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## Abstract

Since the 1990s, Chile has experienced an accelerated pace of economic development that has been mainly based on the exploitation of its natural resources. The dependence on raw materials and an accelerated economic growth has increased the threats imposed to biodiversity, ecosystems and the livelihoods of indigenous and local communities that live upon them. This chapter outlines the geographic distribution of wetlands in Chile and the national and regional efforts to protect and manage these ecosystems. Important challenges remain in order to achieve effective wetland conservation, especially in terms of enabling an effective participation of local communities in natural resources management.

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Wetland conservation · Wetland policy · Ramsar sites · Biodiversity conservation · Community participation · Natural resources management

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**Introduction**

Since the 1990s, Chile has experienced an accelerated pace of economic development that has mainly been based on the exploitation of its natural resources. Mining activities accounts for 46% of national exports, while agriculture, fisheries, and forestry contribute to 40% (OECD and CEPAL 2005). Chile's dependence on raw materials has increased threats to biodiversity and ecosystems.

However, the return of democracy and democratic institutions in 1990 encouraged the promotion of environmental protection and strengthened Chile's international commitment to work towards sustainable development. In 1971, the Chilean Government became a signatory of the Ramsar Convention, which came into force in 1981.

Although Chile is not rich in terms of overall quantity of species when compared to tropical areas, it is nevertheless important in terms of the genetic variability existing between species and for the presence of an important number of endemic species, which represent a genetic patrimony unique in the world. For example, 85.5% of Chilean flora has its origin in Chile, from which 44.6% are endemic (Manzur and Lasen 2003).

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**Wetlands in Chile**

A survey undertaken in 1999 concluded that Chile encompassed 4.5 million hectares of wetlands, representing 6% of the national territory. These wetlands are highly diverse in nature, largely due to the wide diversity of bioclimates found across the country.

**Geographical Distribution of Wetlands in Chile**

From the north of the country to as far south as Santiago, drainage basins tend to be arid or semiarid; consequently, wetlands are scarce in this part of the country, occurring only in exceptional situations. The term *bofedal* (wetlands located at more than 2800 m in the High Andes) is mainly used by the *Aymará* people in the Parinacota province, whereas the name *vega* is used by the Atacameños to identify the vegetation associated with wetlands. These indigenous cultures are closely linked to wetlands and have vernacular names for a high percentage of wetland species. They consume wetland resources such as fish and algae, divert water resources and use these areas for grazing (Centro de Ecología Aplicada and CONAMA 2006).

Coastal wetlands occur in the central region of Chile, located on bays and estuaries with both oceanic and continental water influences. These coastal wetlands are rich in biodiversity. Of a total of 63 species of flora located in the area of Coquimbo, 17 are considered native, 19 are endemic, and 5 have been classified

as vulnerable. In terms of fauna, out of a total of 173 species, 15 are considered endemic to Chile, 8 are native, 4 are in danger of extinction, 11 are vulnerable, and 1 is considered rare (Centro de Ecología Aplicada and CONAMA 2006).

Towards the south of the country, wetlands are more frequent and they have also concentrated the activities of different cultural groups for centuries. *Hualves*, boggy wetlands dominated by arboreal species, are found in the Araucanía region. *Ñadis* (meaning ‘seasonal swamps’ in Mapudungun: the Mapuche language) are also present in the Araucanía and in the Lakes region. Flat areas with volcanic soil are also found here, constituting a waterproof horizon which is drenched for a period of 4–8 months a year. Further south, there are *turbas* (peatlands) and *mallines*. The latter are sunken, water-saturated areas with alluvial and aeolic sediments, with characteristics of gleysolic soils (Centro de Ecología Aplicada and CONAMA 2006).

## Chilean Wetlands of International Importance

Chile has declared 12 Ramsar sites of international importance. These are located in the High Andes (7), the coast of central Chile (2), the mountainous area of central Chile (1), and at the coasts of the Lakes Region (1) and the Magallanes Region (1). In total, these Ramsar sites represent 205,876 ha. Ten of these sites are managed by public institutions, and two are under private management (CONAF 2010).

Chile participates in a range of regional initiatives to protect migratory species that depend on wetlands, including for example two Memoranda of Understanding (MoUs) signed with Argentina; one of them aims at protecting the *canquén de cabeza colorada* (the ruddy-headed goose, *Chloephaga rubidiceps*) and the other protects the *huemul* (the south Andean deer, *Hippocamelus bisulcus*). Another MoU has been signed with Perú and Bolivia for the conservation of flamingos. The AGCI (Chilean Agency for International Cooperation) project between Chile and Mexico promotes the standardisation of strategies and protocols on awareness-raising about the importance of wetlands in both countries (Informe Nacional Ramsar 2014).

