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Situational Analysis of Water Resources

Update of results for the High Andean Macrozone of the Tarapacá and Antofagasta Regions and for the San Jorge Bay

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Authors: Dr. Edmundo Claro and Dr. Francisco Molina

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1. INTRODUCTION

Global water management faces major challenges, such as increasing water demand, the limited availability of land-based water resources, and the need to reduce overuse. These are intensified by climate change and the need to balance industrial, community and environmental interests. To address these challenges and move towards water security, it is essential to promote collaborative initiatives.

In this context, BHP conducts a Situational Analysis of Water Resources (ASRH) for the areas where it operates, considering a scope defined in collaboration with key stakeholders and partners, including indigenous peoples. The goal of an ASRH is to improve understanding of the area's water context by identifying shared water challenges and opportunities for collective action to address those challenges. The ASRH is an exercise conducive to the exchange of knowledge, the generation of trust and the validation of collaborative work on the water challenges of a particular area.

Between 2018 and 2020, the CSIRO Chile Research Foundation developed ASRHs for three areas: the High Andean macrozone in the Tarapacá and Antofagasta regions, San Jorge Bay in Antofagasta, and Mejillones Bay in the same region.[1] Although the results were published and the work included thorough desk research, national and international circumstances prevented the participatory phase needed to engage stakeholders and collect their input.

In order to update these results and carry out the corresponding socialization and participation stages, BHP contracted Estado Local in 2024. This document, which collects the participation of various stakeholders, presents the shared challenges and opportunities for updated collective actions for the High Andean macrozone of the Tarapacá and Antofagasta regions and for the San Jorge Bay.

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1 Published documents can be accessed at: https://www.bhp.com/sustainability/environment/ water/shared-water-challenges/what-is-wrsa.

2. UPDATE ON SHARED CHALLENGES AND COLLECTIVE ACTIONS FOR THE HIGH ANDEAN MACRO ZONE OF THE TARAPACÁ AND ANTOFAGASTA REGIONS

2.1 Shared Challenges

A shared challenge refers to a water-related problem, concern or threat involving different stakeholders. Since these water challenges impact multiple parties, their management requires collaborative work. The shared challenges identified in the desk work (2018-2020) were presented and discussed in two workshops - one in San Pedro de Atacama and another in Pozo Almonte - together with local stakeholders, between November and December 2024. These meetings made it possible to update the challenges previously defined, which included rewording and clarifying the focus of some of them, and eliminating one of them due to changes in the country's political circumstances. The updated shared challenges are detailed below.

1 Insufficient water resources to meet the demand of the different sectors

The challenge acknowledges that available water resources are insufficient to meet the demands of various sectors. It highlights the need to assess actual water consumption in relation to available supply, taking into account the natural recharge of surface and groundwater sources. In addition, the importance of promoting effective governance and integrated water management at the basin level by advancing cross-sectoral agreements that address water allocation, monitoring, governance, and joint investments is stressed. This approach, although it has already shown progress in other regions of Chile, needs to be implemented and strengthened in the regions of Tarapacá and Antofagasta.

Lack of access to water, sanitation and hygiene (WASH) in local communities[2]

The challenge reflects the lack of access to water, sanitation and hygiene in local communities, despite the existence of an institutional framework for rural sanitation. In addition, the lack of practical tools makes it difficult to obtain the sanitary resolutions necessary to participate in formal food markets (such as the vegetable market) and in tourism activities. A key cause is the absence of sewage systems in the villages, which makes the limitations of socioeconomic development in the localities worse.

Environmental impacts of changes in water resources and the difficulty of understanding their magnitude and effects on biodiversity

The challenge emphasizes the need to assess and understand how changes in water resources, including proposals such as diversion of water from streams for economic activities, impact biodiversity and groundwater-dependent ecosystems. Although these initiatives can generate economic benefits, they also entail significant risks to the environment, especially in sites of high ecological fragility and species in conservation category.

Lack of confidence in the use of models and scientific-technical information describing hydrological and hydrogeological systems

The challenge arises from the distrust towards the use of scientific models and measurements, which allow for different interpretations and offer different results. These discrepancies make dialogue and decision making difficult, so it is necessary to agree among the participants on the models and methodologies to be used.

Vulnerability and lack of adaptation to climate change and extreme climate events

The challenge reflects the need to address the vulnerability of high Andean communities to climate change and extreme events. Although the historical adaptive capacity of indigenous peoples, based on their ancestral knowledge, is recognized, its application may be limited in contexts where the environment has been significantly transformed. In addition, it is often unpopular for authorities to propose changes in community practices aimed at risk reduction, which makes it difficult to implement adaptive strategies. Also, there is limited technological innovation in agriculture and water management, areas that require greater impetus from the State in order to address climate challenges in a comprehensive manner.

