

# Ex post evaluation – Peru

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**Sector:** Drinking water, water management, wastewater/solid waste (1403000)  
**Project:** Drinking Water Supply and Sewage Disposal Pisco (BMZ no. 1995 66 142\*)  
**Implementing agency:** Empresa Prestadora de Servicios de Saneamiento de Pisco (EMAPISCO)



## Ex post evaluation report: 2019

(EUR million)	Main measure (Planned 1998)	Main measure (Actual 2010)	Complementary measure (Planned 2010)	Compl. measure (Actual 2017)
Investment costs	18,215	14,775	3,780	4,396
Counterpart contribution	5,434	3,384	1,040	1,654
Funding	12,781	11,391	2,740	2,741
of which budget funds (BMZ)	12,781	11,391	1,390	1,391
of which SECO )	0.00	0.00	1,350	1,350

\*Random sample 2018

**Summary:** The project measures included an increase in drinking water production (construction of a new infiltration gallery), the expansion and rehabilitation of the water supply and sewage disposal networks and sewage treatment in Pisco. The implementing agency was the municipal water utility EMAPISCO. The project was related to other water supply and sewage disposal projects in Peru that were originally supposed to be implemented in close cooperation with the TC implementing agency programme “Drinking Water and Sanitation Programme in Selected Cities” (GIZ, formerly GTZ/PROAGUA). Due to delays, however, the FC and TC interventions were not carried out within the scope of a cooperation project. A distinction must be made between main and complementary measures. The originally planned measures were largely completed before 2007. In 2007, Pisco was hit by a severe earthquake that also caused considerable damage to the infrastructure that had been built. The remaining funds from the project and SECO delegated funds were used as part of a complementary measure consistent with the original project objectives. This involved repairing some of the damage to the facilities caused by the earthquake and procuring some additional equipment.

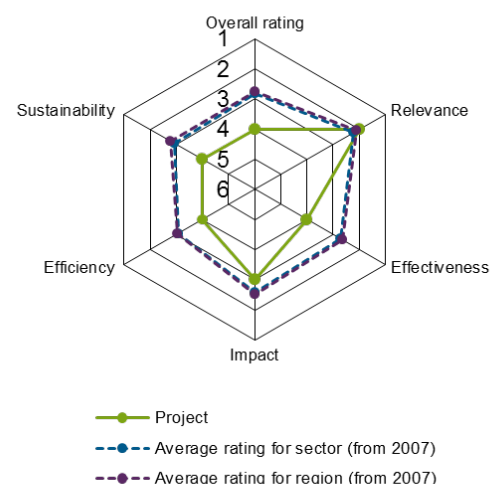
**Objectives:** Contribution to reducing the health risks to the population of Pisco and San Andrés and the neighbouring communities of San Clemente and Túpac Amaru caused by water-induced diseases, and to reducing the sewage-induced pollution of marine fauna and flora on the beaches up to the Bay of Paraca (impact). Year-round, continuous supply of quality drinking water to the population in the entire project area; ensuring the hygienically safe and environmentally friendly collection and treatment of sewage for the narrower project area and sustainable increase in the technical and economic efficiency of the water supply/sewage disposal system (outcome).

**Target group:** 121,200 residents in the city of Pisco including several suburbs.

## Overall rating: 4

**Rationale:** The indicators were not achieved in the water supply sector. While the objectives of the main measures seem appropriate, the complementary measures after the earthquake were not geared to meeting the actual need to improve the performance of the water supply system. There are considerable risks related to economic sustainability. The water utility company is currently being operated in a practically insolvent manner.

**Highlights:** The Peruvian model introduced two years ago for running highly unprofitable and poorly operated municipal water utility companies by a central government unit (Organisacion Tecnica de Apoyo al los Servicios de Saneamiento, OTASS) has the fundamental potential to contribute to improving economic sustainability in the long term.



