

Participative territory management for the conservation of the Espinal native forests: A case study in Argentina

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ABSTRACT. Natural systems in Argentina have gradually faded as a consequence of land use change, resulting in a diminished capacity to provide the ecosystem services (ES) essential for the well-being of the communities. The basin of the Chocancharava River fits within that context and is immersed in an urban-agricultural matrix that has produced major forest fragmentation. Based on this socio-environmental problem, the present report recounts the challenges and possibilities pertaining to an experience in community management. First of all, a conservation-status assessment of the forest remnants was used as a steppingstone to convene the first meeting of institutions linked to the territory. This interagency coupling allowed for a more holistic diagnosis and the formulation of action plans. The first result was the creation of a peri-urban provincial reserve. Managing the reserve demanded a wider involvement from the community and the provision of a space where all possible voices could be heard. Therefore, the first participative workshop was held, in which ties with the environment were problematized through the ES framework. This experience was of importance when pondering about unilateral decision-making models and grasping the value of community-based networks to generate more inclusive policies. In addition, the workshop provided a space for the co-production of knowledge regarding main actors and tensions about natural resources uses. Furthermore, this process constituted a road of reflection regarding our practices, which are vital for new community processes with results that are legitimate and relevant for the socioecological transformation of the system.

[Keywords: ecosystem services, institutional cooperation, protected area, social value, participative workshop, biodiversity]

RESUMEN. La gestión participativa del territorio en la conservación de los bosques y sus servicios ecosistémicos: Estudio de caso en la Argentina. Los sistemas naturales en la Argentina fueron desapareciendo como consecuencia del cambio de uso de la tierra, reduciéndose así su capacidad para brindar los servicios ecosistémicos (SE) esenciales para el bienestar de las comunidades. En este contexto se enmarca la cuenca media del Río Chocancharava, inmersa en una matriz urbano-agrícola que produjo una gran fragmentación de los bosques, quedando pequeñas áreas remanentes distribuidas en forma de parches aislados. A partir de esta problemática socio-ambiental local, en este artículo se narran las potencialidades y desafíos de una experiencia de gestión comunitaria. En primer lugar, se realizó un diagnóstico del estado de conservación de los remanentes de bosque como punto de partida para convocar la primera reunión de instituciones vinculadas al territorio. Esta unión interinstitucional permitió un diagnóstico más holístico y la formulación de planes de acción. El primer resultado fue la creación de una reserva provincial periurbana. La gestión de la reserva exigía una mayor participación de la comunidad y la construcción de un espacio en el que se pudieran escuchar todas las voces posibles. Por ello, se realizó el primer taller participativo, en el que se problematizaron los vínculos con el ambiente a través del marco de los SE. Esta experiencia fue importante para reflexionar sobre los modelos de toma de decisiones unilaterales y comprender el valor de las redes comunitarias para generar políticas más inclusivas. Además, el taller proporcionó un espacio para co-producir conocimiento sobre los principales actores y tensiones en los usos de los recursos naturales. Además, este proceso permitió reflexionar sobre la propia práctica, indispensable para generar nuevos procesos comunitarios con resultados legítimos, válidos y relevantes para transformar los conflictos socio-ambientales.

[Palabras clave: servicios ecosistémicos, cooperación institucional, áreas protegidas, valor social, trabajo participativo, biodiversidad]

INTRODUCTION

The fabric of life supporting human wellbeing is in rapid decline, which generates a cascade of interdependent negative effects for people and ecosystems around the world (Zafra-Calvo et al. 2020). In this regard, biodiversity is needed to maintain the key functions of ecosystems, as well as their structure and processes, which strengthens ecosystem services (ES) and/or nature's contributions to people (NCP *sensu* Díaz et al. 2018; see below). A loss of biodiversity makes ecosystems more vulnerable to disturbances, strips their capacity for recovery, and reduces their prospects for survival (Oberhuber et al. 2010), not to mention the ethical implications of this loss (Nelson and Vucetich 2009).

At the present time, the disruption of ecosystems due to climate change and other anthropogenic factors entail biophysical changes to the biota and to ecological processes, as well as adaptive responses to those changes by society. As ecosystems become disrupted, so do the quality and quantity of ES on which the livelihood and wellbeing of humanity depend, as well as the relations between societies and nature (Colloff et al. 2020). The scale of the current crisis with regard to climate and biodiversity demands an immediate transformative shift in the public planning and decision-making processes in order to reverse present trends and open up paths towards a more just and sustainable future (Zafra-Calvo et al. 2020).

One of the primary anthropic factors that exerted significant pressure on natural systems is land use change mainly arising from the expansion of cities, which currently accommodate around 55% of the world's population and is expected to reach 70% by 2050 (Legado Chile Foundation 2018). This, coupled with current intensive farming practices is causing fast-paced pollution and demand for natural resources (Jaeger et al. 2010). On top of this, land-use planning dictating urban growth processes in Latin America and the Caribbean did not consider natural resources nor their incidence on the living standards of the population (Langebeck Cuéllar and Beltrán Vargas 2016).

Specifically in Argentina, the loss of natural and semi-natural systems was and still is due to the advance of agricultural frontiers (Grau et al. 2005; Donald and Evan 2006; Natale et al. 2019), which bring the reduction of

forests and the services they provide to an alarming level. The Argentine Ministry of the Environment and Sustainable Development (2017) concluded that during the 20th century, the country lost more than 70% of its native forest; by 2014, 4.3% of global deforestation was taking place in Argentina, and in 2017, 172639 ha more had been lost, with a rate of deforestation of 0.38% (Minaverri 2018). In the province of Córdoba, original native forests accounted for around 71.4% (11803919 ha) of the 16532100 ha total surface area; in the past century, more than 95% of these were lost, and nowadays they only account for 3.6% (424914 ha) of the original surface area (Zack et al. 2008).

