Palestinian Territories: Drinking Water Supply Hebron

Ex post evaluation report

OECD sector	14020 / Water supply and sanitation – large systems	
BMZ project ID	1.) 1995 67 033 (investment in fixed assets) 2.) 1995 70 482 (Studies and Expert Fund, drilling costs financed from regional fund)	
Project executing agency	City of Hebron	
Consultant	TAHAL Consulting Engineers Ltd., Tel Aviv	
Year of ex post evaluation	**2006**	
	Programme appraisal (planned)	**Ex post evaluation (actual)**
Start of implementation	4th quarter 1995	4th quarter 1995
Period of implementation	20 months	46 months
Investment costs	1.) EUR 4.397 million 2.) EUR 1.285 million	1.) EUR 5.775 million 2.) 1.285 million
Counterpart contribution	EUR 0.025 million	EUR 0.025 million
Financing, of which FC funds	1.) EUR 4.397 million 2.) EUR 1.285 million	1.) EUR 5.775 million 2.) EUR 1.285 million
Other institutions / donors involved	None	none
Performance rating	5	
Significance/relevance	4	
• Effectiveness	5	
• Efficiency	5	

Brief description, overall objective and project objectives with indicators

The project comprised the construction and equipment of two deep wells to tap the ground water resources of the Eastern aquifer, situated approx. 15 km north of Hebron, as well as a water transport main to the elevated reservoir of the existing drinking water distribution system. The project aimed at ensuring (by the year 2000) the continuous supply with hygienically safe drinking water for the approx. 200,000 Palestinian inhabitants of the city of Hebron, who at the time only had 40 l per inhabitant per day at their disposal. Particularly during the dry summer months, the volume of water available in Hebron dropped sharply, forcing the city to shut off entire city districts on a rotating basis and leading to interruptions in supply which often lasted several weeks. Due to the fact that the water pipes ran empty, sewage could seep into the network wherever there were leaks, thereby contaminating the drinking water. Furthermore, numerous homeowners tried to collect the rainwater on their roofs during the rainy season and to store it in cisterns for months as drinking water reserves. The later

consumption of the stored water led to considerable health risks. One reason for the water shortage in the Palestinian territories in the West Bank was the preferential supply of drinking water to the Israeli settlements, where water consumption amounted to approx. 250 l per inhabitant per day. Given the natural and political circumstances in the region, drinking water is a very delicate political issue, leading to considerable distribution conflicts. The ground water resources, which are used by the Israelis and the Palestinians in the West Bank, are one of the most contentious issues of the Palestinian-Israeli peace process. The Oslo II Agreement was to contribute to solving the conflict by regulating the use of the ground water resources: According to the Oslo II Agreement, at the time of the project appraisal, the Palestinian population consumed 17% (around 115 million m^3/y) of the renewable water resources of the West Bank (679 million m^3/y) and the Israeli population 71% (approx. 482 million m^3/y). In the Agreement the Palestinian population were granted an extra claim to 70-80 million m^3/y of drinking water. Of the total requirement, a portion of 28.6 million m^3/y was defined as the immediate drinking water need which had to be satisfied during the interim period through joint Israeli and Palestinian efforts pending the adoption of a final solution to the problem of drinking water supply for the Palestinian territories. Politically, it was agreed that the city of Hebron was to be supplied from the Eastern aquifer. A Joint Water Committee with equal Israeli and Palestinian representation will decide in closed sessions on the different projects regarding the use of water resources.

The target system was defined as follows:

Overall project objective:

> Reduction of health risks for the population of Hebron from water-borne diseases.

Project objective:

> Contribution to the continuous improvement of the supply of hygienically safe drinking water to the Palestinian inhabitants of Hebron and the adjacent villages.

Indicators of achievement of the project objective:

> During the first three years after the start of operation of the installations no measures to reduce water consumption are necessary.

In the course of the progress reviews, this indicator was substituted by the indicator:

> Provision of 7,700 m^3/d of drinking water at the end of the transmission line (elevated tanks of Mamre and Al Jaladeh).