## Rating according to DAC criteria

### Overall rating: 4

#### Ratings<sup>1</sup>:

Relevance	2
Effectiveness	4
Efficiency	4
Impact	3
Sustainability	4

#### Relevance

The project aims to make a contribution to the global development agenda (Millennium Development Goal 7/Environmental sustainability and Sustainable Development Goal 6/Clean water and sanitation) by guaranteeing access to hygienic drinking water for 88,000 people (planned). This is also a stated development goal for Peru. The 2021 development plan (Plan Estratégico de Desarrollo Nacional, Peru hacia el 2021) aims for a national drinking water and sewage supply coverage rate of 90% by 2021.

At the project appraisal, only about 72% of the population in the project area was connected to the water supply, which in some cases was only provided a few hours a day and with inadequate water quality. Only 70% of the population was connected to an already overloaded sewer system.

The water supply component focused on the construction of a filter gallery for water extraction and the creation of the main line to the water supply network, which was rehabilitated and extended in the urban area (in some cases with house connections) as part of the project. This is intended to improve the level of supply, continuity of supply and water quality.

As part of the sewage component, financing was provided for a new lake sewage treatment plant and the expansion of the sewerage network. The improved collection and treatment of sewage aimed to reduce unregulated disposal of sewage within residential areas and the contamination of water bodies.

These measures were generally suitable for ensuring a sufficient and continuous supply of drinking water for the target group and for ensuring the regulated collection and treatment of sewage. The project design was thus suitable for contributing to the targeted health impacts (both components) and environmental impacts (sewage component).

Before the project measures were implemented, the collected wastewater was discharged untreated into the sea. The expected reduction in pollution of the coastal zone up to the Bay of Paracas in the south of Pisco as a result of the sewage treatment thus also appears plausible. In view of the fisheries and refineries already located on the coast at the project appraisal, however, the expected contribution appears somewhat overestimated. Even with the satisfactory treatment of municipal sewage from Pisco, the water quality of the Bay of Paracas will remain threatened by industrial discharge.

As far as the complementary measure is concerned, the question is whether greater focus should have been placed on the demand side to strengthen the technical and economic performance of the implementing agency through increased revenues, instead of carrying out selective repairs or investing in sewer cleaning (requiring the purchase of an expensive vehicle for sewer cleaning). From today's perspective, financing could have been provided particularly for the installation of additional consumption water meters to create a better basis for consumption-based billing of drinking water.

We rate the relevance as good overall.

#### Relevance rating: 2

<sup>1</sup> All ratings related to the overall project including the main and complementary measure.

## Effectiveness

There are considerable shortcomings in the project results, especially in the area of water supply. In particular, it was not possible to achieve more effective use (including sectoring) of the system with improved demand management (water meters); no sectoring of operations has apparently taken place yet. According to EMAPISCO, only 5,300 connections were equipped with functioning water meters in August 2018. Also worth noting is the high percentage of non-active water connections (over 30% of approx. 27,000). Due to the limited scope of measurements in water production and consumption, it is not possible to make a reliable statement about unaccounted for water.

The collection and treatment of sewage in Pisco and San Andrés is undertaken to an adequate extent. The condition of the lake treatment plant financed from FC funds is satisfactory. The indicators for sewage collection and treatment were partially achieved. The effluent values of the sewage treatment plant are slightly above the defined indicator, but still within an acceptable range. The connection quotas for sewage targeted at the project appraisal were achieved.

The water supply indicators defined during the project appraisal are incomplete or need to be clarified (see table below). Indicator 1, which relates to the connection rate, refers only to the population of the narrower project area (Pisco and San Andrés) in the original version, while the project objective explicitly covers the population of the entire project area (Pisco, San Andrés, Túpac Amaru Inca and San Clemente). There is no indicator for the duration of supply, although a continuous supply was defined as the goal. This is why a corresponding indicator was included for the purpose of the evaluation and replaces the indicator for water production, as this does not allow any conclusion to be drawn on the actual supply situation of the population. An indicator on technical efficiency was added as this was also part of the objectives. The water quality generally conforms to the WHO standard with the exception of cases where the standard for arsenic is occasionally exceeded. According to the water authority ALA (Administración Local de Agua), this can be attributed to decommissioned mines. EMAPISCO, ALA and OTASS (Technical Organisation for the Administration of WSS services, unit of the Ministry of Housing) are aware of the problem and the need for further intensive monitoring.