In this context, the ongoing degradation of drainage basins and their inadequate management have reduced the availability of ES such as water harvesting capacity, soil protection and nutrient cycle regulation, and caused the decline of native species, some into extinction (Elosegi and Sabater 2009; Natale et al. 2019). Moreover, social and economic problems have increased around the communities, which fostered the onset of various socio-environmental conflicts (Rincón Ruíz et al. 2016).

The basin of the Cuarto River (i.e., the Chocancharava River), located in the center region of Argentina, is not immune to this situation, and there are still several relicts of natural and semi-natural vegetation connected to its banks and distributed in isolated patches divided by a grid of agro-ecosystems and urban areas (Natale et al. 2019). Even though riparian forests are recognized as one of the most important ecosystems, anthropic activities taking place at the basin relicts, such as sand extraction, landfills, urban developments and intensive farming, among others, are leading to the conversion of these natural systems and modifying the physical and chemical characteristics of the basin and the quality of the water, which has a strong influence on the river system functioning, the biota and human health (Natale et al. 2019). This situation is associated with forms of territorial and environmental governance, which are often disjointed, unstable, discontinuous and low in effectiveness (Fernández Vargas 2017).

In that sense, even though the multifaceted nature of sustainability issues has been known for decades, the real-world implementation of inter- and/or transdisciplinarity and research related to the concerned parties has

been delayed (Sala and Torchio 2019 and references therein). However, this is starting to change as both policies and institutions are increasingly supportive of more holistic research approaches (Fischer et al. 2015). For that reason, producing detailed diagnoses on the situation of natural systems does not suffice, and it is also vital to generate participative processes that promote social integration and strengthen involvement and synergy among stakeholders, so that they contribute to implementing solutions that aid territory management and administration (Ortega et al. 2014; Fischer et al. 2015). These processes will lead to the creation of strategies that allow for an effective conservation of the biodiversity and its ES in areas with heavier anthropic use, thus meeting one of the biggest challenges in conservation biology (Kareiva and Marvier 2012).

In view of the aforementioned, the aim of this paper was to create a model experience of the articulation of existing scientific knowledge regarding the natural systems of the Chocancharava corridor (Natale et al. 2019) and the various social actors, ranging from provincial to municipal government agencies and NGOs. In addition, the valuation of the local ecosystem (i.e., Espinal native forest) and its benefits, by different social actors, as well as the main environmental problems that they identify, were investigated. All this, in order to promote public policies, aimed at solving and mitigating the most pressing problems present in the territory, promoting the conservation of forests and the ecosystem services they provide to society.

MATERIALS AND METHODS

Contexts of the Chocancharava corridor

This case study is set in the middle basin of the Cuarto River, which originates at the confluence of the rivers Tapias and Piedras Blancas (32°53'54.83" S - 64°44'10.01" O; 650 m a. s. l.), point at which the watercourse is named Chocancharava (Natale et al. 2019) (Figure 1). Not far from there, at 480 m a. s. l., lies the city of Río Cuarto, with its 184561 inhabitants, and a little further south, Las Higueras, with 8000 inhabitants. As is often the case with most metropolitan cities, these conglomerates can be understood as a single ecosystem with various inputs and outputs of energy, matter and information, with its ecological processes converging in a complex

network of green patches, biological corridors made up of water or vegetation and artificial shelters that are immersed in a grid of concrete, coupled with a context of intensive farming. Throughout history, all these components have been dealt with as disconnected pieces of a jigsaw puzzle in a difficult context for the environmental management led by local governments, which was mainly due to the lack of specialized tools and information, as well as constrained budget realities (Legado Chile Foundation 2018). Therefore, natural habitats gradually turned into 'sacrifice zones' or pockets of unhealthiness and insecurity, particularly in lower income areas. As a result, forest remnants along the river became the hidden and marginal parts of both cities.

Preliminary diagnosis

In the year 2012, work began on the diagnosis of these natural and semi-natural systems making it possible to identify and assess a total of 123 vegetation remnants (1388 ha) connected to the ejidos of the Río Cuarto and Las Higueras localities. The environmental assessment revealed that 71.5% (88) of the patches were in a poor state of conservation, 22.7% (28) in regular condition, 5% (7) evidenced good condition and only 0.8% (1) had a very good conservation status (Natale et al. 2019). The poor condition of the remnants was mainly due to the presence of invasive alien species and thinning of large surfaces. As for anthropic activities in the area, a survey showed a total of 69 sand mining quarries and more than 36 sites with widespread garbage buildup in fluvial terraces. In addition, the watercourse features free meanders that wander through a floodplain creating active erosion sites configured as natural hazards. Forty-three (43) productive properties were identified as main actors in the territory.

The results of this preliminary diagnosis showed that, on the one hand, conservation of patches showing good and very good condition should be promoted with minimal anthropic intervention by implementing strategies that allow for the strengthening of the homeostasis and resilience qualities of their components. On the other hand, patches in poor state of conservation require the implementation of strategies aimed at the restoration of environmental factors and degraded areas. Thus, bearing in mind the spatial distribution of surveyed patches and the protection and distinctiveness

