Ex post evaluation – Jordan

Sector: Water supply – large systems, CRS code 14020
Programme/Project: (A) Karak water loss reduction*, (2002 65 413), (B) complementary measure (2004 70 658)
Implementing agency: Water Authority of Jordan (WAJ)

Ex post evaluation report: 2017

		Project A (Planned)	Project A (Actual)	Project B (Planned)	Project B (Actual)
Investment costs (total)	EUR million	25.00	24.35	2.24	2.22
Counterpart contribution	EUR million	8.80	8.56	0.00	0.00
Funding	EUR million	16.20	15.79	2.24	2.22
of which BMZ budget funds	EUR milli	16.20	15.79	2.24	2.22

*) Random sample 2017

Summary: With the aid of the project, the water supply in Karak Governorate was restructured and converted from a pump system to a gravity-flow system. Supply lines, reservoirs, pumping stations, main distribution systems in the North, West and South-West, and distribution networks in various selected localities were renovated and extended. As the original financing, which was only based on rough estimates, was insufficient for the entire governorate, further funds were supplied within the scope of another project (2008 66 251). In total, 429 km of pipeline were laid. The WAJ administration in Karak was strengthened with a complementary measure to safeguard the sustainability of the investments. The WAJ administration in Karak was intended to be restructured into a semi-autonomous entity (Karak Water Administration/KWA). The measures executed included rolling out an electronic customer register supported by coordinates, updating the customer data in the Geographic Information System (GIS) and analysing the human resources, determining the need for training and conducting training measures.

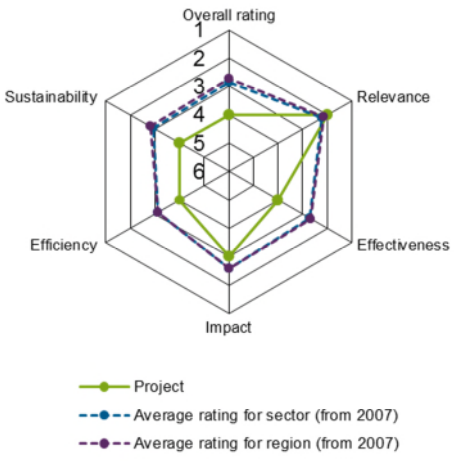
Development objectives: The project's objective was to reduce technical and commercial unaccounted for drinking water (UfW) in the KWA supply area to ensure that users are supplied with clean drinking water cost-effectively in Karak Governorate (module objective/outcome). This was intended to make a contribution to efficient and sustainable management of the scarce water resources (programme objective/impact).

Target group: The target group was all inhabitants of Karak Governorate (around 316,000 in 2015).

Overall rating: 4

Rationale: The need for efficient water use in this arid country has increased considerably since the appraisal. However, it was not possible to form a semi-autonomous entity. Additionally, commercial UfW was not reduced. Deficiencies were also noted in the operation of the electro-mechanical equipment, as well as in maintenance and upkeep. Given this state of affairs, the reduction of technical UfW faces substantial sustainability risks.

Highlights: Operational improvements appear difficult to implement within the current structure of the KWA. Nonetheless, it was possible to improve the population's supply situation.



Rating according to DAC criteria

Overall rating: 4

Ratings:

Relevance	2
Effectiveness	4
Efficiency	4
Impact	3
Sustainability	4

The aim of a significant overall reduction in unaccounted for water (UfW) could not be achieved, though technical UfW was reduced. The project stabilised the supply situation for the population in Karak Governorate.

Relevance

A key problem for water resource management in Jordan are scarce resources, which have fallen from 160 m³ (2000) to 60 m³ (2014) per year per capita. Two waves of refugees, from Iraq in 2003 and Syria in 2011, contributed to a high level of population growth. The governorate's population increased over the last decade from 169,000 (2004) to 316,000 (2015). As a result, the pressure on water resources has grown further. In this respect, the relevance of the project has increased substantially since the programme appraisal.

The Jordanian government therefore aims to make efficient use of the scarce water resources that are available. The current water strategies, as with all that preceded them, focus on tapping additional resources and reclaiming wastewater as well as reducing technical and commercial unaccounted for drinking water from the public utility corporations. The priority objective of the Jordanian water strategies is to supply the population with a sufficient quantity and high quality of drinking water. Building on the Jordanian water sector strategy, key elements of efficient water resource management were agreed between the governments of Germany and Jordan in a priority area strategy paper in 2001. The development strategies, which were jointly defined and used as a basis for the project, also reflect the Millennium Development Goals introduced at the time of the programme appraisal, in particular Goal 7 (to ensure environmental sustainability). From today's perspective, the intention is to contribute towards Sustainable Development Goal (SDG) 6 (ensure availability and sustainable management of water and sanitation for all).

As in the whole of Jordan, there is a water shortage in Karak Governorate. The water supply systems were fragmented during the programme appraisal. The entire supply was pumped directly into the distribution system. The high water pressures, but also a dated, corroded network of pipes, led to an overall UfW level of 51% as of the programme appraisal. In light of the scarce water resources, an IWRM (integrated water resource management) approach was chosen for the project. This approach aimed to achieve efficient use of the scarce water resources by adopting measures to improve the water inventory – in particular reducing UfW levels – and by more efficient, customer-focused drinking water management.

