Maipo River basin at a glance

Overview

Located in central Chile, the Maipo River basin is of critical importance to the Metropolitan Region. The Maipo River is a main source of drinking water and irrigation for the region, in addition to supporting industry and hydroelectric production. Increasing climatic variability poses signficant challenges for the Maipo River basin, as it increasingly faces competing interests and rising demands, as well as social and environmental conflicts.

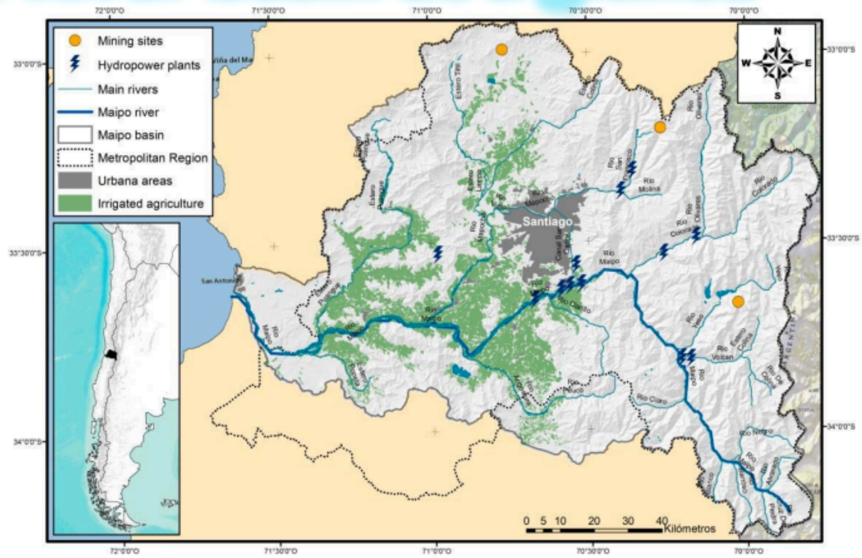


Image: (Vicuña et al. 2014)

Geographic and physical features The Maipo River Basin is located in Central Chile and covers almost the entirety of the Santiago Metropolitan Region as well as small parts of the regions of Valparaíso and Libertador Bernardo O'Higgins (approximately 15,000 square km between the latitudes of 33 and 34 degrees South). This semi-arid region is characterized by a temperate Mediterranean climate in the lower elevations of the basin, while the upper basin, situated in the Andes cordillera at the eastern edge of the region, has a much colder climate. The Maipo River flows 250 kilometers to the Pacific Ocean from the Maipo Volcano (5,623m) in the southeastern corner of the region, bordering Argentina (1). Average temperatures in the basin range from 20°C in summer to 8°C in winter and annual precipitation is about 350 mm in the central valley (increasing with altitude in the Andes), with more than 70% of total rainfall occurring in the winter months (2). The Maipo River basin has been experiencing an extended period of drought since 2009 (3).

Hydrologic features

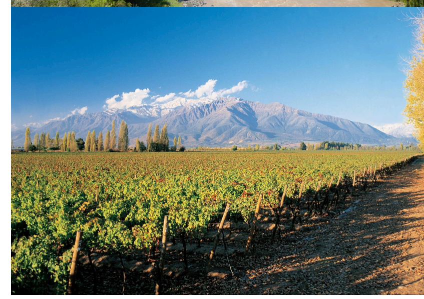
The Volcan and Yeso rivers feed into the Maipo river in the mountainous upper part of the basin, meeting the Colorado River just below the town of San Jose del Maipo before flowing down into the valley and around the southern edge of Santiago. The Maipo is met by the Mapocho River just west of Santiago, and then the Angostura River as it flows west to the coast. The average annual flow of the Maipo River is about 90 cubic meters per second, and it has a snowmelt dominated regime with highest flows occurring in December (4). The Laguna Negra, the San Ramon stream, and the Yeso reservoir (220 million cubic meters) are other important bodies of water that supply the Metropolitan Region (5). Groundwater, primarily from the Santiago aquifer, also provides 30% of the water supply for the region (6). There is variable permeability within the aquifers in the basin, with alluvium mainly composed of gravel and sand, interlayered with more fine-grained silt and fluvial deposits with thicknesses of as much as 600 m (14). In the upper Santiago Valley, expanding urban areas are contributing to increased groundwater pumping rates, and there is concern about aquifer depletion and overallocation of water rights (14).

