

**Turkey: Water supply Kayseri**

**Ex post evaluation report**

OECD sector	14020 / Water supply and sanitation– large systems	
BMZ project ID	1996 65 431	
Project executing agency	Kayseri Su ve Kanalizasyon Idaresi (KASKI)	
Consultant	Dorsch	
Year of ex post evaluation	<b>2007</b>	
	Programme appraisal (planned)	Ex post evaluation (actual)
Start of implementation	Q3 1996	Q4 1997
Period of implementation	37 months	66 months
<b>Investment cost</b>	EUR 14.7 million	EUR 18.9 million
Counterpart contribution	EUR 4.5 million	EUR 9.1 million
<b>Financing, of which FC funds</b>	EUR 10.2 million	EUR 9.8 million
Other institutions / donors involved	none	none
Performance rating	2	
<b>Relevance</b>	2	
• <b>Effectiveness</b>	2	
• Efficiency	2	
<b>Overarching developmental impact</b>	2	
• Sustainability	1	

**Brief description, overall objective and project objectives with indicators**

The project aimed at improving the water supply in the city of Kayseri. At the project appraisal measures had been planned to set up supply zones and to measure drinking water losses in the individual zones, including repair and rehabilitation measures such as repair of leakages, expansion of storage capacities and the replacement of pumps and feeder pipes. The measures were implemented in the form of an open programme. The project objective was to reduce technical and non-technical water losses and ensure the continuous and sufficient supply of drinking water for the population of Kayseri. The overall objective of the project was to contribute to saving water.

At the project appraisal the situation of the population in terms of supply with drinking water was as follows: a large proportion of the inhabitants of the city (90%) had access to drinking water from a well field, which provided water of good quality that did not require any further treatment. The main problem identified at project appraisal was high water losses of about 45%, which threatened to cause medium-term supply bottlenecks. According to the project appraisal report, the production capacity at the time of around 60 million cbm/a would not have been sufficient within the time span planned for the project (2015) to provide sufficient supplies of drinking water for the fast-growing population. For this reason it was assumed that, unless reduction

measures were introduced, the high losses would in the medium term require tapping new water sources through the capital intensive construction of dams (on the Sarimsakli river upstream of Kayseri).

At the project appraisal the following target system was defined to measure the success of the programme:

- a) Reduction of technical and non-technical water losses in the network. Indicator: Once the leakage detection and repair measures as well as the rehabilitation measures in the project regions have been completed, water losses account for less than 30% of total water produced;
- b) Ensuring the continuous supply of the population of Kayseri with sufficient quantities of drinking water. Indicator: The number of disruptions due to pipe bursts is reduced by 50% in those districts where leakage detection and repair measures as well as rehabilitation measures have been implemented.

An indicator to measure the achievement of the overall objective was not defined.

In the course of the project implementation the project rationale changed insofar as a reduction of losses was not required to avoid a capital intensive tapping of new water resources and, thus, water supply bottlenecks. Instead, the tapping of new wells turned out to be feasible and, as opposed to loss reduction, also proved to be the more economic measure. As a result, a major share of project funds was used for the expansion and rehabilitation of the water supply network in the framework of the open programme, which meant that the original overall objective of contributing to saving water resources was in fact replaced by the new overall objective of contributing to orderly urban development. Thus, the indicator for the project achievement regarding water losses (a) is now longer relevant with a view to the achievement of the overall objective.

Against the background of the redefined overall objective (orderly urban development) , indicator (b) for the achievement of the project objective has to be complemented. In consequence, taking into the account the initial situation, the criteria usually applied in the sector are to be used. These are: the supply rate (full supply for the increased urban population), water quality (WHO standards), per-capita consumption (maximum 120 l/cd) and the supply time (24 h/d).

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

The measures, which had been planned and implemented as an open programme at the time of the project appraisal, comprised:

- Emergency measures: Repair of large known leakages in the distribution network with the aim of reducing water losses;
- Zone separation: zoning of the water supply network into independent distribution and district zones with the aim of increasing supply reliability;
- Rehabilitation of the system: Repair and replacement of pumps and other technical installations in the production facilities in order to increase the reliability of supply and reduce production costs;
- Expansion of the system: Expansion of the network of feeder pipes from the well fields and the storage capacity in order to increase the reliability of supply.

- System for the supervision of operations: Equipment of water production facilities with water meters and pressure gauges, whose data are fed into the existing expanded computer based SCADA remote control system as a prerequisite for a water loss reduction programme;
- Prevention of water losses: On the basis of the analysed SCADA data, identification of further leakages and their elimination;
- All individual measures were supported by a consultant.

During the project implementation it was decided to establish an additional distribution zone in the east of the city and to open up the required new well field. Due to these new resources it was possible to increase the production capacity from 60 to 88 million cbm/a, which is estimated to be cover the water needs of the population (Kayseri without incorporated neighbouring municipalities) up until 2017. Thus, from today's perspective, even though water losses were not substantially reduced, the capital intensive construction of dams was not required on a medium term basis (i.e. within the planned time to 2015).

