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Self-organizing processes in urban green commons. The case of the Angachilla wetland, Valdivia-Chile

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Abstract: This article focuses on self-organizing processes in contested urban social-ecological systems. It analyzes a wetland conservation program and civic management effort in the Angachilla sector of the city of Valdivia, Chile in a 15-year time frame. The aim is to understand what triggers collective actions and self-organization in the attempts of preserving an urban green common. The study uses a qualitative approach based on action-research methodologies. It examines key variables influencing self-organizing processes; including social-environmental crises, governance vacuums, wetland valuation, and leadership.

It also discusses collective strategies for the transformation of negative feedback loops, such as norms and regulations detrimental to wetland protection, and those related to resistance to change of wetland surface area due to unregulated urbanization. From an Urban Green Commons perspective, this work illustrates the complexity of dealing with contested nature, making it a resource difficult to govern collectively given all the different interests and values in place. It also shows that there have been successful periods of active wetland management that have influenced active democratic processes regarding land use and land use change in the city.

Keywords: Chile, self-organization, social-ecological systems, urban green commons, wetlands

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1. Introduction

The article is centered on self-organizing processes for the conservation of urban green commons. Self-organization can have a strong influence on the management possibilities of common resources when seen from a social-ecological system perspective (Ostrom 2009). Particularly, we present the case of the Angachilla wetland, located in a growing neighborhood of the city of Valdivia, in the south Chile. Through the analysis of this case, we aim to understand how an urban wetland becomes a political object of civic intervention in which evolving management strategies create both new possibilities for its conservation and emerging organizational challenges.

Case studies of commons are well described in rural or low-density areas worldwide, but examples of urban commons management are still scarce in scientific literature (Colding et al. 2013; Sandberg et al. 2013). For instance in the Digital Library of the Commons (Indiana University 2009), out of the 477 case studies of common-pool resources, only 27 focus specifically on urban situations.[1] Furthermore, the majority focus on spaces that have been transformed into green areas, such as gardens, orchards and urban parks (Lawrence et al. 2010; Matisoff and Noonan 2012; Colding and Barthel 2013; Colding et al. 2013), but not on surviving unmanaged or natural habitats within the city. For the latter, the commoning tends to be more difficult as urban wilderness areas may not be clearly perceived as "resources" benefiting citizens, and their conservation is usually

[1] Consulted December 2016.

perceived as pertaining to the public implementation of parks or conservation areas, where citizens are merely visitors (Colding et al. 2013).

Urban wetlands are a particular type of urban green area under significant stress, due to urban expansion (Millennium Ecosystem Assessment 2005) and deficient articulation of planning instruments (Rojas et al. 2015). For example, in the Chilean case, urban wetlands are not deemed to be significantly important under State regulations, and therefore are not protected by law. In fact, in Chile, there are 13 wetlands recognized in the international RAMSAR convention (RAMSAR Convention Secretariat 2014), none of which are located in urban settings, leaving urban wetland management to voluntary efforts and sometimes conflicting uses.

This work is exploratory and focuses on how a segment of the Angachilla wetland has been appropriated by different users and actors over a 15-year period; resisting interventions causing its degradation and attempting to change some aspects that have led to mismanagement. This case describes the challenges and achievements of self-organizing processes and their influence on the management and conservation of the urban wetland network through time. The article attempts to shed light on two questions: 1) what triggers collective action regarding urban natural ecosystem conservation and management; 2) how self-organizing processes evolve through time, deliberately trying to transform a social-ecological system perceived to be in an undesired state. We think the case contributes to understanding the processes by which an urban wetland becomes a contested object whose status is disputed by different agents through collective action. In the light of this research, commoning processes unfold as open-ended socio-material arrangements emerging from self-organization.

The article is structured as follows: Section 2 explains the conceptual framework; Section 3 describes the methodology used to collect and to analyze data; Section 4 presents the social, economical and political context of the case study; Section 5 presents the results, following the intentional transformation framework of Moore et al. (2014); Section 6 presents a discussion on three key aspects: triggers for self-organization; changes in the system through time and space; and some reflections while viewing this social-ecological system as a contested urban common. In the last section, the conclusions of the study are presented.

2. Self-organization in urban social-ecological systems

Social-ecological systems may be defined as "dynamic systems in continuous change, which co-evolve from the interactions between actors, institutions, and resources, confined and molded in a given social-ecological space" (Schlüter et al. 2014). Ostrom (2009) developed a framework that focuses on the interactions between four subsystems (actors, governance, resource units, and resource systems) and the dynamics of exchange with related systems outside their boundaries. From a governance perspective, Ostrom's framework focuses on common pool resources, common-management systems, and their sustainability through

collective efforts. Interaction among these four subsystems result in processes such as self-organization, harvesting, networking, etc., leading to different sustainability outcomes depending on whether they reinforce positive or negative feedback loops.

Moore et al. (2014) developed an analytical framework for understanding intentional transformations in social-ecological systems as they change through time, complementing Ostrom's work, which focused on a fixed time frame. Moore et al. (2014) focused on collective actions that deliberately attempt to move systems away from a perceived undesired state. According to the authors, transforming a social-ecological system, implies that at least one core element in each of the social or ecological dimensions is modified and as a result, dominant feedbacks are changed. Changes in the ecological subsystem include modifications of the ecological processes and functions that generate ecosystem services. In the social subsystem the key elements that are expected to change are values and beliefs; rules and practices – such as laws, procedures, and customs – and the distribution and flow of power, authority, and resources (ibid). Their framework presents a four phase process, acknowledging that they may occur simultaneously or in varying order, as follows: pretransformation or triggers, preparing for change, navigating the transition, and institutionalizing the transition.