To measure the achievement of the project objectives, it would have been necessary to focus more strongly on continuous water supply. Thus, under the present ex post evaluation an additional indicator was introduced: continuous water supply to the people living in the Palestinian territories during at least 16 hours/day thus avoiding the need to refer to hygienically unsafe storage of drinking water in cisterns. Moreover, with regard to distribution inequality and the resulting conflict potentials, the following indicator was added to the system of indicators: "per-capita consumption in the Palestinian territories amounts to at least 75l/cd". Given the dangers of contamination inherent to the drinking water network, the achievement of the project objective will also

be measured in terms of the indicator "the water quality corresponds to WHO standards".

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

To improve the drinking water supply in Hebron, the measures comprised the construction and equipment of two deep wells and of a second transmission main to the city's central reservoir. The measures comprised the drilling and expansion of the two deep wells, one of them at the upper groundwater level and the other one at the lower groundwater level, the construction of an intermediate tank, a pumping station and a transmission main from the well field to the elevated tank at Mamre in Hebron as well as the provision of consulting services.

The target group was the Palestinian population of the city of Hebron, estimated at the time of the project appraisal at 180,000 inhabitants, and the villages connected to the urban distribution network, including public institutions and approx. 1,000 small and medium-sized commercial enterprises. At the time of the project appraisal, no poverty relevance was noted. The project also aims at reaching peace policy of the partner countries by promoting equal treatment of Israelis and Palestinians.

The project target was the increase of the drinking water supply for the city of Hebron. It was planned to realize the project within two phases: First, it was planned to install only one well, which should have been connected to an existing water transport main which still had spare capacity. Until completion of the new water pipeline and another well (2nd phase), this was to constitute an interim solution to ensure rapid drinking water supply to the Palestensian population. The energy supply for the two pumps was to come from a power line running directly along the well field.

After the first test borings in the rainy winter season it became obvious that the existing water volume was not as high as expected. In 1998, the realistic production volume was reduced to 280 m³/h for well number 1 (planned capacity 350 m³/h) and to 80 m³/h for well number 2 (expected capacity 120 m³/h). In fact, the water production capacity of well number 1 was even lower in continuous operation. For this reason, in 2002, the pump was replaced by a pump with a lower capacity. Contrary to original expectations, drilling measures for well number 2 had to have a depth of an additional 100 m to reach the groundwater of the upper aquifer (350 m instead of 250 m). For a short period water production of this well was 65 m³/h but it dried up subsequently. Since then, no rise in the water level could be observed and is not to be expected either because various hydro-geological studies have indicated heavy overuse of the upper groundwater aquifer (the ground water level in well number 1 had fallen off by 32 m already at the time of the final inspection). This ground water problem was primarily caused by the very uncoordinated groundwater withdrawals, which should have been controlled by the Joint Water Committee in the framework of the projects financed by donor funds.

The well drilling and the pumping tests were awarded to an Israeli company after a limited invitation to tender at the local level. From today's point of view and given the above-mentioned substantial differences between the expected and the actual production capacity of the deep wells, there are doubts as to whether the Israeli company Mekorot conducted the pumping tests with the proper diligence under the supervision of the Israeli partially state-owned consulting company TAHAL (which according to the project appraisal documentation had comprehensive knowledge about the hydro-geological situation in the project region and had already prepared different studies and master plans on the drinking water supply in Hebron). Given the urgency of the project (at project appraisal it was classified as emergency relief), TAHAL had been contracted directly by the project executing agency with the consent of the German Ministry for Economic Cooperation and Development (BMZ). Due to the Oslo II

Agreement, which regulates the water withdrawal from the Eastern aquifer, there was no possibility to tap alternative drinking water resources under the project to make available the required amount of drinking water.

The water transport main, the pumps and the water infrastructure were planned and built for a capacity of 700m³/h, despite doubts arising as to the capacity of the wells. At this point in time an intensive review of the actual groundwater production would have been necessary - even though the tender process for the construction works and supplies had been nearly finished – in order to find out what capacities for the pumping station and the transport main would have been adequate. The decisive factor for adhering to the original concept, and thus to the huge overcapacities created, was the hope that it would be possible to exploit further water resources in the Wadi Sa'ir area.

