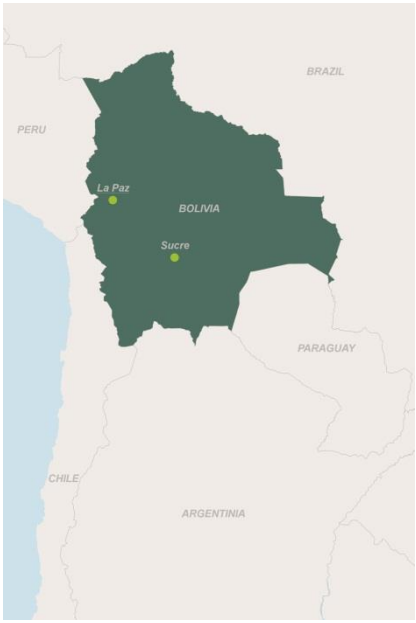
Ex post evaluation – Bolivia

Sector: Water Supply and Sanitation (CRS code 1402000)
Programme/Project: Water Supply System Potosi -- BMZ-Nr.: 1996 65 035*
Implementing agency: Administracion Autonoma para Obras Sanitarias (AAPOS)



Ex post evaluation report: 2016

		Project A (Planned)	Project A (Actual)
Investment costs (total)	million EUR	7.90	7.94
Counterpart contribution	million EUR	0.40	0.50
Funding	million EUR	7.50	7.44
of which BMZ budget funds	million EUR	7.50	7.44

*) Random sample 2015

Summary: Joint intervention by German Financial Co-operation (FC) and Technical Co-operation (TC, through GIZ) to improve water supply for the city of Potosí in technical, economic and institutional terms. This FC project supported a water treatment plant, water tanks, connection pipes, water taps, water meters, a water meter repair workshop, as well as a sophisticated laboratory for water quality testing. The total investment costs of the project amounted to EUR 8.4 million, of which EUR 7.44 million were financed from German FC budget funds through KfW. In addition to upgrading Potosí's supply system and its existing water sources with German support, Bolivia undertook to establish a separate, 52 km transmission main to provide the city with supplementary water - a project financed by the Interamerican Development Bank (IADB) and Japan.

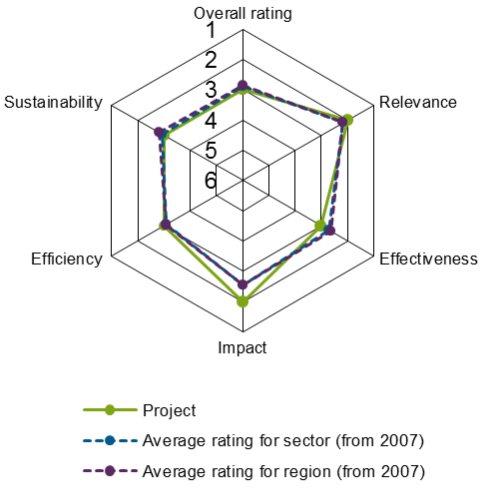
Objectives: The project was designed to reduce health hazards for the population of Potosi resulting from waterborne diseases as well as to generally improve living conditions in the supply area (impact/ overall objective). Intended outcomes were to provide Potosí's inhabitants with a year-round continuous supply of hygienic drinking water as well as to sustainably increase the water supply system's efficiency.

Target group: The project's target group was the population of Potosi benefitting from the rehabilitation and extension activities of the central water supply system (population with direct water connection or taps). At appraisal, the population was approximately 120.000. The population in 2015 is estimated at around 200.000 inhabitants.

Overall rating: 3

Rationale: The project provided improved drinking water for the mining city of Potosí which improved health outcomes. The water treatment plant´s maintenance and operation work well - as does water quality monitoring. Cost coverage still complies with Bolivia's norm at the moment - but not in the future, if current trends persist. Tariffs have not been raised since 2005, putting the utility´s financial sustainability at risk. Waste water remains a problem.

Highlights: In Potosí, water-related diseases decreased from around 18,000 cases at appraisal to 12,227 cases in 2014. Nonetheless, a waste water treatment plant still does not exist - neither for effluents from households nor from the mining industry. All waste water is collected and channelled into rivers; what does not infiltrate ends up in the Rio de la Ribera, which transports highly polluted water as far as Argentina and Paraguay.



