

**Jordan: Sewage Disposal Greater Irbid I**

**Ex post evaluation report**

<b>OECD sector</b>	14020 / Water supply and sanitation – large systems	
<b>BMZ project ID</b>	1992 66 180	
<b>BMZ Project-ID and related training measure</b>	1998 196	
<b>Project-executing agency</b>	Water Authority Jordan (WAJ)	
<b>Consultant</b>	Deutsche Abwasser Reinigungsgesellschaft MbH	
<b>Year of ex post evaluation</b>	<b>2006</b>	
	<b>Project appraisal (planned)</b>	<b>Ex post evaluation (actual)</b>
<b>Start of implementation</b>	4th quarter 1993	2nd quarter 1994
<b>Period of implementation</b>	51 months	94 months
<b>Investment costs</b>	EUR 48.5 million	EUR 60.1 million
<b>Counterpart contribution</b>	EUR 9.5 million	EUR 19.3 million
<b>Financing, of which Financial Cooperation (FC) funds</b>	EUR 39.0 million	EUR 40.8 million
<b>Other institutions/donors involved</b>	-	-
<b>Performance (overall rating)</b>	3	
• <b>Significance / relevance (sub-rating)</b>	2	
• <b>Effectiveness (sub-rating)</b>	2	
• <b>Efficiency (sub-rating)</b>	4	

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

The overall objective of the project was to reduce the health hazards to the population and to protect the scarce water resources. The project objectives were the proper disposal of sewage and faeces in the project area and the reduction of dirt and pollutants discharged into the watercourses (wadis). The project comprised the expansion of the sewage disposal system of the city of Irbid and the surrounding villages. The target group comprised the the totality of the population living in the project area, which covers parts of the city of Irbid and five neighbouring rural communities and is estimated to have a total number of altogether approximately 202,200 inhabitants in 2010. Besides the construction of the required main and subsidiary collectors, two treatment plants, Wadi Arab and Wadi Hassan, were built for the two topographic catchment areas. The project was the first stage in a comprehensive programme to expand the sewage elimination systems in the Irbid region. The purified waste water from both treatment plants was to be reused for agricultural irrigation purposes.

The overall objectives and the project objectives were to be considered achieved if the connection rate for the population living in the city of Irbid had reached 75% and the connection rate for the remaining population living in the area of the sewerage systems was at least 70%. The discharge values of the treatment plants were not to exceed the legal Jordanian standards

for the discharge of treated waste water into water bodies. At the ex-post evaluation indicators were subsequently defined for the use of treated waste water and included in the system of targets.

### **Programme design / major deviations from the original programme planning and their main causes**

The project concept comprised the extension of waste water disposal facilities in the city of Irbid and five other villages and was largely adhered to. The main project measures comprised the construction and commissioning of the Wadi Arab and Wadi Hassan treatment plants and the related sewage systems and pumping stations. In order to ensure the sustainable operation of the treatment plants training measures were implemented to qualify the operating staff.

In deviation from the original project design and due to objections raised by the neighbouring municipalities, the treatment plant in the Wadi Hassan catchment area was built at a different site and complemented by a sewage pumping station. Due to the limited funds available and the low priority the extension of the sewage system in the north-western part of the greater Irbid area (Natifa and Bayt Ras) was first postponed and is now included in the successor project entitled "Sewage Disposal Greater Irbid II" (Wadi Shallala treatment plant). The underlying concept – a gravitational sewage system with sewage separation and treatment in central biological treatment plants – was adequate and convenient. The applicable Jordanian standards for the use of treated waste water in agriculture can easily be fulfilled with the chosen treatment procedure (single-stage sludge activation procedure with integrated sludge stabilisation). The procedure is so robust that peak pollutant and sewage loads can be treated. In addition, the required qualifications of the operating personnel are low. However, these advantages (resulting from the change in site) have to be weighed against the disadvantage of high energy costs. Given the drastic increase in electricity prices, one would probably opt today for a different treatment procedure (e.g. trickling filter method or multi-stage mechanical-biological procedure for sludge digestion to generate biopower), which is however more complex in its operation.

