the environmental commissions in Peru provided a space in which organizations that were not in direct contact could confront each other (pp. 289–291). It would seem reasonable that such commissions should be implemented in Bolivia.

It also seems important to strengthen the public organizations that presented an exception to the general patterns of institutional weakness and mistrust. The organizations in charge of holding others accountable, such as the State Comptrollers in both countries proved to be significantly stable, notwithstanding the changes at the high-ranking managerial levels. Giving them responsibilities over long-term tasks such as

maintaining the institutional memory of the environmental area, would seem a good option for securing long-term gains.

In comparing Peru and Bolivia, key differences emerged that provide some insight into what institutional designs proved most successful. Most importantly Peru had created several agencies of control and supervision. Besides the State Comptroller, we saw in Peru the importance of the Environmental Ombudsmen and of the Environmental Prosecutor whose mission is now supported and taken further by the creation of OEFA.³⁴⁹ The role of these organizations was crucial to make actors take environmental regulation seriously by introducing concerns on social accountability (Ombudsman) and legal responsibility (Prosecutor). Even though they had different prerogatives, we can distinguish some degree of redundancy over their aim: compliance with environmental regulation. The case of Peru therefore provides evidence to support the positive view of redundancy, understood as the development of “many regulatory mechanisms to perform similar functions” (Anderies and Janssen 2013, 529), that we find in the SES literature (Folke et al. 2005). This goes against the view of redundancy as costly and diminishing efficiency³⁵⁰, a view commonly held by officers in the field. The concept of redundancy needs to be further explored in future research and distinctions between redundancy and exact reproduction need to be introduced. This will allow to understand in which domains of the SES, and particularly, of public policy, redundancy constitutes a positive mechanism.

³⁴⁹ The timeframe established for this study did not allow me to investigate in depth OEFA, which was in the process of being established at the time of fieldwork. The work of the organization would require future scholarly attention.

³⁵⁰ See Low et al. (2003) for a discussion.

The experience of the Environmental Ombudsmen in Peru (p. 290) suggests that the Ombudsmen for Mother Earth affairs in Bolivia may play a determinant role in ensuring accountability.³⁵¹ As far as Environmental Prosecutors are concerned, not only were they able to initiate judicial processes, potentially leading to sanctions, but their presence in the CARs allowed other actors to justify their positions and negotiate (p. 289). Importantly, from the comparative perspective, it emerges that the main differences between Peru and Bolivia are: (i) the institutionalization of large coordination mechanisms such as CAR and CAM; (ii) the creation of several supervisory agencies; and (iii) the creation of opportunities to negotiate that the presence of representatives of these supervisory agencies in the coordination mechanisms gave the other actors.

The role of the agencies of control and supervision in terms of bringing organizations to *effectively* comply with their responsibility is however not decisive. Indeed, we do not observe significantly contrasting results between Peruvian and Bolivian environmental performance that could be attributed to the pressure exerted by these agencies. What seems clear is that the agencies of supervision brought the environmental area to decision-makers' attention. This might not have an immediate effect on the management structure but it contributes to raise awareness over environmental responsibilities, which might have effects in the long run.

The evidence collected during fieldwork does not allow to conclude that the differences between the environmental understanding promoted by Bolivia and that promoted by Peru result in differences in the policies and programmes actually put forward. It is worth

³⁵¹ This is not to say that the Ombudsmen for Mother Earth will necessarily be effective in holding organizations accountable. It's important to point to the reader that Uggla's (2004) cross-country studies on the Ombudsman indicate that it is more successful in certain countries than in others. It is worth noting that he classifies Bolivian and Peruvian Ombudsmen as having similar abilities to influence.

noting that at the time of fieldwork policies inspired by *Suma Qamaña* perspective were not yet implemented in Bolivia (p. 184; pp. 313–314). This is partly explained because fieldwork took place relatively soon after the approval of the Bolivian Constitution in which *Suma Qamaña* was defined as guiding the country's development project. Yet, it is also necessary to remain aware that respondents often depicted the MAS government as dominated by the 'developmentalist' tendency at the expense of the defenders of *Suma Qamaña* (p. 184; p. 277; p. 314). Regardless of how ambitious (or how modest) the implementation of *Suma Qamaña* inspired policies turns to be, it is likely to introduce new changes in the system. Delays in coordination and general management arrangements need to be forecasted before the effects of this generation of policies can be evaluated.

Furthermore, it is important to signal that cooperation agencies, which play a significant role in funding projects in the environmental area, are able to work creatively to secure further institutional stability in order to advance in their own agendas. For example, to give continuity to the projects across electoral terms, CAN decided to include the future mayor of Peruvian Desaguadero in all the meetings on the building of the city sanitary landfill so that he would give continuity to the project once in office (p. 276). Creative initiatives securing the effective implementation of projects could certainly be extended.

While a sound institutional design cannot 'fix' environmental problems, it can help in what I have called 'capturing spaces' of environmental protection. As we have seen, even though state capacity in the area is weak, institutionalized practices or visions are used by the actors in the field as tools to argue for the legitimacy of their demands (p. 314). It is necessary, however, to give actors the space for such 'capturing'. This is achieved through creating more instances of coordination and participation mechanisms and conceiving them as spaces in which to negotiate. It is crucial indeed to remain aware that both in organizational cooperation and in popular participation instances, "open and

transparent forums alone do not compensate for power differentials among participants, or for differences in resources and skills” (Brugnach and Ingram 2012, 50).

The complex and diverse relationships between residents, civil society associations and public organizations provided one of the main interactions in the system. Civil society organizations played different roles in trying to consolidate their agendas, which were more or less aligned with the governments’. This was particularly complex in the Bolivian case wherein civil society associations and NGOs had played a crucial role in leading the MAS to power and in providing Morales’ administration with public officers. We saw, for example, the case of CONAMAQ (p. 184), and its officers’ commitment to supervise the government’s effective will to fulfil campaign promises. Therefore, CONAMAQ officers, to some extent, held the government accountable by bringing such issues to the public forum. NGO Lidema provided us with a different example as it took upon the task of reactivating the inter-institutional group working in Cohana. The NGO, for its involvement in the region (p. 106; p. 209), its history as a group bringing together the country’s more prominent environmentalists (p. 155) and its past involvement with public organizations over the situation in Cohana (pp. 296–298), was a legitimate actor to undertake such task. In Peru, we discussed the involvement of civil society associations in the *mesas* against poverty (pp. 218–219) and in the participatory budget mechanisms (pp. 232–237), both of which presented limitations in terms of the representativity of the participants. These spaces seemed to function well for the actors that had managed to capture them, but no initiative was in place to open them up for other participants. Again, it might be appropriate to involve independent agencies of accountability such as the Ombudsman to highlight these shortcomings and contribute, through their recommendations, to address them.

As far as residents are concerned, I would like to highlight here the lessons that can be drawn from the implementation of participatory mechanisms in projects. Indeed, the PDSLT officers insisted that other actors trying to implement sanitation and waste management services should draw on their experience. The difficulties they faced in negotiating with communities resonated with the literature findings on basic service provision projects (p. 228). When such projects emerge from an organization, they do not necessarily follow what communities have defined as their needs and wants. Consequently it is important to keep in mind that a service provision project allows communities to engage in a negotiation and acknowledge their bargaining power. The literature on the evaluation of development projects generally seems to point towards the necessity to make sure projects emerge from communities. Another option would be to simply acknowledge that any project involves numerous actors and that the ‘origin’ of the proposal is only one of the components of its contested legitimacy. Therefore, envisioning each project as necessarily going through a series of negotiations might be an equally acceptable option.

Finally, as far as negotiations are defined, it is critical to adopt a positive approach to conflict, as it can play a fundamental role in allowing powerless actors to express their position (Muradian, Walter, and Martínez-Alier 2012; Triscritti 2013). We saw that demonstrations fulfilled such roles and the institutionalization of the protest movements in the system constitutes a possibility to trigger change. Following Brugnach and Ingram (2012, 50), I argue that “it should not be assumed that conflict necessarily disadvantages the politically powerless: on the contrary, it may serve to generate interest, make issues more salient, and mobilize the disengaged”. This reinforces the idea that organizations in charge of canalizing conflict, such as the Ombudsmen, should be strengthened.