Rating according to DAC criteria

Overall rating: 3

Relevance

The project was highly relevant at the time of appraisal: back then, water supply was deficient in terms of quantity and quality, and a high incidence of water-related diseases prevailed in the high altitude mining town of Potosí (approx. 4,000 meters asl).

The project´s intervention logic was consistent, as, for the sake of an improved health situation, it intended to upgrade the drinking water supply for Potosí's residents. With hindsight, the aspect of improving general living conditions did not feature as prominently as it would have merited from today´s perspective (considering, e.g., the large-scale replacement of public taps by house connections). In parallel, a wastewater treatment project (BMZ-Nr.: 1998 67 201) was to address widespread sanitation constraints. At the time of appraisal, both interventions were highly relevant. Unfortunately, the wastewater project was cancelled in 2004, because the population heavily opposed a treatment plant in their vicinity - and no land was made available for that purpose. From today's perspective, Potosí needs to emphasise adequate wastewater treatment that still does not exist.

In summary, it can be concluded that, at the time of appraisal, the set of interventions - including those which ultimately did not materialise, like sanitation measures - complied with both the BMZ's strategy and Bolivia's needs and strategies. More recent political developments in Bolivia have even enhanced the project's relevance: Bolivia's new constitution from February 2009 guarantees the equal and universal access right to water supply and sanitation.

Relevance rating: 2

Effectiveness

In terms of outcome, the project aimed to continuously supply Potosí's inhabitants with sufficient hygienic drinking water as well as to sustainably increase the efficiency of the water supply system.

The project's objectives - as defined at appraisal - were to be measured by the following indicators that are adequate to measure achievements at the outcome level:

Indicator	Ex post evaluation
(1) At least 107,000 inhabitants of Potosí (or 77 % of the estimated population) are directly connected to the water supply system. They are provided with a continuous supply of drinking water in adequate quantities (an average of 112 l/c*d), complying with WHO standards in terms of microbiological, chemical, and physical properties.	This indicator has been largely achieved: - In 2014, Potosí's water supply system covered 198,479 inhabitants, almost twice as many as originally planned, which is equivalent to 99 % of the population, of which over 90 % are directly connected. - However, water supply is not yet continuous everywhere. On average, the system provides the population with 6 hours of water per day (varying between 4 and 24 hours). In the historic centre, water runs 24 hours per day. - In 2014, the quantity of water supplied amounted to 151 l/c*d per house connection (and to 144 l/c*d for public taps), which again exceeds the amount originally planned. - The water supplied by AAPOS corresponds to 100 % with the national norm, which includes - and partly exceeds - WHO parameters. The AAPOS laboratory also measures the occurrence of heavy metals in the water supply system, which is especially relevant because of the mining activities around the city.

(2) The water pressure remains stable between a minimum of 0.7 bars in the upper town and a maximum of 6 bars in low-lying areas.	This indicator has been partially achieved: According to measurements conducted during the mission, the water pressure varies between 2.76 and 11.8 bars. As a pressure exceeding 7 bars could damage the piping system, its separation into different pressure zones is important - something not achieved to date.
(3) Technical water losses have been reduced to 25 % of production.	This indicator has been achieved. In 2014, AAPOS reported its unaccounted-for water (UFW) to have declined from 45 % at appraisal down to 16 %.

The water supply measures (rehabilitation of 3 instead of originally planned 9 water tanks, water mains, house connections and water meters) have delivered important benefits to the local population. However, some of the activities planned originally have not been implemented (such as rehabilitating the water basins and dikes, 6 additional water tanks as well as pressure zoning within the supply system). A complementary intervention, the "San Juan" transmission project supported by Japanese Co-operation, helped to boost per-capita consumption figures from 2011 onward, which - after this project´s completion - had already reached 123 l/c*d. It is, however, difficult to establish with certainty to what extent this generous supply volume contributes to excessive water use - especially in the case of low tariffs.

The water treatment plant's laboratory as well as its automated chlorination and measurement system of the water's physical, chemical, and bacteriological components allows for an excellent control of water quality that is exemplary in the region. A water quality control programme with monthly tests allows for evaluating water quality from the source (raw water supply) to the beneficiary (the latter of which was verified by the evaluation mission through testing water at the household level). This monthly analysis also includes the control of heavy metals using a project-financed Atomic Spectrograph which allows to measure water quality compliance with Bolivia's water quality norm ("Norma Boliviana Agua Potable y Requisitos de Calidad", NB-512). Water tests demonstrated that measurements at household level comply by 100 % with this norm, although values were slightly above those in the water treatment plant.