Serious water hammer problems, which were caused by the oversized transport main, the irregular power supply of the pumps and the lacking installation of regulative air valves caused technical damage to the water installations - which had to be repaired at high costs during project implementation - and led to protests of the residents who felt bothered by the noise. If technical planning had been conducted more carefully, it would have been possible to prevent the water hammer problem.

The planned interim use of the existing water transport main, which at the time of the project appraisal still had spare capacities of 5,000 m³/d, did finally not materialize because these capacities were used primarily to supply drinking water to the Israeli settlements of Kiryat Arba and Harsina, whose residents nearly doubled in number during the project period.

Contrary to the assumptions made during the project appraisal, the electricity supply system could not be connected to the existing power supply line of Israel Electric Co. due to political controversies. Thus, the construction of a new power supply line to the well field became necessary.

Due to the delivery hight it was also necessary to build intermediate stores, which were not included in the original concept.

Delays in the time schedule could not be avoided due to the sluggishness of the Israeli authorities in issuing the necessary approvals and due to the refusal of the city of Sa'ir to have the transport pipeline be constructed along their main road. After one year of negotiations, the city approved the construction of the pipeline, provided that the roads along the transport pipelines were asphalted and that a supply of 300 m³/d of drinking water from the transport pipeline was ensured.

The project had to be carried out under extremely unfavourable framework conditions. After the beginning of the second Intifada in 2000, the project works were strongly hampered due to the partial or total closing of the city in the centre of which is an Israeli settlement. Orders given by the Israeli military hindered the free movement of the population and the project staff. The construction works, whose completion was planned for mid-1997, could only be completed about two years later, although the project had been initiated as an urgent emergency measure. The water supply system only started operation in 2001 and the project works were completely terminated only in 2003.

According to the Oslo II Agreement, sufficient drinking water resources could have been available to the Palestinian population which; from an ex post view however this turned out to be wrong. It had not been possible to verify the hydro-geographical data before the project implementation started because the details were neither made available to the project executing agency nor to KfW nor, as a matter of principle, to any third party. For this reason, the present concept caused high cost increases (by approx. 31%), produced inefficiencies and, in the end, contributed only slightly to an alleviation of the initial problem (see below).

The total costs of the project amounted to EUR 7.09 million. The financing agreement signed in 1996 had a volume of EUR 4.397 million and was increased to EUR 5.775

million on the basis of three supplementary agreements. The costs of well drilling and of the consulting services which amounted to EUR 1.285 million were financed from the Regional Study Fund (1995 70 482). The counterpart contribution of the city of Hebron amounted to EUR 25,000 for the acquisition of the well site. Compared to the amounts planned at time of the project appraisal, total costs increased by EUR 1.38 million. This was due to the above-mentioned conceptual changes, such as the extension of the transport pipeline, the replacement of the pumps, the acquisition of diesel generators, and due to additional consulting costs, but also to road asphalting requested by the city of Sa'ir. The remaining funds amount to approx. EUR 86,000. Originally, they were to be used to eliminate water hammer problems. However, due to the fact that so far, the project executing agency has not used the funds for this purpose and it cannot be expected that it will do so in the future, we suggest cutting these funds. According to the final inspection, all FC funds have been properly disbursed and used as contractually agreed.

Key results of the impact analysis and performance rating

Since the commissioning of the project, the organisational responsibility for the operation of the system has been with an independent department of the city administration responsible for the maintenance of the water supply for the city of Hebron including groundwater production in the well field of Al Safi.

The water production in the well field is conducted by the organisational unit "Wells", which carries out the measurements and control measures in the area of water production, the chloride dosing and simple maintenance measures. However, the delicate overall situation in the region strongly affects the operation of the drinking water supply. Due to entry ban and restrictions to the free movement imposed by the authorities, the staff of the water departments could temporarily not reach the water installations at all or only with considerable delay. In addition, the motivation of the staff dropped because wages were paid irregularly or not at all.