LAST REMARKS: LIMITATIONS AND FUTURE RESEARCH

As indicated in the introduction, the thesis aims to contribute to the SES literature in its relevance to development studies. While it draws inspiration from several other bodies of literature, particularly sociological and political science works on Latin America, it does not thoroughly review all of them. It is not my intention to spell out here all the analytical framework options that could have been followed to understand one aspect or another of the Lake Titicaca case. Yet, I would like to explore two avenues that the limitations of this work highlight, as they might prove particularly fruitful for future scholarship. I would like to introduce some questions posed by this research firstly for the scholarship on environmental social movements and secondly for the scholarship on Latin American bureaucracies and decision-makers.

As far as social movements are concerned, we saw that the political context carried significant weight in determining the kind of mobilizations that appeared (such as the mobilization of Cohana's indigenous fishermen at the time of the election of President Morales) and their outcome (such as the institutionalization of the mining protests in Peru). This echoes some of the sociological literature findings (Gamson and Meyer 1996). Yet, how the movements discussed in this thesis exactly fit with the dynamics of social movements in the Andean region and how they can inform broader aspects of the sociological literature needs to be further explored. To fully understand the mobilized groups that play a role in Lake Titicaca, they need to be examined using the parameters identified in the literature as crucial to understanding the dynamics of social movements: leadership, mobilization tactics and network composition (Lobina, Terhorst and Popov 2011; Taylor 2011). For such a study, the approach would need to be modified: the majority of the variables identified in this thesis should be considered as external drivers,

i.e., variables that affect the movement but are not affected by it, and focus should be put on the internal dynamics of those movements.

Exploring the dynamics of environmental social movements is particularly relevant in the current regional context wherein such movements can play a crucial role in holding elected governments accountable for their promises. For example, future research might want to compare the dynamics of what could be called the ‘reactive’ movements presented in this thesis (such as those mobilizing against the effective degradation of water quality, for example the Peruvian anti-mining movements) with what could be called the ‘preventive’ movements against projects that would lead to environmental destruction. I particularly think of the mobilization against the building of a road across a Bolivian national park, the TIPNIS, which is both a natural protected area and an indigenous reserve (Perrier Bruslé 2012) on the one hand, and the mobilization against the building of the Inambari dam in Puno on the other hand (The Economist 2009). A comparison of these types of movement would inform on who are the key actors, how they view the system and their role in it, as well as the kind of roles environmental movements can play in future agendas.

The thesis also raises questions for political science which I hope to explore in future research. Focusing on bureaucracies and decision-makers and bringing in certain branches of the political ecology literature opens up the possibility to integrate the study of power into the SES framework so that it becomes fully operational and speaks to broader academic audiences.

The complexity of the Lake Titicaca case has provided an insightful account of the variables shaping the kind of interactions that sustain and modify the SES and has shed light on the specific roles of bureaucrats and decision-makers in the environmental area. Yet, studies in different contexts and with larger time-spans are necessary to confirm the

validity of the variables identified here, and uncover others. In particular, two questions arise that could usefully be explored in further studies: (i) are the variables identified in the Titicaca case meaningful for bureaucrats and decision-makers in other regions? and (ii) what relevance do the networks created by the Titicaca actors have for the system in the long-term?

Answering these questions will uncover the specificities of environmental bureaucracies vis-à-vis other bureaucracies, and help determine the weight of the environmental area for decision-makers for whom it is only one area among many. Retaining the focus on water management is appropriate since the challenges for development posed by the issue are far from being successfully addressed and will remain crucial in coming years.

To explore whether the variables identified in the Titicaca case are meaningful for bureaucrats and decision-makers in other regions, it would be necessary to compare the results obtained here with results from other areas where a similar approach is followed. Particularly appropriate cases for comparison would be other trans-boundary basins in Peru and Bolivia. This would allow us to appreciate whether regional differences in certain variables (for example, the level of development of the region, the main economic activities, the history of the management) are significant. Introducing a new Latin American country would also provide rich comparative elements informing the larger expandability of the findings while ensuring compatibility by focusing on the same region. It would be interesting to introduce either Brazil or Chile for the relative institutional strength and development these countries have in comparison to Peru and notably, to Bolivia. Moreover, including these countries in the study seems particularly important since their water management choices have received scholarly attention. In Brazil, research has investigated the tensions between water bureaucracies and civil society (Abers 2007; Ioris 2009; Lemos and de Oliveira 2004; Tankha and Fuller 2010).

In Chile, the political ecology scholarship has explored diverse aspects of the role of water and the institutionalized ‘knowledge’ over it in sustaining the distribution of power brought about by neoliberal reforms (Bauer 1997; Budds 2009; 2013).

These studies have examined the role of bureaucracies, which brings me to the potential this literature has to support the investigation posed by the second question presented. Traditionally, bureaucracies have been studied with the intention of determining what made them ‘efficient’. Put roughly, this approach created recommendations on how to guide their behaviour to obtain better outcomes (Rauch and Evans 2000; Schneider 1993). By contrast, the study I propose would investigate the role of different bureaucracies in defining the kind of system that appears and in sustaining it over time. While grounded in SES theory, the study would resonate with the scholarship on bureaucratic autonomy (D. Carpenter 2001), as it examines the role of formal and informal institutions in crafting and modifying the system. The project would also draw on the scholarship on technocrats that constitutes a central part of the study of politics in Latin America.³⁵² Crucially, the study will bring in the political ecology literature as the study of bureaucracies is intrinsically linked to that of power.

Tentatively, it seems that a multi-level comparative study of Peruvian and Chilean or Brazilian water bureaucracies would be the most fruitful way to answer the questions presented here. Indeed, focusing on Peru seems particularly relevant as water bureaucracy in Peru has received less attention than in other countries in the region.³⁵³

³⁵² This scholarship has mainly focused on the role of technocrats in authoritarian regimes (Centeno and Silva 1988) and the tensions between ‘technocracy’ and democracy (Williams 2006).

³⁵³ It has focused on water provision, and specifically so in Lima (Ioris 2012). It is also important to mention the critical study by Cleaves and Scurrah (1980) on the ‘agriculture’ bureaucracy during the authoritarian regime.

Perhaps more importantly, because of the recent evolution of the institutionalization of water management, Peru appears as a very interesting case.

As we saw, the creation of the National Water Agency (ANA, attached to the Ministry of Agriculture) in 2008, and the approval of the new Water Law in 2009, opened the door for a revision of water administration. As far as the bureaucrats were concerned, the ANA was staffed by irrigation engineers, which suggests that the agency put less emphasis on the public and ecosystem health aspects of water management (Deutsch-Lynch 2012). Moreover, the decentralized instances created with the ANA, the Administrative Authorities of Water (AAA, at the basin level) and the Local Authorities of Water (ALA, at the sub-basin level) built on the pre-existing local Irrigators Committees, confirming that irrigation was given a significant weight in the design of water management.

On top of that, the new water management design established that each of the country basins and sub-basins should have Basin Council for Water Resources in charge of designing and implementing basin management plans. These councils are meant to include all water stakeholders and therefore go well beyond irrigation. It will be particularly interesting to study the positioning of different bureaucracies (mining, environment) vis-à-vis the defenders of the neo-liberal approach to water management and the actors that resist it, typically peasant communities. Indeed, in the years immediately preceding the election of President Ollanta Humala, the neoliberal approach to water management saw a revival, and so did the resistance of peasant communities (Deutsch Lynch 2012). Through the study of the Councils for Water Resources, which are designed as participatory instances, it will be possible to determine the kind of alliances bureaucrats with differing relative power manage to establish.

Currently, only six of the 159 councils have been formed. The study I would like to undertake will focus on three of these and retrace the networks built by the different bureaucracies participating in the councils since their formation. An in-depth network study of the different bureaucracies at play will allow us to determine the role of these networks in putting forward specific visions of water and the ecosystem. Adopting an SES approach to studying the different bureaucracies will determine the ways in which the diverse understandings held by these bureaucracies affect the system and are affected differently by the same water 'events'. Pursuing a comparative study with either Chile or Brazil will test the applicability of the findings on bureaucratic networks and confirm the variables identified in this thesis: particularly the role of different sorts of knowledge in determining the possibilities of interaction with water as well as the state of the system.