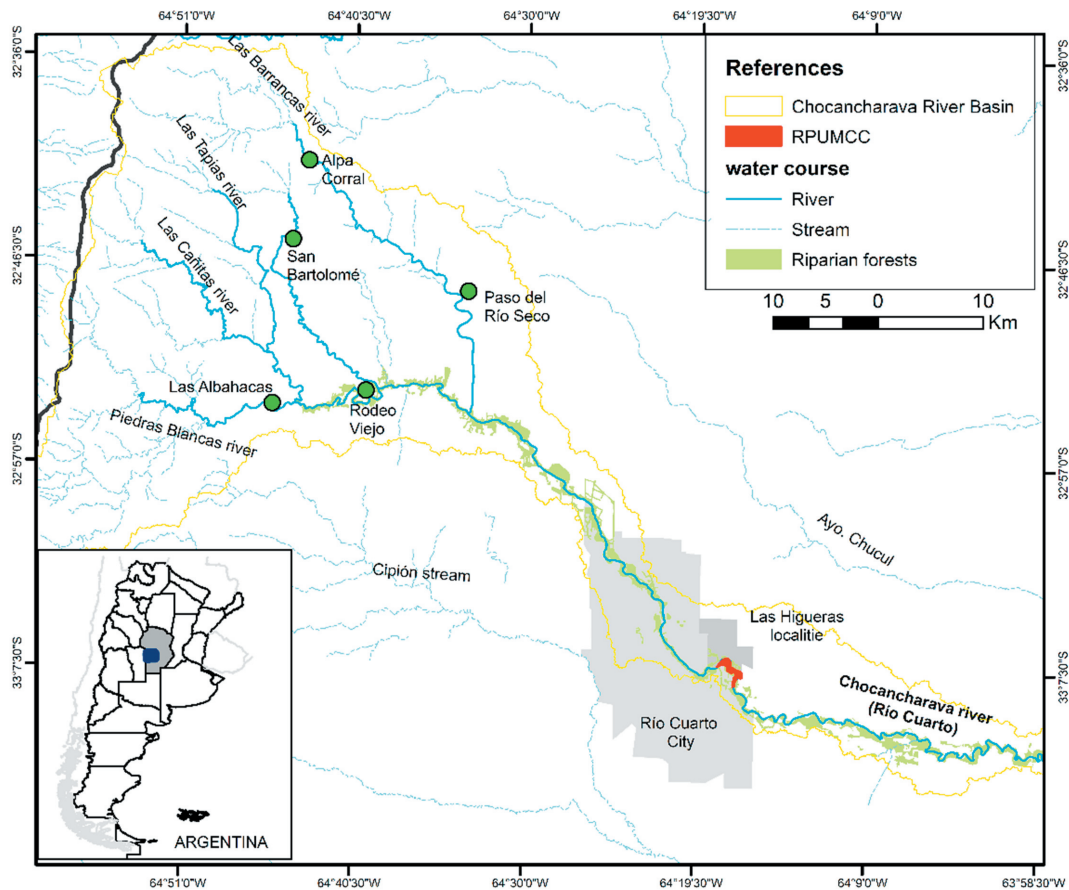


Figure 1. Location of the studied area.

Figura 1. Localizaci6n del 6rea de estudio.

values obtained, a set of management recommendations was generated that could be included in the land-use planning of both localities (Natale et al. 2019).

Participative working methodology

In order to provide an effective answer to the dynamics of socio-ecosystems, the decision-making process must include social, economic and environmental considerations from the various groups involved (Berkes et al. 2003; Ostrom 2009). The communication and cooperation amongst different institutional levels, sectors and social groups are therefore a critical element. It is important to establish a widely accepted framework that allows for the institutionalization of interactions between interest groups, the negotiation of conflicting interests and the generation of conflict-resolution mechanisms in order to determine the way in which decision-making and resource management will be handled (Ortega Uribe et al. 2014). One method for the

improvement of environmental management is the involvement of bridge organizations that prompt communication amongst institutions and ecosystems, and the explicit recognition of the underlying cross-scale structure and non-linear interactions of these linked systems by policymakers. That is why this type of organization plays a key role in the enablement of joint management and adaptive governance, and is essential when managing the resilience of social-ecological systems (Berkes et al. 2003; Ostrom 2009; Allen et al. 2011; Rathwell and Peterson 2012; Sala and Torchio 2019). Based on these premises, in the first instance, a map of actors was made following the methodology proposed by the Central Regional Directorate of the National Parks Administration for the realization of management plans (DRC 2017).

Considering that the forest remnants surveyed had a great potential to become biodiversity refuges and offered an opportunity for the community to reconnect with nature, the

Conservation and Development Foundation (i.e., *Fundación Conservación y Desarrollo*) functioned as a bridge organization and fueled a community empowerment and socio-political coordination process with the aim of securing an effective conservation of the remnants. This process took place through the implementation of a series of workshops where the actors involved shared different perspectives on the issues surrounding the basin and had the opportunity to recount the measures undertaken up to that moment. Within this framework there was an exchange of varied and heterogeneous discourses built from the different institutional logics, sectoral interests and reference knowledge. This exchange gave way to a more comprehensive understanding of the issue and served as a starting point for the development of an action strategy that took this complexity into account. The topics discussed and the agreements made were recorded in commitment minutes.

In addition to this, and to involve a greater number of possible social actors, a participatory workshop was held using the methodology proposed by Sepulveda et al. (2015). The data was analyzed using a modality between restorative and analytical. In the restitutive mode, the words of the participants were reproduced without interpretation by the researchers. Then, in the analytical mode, the categories that organize the data were identified and compared to arrive at common story structures (Kornblit 2007).

RESULTS

Participatory territorial management

In May of 2017, after the correct identification and mapping of social actors with some sort of connection to the basin, who often were carrying forward initiatives of their own, the first meeting of social institutions and government bodies came to fruition. The aim of said meeting was to face the challenge posed by the sustainable development of the cities, including the environmental component of their territory-planning.

Both the organizations and the neighbors in general realized that the city had grown turning its back on one of the resources vital for life in the planet: water. That is how the Chocancharava River was pinpointed as an irreplaceable asset for the environment that falls within social capital given its cultural, economic and ecological value, and that needs

to be preserved and maintained to safeguard the interests and rights of current and future generations. Lastly, it was determined that the Córdoba Ministry of Water, Environment and Public Services, and its pertinent areas would be accompanied by the National University of Río Cuarto (UNRC), the Río Cuarto municipality, Las Higueras municipality and all intermediary organizations in an exemplary effort of cooperation.