Self-organization, the focus of this study, may be an emergent property of the social-ecological system, as seen in Ostrom's framework. However, human actions usually dominate the system, therefore they can exhibit intent, aiming at managing resilience (Walker 2004) or to a deliberate transformation of the system (Moore et al. 2014). We will focus here on self-organizing processes related to actions and practices within a collective to adopt coordinated strategies with the aim of obtaining better common benefits or to reduce damages (Ostrom 2002).

Ostrom's framework for social-ecological systems (Ostrom 2009) highlights a set of variables found to be associated with self-organization. Some of these variables may not apply to urban natural segments, as there is no material dependency on the resource. However, there are other aspects to consider in urban cases: 1) the intrinsic value attached to ecosystems, related to the symbolic importance of nature and its conception as a moral subject in biocentric lines of thought (Aguilar 2006; Gudynas 2010); 2) the change in valuation, related to changes in cities such as some kind of crisis, conflict, or catastrophic disaster (Tidball and Stedman 2012; Colding and Barthel 2013; Moore et al. 2014; Villagra and Felsenhardt 2015); and 3) social-ecological citizenship associated with a deep sense of place and community (Gudynas 2009; Tidball and Stedman 2012; Colding and Barthel 2013; Rode et al. 2015).

One possible self-organization strategy is the collective management of urban natural resources to avoid further degradation or to improve their state. A limit to this strategy is often related to property rights and the conceptual and practical tension between private ownership of a resource vs. collective entitlement. Without questioning the private ownership regime, Colding and Barthel (2013), introduce the concept of Urban Green Commons, referring to green areas in the

city where local citizens hold the right to manage the area collectively and state that properties may have multiple rights beyond ownership, some of which, such as administration and management, may be granted to communities or groups.

Other authors argue that commoning can be conceived as a process applicable to any type of property (Gibson-Graham et al. 2016), produced through intensive use patterns and collective dwelling, which sometimes must rely on political claims to maintain their status (Blomley 2008). Most case studies for Urban Green Commons fail to address questions regarding what constitutes an ecosystem, who owns it and who benefits from green areas in the city, and mainly focus on how to manage them.

3. Methodology

This exploratory work presents a longitudinal single case study (Yin 2009), following the conservation process of the Angachilla wetland in the city of Valdivia over 15 years (2000–2015). The scale of analysis is the social-ecological system of the Angachilla wetland in its urban segment, informally known as the Angachilla Urban Natural Reserve,[2] embedded in the Valdivia wetland network (Figure 1). We pay particular attention to the social components of this social-ecological system, which includes Actors and Governance Systems (following Ostrom's characterization) that influenced the state of the wetland at any given time during this period. This scale is not fixed as the actors involved in the wetland protection initiatives have varied from a neighborhood, to the entire city over time. The biophysical components, or as Ostrom calls them, the resource system and resource units, are not characterized in detail as there is not enough hard data for the study's time interval. This poses some limitations in the case analysis, as it portrays the wetland as a passive single entity, with static properties, which is not the case. Given the limited biophysical data, we have focused on how people interact, and their strategies relating to the wetland management process, rather than on the wetland itself.

As this study focused on the organizational dimensions of the social-ecological system, the primary data is mostly from qualitative sources. Secondary sources were used to describe the wetland, including previously published research, reports, and satellite images. Primary sources were collected during two periods: i) a long term Participatory Action Research, from 2004 to date, led by one of the authors, who has been involved in activism related to the city's wetland conservation and has accompanied the neighborhood organizations in their initiatives; ii) a one year in-depth fieldwork that took place in 2015 and included 18 semi-structured interviews of people belonging to local organizations that have led initiatives to protect the Angachilla wetland, and

[2] The term Urban Natural Reserves was locally coined by the Biosfera grassroot organization to refer to green areas in the city that preserve native biodiversity and have both conservation and educational goals (See a list of these reseves in the city of Valdivia in Jacques-Coper 2012 and Biosfera 2011).

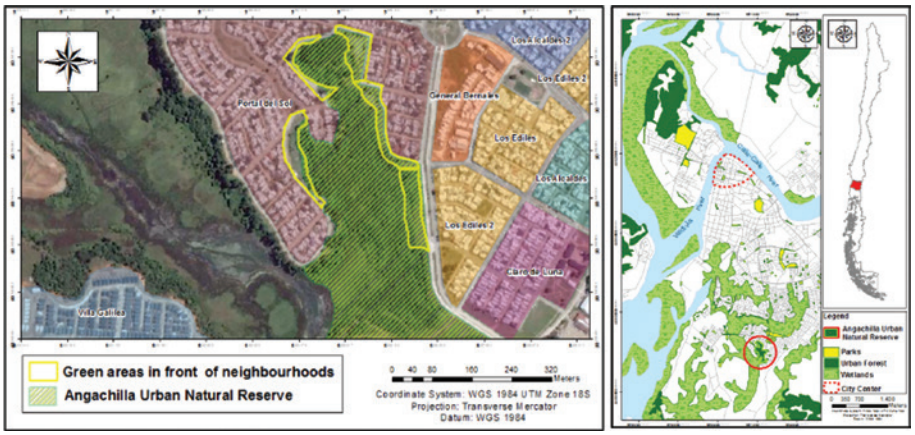

Figure 1: Maps of the Study Area (left) Angachilla Urban Natural Reserve and adjacent neighborhoods (Modified from CEAM-UACh FORECOS 2015). (Right) Urban Natural Reserves in Valdivia with Angachilla wetland circled in red (Adapted from Biosfera 2011).

participant observation during key wetland conservation events. There was particular interest in understanding why different groups of participants got involved and why they stopped; their triggers, motivations and inhibitors for collective action, self-organizing and their influence on urban green commons management over time.