To sum up, the new study I put forward would shift the perspective from a problem (water pollution) to a focus on a specific category of actors (bureaucrats), which will further align SES theory with institutional analysis and political ecology. Providing the SES framework with the tools to explore the complex web of relationships, motivations, negotiations and power allocations affecting bureaucrats will help focus attention on a set of variables that are both crucial in determining the kind of system in place and in creating an adaptive institutional design. Indeed, concentrating on the bureaucrats will help identify some of the difficulties in leading the system towards a desired outcome as well as the variables that support this outcome. Such research is essential if we are to design institutional structures that encourage the resilience of rich social-ecological systems that provide local people with multiple resources to craft their own development.

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ANNEX 1. IN-DEPTH INTERVIEWS GUIDE

This annex contains a general guide for interviews together with the interview outlines for the different groups of interviewees. While the general themes discussed with all my interviewees are similar, the length and level of detail devoted to one area or the other varied in line with the information I was seeking and the perceptions I was investigating. I always used this written guide in my interviews but the order followed and the phrasing of the questions varied organically.

GENERAL GUIDE

1. Information about the interviewee (time in post, position previously occupied, brief personal history)
2. Perceptions about the organization (availability of resources and staff, main strengths and challenges, transmission of information, relationships between officers within the organization – with peers and hierarchy)
3. Coordination with other organizations (at different administrative levels and at the binational and international levels), discussion of historical and political tensions, perception of other organizations and hypotheses on the perceptions of other organizations/residents on the organization of the interviewed officer, weight of bi-national /transboundary issues
4. The management of the lake (knowledge, values, definitions, history, agreement with other organizations, challenges, how the organization fit in the general organizational web, impacts of changes in national politics, bi-national relations)
5. The legal and political frame of the country and its history (definitions of and tensions over ‘environment’ and ‘development’ / ‘water management’ and ‘environmental management’)
6. The legal and political frame of the bi-national aspects of management

INTERVIEW MODELS

Public officers

- For how long have you hold this post?
- What did you do before?
- What are the changes you have witnessed in the recent years?
 - o In water management?
 - o In environmental management?
 - o In decentralization policies?
- Have there been any changes in budget/staff allocation?
- How do you evaluate your allocated budget respective of your estimated needs?
- What is the strength of your organization?
- What are the main challenges?
- What are the aspects of your work that you judge more relevant for the management of the lake?
- What are the main sources of knowledge/guidance you use?
- How do you define water quality?
- How do you define the state of the bays?
- Is the current state sustainable? What is necessary for it to be?
- Do you use archives from previous administrations?
- How was the transition? Do you communicate with former officers?
- What are the priorities for your directorate?
- What should be the priorities for the lake?
- What are the main coordination patterns your organization fits into?
 - o My interviewees here usually gave a general appreciation on the matter and then I proceeded to ask specifically on each of the organizations intervening in the lake or constituting the hierarchy of the organization wherein the officer was based
- Are there organizations with which it is easier/more difficult to coordinate? Why? How has this evolved?
 - o Can you specifically comment on multi-level aspects?
 - Have the tensions between the regional and central governments affected your work? (if relevant)

- Can you specifically comment on bi-national aspects?
 - Have the tensions between Presidents Morales and García affected your work?
- Social participation? How are your relationships with civil society? The residents of the area?
- Have these evolve? How can this be explained?
- How have the recent changes at the national level affected your work? (opening of the Minam / Morales' discourse)
- How have the administrative changes of the past affected your work?
 - In terms of the management of the bay?
 - As water management / environmental management are concerned?
- What role does international cooperation play in the area?
- What roles do NGOs play?
- What role do you think it/they should play?
- How do you imagine the future of the lake? Would any particular change be necessary?

Academics (natural scientists)

- What previous studies exist on the lake? Which ones do you use? Why?
- What can be said about the ‘quality’ of the lake water / state of the lake bays?
 - o What are the causes of what you describe?
 - o The consequences?
 - o What solutions do you think would be available for policy-makers?
 - o Why are these not implemented?
 - o What do you think about traditional or indigenous knowledge?
 - o How do you interact with the lakeshore residents? (academics usually visited the area to measure water quality)
- How is the lake state measured? How should it be?
- What has been the evolution on this topic?
- Have the definitions of the situation changed?
- Have they triggered interventions?
- What aspects do you find particularly worrying?
- How do you see the evolution of the situation?
- What different scenarios can be forecasted?

NGO officers, environmental consultants and actors interviewed to understand the background

- What are the significant steps in the history of ‘sustainable development’, environmental and water management in the country?
- What do you consider to be the main achievements / problems in terms of institutionalisation of environmental management / water management?
 - o Who have been the leading actors behind these achievements / issues?
 - o What roles has the international community played?
 - o What roles have NGOs played?
 - o What do you think would have been the best approach to the question?
 - o Why has it not been followed? (if relevant)
- What have been the main challenges?
 - o How have ‘development’ and ‘environment’ been conciliated?
 - o How has ‘water management’ been understood?
 - o How are these challenges addressed now?
 - o What do you think remains to be done?
 - o What new challenges do you identify now?
 - o What reasons do you identify as drivers of these challenges?
- How do you see the recent changes introduced in the environmental / water management area?
 - o How do you evaluate them so far?
 - o Are changes in definitions of the ‘environment’ important?
 - How are these institutionalised? Is this important?
- How are your relationships with the public authorities (different levels)?
 - o How have these changed / evolved?
 - o How do these relationships affect your work / agenda?
- How are your relationships with cooperation agencies?
 - o What role do these actors play?
 - o How have these changed / evolved?
 - o How do these relationships affect your work / agenda?
- The lake.
 - o If the interviewee was participating in a project with direct effect on the lake, similar questions to those asked to public officers were asked.

- To all: how important do you think Lake Titicaca is for the country from an environmental / developmental point of view?
- How are the problems of the lake different to those of other areas?

International cooperation officers

- What are the main priorities the agency has for the country?
- How are those priorities defined?
- What would you classify as the main achievements?
- What have been the main challenges?
 - o Have there been any frustrations?
- How do you see your role in forthcoming years?
- What are the main changes the country has made in the environmental area / water management in recent years?
- How has the agency supported these changes?
- What other changes do you think should have been made?
- What are the most urgent challenges?
- How is your relationship with national officers?
 - o Has it evolved with the changes in government? At different administrative levels?
- What are the main challenges when coordinating with national officers?
- How do you cope with these?
- How are your relationships with NGOs? What role do these actors have?
- The lake.
 - o If the interviewee was participating in a project with direct effect on the lake, similar questions to those asked to public officers were asked.
 - o To all: how important do you think Lake Titicaca is for the country from an environmental / developmental point of view?
 - o How are the problems of the lake different to those of other areas?

ANNEX 2. QUESTIONNAIRES

348 questionnaires were run: 98 people in Copacabana, 103 in Puno, 44 in Bolivian Desaguadero, 51 in Peruvian Desaguadero and 52 in Cohana. The sampling was defined with local researchers, its rationale consisted in focusing on events (such as Desaguadero fair) or spaces (such the area around the church in Copacabana) that brought together heterogenous populations in terms of occupation and age range, which provided with relatively randomized samples. In Cohana, I proceeded by including members from each of the communities in the area. Questionnaires were used as a qualitative research tool and therefore, seek to explore the multiplicity of views at play in the field and not to produce statistically representative data. Many questionnaires were followed by extensive discussions.

My first fieldwork design included the running of focus group, which I was discouraged to do by my contacts in the field. The questionnaires were prepared with the help of those contacts who suggested considerable modifications to the questions as I had planned, for they judged these were too technical (I had planned to start by asking my respondents how they would evaluate water quality) or too disconnected with the reality of the field (I had planned to ask my respondents whether they believed there were environmental problems in their living area). I present here the questionnaire that was actually ran.