That way, a proposal was put forward for the establishment of a work space with the following objectives: 1) training and education regarding environmental awareness and care, 2) supervision and control in accordance with current regulations, 3) identification and management of projects related to the regulation, retention, conduction or protection of margins, 4) cleaning of landfills and pollution sources of the riverbed, 5) forestation and protection of native vegetation patches, 6) public use planning for the various spaces within the corridor, and 7) the formulation of legally binding projects, which tend to strengthen institutional coordination at various levels and for different initiatives. In December of 2017, after several months of collective work, an agreement memorandum was signed for the foundation of the Chocancharava Corridor Inter-Agency Board (MICC), which gathered more than 20 organizations, including provincial and municipal public authorities, private entities, NGOs and educational institutions, among others (Figure 2).

To fully account for the complexity of the actors involved in the territory and the process studied (see Figure 2), it should be noted that important provincial and national institutions, with a strong developmentalist character and with the presence of private actors of great economic power, have also participated. In this sense, it is worth mentioning the Ministry of Agriculture and Livestock of the province of Córdoba and its Worktable for Good Agricultural Practices (i.e., constituted 100% by large producers), the Soil Preservation Council and the National Institute of Agricultural Technology (INTA, by its acronym in Spanish). Three spaces that share a clear productivist and utilitarian vision of the system. In the same sense, it is necessary to mention the participation of the Association of Architects, linked to municipal areas of urban development such as the Municipal Institute of Urban Planning of Río Cuarto (IMPURC, by its acronym in Spanish). This led to the

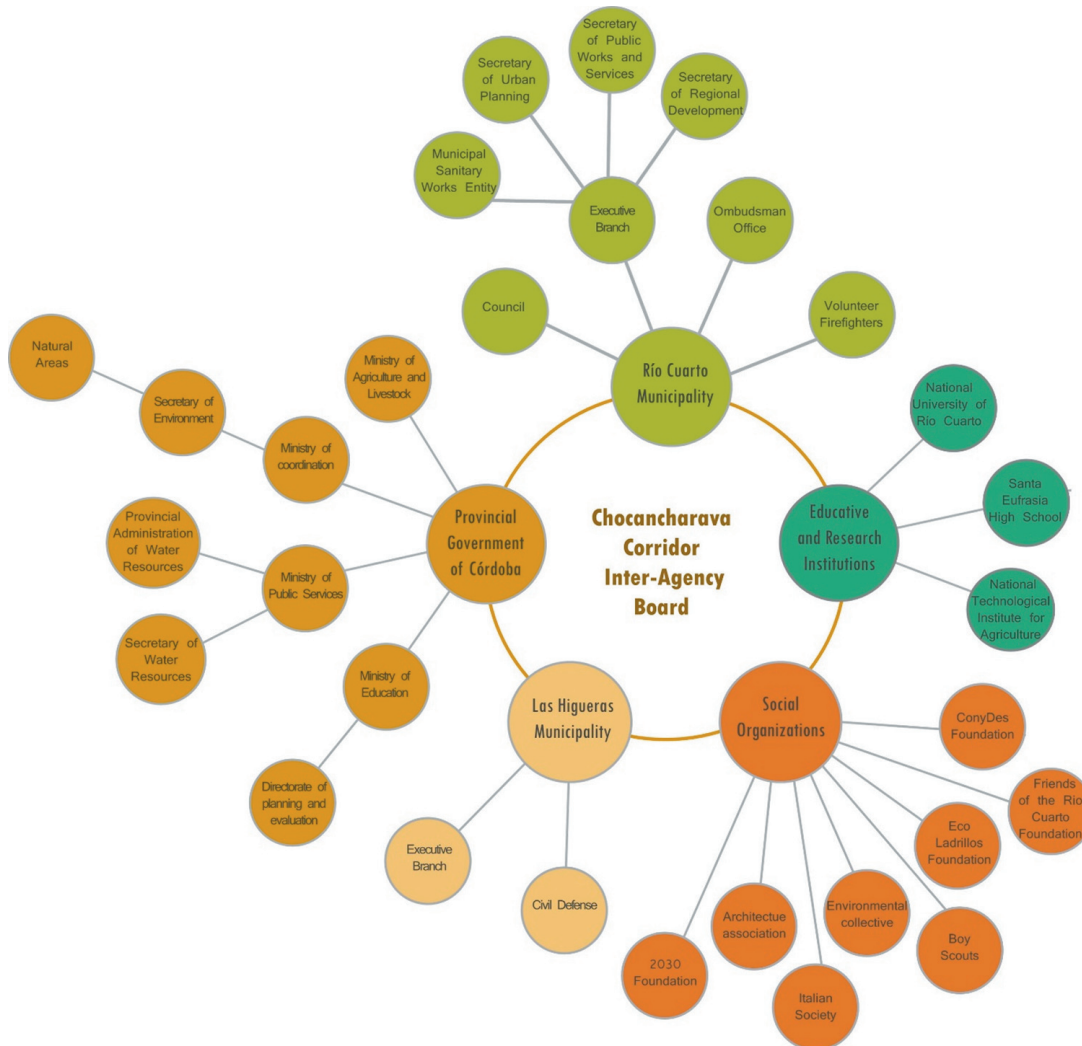


Figure 2. Scheme of actors that formed the Chocancharava Corridor Inter-Agency Board (MICC).

Figura 2. Esquema de actores que conformaron la Mesa Interinstitucional del Corredor Chocancharava (MICC).

configuration of an inter-agency forum for the articulation, coordination, and validation of State action at its various levels, along with the institutions and representatives of civil society as far as the river regional system is concerned.

