Information Template:

Water Use and Existing Experience on Water Recycling and Reuse Applications in Copiapó River Basin

1. Correspondent's Information

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2. General Information

Name of the area	Atacama Desert, Chile
Name of the basin	Copiapó River Basin
Total area (Km^2)	18.538 km^2
Population (urban/rural)	170.000
Land use (main)	Agriculture
Main economic activities	Mining and Agriculture
Short description of the area (including maps or photographs of the area if possible)	
The Copiapó River Basin is located in the Atacama region of Chile and has a semiarid climate with an average annual precipitation of 28 mm. The population of the Copiapó River Basin has increased exponentially during the last 40 years reaching almost 200'000 inhabitants in 2012, and will face a rapid development in the next 20 years driven mostly by the development of the mining industry. The main economic activities and water users of the region are agriculture and mining. The consumption is estimated to be around 153 million of m^3 for the agriculture sector, 11 millions of m^3 for the mining industry and around 17 million of m^3 for domestic use. The water demand is met using all surface water resources of the region (the entire Copiapó river flow is used for irrigation) and groundwater resources. Unfortunately the increase of the demand has led to a situation where the intakes from the aquifer is bigger than the recharge (6'000 L/s against 4'000 L/s) which cause a decrease of the volume stored in the aquifer and a situation of water scarcity. The main water management problem in the region is that too many water rights have been granted during the last decades and that not all of them have been registered to the water agency. Between 20,000 and 25,000 l/s of water rights have been distributed but only 6'000 l/s are actually exploited by end-users	

3. Water Resources Information

3.1 *General information*	
Total water demand (m^3/year)	181,1 million m^3/year
Water availability (m^3/inhabitant/year)	630 m^3/inhabitant/year
Total Supply capacity (m^3/year)	199,3 million m^3/year
Supplied population (%)	99,73%
Average infrastructure status/level (Aged -	Fair

New, Poor, Deficient, Fair, Satisfactory, Excellent)	
3.2 Domestic sector	
Water demand (m^3/year)	16,6 million m^3/year
Water supply (m^3/year)	34,8 million m^3/year
Average water quality (based on National Standards) – Very Low, Low, Fair, Good, Very Good	Good
Proportional contribution of water sources (% surface, groundwater, reclaimed water, desalination, other)	100% Groundwater
Pricing scheme (currency/ m^3)	Around 1000 CLP / m^3
3.3 Agricultural sector	
Water demand (m^3/year)	153,1 million m^3/year
Water supply (m^3/year)	153,1 million m^3/year
Average water quality (based on National Standards) – Very Low, Low, Fair, Good, Very Good	Good
Proportional contribution of water sources (% surface, groundwater, reclaimed water, desalination, other)	65,9 % groundwater 31,1 % surface water 3 % reclaimed water
Main irrigation practices	Drip (87%), Flooding (9%), Sprinklers (2%), Furrow (1%), Micro-Sprinklers (0,1%)
Irrigated area (ha)	12753
Main crops grown in the region	Grapes (71%), Olives (10), Vegetables (10%), Grains (4%) and Alfalfa (3%)
Pricing scheme (currency/ m^3)	Pricing scheme following water rights market
3.4 Industrial sector	
Water demand (m^3/year)	11,4 millions m^3/year
Water supply (m^3/year)	11,4 millions m^3/year
Average water quality (based on National Standards) – Very Low, Low, Fair, Good, Very Good	Good
Proportional contribution of water sources (% surface, groundwater, reclaimed water, desalination, other)	100% Groundwater
Main industrial activities	Mining
Main industrial activities' consumption (m^3/year)	10,4 millions m^3/year
Pricing scheme (currency/ m^3)	Pricing scheme following water rights market
3.5 Environmental & Other Water Uses	
Environmental water uses (m^3/year) (e.g. minimum stream flow requirements, minimum groundwater recharge, etc.)	-
Recreational water uses (m^3/year)	-

(e.g. maintaining pond levels, fountains, etc.)	
Other water uses (m^3/year)	-
Proportional contribution of water sources (% surface, groundwater, reclaimed water, desalination, other)	-
Pricing scheme (currency/ m^3) (if applicable)	-
3.6 Wastewater & Sanitation Conditions	
Sanitation services (% of population or households)	95.7% of waste water effectively treated
Sanitation practices (e.g. sewerage, waste water treatment, septic tanks, simple hand washing etc.)	Waste water plants using activated sludge technology
Number of wastewater treatment plants	2
Nominal capacity of existing plants (m^3/day)	44'669 m^3/day
3.7 Additional information / comments	

4. Existing Experience on Water Recycling and Reuse (WR&R) Applications

4.1. General Information	
Reclaimed water capacity (m^3/year)	15,93 millions m^3/year
Reclaimed water consumption (m^3/year)	15,93 millions m^3/year
Main reclaimed water consumption /sector (m^3/year)	Agriculture: 5,53 millions m^3/year Mining Activities: 10,4 millions m^3/year
Water uses currently supplied by reclaimed water (directly or indirectly)	Irrigation, transport and extraction processes inside mining industry
Reclaimed water charges per m^3 provided	??