During the implementation of the project it also became apparent that given the funds provided for the project it was not possible to achieve the separation of all zones and the ensuing rehabilitation of the distribution network within the zones. In accordance with the established work programme, the new distribution zone as well as one other selected distribution zone (out of a total of 7) were partially divided into district zones (5 isolated district zones of a total of more than 100 district zones in the entire Kayseri area) and the required replacement works were carried out. Due to delays in the implementation, but also due to the establishment of the new zone and the related opening up of the well field, the total cost of the project rose by around EUR 4.2 million (this amount was provided entirely by the Turkish side) to a total of EUR 18.9 million.

Due to the before mentioned changes, the water supply component (system renewal, rehabilitation and expansion) accounts for a higher share of total costs than the resource protection component (emergency measures to reduce water losses, zone separation and prevention of water losses), even though it is not possible to specify the precise percentages since it is difficult to clearly assign individual components to the two categories. At the project appraisal, the resource protection component accounted for roughly half of all measures planned.

Overall, the quality of the construction works rendered in the course of the programme implementation and the programme results are considered good. The training measures (on-the-job training) provided by the consultant during the project implementation and the detailed multi-year work programme enabled the project executing agency KASKI to implement future water loss reduction programmes in a qualified manner. In order to reduce water losses in the entire network to an acceptable maximum rate of 30% the parties involved agreed that KASKI should continue the programme after the completion of the project. However, as long as the executing agency focuses on the expansion of the sewage disposal system and (in the rural areas that were newly incorporated into the city in 2005) on improving the drinking water quality and supply rate, while on the other hand, due to the political influence exercised on tariff setting, higher revenues are not to be expected, it cannot be assumed that the potential created will be used in the short term to further reduce water losses. Instead, we expect that only once the mentioned investments have been completed in 2008/2010 more attention will again be paid to the issue of water loss reduction.

From today's point of view, the programme measures were appropriate and sufficient to contribute to the objective of ensuring and improving the supply of the population as compared with the situation at project appraisal. The assumption made at project appraisal that there was

an obstacle to development (scarcity of resources against the background of a capital intensive dam project) proved to be wrong and was also not considered in detail in the feasibility study. Moreover, the study did not contain any efficiency analyses comparing the alternatives of loss reduction and construction of new wells. Thus, it is still unclear today which alternative should have been preferred from an economic viewpoint. However, since the project had been designed as an open programme, it was possible in the course of the project to react flexibly to the actual situation so that finally measures were implemented that contributed to providing a better drinking water supply in the city of Kayseri.

### **Key results of the impact analysis and performance rating**

Overall, operations are managed excellently except for the high water losses (see below). According to information provided by the project executing agency, the resource situation (sufficient raw water resources, economical water production) is favourable and for this reason, loss reduction programmes are currently not given any priority, neither ecologically nor economically. Moreover, on the disposal side, it is as yet unclear where the sewage sludge will be finally dumped. The sludge is currently deposited in a mono-purpose dump, which has only limited capacity and will not be sufficient in the medium-term to receive all the sludge produced. The leachate problem that was already discussed with the executing agency in February 2006 has now been settled because the leachate from the sludge is completely treated in the treatment plant. The Kayseri health authority, which regularly takes sewage samples, did not find any cause for complaint.

From the target group perspective, despite the substantial investments made, the project (together with the project 'Waste water disposal Kayseri') led to tariffs that are higher than before the implementation of the project but are still clearly considered as socially compatible. The target group benefits from the project because supply disruptions are shorter and affect smaller areas; water is supplied 24 hours a day and in sufficient quantity, the water quality is good and the supply rate is high.

Negative impacts on women can be ruled out. The project did not have the potential for improving the situation of women since the connection rate was already relatively high at the time of the project appraisal, which means that women were not responsible for fetching water at the time, nor are they today. At the time of the project appraisal water-related diseases did not play a role, thus the project did not serve to reduce the time and effort spent by women in caring for sick family members.

Given the income structure of the target group, which has improved since the project appraisal due to the economic development, the project does not primarily serve to fight poverty but has a general developmental orientation.

The programme did not focus on participatory development or good governance and accordingly does not show any related impacts.

As regards the project objective, the project aimed partially at saving resources through loss reduction measures, which did however not cause any significant changes in the reduction of total losses and, thus, did not produce the expected positive environmental impacts. Together with the project 'Waste water disposal Kayseri', the project contributed through an increase in tariffs to achieving full cost coverage, which enabled investments in the waste water area that were financed from own funds and had positive environmental impacts. The National Water Agency (DSI) prepares studies on the maximum quantity of groundwater that can be withdrawn (e.g. the underground water reserve plan), monitors the impacts of the water withdrawal on the groundwater and authorises the construction of new wells by private individuals or by KASKI only if the wells do not cause any negative environmental impacts. In the past five years the groundwater table has practically not changed.