Towards the creation of a protected space

By the end of 2017, on the basis of the interaction between the institutions that made up the MICC, a proposal was submitted to the legislative power of the province of Córdoba suggesting the creation of a protected area that encompassed the best preserved riparian forests within the middle basin of the Chocancharava River; said proposal was declared of public interest by the city council of Río Cuarto, and in March of 2018, the

Chocancharava Corridor Provincial Reserve for Multiple Purposes (RPUMCC, Reserva Provincial de Uso Múltiple Corredor del Chocancharava) was created by Provincial Law 10525, with a surface of 208 ha. As is the case with any other protected space, the establishment of the legal framework had to be followed with the provision of appropriate planning and management instruments in order to optimize the means available for its maintenance and achieve results that are demonstrable to society (Nello Andreu 2008).

Based on this, and considering the integral and functional character of the basin, which displays interconnected elements that interact with each other (Vidal Abarca et al. 2014), the board addressed the creation of a sustainable

development plan for the region that tends toward the conservation of the protected environment. Thus, taking the reserve as a core, work began on multiple lines: 1) actions for the prevention and/or mitigation of anthropic impacts both within the reserve and across the rest of the forest patches of the basin, with communal participation, 2) recovery of degraded riparian forests through the control of invasive alien species and revegetation with native species, 3) participative planning of environment-friendly public use, 4) design of environmental education programs to be incorporated into the local school curricula, 5) urban development proposals that take the environmental component into consideration, 6) design of landscape corridors within productive areas to restore connectivity between the remnants, and 7) a biodiversity baseline and a reserve management plan. The interaction and collective work among board members led to the November 2018 signing of an agreement for the establishment of a cross-jurisdictional task force aimed at developing a territorial management master plan for the Chocancharava River basin, thus engaging social actors in the upper and lower basin with the preservation of environmental assets related to the river as a whole.

Under this framework, in August 2019, the first participatory workshop was held, of a set of meetings planned, to define the conservation values of the RPUMCC and its associated problems and actors. The workshop methodology included instances of group work and plenary discussions, with broad slogans intended as triggers for dialogue and the expression of points of view, perceptions and evaluations of the participants (see Supplementary Material). This is intended to promote citizen participation and the construction of shared meanings and agreements, thus avoiding the imposition of unilaterally determined technical guidelines. An open call was sent to the whole community and the invitation was promoted through the media and through posters placed in public spaces and business stores across various neighborhoods of both cities. The workshop had an attendance of more than 150 citizens. Participants included government agents (from areas such as public services, urban planning, tourism, mining, educational planning, and city councils), secondary and university-level students and teachers, park rangers, NGOs, boy scouts, representatives from civil engineering and architecture associations, and area residents.

After the introduction of the reserve and the working methodology, the participants were randomly divided into 8 commissions (around 15-20 people each) guided by one or two assistants in order to address three objectives: 1) identify the environmental benefits provided by the reserve and its surroundings, 2) identify how these relate to the natural resources found within the protected area, and 3) identify the main problems affecting the protected area and the actors involved.

It is worth mentioning that the concept of ecosystem services (ES) as such was not used during the workshop. Instead, the term 'environmental benefits' was used in a broader sense so that the participants could express their valuations in relation to the ecosystem using their own words, and without the conditioning of preexisting categories. Afterwards, the participants' valuation of the benefits brought by the reserve were sorted according to the categories set out by the Millennium Ecosystem Assessment (MA 2005). This classification was used in order to facilitate the comparison with other scientific papers. Although we see progress in the reconceptualization of NCP (Díaz et al. 2018), we understand that the level of practical use —and appropriation— by the scientific community, both national and international, is still very limited, we decided here to work with the ES category (see Kadykalo et al. 2019 and references therein).

The environmental benefits of the reserve

The results of the first participative workshop (Figure 3) showed that the community has a growing interest in participating in public discussions about our ecosystems and engaging in activities related to the environment. During the social valuation exercise, we found that the various work groups made gradual collaborative progress towards the identification of ES and managed to identify 19 of those proposed by the MA (2005). Strikingly, the most recognized ES group was that of regulating services (Figure 3), giving weight to the importance of native forest patches as regulators of soil, water and air quality, as well as climate regulation. Cultural ES such as education, recreation and ecotourism were considered by most work groups (Figure 3). In addition, some participants highlighted the valuation of cultural heritage by pointing to historical and archeological elements present in the area. In terms of provisioning ES, the fresh

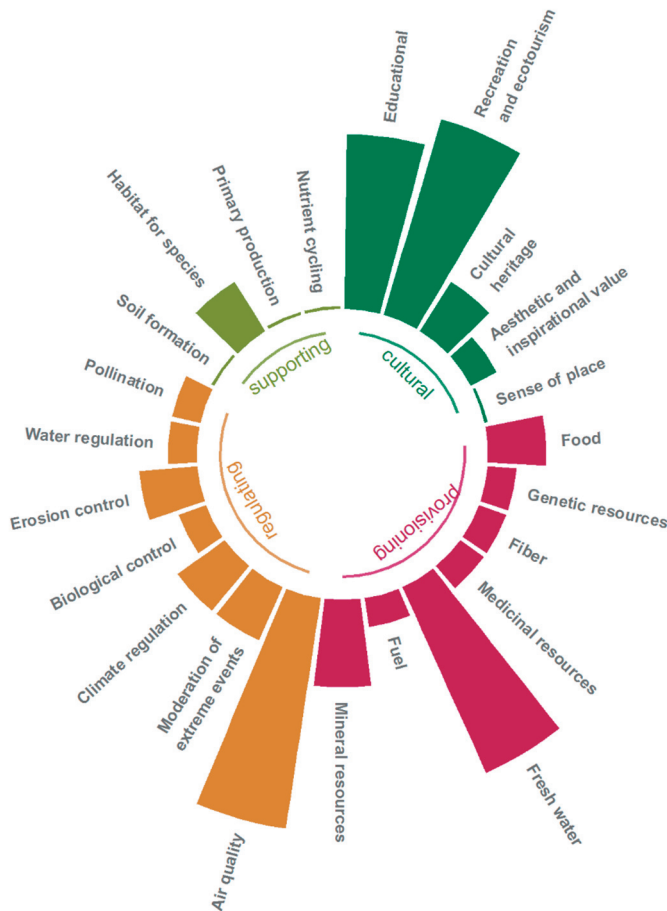


Figure 3. Frequency of mention of the various ecosystem services (ES) according to the classification of the Millennium Ecosystem Assessment (2005).

