Ex post evaluation – Turkey

Sector: Urban development and management (43030)
Project: Municipal Infrastructure Programme II/III (BMZ no. 2002 65 603* and 2003 65 239**) incl. accompanying measures (2003 70 114 and 2005 70 028)
Implementing agency: Utilities services providers of the four project cities (BASKI, SASKI, VASKI, DISKI)

Ex post evaluation report: 2018

		Phase II (Planned)	Phase II (Actual)	Phase III (Planned)	Phase III (Actual)
Investment costs (total)	EUR million	39.1	38.8	96.6	80.2
Counterpart contribution	EUR million	6.6	5.9	21.5	24.0
Financing (incl. EIB)	EUR million	32.5	32.9	75.1	56.2
of which BMZ budget funds		20.5	20.5	40.1	28.9

*) Random sample 2017 **) Random sample 2015

Summary: The projects included measures to improve water supply and sanitation in the cities of Batman (Phase II), and Van, Samsun and Diyarbakir (Phase III). The main project components were the construction of two new wastewater treatment plants, the improvement and expansion of the existing water supply systems including measures for network rehabilitation, rainwater drainage and flood protection. The accompanying measure was intended to improve the administrative and financial capacity of the implementing agencies. The measures in Batman and Samsun were co-financed by the EIB.

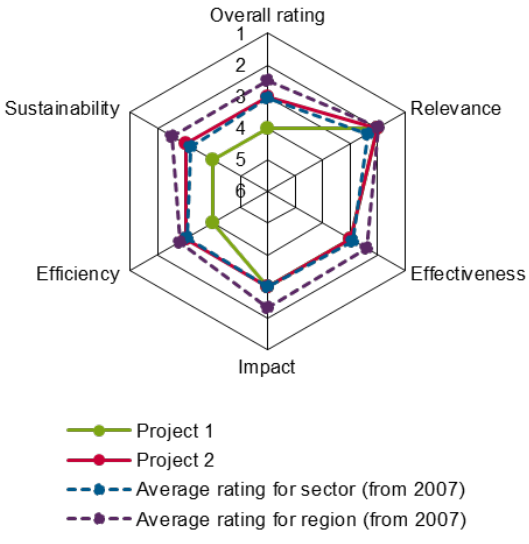
Objectives: The objectives at outcome level were the hygienically safe and environmentally sound disposal of urban wastewater from the four programme locations, the improved supply of drinking water to the population in Batman and Van, the reduction of unaccounted for waer in Van and Diyarbakir, and the efficient and sustainable operation of the provided or improved water supply and sanitation infrastructure at all locations. The objectives at impact level included contributions to resource conservation (Phase II) and environmentally sound municipal development (Phase III), as well as to improving residential sanitation and the population's socio-economic living conditions.

Target group: The project target group was the population of the four programme cities and their neighbouring municipalities.

Overall rating: 4 (Phase II) / 3 (Phase III)

Rationale: In Batman (Phase II), the project objectives were achieved to a limited degree only. The high unaccounted for water in particular, as well as the low collection rate, result in high production costs with low revenues and ultimately in inefficient and economically unsustainable operation. In addition, reducing unaccounted for water in Turkey is an important prerequisite for reconciling long-term resource availability and water demand. Both supply targets and business objectives were achieved in Samsun (Phase III).

Highlights: There was no reliable up-to-date operating data available for the Van and Diyarbakir (Phase III) locations at the time of the EPE, so the assessment is based primarily on the current data available for Samsun. Due to the relatively good development in Samsun, Phase III was still rated as satisfactory, but these outcomes cannot be transferred to the other locations, especially as the available data indicates a significantly worse development than in Samsun. However, Van and Diyarbakir accounted for a significantly smaller share of the financing funds.



Rating according to DAC criteria

Overall rating: 4/3 (Phase II/III)

Ratings:

Relevance	2/2
Effectiveness	3/3
Efficiency	4/3
Impact	3/3
Sustainability	4/3

NB: Due to the security situation in the Kurdish regions of Turkey, an evaluation trip to the project area was not possible. For this reason, too, there was little reliable information available for the Van and Diyarbakir locations.

Breakdown of total costs (only for 3 or more projects/phases)

	Phase II (Planned)	Phase II (Actual)	Phase III (Planned)	Phase III (Actual)	CM* (Planned)	CM (Actual)
Investment costs EUR million	39.1	38.8	96.6	80.2	2.2	1.7
Counterpart contribution EUR million	6.6	5.9	21.5	24.0	0.0	0.0
Funding (incl. EIB) EUR million	32.5	32.9	75.1	56.2	2.2	1.7
of which BMZ budget funds EUR million	20.5	20.5	40.1	28.9	2.2	1.7

*) BMZ no. 2003 70 114 (EUR 1.0 million) and BMZ no. 2005 70 028 (EUR 0.7 million, residual funds of EUR 0.5 million were used for FC projects in other locations).