The Water Authority Jordan (WAJ) was responsible for implementing the project acting as project-executing agency. Since the time of the project appraisal the executing agency has clearly improved its centralised organisational structure. A semi-autonomous unit of the WAJ was established in 2001, which is in charge of the operation of the water supply and waste water disposal in the Northern Governorates. This development also contributed to clearly improving the sustainable operation of the treatment plants.

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

The maintenance condition of the two treatment plants is satisfactory (Wadi Arab) and good (Wadi Hassan). At both plants the required repair works are effected in a timely manner. Spare parts are stored properly in lockable storage rooms in sufficient quantity. The components of the treatment plants and pumping stations are regularly maintained. "Maintenance cards" have been created for this purpose, on which the type and scope of the activity is recorded manually with the date and signature. Due to the good quality of the components and the equipment no repairs beyond the routine maintenance were required after the end of the guarantee period so far.

The volume of sewage treated at the two treatment plants does not only fulfil Jordanian but also German minimum standards for the discharge of treated sewage into bodies of water. Thus, the prerequisites for using treated waste water in agriculture are fulfilled in terms of quality. According to information provided by the university, on average 1,120 m<sup>3</sup>/d of fresh water are replaced by treated waste water, which is used to irrigate parks on the university campus and commercially operated fruit tree plantations. Otherwise, drinking water would have to be used for irrigation and, thus, the scarce resource water is conserved. Under development policy aspects this substitution is to be welcomed. The treated waste water from Wadi Arab and Central Irbid is discharged via a common pipe that leads along the Wadi Arab reservoir into the Jordan Valley. Due to the comparatively bad quality of the waste water from Central Irbid it is not attractive for farmers in the Jordan Valley to use waste water that consists of a mixture of the two waste water streams. In the summer months the sludge, which was dried in a sludge

drying bed, is deposited together with solid waste at a dump site, which is operated on a sustainable basis.

The project did not have any direct impact in terms of poverty reduction. Only a small share of the target group in a Palestinian refugee camp, which is connected to the system, and a small number of the urban population can be considered as poor. The average costs from water and sewage tariffs incurred by the connected households is acceptable (1.2% of household incomes).

The project objectives did not target gender equality. The project contributes to reducing water-induced diseases and in this respect helps to relieve the burden on women because they have to spend less time and effort on caring for sick family members. However, this easing of the burden on women does, in the given cultural context, not entail a stronger participation of women in society or the economy or a change in the distribution of roles between the genders. Thus, from today's perspective and in the given cultural context, there was no potential for achieving an impact on gender equality. The programme does not focus on participatory development or good governance.

The main project objective is to protect the environment and conserve natural resources. The project did not produce any negative impact on the environment. On the contrary, due to the use of treated sewage and the improved waste water quality the scarce water resources are protected.

The project largely fulfilled the indicators for the achievement of the project objectives. The project helps to ensure the sustainable central sewage disposal system in the greater Irbid area, which shows an acceptable sewage connection rate and a satisfactory sewage treatment volume. The sludge is discharged in a sustainable manner. The only negative aspect is that the treated sewage is not utilised to a sufficient extent in agriculture. While 100% of the sewage treated at the Wadi Hassan treatment plant is used for fresh water substitution, this applies to only 14% of the treated sewage from the Wadi Arab plant (which is ten times as large). This is due to the above-mentioned problems related to the mixing of the sewage with the sewage from the Central Irbid treatment plant. However, since we expect this situation to improve in the future because the relevant implementation plans are already existing, we rate the overall **effectiveness** of the project as **satisfactory (rating: 2)**.