Figura 3. Frecuencia de mención de los distintos Servicios Ecosistémicos de acuerdo a la categorización de Evaluación del Milenio (2005).

water supply was the most widely recognized, and, to a lesser extent, identification included food (fish), mineral resources (construction sand), fuel (firewood), genetic resources (seed source) and medicinal resources (flora). It is worth highlighting the absence of fiber among the ES present in the workshop results. And lastly, with regard to supporting ES, forests were identified as a habitat for wildlife species, although there was no mention of nutrient cycling services, primary production or soil formation.

Natural resources and environmental benefits

Figure 4 shows the natural resources mentioned by the participants in this instance; their scope presumably attests to a general (forests, flora and fauna) and utilitarian (bees, sand, firewood) awareness among citizens regarding natural spaces. When it comes to the relationship between resources and benefits, native forests, shrublands and grasslands were recognized as the main sources of regulating services (of local climate, water, air and soil).

Some groups established the relationship between native vegetation and regulating ES, such as soil quality, in a more detailed manner. Conversely, the river, the lagoon, and groundwater were identified as sources of fresh water, and native forests, natural ravines and the lagoon were identified as the main sources of cultural services.

The main problems and the actors involved

Lastly, Figure 5 outlines the identified environmental problems as well as the relationships with different actors within society to whom responsibility over the occurrence and/or solution/treatment of said problems is allocated. The most frequently mentioned problems were those related to the historical use of natural resources, such as intentional burning for pasture improvement, selective logging for firewood and sand extraction. Additionally, the river and the territory of the reserve were identified as a usual place for waste deposits (small waste dumps). It is worth highlighting that the



Figure 4. Natural Resources found in the reserve that the participants linked to the identified environmental benefits. Font size represents the number of mentions.

Figura 4. Recursos Naturales presentes en la reserva que los participantes relacionaron con los beneficios ambientales identificados. El tamaño de la letra indica la cantidad de veces que fue nombrado.

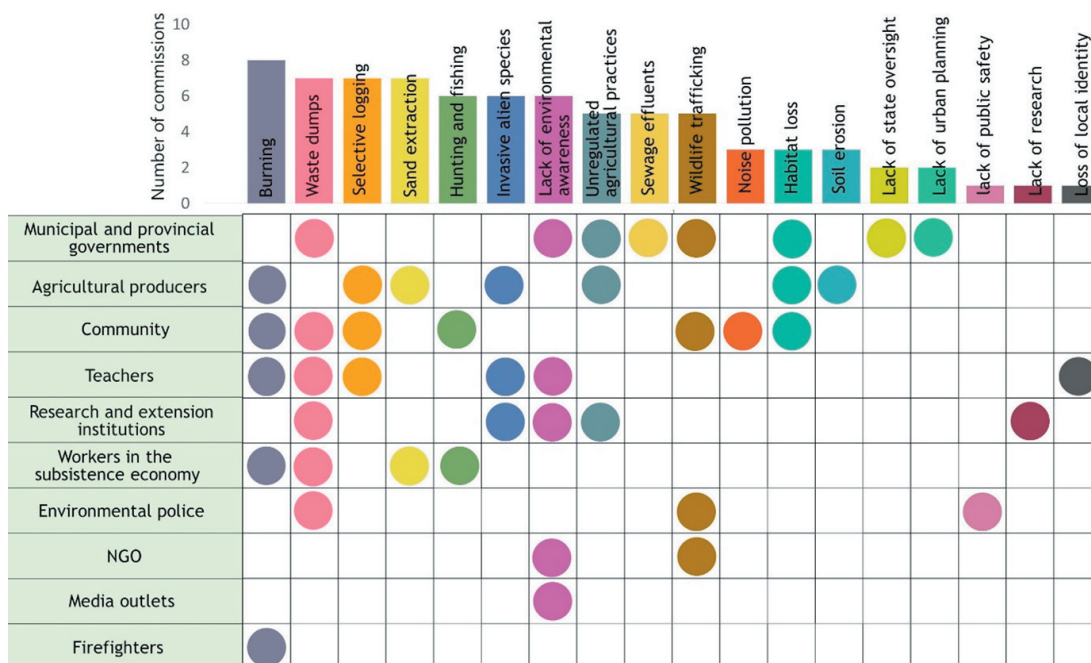


Figure 5. Environmental issues taking place in the protected area and social actors with an existing link according to what was stated in the work commissions.

Figura 5. Problemas ambientales que ocurren en el área protegida y los actores sociales que presentan algún vínculo según lo expresado en las comisiones de trabajo.

participants identified the presence of invasive alien species and farming practices as a threat to the protected area, given that both issues are part of the everyday landscape of the citizens.

Secondly, problems related to the regulation of human activities on natural environments were recognized, including the lack of urban planning and state supervision, which brings about the chaotic advance of urbanization and agricultural frontiers. This advance was linked to the loss of habitat and connectivity among the riparian environments. About the previously mentioned problems, the lack of awareness was recognized by most commissions as being a backdrop or trigger for other conflicts.