QUESTIONNAIRE MODEL

Descriptive data on respondents

- Place of residence? If several, precise.
- Age
- Occupation
- Gender

Questions

- What are the main environmental problems in your place of residence?
- What causes these problems?

- Has any organization explained this to you? Has any organization provided you with information that has modified your perception of the problem?
- Who should solve this problem?
- Does this problem affect you? How?
- If Yes: Who is helping you with this?
- Which organization is the one doing the best job? Why?
- In Cohana: Which organizations are present in the area?
- If you were told you are doing something negative for the environment, would you be ready to change?

ANNEX 3. EXAMPLES OF FIELD-NOTES (DISCUSSIONS AND OBSERVATION)

Observation was one of my central research techniques. It aimed at accounting for the diversity, complexity and ambivalence of the perceptions and understandings at play. Formal interviews were followed by informal discussions, which I categorized as ‘field-notes’. When invited to field-trips with diverse organizations, I also took extensive notes. When my interviewees in different organizations attributed behaviours, perceptions or feelings to the residents of the lake, my own observation allowed me to confirm or reject such reports. In case of rejection, I tried to contextualise how my interviewees’ interpretation could be explained. Finally, many of the questionnaires were followed by long discussions with my respondents. I spent significant amounts of time observing and talking with members of the different groups targeted in each of the field-settings.

I provide here some examples of how I classified my observations.

Data	Examples: Context and Date
Visible Manifestations of ‘Pollution’ (Duckweed and Waste)	<p>My respondents pointed at these as we saw them (the vast majority of discussions took place outdoors). Examples include:</p> <p>*Copacabana: one of the groups targeted in the sampling (‘tourism’) included the tenants of the restaurants by the beach, who signalled the presence of plastic bottles and other ‘waste’ by the lakeshores. Moreover, the MMAyA together with the Municipality of Copacabana and the La Paz Regional Government, organized an event (27/11/2010) aiming at the collection of waste on the beach, which gave my respondents the opportunity to further comment on the issue.</p> <p>*Desaguadero: during the fair, my respondents encouraged me to observe the waste accumulating under the Desaguadero bridge and on the streets as the day of the fair advanced.</p> <p>*Puno: I met several biologists (through snowballing techniques, as one of them had cooperated in past research projects with my interviewees from the UMSA in La Paz, and then he introduced me to others) who showed me pictures from previous years where I could</p>

see the bay being completely covered by the duckweed.

*Cohana: the duckweed was signalled to me as encountered, and so was waste. My interviewees also showed me pictures of the bay from previous years.

Bad Smells and Headaches

*Puno, one of the groups targeted ('tourism') shared the problem, it was a source of commercial concern especially because the handicraft market, one of the touristic attractions of the city, was by the lake.

*Cohana, it was reported by some of the farmers. They specifically indicated that it was "worse in the rainy season".

The true state of the lake as pure blue

In Bolivia, it was extremely common that my respondents would say that the lake was "their sea" and that it was "as blue as the sea".

*Cohana: some of the residents explained that people from La Paz would never believe that "the Lake was green" because their perception of the Lake was based on Huatajata (village at equal distance from Cohana and Copacabana, situated on an open bay and away from the arrival of Katari river, it's a typical week-end destination for La Paz residents), where the lake "looked like the sea".

*Discussions with managers in La Paz: several managers shared their belief that "people" were "unaware" of "the situation in the lake" and that in their imaginary the lake was "pure blue" (as opposed to green). This "unawareness" was also mentioned by one of the speakers at a conference organized by the Bolivian Naval Forces on the Lake (12/10/2010). This conference brought together Bolivian and Peruvian participants.

*Copacabana: my respondents recommended me to go to the top of Calvario hill so that I could see the lake was "in fact completely blue" (i.e., I would not see the waste).

*Puno: my respondents advised me to observe the lake from one of the city's viewpoints where the lake is "only blue" (i.e. the interior bay could not be seen).

ANNEX 4. LIST OF RESPONDENTS QUOTED

In alphabetical order of ID.

ID	Details	Date
AAOFFXER	Officer at MMAyA (Vice-Ministry of Environment)	04/03/2011
ALAU2	Officer ALA Huancané	21/09/2010
ALT1	High rank ALT Officer	08/11/2010
ALT3	High rank ALT Officer	15/09/2010
ALT5	ALT Officer	25/10/2010
ALT6	ALT Officer	09/11/2010
ALTDM	High rank ALT Officer	29/09/2010
ALTUNEP	ALT Officer in charge of coordinating with UNEP	21/09/2010
CAN1	Officer participating in the PIGARS Desaguadero Project	10/12/2010
CANCUE	High Rank Foreign Affairs Officer - Bolivia	05/11/2010
CFCMN2	Cohana Resident - <i>dirigente</i>	16/11/2010
CFMVCV	Cohana Resident - <i>dirigente</i>	17/11/2010
CFOALL	Cohana Resident - <i>dirigente</i>	17/11/2010
CFSCITL	Cohana Resident – marka level <i>dirigente</i>	15/11/2010
CIWRMPN	Environmental consultant, having worked extensively with national administrations in Peru and Bolivia on water management	03/02/2011
CNQD	CONAMAQ Demonstrator	09/10/2010
CONVMUT	High-Ranking Officers at the Ministry of Foreign Affairs	11/11/2010
COPALE	Mayor of Copacabana	28/03/2011
COPNBAS	<i>Dirigente</i> in the neighborhood association of Copacabana	28/03/2011

COPOIR	Environmental Consultant	29/09/2010
COOPIE	Cooperation Officer based in Bolivia	14/03/2011
COOPLNS	Cooperation Officer based in Bolivia.	25/10/2010
COOPLUS	USAID Officer based in Cohana	15/11/2010 (field-notes)
CTRMA	Officer at the Bolivian State Comptroller	14/03/2011
DPTMASSL	Senator in the Mother Earth Commission	22/03/2011
DIRESUP	Officer at the Regional Direction of Environmental Health – Ministry of Health (Puno)	10/02/2011
EAJVMA	<i>Dirigente</i> in the neighborhood association of El Alto	30/10/2010
EDRGP1	Officer at the Directorate of the Environment in the Regional Government of Puno	28/09/2010
EDRGP3	Officer at the Directorate of the Environment in the Regional Government of Puno	25/10/2010
EDRMP1	Officer at the regional office of the Ministry of Production in Puno, in charge of environmental affairs	15/02/2011
EMSAIE	High Rank officer at EMSA PUNO	10/02/2011
EPSASPKIO	Officer at EPSAS, in charge of the expansion of Puchukollo treatment plant	05/11/2010
FCHA	Cohana resident – <i>dirigente</i>	15/11/2010
FISAM	Officer at the Environmental Prosecutor	07/02/2011
GRMAAR	Officer at the Directorate of the Environment in the La Paz Regional Government	13/10/2010
KPRKRO	Officer at the MMAyA – Katari River Basin Programme	03/03/2011
Lachai	Environmental Consultant working at the local level in Bolivia.	07/09/2010
LIDOFF1	Lidema Officer	30/10/2010
MAAQP	Officer at the Aquaculture Directorate – Ministry of Production - Lima	14/12/2010