The project is in line with the priorities that were confirmed on the occasion of the latest German-Turkish government negotiations, namely to support the urban infrastructure in less developed provinces of the country. This meets both the sector requirements of the BMZ and the policy guidelines of the Turkish government. The core problem of a supply bottleneck expected to occur until 2015, which would have been eliminated only through loss reduction or the capital intensive construction of dams, was not apparent at the time and was neglected during the project appraisal. From an ex post point of view, the assumptions regarding population development, possible alternative solutions and the prevailing resource bottleneck proved to be wrong. Thus, it would have been possible to sufficiently supply the current population with the capacities available at project appraisal – even taking high losses into account. The higher population forecast until 2015 can be supplied through the newly developed well field. As the project was designed as an open programme, it was possible to address the actual water supply need; thus, the measures, which were aimed not so much at loss reduction but more at system renewal and expansion, to some extent led to the desired results and contributed to achieving the project objectives (in particular with regard to service quality and connection rates). The original overall objective of saving water was not suited to measure the project impacts. The newly defined overall objective of orderly urban development, which corresponded with the second project objective of ensuring the continuous supply of the population, was better suited to measure the project impacts. Other policy areas did not interfere with the project, while the project, in turn, did not have any negative impacts on such policy fields (coherence). The donor coordination by the State Planning Organisation (SPO) worked well and succeeded in suitably assigning the required investments to the different donors. The project partially benefited from the structures and procedures existing in Turkey (alignment). To summarise, we assess the relevance of the project still as good (sub-rating 2).

The (modified) indicators relating to the project objective were met in full. The supply rate is 99%. The water quality meets WHO standards. Supply is usually ensured 24 hours a day. The number of disruptions, however, has remained unchanged since 1996 (about 4,500 disruptions annually); this has to be seen against the background that the network was extended 23% since 1999 and, thus, it can be assumed that the situation in this area has improved. In terms of length and geographical scope, the supply disruptions are now only few hours a day instead of several days and usually affect only few streets instead of entire city districts. Per capita consumption is 110 l/d. In view of the high level of expectation, however, the project objectives were well achieved. This is mainly due to the fact that the supply situation in Kayseri had already been very good at project appraisal due to the executing agency which had already been very efficient and high performing at the time. Thus, the good achievement of the objectives can be attributed only partially to the project and, thus, the effectiveness of the project is rated not as very good but only as good (subrating 2).

Due to the lack of data available it is difficult to give an assessment of the production efficiency: Though it was possible to reduce losses in the pilot zones to 5%, which is only 1% of the total production, losses in the network as a whole are invariably high at around 45%. No profitability calculations were made to answer the question whether the cost of capacity expansion implemented might have been cheaper than the loss reduction measures. The capacity utilisation of production facilities is roughly 53% and can be rated as low <sup>1</sup>. No information is available on the capacity utilisation of the network or the storage possibilities. Allocation efficiency has been achieved due to the fact that KASKI has reached full cost coverage and generates income, while tariffs are socially compatible and the collection efficiency is 99%. This positive economic situation is mainly the result of the accompanying measures to the ongoing waste water disposal project. The measures were implemented in due course, thus, it was

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<sup>1</sup> A comparison of production capacities and consumption shows that only 28% of production capacities are required to satisfy the demand for water.

possible to ensure the supply of the growing population. Despite the high water losses, which do not have a negative impact on the financial situation of the project executing agency, and due to the stronger weight attached to the aspect of allocation efficiency, we rate the overall efficiency of the project as good (subrating 2).

The objective newly defined at project appraisal of ensuring the orderly urban development was fully reached. Almost all inhabitants of the grown city are supplied with qualitatively good drinking water in sufficient quantity: Thus, there is no danger of contracting water-induced diseases and no urban structures could develop that might have been unattractive to the population because of undersupply. Beyond the overall objective, the project does not have any further negative or positive impact or structural effects. Thus, the developmental efficacy of the project is considered as good (subrating 2).

**Sustainability risks** do not exist, neither in terms of relevance nor effectiveness or overarching developmental impacts. It can generally be assumed that developmental efficacy will continue undiminished (sustainability level 1).

Having weighed all criteria, we assess the project's developmental efficacy as good (rating 2).

### **General conclusions and recommendations**

In general, larger investment projects in complex water supply systems should only be approved on the basis of a suitable feasibility study (including a comparison of adequate alternatives). In the present case this means that it would have been required to thoroughly examine and compare the alternatives 'dam construction', 'drilling of new wells' and 'loss reduction'; in this way it would have been possible to avoid the wrong assumptions about the reasons for the core problem identified.

If the data available for planning is insecure, the concept of an "open programme" is a suitable instrument to flexibly adjust the technical concept to existing needs. The effect in the present case was that a loss reduction programme was largely changed into project for orderly urban development. When implementing projects of the type "open programme" in the future, attention should be paid to ensuring that the flexibility of the measures does not entail a creeping change in the fundamental orientation of the project, i.e. the flexibility has to be limited by the project objective and the overall objective.

If it becomes apparent during the project implementation that key assumptions and planning parameters are not correct the overall project design and the target system should be reviewed and adjusted if necessary.

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

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

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

A rating of 1 to 3 is a positive assessment and indicates a successful project while a rating of 4 to 6 is a negative assessment and indicates a project which has no sufficiently positive results.

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 an improvement is very unlikely. 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.