4.2. Existing WR&R quality standards and restrictions (if available)		
Reclaimed water uses	*Quality/Technical standards*	*Restrictions*
Urban reuse	The norm number NCh 1333 defines water quality standards for esthetic use (between others). Regarding irrigation of public areas, the same norm NCh 1333 defines quality standards for agricultural	**Esthetic use:** No sediment, floating waste, oils, foam and other solids, color, smelling and turbid substances, material (radionuclides include) in concentration that can be

	reuse.	toxic or produce not wanted physiological effects on human, fishes and other animals and plants, materials that avoid aquatic life
Agricultural reuse - food crops	Norm n1333 defining quality standard values for: pH, chemical elements, SAR (fixed by the competent authority), specific conductivity and total dissolved solids, herbicides (fixed by competent authority)	For crops growing close to the ground and consumed row, maximum value for fecal coliform concentration can't be superior to 1000 organisms / 100ml
Agricultural reuse non-food crops	Same as food crops	-
Recreational reuse	Norm n1333 defining quality standards value for different water use.	**With direct human contact:** pH, temperature, clarity, floating waste, oils, foam, turbidity, fecal coliforms, substances that produce bad smell and inconvenient taste **Without direct human contact:** floating and visible solids and no natural foam, floating oils and fats, oils and fat emulsified, substances that produce bad smell and inconvenient taste
Environmental reuse	Residual Water to be disposed in the environment needs to be conform to the norm N°46 (when released into the aquifer), and to norm N°90 (when released into surface water). Those norms fix the maximum diary contamination charge for numbers of pollutants.	-
Industrial reuse/recycling	In the case of recycling inside mining industry, the technical standards depend on the process used	Technical restrictions depending on the process used

Groundwater recharge	There is a decree, the N°46, that specifies norms of quality for liquid waste that can infiltrate to groundwater. The norms depend on the vulnerability of the aquifer that needs to be evaluated by the DGA (National Water Agency). The vulnerability of the aquifer is defined by the rate (velocity) of migration of a pollutant to reach the saturated zone. It can be high, medium and low.	To reject effluent directly into the saturate zone of the aquifer, the quality of the effluent need to be of the same or better quality than the groundwater. If the aquifer is depicted as vulnerable by the DGA, the quality of the effluent need also to be of the same or better quality than the groundwater.
Potable reuse	Norm number NCh409 defining drinking water quality standards	-
Other (please specify)	-	-
4.3. Information on existing WR&R schemes		
Location of WR&R application	-	
Type of application (formal/informal reuse) (i.e. planned, controlled & monitored reuse of effluents for specific purpose/unplanned, uncontrolled use of untreated wastewater)	Reus of waste water treatment plant effluent for irrigation: informal, uncontrolled use of the effluent of the water treatment plant along the river Reus of waste water treatment by a mining company: formal, estipulate in a contract made by the water company and the mining company	
Design purpose (not applicable for informal reuse applications)	Decrease of fresh water consumption, economical purposes	
Direct/indirect reuse (i.e. direct transfer of reclaimed water from the WWTP to the reuse site/use of reclaimed water after it has been discharged from the WWTP into a natural water body)	Direct	
Target users	Agriculture, Mining Industry	
Sources of reclaimed water (e.g. effluents generated by WWTPs, industrial process water, drainage of agricultural irrigation systems, etc.)	Waste water treatment plant effluent	
Main Treatment technologies applied	No additional treatment than activated sludge (waste water treatment plant)	

Sources of financing (from inception to date)	Private
Challenges faced during the development of the schemes	Social acceptance: The sanitation company that sells reclaimed water to the mining company faces social disapproval from the population of the region because the users are the ones that are paying the water and waste water company for treating waste water, and the same company is then selling this water to the mining company.
Problems faced during the operation of the schemes	-
Social acceptance	Reclaimed water for irrigation: good, even if people are concerned by water quality of the reclaimed water Reclaimed water used in the Mining Industry: bad
Environmental impacts	No impacts are known.

5. Potential for future WR&R implementation in the Area

Potential Users for more intensive water reuse practices	Households (grey water recycling)
Level of social awareness & acceptance	Low
Planned schemes (if any)	Two see water desalination plants, one supplying water demand for a mining company and the other one for drinking water supply, are going to be constructed or are under construction.