The project's chosen approach, to reduce technical UfW by replacing the old, corroded steel pipes with plastic or ductile cast iron pipes, is suitable in principle to ensure better use of the scarce water resources. On account of the age and condition of the old pipelines present during the programme appraisal, the only option to be considered is the complete replacement of the pipeline network. Converting to a gravity-flow distribution system also prevents high pressure levels in the drinking water pipes, meaning that the UfW levels are lowered in the event of damage to lines. In the absence of the measure, the public water supply may have come to a standstill in areas of the governorate. In addition, the introduction of pressure zones

is an important step in reducing technical UfW. The inclusion of commercial UfW also adds to the project's relevance.

Relevance rating: 2

Effectiveness

The project aimed to ensure a comprehensive, cost-effective supply of clean drinking water in Karak Governorate. The financing needs at hand were initially estimated in a concept paper. Due to the poor data availability, some components of the water network were not considered in the first cost estimate, meaning that the estimated financing needs proved to be too low in retrospect. It was possible to replace around 80% of the drinking water systems with the aid of additional funds from BMZ No. 2008 66 251 (Water Resources Management Programme). Although the supply is only intermittent (weekly to fortnightly), the improvement in the supply situation was confirmed in interviews with users, on the grounds that the supply used to be interrupted over longer periods by burst pipes. A comprehensive improvement was not achieved throughout the governorate, as the entire drinking water system could not be renovated owing to cost increases. Old components of the network therefore still need to be included in the new drinking water system. Technical UfW levels remain high in these unrenovated network sections on account of the pipelines' poor state, and conditions are difficult for proper pressure management. The supply continues to be affected by leakages and burst pipes in these areas.

Informed approximations are the only way to work out the extent of the reduction in technical UfW, as calculating the technical levels for the entire network is impossible with the data available. A WAJ internal study arrives at a number of 29% for technical UfW within a selected zone. This level can be attributed to new leakages, particularly at the pipelines' connections or due to mechanical damage (for example, during the construction phase). Consequently, this UfW rate is high in view of the newly installed pipes, but must nonetheless be seen as an improvement compared with the previous network of rusted steel pipework. The water quality supplied to the customer must also be rated as good overall. The operator sent laboratory results for the drinking water quality for November 2016. All the samples extracted from the network were safe and within the permitted limits.

The project's success was very limited from an institutional and business perspective. The commercial UfW remains high and has increased since the appraisal. The total unaccounted for (amount of water for which no revenue is obtained – non-revenue water/NRW) rose from 53% to 70%. This is caused by illegal connections to the distribution network and tampering with legal connections. The partial autonomy for the KWA that was assured in the implementation agreements was not put in place. Similar to Jordan's northern governorates, the plans envisaged an autonomous authority that would manage its own revenues and expenditures with operational independence from the WAJ. Yet as of the evaluation, the KWA continues to pay its revenues to the WAJ, and important operating decisions are made centrally by the WAJ. Furthermore, only partial use is made of the customer management systems established through the complementary measure. The processing time for customer queries is not recorded. According to the WAJ, a central service system for all of Jordan will soon be put into operation.

The attainment of the programme objectives defined during the project appraisal can be summarised as follows:

Indicator	Status PA, target value PA	Ex post evaluation
(1) Non-revenue water (NRW)	Status PA: unknown, 2006: 53% Target value PA: < 25%; 2011: revised to < 54%	There is no reliable information available about technical UfW. This is highly likely to have decreased. But NRW has increased since 2006 (70% as of the EPE)
(2) Regular and comprehensive supply for the population	Status PA: irregular but close to comprehensive supply Target value PA: 95%	Supply even closer to being comprehensive. Supply mostly regular.

(3) Operating cost recovery ratio in Karak Governorate	Status PA: unknown Target value PA: > 50%	The cost recovery rate cannot be determined. Revenues fell continually as a proportion of expenditures between 2006 and 2015 from 49% to 24%. (See “Efficiency” section.)
(4) Processing of customer queries within four days	Status PA: very low Target value PA: 80%	Processing times are not documented

Most of the investment flow was aimed at reducing technical UfW. Indeed, from today’s perspective, a significant reduction in technical UfW can be assumed, even if this cannot be quantified. However, in the interests of achieving the programme objective (sustainable and more efficient management of water resources), it became necessary to reduce both technical and non-technical UfW. In fact, NRW has increased since the project appraisal. The business and institutional objectives could not be achieved.

Effectiveness rating: 4

Efficiency

All the inhabitants of the governorate benefited from the measures, as the extensive renovation of the distribution network was accompanied by rehabilitation of the primary water system. The cost per resident was around EUR 155, taking into account the additional funds from BMZ No. 2008 66 251 and the population statistics for 2016. All investments made were planned and executed professionally and sensibly. Only a few smaller parts of the system such as disinfection facilities and the remote control system are not currently in use, because this is not deemed necessary from the operator’s perspective. These only represent a very small proportion in cost terms and can also be put into operation if necessary. The building prices were determined in the competitive bidding process, meaning that the measures were put together at an appropriate price. The production efficiency is therefore considered appropriate.