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[2] The acronym WASH is an abbreviation for "Water, sanitation and hygiene".

Tension in the conceptualization and value of water between indigenous communities, the State and the industrial and mining sector

The challenge reflects the coexistence of different ways of valuing and understanding water among the various stakeholders. For many indigenous communities, water is part of a cosmovision that deeply links them to the land and nature, as living entities. This vision contrasts with more functional or productive approaches to the resource, which are present in different sectors of society. Added to this is a perception of uncertainty in the way in which the State regulates certain components of the water system, as in the case of brines from salt flats, which in some contexts have been treated as a mining resource and in others as a water resource. These tensions highlight the need to move towards an integrative approach that recognizes and articulates the various cultural, sectoral and regulatory perspectives related to water.

Low levels of water governance and management at the local level

This challenge addresses multiple dimensions of water governance and management. From a political perspective, it highlights the importance of the State promoting true territorial autonomy for communities, allowing them to manage their resources independently. Regarding the design of governance models, the challenge underlines the need for these to be co-created with local stakeholders and focused on integrated basin management. At the geographical level, the challenge highlights the importance of establishing water management and analysis units that consider the entire system, from the sea to the mountains.

Migrations and demographic changes in rural high Andean towns of northern Chile

This challenge is closely linked to water availability in the region. Water shortage impacts agriculture, grazing and the cultural practices of indigenous communities. Uncertainty about future access to water drives migration, which leads to depopulation, unemployment and a reduction in arable land, threatening food security and the permanence of communities in the area. At the same time, the increase in tourism intensifies pressure on water resources, generating competition with traditional and community uses. Considering this, indigenous organizations have advocated for mechanisms to protect high Andean water resources, highlighting their central role in the life, culture and sustainability of the region.

2.2 Collective Actions

A collective action is a commitment among stakeholders, within an agreed process, that seeks to achieve common objectives in response to shared water challenges. As with the shared challenges, the collective actions identified in the desk work (2018-2020) were presented and discussed in two workshops -one in San Pedro de Atacama and another in Pozo Almonte- with local stakeholders, between November and December 2024. These meetings made it possible to update the collective actions previously defined, which included rewording of some of them and refining their focus. The updated class actions are listed below.

Develop instances of collaborative governance at different territorial scales

This action highlights the need to create governance spaces that are inclusive, decentralized and adjusted to local realities. It emphasizes the co-design of policies and initiatives with a territorial approach, highlighting the importance of inclusive stakeholder participation to achieve integrated basin management. It also underscores the critical role of high Andean aquifers as essential ecosystem components and key water sources for urban centers. One possible initiative to consider is the experience of the multi-stakeholder roundtable led by GIZ in the Salar de Atacama.

Develop collaborative monitoring and public access web platform

This action aims to connect the existing monitoring systems of the high Andean water systems (public, private, community) in a single web platform available to the public, using standards that facilitate the use and analysis of the data.

Validate and expand participatory management models for environmental assets

This action reflects the need to involve local communities in the management of environmental assets. An interesting example to evaluate is the initiative led by the Ministry of National Assets in which it has concession contracts with local communities that participate in the management of reserves, parks, etc.

Develop collaborative plans for adaptation to extreme events

This action highlights the relevance of generating adaptation plans for extreme events, such as droughts or floods, that include the involvement of all stakeholders, such as communities, the public sector, the private sector, and the relevant scientific/academic sector. It is important to note that this is included in the Framework Law on Climate Change, in the communal adaptation plans.[3]

[3] The Framework Law on Climate Change (Law No. 21,455) establishes the Sectoral Plans for Adaptation to Climate Change, which must contain measures and actions to increase the resilience of the most vulnerable sectors to the adverse effects of climate change. Likewise, it includes the Communal Action Plans on Climate Change, which must consider the characterization of local vulnerability and establish climate risk management and adaptation measures. Source: Library of the National Congress of Chile, available at https://www.bcn.cl/leychile/navegar?idNorma=1177286.

Explore opportunities for water exchange between sectors

This action seeks to identify and implement mechanisms for the temporary or permanent exchange of water sources—such as surface water, groundwater, and desalinated water—among sectors like mining, agriculture, industry, and communities. It promotes a collaborative approach that prioritizes human consumption and ecological sustainability.

Identify areas for drinking water supply

This action seeks to address the increasing limitations in the availability of potable water in the high Andean zone. One example is the case of Peine, where the community is facing less rainfall and a reduced flow in the springs, which has led it to request support from companies to collaborate with the supply. This situation underscores the urgency of identifying new water sources and ensuring sustainable management for the continued supply of communities.

