Bolivia: Drinking Water Supply / Sewage Disposal Sucre II

Ex post evaluation

OECD sector	14020 Water supply and sanitation - large systems	
BMZ project ID	1992 66 124	
Project executing agency	Empresa Local de Agua Potable y Alcantarillado Sucre (ELAPAS)	
Consultant	GKW Consult / IPP / CPM	
Year of ex post evaluation	**2006**	
	Project appraisal (planned)	**Ex post evaluation (actual)**
Start of implementation	Q1 1995	Q4 1998
Period of implementation	54 months	54 months
Investment costs	EUR 24.2 million	EUR 24.0 million
Counterpart contribution	EUR 5.8 million	EUR 6.0 million
Financing, of which Financial Cooperation (FC) funds	EUR 18.4 million	EUR 18.0 million
Other institutions/donors involved		
Performance rating	2	
• Significance/relevance	2	
• Effectiveness	2	
• Efficiency	3	

Brief description, overall objective and project objectives with indicators

The aim of the project, which was appraised in 1994, was to improve the water supply and sewage disposal in the town of Sucre and to lessen the sewage-related negative impact on irrigation agriculture in the Quirpinchaca Valley (project objective). The intention was to contribute to reducing health hazards among the urban population and among the people living in the Quirpinchaca Valley (overall objective). The groups targeted in the improved water supply and sanitation project thus comprised the entire population of the town of Sucre (2005: 224,000 inhabitants) as well as around 10,000 people living along the Río Quirpinchaca between Sucre and the small downriver town of Yotala. The project executing agency was the municipal water supply company ELAPAS (Empresa Local de Agua Potable y Alcantarillado Sucre). No indicator was defined for the overall objective. The indicator values for the project objective were as follows:

- An appropriate amount (90 litres per capita per day) of drinking water is constantly available to at least 143,000 people who are connected to the water supply system (92% of the estimated population in the urban area). This indicator was supplemented in the course of the project to include the microbiological, chemical and physical quality of the drinking water, the aim being for it to meet WHO requirements.

- The sewage produced by at least 85,700 inhabitants (55% of the estimated population) is collected centrally and channelled to the sewage treatment plant.

- The discharge values for the pond treatment plant are 30 mg/l BSB_5.

Project design / major deviations from the original project planning and their main causes

The following measures were carried out as part of the project:

Water supply system
Main pipes covering 5,525 metres were laid, two elevated reservoirs with a capacity of 2,000 m^3 each were built, and 45.5 km of main distribution pipes were laid.

Sewage disposal system
The centralised sewage system was extended to cover around 89 ha (approximately 11,500 m); the main and secondary collector systems were extended (10,645 m); a main 8,680-metre-long drainage channel was built; a multiple stage mechanical/biological treatment plant was built (capacity: 400 l/s).

Rainwater disposal system
The rehabilitation of 12,800 m of rainwater conduits was carried out, 200 entry shafts restored and 305 street inlets fitted.

The measures carried out were essentially in line with those planned at project appraisal. Sizeable changes to the design occurred with regard to the following measures.

- Changes to the network plans and network design rendered two of the four elevated reservoirs unnecessary.

- It was also decided not to dig sewage pits; instead, more extensive sewage networks were built because they are easier to operate.

- For legal reasons, ELAPAS was unable to finance the planned household connections to the sewage system; the home owners had to bear the connection costs.

- A shortage of space and operational aspects meant that the oxidation pond sewage treatment plant originally planned was not built; instead, a conventional sewage treatment plant with Imhoff tanks, percolating filters and secondary treatment ponds was built.

Apart from the changed sewage treatment method, the changes made were relatively insignificant and within the bounds of usual deviations that occur in the detailed planning stage. In order to realise the pond sewage treatment plant originally planned, large areas of land would have been needed and these could not be provided. This made it necessary and appropriate to change the sewage treatment method.

By laying new supply pipes, building two elevated reservoirs with a capacity of 2,000 m^3 each and extending the distribution network, a distinct improvement in the water distribution was achieved. Instead of the distributable volume of drinking water anticipated at project appraisal (6.6 million m^3 per annum in 2005), 7.6 million m^3 was provided through the distribution network. Overall, the measures selected were appropriate as a means of achieving the objectives. The construction of a more extensive network in higher altitude new, mainly informal settlement areas that are currently without a water supply system is desirable as a means of reducing poverty but this would benefit illegal settlements and the concomitant negative consequences for the inhabitants (e.g. houses that collapse on unstable hillsides). From the perspective of ELAPAS, the high investment costs and the long-term high pumping costs that supplying these

areas would entail as well as the limited availability of water make further expansion of the network in the informal settlement areas economically unattractive.

The decision to extend the sewage network substantially, to rebuild the main collector and to build a main conduit was also appropriate and proved its value; all sewage from the areas in the vicinity of the town of Río de la Plata (where 90% of the people live) that are connected to the sewage network is now channelled to the treatment plant where it is then treated.

