China: Water supply in Zuny

Ex-post evaluation

OECD sector	14030 / Basic water supply and basic sanitation	
BMZ project ID	1992 66 065	
Project-executing agency	Zunyi Water Supply & Drainage Company (ZWSDC)	
Consultant	Consulting Engineers Salzgitter (CES)	
Year of ex-post evaluation	**2005**	
	Project appraisal (planned)	**Ex-post evaluation (actual)**
Start of implementation		
(a) Investment in fixed assets	(a) Q2/1994	(a) Q4/1993
(b) Basic and advanced training	(b) Q3/2002	(b) Q4/1995
Period of implementation	(a) 66 months	(a) 39 months
	(b) 8 months	(b) 12 months
Investment costs		
(a) Investment in fixed assets	(a) EUR 7.60 million	(a) EUR 7.69 million
(b) Basic and advanced training	(b) EUR 0.25 million	(b) EUR 0.21 million
Counterpart contribution	EUR 3.51 million	EUR 4.22 million
Financing, of which Financial Cooperation (FC) funds	EUR 4.09 million	EUR 3.47 million
(a) Investment in fixed assets (loan)	EUR 0.25 million	EUR 0.21 million
(b) Basic and advanced training (grant)		
Other institutions/donors involved	None	None
Performance rating	2	
• Significance / relevance	2	
• Effectiveness	1	
• Efficiency	2	

Brief description, overall objectives and project objectives with indicators

The FC project was concerned with improving and expanding the central drinking water supply in Zunyi, the second largest city in Guizhou Province. It was part of a long-term expansion programme that was intended to counter an existing and growing supply shortfall and to cater for future needs. The core of the project was to expand the catchment and treatment capacities for the drinking water supply from 80,000 m^3/d to 150,000 m^3/d.

The project objectives were to ensure that the population has a year-round supply of hygienically safe drinking water, to increase of the number of connections to the water supply system, to produce more

drinking water in keeping with demand and to raise the share of surface water in total water extraction. The overall project objectives were to reduce the risk to the health of the population, to improve the production conditions for commerce and industry and to conserve local groundwater resources.

The following indicators were to be used to measure the achievement of the project objectives:

- The drinking water produced meets national quality standards, which essentially comply with WHO recommendations.
- The number of household connections goes up from 75% (1991) to 80% by 2000 (taking population growth into consideration).
- Demand (1991: approximately 40,000 m^3/d) and the future peak demand (2000: approximately 110,000 m^3/d) are being met.
- There is a constant supply of drinking water in the dry months, too.
- There is a reduction in the industrial use of groundwater (1991: approximately 70% of total industrial consumption, 2000: approximately 60% of total industrial consumption).

The group to be targeted by the improvements in the water supply was all consumer groups in Zunyi (residents, industry, trade and administration). According to the project appraisal report, the aim was not merely to cover the residents' basic requirements but also, with regard to their income opportunities, to offer them favourable terms because the further economic development of the city would be at risk if there were no water supply.

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

The project design included the following measures in the water supply system operated by ZWSDC:

- Setting up a new purification plant at the southern water works in order to double the purification capacity from 50,000 m^3/d to 100,000 m^3/d (including the installation of additional pumping capacity at the raw water intake plant on the Luojiang River and to double the drinking water pumping capacity).
- Extending and strengthening the supply lines from the water works in the southern part of the city and the conduits connecting to the existing network as well as expanding the distribution system and creating the space required for the high-level reservoir.
- Rehabilitating and expanding the northern water works on the Laba River from 30,000 m^3/d to 50,000 m^3/d;
- Improving operation, maintenance, repairs, control and monitoring by renewing the operating areas and their equipment and setting up a modern control room;
- Providing supporting advisory services in planning and construction supervision as well as basic and advanced training measures to ensure that the water works operate properly.

Altogether the technical cooperation in the project was satisfactory. All measures were carried out in accordance with the project design. Only the some of the regulation and measurement facilities have

not been adjusted to the operating conditions or the qualification level of the project-executing agency, which is why the project-executing agency reverted in the past to proven manual control.