A challenge that remains is the hygienically safe disposal of wastewater, which is only collected, but not treated. The mines, in particular, discharge their wastewater directly into the rivers, although this is illegal.

In summary, the evaluation mission concludes that the project objectives have been partially achieved and rates effectiveness as marginally satisfactory.

Effectiveness rating: 3

Efficiency

Construction and assembly works lasted over 11 years, as opposed to the 4 years foreseen originally. This increased implementation costs and delayed benefits to the local population.

In order to evaluate AAPOS' financial efficiency, the evaluation mission used the indicators of operational costs and solvency. Those were compared to the criteria set by Bolivia's regulator "Autoridad de Fiscalización y Control Social de Agua Potable y Saneamiento" (AAPS): AAPS stipulates unit costs for operations and maintenances of equal or less than 70 % of the average tariff. In relation to average tariffs, AAPOS' specific operational unit costs increased from 69 % in 2010 to 122 % in 2014. This illustrates a significant decline in AAPOS' solvency since the end of the project. Collection efficiency has improved from about 50 % at appraisal to 87 % in 2014.

Whereas AAPOS' income has increased due to new users, tariffs have not been raised since 2005. This lack of tariff increases is particularly dramatic given that - according to Bolivia´s Central Bank - cumulative inflation amounted to 60.1 % between 2005 and 2014.

In order to evaluate the cost-effectiveness of the project's investments, a dynamic prime cost calculation for the water supply system in Potosí was conducted on the basis of 2015 in USD. The dynamic prime costs per m^3 of consumed water amounted to 0.36 USD, assuming a collection efficiency of 100 % and

using a discount rate of 5 %. At appraisal in 1996, the estimated value for consumed water amounted to 0.22 DM or 0.15 USD. Thus, cost estimates were much lower at appraisal. However, given the long implementation period, the dynamic prime costs can still be considered acceptable.

Another relevant indicator is the number of employees per 1,000 connections. In 2011, this indicator amounted to 4.83 employees compared to 4.37 employees in 2014, which indicates a slight improvement in AAPOS' efficiency, but still exceeds the target set by AAPS - ranging between 2 and 4 employees. Furthermore, the evaluation mission found that the implementation rate of investments programmed, which stood at 52 % in 2010, has declined to 44.5 % by 2014.

Finally, the installation of water meters that covered 87.3 % of households in 2014 allows to determine the Unaccounted-for Water (UFW) as well as to discourage excessive water consumption. At the same time, water savings allow to extend the system to additional customers.

In terms of allocation efficiency, the population's health has improved substantially. However, it is difficult to ascertain how much of this improvement is due to the revamped water system. Moreover, the situation is compromised by the lack of adequate sanitation services (see above). In any case, people in Potosí manifest their appreciation of water supply services through their willingness to pay.

In summary, the evaluation mission concludes that the project´s efficiency was still satisfactory.

Efficiency rating: 3

Impact

The project's intended impact was to contribute to reducing health hazards for Potosí's population that resulted from waterborne diseases.

In Potosí, water-related diseases decreased from 20,363 cases in 2010 (11.9 % of total illnesses) to 11,349 cases in 2012 and slightly increased again to 12,227 cases in 2014, when they accounted for 10.79 % of total illnesses. Thus, the evaluation mission finds improvement in relative as well as (less pronounced) absolute terms - when comparing these figures with the ones from 1996: back then, roughly 18,000 cases of water-related diseases accounted for 46 % of all illnesses reported - as stated in the appraisal report.

Based on anecdotal evidence gathered from interviews with project beneficiaries, the project had a positive impact on health as well as on general living conditions. Inhabitants indicated that no water-related illness had occurred during the past month. In addition, red coloured particles that used to come out of the water tap before the start of the project cannot be found anymore. Whilst this evaluation cannot establish a causal relationship between an improved water supply and increased health benefits, a contribution by the project is highly plausible.

As a consequence of increased water flows in the Potosí system, more wastewater is produced. Effluents are not treated and directly channelled into various rivers - through a system that has been constructed during colonial times. This limits the project's impact at least for the communities downstream.