The water tariff has increased considerably since the project appraisal. It is composed of a complex system of basic fees and consumption-based fees. The water fees have approximately doubled since the PA, after adjustment for inflation. In spite of the increased revenue levels, the cost recovery rate has fallen in comparison with the time of the appraisal. Above all else, this stems from the cancellation of the power supply subsidies.

The microeconomic benefits of the project for the WAJ that were forecasted during the project appraisal are limited ex post to the reduction of physical UfW and energy demand by switching to a gravity-flow distribution system. Moreover, the water production was more than doubled by utilising new resources. However, administrative UfW levels have risen. There has not been a discernible increase in the systems’ efficiency in terms of operations, upkeep and management. The collection rate has dropped from around 90% as of the programme appraisal to around 70%, with the causes of this trend unknown.

Since costs have not been consistently broken down at the KWA and WAJ level, it is not possible to reliably calculate the operating cost recovery rate for Karak. To do this, it is necessary to refer to the WAJ’s performance indicators for Karak Governorate, which make it possible to obtain a trend result for the cost recovery ratio at the level of payments. This shows revenues falling continually as a proportion of operating costs since 2006 from 49% to 24%. Stabilization or improvement of the cost recovery ratio were not achieved. The cancellation of subsidies for the power supply also previously compounded the cost increase.

Since the reduction in technical UfW must be viewed as particularly relevant in the local context, the allocation efficiency can be classified as satisfactory with regard to this objective. Overall, however, the efficiency of the project is below expectations.

Efficiency rating: 4

Impact

The FC measure's development policy objective was defined as making a "contribution to efficient and sustainable management of the scarce water resources". From today's perspective, this goal must be expanded to include the improvement of living conditions for the target group. Indicators were not set in the project appraisal.

It is plausible that a contribution could be made to sustainable and efficient management of water as a resource by reducing technical UfW. However, since the project appraisal there has actually been a deterioration with commercial UfW, whose reduction would also have contributed to more efficient resource management, as the NRW increased.

The living conditions of the target group improved due to the measure. This is indicated by the intensification of building development and the increase in service connections, even if both factors were primarily influenced by the population growth. Specifically, the number of service connections has increased from around 30,000 to 48,000 since the project appraisal. The reduction in disruptions of operation in the water supply supports the assumption that the poorer population's situation has improved. In particular, this group is now only reliant to a small extent on buying water from private sellers. In general, the living conditions of the target group have improved, as the water supply was stabilised and the population now has regular access to water for drinking and as a basic resource for personal hygiene.

Impact rating: 3

Sustainability

At the project appraisal, the lack of skills and qualifications among the implementing agency's staff was identified as a risk to the project's sustainability. Conducting training measures was in itself not seen as sufficient, so a structural change in the company organisation was laid down as an implementation agreement. The risks to a successful implementation of the institutional changes were adjudged to be high. This assessment proved to be true. Structural changes could not be implemented successfully, which is especially clear from business indicators. The absolute number of employees rose from 415 (2001) to 591 (2016). The labour intensity only dipped slightly from 14.3 to 12.3 employees per 1,000 connections, which still keeps this far above an acceptable level. The customer information system developed in the course of the complementary measure and the Geographic Information System (GIS) were only partially used. In addition, the SCADA system that was implemented for operational optimisation is unused. The total unaccounted for water has increased since 2006, from 53% to 70% (2015) with fluctuations in the intervening time.

The structural condition of the constructed facilities, found during the evaluation, was also rated to assess sustainability. Some parts of the system were in a poor state of repair, and safety installations were found to be out of order. Flaws persist in the technical operations and maintenance of the systems. In particular, the probability of the installed pumps failing is enhanced by the lack of maintenance. A few parts of the system constructed in the project are now out of operation. These included some bulk water meters, disinfection facilities and the remote control system that was installed (SCADA[1] system).

The bulk of the investments, specifically into the underground water supply pipes that were replaced, could not be rated in their state at the time. But we can assume that the water network remains in good condition so soon after the new construction, even though the information obtained indicates comparatively high UfW levels. At the very least, the distribution of water via a water supply network that is relatively leak-tight and adapted to local pressure conditions can be regarded as sustainably secured. Additionally, the pipelines will in all likelihood stay in good condition, owing to the use of better materials.

Operation of the water supply faces a continuing sustainability risk because of the poor maintenance and upkeep of the electro-mechanical system parts. Moreover, the KWA's current organisational structure and the WAJ's present financial situation – in particular, the very low cost recovery ratio – are not suitable for lowering the risks to sustainability. The WAJ has presented a list of measures to boost the revenue situa-

[1] Supervisory control and data acquisition

tion, which are now being gradually implemented. An improved financial situation may improve the state of operations at the KWA somewhat.

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:

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).