The new treatment plant at the southern water works, including the extended raw water and drinking water pumping stations have been operating constantly since May 1998, despite some damage caused by insufficient maintenance to individual secondary components such as windows, gates, etc. Since operation was resumed, the capacity utilisation at the southern water works is approximately 60%. The existing treatment plant at the northern water works has been fitted with only a limited number of modern components in terms of the overall investment and was operated until 2003 with a maximum capacity of 50,000 m^3/d. On the basis of its expectations with regard to the development of needs, the project-executing agency is seeking to double the capacity of the northern water works and considers it uneconomical to refurbish the buildings at the old plant. In 2004, therefore, the old treatment plant was replaced by a new plant with a maximum treatment capacity of 100,000 m^3/d. Most of the equipment financed by FC at the old plant was reused at the new plant or elsewhere. The current utilisation of the northern water works accounts for roughly 110% of the capacity of the output pumping station, or 57% of the nominal capacity of the treatment plant. Average capacity utilisation of the plants set up as part of the FC project at the southern and northern water works is approximately 78% of the nominal capacity. An increase in capacity utilisation to 88% can realistically be expected by the extension deadline in 2010.

Key results of the impact analysis and performance rating

The water supply facilities are operated continuously and reliably. For emergencies there is a repair service which can carry out smaller repairs independently. Specialist companies from the private sector are contracted to carry out larger repairs. Repairs to the main conduits and in the distribution network are normally carried out within a day; in the event of longer down times (> one day), the municipal authorities are informed and the residents are informed via the media. The manual chorine gas feed is monitored and ensured by means of daily bacteriological analyses. Now and then the raw water is found to contain slight bacteriological impurities. After the drinking water has been treated, i.e. in the distribution network, however, no more germs can be detected, which indicates that the dosage of chlorine is appropriate. Commercial operation is largely satisfactory: the factoring efficiency is nearly 100% and the collection rate in the case of households (including public administration) is roughly 95%. However, problems with payment ethics are apparent in the case of trade and industrial concerns, which are obviously protected by the provincial government. Owing to the great willingness to pay among the private household and the type of meter readings, which are strictly monitored, it can be assumed that the overall loss of some 35% is attributable almost entirely to technical losses.

The two available sewage treatment plants are appropriately operated by the project-executing agency. In terms of the biological and chemical oxygen demand, the purification capacity is 90% in the plant at the confluence of the Xingjiang and Laba and 80% at the plant on the Luojiang. The discharge values at the former plant are within internationally acceptable limits; at the latter plant, however, the acceptable figures for BOD and settleable solids are being exceeded. This could potentially lead to an impairment of the quality of the water. However, the self-cleaning capacity of the receiving stream would appear to be adequate to absorb untreated sewage – or at least no increase in the growth of algae could be detected. The sewage sludge is removed to a communal waste dump which began operation in 2000 and meets Chinese standards.

The programme objectives did not target gender equality. However, experience shows that women derive above-average benefit from improvements to the water supply and the sanitary conditions in their living environment. Particularly in the poorer areas in the project region, women are traditionally

responsible for taking care of the drinking water in the home and for hygiene and health in the family, including taking care of sick relatives. As a result of improving the availability of hygienically safe drinking water and general health, it can be assumed that an improvement in the situation of women is achieved.

By developing the social infrastructure in order to satisfy the basic needs in one of the poorest regions of China (at roughly EUR 386 per capita GDP in Zunyi is less than 30% of the national average), the project has made a direct contribution to poverty reduction. Experience has shown that the permanent and sufficient availability of hygienically safe drinking water makes an above-average contribution to improving the living conditions of poor sections of the population.