Improve sanitation and education about water quality in the communities

This action aims to address sanitation needs in high Andean communities, emphasizing the importance of education about water quality. For example, the assumption is that crystal clear water from a well is safe to drink or that simply boiling it makes it safe for consumption. This situation underscores the need to complement sanitation actions with educational campaigns to improve understanding of drinking water and its proper treatment.

Implement citizen science for water-environmental monitoring

This action seeks to strengthen the monitoring of water resources and environmental assets through citizen science initiatives that actively involve local communities. It enables data collection in isolated or data-deprived areas, improving monitoring capacity and fostering greater public understanding of science. In addition, by integrating the communities in the generation of data, their participation and commitment to water-environmental management is enhanced. One possible initiative to consider is collaboration between Albemarle, the Atacameño community of Peine and CONAF.

Develop guidelines for using indigenous knowledge in water and land management

This action aims to generate practical documents that collect and value the ancestral practices of indigenous peoples in the management of water and land. It also reflects the need for the State to be sensitive to these practices and integrate them into its policies. Examples such as "native recovery" in Cancosa, which includes manual techniques such as planting water and infiltrating aquifers, show how these practices have been important for the preservation of ecosystems.

3. UPDATE ON SHARED CHALLENGES AND COLLECTIVE ACTIONS FOR SAN JORGE BAY

3.1 Shared Challenges

A shared challenge refers to a water-related problem, concern or threat involving different stakeholders. Since these water challenges impact multiple parties, their management requires collaborative work. The shared challenges identified in the desk work (2018-2020) were presented at a workshop in Antofagasta together with local stakeholders in November 2024. This meeting made it possible to update the challenges previously defined, which included rewording of some of them and refining their focus. The updated shared challenges are detailed below.

1 Low levels of governance to address potential synergistic and cumulative impacts associated with intensive use of seawater

This challenge indicates that if cumulative and synergistic impacts arise from intensive seawater use—especially from industrial and desalination activities—governance in the coastal zone of Bahía San Jorge may be inadequate to effectively manage them. In addition, uncertainty persists about the effects of brine on the marine environment and climate change, such as droughts and sea level rise, which calls for more integrated and evidence-based management. Progress along these lines is considered key to fostering cooperation and minimizing conflict among stakeholders.

2 Difficulty for civil society organizations to materialize petitions related to the protection and use of the coastal zone

This challenge points to the fact that the management of the coastal border in Bahía San Jorge is fragmented in institutions with different mandates and disconnected from local authorities, which makes coordination difficult. It also indicates that the lack of tools limits civil society organizations in their ability to protect and develop this space.

3 Need for integrated management to address water shortage

This challenge emphasizes that the coastal zone of Bahía San Jorge faces a growing water demand in a context of natural shortage, lack of environmental education and the perception of seawater as an unlimited resource. The expansion of industrial activity could worsen the degradation of the bay, highlighting the need for integrated sustainable management.

Low levels of governance among stakeholders related to biodiversity conservation

This challenge highlights the potential for weak governance in biodiversity conservation in the coastal zone of Bahía San Jorge, where existing regulations may not explicitly address the cumulative impacts of industrial activities or other sources of pressure on the bay. There is a perception that the intensive use of seawater worsens environmental deterioration, while conservation efforts focus on specific areas and species, leaving others unprotected. In addition, the lack of representative local strategies hinders effective protection of coastal biodiversity.

Insufficient knowledge and management of contaminant concentrations and their cumulative impact on marine sediments

This challenge is based on the lack of specific regulations and a baseline on marine sediments in Bahía San Jorge, which has prevented an adequate assessment of the impact of projects on local biota. The absence of data on chemical concentrations and their toxicity limits the ability to identify the cumulative effects of contaminants in sediments. In addition, institutional weaknesses in marine water management worsens this challenge, underscoring the need to strengthen regulation and monitoring in the coastal zone.

Weakening of traditional practices for the extraction of marine resources

This challenge emphasizes the weakening of artisanal fishing as well as other extractive activities in the coastal zone of Bahía San Jorge. This phenomenon is driven by the decline of marine resources, a lack of interest among younger generations—who are pursuing greater educational opportunities—and strict sanitary regulations that hinder the commercialization of marine products in formal markets. These factors contribute to the deterioration of these practices, which are important for the cultural and economic identity of the region.

Increase in greenhouse gas emissions due to new desalination plants

The main challenge is not desalination itself, but the high energy demands of the process and the transportation of desalinated water to consumption centers. If powered by fossil fuels, these activities could lead to a significant rise in greenhouse gas emissions. This underscores the need to adopt cleaner and more sustainable energy sources in new desalination plants to minimize their environmental impact.