Following the coding methodology from Lamers et al. (2014), we assigned the subsequent categories to the interviews for referencing purposes: C=Claro de Luna residents, N=residents of other neighborhoods, U=University Students. Added to that, numbers from 1 to 18 were assigned to each of the interview records. The different categories were selected to gain perspectives on actors' interests and influence: 1) residents who began the wetland protection effort (Claro de Luna); 2) residents of surrounding neighborhoods who may have participated in some activities, but were not closely involved, and; 3) a non-resident university student who became involved in the wetland protection process at an early stage.

The interviews were processed in Atlas.ti. and coded using the following categories: 1) memories of place at 1.a) arrival 1.b) when the neighborhood organization was formed 1.c) at the peak of wetland management activism 1.d) when the activism decreased 1.e) current level of initiatives; 2) motives for engagement in ecological actions and practices – or not – in every phase; 3) social-ecological threats related to 3.a) the wetland 3.b) the neighborhood 3.c) community organization; 4) Wetland valuation and meaning; 5) Past and present uses of the wetland, and future preferences. This helped capture their perceptions and motivations as well as their view on collective efforts. Findings from interviews were cross-validated and triangulated with field observations, action-research activities, and secondary data sources.

4. The context

Valdivia, the capital of the Los Ríos Region in Chile, is an intermediate-size city with a population of 166.080 in its urban sector (2017 Census). Its main geographic characteristic is the presence of important bodies of water and wetlands. Many of these wetlands, including Angachilla, are former farmlands that were flooded after a major earthquake in 1960. Although flooded areas may be formally categorized as National Goods of Public Use when they have remained flooded for over 5 years, this requires a very detailed and costly delimitation. This uncertainty, of whether the flooded terrains remain private or become public, has caused conflict between social-environmental groups and private owners who, in several cases, have sold them for housing projects.

In addition, there is also a lack of articulation between the institutions with jurisdiction for wetland protection, monitoring and sanctioning at local, regional and national levels (Rojas et al. 2015), creating an opportunity for uncontrolled use. In Chile, a wetland can be in several, one or none of five protection categories. According to Desplanque (2016) only 2.7% of the wetlands inventoried fall into those categories, but it does not guarantee their protection, only that they have an environmental evaluation, and therefore the decision to encroach upon them is, finally, political. Urban wetlands in particular are not considered as a specific category for conservation and only partial aspects related to some of their components are under protection, with environmental competencies scattered among different public institutions, belonging to different ministries. Currently, there is a bill to include urban wetlands in a specific protected category in Chilean law (El Ciudadano 2017).

In addition, the zoning plan for Valdivia has been modified by the city Council to reduce the wetland areas designated as flood-risk zones, without requiring public consultation. Public opinion on the matter is also non-binding. The city-zoning plan identifies most of the wetlands as flood risk zones, which imposes restrictions on the type of construction allowed and demands engineering work to mitigate or remediate the potential risks (Antiao 2013). The city-zoning plan may grant recognition to already protected wetlands, but they cannot create any new protection zone and designate a special use (ibid). This zoning plan is pending an update that includes a city expansion of about 1600 ha, mostly to the south and southwest where there is a high concentration of wetlands.

Skewes et al. (2012) state that the concept of wetland probably acquired meaning among the inhabitants of Valdivia with the Rio Cruces wetland crisis – the only wetland in the area with international recognition. A local social movement called *Acción por los Cisnes* arose in 2004 after the death of thousands of black-necked swans, – triggered by the operations of the Celco-Arauco wood pulp mill. Actions included several marches of over 2000 people; legal and technical assessment of environmental permits issued to the company, revealing institutional failures; and sustained pressure in public media demanding a precautionary approach to stop the operation of the mill until the company's responsibility was clarified.[3]

[3] For more details on this wetland-related environmental conflict see Sepúlveda and Villarroel 2012.

From this point forward, suggest Skewes et al. (2012), the environmental imaginary was modified and other urban wetlands became valued, including those that were previously considered abandoned lots, and a new social-environmental citizenship took form, expressed in a wide participation in environmental projects, discourses and activities oriented towards self-governance on local environmental issues.

The Angachilla wetland in its urban segment is in the southern part of the city. This area has had an urban expansion of 172% between 1992 and 2007, making it the fastest increasing urban area in Valdivia in 2007, with constant and growing wetland filling (Osorio 2009). A segment of this wetland, called the Angachilla Urban Natural Reserve, has been under different common-management regimes during the last 15 years (Figure 1).

According to Biosfera (2011), the Angachilla Urban Natural Reserve is constituted by a wetland that feeds off a branch of the Angachilla river, and serves as a nesting area for many birds, including the emblematic Black-Necked Swan. Before the 1960 earthquake, it was part of a private landholding. The land surrounding the wetland's urban limits, including the Angachilla Natural Reserve, is owned by a private housing company and by the Ministry of Urban Planning and Housing – sectional Los Ríos Region (Figure 2).