Socio-economic features

The Maipo River is a crucial source of water for the Metropolitan region, supplying more than 70% of the total demand for irrigation in the basin and up to 90% of the residential demand for drinking water (1). Approximately 93% of the population in the Metropolitan Region lives in urban areas (5). Santiago, the capital of Chile, covers 640 square kilometers and has a total population of more than 6 million inhabitants (almost 40% of the national population) (2). Average per capita water usage is 150 liters per day (7). Almost 43% of the gross domestic product is generated in Santiago, a main center for industry, commerce and financial services (2). Agriculture is also very important in the region, where much of the country's fruit, wine, cereals, and vegetables are produced (5). Irrigated agriculture constitutes the main consumptive use of water in the basin, providing for 136,000 hectares, while hydropower represents the main non-consumptive use - there are now 11 run-of-the-river hydroelectric plants (3). The Cajón del Maipo is an important site for ecotourism and outdoor recreation, and also includes several conservation areas in the mountains outside of Santiago.

Institutional features

Chile's 1981 Water Code established a market-based system of private, tradable water rights, with distinction between surface and groundwater and between consumptive and non-consumptive water uses (8,9). All permanent water-use rights for the Maipo River had already been allocated by 2003 (4). The Dirección General de Aguas (DGA) is responsible for granting water rights when available, while water use is monitored by water users associations. In the Maipo Basin, the canal user associations and the "vigilance committees" are particularly active in overseeing allocation according to legal water rights (5). The Maipo and Mapocho rivers have been divided into sections for administrative purposes. The first section of the Maipo alone provides irrigation to more than 45,000 hectares and the three sections together provide for 68% of the total water demand in the region (5). Under supervision of the Superintendent of Sanitary Services (SISS), Aguas Andinas, a private company, provides sanitary services and distribution of potable water for the Metropolitan Region, and has acquired approximately 25% of the rights available for the first section of the Maipo river, as well as for much of the Mapocho river (2). The company also manages the Yeso Reservoir, which provides a crucial backup supply of water in periods of drought (2).



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bottom: grayline.com

Current challenges:

As a region already stressed by drought, the Maipo River basin faces significant challenges in light of increasing **climatic variability**. Growing demands for drinking water and irrigation, as well as industry and hydroelectric development, put pressure on the water sector in the region, which is already experiencing significant reductions in precipitation, in addition to rising temperatures and increased snowmelt (2).

There is growing attention on the need to descrease household consumption and improve **efficiency** of agricultural and distribution systems in order to prevent **overexploitation of the acquifers** as surface water becomes more scarce. Agricultural efficiency is currently only at 50% and could be improved by transitioning to drip irrigation systems, which are used on only one third of the irrigated land in the region (2). There are also issues of efficiency in the distribution sector, with 30% of water being lost from underground pipes before being delivered (3). Though the potable water and sanitation coverage is very high in the Metropolitan Region (9), certain populations are still vulnerable due to a lack of services, especially in communities at the outer edges of the region (10).

In addition to these infrastructure and production challenges, there have also been challenges related to water **governance**. The market-based system of water management has resulted in problems stemming from unclear definition of property rights and the inability of the DGA to **coordinate multiple water users and resolve conflicts** (8). **Documentation of water rights** and organization of water user associations is still lacking in some parts of the basin (1). Few women hold water rights titles and thus are largely excluded from decision making processes (11).

Protection of **biodiversity and local livelihoods** has been a main issue in conflicts around **hydropower and industry development** in the region (12). Industrial **pollution** and related **environmental degradation** has been an ongoing issue in the river basin, addressed by several campaigns and policy plans since 2007. Recently, there has been increased focus on creating national and regional **climate adaptation** plans (13), which aim to increase stakeholder dialog and collaborative decision-making in order to plan for future climate variability and the threat of water scarcity. In addition, an interdisciplinary team of researchers from six countries is working toward strengthening science-policy dialogue over complex water security challenges in the Maipo, as well as the Elqui and Limarí basins in northern Chile, and ten other basin around the Arid Americas.

References - For full references see http://aquasec.org

1. DGA 2011 **2.** Meza et al. 2014 **3.** Vicuna et. al 2014 **4.** DGA 2003
5. DGA 2004 **6.** ANDESS 2013 **7.** SSIS 2009 **8.** Bauer 1998, 2004, 2009
9. Hearne and Donoso 2005 **10.** GORE 2012 **11.** DGA 2009
12. Yurish and Toledo 2013 **13.** Barton et al. 2014 **14.** Muñoz et. al 2013

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