As an equally important overall objective, reducing the excess use of groundwater resources was also the focus of the project. Before the project began, public water supply at Zunyi had been fully changed over to the use of river water. Through the increase in the production capacity and the policy that is consistently pursued in parallel of restricting private and industrial groundwater extraction, groundwater has been increasingly replaced by surface water. While drinking water is now taken almost exclusively from the public supply system, some industrial companies which need large amounts of water in their production processes have installed their own facilities for treating surface water. Industrial operations today use less than one-fifth of the groundwater that they required when the project appraisal was carried out. However, counterproductive in terms of this development, which is being implemented by regulatory means, is the fact that the tariff for raw water extraction has not changed for ten years and that the same tariff applies to groundwater and surface water from the reservoir. Increasing the tariff for groundwater extraction could provide additional economic incentives to protect the natural resources. No major negative impacts on the environment caused by the project can be detected. The municipal sewage collected in the central collection system has been purified entirely by a mechanical-biological process since the two sewage treatment plants were put into operation in 2003.

An improvement in participation or governance was not among the project objectives and no effects of this kind can be detected.

All the project objectives have been achieved and some even exceeded. With regard to the full coverage of costs, from the present perspective the project objectives can be said to have been achieved sustainably. The insufficient independence of the project-executing agency from state intervention is a medium risk to the sustainability of the objective achieved. Overall, we classify the project's **effectiveness** as **good (sub-rating 1).**

From today's point of view the project structure was adequate to solve the problem. By increasing the central water supply and at the same time consistently reducing the use of groundwater by households and industry in the project region, priority key development problems (protection of water resources, reduction of the health risk from hygienically unsafe groundwater) were addressed and resolved. The overall objectives in this respect have been met. However, the project did not help to improve the production criteria for industry owing to the change in the economic structure in Zunyi. However, by increasing the storage capacity on the Lujiang and Laba rivers, an improvement in the long-term availability of river water for production processes was achieved. A certain broad-scale impact has possibly been achieved beyond the scope of the actual project given the high degree of attention that Zunyi as a location enjoys because of its historical significance for the history of the Communist party in China. Political decision-makers can be expected to recognise the model character of the project and adopt the project experience for the supply and disposal systems in their own sphere of activities. We evaluate the overall **significance** and **relevance** of the project as **satisfactory (sub-rating: 2)**.

The specific investment costs of the project are appropriate, as is the manpower used to operate the water supply. Overall production efficiency is therefore good. ZWSDC is able to cover the dynamic operating costs and depreciation for the water supply fully from tariff revenues. As much as 96% the entire dynamic costs including financing costs are being covered. This is set against technical water losses of roughly 35% and the low average collection rate of roughly 64%. Owing to the low collection rate at industrial and commercial companies, industrial use is cross-subsidised by the tariff for private households, which could be reduced substantially if the collection efficiency for industry and commerce were increased. The average capacity utilisation of the plants set up as part of the FC project is currently approximately 78% and will rise to 88% by the expansion deadline in 2010. After considering the various aspects, overall allocation efficiency can be said to be satisfactory. Overall we classify the **efficiency** of the project as **satisfactory (sub-rating 2)**.

For the project as a whole, taking account of the sub-ratings, the project can be classified as having **satisfactory developmental effectiveness (rating 2).**

General conclusions and recommendations

The following general conclusions can be reached:

- For regulating and measurement facilities, attention should be paid to using technologies that are suitable for the operating conditions (e.g. climatic conditions) and the qualification level of the project-executing agency. Manual operating components are often preferable to modern electro-mechanical control equipment. Non-adjusted system components can be counterproductive for the smooth functioning of the plants.

Assessment criteria

Developmentally successful: 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 efficacy
Developmental failures: Ratings 4 to 6	
Rating 4	Overall slightly insufficient degree of developmental efficacy
Rating 5	Clearly insufficient degree of developmental efficacy
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:

- Have the **project objectives** been achieved to a sufficient degree (project **effectiveness**)?
- Does the programme generate sufficient **significant developmental effects** (programme **relevance** and **significance** measured in terms of the achievement of the overall developmental 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 **appropriate** with a view to achieving the objectives and how can the programme's microeconomic and macroeconomic impact be measured (**efficiency** of the programme design)?
- To the extent that undesired **(side) effects** occur, are these tolerable?

We do not treat **sustainability**, a key aspect of project evaluation, as a separate evaluation category but instead as a theme that cuts across all four fundamental questions of 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.