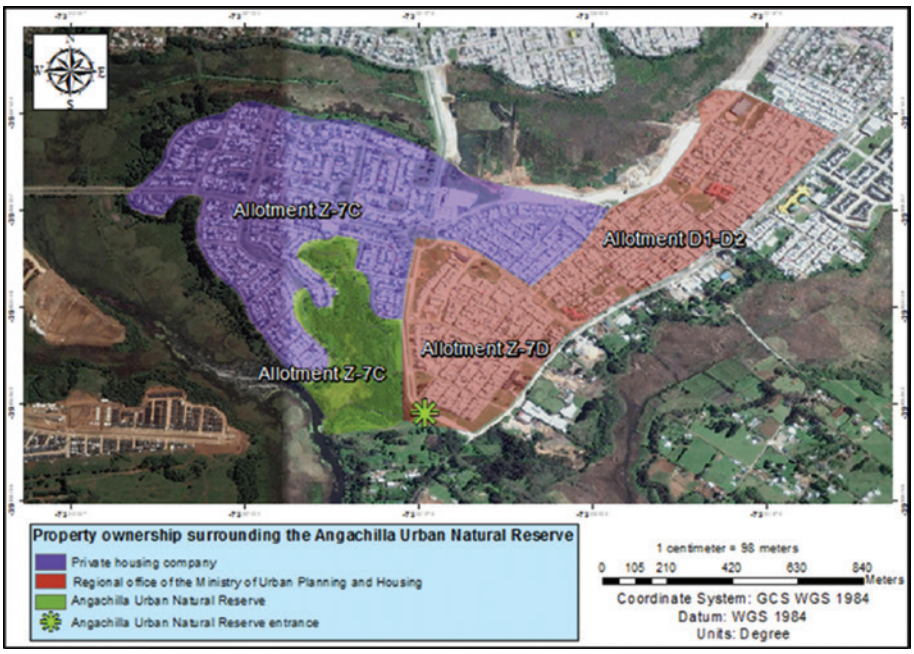

Figure 2: Public and private housing developments in relation to Angachilla Natural Reserve. (Modified from CEAM-UACh and FORECOS 2015).

According to local researchers, Angachilla has one of the highest levels of conservation among the urban natural reserves identified in the city (Rojas 2011; Jacques-Coper 2012), exemplified by the high number of native species (105 were identified, constituting 55% of the species found in the city). However, several threats have been identified, including trash dumping, logging, introduction of exotic vegetation, and land use change (Paredes 2010; Rojas 2011; Jacques-Coper 2012).

5. Results

Results are organized using the framework for intentional transformation of social-ecological-systems of Moore et al. (2014). They show, in a descriptive manner, how the self-organizing processes related to the urban segment of the Angachilla wetland have evolved through time and the key events that have triggered collective action in this urban social-ecological system.

5.1. Crises and first steps towards transformation: 2000–2006

The Angachilla wetland was part of the countryside, but as the city began expanding southwards in the 1990s, several social housing projects emerged around it. One of the surrounding neighborhoods, Claro de Luna, started as a private housing project specifically targeting middle class workers, mainly from the service and commercial sectors (Skewes et al. 2012). When people arrived in the neighborhood in 1999, they could still see cows passing by (C-12). The un-built area in the front of the neighborhood had a small forest and grassland, with the wetland hidden behind trees (C-12, C-16). There were more than 60 hundred-year-old trees such as Patagonian Oaks (*nothofagus obliqua*) and Laurel (*Laurelia sempervirens*). Animals such as foxes, hares, owls, quails, ducks, pigeons, herons, and black-necked swans could be seen (C-11, C-18). Wild berries, medicinal plants and edible mushrooms were also abundant.

Two or three years after residents moved to the neighborhood most of the old oaks were suddenly cut down (C-7, C-11, C-16, C-17, C-18). The felling of these old trees was the first sign of conflict related to land use in the area. Local residents wanted to protect "the forest in their backyard" (C-12), in contrast to other people who wanted to use the wood, probably for heating purposes. This green area became an open space with no regulation, where different people could extract whatever they needed without any control or sanction from official owners, who, at the time, neighboring residents did not know of. Some people in the Claro de Luna neighborhood began discussing what to do to avoid further damage. Some of them had a strong appreciation for nature:

> "For me these things [taking care of the environment] have more of a sacred meaning […] it has to do with a mandate for me to care for this place […] I think there are spirits here that call people to care for this place. This wetland

> is part of my spirit […] every time something happens to this wetland I feel it happens to me" (C-7)
>
> "I was a country person, I lived in the countryside until I was 16 […] my appreciation for nature starts there, because among our parents and grandparents there was a lot of respect for nature […] that was what life was about: trying protect a tree, a bird, any animal in the wild, even a butterfly, because that gave color and life to our existence" (C-11)

Soon after the Claro de Luna neighborhood was built, in 1999, a neighborhood committee was formed. Neighborhood committees are civic and voluntary organizations that receive support from the local governments to prioritize local needs. This committee did not prevail, only in 2006 did it re-emerge, due to neighbors concerns on how to deal with vandalism in the area. At this point, the wetland was a major agent as it served as a hiding place for burglars:

> "While nature was endangered, so it was the resident's physical integrity […] it was only logical that we needed to do something, because we were being affected by the ecological damage, both things were hand in hand" (C-17)

It was only at this point that the wetland became an active agent, when it impacted neighbors' lives directly and negatively. Until then, people who appreciated nature passively used the wetland, but it did not trigger collective actions. Local leaders found that a good strategy to mobilize people around the wetland was to highlight its beauty and its belonging to the neighborhood, creating a collective identity.

5.2. Preparation for change: the commoning of the wetland – 2007–2010

In December 2007 the Claro de Luna neighborhood committee started the first big project to protect the wetland. Different activities were developed and executed, such as community cleaning days and environmental education workshops. In 2008, a colloquium on environmental heritage took place in the neighborhood, supported by the outreach office of the Universidad Austral de Chile, the local elementary school San Nicolás, and several social organizations, including Biosfera, one of the key grass-root organizations in the city-wide wetland protection efforts.

