Turkey: Adana Water Supply Project

Ex-post evaluation report

OECD sector	14020/Water supply and sanitation, large systems	
BMZ project number	1997 65 025	
Project executing agency	Adana Büyüksehir Belediyesi Su ve Kanalizasyon (ASKI)	
Consultant	GKW Consult	
Year of ex-post evaluation	**2006**	
	Project appraisal (planned)	**Ex-post evaluation (actual)**
Start of implementation	4th quarter 1996	4th quarter 1996
Period of implementation	58 months	70 months million
Investment costs	EUR 83.9 million	EUR 100.7 million
Counterpart contribution	EUR 43.0 million	EUR 59.8 million
Finance, of which FC funds	EUR 40.9 million	EUR 40.9 million
Other institutions/donors involved	None	None
Performance rating	2	
• Relevance	1	
• Effectiveness	2	
• Efficiency	3	
• Impact	3	
• Sustainability	2	

Brief Description, Overall Objective and Project Objectives with Indicators

The project objective was to secure the supply of hygienically safe water for the city of Adana up to the year 2010. Ensuring drinking water supply was to make a major contribution to reducing health hazards to the population (overall objective) due to nitrate pollution in about 40% of the groundwater wells at project appraisal. The existing groundwater supply system was therefore to be converted to deliver treated surface water.

Project objectives achievement was to be measured with the following indicators:

- Supply in the city area is continuous 24 hours a day.
- Nitrate content in the water amounts to less than 50 mg/litre.
- More than 80% of the drinking water samples are coli negative.

The set of objectives and indicators can rate as largely adequate in hindsight. An additional objective indicator was added for coverage at ex-post evaluation (continued high coverage index of at least 95%). The objective indicator on water quality was also supplemented to include

the requirement of meeting WHO standards.

No overall objective indicator was defined. In view of the ex-post evaluation findings on health status, an indicator on the reduction of health risks for the population would have been appropriate for assessing overall objective achievement. The following two **additional indicators** were accordingly chosen for this: reduction of potential health hazards from nitrates in drinking water and a significant decline in water-induced diseases.

The target group of the project was the population of the city of Adana. The project did not aim directly at improving the situation of women. The share of the population living in absolute poverty could not be determined exactly at project appraisal for lack of data. Owing to the relative economic prosperity in Adana at project appraisal, however, the poor percentage in the population was considered small, thus ruling out poverty relevance.

Project Design/Major Deviations from Original Planning and Main Causes

In the 1997 appraisal report based on a feasibility study from 1995, the project measures were defined as follows: abandonment of groundwater supply for all wells with a nitrate content of more than 50 mg/l, construction of a waterworks at the Catalan Dam for a capacity of 250,000 m of m³/d, installation of downpipes to the grid for a capacity of 500,000 m³/d, erection of an intake structure at the reservoir and the tunnel stretches for the transmission of 1,000,000 m³/d.

The project diverged from the original plan, because far fewer wells could be used due to the specified nitrate contents in the groundwater of < 50 mg/l (38 instead of the scheduled 80). The treatment facility was located at a higher topographical level to be able to make use of gravity for water distribution to a maximum urban area with a view to energy savings. In a change to detailed planning, supply to the district situated east of the Seyhan River was secured by means of a separate (second) downpipe with appropriate tanks and pumping stations for the high zones. This was necessary, as fewer wells than planned could be used to supply this district. The reorganization of the grid and the subdivision into different pressure zones as planned has made a major contribution to the continuous supply of hygienically safe water. Another major layout change was made in response to the demand on the part of the Turkish state water authority (DSI) to lay the downpipes along two bridges over Seyhan Lake instead of through it as planned.

After redivision of the distribution grid into pressure zones with approx. 6 bar delivery pressure and due to inefficient management, total losses (technical and administrative) increased from originally approx. 60% to about 70%. Based on the correct assessment that losses could only be successfully reduced in a long-term programme, ASKI decided in 2004 to double water treatment capacity below the Catalan reservoir to ensure water supply (completion July 2005). ASKI can meet the resulting higher operating costs, because the abandonment of water supply from wells has afforded considerable savings in electricity costs. In theory, ASKI has gained sufficient leeway through increased water treatment capacity to be able to take careful measures for loss reduction without time pressure. The ASKI management does not, however, appear to attach foremost priority to remedying losses. Administrative losses impair the annual operating result directly. The technical losses have indirect adverse effects on the underground infrastructure installed by others (e.g. private home owners, road construction authority, telecommunications provider). From a macroeconomic standpoint, therefore, adverse external effects can be attributed to the water supply project, which were evident as quality deficits at ex-post evaluation but could not be quantified in any more detail in the present review.