MAOFFPP	Cooperation Officer – Water and Sanitation specialist. Former Public Officer in Bolivia (Chief of the General Environmental Directorate at the MMAyA)	06/09/2010
MASSV	Hing-ranking MAS leader involved in the drafting of Mother Earth law	02/03/2011
MINAM7	Officer Minam (Directorate of Climate Change Desertification and Water Resources – Vice-Ministry for the Strategic Development of Natural Resources)	14/12/2010
MINAM12	Officer Minam (Directorate of Climate Change Desertification and Water Resources – Vice-Ministry for the Strategic Development of Natural Resources)	07/12/2010
MINAMDM	Officer at the Minam (Directorate of Environmental Education, Culture and Citizenship – Vice-Ministry of Environmental Management)	14/12/2010
MINAMIAM	Officer at the Minam (Directorate of Environmental Quality – Vice-Ministry of Environmental Management)	10/12/2010
MINAMLI	Officer at Minam (Directorate of Territorial Ordering – Vice-Ministry for the Strategic Development of Natural Resources)	13/01/2011
MINAMLU	Officer at Minam (Directorate of Territorial Ordering – Vice-Ministry for the Strategic Development of Natural Resources)	14/12/2010
MINAMON	Officer at the Minam (Cooperation and International Negotiations Office)	10/12/2010
MMAyAKC1	Officer at the MMAyA (Katari River Basin Programme – Vice-Ministry of Water Resources and Irrigation)	03/03/2011
MMAyAOEA	Officer at the MMAyA (Office of the Minister)	06/10/2010
MNCPWR	Officer at the Municipality Copacabana	29/03/2011
MNPNRE	Officer at the Environmental Directorate of the Municipality of Puno	08/02/2011
MNPNREA	Officer at the Environmental Directorate of the Municipality of Puno	29/10/2010
MSHNBD	Bolivian environmentalist who had worked	11/11/2010

	in diverse NGOs and as a consultant for different national administrations	
MUNPNDE2	Officer at the Municipality of Puno	10/02/2011
MUNPNDBL1	Officer at the Municipality of Puno (Programme on the depollution of the bay)	30/09/2010
MUNPNOFFDI	Officer at the Municipality of Puno	30/09/2010
NGOASG	Officer at the NGO Sustainable Water (La Paz)	11/11/2010
NGOBCI	Officer at the NGO Institute for the Common Good (Lima), specialist in environmental affairs	15/12/2010
NGOCAOI	Officer at the Andean Coordinator of Indigenous Organizations (CAOI - Lima)	12/12/2010
NGOCNQ2	Officer National association grouping together the Ayllus and Markas (La Paz)	05/10/2010
NGOCPTSUEA	Officer at the NGO Centre for the Promotion of Sustainable Technologies (La Paz)	21/10/2010
NGODO	Director of the Regional Office of an International Environmental NGO based in La Paz	09/11/2010
NGOHHU	Officer at the NGO Centre for Sustainable Development (Puno)	07/02/2011
NGOim	Officer at the NGO Lidema (La Paz)- National Coordinator of the Research and Environmental Monitoring Programme	13/09/2010
NGOneu	Officer at the NGO Institute for Rural Development (Puno)	27/09/2010
NGOSERLA	Officer at the NGO Rural Educative Services, in charge of governability and decentralization (Puno)	27/10/2010
NGOuo	Officer at the NGO Suma Qota (Puno)	03/02/2011
NRTEO	High rank officer at the National Reserve of Titicaca	04/02/2011
OFFVCAA	Officer at the Vice-Presidency of the State, in charge of providing support to the chambers work on the law of Mother Earth	21/10/2010

OMBPNMA	Officer in charge of environmental affairs at the Ombudsman Office in Puno	4/10/2010
PDSLTAU	PDSL'T Officer - Former public officer (MMAyA)	24/09/2010
PDSLTOFF3	PDSL'T Officer – had worked in the project in the different stages	25/10/2010
PELTZ	PELT officer	21/02/2011
PNASVS	<i>Dirigente</i> at the neighborhood association in Puno	27/11/2010
PNRGUL	Officer at the Regional Office of the Ministry of Tourism	25/10/2010
PNUMAGC	Focal point in Puno for the UNEP project Geo Titicaca	03/02/2011
R0003	Copacabana handicraft shop-keeper (male, age 60)	28/03/2011 (questionnaire)
R0040	Copacabana tourism agent (male, age 34)	29/03/2011 (questionnaire)
R0161	Puno café tender (female, age 35)	28/09/2010 (questionnaire)
R0167	Puno craftsman (male, age 51)	03/10/2010 (questionnaire)
R0208	Desaguadero Peru farmer (male, age 50)	25/03/2011 (questionnaire)
R0226	Desaguadero Peru shop-keeper (female, age 36)	25/03/2011 (questionnaire)
R0290	Desaguadero Bolivia housewife (female, age 25)	25/03/2011 (questionnaire)
RNTAR	High rank officer at the National Reserve of Titicaca	12/10/2010
STCPAL	Officer at the State Comptroller (Lima)	6/12/2010
TOTORPN	Officer in Puno – details omitted	21/02/2011
UOBEE	UOB Director	21/09/2010
VCAIB	Vice-Minister	15/09/2010

Used generically in text but not directly quoted:

Organization	Number of officers interviewed
Authority for the Supervision and Social Control of Drinking Water and Sanitation (AAPS)	2
ALA (Local Authorities of Water)	3
ALT (Bi-National Autonomous Authority)	3
ANA (National Authority of Water)	2
Andean Community	2
Cohana <i>dirigentes</i>	7
Cooperation Agencies	16
Members of Congress (Bolivia)	3
Environmental consultants	3
EPSAS (Public Social Company for Water and Sewerage)	4
FPS (Social and Productive Investment Fund)	1
Former ALT	2
Former Ministers	4
Former Vice-Ministers	3
La Paz Regional Government	7
Ministry of Defense (Bolivia)	2
Ministry of Environment and Water (Bolivia)	11
Ministry of Foreign Affairs (Bolivia)	2
Ministry of Land (Bolivia)	2
Ministry of Planning (Bolivia)	1
Ministry of Economics and Finances (Peru)	3
Ministry of the Environment (Peru)	3
Ministry of Foreign Affairs (Peru)	5
Ministry of Health (Peru)	1
Ministry of Housing (Peru)	2
Ministry of Mining (Peru)	3
Ministry of Production (Peru)	8
Ministry of Tourism (Peru)	2
Municipality of Copcabana	5
Municipality of Desaguadero Bolivia	2
Municipality of Desaguadero Peru	1
Municipality of El Alto	3
Municipality of Pucarani	6
Municipality of Puno	9
National Centre of Strategic Planning (Ceplan Peru)	1
National Institute of Andean People Development (Indepa Peru)	1
Naval Forces Bolivia	1
NGOs	18
Organism for Environmental Evaluation and Supervision (Peru)	1
Ombudsman (Peru)	1
PDSLIT (Sustainable Development of Lake Titicaca Project – Bolivia)	3
PELT (Special Project Titicaca Lake – Peru)	5
Puno Regional Government	13
Senators (Bolivia)	4

SUNASS (National Sanitation Services Authority)	1
State Comptroller (Peru)	2
State Comptroller (Bolivia)	1
Universities	13
UOB (Bolivian Operational Unit – Bolivia)	1
Vice-Presidency (Bolivia)	3

ANNEX 5. BUDGET ANALYSIS

Budgets were calculated in real terms and percentages for each year and organization following the rationale explained in Chapter Six. The conclusions drawn from this exercise are included in the text of Chapter Six. Two examples of the kind of budget tables composed for the analysis are provided here as an example. All budget tables can be provided upon request. The figures presented here are respectively in Nuevos Soles (Peru) and in Bolivianos (Bolivia).

Bolivia 2011	TGN	TGN as percentage of orga budget	Specific Resources	Spc Res as percentage of orga budget	Credits	Credit as percentage of orga budget	Donations	Donations as percentage of orga budget	Total
MMAYa	54211607	12%	0	0%	163639369	37%	221331477	50%	439182453
MMAYa as percentage of budget type	82%		0%		100%		98%		
Sernap (part of MMAYa)	13862380	29%	0	0%	0	0%	33908853	71%	47771233
Sernap as percentage budget type	21%		0%		0%		15%		
Emagua	4417377	56%	93600	1%	0	0%	3320387	42%	7831364
Emagua as percentage of budget type	7%		0%		0%		1%		
FONABOSQUE	0	0%	16437715	100%	0	0%	0	0%	16437715
Fonabosque as percentage of budget type	0%		53%		0%		0%		
Sostenibilidad SanBasic	809809	11%	6107126	82%	0	0%	519321	7%	7436256
Serv Sost San Bas as percentage of budget type	1%		20%		0%		0%		
Fiscal AguaPot Sanem	6841337	44%	8600000	56%	0	0%	0	0%	15441337
Fiscal AguaPot Sanem as percentage of budget type	10%		28%		0%		0%		
Total Area	66280130	14%	31238441	6%	163639369	34%	225171185	46%	486329125