Meanwhile, in another neighborhood, Huachopihue, a collective effort to protect a local creek was taking place. Both neighborhoods began collaborating in 2008 and some residents were members of Biosfera. Through several initiatives, they promoted, discussed, and protected what they called Urban Natural Reserves, fragments of forest and wetlands in the city where the structure and dynamic characteristics of natural ecosystems may be observed (Biosfera 2011). In 2009 the Angachilla leadership team began using the term Urban Natural Reserve when referring to the wetland in different activities and projects.

In 2010, the Claro de Luna neighborhood committee launched their second big project related to wetland protection: "Restoration and conservation of the Angachilla wetland, through the creation of an Urban Natural Reserve", sponsored

by the Ministry of Environment. This project was co-directed by a professor from the outreach office of the Universidad Austral, who had helped in previous initiatives. The project also had additional support from university students who later developed their own environmental projects and research in Angachilla and other wetlands. Activities included environmental education, recreation, seminars, reforestation, mural painting, wildlife observation benches, information points and trashcans at observation points. With the funds, the neighbors fenced the area and designated an official pedestrian entrance, in an effort to control motor access and garbage dumping. A common management regime took place during the one-year duration of the project, with the land temporarily granted to the committee for these activities. This project also extended ties to surrounding neighborhood organizations in Los Alcaldes, Los Ediles and Ampliación los Ediles (see Figure 1), in addition to local schools and local social organizations.

For the Claro de Luna leadership there was a perception of integration with other leaders in surrounding neighborhoods and ecological committees. However, for some people in the surrounding areas there was a feeling of exclusion, as they were neither directly invited, nor consulted on the initiatives taking place, in particular those who lived in the proximity of the wetland and green area being intervened (N-4).

Despite all the efforts, the biomass withdrawal activities continued (C-11), trash was still dumped and small fires were provoked. This caused some active neighbors to slowly, become discouraged (C-12, 16, 18).

5.3. Stagnation phase: leadership and collective efforts reshaped – 2011–2013

By the end of 2010, the Claro de Luna neighborhood committee had changed. The leadership teams were neighborhood residents who were elected by the residents themselves and therefore their perception of the neighborhoods needs was subject to constant change. The new committee was not interested in continuing the wetland protection initiatives and therefore "everything [related to the wetland] became stagnated" (C-11). The former leader of this organization was very charismatic, with a strong drive towards improving wetland conditions, therefore drawing many people towards the activities and initiatives developed between 2006 and 2010. Many of the neighbors stopped participating because, in the past, they felt motivated by this leader, but did not necessarily feel personally driven towards the actual wetland cause. "We participated to support them [the neighborhood committee leaders] in their interest for nature" (C-12).

However, given all the networking and all the external support towards the cause, activities and projects did not cease; they were coordinated through different actors. For example, in 2011, the parents' association of the local school, San Nicolás, developed its own environmental project with activities such as reforestation and environmental education in the wetland. Former neighborhood committee leaders and supporters formed a new group, "Angachilla ecological committee", specifically oriented towards wetland conservation initiatives, whose

members were mostly environmental activists. This organization, however, did not last long. It was only active for one year due to internal differences between the members, mainly related to use of financial resources (U-2).

In 2012, thanks to the visibility of previous efforts, the Ministry of Environment called for a public tender to run an ecological restoration project in the Angachilla wetland as a whole, not only the segment that had been appropriated by the local community. Even though the tender was open to the public, the terms were so rigid that only a professional organization was able to apply and win. An association between the Transdisciplinary Center of Environmental Studies at Universidad Austral (CEAM) and the FORECOS Foundation (a technical organization from same university, aimed towards protecting Native Forest) applied and obtained the project funding. Some of the former active members in Claro de Luna stated that the CEAM-FORECOS project neither recognized the environmental efforts from the previous groups nor involved the former leaders, other than asking them for information (C-7).

In 2013, when the project started, the restoration project team found practically no activity in the neighborhood regarding the wetland. Some organizations that in the past had led wetland conservation efforts were either inactive or very passive. They highlighted how the change in neighborhood leadership, which had taken place again that year, had an effect on participation, because they were focused on other social priorities related to housing improvement and social centers (CEAM-UACh and FORECOS 2015). The project did not attract many people, and according to the neighbors, it was not a local priority.

This project's influence on people's perceptions of the wetland is debatable. Some of the interviewees, mostly leaders not belonging to Claro de Luna, who attended these activities, acknowledged the importance of this project in creating awareness, and highlighted their learnings on the value of wetlands and their "ecosystem services" (N-4, N-6, N-15, C-7, C-11). However, interviewees who were active participants before the CEAM-FORECOS project still had more of a cultural valuation of the wetland. They described it as "nature", "river", "estuary", "our own ranch in the city", "a beautiful place", and wanted to protect it; because it was pretty, because it reminded them of the rural areas that many came from (C-12, C-16, C-17, C-18), or because it provided a safe environment for children to play outside (C-16), but did not signify the new knowledge presented during the project.

5.4. New triggers and reactivation: 2013–2015

In 2013 a new conflict arose: the construction of "La Circunvalación", a beltway surrounding the city as part of a regional infrastructure strategy to redirect heavy traffic from downtown and to improve the connection between the inland forestry sector and the coastal ports. According to the plans, this road would cross the Angachilla Urban Natural Reserve, with landfilling instead of a bridge, an intervention that would cause significant damage to the biodiversity and biophysical

structure of the wetland (C-7, C-11). This caught the attention of Claro de Luna residents again because it would directly affect the green area in front of their neighborhood. Since 2010 citizens and social-environmental organizations in Valdivia had opposed the modification of the municipal zoning plan, in part because it included several interventions such as roads crossing wetlands, which they considered a threat to the conservation efforts and detrimental to a sustainable plan for the city (Plan Valdivia 2010).