Relevance

With the aim of reducing considerable environmental and health hazards in the project locations, both projects were dedicated to improving the living conditions of the population and protecting the bodies of water close to the city. Three of the four locations (Batman, Van and Diyarbakir) are located in poorer, predominantly Kurdish-populated areas of eastern Turkey, where average incomes are below 50% of the Turkish average, putting them in line with needs-based site selection. These three eastern locations were also exposed to particular pressures on existing infrastructure due to a significant increase in population (including rural exodus related to the Kurdish conflict). The different initial conditions in the project locations were taken into account when designing the specific measures, allowing the financed investments to address the most relevant bottlenecks in the respective locations. Specifically, bottlenecks in the sewerage system (which also occurred in the form of wastewater flooding in Batman and Van as a result of overloaded pipes) and wastewater treatment were to be reduced by rehabilitating wastewater networks and building new wastewater treatment plants or upgrading existing ones. This was intended to reduce the ongoing contamination of the bodies of water used as receiving waters (e.g. Lake Van and the Black Sea near Samsun) in all locations. The inadequate drinking water supply in Batman, which had also led to the use of unsafe and contaminated drinking water sources, as well as the very high levels of unaccounted for water (UfW) in the three eastern cities, were to be addressed by targeted investments in water production and distribution structures and supplemented by specific measures to find and repair leaks. The causal relationships between the investment measures and the containment of health and environmental risks are direct, the result being commensurately short results chains. For instance, the rehabilitation or expansion of the relevant infrastructure (output) was intended to improve the water supply and sanitation (outcome) with positive impacts on the health of the target group and on the environmental situation (impact).

All measures were therefore suitable for addressing the core problems of water supply and sanitation in the four project cities. However, making a long-term contribution to achieving the objectives depended on the operators sustainably running the improved or newly constructed infrastructure, which is particularly

important for the wastewater treatment plants. Staff support under the accompanying measures was intended to contribute to this. However, the project approaches were unable to address overarching problems such as the weak financial situation of the three eastern cities, the lack of specialist staff or the difficulties arising from the operators' extended catchment areas.

The projects served to strengthen the social infrastructure in eastern Turkey, in addition to protecting the environment and resources in the region. Both phases were thus aligned with the development policy priorities of German-Turkish FC and Turkey's development planning.

From today's perspective, the relevance of both projects is assessed as good.

Relevance rating: 2 (both phases)

Effectiveness

The quantitative target achievement based on the defined indicators can only be assessed on the basis of the information provided by the respective implementing agencies. The security situation precluded a visit to the sites, so it was not possible to check or verify the plausibility of the information. Due to different technical conditions and different initial situations at the various locations, the target values were defined specific to each location, in particular for the wastewater treatment plants' effluent values. The achievement of the objective at outcome level can be summarised on this basis as follows:

Indicator	Status PA, target PA	Ex post evaluation
(1) Duration of drinking water supply	**Batman**: PA: no data Target: 24 h/350 d **Van**: PA: no data Target: 22 h/330 d	**Batman**: EPE actual: 24 h with the exception of densely populated areas (Syrian refugees) **Van**: Final review (2014): 24 h
(2) Unaccounted for water (UfW)	**Batman**: PA: 73% Target: <40% **Samsun**: PA: 46% Target: <46% **Van**: PA: >70% Target: <52% **Diyarbakir**: PA: >70% Target: 60%* (Baglar city district)	**Batman**: EPE actual: 74% **Samsun**: EPE actual: 37% **Van**: Final review (2014): 77% **Diyarbakir**: Final review (2011): unknown, Diyarbakir total 52%
(3) Water supply connection rate	**Batman**: PA: no data Target: 99% **Van:** PA: 85% Target: 90%	**Batman**: EPE actual: 100% **Van:** Final review (2014): 95%:
(4) Chlorination of drinking water**	**Diyarbakir**: PA: no data Target: regular reports indicating sufficient residual chlorine	**Diyarbakir** EPE actual: unknown