As to the identification of social actors linked to the current reality of the reserve, the municipal and provincial governments were pointed out as the main responsible actors, both in terms of the causes and their handling. Another set of actors that was often mentioned were agricultural producers, who were identified as being responsible for issues such as uncontrolled fumigation, the advance of the agricultural frontier, burning for pasture improvement, soil erosion, the presence of invasive alien species, among others. Thirdly, the community as a whole was mentioned as the generator of some of these issues; however, they do not find themselves accountable for the production of social changes to the environment.

DISCUSSION

The community networks for local sustainability

In the last few decades, the importance of the existing links between nature and people have been increasingly recognized from the perspective of social-ecological systems (e.g., Berkes et al. 2003; Ostrom 2009; Sala and Torchio 2019). The various approaches to the understanding of this link reveal both nature's contributions to the wellbeing of societies and the human actions that impact ecosystems through institutions (Martín-López et al. 2014; Reyers et al. 2015; Díaz et al. 2018). Considering these interactions, and in order to achieve a sustainable governance across local territories, we must go beyond the top-down approach and pave the way for management practices in which interested parties engage in cooperation, build horizontal consensus and propose objectives and actions within a

platform that allows for social learning (Rist et al. 2007; Zafra-Calvo and Geldman 2020). With the aim of encouraging community management within the scope of our case study, bridge organizations were used as a mean to prompt the first meeting of institutions across different levels (municipal, provincial and national) and with various work histories within the basin territory. This inter-agency connection played a role in enriching the perspectives of each institution regarding the basin and strengthening the ability to act on the socio-environmental issues of the region.

The intention behind this strategy was to work towards more interactive agreements between academic and non-academic actors with the conviction that the co-production of contextualized —or situated— knowledge will also contribute to the development of new capabilities and the creation of new networks to build paths towards a sustainable future and avoid falling into prescriptive or 'externally' imposed definitions (Norström et al. 2020). Consequently, the coordination of different institutional sectors (related to the environment, public services, education, agriculture, urban planning, legislation, etc.) created the conditions for the establishment of a protected area as the main achievement and for the development of actions at various levels within the basin. Another strength of this management space was the relative continuity of the meetings in the course of time, which allowed for a first stage of diagnosis, the outline of the main lines of action and their implementation.

In this sense, and based on a critical view of political ecology (e.g., Sala 2021), we believe that the effective realization of the reserve was favored by multiple factors, particular to this experience and not necessarily extrapolated to other cases (i.e., place-based transdisciplinary research). On the one hand, the area defined for the conservation unit did not constitute a great threat to productive interests, even though there were important real estate development projects in that area. In addition, the majority consensus, fostered during the participatory process, regarding a 'noble environmental cause' silenced any opposition initiative. Finally, the area chosen for the reserve was recognized by the actors, until then, as an area of unhealthiness and insecurity in the city, so its transformation into a reserve was perceived as a gain for most of the participants in the process.

The project for the establishment of a protected area had the aim of overcoming traditional society-nature duality and viewing the protected area as a space where residents and their organizations become the main actors, and where the main goal is to transform the relationship between social groups and ecosystems. All within a framework for the creation of new alliances, as well as dialogue and participation strategies. Given that the changes required to achieve sustainability may affect fundamental aspects of the community, such as lifestyle or models of economic organization, building consensus and social engagement is of great importance (Bertoni and López 2010; Durand and Jimenez 2010; Sala and Torchio 2019). In that sense, we concur with the remarks made by Palomo et al. (2014), who expressed that governance of these complex adaptive systems must consider the opinions of all the parties involved, as well as their systems of values and knowledge sources. In order to include the voices of all interested parties within our local system, which was immersed in a complex urban-agricultural interface, it was necessary to promote broader participative spaces and improve communication among decision-makers, protected area administrators, and users. This way, the participants of the MICC invited users into the space through the performance of public workshops in order to raise the effectiveness of conservation programs, reduce or avoid social conflicts, and democratize the access and management of ES.

A community experience of social valuation

The participative workshops had the objective of promoting citizen involvement in the participative management of the reserve, trying to reconnect to our natural heritage as a community and moving towards the identification of links between nature and society through the perspective of ES. This type of tool was of great use to evaluate the multiple values attributed to nature by social actors linked to the protected area, as well as to determine how this knowledge can become a guide for decision-making (Rincón-Ruíz et al. 2014; Berbé-Blázquez et al. 2016; Rincón-Ruíz et al. 2019). In addition to this, the emphasis was placed on the need to reclaim our physical, psychological, economic and political relationship with natural environments through the plural valuation of ES (Nayak and Berkes 2012; Jacobs et al. 2016; Ives et al. 2017).

On the other hand, results showed that the community has a great interest in participating in public discussions about our ecosystems and engaging in activities related to the environment. We consider that this type of exercise creates opportunities for the co-management of the area, as it could generate more social support than strict biodiversity conservation programs through the integration of local needs and expectations (Palomo et al. 2014; García-Llorente et al. 2018).

It is worth stressing the importance that the participants placed on native forest environments, which were identified as being the main providers of cultural, supporting, provisioning and regulating services. It can be inferred that this acknowledgement of the forests is linked to the vast struggle of the peasant movement and the social organizations in order to protect them from the advancement of urbanization and agricultural frontiers (Silvetti 2013; Minaverry 2018). This led to the promulgation of National Law 26331 on Minimum Standards for the Protection of Native Forests and received provincial coverage as a result of the debate surrounding the territorial planning of our forests. In this way, our historical relationship of degradation has been gradually problematized during the last decade.

The most brought up points during the debate around the main issues linked to the reserve were historical activities like sand extraction, logging for domestic use and fishing, which point to social representations of a standard biodiversity conservation, where protected areas are seen as restricted places available for touristic, recreational and educational purposes only. However, the identification of fumigation, lack of planning and other issues taking place outside the protected area limits denote a broader view of the territory, which takes note of interactions with the surroundings.