In 2013, the segment that would cross the Angachilla wetland was put up for tender and the active Angachilla neighbors, individual supporters working at the Universidad Austral de Chile, and organizations such as Biosfera collected more than 1000 signatures and held protests to stop the project. Given the massive campaign by this new movement *Salvemos el Humedal Angachilla* (Saving the Angachilla Wetland), this part of the road project was suspended and the local representative of the the Ministry of Public Works promised to subject it to a voluntary environmental impact assessment, a promise still pending. This new threat reactivated initiatives to defend the Angachilla wetland and reconnected groups that had been working on this issue before. "Now it is not only the Angachilla wetland, we are networking for all of Valdivia's wetlands" (C-9).

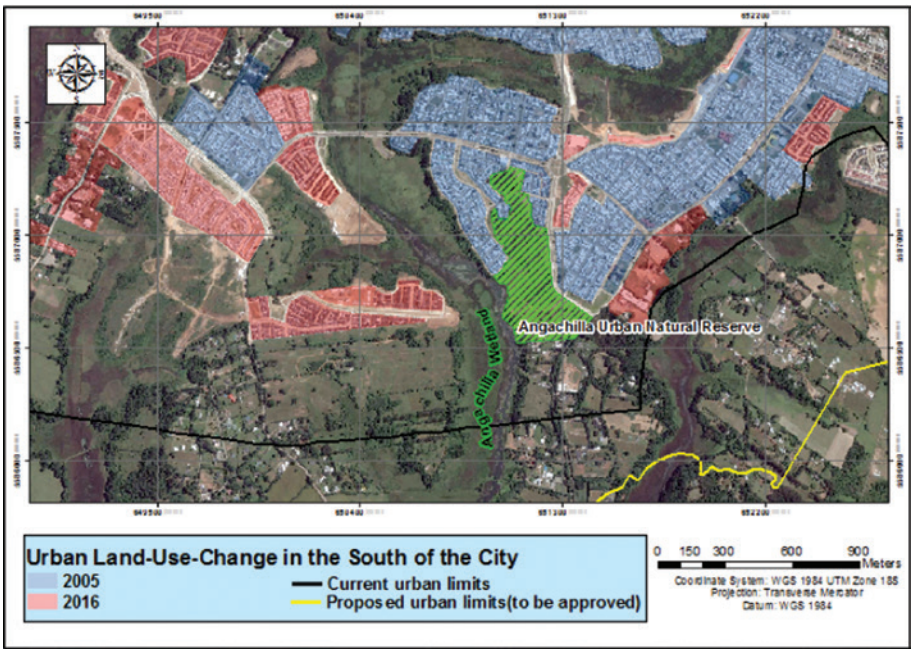

Figure 3: Urban land use change in area near Angachilla wetland

A parallel threat was the increase in housing projects in the area (Figure 3). Right in front of the Angachilla wetland, a new privately owned complex, Galilea, began building in 2012. Some of the Angachilla defenders sued the housing venture because they argued that waste from the project was being dumped into the wetland, right in front of the Angachilla Urban Natural Reserve, but the response from the legal authorities was that the company had the right to build and dump debris there (C-7). This gave way to another discussion on wetland boundaries, land use and their ambiguity in current legislation. Also, it raised questions on the ability of the municipal zoning plan to protect the wetlands and monitor designated use. Due to all these issues, Angachilla actors began petitioning a wetland ordinance from the local government.

Discussions regarding the Angachilla wetland and urban development conflicts took place in 2014. This became a political issue and several politicians and institutional representatives visited the wetland, but neither the official changes for the road plan nor consultations with the community on possibilities for modification took place, meanwhile the road was being completed on the other side of the wetland, in the Galilea complex.

From 2014 to 2015, additional funds were granted to social organizations working on wetlands, two of them based on Angachilla. As with previous projects, they also lacked significant participation of the closest residents, in contrast with the broad participation of Valdivian residents in general, who showed a strong interest in environmental causes, but did not necessarily live near a wetland.

5.5. Institutionalizing changes: 2015-present

In 2015, a new situation provoked a vigorous reawakening of urban wetland protection. An indigenous community shared their concerns about a wetland being filled in their neighborhood and called for wider support, since their efforts to stop the activity had not been successful. The area being affected was located in a neighborhood close to the Universidad Austral de Chile, in a more central area, attracting more attention. This conflict triggered meetings with environmental activists, including the former leaders of Angachilla, members of Biosfera as well as students and professors from the Universidad Austral de Chile, who called for pressure on official institutions to prevent further damage on urban wetlands. Researchers found that about half of the wetland being intervened was categorized as at "flood risk" in the zoning plan, but the category was modified to "constructible with restrictions"[4] by the city council in 2004. Also, the filling was potentially illegal as it was beginning to staunch the natural drainage of rainwater, which by law cannot be modified unless approved by the pertinent authorities. People who had been involved in wetland activism reacted strongly, especially

[4] Constructible with restrictions allows the filling of the area following very specific rules on soil integrity.

since history seemed to be repeating itself and there was no authority to monitor or stop these interventions.

A new movement *Salvemos los Humedales Urbanos* (Saving the Urban Wetlands) was formed and one of their main demands was that the municipality coordinate the creation of a wetland ordinance that could, at least, articulate the different segmented laws and institutions, after observing that urban wetland intervention was becoming a systemic issue related to policy deficiencies. This demand gained visibility with local media coverage. Finally, after strong pressure from this new movement, a few objectives were achieved: 1) the ordinance was discussed in the city council and the regional government; 2) due to a new participatory rule the first public hearing took place, where pro-wetlands movement representatives were able to present their demands to the mayor and city council; 3) the mayor finally accepted to work on the ordinance, after months of denial; 4) a municipal technical committee was formed to discuss wetland protection strategies, channeling suggestions from different social groups regarding the content of this ordinance. The ordinance was finally approved in February 2016, but some parts still need to be ratified by the National Comptroller's office.