The indicators were defined at the project appraisal and were not adjusted during the supplementary assessment after the earthquake of 2007. The achievement of the project objectives can thus be summarised as follows:

Indicator	Comment	PA status	Ex post evaluation
(1) At least 80% of the population in the extended project area (Pisco, San Andrés, Túpac Amaru Inca, San Clemente) are supplied with drinking water (quality that meets WHO standards).	Indicator specified in more detail consistent with objectives.	72%, no conclusion on the quality of the drinking water	70% (not achieved)
(2) Average duration of supply in the extended project area of at least 18 hours	Replaces original indicator on water production.	Several hours, only 20% with 24-hour supply.	10 hours (not achieved)
(3) Ratio of house connections with water meters of at least 50%	Newly introduced in line with objectives and budget	2%	31% (not achieved)*
(4) The sewage from 80% of the narrower project area is collected and treated.		0%	90% (achieved)

(5) Lake sewage treatment plant discharge values of 30mg/L BOD5 achieved in the 24-hour composite sample; values in excess of 60mg/L only in exceptional cases.		-	40-50 mg/l BOD5, in exceptional cases > 60 mg/l (not completely achieved)
(5) The effective average tariff is at least 75% of the dynamic production costs and the collection rate is at least 85%. **		Production cost recovery: 40%; collection rate: 60-70%	Production cost recovery: max. 60%; collection rate: 100% (according to EMAPISCO**) - (not achieved)

\* In relation to active connections,

\*\* According to EMAPISCO's annual reports, the collection rate was more than 100% in 2012-2017, but this cannot be reconciled with the financial reports.

Overall, the indicators for water supply were not achieved. A continuous water supply of at least 18 hours/day cannot be achieved in any part of the supply area. The weighted average duration of supply is only 10 hours. In some parts of the extended project area, EMAPISCO only supplies water for 2 hours over a three-day period. The indicators for increasing operating efficiency were not achieved with the exception of the collection rate, but this could not be verified.

The target level of the indicators at the project appraisal was appropriate overall. It is also acceptable that the target values were not adjusted during the supplementary appraisal after the earthquake, as the complementary measures aimed to restore the state that existed before the earthquake.

**Effectiveness rating: 4**

### Efficiency

Overall, the unit cost of investment of EUR 214 per inhabitant for water supply and sewage disposal (main project and complementary measures) seems appropriate. However, it must be taken into account that some of the construction work was faulty (e.g. main collector with corrosion damage even before the earthquake, leaks in the extended reservoir after the earthquake, apparently faulty or non-existent installation of the majority of household water meters). It is difficult to assess retrospectively how reasonable the costs of the individual work were. Only the expenditure for the sewer cleaning vehicle (hydrometer) appears to be too high in relation to the situation.

It is not clear whether the overarching developmental impacts (see below) could have been achieved using fewer resources. A different focus of the measures (e.g. on the network or demand side) could possibly have achieved more sustainable improvements using comparable resources. Still, we rate the allocation efficiency as satisfactory overall.

The main measures were already completed between 2000 and 2003. However, the project was not finished for various reasons (planned private sector involvement, unclear use of remaining funds). It then took six years to implement the complementary measure, so it was not completed until 10 years after the earthquake of 2007. From a formal standpoint, the implementation period from project appraisal to final review was 19 years. Even taking into account the fact that the 2007 earthquake was a turning point, this long implementation period can no longer be considered efficient.

In summary, we rate the project's efficiency as unsatisfactory.I.