Regarding the role of social actors linked to the issues identified, most participants viewed citizens as the mere recipients of regulatory or educational public policies. As such, it can be noticed that the top-down governance practices of a regulatory State that controls activities across the territory are still embedded in the social imaginary. Under this management paradigm, most participants do not identify as being active agents transforming socio-environmental reality, but rather demand external actions from decision-

makers, educators or NGO members. In that sense, it is necessary for future encounters to include spaces for discussion on the various types of governance (top-down, bottom-up, multilevel, polycentric) and the importance of active civic participation in environmental decision-making (Hanspach et al. 2020).

It is interesting to note that, on top recognizing the importance of the reserve's functionality, having specifically identified various regulating services, participants also pointed out threats such as erosion, habitat loss and fires, which all lead to the deterioration of said functionality. In that way, they recognize the creation of protected areas as a fundamental strategy for the preservation of biodiversity (Provincial Resolution 151/17).

Limitations, challenges and lessons learned

Firstly, it must be understood that no methodology for the social valuation of the environment is neutral, because they involve institutions that uphold values, they support the assumptions of their designer and their implementation does not stop at value recognition, but goes on to include value creation during the process itself (Martín-López et al. 2013). Starting from this point, the participative workshop led to some reflections on our methodological and epistemological limitations, as well as an abundance of lessons about this way of doing science. These limitations and methodological uncertainties stayed with us along the whole process, as expected under the paradigm of post-normal science (Funtowicz and Ravetz 1993; see Sala and Torchio 2019 and references therein). On the one hand, we realized that both the open call to join the workshop and the location chosen for the meeting had their share of implications about the type of actors in attendance. Even though we had the participation of various social actor groups (e.g., decision-makers from different sectors, educators, researchers, NGO members and neighbors in general), some key actors with a stronger connection to the reserve did not participate, including agricultural producers, neighbors of the reserve and workers in the subsistence economy, among others. On the other hand, the formation of discussion groups was done at random as prescribed by the workshop methodology and with the aim of promoting exchanges between actors from different social spheres. This approach aids in the exchange of life experiences related to the environment, the enrichment of perspectives

on that topic and the disclosure of conflict issues. However, it can also create a context of pronounced power asymmetries, where only a few actors express their opinions and others do not have the confidence needed to speak freely, which results in a false consensus. Consequently, we believe that future participative instances should summon these key actors through direct invitations and consider more suitable exchange scenarios, creating initial focal groups that consist of a single type of actor in order to reduce power asymmetries and knowledge disparity, and promote increased confidence and openness (Cáceres et al. 2015; Horcea-Milcu et al. 2019). On top of reducing asymmetries in future experiences, we believe that, in order to achieve a participative and sustainable management of the territory in question, it would be necessary to conduct studies on the power relations that mediate the access, use and distribution of ES (Berbés-Blázquez et al. 2016).

Despite the limitations detected during the process, this kind of experience provides opportunities to engage in meaningful discussion about the theory, methodology and techniques that build the framework for meetings with other social actors. A more participative approach to the practice of science offers a set of lessons and opportunities that need to be managed and supervised in order to move towards more fruitful and democratic experiences (Vessuri et al. 2014).

CONCLUSIONS

The complexity of the socio-environmental situation of the Chocancharava corridor basin, historically framed within unidirectional governance practices, brought about an emergent initiative of social organizations, which built networks for the creation of an inter-agency board that transcended academic and government realms to include other spheres of citizen participation. The flow of information and the institutional coordination promoted the creation of the first peri-urban provincial reserve in the region. However, they gradually showed that the management of this space required a wider participation in order to increase involvement, encourage projects, mitigate conflicts regarding the use of resources, integrate various types of knowledge and promote social learning.

The participative workshop constituted the first experience in which government

agents, educators, environmental workers and neighbors met together for the valuation of the environment. Despite its limitations and challenges, it was a great opportunity for our work group to exchange different ways of interpreting the same environment. Even though this exercise did not include all interested parties, it incorporated a wide range of perspectives, generating knowledge regarding the most valued ES, main actors involved, tensions surrounding the use of resources, actors identified as being responsible or as drivers of change and potential partnerships to develop community action strategies.

The values regarding our ecosystems are linked to culture and traditions, which have a joint impact on nature through various mechanisms. Consequently, these valuations are not neutral and they implicitly rely on the lenses through which the relationship between humans and nature is perceived. Therefore, the differences in how we relate to nature are at the center of socio-environmental conflicts and represent a crucial point to insure a sustainable and equitable flow in terms of ES and/or NCP (Díaz et al. 2018; Jacobs et al. 2020). In that light, the ES approach was deemed a sufficiently flexible and inclusive tool, capable of articulating the various disciplines and non-academic groups for the co-production of knowledge that is pertinent to local stakeholders (Mastrangelo et al. 2015; Rincón-Ruiz et al. 2015).

As mentioned above, this approach of co-construction of place-based transdisciplinary

knowledge, where the design, implementation and evaluation of the project is conducted by a system of extended peers —scientists and non-scientists contributing jointly to the same process— positions us under the approach of post-normal science proposed for the first time by Funtowicz and Ravetz (1993). This is something that must be promoted and strengthened among the community of ecologists from the Global South if we truly want to see positive results in the stewardship of our protected areas (e.g., see the “public policy-ready science” concept of Sala and Torchio 2019).

Lastly, the experience and lessons taken from this journey, as well as future participative meetings, aim to provide an alternative path of co-creation of knowledge, where science is no longer a means to legitimize policies of narrow consensus, but an enabler for the dialogue of knowledge (e.g., Sala 2021). In that sense, it becomes necessary to include new voices, develop new methods and improve plural valuation networks and practices so that it becomes a community tool that generates social learning and transforms local socio-environmental issues (Leff 2007; Ortega-Uribe et al. 2014; Horcea-Milcu et al. 2019; Hanspach et al. 2020).

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