Hungary

Environmental Improvement Project in The Varpalota Region (Municipality Utilities Project)

Report Date: October 2002
Field Survey: September, 2001

1. Project Profile and Japan's ODA Loan

Site Map: Varpalota Region

Site Photo: Heating Power Plant (Varpalota)

1.1 Background

The Varpalota region, which is located 120 Kmaway from Budapest to southwest and in the northeast of Lake Balaton, is the wider area around Varpalota City and the second largest heavy chemical industrial area in the country with Lake Balaton as a tourist resort. However, due to the lack of environmental considerations in the past development of the region, the Varpalota region was one of the most environmentally polluted areas in Hungary (air and water pollution). Although all water in the region was supplied by wells, two out of twelve wells did not fulfil the drinking water quality standard of Hungary (less than 20 mg/l of NO_3 ion content). Sewage was served for 0-40 per cent of population, leading to well water contamination. In addition, coal for heating purposes used during the winter season had low calorie and was of poor quality, containing a three per cent sulfur content. Consequently, the content of aerial sulfur oxide and ash dust did not meet environmental standards during the winter season.

Therefore, the Government of Hungary formulated this project to improve environment of the region.

1.2 Objectives

This project aimed at constructing water supply and sewage systems and improving heat supply systems (gas supply) in the targeted six locations (Varpalota, Berhida, Osku, Osi, Tes and Balatonalmadi [Vorosbereny Region])—of three Varpalota Regional Environment Improvement Projects (local autonomy public works, factory project, and factory waste and municipal waste disposal project)—and thereby improving the environment of the region.

1.3 Project Scope

① Water Supply Construction (4 targeted locations: Varpalota, Osku, Tes, Balatonamadi)
- Wells－3 wells
- Storage Tank－7 tanks
- Pipelines－18.4km
- Pumping Stations－2 stations

② Sewage Construction (6 targeted locations: Varpalota, Berhida, Osku, Osi, Tes, Balatonalmadi)

Pipelines－115.38km
Sewage Treatment Plants－6 planes
Compost Plant－1 plant

③ Heat Supply System Improvement (Gas Supply) (5 targeted locations: Varpalota, Berhida, Osku, Osi, Balatonalmadi)
Heat Supply System (Boiler) Construction－2 systems
Pipelines－161.85km

④ Consulting Services

The ODA loan covered 60 per cent of the total project costs, and was targeted at procurement of equipment and materials, finance, and consulting services related to the above ①–④.

1.4 Borrower / Executing Agency

The Government of the Republic of Hungary / Ministry for Environment (former Ministry of Environment and Regional Policy)

1.5 Outline of Loan Agreement

Loan Amount Loan Disbursed Amount	4,914 million yen 4,614 million yen
Date of Exchange of Notes Date of Loan Agreement	October 1994 November 1994
Teams and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 5 % p.a. 25 years (7 years) General Untied
Final Disbursement Date	November 1999

2. Results and Evaluation

2.1 Relevance

The objective of this project was the environmental improvement of the Varpalota region. The region had one of the most serious problems in Hungary in terms of environmental pollution (air and water pollution). It was recognized that factors involved included the pollution of well water by untreated domestic and industrial waste water, and air pollution by coal-based domestic heating and factory smoke. These kinds of environmental pollution were posing a high risk to human bodies. Since many environmental indicators substantially exceeded environmental standards permitted in the country, achieving permitted environmental standards, improving indictors through development of water supply, sewage system and regional heat supply system, and improving health of local residents and life conditions were all in a high priority, and thus relevance of this project at the time of appraisal was high. The environmental conservation of Lake Balaton, one of the greatest domestic tourism resources, and the environmental improvement of this region still continue to be matters that should be prioritized on a national as well as a regional level. For instance, decisions based on cabinet meetings regarding the Lake Balaton Development Plan in 2000, The Varpalota Region Local Development Plan, in 2000, Balatonalmadi Local Development Plan in 1998, and Environmental Protection in Varpalota Region in 2001 acknowledged this importance. Thus the relevance of this project plan is still valid.

2.2 Efficiency

2.2.1 Project Scope

The project scope was revised on the basis of local situations. As regards the water supply, the construction of all wells was cancelled due to water pollution that was identified by research work conducted after appraisal, and the specification and number of pumping stations and storage tanks were adjusted. In the case of sewage, the construction of one of the two sewage treatment plants, in Varpalota that had been planned, was cancelled, while sewage pipe networks were extended. As far as the regional heating system (gas supply) is concerned, the length of gas pipe laid was adjusted, while the construction of one of the two heating supply plants that had been planned in Varpalota was cancelled. One of the heat supply plants which was cancelled was compensated for by the rehabilitation of the heating steam supply systems of existing chemical factories. Municipal governments were supposed to take on part of the project costs (25 per cent), but for financial reasons they partially revised the plan. This also necessitated the adjustment of the project scope.