However, small volumes of sewage from households and regions that are not connected to the sewage system and from faulty connections to the rainwater drainage system seep into the Río Quirpinchaca. In addition, it would have been too expensive and too difficult to divide the mixed system in some parts of the town, with the result that a considerable amount of sediment is channelled with the rainwater to the treatment plant. This results in sediment settling in the sewage system and, together with the solid waste thrown into the system, leads to blockages which were detected at final review and criticised. This means that ELAPAS needs to do more cleaning.
Overall, the package of measures was appropriate as a means of mitigating the initial problems. Suitable, easily handled and technologically appropriate procedures (sewage treatment plant) were introduced and properly implemented.

Key results of the impact analysis and performance rating

The overall good performance by the project executing agency was evidenced by the annual Bolivian benchmarking in the water sector, which is carried out by the regulatory authority SISAB; for several years ELAPAS has been ranked third after the cities of La Paz and Santa Cruz. Good values were achieved in all efficiency indicators in the water/sanitation sector, e.g. with regard to the degree of supply and disposal, water quality, number of employees for 1,000 connections, etc.

Owing to the good performance by the project executing agency, the project had the following effects. Today 199,000 of 224,000 inhabitants are supplied centrally with safe drinking water which complies with the WHO standards, i.e. far more than planned (+ 56,000). However, because of illegal settlement structures and the high population growth rate of 4.3% per annum, the connection rate is only 88.7%. Given the number of people actually reached, however, undershooting the target value to this extent is acceptable; approximately 80% of the people with central connections have a continuous supply of drinking water, around 10% of the centrally connected people have drinking water every second day and the remaining 10% are supplied from tank trucks belonging to ELAPAS. Average consumption is 79 l/cd.

With 169,000 people with waste water connections and a connection rate of more than 75%, the indicator value for sewage collection was far exceeded.

The picture of the impact of the sewage treatment plant is somewhat more varied. The discharge values range from 15 to 60 mg/l. The target value of 30 mg/l BSB_5 is only achieved in just over half the weekly measures. Although the discharge values are therefore unsatisfactory, or they could be better if other operational procedures were followed, they are still within the target corridor. As expected, a sufficient reduction in the bacterial count cannot be achieved in the short time that the sewage remains in the secondary treatment pond, and therefore the restrictions for irrigated agriculture still exist, i.e. only tall plants (cereals, fodder crops, etc) can be cultivated with the treated water without risk to human health. We therefore advised the project executing agency to inform the farmers living below the sewage treatment plant of these health risks involved in using river water for irrigation purposes; this has, however, not yet taken place.

No indicator was defined for the overall objective. At the time of project appraisal, diarrhoea and typhus were the illnesses most frequently named. At the time of the ex post evaluation, the statistics on the occurrence of diarrhoea since 2001 showed a stable number of incidences

(between 31,000 and 34,000 per annum). Of a population of 224,000 it is calculated that one in 14 inhabitants suffers once a year from diarrhoea, although there are many different causes and the incidences are not necessary triggered by the water. If account is taken of the fact that there was demographic increase of around 16% in the period under review while the number of incidences remained stable, there has actually been a decrease in the incidences of sickness as measured in terms of the number of inhabitants. There are no current data on the incidences of typhus referred to at project appraisal, but the situation has since been described by the local health authority as unproblematic. The quality of the drinking water complies with WHO standards and the quality of the waste water is largely in line with the statutory Bolivian standards, with the result that neither the water nor the waste water poses any significant health risk, meaning that a major contribution was made to achieving the overall objective. With regard to the water supply, this also applies to the 10% of people who are not supplied centrally and who receive drinking water from ELAPAS tank trucks.

The macroeconomic impact of the project is mainly that today most of the people living in the rural area have a sufficient continuous supply of drinking water and a proper sewage disposal system (including rainwater drainage). This has led to an improvement in hygiene and health among the urban population. The sewage collected in the sewage system is channelled out of the town and treated, leading to a significant reduction in waste water pollution in the Quirpinchaca Valley.

The project with its sewage disposal component was geared in terms of the project objective to environmental protection. Although the plant was at times not adequately cleaned and some unavoidable amounts of untreated sewage (inhabitants not connected and undetected wrong connections to the rainwater system) still flowed into the river, this only had a minor adverse impact on the environmental success of the project.

Although the project envisaged improvements for the entire population of Sucre, the connection of town districts which are located higher up and inhabited mainly by poor people was of particular benefit to the poor people. Overall, at around 55%, the percentage of poor people in the population of Sucre is very high. Virtually all the people living further down the Río Quirpinchaca are poor rural people.

The project placed no particular emphasis on participation and good governance.