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## Chile’s National Wetlands Strategy

A document outlining Chile’s National Wetlands Strategy (NWS) was developed in 2005. The Strategy has enabled the country to work towards a coordinated and efficient protection of priority wetlands in Chile, and to highlight their importance for sustainable development. The NWS complements the priorities promoted by the Chile’s National Biodiversity Strategy (CONAMA 2003), which itself serves the vital function of representing a wider framework for conservation in the country. The NWS states that *wetlands are zones where biodiversity concentrates, and they determine the functioning of ecosystems and hence, of human life* (CONAMA 2005).

One of the objectives of the NWS is to *increase knowledge about wetlands*. In order to achieve this objective, Chile’s Ministry for the Environment has created

a system to classify Chilean wetlands in relation to their functions and structural characteristics, as a transparent basis for defining different ecotypes of wetlands. Each ecotype is associated with particular functions and threats, enabling development of generic management plans for each ecotype (MMA and Centro de Ecología Aplicada 2011).

A National Wetlands Inventory capturing this information is currently being developed. A wetland information system will become available to the general public, containing complete information on the wetlands that have already been surveyed. The General Water Commission (DGA, associated with the Ministry of Infrastructure) manages and shares information related to water quality and seasonal flow rates of the main rivers and lakes the Commission monitors (Informe Nacional Ramsar 2014).

Another objective of the National Wetland Strategy is to raise environmental, economic, social, and cultural awareness about wetlands. The NWS document also refers to the importance of implementing a legal and institutional framework for the conservation and sustainable use of wetlands. The participation of different actors – such as the private sector, indigenous peoples, universities, and NGOs – is specifically referenced, and the need to develop tools for participatory planning and management of priority wetlands is also stressed (CONAMA 2005).

## **National Wetlands Action Plan**

In order to implement the NWS, a National Wetlands Action Plan was created in 2006. Different governmental organisations participated in its creation including the DGA, the Agriculture and Livestock Service (SAG), the National Natural History Museum (MNHN), the National Forestry Corporation (CONAF), and the National Commission for the Environment (CONAMA) which has been replaced by the Ministry for the Environment (MMA). The National Wetlands Action Plan is currently under review.

## **National Wetlands Committee**

A National Wetlands Committee was also formed in 2005, directed and coordinated by the Ministry for the Environment. The Committee is formed by the Ministry of Foreign Affairs, the DGA, National Commission on Irrigation, SAG, CONAF, MNHN, SERNAPESCA (the National Fishery Service), SERNAGEOMIN (National Geological and Mining Service), and DIRECTEMAR (the Commission for Maritime Affairs).

The Committee meets monthly, and also for special activities if required by any of its members. Committee members analyze documents from the COPs of the Ramsar Convention, so that they can agree on a national view on a range of matters including, for example, the listing of new Ramsar sites and implementation of the NWS and its Action Plan.

## Regional Conservation and Sustainable Use Under the High Andean Wetlands Strategy

The Ramsar Convention recognizes the importance of High Andean wetlands as strategic ecosystems, promoting international cooperation in order to preserve their valuable biodiversity, their role as water regulators and as vital spaces for a range of local communities in the Andes, including farmers and indigenous peoples (CONAF 2010).

Argentina, Bolivia, Chile, Perú, Ecuador, Venezuela, Colombia, and Costa Rica, with the support of the IOPs (International Organization Partners), the Flamingo Conservation Group, CREHO (Ramsar Regional Centre for the Western Hemisphere), and CONDESAN (Consortium for Sustainable Development of the Andean Ecoregion), developed in 2005 the High Andean Wetlands Strategy.

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### Challenges

- There is still much to do in terms of implementing effective planning, including Strategic Environmental Assessments, in those places where policies, programs, plans and development projects could impact on wetlands and on the local and/or indigenous communities surrounding them.
- Limited funds are inhibiting effective wetland conservation, allied with a lack of applied and basic research on wetland ecosystems.
- There is a need for specific planning for each Ramsar Site and a higher level of commitment from the private sector.
- Monitoring and surveillance are especially important. It has been necessary to implement new environmental institutions, especially in the areas of biodiversity conservation and monitoring, for example with the replacement of CONAMA with the new Ministry for the Environment (MMA) (Informe Nacional Ramsar 2014).
- Governmental institutions are currently working on the national inventory on wetlands, which will support implementation of the Ramsar Convention and the National Wetland Strategy. This is considered a fundamental step towards achieving the sustainable management of Chile's wetlands (CONAMA 2005).
- There is a need for greater community participation in the management of wetland resources, through deliberate efforts for cooperation between public authorities and local communities in ways that promote sustainable and just outcomes.

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