Since adjustments were made in response to changing external factors and the financial conditions of municipal governments, the above adjustment of project scope was unavoidable if there was to be a more realistic project implementation.

2.2.2 Implementation Schedule

Initially, the overall construction period was 50 months from November 1994 to December 1998 (from consultant appointment to construction completion). In fact, it was 44 months from September 1995 to April 1999. Although construction commenced with a 10 months delay, the delay of completion in comparison with the original plan was six months, as a result that the overall construction period got shortened to 44 months. Major factors for delay were (1) longer revision of the project scope and (2) delayed commencement of water supply construction in order to avoid overlap in the timing of water supply and sewage construction.

2.2.3 Project Cost

The initial plan estimated the total project cost at 8,190 million yen. Of this, 4,914 million yen—60 per cent of total project cost—was supposed to be covered by the ODA loan. The actual total project cost was 7,777 million yen, and 4,614 million yen was covered by the ODA loan. Thus the project was within the planned project cost. Major reasons for this were: (1) the lowered exchange rate of the local currency (Forint) to the yen,[1] and a subsequent change of covered cost of the water supply and sewage construction from the foreign currency to the local currency; (2) the revision of the plan that was accompanied by a partial cancellation in the project scope; and (3) the lowered cost for procurement of equipment, materials and services as a result of competitive bidding.

2.3 Effectiveness

①Water Supply Construction

Water supply construction was targeted at four places: Varpalota, Osku, Tes, Balatonamadi (Vorosbereny region). These municipalities had problems such as the pollution of ground water that was a main source for drinking water, and water shortage due to the lowering of the ground water level during the summer season. Particularly, in Osku, Tes, Balatonamadi (Vorosbereny region), the

[1] The exchange rate to yen decreased 29.3 per cent between1996 and 1998—1 yen＝1.442 HUF (1996), 1.5421 HUF (1997) and 1.8654 HUF (1998).

content of nitric acid ion (NO_3 ion) in water was more than 20 mg/l of the standard and at the risk of harming resident health. Thus, this project was to replace dangerous wells with new wells, and to expand the supply water system from a safe water source.

Since 100 per cent of the population had already been provided with water supply before project implementation, what the water supply project accomplished were: (1) improvement of water quality and (2) the establishment of a stable water supply without any suspension in summer time.

Nonetheless, well construction that was initially planned (2 wells in Varpalota, 1 well in Tes and 1 well in Balatonalmadi) as part of the water supply construction project was cancelled since the water survey revealed that water source around which the wells are planned to be built was contaminated. Accordingly, alternative water sources were ensured through (1) in Varpalota, existing nine wells which were continuously used ; (2) in Osku, a water source in Varpalota that was acquired through extension of the waterline while abandoning a seriously polluted well ; (3) in Tes, wells of the Csenteny region instead of wells which were not used due to pollution (Szentkutin region); and (4) in the Vorosbereny region in Balatonalmadi, waterline extension from the Balatonalmadi City Water Supply System, which was sourced from Lake Balaton, together with construction of pumping station, instead of well construction.

As a result, as table 2 shows, in seriously polluted Osku and Tes, there was outstanding qualitative improvement of water after project completion. In the Vorosbereny region in Balatonamadi, since water supply from wells had been prohibited due to pollution, residents drank bottled water. By conveying waterthat was taken from Lake Balaton and pumping it to the region, residents were able to receive safe water supply services. But in Tes, despite improvement of water quality, the content of nitric acid ion still exceeded the standard. This was due to the fact that new wells constructed were obliged to utilize the relatively less polluted water sources of the Csenteny region as an alternative to the seriously polluted wells of the Szentkut region.

In Varpalota, the Pet region (Varpalota), Berhida and Osi, the content of nitric acid ion remained on the same level or it slightly deteriorated, but it met the standard of drinking water quality in Hungary (less than 20 mg/l content of nitric acid ion).

A major factor in water pollution in the Varpalota region was thought to be well water pollution by untreated domestic and industrial waste water. To make a fundamental solution to this problem, a continuous effort to establish and diffuse the appropriate disposal capacity of sewage including industrial waste water is indispensable.