In general, the operation of the project-financed system was influenced negatively by water provision problems and deficiencies in the construction of the water transmission system. After a short time of use, well number 2, which was fed from the upper groundwater aquifer, fell dry. Contrary to original expectations, the other still functioning well delivered only 19% of the planned water quantity (in total, 1,479 m^3/d), which is due, among others, to substantial water extraction from the Eastern aquifer under USAID-financed projects. Daily per-capita consumption amounts between 90 to 100 l. This supply is ensured first and foremost via the integrated network of Mekorat. The FC project's contribution to the overall water supply accounts for only 9 l/cd (10%). According to current information from the project executing agency, continuous supply is guaranteed during winter months, whereas in the summer months water rationing measures are still necessary and the supply of drinking water is cut to a few hours a day. Water losses are unacceptably high (44%) given the scarcity of water resources. However, due to the multitude of loss reduction programmes of different donors (World Bank, UNDP, French government), under which, in total, more than 50 km of the main distribution network were rehabilitated or replaced, it can be assumed that the losses are, primarily, an administrative problem (illegal water withdrawals, manipulated water meters, wrong meter-reading).

According to current data provided by the project executing agency, the connection rate of the population to the central supply network is only 75%.

The sewage collection network of the city of Hebron was rehabilitated and expanded with the support of Finland, the EU and UNDP. In addition, USAID financed the construction of a sewage treatment plant, which due to the political withdrawal of USAID was not fully completed and will most probably not be put into operation.

Given the present water supply situation and the socio-economic and political conditions, the collection of water tariffs will be difficult. In 2004, collection efficiency,

which at the beginning of the project amounted to 60% and increased to 95% in 1997, dropped to only 50% in 2004 and even to 25% in 2006. Taking into account the very low collection efficiency, the current water tariff of 5 NIS/m³ drops down to only 1.25 NIS/m³ and is not sufficient to cover operating costs which amount to 2.6 NIS/m³ (48% coverage of operating expenses). The remaining cost recovery gap must be covered from the municipal budget and poses a high risk to the sustainable operation of the water supply systems.

During the project appraisal the project was judged to have an indirect impact on the target group. From an ex post perspective, too, it can be stated that the project did not have any potential to promote gender equality. The project was not poverty-oriented but was beneficial to the entire Palestinian population. The project was to contribute to equal treatment of Palestinian and Israeli population and thus to the protection of human rights. However, the intended contribution to crisis prevention was achieved only to a very low extent. The project did not aim at protecting the water resources - instead, the scarce water resources are still being overused and the groundwater level continues to fall.

None of the project objectives was sufficiently achieved. While from 1994 to 2003, specific average water consumption amounted to approx. 45 l/cd, at present, the consumption rates of the 150,000 inhabitants connected to the central drinking water supply system have risen to 90 to 100 l/cd, according to data provided by the project executing agency. However, the project's contribution is only 9 l/cd. Thus, the consumption rate of 75 l/cd, defined ex post, at the time of the final inspection, would have been achieved also without the project - due to measures implemented by other donors. Although the water supply during the summer months has improved, the scarce resource situation still only allows for intermittent service. Thus, the indicator for the achievement of measures to restrict consumption could not been fully achieved. In total, only 1,479m³ of the intended 7,700m³ of drinking water per day could be provided. According to the information available, the water quality is good. Despite the politically difficult environment and due to insufficient donor coordination of the Joint Water Committee, we judge the project's **effectiveness** as **clearly insufficient** in terms of development policy (**sub-rating 5**).

We have no reliable information regarding the achievement of the overall project objective. However, due to the fact that the danger of drinking water contamination due to the entry of dirt into the pipeline network was reduced through the rehabilitation of the water distribution network by different other donors, water quality is qualified as good and drinking water supply in the summer months is ensured at least for some hours, it can be plausibly assumed that health hazards for the population living in the project region were reduced. Nevertheless, the contribution of the project to these impacts is rather low. One negative side effect is the continuous decrease of the groundwater level through overuse. This continues to be a high risk for a reliable and adequate water supply in the future and also affects the neighbouring deep wells installed by others. From today's perspective, it was an error at the time of the project appraisal to assume that the groundwater resources would not be overexploited. Despite the politically opportune basic concept of an autonomous water supply for the Palestinian settlements in Hebron and due to the very low contribution of the FC project to an improvement of the initial situation and the overall insufficient donor coordination by the Joint Water Committee, we judge the project's developmental **relevance/significance** to be **slightly insufficient** (**sub-rating 4**).