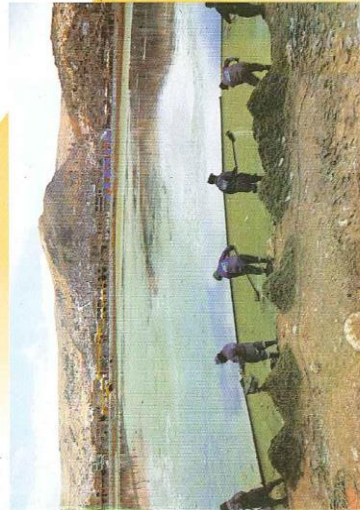
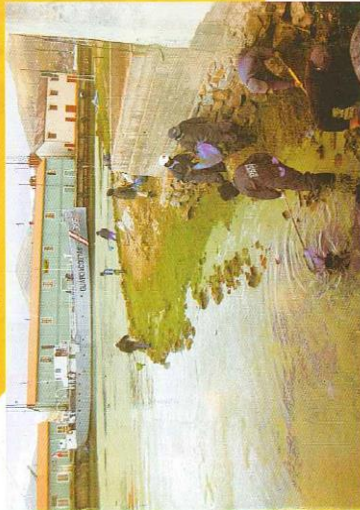
Peru 2011	Ordinary Resources	Ord Res as percentage of the organization budget	Self-Collected Resources	Self-Collected Res as percentage of orga budget	Credits	Credits as percentage of orga budget	Transfers and Donations	Transfers and donations as percentage of orga budget	Total
Minam	76410000	100%	0	0%	0	0%	0	0%	76410000
Minam as percentage of budget type	41%		0%		0%		0%		
Superintendence of Sanitation Services	0	0%	19000000	100%	0	0%	0	0%	19000000
Superintendence of Sanitation Services as percentage of budget type	0%		24%		0%		0%		
OSINFOR	16947000	93%	1200000	7%	0	0%	0	0%	18147000
OSINFOR as percentage of budget type	9%		2%		0%		0%		
SERNANP	43084550	86%	7300000	14%	0	0%	0	0%	50384550
Sernanp as percentage of budget type	23%		9%		0%		0%		
ANA	25009080	28%	47217900	52%	17613000	19%	666900	1%	90506880
ANA as percentage of budget type	14%		60%		100%		100%		
OEFA	23518597	87%	3567392	13%	0	0%	0	0%	27085989
OEFA as percentage of budget type	13%		5%		0%		0%		
Total	184969227	66%	78285292	28%	17613000	6%	666900	0%	281534419

ANNEX 6. INSTITUTIONAL DOCUMENTS

The majority of institutional documents used here are available online, that is the case of the laws and budgets quoted, as well as the municipal plans and the press releases. Internal auditing were accessed confidentially so cannot be shared. I reproduce here the PELT brochure because it is a document for which the analysis is extensively developed in the thesis.

PELT Recuperando la Bahía Interior de Puno

En la actualidad el PELT viene realizando jornadas de limpieza de lenteja de agua en la bahía de Puno este trabajo viene realizandolo por más de 2 años, ya que estamos convencidos que no es la solución frente a la contaminación, pero si es una forma de mitigar los efectos de la contaminación



Que usos le podemos dar a la Lenteja de Agua

En investigaciones recientes sobre la composición química de la lenteja de agua, nos indica que el nivel de proteínas esta sobre el 23%, lo que hace digestible para animales menores como los ovinos (Quispe, 1999), pollos en producción de carne, obteniendo buenos resultados en la producción en ganancia de peso durante los primeros 35 días (Ichuta, 1993).



Otro de los usos que se le puede dar, es la transformación a compost, para darle un uso como fertilizantes naturales en los cultivos alto andinos.



Literatura Citada:

- ▶ ICHUTA, N. D.D., 1993. Identificación de Lenteja de Agua en la Utilización de Dieta para Pollos de Carne, Ensayo de Crecimiento, Tesis pre-grado, Universidad Nacional del Altiplano.
- ▶ HAUSTEIN, A., 1985. Estudio de la Lenteja de Agua "Lemna sp." En aguas servidas - Lima Peru
- ▶ QUISPE, F. B. C., 1999. Caracterización Nutricional de la Lenteja de Agua Lemna sp. en ovinos, Tesis pre-gradual, Universidad Nacional del Altiplano, S.A.
- ▶ WETZEL, L., 1981. Limnología editorial Ortega, S.A. España

Lemna sp.

"Lenteja de Agua"



PLAN DE EDUCACIÓN AMBIENTAL

Una Realidad que nos Indica que ya... Debemos de Parar la Contaminación



“Lenteja de Agua”

Muchas veces *Lemna* spp. “Lenteja de agua” fue considerada como uno de los contaminantes de las aguas de la Bahía interior de Puno, lo cual no es cierto ya que como cualquier organismo acuático, su presencia nos indica algunos cambios que se producen en el ecosistema, siendo el caso de la lenteja, que actúa como un indicador de aguas con presencia de nitratos y fosfatos que son productos de la contaminación; hoy en día la bahía interior de Puno viene recibiendo una carga de aguas servidas de más de 120 000 habitantes, lo que hace que sea más vulnerable a la eutrofización y a la sobrecarga de estos nutrientes, trayendo con ello la degradación de esta parte del Lago Titicaca.

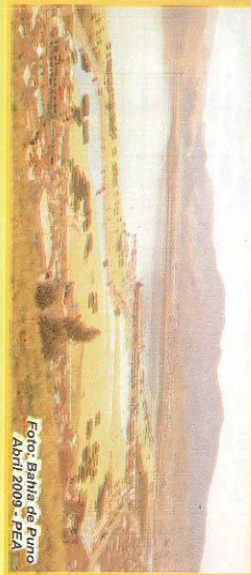
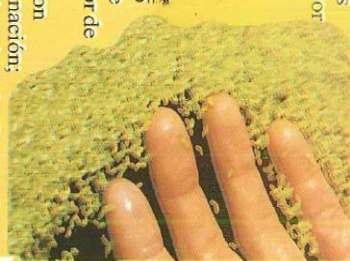
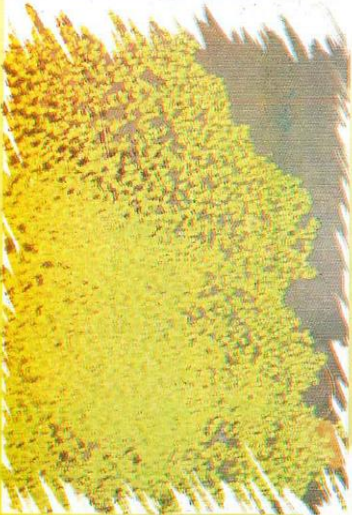


Foto: Bahía de Puno
Abril 2009 - PEA

Sualidades de la Lenteja de agua

La capacidad nitrificantes de la lenteja de agua hoy en día es utilizada para el tratamiento de aguas servidas, esta planta tiene la capacidad de disminuir la demanda bioquímica del oxígeno (DBO) los sólidos totales en suspensión (STS), los niveles de fósforo; y lo más resaltante, disminuye la concentración de nitrógeno de la aguas residuales (Poole, 1995) por ende la limpieza de la lenteja en la bahía de Puno realizada por el PELT sería algo insulso, lo cual no es así, ya que la lenteja es usada en plantas de tratamiento de aguas servidas mas no en el cuerpo de agua que se quiere conservar (Bahía de Puno), por lo que vemos una alternativa de mitigación el recojo constante de esta planta ya que en grandes cantidades afecta el ecosistema de la Bahía.



Foto: Bahía de Puno
Abril 2010 - PEA

La lenteja de agua es una planta acuática con tres pequeñas hojas flotantes la reproducción se realiza por propagación vegetativa, a través del desarrollo de estolones laterales que dan lugar a nuevas plantas (WETZEL, 1981) Viven bajo un amplio rango de temperaturas de 8 a 25 °C formando densas colonias (HAUSTEIN, 1985)

ECOSISTEMA



La acumulación de lenteja de agua en la Bahía de Puno nos trae como consecuencia la modificación del ambiente acuático, restándole rayos solares, el cual es elemento indispensable para el proceso de fotosíntesis de plantas microscópicas y seres vivos que ayudan a disminuir los niveles de nitrógeno y fósforo. Lo que trae como consecuencia un desequilibrio ambiental en este medio.