As a whole, the project design was correct. In Adana, it was only possible to ensure sustainable reliable water supply at the requisite quality and quantity through a gradual shift away from groundwater extraction. The new gravitational supply system saves electricity costs of more

than EUR 6 million a year. If ASKI manages to reduce the losses to the 30% already specified at project appraisal by 2010, the present waterworks capacity of approx. 180 million m³/year at a present consumption of approx. 90 million m³/year will suffice to meet needs up to 2025 and beyond. However, due to the very high losses, 160 m³ of water is already produced every year, making for a capacity utilization of 89%. Under these circumstances and without the determined implementation of a loss reduction programme, capacity could be insufficient to meet needs up to 2025. To prevent a further deterioration in the harmful, external, macroeconomic effects, ensure the functional sustainability of the transmission grid and halt future wastage of the water produced, replacement investments should be speedily made to reduce losses.

Except for leak detection, all individual measures have been extremely successful. A complementary measure to deal with the causes of the administrative losses would have been appropriate in hindsight. By replacing water meters, prompt controls of individual meterings and similar measures, the illegal consumption could have been curtailed substantially from the current annual volume of approximately 50 million m³.

Today, the plan of implementation would have been supplemented by a complementary measure to support the executing agency in collection and household consumption monitoring.

Key Results of Impact Analysis and Performance Rating

The primary socio-economic benefit of the project envisaged in the appraisal report, the continuous supply of hygienically safe water to the population of Adana, has been achieved. Water health risks to the target group have been practically eliminated. Thanks to the measures for sewage treatment carried out in connection with the water supply project (financing of two treatment plants by EIB on the right and left side of the Sehyan River), the quality of the groundwater and surface water is improving. So the project carried out to complement the EIB sewage project has also had indirect benefits on water supply to the rural surroundings of Adana that are not connected to the central supply grid and remain dependent on the use of groundwater resources. The project has had positive side effects on the energy balance and with that on the climate. The gravitational distribution of the drinking water saves about 78% in energy consumption compared to the previous system with electric feed pumps.

The project has not had any gender impacts. Women in the urban project region are not directly responsible for fetching water. There was therefore no scope for improving gender equality. The project had a general developmental purpose and was not directly concerned with poverty alleviation or participatory development/good governance.

In the following, we provide a summary assessment of risks to the sustainable developmental efficacy of the project and the KfW rating.

The project conforms with the priorities jointly agreed on at the German - Turkish intergovernmental negotiations and contributes to mitigating one of the core problems in providing social infrastructure in underprivileged areas. It is embedded in complementary sectoral measures in sewage disposal and treatment. Under the overall system, the additional volumes of drinking water made available on the supply side through the FC water project are complemented on the disposal side by the extension of the sewerage system and the construction of two sewage plants. In terms of layout and implementation schedule, the measures (water supply by KfW and sanitation by EIB) were agreed on with the Turkish side and carried out on time. Adana is a transit point for migrant labour from East Anatolia and home to diverse ethnic groups (including a large Kurdish community). Integration is an ongoing concern of municipal policy. Securing a functional delivery of basic social services, such as water, sewage and health care, makes a substantial contribution to peaceful co-existence amongst the various social groups and helps prevent conflict. The project is congruent with the goals of the local administration and helps in

implementing a dynamic integration policy (alignment between municipal and project objectives). The project design was appraised at the beginning of implementation and geared to the water and energy potential of the Catalan reservoir, accounting for modern sustainability principles and economic and ecological standards. The infrastructure scheme complies with modern planning principles for the long-term, energy-efficient and economical operation of large-scale technical plant. Considering programme alignment with national developmental constraints, the coordination between the donor and Turkish institutions, its contribution to preventing social conflict and the amendment of project design for improved energy efficiency, we assess project **relevance** as **very good** (**Subrating 1**).

All indicators for project objective achievement have been met in full. Coverage amounts to 98%. Drinking water is available to the population for 24 hours a day. Drinking water quality meets WHO standards, with nitrate content at 2 mg/l well below the target of 50 ml/l and over 99% of all water samples recording no coli bacteria at all. We therefore judge the **effectiveness** of the project as **satisfactory** (**Subrating 2)**.