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(5) Sanitation connection rate	**Batman**: PA: no data Target: 70% **Diyarbakir**: PA: no data Target: 80% (Baglar city district)	**Batman**: EPE actual: 98% **Diyarbakir** Final review (2011): 95%
(6) Percentage of wastewater routed to the wastewater treatment plant	**Batman**: PA: no wastewater treatment plant Objective: 70% of wastewater **Samsun**: PA: no wastewater treatment plant Target: 90% of wastewater **Van**: PA: 40% Target: 50%	**Batman**: EPE actual: 98% **Samsun**: EPE actual: 99% **Van**: Final review: 65%:
(7) Complete prevention of stagnant areas of wastewater in Baglar city district	**Diyarbakir**: PA: available Target: zero	**Diyarbakir**: Final review (2011): zero
(8) Frequency of local floods	**Diyarbakir**: PA: no data Target: <2 p.a.	**Diyarbakir**: Final review (2011) achieved
(9) Purification capacity of the wastewater treatment plant	**Batman**: PA: no wastewater treatment plant Objective: 50% BOD5 reduction* **Samsun**: PA: no wastewater treatment plant Target discharge values Filterable substances <35 mg/l COD[1] <125 mg/l BOD_5[2] <25 mg/l Nitrogen <10 mg/l Phosphorous <1 mg/l **Van**: PA: no data Target: BOD5/COD: 75% reduction	**Batman**: EPE actual: 43% **Samsun**: EPE actual: Discharge values: Filterable substances: 8.25 mg/l COD: 23.44 mg/l BOD_5: 10.05 mg/l Nitrogen: 5.36 mg/l Phosphorous: 0.52 mg/l **Van**: Final review (2014): BOD_5/COD: 75% TSS: <1 ml/l

1 Chemical oxygen demand
2 Biological oxygen demand

	TSS[3] <10 ml/l	
(10) Collection rate	**Batman**: PA: 75% Target: 85%** **Van**: PA: 75% Target: >85%	**Batman**: EPE actual: 54% **Van**: Final review (2014): 81%:
(11) Average tariff (water + sanitation)	**Samsun**: PA: EUR 0.60 Target: min. EUR 0.75/m³ (real, 2002 price basis) **Van**: PA: EUR 0.27 Target: min. EUR 0.55 (real, 2002 price basis)	**Samsun**: EPE actual: EUR 0.56*** **Van**: Final review (2014): EUR 0.43

* Target value adjusted for EPE ** New indicator for EPE *** Target value would be (for 2002 price basis) around 3.60 TRY, actual value for 3.13 TRY.

In **Batman**, the target values were for the most part reached, but were missed in some cases (purification performance of the wastewater treatment plant) or clearly missed (UfW, collection rate). There have been improvements in the supply of drinking water, but there are still shortcomings, especially in the more densely populated areas. This mainly concerns those parts of the urban areas that have seen an increased influx of Syrian refugees and a corresponding increase in population density (Kuyubasi Toki area). The concentrated migration within the urban area puts an additional burden on the supply infrastructure, even though the percentage of refugees in the population as a whole is only estimated at around 5%. No improvement was made in the very high technical and administrative unaccounted for water (total UfW at around 75%). On the other hand, significant improvements were made in the area of sanitation. Around 98% of the wastewater is collected and routed to the newly constructed wastewater treatment plant, although this does not fully meet the treatment parameters. This is likely due in part to the shortage of skilled staff already identified during the final review, but also to the high level of wastewater contamination from an abattoir which appears to discharge wastewater that has either not been treated or has been treated inadequately. Both UfW and collection rates are indicators that have a significant influence on the costs and revenues of the supplier and thus on the economic sustainability of their activities: both clearly fail to meet the targets.

The target values were achieved and in some cases significantly exceeded (purification capacity of the wastewater treatment plant) at the **Samsun** location. However, it should be noted that the municipal operator SASKI does not operate the wastewater treatment plant itself, but has commissioned a private operator for operation. The original plan which envisaged SASKI taking over operation in 2019 seems to have been abandoned. Instead, an external operator is set to continue running the facility. From the evaluation's perspective, it is not clear whether this solution is preferable because the implementing agency's staff lack sufficient qualifications or because of business management factors. The planned tariff level was largely reached.

Due to the lack of updated data from the **Van** and **Diyarbakir** project sites, the statistics gathered during the final review (conducted in 2014) must be used as an approximation to evaluate the indicators at the Van location. According to these numbers, the supply and capacity targets were clearly achieved in Van, while the business targets (collection rate, tariff level) were narrowly missed. The target defined for UfW reduction was missed by a wide margin. At 77%, total UfW is still above the level recorded at the time of the project appraisal (70%).

3 Total suspended solids

The data available for Diyarbakir is completely outdated, as even the final review (2011) is still partially based on data from 2009. This data can no longer be used for target achievement at the time of the evaluation; the implementing agency did not respond to relevant enquiries.