The project offered no recognisable gender equality potential as the people who were not connected to the central supply system obtained clean drinking water from tank trucks and women were not responsible for collecting water, therefore sustaining neither a loss of time nor physical disadvantages.

With some slight reservations, the project objective was achieved. Given the limited water resources, however, the non-achievement of the targeted per capita consumption is assessed positively as the water available to people has been shown to be hygienic and to have positive effects on health. Although, because of the fairly high demographic growth rate, the targeted volume of connections was not realistically achievable, far more people were supplied with drinking water than defined in the target. Assuming that operation, repair and maintenance is continued at least to the present extent, the present good state of the plant and supply and disposal can be expected to be maintained over the long term. We assess the effectiveness as satisfactory (sub-rating 2).

However, it is feasible that in the medium term the water supply will not be able to meet the demand from the rapidly increasing population and that, unless additional water resources are tapped, a supply gap will occur. However, ELAPAS will not be able to fund this expansion out of its own financial resources. Average per capita consumption could thus decrease and make corresponding rationing necessary.

A reduction in the health hazards can be plausibly assumed because the project has led to a larger percentage of sewage being collected (connection rate at project appraisal: 52%; at present: 75%) and the sewage treatment system channels significantly less untreated sewage into the Río Quirpinchaca, which is used as a source of water for irrigated agriculture. The incidences of water-borne diseases (diarrhoea) are decreasing, although there are still frequent occurrences of diarrhoea which cannot be clearly attributed to a specific cause. Owing to the limited reduction of coliform bacteria in the sewage treatment plant, irrigated agriculture cannot be ruled out as a cause of diarrhoea. The drinking water complies with WHO recommendations and is unlikely to conceal any health hazards as, because of the continuity of the water supply (24 hours a day or every second day in some town districts located higher up), water does not need to be stored or needs to be stored only for a short time. The connection rate has increased in line with the urban population (project appraisal: 88%; at present: 89%) and 56,000 more people are being supplied than planned. The huge expansion of the sewage system and the building and operation of the sewage treatment plant have made a distinct improvement in both the hygienic conditions and the environmental situation in the town and along the Río Quirpinchaca. Overall, we assess the **relevance/significance** of the project as **satisfactory** (**sub-rating 2**).

At EUR 120 per person, the specific investment costs for the water supply and sewage disposal systems are appropriate. Taking account of the collection efficiency, ELAPAS has a dynamic operating cost recovery of 129% and a dynamic full-cost recovery of 53%. At 25%, the total loss rate is just appropriate. In total, operation could be more efficient; the collection efficiency of 76% is not sufficient. Overall, **efficiency** is assessed as **sufficient** (**sub-rating** 3).

On the basis of the sub-ratings, we assume that the **developmental efficacy** is **sufficient** (**rating 2**).

General conclusions and recommendations

As a general conclusion it can be said that in cases in which it is agreed at project appraisal that the loan is to be lent on to the project executing agency, special care must be taken in reviewing and monitoring the financial situation of the project executing agency with regard to its debt capacity in order to avoid financial distortions when loan repayment starts. In the case of ELAPAS, without debt release the economic existence of a sufficiently efficient project executing agency with the highest tariffs in the country would have been in jeopardy. If at a project appraisal a realistic tariff level which permits future debt repayment (full-cost recovery) does not seem to be feasible, KfW should insist on onlending conditions that are affordable for the project executing agency.

Legend

Developmental success: Ratings 1 to 3	
Rating 1	Very high or high degree of developmental efficacy
Rating 2	Satisfactory developmental efficacy
Rating 3	Overall sufficient degree of developmental effectiveness
Developmental failure: Ratings 4 to 6	
Rating 4	Slightly insufficient degree of developmental effectiveness overall
Rating 5	Clearly insufficient degree of developmental effectiveness
Rating 6	The project is a total failure.

Criteria for the evaluation of project success

The evaluation of the "developmental efficacy" of a project and its classification during the ex post evaluation under one of the various levels of success described in more detail above concentrate on the following fundamental questions:

- Have the **project objectives** been achieved to a sufficient degree (project **effectiveness**)?
- Does the project generate sufficient significant developmental effects (project relevance and significance measured by the achievement of the overall development-policy objective defined beforehand and its effects in political, institutional, socio-economic and socio-cultural as well as ecological terms)?
- Are the **funds/expenses that were and are being employed/incurred** to reach the objectives appropriate and how can the project's microeconomic and macroeconomic impact be measured (aspect of **efficiency** of the project conception)?
- To the extent that undesired **(side) effects** occur, can these be tolerated?

We do not treat **sustainability**, a key aspect to consider when a project is evaluated, as a separate evaluation category, but rather as an element common to all four fundamental questions on project success. A project is sustainable if the project executing agency and/or the target group are able to continue to use the project facilities that have been built for a period of time that is, overall, adequate in economic terms, or to carry on with the project activities independently and generate positive results after the financial, organisational and/or technical support has come to an end.