Table 1: Water Supply Project in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Varpalota（Petfurdo Region, included）									
Capacity of Water Supply (m^3/day)	18,780	18,780	18,780	18,780	18,780	18,780	18,780	18,780	18,780
Water Supply (m^3/day)	7,702	9,655	8,375	8,060	7,213	6,492	6,245	5,396	5,500
Water Consumption (m^3/day)	7,702	6,269	5,520	5,904	4,674	4,146	3,935	3,842	3,950
Water Loss (%)	18.9	19.5	20.2	19.1	19.0	18.7	18.3	18.0	17.1
Population Served (%)	100	100	100	100	100	100	100	100	100
Osku									
Capacity of Water Supply (m^3/day)	900	900	900	900	900	900	19.7*	19.7*	19.7*
Water Supply (m^3/day)	308	297	246	207	165	239	327	347	360
Water Consumption (m^3/day)	219	206	189	226	194	184	150	176	183

Water Loss (%)	21.0	20.5	20.8	20.0	19.7	18.9	19.5	17.3	16.2
Population Served (%)	100	100	100	100	100	100	100	100	100
Tes									
Capacity of Water Supply (m^3/day)	460	460	460	460	460	460	350	350	350
Water Supply (m^3/day)	112	112	112	108	94	102	89	87	95
Water Consumption (m^3/day)	77	70	64	77	64	65	55	68	75
Water Loss (%)	26.8	27.1	29.0	21.8	24.2	27.0	26.2	23.0	20.5
Population Served (%)	100	100	100	100	100	100	100	100	100
Balatonalmadi (Vorosbereny Region)									
Capacity of Water Supply (m^3/day)	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Water Supply (m^3/day)	850	850	850	850	850	850	850	850	850
Water Consumption (m^3/day)	800	800	800	800	800	800	800	800	800
Water Loss (%)	25	23	24	20	21	18	17	15	15
Population Served (%)	80	82	85	90	100	100	100	100	100

Source: Ministry of Environment, Government of Hungary.

Note *: Osku has been supplied with water from Varpalota Region since 1999.

Table 2: Content of NO_3 Ion and NH_4 Ion in Drinking Water in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Varpalota									
NO_3 ion (mg/l)	N/A	5.0	5.0	3.9	4.8	5.0	4.9	5.2	5.4
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petfurdo Region (Varpalota)									
NO_3 ion (mg/l)	N/A	10.0	5.5	5.8	6.2	4.6	10.9	11.0	11.4
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Berhida									
NO_3 ion (mg/l)	N/A	6.0	6.0	5.5	5.8	8.7	7.0	9.1	9.3
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Osku									
NO_3 ion (mg/l)	N/A	24.0	23.0	26.5	21.5	33.0	4.9	5.2	5.4
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Osi									
NO_3 ion (mg/l)	N/A	6.0	6.0	5.5	5.8	8.7	7.0	8.8	9.3
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tes									
NO_3 ion (mg/l)	N/A	43.0	43.0	36.0	43.0	43.0	25.0	25.0	26.0
NH_4 ion (mg/l)	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Balatonalmadi (Throughout City)									
NO_3 ion (mg/l)	03	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
NH_4 ion (mg/l)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Ministry of Environment, Government of Hungary.

Note: NO_3 ion refers to nitric acid ion and NH_4 ion to ammonia ion.

A stable water supply, the second accomplishment of this project, solved the water shortage problem during the summers after completion. This was because the efficiency of water conveyance and distribution was improved by the rehabilitation of old water pipelines under this project. But more decisively, it was because the water consumption volume in whole region drastically decreased from 8,798 m^3/day on average (1993) at the time of appraisal to 4,940m^3/day (1999) after completion. In all project areas, the water supply capacity is sufficient in view of the current water consumption volume. Now that the water shortage problem during the summer time was solved, it can be said that year-round stable water supply had been achieved. Nonetheless, since this project did not enlarge the size of the water supply capacity, this result was greatly influenced by external factors of decreased water consumption in the whole project area.

②Sewage Construction

The targeted municipalities for sewage construction were Varpolota, Berhida, Osku, Osi, Tes and

Balatonamadi (Vorosbereny region). In these municipalities, sewage installation was considerably delayed compared with water supply construction, and this caused ground water pollution. Particularly, Osku, Osi, Tes and the Vorosbereny region in Balatonamadi did not have sewage disposal facilities, and waste water was discharged without treatment from households' holding tanks to ground. The rate of population served by sewage systems was 42 per cent in Varpolota and 20 per cent in Berhida. Thus, it was planned that this project would construct and expand sewage disposal facilities in municipalities, and establish a waste water treatment system.