Effectiveness rating: 3 (both phases)

Efficiency

The drinking water supply cannot be considered efficient in **Batman** due to the very high level of UfW which, after improving temporarily, fell to the same level as during the project appraisal.

UfW in **Samsun** was at a much lower level at the outset, but was further reduced and, according to the implementing agency, is currently at 37% (total unaccounted for), which is a relatively acceptable figure. At 85% (2017), the collection rate is relatively high, which – organisational expertise notwithstanding – can also be interpreted as equivalent to the population's appreciation of the service provided (allocation efficiency).

In both Batman and Samsun, the specific investment costs (wastewater component including construction of wastewater treatment plants) were low at EUR 37 per capita (Batman) and EUR 44 per capita (Samsun).

An extremely high level of UfW also adversely affects the efficiency of the public utility corporation in **Van** (according to 2014 data), while there is no reliable information available for Diyarbakir.

All locations experienced significant delays in implementation, estimated ex ante at 44 months each (Batman: 47 months). In **Diyarbakir**, the duration was extended by a factor of 1.7, while in the other locations the factor was 2.4 to 3.0.

Efficiency rating: 4 (Phase II), 3 (Phase III)

Impact

The ongoing contamination of groundwater resources in **Batman**, which was already known at the time of project appraisal, appears to be problematic. According to the implementing agency, there are no problems with the contamination of groundwater resources by the petrochemical industry based in Batman. However, this seems to be contradicted by a study conducted in 2016[4] in which a large number of groundwater samples were tested for contamination of this nature. The study concludes that, in particular, the groundwater resources contain problematic concentrations of arsenic, lead, uranium, aluminium, iron and manganese, resulting in significant health risks from the use of Batman groundwater as drinking water. This apparent contradiction may be due to the fact that the study is based on groundwater resources in the city, while the supplier accesses well fields outside the urban area. It is unclear to what extent these potential risks have concrete health implications for the supplied residents – or whether the well fields used by the supplier outside the city of Batman are also contaminated. However, it is known that at the time of the project appraisal, the section of the population not receiving their water via this supply system inevitably had to be supplied from the polluted resources in the urban core. Since this population group is likely to decline significantly as a result of achieving the quantitative supply targets, we can assume a positive impact on health in this context. In addition, according to the supplier, the improved sanitation has also had positive health effects in the form of declining numbers of typhoid fever, hepatitis and diarrhoea cases. However, specific figures are not available.

When the Batman wastewater treatment plant was designed in 2002, it was expected that investments would be made in another (biological) treatment stage in the near future. This would have improved the purification capacity of the plant, having a positive effect on protecting the bodies of water. Due to insufficient financial flexibility, however, an additional purification stage has not yet been set up.

According to the local health authority, the prevalence of typhoid fever, hepatitis and diarrhoea declined in **Samsun** between 2011 and 2017. Yet a correlation with the project measures cannot necessarily be as-

4 Nalbantcilar & Pinarkara, 2016, "Public health risk assessment of groundwater contamination in Batman, Turkey", Journal of Water & Health, February 2016

sumed, as around 90% of Samsun's inhabitants were already connected to the central sanitation system at the time of the project appraisal, and there were no bottlenecks in the drinking water supply. However, at that time, untreated wastewater from more than 600,000 people was discharged into the Black Sea. The key impact of improved sanitation therefore lies in protecting bodies of water through the operation of the wastewater treatment plant, especially since the addition of further organic contaminants was identified as a significant threat to maritime biodiversity during the project appraisal. In addition, we can plausibly surmise that there were positive impacts on health, as the coliform concentration in the lake water was above the applicable limit values before the start of the project, posing a health hazard to the population. A contribution was thus made to improving the quality of the water close to the coast in the Black Sea. Nevertheless, the local water quality must still be viewed in a critical light, as further organic contaminants (in particular from agriculture and wastewater discharged via nearby river estuaries) result in eutrophication and, together with additional industrial water pollution, lead to increasing degradation of maritime habitats.[5]

(Note for Van and Diyarbakir sub-components: evaluation based on the respective final reviews of both components due to lack of current data).

In **Van**, in addition to the improvement in living conditions resulting from the greatly improved drinking water supply (24-hour supply instead of 3 hours per day in some cases at the time of project appraisal), the protection of bodies of water thanks to improved wastewater treatment plant operation can be regarded as an outstanding impact. At the time of the final review, the annual volume of wastewater treated by the wastewater treatment plant was 63 million m³. The purification level was 75%. Compared to the time of project appraisal – when operation of the treatment plant was inadequate and most of the wastewater was discharged in an untreated state into Lake Van, which is at risk of eutrophication – the project made a significant contribution to reducing the discharge of harmful contaminants into the lake, even though 35% of the wastewater was still discharged in an untreated state in 2014.