Assuming that the still functioning well and the other system components financed under the project can be used for 15 years and that the well capacity does not change during the lifetime, specific investment cost would amount to EUR 0.88/m³. Thus, they are comparably high because the overdimensioning caused incremental costs (higher costs of materials, costs of construction works and additional costs for subsequent repairs) and additional costs were produced by the asphalting the roads of the city of

Sa'ir. Only 25% of the newly created capacities of the pump station and of the transport main are being used. This strong under-utilisation could have been avoided because already before awarding the contract it was clear that the production volume would be lower than originally expected. Thus, we rate the production efficiency to be clearly insufficient. The high administrative losses are not acceptable given the fact that water resources are scarce and particularly that operating costs are not covered. Tariffs that cover operating costs and take into account aspects of collection efficiency were not be established. We therefore assess the allocation efficiency as inadequate. Overall, we rate the developmental **efficiency** of the project as **clearly insufficient** (**sub-rating 5**).

In summary, we judge the developmental effectiveness of the project to be clearly insufficient (rating 5).

General conclusions and recommendations

Before making an intervention in the water sector in an area of conflict, a socio-economic preliminary study is to be prepared – even if the local situation is difficult and even if such a study, given the prevailing circumstances, can only be prepared under a short-term expert assignment. Based on such a preliminary study, the problems of blockage that arose in the city of Sa'ir and the city's refusal to provide access to the power supply could possibly have been identified before the final project design.

In crisis areas in which conflicts arise, among others, for the use of the existing scarce water resources, the data on the hydro-geological situation in the conflict region published by the public authorities has to be interpreted with particular caution. In case of any legitimate doubt as to the survey method of data collection or to the reliability of the data, a neutral expert study is to be obtained in coordination with the others donors.

Projects in regions with few water resources (with and without conflict potential) are to be integrated into a water resources management concept to establish a more conscious use of the water resources and, moreover, to help avoid (further) overuse of the existing resources. However, if due to political difficulties it is not possible to prepare such a concept and if in addition it becomes clear that the consumption behaviour will lead to a further deterioration of the prevailing resource situation, the project should not to be financed.

In case of high water losses in arid regions, greater attention is to be paid to loss reduction, particularly if these losses are, above all, of an administrative nature. The identification of illegal connections as well as consumption-based invoicing of all clients will lead to a more conscious use of the water resources on a broad scale.

Legend

Developmental success: Ratings 1 to 3	
Rating 1	Very high or high degree of developmental efficacy
Rating 2	Satisfactory developmental efficacy
Rating 3	Overall sufficient degree of developmental effectiveness
Developmental failure: Ratings 4 to 6	
Rating 4	Slightly insufficient degree of developmental effectiveness overall
Rating 5	Clearly insufficient degree of developmental effectiveness

Rating 6	The project is a total failure.

Criteria for the evaluation of project success

The evaluation of the "developmental efficacy" of a project and its classification during the ex post evaluation under one of the various levels of success described in more detail above concentrate on the following fundamental questions:

- Have the **project objectives** been achieved to a sufficient degree (project **effectiveness**)?
- Does the project generate sufficient significant developmental effects (project relevance and significance measured by the achievement of the overall development-policy objective defined beforehand and its effects in political, institutional, socio-economic and socio-cultural as well as ecological terms)?
- Are the **funds/expenses that were and are being employed/incurred** to reach the objectives appropriate and how can the project's microeconomic and macroeconomic impact be measured (aspect of **efficiency** of the project conception)?
- To the extent that undesired **(side) effects** occur, can these be tolerated?

We do not treat **sustainability**, a key aspect to consider when a project is evaluated, as a separate evaluation category, but rather as an element common to all four fundamental questions on project success. A project is sustainable if the project executing agency and/or the target group are able to continue to use the project facilities that have been built for a period of time that is, overall, adequate in economic terms, or to carry on with the project activities independently and generate positive results after the financial, organisational and/or technical support has come to an end.