Impact rating: 3

Sustainability

Neither the municipal government of Potosí nor its environmental agency has conducted studies about the hydrological balance of the watershed estimating current and future water availability. In this respect, it would be important for securing water quality and availability for the future, to implement a strategy to protect the water resource, and to minimise contamination risks.

The water treatment plant has a capacity of 189 l/s and produces between 180 and 185 l/s in the rainy season, reaching 100 % utilisation. This shows that the plant is operating at the limit of its capacity. Operations and maintenance are adequate, something that is supported by the plant's online operations and maintenance system for closer monitoring. The system's water tanks are also being adequately operated and maintained, due to macro meters that help with monitoring of water leaks. Rehabilitating the addition-

al 6 water tanks under the project would have been desirable, but was not possible due to increased project costs and a shortage of funds.

In order to ensure the water supply network´s technical sustainability, it is important (1) to introduce pressure zones, (2) to extend its reach especially to higher locations and (3) to increase the water retention and storage capacity. Besides, it would be important for the enterprise to set up a renovation plan for the water supply network.

Overall, maintenance of the water supply system is reactive with respect to repairing leaks and cracks. Therefore, preparing a preventive maintenance plan for the water supply system and the water meters would be important.

AAPOS encountered difficulties with the replacement of spare parts for its supply system, which is designed and built according to European norms. Respective spare parts are expensive and difficult to find in Bolivia. This creates the risk of network breakdown when spare parts cannot be delivered in time.

Furthermore, AAPOS' financial situation will deteriorate sharply at the latest in the medium term, if tariffs are not significantly adjusted.

As mentioned above (see "Relevance"), a parallel project was to fund wastewater treatment in Potosí. However, this project was cancelled in 2004, and wastewater remains untreated. All effluents that do not infiltrate downstream end up in the Río de la Ribera. That river transports highly polluted water to downstream communities - as far as Argentina and Paraguay. As a consequence, there has been an international incident between Bolivia and Argentina with respect to the obligation to treat transboundary waters according to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

In summary, the evaluation finds that the project faces important risks with respect to its future water resources and wastewater treatment.

Sustainability rating: 3

Notes on the methods used to evaluate project success (project rating)

Projects (and programmes) are evaluated on a six-point scale, the criteria being **relevance, effectiveness, efficiency** and **overarching developmental impact**. The ratings are also used to arrive at a **final assessment** of a project's overall developmental efficacy. The scale is as follows:

Level 1	Very good result that clearly exceeds expectations
Level 2	Good result, fully in line with expectations and without any significant shortcomings
Level 3	Satisfactory result – project falls short of expectations but the positive results dominate
Level 4	Unsatisfactory result – significantly below expectations, with negative results dominating despite discernible positive results
Level 5	Clearly inadequate result – despite some positive partial results, the negative results clearly dominate
Level 6	The project has no impact or the situation has actually deteriorated

Rating levels 1-3 denote a positive assessment or successful project while rating levels 4-6 denote a negative assessment.

Sustainability is evaluated according to the following four-point scale:

Sustainability level 1 (very good sustainability): The developmental efficacy of the project (positive to date) is very likely to continue undiminished or even increase.

Sustainability level 2 (good sustainability): The developmental efficacy of the project (positive to date) is very likely to decline only minimally but remain positive overall. (This is what can normally be expected).

Sustainability level 3 (satisfactory sustainability): The developmental efficacy of the project (positive to date) is very likely to decline significantly but remain positive overall. This rating is also assigned if the sustainability of a project is considered inadequate up to the time of the ex post evaluation but is very likely to evolve positively so that the project will ultimately achieve positive developmental efficacy.

Sustainability level 4 (inadequate sustainability): The developmental efficacy of the project is inadequate up to the time of the ex post evaluation and is very unlikely to improve. This rating is also assigned if the sustainability that has been positively evaluated to date is very likely to deteriorate severely and no longer meet the level 3 criteria.

The **overall rating** on the six-point scale is compiled from a weighting of all five individual criteria as appropriate to the project in question. Rating levels 1-3 of the overall rating denote a "successful" project while rating levels 4-6 denote an "unsuccessful" project. It should be noted that a project can generally be considered developmentally "successful" only if the achievement of the project objective ("effectiveness"), the impact on the overall objective ("overarching developmental impact") and the sustainability are rated at least "satisfactory" (level 3).