ANNEX 7. LEGAL STRUCTURE

PERU

To facilitate the reading, I follow a coded system wherein: bold-underlined is used for **the bi-national level**; bold for the **national level**; bold italic for the ***regional offices of national organizations***; italics for the *regional level*; underlined is used for multi-lateral organizations and cooperation agencies; and regular font for the local level. When laws are not referenced here it is because responsibilities were specified in the body of the thesis.

Responsibilities	Sewerage	Industrial Water Disposal	Small and Artisan Mining Water Disposal	Urban Solid Waste
Direct responsibility	Municipality– Municipal Company for Sewerage and Water (EMSAPUNO) ³⁵⁴	National Water Authority (ANA) ³⁵⁵	<i>Regional Government</i> ³⁵⁶	Municipality ³⁵⁷ Regional Directorate of Health (Diresa) ³⁵⁸
Secondary responsibility (supervision and monitoring)	Environmental Prosecutor Organism for Environmental Evaluation and Supervision (OEFA) National Sanitation Services Authority (SUNASS)	Environmental Prosecutor OEFA	Environmental Prosecutor	<i>Regional Government</i> ³⁵⁹ Diresa ³⁶⁰ Environmental Prosecutor OEFA

³⁵⁴ Art. 122.1 General Law 28611 of the Environment (2005): “Responsible entities for sewerage services have responsibility for the treatment of domestic liquid waste and rainwaters.” & Art. 80.1.1. Organic Law 27972 of Municipalities (2003): “Regulate and control the process of final disposition of solid, liquid and industrial waste in the provincial sphere.” (See also 80.2.1, 80.3.1, 80.4.1)

³⁵⁵ Art. 137.1 Law 29338 of Water Resources (2009): “The National Authority of Water gives authorizations of disposal of residual treated water with the favourable technical opinion of the General Directorate of Environmental Health of the Ministry of Health and of the competent environmental sectorial authority in accordance with the procedures, that for such effect, the Authority establishes.

³⁵⁶ Art. 59.c Organic Law 27867 of Regional Governments (2002): “Promote and supervise the activities of small and artisan mining and the exploration and exploitation of mining resources in the region in compliance with the Law.”

³⁵⁷ Art. 80.1.1. Organic Law 27972 of Municipalities (2003) & Art. 119.1. General Law 28611 of the Environment (2005): “The management of solid waste of domestic or commercial origin or from different origins presenting similar characteristics, are responsibility of local governments.”

³⁵⁸ Regulation of the General Law of Solid Waste (Supreme Decree 057-2004-PCM (2004)). Art. 6.1.b “Approve the environmental impact study and the programme for the adaptation and the environmental management of the infrastructure projects for the transfer, the treatment and the final disposal of waste.”

³⁵⁹ Art. 9. Legislative Decree 1065 (2008) modifying the General Law 27314 of Solid Waste (2000): “The Regional Government needs to assume in coordination with health authority of its jurisdiction and Minam, or asked by any of these authorities ... to complement or substitute the actions of those municipalities provincial or district that cannot assume the same in an adequate form.”

³⁶⁰ Art. 7.5 General Law 27314 of Solid Waste (2000): “Control the management of solid waste, having to adopt as appropriate the following measures:

a/inspect and communicate to the competent sector authority the detected infractions within the areas and installations indicated in the precedent article, in case negative health impacts are generated in their exterior.

b/dispose the elimination or control of sanitary risks generated by the inadequate management of solid waste.

c/require with the due substantiation the performance of the present law to the municipal authority under responsibility.”

Responsibilities	Sewerage	Industrial Water Disposal	Small and Artisan Mining Water Disposal	Urban Solid Waste
Defines national policy / coordinates	Ministry of Housing Minam ANA	Ministry of the Environment (Minam) Ministry of Health Ministry of Production (PRODUCE)	Minam Ministry of Mining Ministry of Health	Minam Ministry of Health deals with the health and technical aspects of management
Additional interventions	<u>KfW loan for treatment plant – Puno Municipality</u> Ombudsman	Ombudsman	Ombudsman	<u>Japanese cooperation agency (JICA) funding supporting a nation-wide programme on sanitary landfills</u> <u>ALT / CAN / European funding in Desaguadero</u> Ombudsman

Responsibilities	Environmental liability	Measuring Water Quality			
Direct responsibility	Minam ³⁶¹	In bodies of water	After treatment	For human use	Impact of activities promoted by the Ministry of Production
	<u>Bi-National Autonomous Authority (ALT)</u>	Minam ³⁶² <i>National Reserve of Titicaca (RNT)</i>	Ministry of Housing, Construction and Sewerage ³⁶³	<i>Directorate of Ecology and Environmental Protection in Diresa</i>	<i>Environmental Department of the regional Delegation of the Ministry of Production in Puno (impact of productive activities)</i>

³⁶¹ Art. 30.2 General Law 28611 of the Environment (2005): “The entities with environmental responsibility promote and establish plans of depollution and recuperation of degraded environments. The National Environmental Authority establishes the criteria for the elaboration of such plans.”

³⁶² Art. 32.1 General Law 28611 of the Environment (2005): “The MPL (Maximum Permissible Limit) is the measure of the concentration or degree of elements, substances or physical, chemical and biological parameters that characterize an effluent or an emission that when it is exceeded causes or can cause damage to health, human wellbeing, and the environment. Its determination is the prerogative of the Ministry of the Environment. Its performance is legally demandable by the Ministry of the Environment and the organisms that form the National System of Environmental Management. The criteria for the determination of supervision and sanction will be established by the aforementioned Ministry.”

Art. 33.1 “The National Environmental Authority directs the process of elaboration and revision of the SEQ (Standards of Environmental Quality) and MPL, and in coordination with the relevant sectors, elaborates or commissions the proposals of SEQ and MPL that will be transferred to the Presidency of the Council of Ministers for their approval through Supreme Decree”.

³⁶³ Art. 122.2 General Law 28611 of the Environment (2005): “The housing, building and sewerage sector is responsible for the surveillance and sanctioning of the failure to comply with the MPL in domestic liquid waste in coordination with sectorial authorities that exercise functions relating to the discharge of effluents in the public sewerage system.”

Responsibilities	Environmental liability	Measuring Water Quality
Second Responsibility		<i>Environmental Prosecutor</i> ANA and <i>Administrative Authority of Water (sanctions at the basin level)</i> ³⁶⁴ Ministry of Health ³⁶⁵ <i>Peruvian Sea Institute (Imarpe)</i>

³⁶⁴ First Final Supplementary Provision of the Legislative Decree 997 (2008) approving the organic law of the Ministry of Agriculture and Creating the National Authority of Water: “Creates the National Authority of Water, organism assigned to the Ministry of Agriculture, responsible for dictating the norms and establishing the procedures for the integrated and sustainable management of water resources”, Art. 32.d. Organization and functions regulation of ANA (Supreme Decree 039-2008-AG (2008)): “Coordinate with Administrative Authorities of Water and Basin Councils of Water Resources activities of control and surveillance of the quality of water in its natural sources” and the website of ANA, entry “Nuestra Actividad Funcional” (2013).

³⁶⁵ Organization and functions regulation of the Ministry of Health (Supreme Decree 023-2005-SA (2006)): “Propose and arrange the technical foundations for the formulation of national policies of environmental health and establish norms and supervision of the aspects technical and sanitary of the provision of water for human consumption, the management and reuse and the disposal of domestic residual water and excretes, the management of solid waste; the surveillance and control of vectors of transmissible illnesses and plagues of importance for public health in the frame of the current norms.”