Accordingly, as the accomplishment of the sewage construction project, it was expected to achieve a 100 per cent treatment of sewage and to improve the quality of water supply by the pollution control of ground water. The ratio of sewage treated was improved: the sewage treatment capacity was greatly improved in the four municipalities, and sewage networks were established. Consequently the population served by sewage treatment reached nominally 100 per cent in four municipalities.

However, the actual population served by sewage treatment is considered to be 70–85 per cent depending on differences among the municipalities, meaning that the rest of 15-30 per cent is not served.

According to the implementing agencies and targeted municipalities, each household was required to pay for and install a drainage pipe which connects each household to the end drainage networks in order to receive sewage treatment services, and there were some households that did not have connection to drainage pipes since they could not afford the installation charges. Every municipality continuously urges such households to gain access in order that they can appropriately dispose of all waste water.

Regarding water quality improvement, an investigation of the content of nitric acid ion and ammonia ion in disposed waste water in the project area does not show a tangible effect of the project, though sufficient data are not available. In particular, in the three municipalities of Varpolota, Osku and Tes, the degree of pollution deteriorated. In Tes in 1999 and 2000 as well as in Osi and Osku in 2000, it was pointed out by the authority that treated waste water did not meet the environmental standard. Although the survey was not able to reveal the causes, they might be attributable to operation of sewage treatment facilities, ways of treatment, or quality of industrial effluent drained directly from factories.

In Varpalota, as a pilot project, this project constructed a compost plan with the aim of recycling polluted mud which was created in the process of sewage treatment. Fertilizer has already been produced, and it is aimed at commercially self-reliant production in the future after improving the quality and achieving mass production .

Table 3: Sewage Project in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Varpalota									
Capacity of Water Treatment (m^3/day)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Sewage Treatment Amount (m^3/day)	3,020	3,105	2,787	2,675	2,273	2,420	2,485	2,599	2,800
Population Served (%)	42	65	68	70	85	100*	100*	100*	100*
Berhida									
Capacity of Water	180	180	180	180	180	900	900	900	900

Treatment (m^3/day)									
Sewage Treatment Amount (m^3/day)	N/A	30	28	27	22	640	977	854	840
Population Served (%)	20	20	20	20	20	100*	100*	100*	100*
Osku									
Capacity of Water Treatment (m^3/day)	0	0	0	0	0	350	350	350	350
Sewage Treatment Amount (m^3/day)	ST	ST	ST	ST	ST	170	177	181	180
Population Served (%)	0	0	0	0	0	100*	100*	100*	100*
Osi									
Capacity of Water Treatment (m^3/day)	0	0	0	0	0	350	350	350	350
Sewage Treatment Amount (m^3/day)	ST	ST	ST	ST	ST	183	245	289	290
Population Served (%)	0	0	0	0	0	100*	100*	100*	100*
Tes									
Capacity of Water Treatment (m^3/day)	0	0	0	0	0	150	150	150	150
Sewage Treatment Amount (m^3/day)	ST	ST	ST	ST	ST	116	57	61	60
Population Served (%)	0	0	0	0	0	100*	100*	100*	100*
Balatonalmadi (Throughout the City)									
Capacity of Water Treatment (m^3/day)	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Sewage Treatment Amount (m^3/day)	4,535	4,926	5,548	6,562	5,819	6,542	6,230	7,240	6,570
Population Served (%)	35	40	40	45	50	50	100*	100*	100*

Source: Ministry of Environment, Government of Environment.

Note: ST refers to sewage treatment by 'septic tank' (sewage hold tank).

* 100 per cent of the population served in Varpalota, Berhida, Osku, Osi and Tes after 1999 refers to that number of conduit pipes of households connected to the sewage network infrastructure constructed by public works. The share of user households served by sewage treatment is below 100 per cent because each household is required to arrange and pay for the installation of conduit pipes end conduit networks and some households have financial difficulties.

Table 4: Content of NO_3 Ion and NH_4 Ion in Disposed Waste Water in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Place
Varpalota									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	5.0	37	40	Biva-lyos Pond
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	2.11	0.71	
Petfurdo Region (Varpalota City)									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	-	4.6	-	-	N/A
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	-	-	
Berhida									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	8.7	-	-	Veszprémi Séd Creek
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	1.32	12.4	
Osku									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	8.7	10.3	46.3	Péti-creek
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	0.11	2.9	
Osi									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	33.0	-	-	Nádor-canal
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	0.6	7.6	
Tes									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	43.0	117	179.5	Gaja-creek
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	12.1	0.45	
Balatonalmadi									
NO_3 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.3	-	-	N/A
NH_4 ion (mg/l)	N/A	N/A	N/A	N/A	N/A	0.0	-	-	

Source: Ministry of Environment, Government of Hungary.