6. Discussion

The results out of this study contribute to the discussion on contested urban green commons, in particular wetlands, and self-organizing processes aiming at creating collective arrangements for their conservation. These contested aspects are related to physical and symbolic delimitation, multiple and competing uses, and property rights, which in the case presented creates a significant vacuum for governance and "free-loaders".

6.1. Triggers for collective action in the Angachilla urban wetland

6.1.1. Social-ecological crises

One important element that triggers collective efforts are crises that provoke responses from both nature lovers and lay people (Tidball and Stedman 2012; Moore et al. 2014). The crises, as seen here, are also related to the subjective interpretation of resource importance.

There have been at least five different crises that have triggered action in the case of Angachilla: 1) the Rio Cruces wetland crisis, which generated initial momentum towards city-wide wetland protection; 2) the logging of most of the hundred-year-old trees in the area surrounding the Angachilla wetland, which triggered initial discussions among Angachilla residents; 3) the area becoming a garbage dump, and later a haven for criminals, leading to a collective action to clean up the wetland and avoid further delinquency; 4) the risk of serious wetland damage from a beltway project and to a lesser extent, the housing projects around it, which triggered new strategies, regrouping, collection of signatures and eventually halted the project; and 5) the repetition of some of these issues in other

neighborhoods, triggering city-wide actions such as the demand for a municipal wetland ordinance. These crises have helped collectives regroup, reorganize and define new strategies to face emergent challenges. However, Paredes (2010) argues that activism towards wetlands in Valdivia has been somewhat reactionary; with groups facing crisis related issues, rather than a planned strategy, anticipating potential threats.

6.1.2. Governance vacuum

Wetlands pose several challenges when managed as commons. Successful common management regimes require, according to Ostrom (2002), clear definition of resources, resource and user boundaries. The definition of the wetland is difficult as, from the biophysical point of view, it mixes land, water and hybrid components, making its demarcation, and comprehension of the whole system a complex task. In addition, in the Valdivian context, from a legal perspective, some of these components have different property deeds and sometimes conflicting uses. Moreover, in these urban wetlands there are unclear definitions of wetland boundaries, which builders take advantage of by extending construction sites or dumping debris. In addition, they neither have a publicly recognized conservation status nor a proper surveillance system, since public institutions monitor segmented aspects, but not the ecosystem as a whole.

The lack of clear regulations and the vague definition of boundaries has had opposite effects on collective actions. Conservation efforts over time have been a challenge, which has influenced continued participation, as many people become discouraged and frustrated. In contrast, however, this very fact has motivated activists to deliberately transform the regulatory system and create a more direct, democratic process in relation to urban development.

6.1.3. Wetland valuation

One of the key variables for self-organization in Ostrom's framework (Ostrom 2009) is the perception of productivity or scarcity of the resource system. However, in the case of these urban wetlands, there is no material extraction of goods, making the concepts of productivity and scarcity difficult to quantify. However, there are symbolic and material relationships with the wetland related to: a) passive benefits as an ecosystem (Millennium Ecosystem Assessment 2005; Gómez-Baggethun and Barton 2013; Van Zoest and Hopman 2014); b) socially-produced services as people engage in the management of natural resources, as well as in the production of place and meaning (Lawrence et al. 2010; Colding and Barthel 2013; Anderson et al. 2014; Barau 2015;), and; c) the valuation of surface area, in the Ricardian sense (Daly and Farley 2003), available for conservation or construction, and its possible uses, ranging from an empty space, a dumping site, an urban park, a conservation or a constructed area, and its implications in individual and collective wellbeing.

Given this subjective perception, there are significant conflicts about what constitutes wetlands and how to deal with them, adding to the stated governance

vacuums. For the municipality of Valdivia, wetlands are part of the city's flood risk zones and as such should be regulated, but the flood-risk zones are modifiable if there is a need for urban development. For housing ventures, both private and public, the wetlands terrains are cheap land that can be filled for construction (Jacques-Coper 2012). For wetland protection groups, the wetlands are natural ecosystems that host life and provide several services to the residents.

6.1.4. Leadership

In Angachilla, leadership has been one of the strongest drivers for self-organizing processes related to wetland protection. At the beginning, leadership stemming from neighborhood committees was key, as they were trusted by the community, and were able to channel significant attention and support to move the cause forward. However, this led to a high dependency on the committee's agenda, causing a decrease in collective neighborhood conservation efforts once specific leaders were gone. Most people interviewed from the Claro de Luna neighborhood participated because they wanted to support the cause of the neighborhood committee's president, or because they wanted to support the committee irrespectively of who was in charge, as part of their civic duties. One could argue that this process did not have a transformative effect on most of the local residents and their efforts did not go beyond helping and assisting. In the long run, the Angachilla initiatives attracted those with a-priori interest in environmental and political issues, related to the use and appropriation of green areas in the city, many of whom are still active today.

Urban nature conservation efforts from leaders of grassroots organizations were vital in upscaling wetland protection efforts. These organizations involved people from different parts of the city, in contrast to the initial neighborhood efforts. At this stage, leadership had a different task, more related to networking and upscaling strategies. As these networks started growing, they centered their attention on institutional changes to overcome the governance vacuum mentioned above.

