



CEDRIG
Operational

Construction of a water treatment plant and sewer system for the Guaqui town, Department of La Paz / Municipality of Guaqui

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June 2018

CEDRIG is a tool developed and offered by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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Swiss Agency for Development
and Cooperation SDC

Overview

General Information

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Overall goal	Improve the current living conditions of Guaquí's inhabitants through the implementation of an appropriate sewage system, benefiting the overall population
Country	Bolivia
Budget	Bs. 7'000'000 (approximately USD 1'000'000)
Duration	September 2016 - July 2017 (approximately 10 months)

Summary

Description	Due to the absence of a sewage treatment plant in the Guaqui town, wastewater is discharged directly to Lake Titicaca, causing serious water pollution. Through the construction of a sewage treatment plant, the water pollution will be reduced along with an improvement of the living conditions of the local population. As a result of frequent lake level fluctuations, however, the sewage treatment plant might suffer negative impacts from flooding. In addition, frosts during the cold winter months can affect the plant's components such as (i) the sewage collection system and inspection chambers, (ii) emissary, (iii) pumping chamber, (iv) pressure pipe, (v) treatment plant, and (vi) infiltration ditches.
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Keywords	Wastewater treatment system	sewage collection system
	emissary	water pumps
	lake contamination	Bolivia
	Floods	frosts

Sectors of Intervention

Health

Tourism

Water and sanitation

Documents

Project Information (pdf, 5.24 MB)

Images



Project_Location

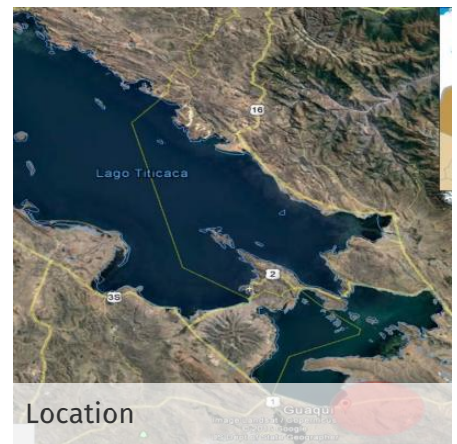
General_project_data

Town of Guaqui
Municipality of Guaqui
Department of La Paz
Autonomous Municipal
Government of Guaqui
EMAGUA (Executing Agency for
Environment and Water)
USD. 1.000.000
USD. 901.344
USD. 47.050
USD. 8.100
USD. 48.500
Sept 2016 – July 2017
Water and Sanitation
3822 inhabitants

Objective: to improve the current situation for the people of the Guaqui town by providing an appropriate sewerage system for a population currently living in a town with a projection of 20 years

Component:
Sewage collection network
Emissary
Pumping sump
Pumping line
Treatment plant
Infiltration ditch

General_project_data



Location



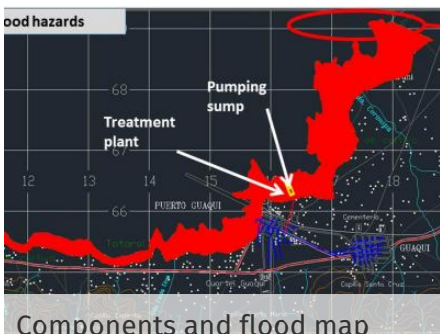
Coverage and extension



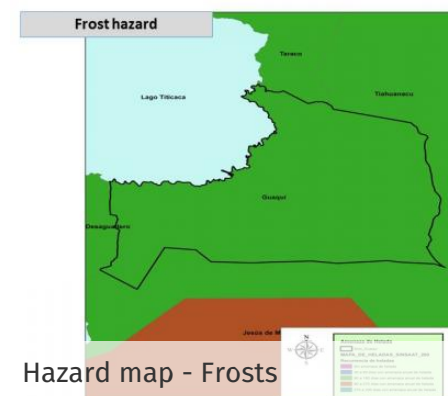
Components



Flood map



Components and flood map



Hazard map - Frosts



Guaqui pictures

Components, plant (oxidation lagoons) and pumping sump



Infrastructure

Infrastructure

Site, plant location, risks, soil types and flood zones



Infrastructure

Infrastructure

○ Risk perspective

Natural hazards (hydro-meteorological and geological)

Hazard name **Flash floods, floods**

Consequence Due to extreme lake level fluctuations, the plant's components could be damaged and filled with sediments. The service would be interrupted. This happens in average every 15 years.

> Selected Risk	Severity	Likelihood	Significance
	Extremely harmful	Likely	High risk

Vulnerabilities Disconnected communities, increased pressure on soils and water resources, fragile incomes, relationship between municipality and Risk Management Unit, additional health risks

Potential Measure **Capacity building in DRR for local communities**
 Score (optional) 3.40
 Comments The local community has no experience in DRR and should be included in the steering mechanisms (social control)
 > Selected Measure

Potential Measure **Strengthen operation and maintainance**
 Score (optional) 3.20
 Comments DRR-related aspects were not considered for plant's operation and management
 > Selected Measure

Potential Measure **Early warning system**
 Score (optional) 2.00
 Comments It is vital to observe the lake level fluctuations as well as the river discharge
 > Selected Measure

Potential Measure **It is vital to observe the lake level fluctuations as well as the river discharge**
 Score (optional) 2.20
 Comments Dykes to protect the plant's components
 > Selected Measure

Potential Measure

Reduction of river discharge (river deviation)

Score (optional) 1.60

Comments Consider structural measures that permit the diversion of inflowing river water