**Efficiency rating: 4**

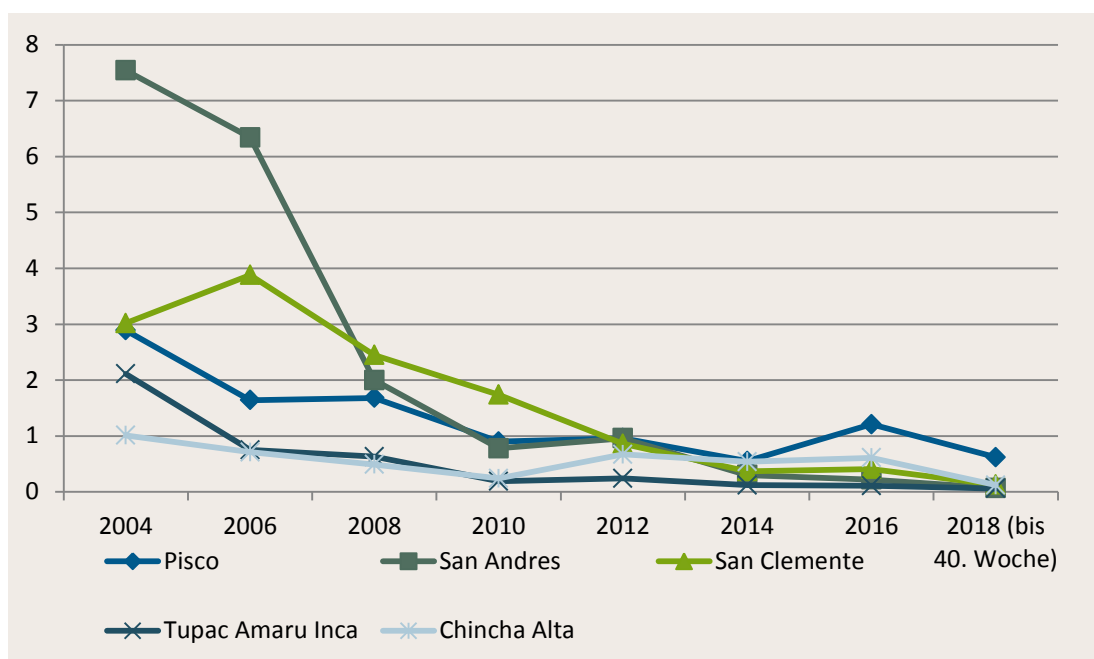
## Impact

The developmental objective was to reduce the health risks caused by water-induced diseases in Pisco and San Andrés as well as in the municipalities of San Clemente and Túpac Amaru Inca and to reduce the sewage-induced pollution of marine fauna and flora and the beaches up to the Bay of Paraca. Indicators were not defined for the developmental objective.

Compared with the situation prior to the start of the project, there has been a quantitative and qualitative improvement in the supply situation, at least in Pisco, San Andrés and Túpac Amaru Inca, including chlorination of the drinking water. It can be assumed that this has reduced the risk of water-induced diseases.

Data on the incidence and prevalence of water-induced diseases is processed by the Ministry of Health, Regional Directorate Ica (DIRESA) and made available for the period from 1999 onwards. In 1999 and 2000, i.e. before the project construction measures began, no cases of cholera were reported in the department of Ica, which Pisco belongs to. Accurate and comparable data over the whole period has only been available since 2004. The incidence of general acute diarrhoea in the project area between 2004 and 2018 remains essentially unchanged between 15 and 20 (per 1,000 inhabitants per year). Since 2004, the occurrence of dysentery in the project area has seen a downward trend, which is particularly pronounced in the San Andrés district (see diagram). In San Andrés, the number of cases fell from 8/1,000 inhabitants in 2004 to less than 1/1,000 in 2018, although 39 dysentery cases were still reported in the entire project area in the first 40 weeks of 2018 (34 in Pisco and 5 in the suburbs).

Diagram: Incidence of dysentery, cases/1000 inhabitants (Source: DIRESA ICA)



The interpretation must also take into account that the project's main construction measures were already completed in 2004. The incidence of dysentery in the entire project area was also higher than in Chinchá Alta, a comparable city 20 km north of Pisco, where no major water and sewage investments have been made in the last 20 years. In addition to water and sanitation, other, possibly more significant influencing factors are likely.