3.2 Collective Actions

A collective action is a commitment among stakeholders, within an agreed process, that seeks to achieve common objectives in response to shared water challenges. Like the shared challenges, the collective actions identified in the desk work (2018-2020) were presented and discussed at a workshop held in Antofagasta in November 2024. This meeting made it possible to update the previously defined actions, which included rewording of some of them and refining their focus. In addition, three collective actions related to desalination were merged into one, and a new collective action was generated focused on the revision of emission standards in coastal waters. The updated class actions are listed below.

Promote collaborative governance for the sustainable development of the coastal zone of the San Jorge bay

This action seeks to foster collaborative governance that integrates the diverse perspectives and knowledge present in the area, promoting the sustainable development of Bahía San Jorge. The need for land use planning that clearly defines the most suitable areas for the installation of coastal infrastructure, such as desalination plants and ports, minimizing land use conflicts, is highlighted. It also underscores the importance of translating the challenges and actions from a technical language to one that is more understandable for citizens, facilitating their comprehension and active participation in the process. Finally, the relevance of strengthening the effective participation of indigenous communities is recognized, allowing them to express their needs and advance their development in harmony with the coastal-marine environment.

Develop tools and instruments to facilitate the implementation of projects for the protection and sustainable use of the coastal zone of the San Jorge bay

This action seeks to develop tools and financing instruments so that social organizations and the community can carry out projects aimed at protecting, conserving and sustainably using the coastal zone. There must be a formal application process to access the corresponding funds, with a continuous and long-term horizon for the application of the tools and instruments.

Implement an integrated and participatory sediment monitoring system

This action proposes to implement a sediment monitoring system with the participation of public, social and private stakeholders to evaluate the presence and impact of contaminants in the area, especially those derived from industrial and port activities.

Implement a collaborative desalination innovation and sustainability program

This initiative supports the creation of a collaborative program for innovation and sustainability in desalination, bringing together public, private, academic, and community stakeholders. Its goals are to promote efficient technologies, manage environmental impacts responsibly, and encourage the use of more sustainable energy sources—advancing a desalination industry that is both more sustainable and respectful of coastal ecosystems.

Implement citizen science initiatives to monitor the environmental quality of the coastal zone

This action proposes to implement a participatory surveillance program to facilitate citizen participation in the environmental monitoring of San Jorge Bay. It is emphasized that participation should not be limited to the use of scientific instruments, but should include accessible methods, such as sending photographs and videos that reflect the state of the bay. In addition, it is suggested that these initiatives be articulated through web and mobile platforms to collect data, alerts and qualitative information. This not only broadens the scope of monitoring, but also strengthens the awareness and scientific capabilities of the lay population.

Develop an awareness program for Water Culture

This action proposes to develop an awareness program to promote a culture of protection and sustainable use of water, addressing the local water cycle, the availability of the resource, the impacts of human behavior and the effects of climate change. The program should promote daily saving and reuse actions that are accessible to the population.

Promote a coastal biodiversity conservation and restoration program

This action proposes to develop a program to conserve coastal biodiversity in areas without direct anthropogenic influence, ensuring the protection of key species and the provision of ecosystem services. In addition, the program will include the restoration of areas impacted by the extraction and excessive use of pelagic and coastal resources, in coordination with relevant stakeholders. The need for tools and financing programs that empower civil society organizations to protect emblematic species such as whales and penguins, taking as an example the progress achieved in the protection of urban wetlands, is highlighted.

Update emission standards in a participatory manner

This collective action seeks to update the emission standards in force in the coastal zone through a participatory process involving public, private, academic and community stakeholders. There is a need to review and adapt the general norms at the national level to reflect the particularities of coastal ecosystems in particular, promoting their effective protection. This update will make it possible to address current environmental challenges and ensure more sustainable management in line with local needs.

4. UPDATE METHODOLOGY

During the months of November and December 2024, three workshops were held to present the results of the ASRHs conducted for the High Andean macrozone of the Tarapacá and Antofagasta regions, and for the San Jorge Bay. In these instances, stakeholders' concerns, opinions and contributions were collected in order to update the findings of the desk research conducted between 2018 and 2020.

Stakeholders invited to the workshops had to meet a number of selection criteria:
a) technical knowledge on the issues addressed in the ASRH, b) interest and rapport to the issues addressed in the ASRH, c) broad and collaborative approach, and d) relatively balanced representation of the four sectors (private, public, civil society, academia).

This exercise, which involved representatives from the Tarapacá and Antofagasta regions, aims to enhance the representativeness of the ASRHs developed in Chile and to foster a collective, collaborative approach to addressing the shared water challenges in the regions where BHP operates.

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