Consequence

Due to flood events, the equipment can not be used and/or broken parts have to be replaced

> Selected Risk

Severity

Extremely harmful

Likelihood

Likely

Significance

High risk

Vulnerabilities

Skills: weak technical knowledge, replacement of spare parts, insufficient access to credits and insurance solutions, lack of ownership of the municipality, emerging local markets and trade

Potential Measure

Use of water-resistant, robust equipment

Score (optional) 1.80

Comments Consider extreme events

> Selected Measure

Potential Measure

Risk transfer measures (insurance solutions)

Score (optional) 2.20

Comments Taking into account the socio-economic situation of the municipality and the local population, a insurance solution could be appropriate

> Selected Measure

Consequence

During a flood event, the wastewater could contaminate the river water and cause health problems for the local population. Due to the topography, contaminated water would flow into the lake and not to the urban zone.

Severity

Slightly harmful

Likelihood

Likely

Significance

Low risk

Vulnerabilities

Health: health education, social hygiene, health stations, health networks, unprotected water sources, precarious health situation

Hazard name

Extreme cold

Consequence

Malfunction of the plant and drastic efficiency reduction of the oxidation basins. 90 to 180 days per year with frosts, 3835m a.s.l., average temperatures of 4°C , minimum temperatures -10°C (on average every 2 years)

> Selected Risk

Severity

Harmful

Likelihood

Likely

Significance

Medium risk

Vulnerabilities Operation and efficiency: communities with respiratory infections, lack of maintenance, low technical capacity, frequent interruption of service

Potential Measure

Change to appropriate materials

Score (optional) 2.40

Comments Identify materials that support extreme cold temperatures

> **Selected Measure**

Potential Measure

Heating system

Score (optional) 1.40

Comments Identify a technical solution that allows the plant's operation within the material's optimal temperature range (e.g. heating system)

Adapt your project

Multi-criteria analysis of identified measures (xlsx, 13.04 KB)

Adapted Logical Framework (in Spanish) (pdf, 59.96 KB)

Impact perspective

Impact on the environment

Component of the project	Water treatment plant (oxidation basins) and pumping chamber
Potential negative impact	Bad odors could disturb the surrounding population
Significance	Worsening of the quality of life for the local population and related health issues > Selected impact
Potential Measure	<p>Artificial cover of the oxidation basins</p> <p>Score (optional) 2.00</p> <p>Comments Prevents odor emissions</p> <p>> Selected Measure</p>
Component of the project	Location of the water treatment plant
Potential negative impact	Landscape changes due to the different construction sites
Significance	The water treatment plant could have a negative impact on the number of tourists visiting the Lake Titicaca region > Selected impact
Potential Measure	<p>Land use plan</p> <p>Score (optional) 3.60</p> <p>Comments The water treatment plant can be included in the plan as an element which improves the quality of stay for tourists</p> <p>> Selected Measure</p>
Potential Measure	<p>Change of technology</p> <p>Score (optional) 1.20</p> <p>Comments It would mean substantial changes in the design of the project</p>
Potential negative impact	The system will require large areas for construction
Significance	The project could have a negative influence on local environmental planning and increase the need for additional human resources of the Guaqui Municipality

Impact on disaster risks

Component of the project	Water treatment plant (oxidation basins)
Potential negative impact	New settlements around the plant in the future
Significance	Structural measures to protect the plant (e.g. through dams) could attract people and lead to new settlements in flood-prone areas > Selected impact
Potential Measure	Security strips Score (optional) 3.20 Comments To be included in the territorial plans > Selected Measure
Potential Measure	Purchase of land in surroundings Score (optional) 1.20 Comments Acquisition of land to avoid new settlements in flood-prone areas
Potential negative impact	Exposure of the Guaqui's local population to greater risks from natural hazards and increase of vulnerability
Significance	The planned structural protection measures could lead of a shift of risks more towards the urban areas. Scientific studies estimate a medium risk for this development.

Impact on climate change

Component of the project	Water treatment plant (oxidation basins)
Potential negative impact	Greenhouse gas emissions from the oxidation basins
Significance	Taking into account the seize of the water treatment plant, high levels of GHG emissions can be expected. Even higher emissions are possible during a malfunction of the system > Selected impact

Potential Measure

Artificial cover of the oxidation basins

Score (optional) 2.20

Comments Storage of gases and burning with appropriate technology

[> Selected Measure](#)

Potential Measure

Carbon sinks (afforestation)

Score (optional) 1.20

Comments Reforestation to compensate for GHG emissions

Potential negative
impact

Emission of additional other gases by the water treatment system

Significance

According to studies, the risk of problems arising from additional gas emissions is low in our study area.

Component of the
project

Power systems of the plant

Potential negative
impact

The generators of the different pumping systems run with diesel causing high emissions of GHG and black carbon

Significance

Taking into account the plant's increasing utilization (close to its limits), the pumping hours will increase in the future along with emissions of GHG and black carbon

[> Selected impact](#)

Potential Measure

Use of alternative energies, energy generation through burning trapped gases from the oxidation basins

Score (optional) 1.60

Comments Strong winds in the study area (high potential for wind energy), and solar power

[> Selected Measure](#)

Potential Measure

Connection to the national power supply system

Score (optional) 1.20

Comments This measure would imply the installation power supply lines over long distances

Adapt your project

Adapted Logical Framework of the project (pdf, 58 KB)

Multi-criteria analysis of identified measures (xlsx, 13.04 KB)