Only about 89% of the technical capacity enabled through water treatment is used due to the very high losses. Only about 56% of capacity is, however, needed for current coverage despite very high per capita consumption. The rapid population growth forecasts in Adana have not materialized at the anticipated scale. Only about 31% of the water volume produced is sold. Technical losses are estimated at 38% of volume, administrative losses at 31%. In comparison with other towns in Turkey and also by international standards, capacity utilization and loss rates are above average. The technical losses have necessitated early extension investments in the water treatment plant and require an excessive use of chemicals. The administrative losses amount to income forfeited for the drinking water consumed. The rates billed to paying ASKI customers are inordinately high due to administrative revenue losses and excessive production costs for technical losses. The estimates from updated dynamic prime costing based on current scenarios show that the rates charged by ASKI are more than enough to meet prime costs (full-cost recovery: 116%). This detracts substantially from allocative efficiency. The excessive rates compel poor sections of the population to cut back on other urgent basic needs (cf. TC 6.03). Altogether, we assess **overall efficiency** as **sufficient** (**Subrating 3**).

The overall objective of reducing health hazards to the population was realistic and also in keeping with current standards for common-welfare, socio-economic value systems. Risk mitigation results under health impacts cannot be quantified for lack of adequate data. Scientifically documented results chains on human consumption of drinking water polluted with nitrate show, however, that this poses particular carcinogenic hazards to human health. Classic water-induced illnesses, such as diarrhoea, are reportedly declining. In part, the high technical losses cause undermining, cavities and damage due to damp in the underground infrastructure (cellars, foundations, roadbeds). Due to the high technical pipeline losses, the project has caused harmful external effects that cannot be quantified in this ex-post evaluation. The development measures in this project connected with the executing institution and the target group have built capacity and have had a broad impact: The executing agency, ASKI, has continually adapted its administrative capacities to the new operational requirements of the technical system; the target group is more aware of the value of hygienically safe water and has planned its payments obligations in its household budgeting. Weighing up the beneficial health and capacity-building effects and the adverse external effects described, we assess the **impact** as **sufficient** (**Subrating 3**).

Direct risks for sustainability cannot be inferred from an analysis of impact or from a risk analysis of effectiveness. The project executing agency still suffers from considerable weaknesses with regard to its persistent lack of commitment to reducing technical losses but this will not impair project sustainability to any great extent. It has, however, started with a programme on its own initiative to reduce losses as of 2005. The implementation of a technical-economic ration-

alization programme, which will only take effect in the longer term and call for costly initial technical investments and administrative reorganization, is uncertain, because it requires local policy approval. The political decision-makers can, however, be expected to become increasingly aware of the above-mentioned harmful external effects in the medium term and come under increasing pressure to take action. We therefore classify the **sustainability** of the project as **satisfactory** (**Subrating 2**).

Owing to the efficiency limitations and the resulting unfavourable external effects, we attest the project **satisfactory overall developmental efficacy** by a narrow margin (**Rating 2**).

General Conclusions

The system option finally implemented (shutdown of all 80 wells and switch to surface water from the Catalan Lake, with the advantage of substantial energy savings through the use of a gravitational grid supply) was not considered in the feasibility study prior to the project. In future projects, a systematic comprehensive review of alternatives should be conducted beforehand to include the effects on overriding constraints such as renewable energies or climatic effects, even if this involves an additional planning input.

The high administrative losses of the executing agency in metering, consumption monitoring and collection were underestimated in problem assessment and as a consequence insufficient personnel was provided for the reduction of revenue losses and for systematic and repeated reminders to the heavily fluctuating target group to pay their water bills. Thus, we also recommend preparing for complementary measures also as a future short-term option to provide temporary support to the executing agency in dealing with operational problems and bottlenecks.

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.

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. A rating of 1 to 3 indicates a “successful” project while a rating of 4 to 6 indicates an “unsuccessful” project. In using (with a project-specific weighting) the five key factors to form a overall rating, it should be noted that a project can generally only be considered developmentally “successful” if the achievement of the project objective (“effectiveness”), the impact on the overall objective (“overarching developmental impact”) and the sustainability are considered at least “satisfactory” (rating 3).