Responsibilities	Environmental liability	Measuring Water Quality
Defines policy / Coordinates	Minam	ANA at the national level , <i>Regional Environmental Commission (CAR) at the regional level</i> and Municipal Environmental Commission (CAM) at the municipal level
Additional interventions	<u>PELT</u> Municipality <i>Environmental Prosecutor</i>	

BOLIVIA

The same code is followed for the description of responsibilities in Bolivia, except that the bold italic font is used to indicate that the intervention is handled by the ***national level with cooperation funding***. Regional offices of national organizations in Bolivia are irrelevant for this study.

Responsibilities	Sewerage	Waste	Mining	Environmental liability	Water quality
Direct responsibility	Autonomous Municipal Government ³⁶⁶	Municipal Government <i>Departmental Government</i> ³⁶⁷	Environmental authority according to exploitation level	ALT	Municipal Governments <i>Departmental Government</i> ³⁶⁸
Secondary responsibility	Authority for the Supervision and Social Control of Drinking Water and Sanitation ‘Central level of the State’ ³⁶⁹ <i>Departmental Government</i> ³⁷⁰	<i>Departmental Government</i>	<i>Departmental Government</i>	<i>Departmental Government</i> Ministry of Environment and Water (MMAyA)	

³⁶⁶ Art. 83. II. 3. a. Framework Law of Autonomies and Decentralization 31 (2010): “Execute programmes and projects of the services of drinking water and sewerage, in conformity with the CPE, in the frame of the water regime and its services and the politics established by the central level of the State. (...)”

III. In accordance with Article 20 of the CPE and the responsibility of the numeral 40 of Paragraph I of article 302 of the CPE, municipal governments have the exclusive responsibility of sewerage and the establishment of taxes upon it.”

³⁶⁷ Art. 88. IV. 2.a. & 3.a. Framework Law of Autonomies and Decentralization 31 (2010): “Autonomous Departmental Governments: regulate and execute, in its jurisdiction, the regime and the policies of solid waste, industrial and toxic, approved by the central level of the State.

Autonomous municipal governments: regulate and execute the regime and policies of solid waste, industrial and toxic in its jurisdiction.”

³⁶⁸ Art. 10. Chap. 2. Regulation on water pollution (Supreme Decree 24176 (1995)): “Establish objectives in terms of quality of the water resource. ... e/ gives permission of disposal of residual water raw or treated ...g/ Build and maintain an inventory of the water resources in terms of quantity and quality of all the bodies of water at the departmental level, aiming at determining its natural and current states.”

³⁶⁹ Art. 83. I. 1.a Framework Law of Autonomies and Decentralization 31 (2010): “Elaborate, fund and execute in a subsidiary way projects of drinking water and sewerage in a concurrent manner with the other autonomic levels, in the frame of the policies of basic services.”

³⁷⁰ Art. 83. II. 2.a Framework Law of Autonomies and Decentralization 31 (2010): “Autonomous departmental governments: a/ elaborate, fund and execute in a subsidiary way plans and projects of drinking water and sewerage in a concurrent and coordinated fashion with the central level of the State, municipal governments and indigenous native farmers

Responsibilities	Sewerage	Waste	Mining	Environmental liability	Water quality
Coordinates/defines national policy	MMAyA				
Additional interventions	<i>Project for the Sustainable Development of Lake Titicaca_PDSL</i> Public Social Company for Water and Sewerage (EPSAS) <u>United States Agency for International Development USAID</u>	<u>Andean Community (CAN) - ALT PDSL</u> <u>USAID</u>		<u>USAID</u>	<i>MMAyA (Catalan Cooperation)</i>

governments that are relevant, being able to delegate its operation and maintenance to the relevant operator, once the works are concluded. All the intervention of the departmental governments needs to be coordinated with the municipality or indigenous native farmer autonomy that benefits from it.” and Supreme Decree 24176 (1995) “is responsible for the departmental environmental management and must safeguard the enforcement of the regulations, control, regulate and coordinate with municipalities in its jurisdiction.”

ANNEX 8. BRIEF CHRONOLOGY OF ENVIRONMENTAL INSTITUTIONALISATION

Details on the laws here mentioned are given in the bibliography, when the law I refer to is unclear, specifications are given in the footnotes.

BOLIVIA

Year	Event
1906	Law of Water
1970	The Ministry of Peasant Affairs and Agriculture is entrusted the “rational use of the natural resources of the country” (focusing on forest management). ³⁷¹
1980	The Institute of Ecology at the Universidad Mayor de San Andrés creates Lidema, a consortium of ‘environmentalists’, bringing together research centres and NGOs who will participate in the drafting of the law of the environment. ³⁷²
1989	The Service of Renewable Natural Resources (Ministry of Peasant Affairs and Agriculture) becomes a Sub-Secretary (Vice-ministerial level). ³⁷³
1990	Drafting of the “National Ecological Chart” (defines areas of “protection, conservation, production and of public interest”). Government agenda aims to “develop a policy of ecological awareness” and to involve “the citizenship in the preservation and care of the environment”. ³⁷⁴ Creation of the FONAMA. ³⁷⁵
1992	Law of the Environment
1992-1997	Regulations of the Law of the Environment – Includes the Regulation on Water Pollution.

³⁷¹ Supreme Decree 9195 (1970).

³⁷² My interviewees reported that some of these people worked with indigenous populations, particularly through NGOs working on rural issues. However, the large association between environmentalists and indigenous populations occurs later, partly during the MAS campaign and then, once the MAS is in power, at Tiquipaya, during the Peoples Conference on Climate Change (19-22 April 2010).

³⁷³ Supreme Decree 22232 (1989).

³⁷⁴ Supreme Decree 22407 (1990).

³⁷⁵ For an analysis of the organization see Flores Bedregal and Gruenberger (1998).

1993	Creation of the Ministry of Sustainable Development and Environment. ³⁷⁶ (First Government Sánchez de Lozada)
1997	The Ministry of Sustainable Development and Planning is created. ³⁷⁷ (Government Bánzer)
2000	Law of Drinking Water and Sanitation Services.
2003	The Ministry of Sustainable Development and Planning becomes the Ministry of Sustainable Development. ³⁷⁸ (Second Government Sánchez de Lozada)
2006	Election of President Morales. The responsibilities of the Ministry of Sustainable Development are distributed between the Ministry of Planning, the Ministry of Water and the Ministry of Rural and Farming Development and Environment. ³⁷⁹
2009	Approval of the Political Constitution of the State.
2009	The Superintendence of Sanitation Services becomes the Authority for the Supervision and Social Control of Drinking Water and Sanitation. ³⁸⁰

³⁷⁶ Law 1493 (1993) and Supreme Decree 23660 (1993).

³⁷⁷ Law 1788 (1997).

³⁷⁸ Law 2446 (2003).

³⁷⁹ Ibid.

³⁸⁰ Supreme Decree 0071 (2009).

PERU³⁸¹

Year	Event
1960	The Regulation on Industrial Wastewater is approved.
1969	The General Law of Water is approved.
1974	Creation of the National Office for the Evaluation of Natural Resources (ONERN).
1979	Political Constitution of Peru (Right to a Healthy Environment).
1990	The Code of the Environment and Natural Resources is approved.
1991	The Framework Law for Private Investment Growth is approved (Article 51 establishes that each sector should determine the activities susceptible of causing an environmental damage).
1992	The ONERN becomes the National Institute of Natural Resources (INRENA). ³⁸²
1992	The National Superintendence of Sanitation Services is created.
1993	Political Constitution of Peru (Confirms the Right to a Healthy Environment).
1994	The CONAM is created.
1997	The CONAM is given a coordinator and advisory role. Sectors need to report to the CONAM. ³⁸³
1997	The Law of the National System of Evaluation of Environmental Impact is approved.
1997	The Organic Law for the Sustainable Use of Natural Resources is approved.
2004	The Framework Law of the National System of Environmental Management is approved.
2005	The General Law of Environment is approved.
2008	The National Agency of Water is created. The Ministry of Environment is created.
2009	The Law of the National System of Environmental Evaluation and Supervision is approved. The Law of Water Resources is approved.

³⁸¹ For a detailed analysis of the institutionalisation of environmental management in Peru previous to 1999, see Charpentier and Hidalgo (1999).

³⁸² Government Decree 25902 (1992).

³⁸³ Law 26786 (1997).