Before the sewage treatment plant was built, sewage was discharged untreated into the sea. Positive environmental impacts on the quality of the sea water (up to the Bay of Paracas, protection of the coastal zone) are plausible even despite the unsatisfactory purification performance of the sewage treatment plant. Sewage is collected in the narrower project area of Pisco and San Andrés, improving the hygiene situation in the city. Sewage treatment values fluctuate at the limits of Peruvian standards. The contribution to protecting the coastal zone was nevertheless made, but it is somewhat offset by the fact that, between Pisco and the southern Bay of Paracas, there are a number of fish factories and a refinery that dis-

charge their pre-treated effluents into the bay; in recent years though, this has repeatedly prompted IMAPRE (Peruvian Marine Institute) to test water quality.

**Impact rating: 3**

### **Sustainability**

Overall, there are still considerable risks with regard to environmental, institutional and economic sustainability.

**Environmental sustainability:** the sewage of the town of Humay is discharged untreated into the Pisco River at the same level as the filter gallery. A sewage treatment plant, which should have been built in the 1990s, has still not materialised 20 years later. EMAPISCO is aware of the risk and closes part of the filter gallery. Another sustainability risk is the presence of arsenic in raw water (see above), which is well above the standards in certain areas.

**Operational/institutional sustainability:** EMAPISCO's institutional weakness had already been identified as a high risk at the project appraisal. Interventions by GIZ have in the meantime contributed to improving the operating ratios, but this has not proven durable in the long term. According to the regulator SUNASS, the achievement of EMAPISCO's operational ratios fell from 85% in 2012 to 26% in 2016. EMAPISCO was finally transferred to what is known as the Regime de Apoyo Transitorio (Transitional Help Regime) in 2016 following a government analysis. The central government agency OTASS has thus effectively taken over the ownership rights to the water utility company and the operational management; the rights of the municipality as shareholder have been suspended. OTASS has defined short and long-term support measures for EMAPISCO, some of which are already being implemented. It remains to be seen whether there will be a sustainable improvement in operations; to date, no significant positive development has occurred in the 1.5 years since the takeover. The success of the OTASS intervention is assessed every three years.

**Financial sustainability:** the most recent financial reports submitted to an auditor date from 2017 (2016 financial year). The auditor did not confirm the reports due to unverifiable information. The figures for the 2016 financial year indicate that operating costs will barely be covered by income from charges for water supply and sewage disposal (1.00). A tariff study approved in 2018 projects an operating cost recovery rate of 1.04 and 1.13 in year 1 (2018) and year 2 (2019). It should be kept in mind, however, that operating cost recovery has not changed significantly in the past and that liquidity bottlenecks occur, which are currently covered by subsidies for capital investments. In the last annual financial statements audited (2016), the cash flow from operating activities was negative (- 962,594 PEN). It was only possible to cover the shortfall because OTASS had made grant funds available for future investments in the same year. The full cost recovery ratio was roughly 0.60 in 2016, and EMAPISCO projects that it will only increase to 0.76 in four years' time. Of particular concern is EMAPISCO's weak focus on the sustainability of commercial operations coupled with a general lack of interest on the part of the Peruvian authorities in a fundamental overhaul of the tariff system. In addition, the persistently low number of consumption water meters that function and are read makes it more difficult to ensure a more sustainable supply operation.

In view of the persistently high risks, the sustainability of the project impacts is rated as unsatisfactory overall.

**Sustainability rating: 4**

### 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:

<b>Level 1</b>	Very good result that clearly exceeds expectations
<b>Level 2</b>	Good result, fully in line with expectations and without any significant shortcomings
<b>Level 3</b>	Satisfactory result – project falls short of expectations but the positive results dominate
<b>Level 4</b>	Unsatisfactory result – significantly below expectations, with negative results dominating despite discernible positive results
<b>Level 5</b>	Clearly inadequate result – despite some positive partial results, the negative results clearly dominate
<b>Level 6</b>	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).