The project made a contribution to achieving the overall objectives and helped to realise further objectives pursued with the German-Jordanian sector strategy. The health situation improved substantially. Only isolated occurrence of diseases such as dysentery, typhus and hepatitis is reported. Non-specific diarrheal diseases were reduced significantly, though this was also due to factors such as an improved general awareness of health issues, better nutrition, the drinking water quality, etc. Due to the improved waste water quality and, to a lesser extent, the use of treated sewage for irrigation purposes it was possible to protect the environment. The project made an important contribution to commercialisation in the water sector. From today's point of view as well, priority would be attached to the respective project objectives, and the objectives are today still being pursued further in development cooperation. In addition, in the areas of orderly sewage disposal, re-use of treated sewage and resource protection, the project had impacts also beyond the Greater Irbid area and its design is regarded as exemplary. Overall, the developmental **relevance** and **significance** of the project are satisfactory (sub-rating 2).

On the whole, the production efficiency of the project was lower than assumed at the time of the project appraisal. Investment costs rose by approx. 14%, the specific investment costs by 37% and the dynamic production costs by 100%. Though staff productivity is in line with the national Jordanian average, 60% to 80% of the staff are redundant in comparison with the standards in the industrial countries. The technology used, which is very energy-intensive in its operation, produced high energy costs. Nevertheless, it has to be mentioned that the increase in energy prices was not foreseeable at the time, and due to its simplicity the technology offers certain advantages in operation and in consequence has shown good operating results. Overall, the production efficiency is insufficient, especially against the background of higher energy costs. The project executing agency WAJ has an operating cost recovery rate of 133 %; this compares with a rate of 148 %, which was requested for the sector in 2006. This means that there is no sufficient potential for cross-subsidising expansion and replacement investments in the different operating units. Another sector objective pursued is the commercialisation of the operating unit NGWA, which is planned to reach an operating cost recovery rate of 105% (currently 76 %).

Due to the fact that sewage tariffs are too low, the provision of treated waste water is very expensive and, thus, constitutes a special burden with regard to the achievement of the commercialisation objectives pursued. The operation of the project facilities by NGWA is ensured, but this is only so because WAJ bears the energy costs. The allocation efficiency is insufficient, especially against the background of the overall sector-policy orientation. Overall, the project's **efficiency is rated as slightly insufficient (sub-rating 4)**.

Despite the efficiency deficits and due to the operation of the project which is ensured on a sustainable basis due to the indirect subsidisation we rate the project as having **sufficient developmental efficacy (overall rating 3)**.

### General conclusions and recommendations

In particular in arid regions the assessment of the capacity utilisation of sewage treatment plants should be based more strongly on the pollutant load and not only on the volume of waste water treated. International experience values have shown that the pollutant load per inhabitant and day is around 60 g/BOD, irrespective of the quantity of drinking water consumed. When defining the relevant indicators at project appraisal the pollutant load should be specified not only the quantity of waste water treated. In addition, it is important to define the indicators in more detail by specifying whether they relate to the average capacity utilisation or the maximum capacity reached at peak load times.

If, given the prevailing political conditions, it seem unlikely that tariffs will be increased, or if political decision-makers have explicitly decided to subsidise a specific sector this should be taken into consideration at the time of project identification and appraisal. In such cases KfW, the partner and the German government should openly discuss whether investments should nevertheless be made in the sector if good reasons, for example resource protection, suggest this. The necessity for continued cross-subsidisation should be clearly explained and the probability for the reliable implementation of such cross-subsidisation should be evaluated, or else a more cost-efficient technology, which is based on the ability and the willingness of the target group to make payment, should be chosen.

### Legend

Developmentally successful: Ratings 1 to 3	
Rating 1	Very high or high degree of developmental effectiveness
Rating 2	Satisfactory developmental effectiveness
Rating 3	Overall sufficient degree of developmental effectiveness
Developmental failures: Ratings 4 to 6	
Rating 4	Overall slightly insufficient degree of developmental effectiveness
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 effectiveness" of a project and its classification during the ex-post evaluation into one of the various levels of success described in more detail below concentrate on the following fundamental questions:

- Are the **project objectives** reached to a sufficient degree (aspect of 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, are these tolerable?

We do not treat **sustainability**, a key aspect to consider for project evaluation, as a separate category of evaluation but instead as a cross-cutting element of 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 on their own and generate positive results after the financial, organizational and/or technical support has come to an end.