6.2. Changes in self-organizing processes in urban social-ecological systems

As the self-organizing processes changed through time, different strategies to protect and conserve the wetlands were pursued. At the beginning the strategy consisted in making the wetland visible, raising awareness of its importance to local people. This was a consequence of the great impact that the environmental disaster in the Rio Cruces wetland had on changing the collective imaginary. Once the wetland was positioned as a subject worth protecting, a new strategy focused on resisting change, specifically uncontrolled urbanization around and on wetland surface area, one of the major threats to its conservation. As networks grew, strategy shifted towards intentional transformation of policies that had allowed for the unregulated exploitation of the wetland surface area. Actions included exposing the gaps in legislation and the need for an instrument that could articu-

late different laws and institutions to conserve these urban natural areas, that otherwise would turn into construction projects or become abandoned lots. Actions also had a political aim: the rights of people to natural green areas in the city, not only as passive users, but also as key agents in deciding how the areas are used.

As the social scale changed, and the number of actors involved increased, the process of self-organization became more complex. Initially the neighborhood organizations leaders were vital in bringing people together to create a local identity involving the wetland, and the wetland conservation efforts became a local community effort. However, as the scale increased, many of the local people dropped out of the initiatives because they did not feel identified with the new, more political and technical discourses. Grass-root organizations focused on wetland protection efforts took the leadership roles to articulate efforts around the city and to create new discourses focused on public policy. With new and diverse actors, there were conflicts inside the organizations that caused people to drop out, particularly when the views and strategies were not in-tune. Some of the crises described also had an influence on how narratives had to adapt to address new issues related to city planning.

Also, there have been particular instances when actor diversity has created an adverse effect. Rode et al. (2015) describe how external incentives may undermine intrinsic motivations and eventually reduce peoples' participation in actions related to biodiversity conservation, or crowding-out effects. In Angachilla, one of the incentives that generated crowding-out effects was the externalization of initiatives to protect the wetland in 2012 with the CEAM-FORECOS project. This project generated two crowding-out effects: 1) on the former leaders. It caused a control-aversion effect as they felt displaced and their previous efforts ignored (C-7), and; 2) distrust from the wider group as the people who were undertaking the interventions were "external" to their community, which may have reduced their desire to participate, since they did not identify with these new actors. In contrast, however, a small group of interviewees claimed that this intervention was very beneficial and had a crowding-in effect as it generated more awareness on wetland related problems, yet this crowding-in effect was not translated in active participation or engagement.

6.3. Commons vs. commoning

The case study illustrates the complexity of managing urban wetlands under a common property regime. On the one hand, these particular types of urban green commons are subject to governance issues: they are difficult to delimit and face a range of normative and practical incongruences from segmented and overlapping rules to complete lack of official protection. On the other hand, there is a more political debate, regarding who defines what is nature within the city, what is a resource and who is entitled to use it. Here the "common" is not a given natural resource in need of collective management by well-defined stakeholders, as it may be in many cases, such as those based on the criteria of rivalry and excludability,

and on ceded property rights (Colding et al. 2013). The common becomes a political object whose status is being disputed by different agents through collective action, leading in many cases to partial outcomes, new uncertainties and, eventually, to unintended effects.

Rather than a well-defined common, the case illustrates a commoning process, a socio-material construction that relies upon political claims, produced through intensive use and collective dwelling (Blomley 2008). The article shows how this commoning process has taken place and how wetland conservation groups have struggled to gain political power to be able to influence the definition and use of urban wetlands in the city of Valdivia. The process has been dynamic and with varied results, given the ever-changing actors, scope, strategies, and scales of influence. The case also revealed the competing interests in wetland area and how different groups have self-organized to achieve their goals, which are not always related to conservation. The latter shows that self-organization can be detrimental or beneficial for conservation of green commons depending on actors' agency, their power strategies, and differential set of values judging the accomplished results.

Considering the Angachilla wetland from the "commoning" perspective, requires that a community be well organized and share a vision towards what and how this common is to be managed (Helfrich and Bollier 2015). The challenges in this regard are two-fold. First, the property regime is not easily changed and the rights of private owners prevail, as is constantly seen in Valdivia when wetlands are filled and turned into housing projects. Second, there is no agreement, legally, technically or socially about what constitutes a wetland, and what its use should be, with many different and somewhat opposing interests in its area.

7. Conclusions

This case study has illustrated how self-organizing processes in the social-ecological system of the Angachilla wetland have changed through time and the key variables that have triggered collective action related to wetland conservation. We have seen how a process that started as a neighborhood initiative, aimed towards improving quality of life in the area has become a political project, changing municipal regulations that could improve wetland protection and also increase the participation of social actors in the decision-making process on a city wide scale.

We have found four key variables that have triggered collective action and self-organizing processes, attempting a transformation of negative feedback loops, such as norms and regulations that have been detrimental to wetland protection, and resistance to unregulated urbanization over wetlands. Those variables include social-environmental crises, governance vacuums, wetland valuation, and leadership. They have triggered collective actions but in some cases have discouraged peoples' continued participation as the differences in perception have sometimes limited the construction of a shared vision.

We have also shown the difficulties in dealing with this wetland system as a common, in particular regarding its contested nature in terms of limits, use, and property rights. This affects the ability to govern this space in a collective and articulated manner and opens the door to unregulated use and overexploitation. These lessons elaborate on the discussion about urban green commons and the need to question what is considered nature within the city, how it is used, who makes the decisions, who benefits from it, and how commoning processes take place, something that has been somewhat unexplored in other urban commons' case studies.

Finally, even though there is still no successful management regime in place that is able to protect wetlands effectively, we have shown the importance of self-organizing processes and strategies towards improving governance, including greater awareness about the importance of wetlands and the need for further institutional and social articulation.

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