The only measures implemented in **Diyarbakir** as part of the project were final measures that supplemented the Diyarbakir Treatment Plant and Sewage Collection project (BMZ no. 1998 65 023 and 2001 65 043, evaluated with an overall rating of 2 in 2010), as there was still a considerable need for action in the city districts of Baglar and Kayapinar. At the time of the evaluation, there was no specific data available regarding the development in these two city districts. However, we can assume an improvement in residential hygiene and thus living conditions in these city districts, based on the statements made at the time of the final review (no more wastewater discharged into the rainwater receiving waters of the Baglar city district, no more flooding caused by wastewater and no significant reduction in stagnant wastewater areas) – at least at that time (2011).

Impact rating: 3 (both phases)

Sustainability

The supplier in **Batman** is financially dependent on the municipality of Batman. BASKI transfers its revenues to the municipality and in return receives budget allocations to cover the costs incurred. In view of the high level of UfW and the improved but still very low collection rate (54%), it cannot be assumed that operation would be financially sustainable if the supplier were an economically independent unit. An additional complementary measure was implemented in 2013/2014 as part of the follow-up phase IV of the project (BMZ no. 2005 70 028). The objective of making economically sustainable operation possible by improving cost coverage and in particular collection rate was not achieved. Based on the chosen supplier model, but also due to the lack of profitability, the supplier remains dependent on financial subsidies from the municipality of Batman. It is precisely the independence of the supplier – in particular the conferral of relevant decision-making powers – that would presumably be a decisive step on the road to profitable operation. The sustainable technical operation of the facilities cannot be assessed without an inspection of the supply systems and their maintenance condition. However, the hydraulic capacity utilisation of the wastewater treatment plant is 100%, meaning that it does not offer any reserves for future population growth or higher water consumption.

5 Atilla Akkoyunlu, 2018, "Land-Based Pollution on the Black Sea along the Turkish Shoreline", Journal of Marine Science: Research & Development, March 2018

The complementary measure also included the development and implementation of a concept for reusing sewage sludge in agriculture. The consultant's final report states that around 5% of the sewage sludge was reused in 2015, but assumes a significant increase in the following years. According to the project executing agency, the sludge is now being fully recycled, though this cannot be verified.

In **Samsun**, too, the (hydraulic) capacity limit of the wastewater treatment plant has effectively been reached, but there are already concrete plans to expand the plant to meet demand by 2030.

The SASKI budget is kept separate from the other municipal budget in accordance with the statutes, with the revenues generated from operation not to be used for other purposes. The revenues can cover 130% of the full costs, but this should also be seen in the context of the low production costs (gravitational supply from the reservoir lake).

According to the information available, although the sewage sludge produced by the plant is not used for agricultural purposes, it is stored in a dehydrated, dried and calcified form in a regulated landfill. The extent to which the landfill has the necessary safety equipment to prevent seepage of harmful contaminants could not be verified.

At the **Van** location, the operating costs were only just covered by revenues (101%), so there is no financial flexibility for new investments or more extensive rehabilitation work (as of 2014). In addition, inadequacies were seen in both the staffing numbers and levels of skills and qualifications during the final review. Furthermore, there is a heavy dependency on the Van municipal administration, with political influence making it difficult to operate the plant in line with technical and economic requirements.

In Van, the collection rate and tariff level did not quite meet the targets set at appraisal. More serious, however, is the high level of UfW (77%, presumably largely due to illegal tapping), which leads to the above-mentioned low level of operating cost coverage. From the evaluation's point of view, however, we cannot conclude whether the underlying operating costs include all appropriate expenses, e.g. payment of all outstanding energy bills or performance of maintenance work that is not strictly required in the short term.

In Batman, the positive development vis-à-vis the sewage sludge problem should be noted – assuming that the information on sewage sludge recycling is correct. However, this stands in contrast to an economically and technically inefficient operation of the water supply and sanitation systems. In addition, the capacities of the wastewater treatment plant are now fully utilised without any plans to expand capacity. Sustainability for Phase II can therefore no longer be rated as satisfactory.

Due to a lack of reliable data, a conclusion cannot be drawn about the sustainability of the measures implemented in **Diyarbakir**. Sustainability for Phase III is still rated as satisfactory on account of the comparatively good situation in Samsun.

Sustainability rating: 4 (Phase II), 3 (Phase III)

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

Projects 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).