Note: NO_3 ion refers to nitric acid ion and NH_4 ion to ammonia ion.

③Gas Supply and Heat Supply System Improvement

The gas supply project targeted the five municipalities of Varpolota, Berhida, Osku, Osi and Balatonamadi (Vorosbereny region), and in Varpalota, heat system improvement was undertaken. In these municipalities, coal was used for domestic heating, resulting in air pollution. In addition,

though boilers were provided for heating purpose from existing power plants and factories in the Varpalota area, the stable provision of boilers became difficult due to the problem of the continued existence of power plants and factories. Hence, this project aimed at installing gas pipelines in the targeted municipalities to encourage a shift from coal to natural gas, and constructing new heat supply systems in Varpalota (Petfordo region, included).

Accordingly, as the accomplishment of the gas supply and regional heating system improvement project, the reduction of sulfur oxide and ash dust that were the causes of air pollution was expected. After project completion, the population served by gas supply increased in all the targeted municipalities, and in Varpalota stable services have been provided to customers of the heat supply system after project completion. Nevertheless, the population served by gas supply did not achieve the initial goal of 100 per cent, except in Varpalota. Major reasons were similar to the case of sewage treatment; i.e.each household had to pay for and install gas pipes, and a considerable number of households could not afford the installation charges.

As far as the regional heating system is concerned, construction of heat supply plants was originally planned in Varpalota and the Petfurdo region. Afterwards, however, chemical factory were scheduled to be rehabilitated, and the boiler supply from the factory to the Petfurdo region was ensured as before . Thus, only one heat supply plant was constructed in Varpalota. This heat supply plant, as planned, has been providing stable services to 130 households in the targeted area.

Regarding the degree of air pollution in the targeted area (content of sulfur oxide, nitrogen oxide and ash dust), the content of ash dust is improving. However, that the content of sulfur oxide and nitrogen oxide has fluctuated according to the year. This project has contributed to controlling flue gas from each household. However, since flue gas from industries also greatly contributes to a source of air pollution, a total approach is necessary in the future.

Table 5: Gas Supply Project in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Varpalota									
Gas Supply Capacity ($000m^3$/day)	N/A	N/A	57.0	57.0	57.0	57.0	57.0	57.0	57.0
Gas Production Volume (t/year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gas Sales Volume (m^3/day)	N/A	N/A	861	2,093	2,663	3,138	5,250	16,214	15,546
Population Served (%)	N/A	N/A	0.01	0.01	0.01	11.5	16.3	18.8	20.8
Berhida									
Gas Supply Capacity ($000m^3$/day)	N/A	N/A	16.2	16.2	16.2	16.2	16.2	16.2	16.2
Gas Production Volume (t/year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gas Sales Volume (m^3/day)	N/A	N/A	1,977	2,135	2,549	2,343	2,542	6,351	5,656
Population Served (%)	N/A	N/A	48.6	50.6	52.3	53.7	54.6	55.5	56.2
Osku									
Gas Supply Capacity ($000m^3$/day)	-	-	-	-	3.2	3.2	3.2	3.2	3.2
Gas Production Volume (t/year)	-	-	-	-	N/A	N/A	N/A	N/A	N/A
Gas Sales Volume (m^3/day)	-	-	-	-	153	874	820	1,021	1,003
Population Served (%)	-	-	-	-	40	51.3	55.4	57.5	60.4
Osi									
Gas Supply Capacity ($000m^3$/day)	-	-	-	5.9	5.9	5.9	5.9	5.9	5.9
Gas Production Volume (t/year)	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A
Gas Sales Volume (m^3/day)	-	-	-	620	1,113	1,121	962	1,113	1,144

Population Served (%)	-	-	-	55.6	66.8	72.0	75.3	78.6	81.8
Balatonalmadi (Vorosbereny Region)									
Gas Supply Capacity (000m^3/day)	N/A	N/A	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Gas Production Volume (t/year)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gas Sales Volume (m^3/day)	N/A	N/A	1,710	2,863	4,150	5,028	4,582	5,555	5,335
Population Served (%)	N/A	N/A	23.0	32.1	48.8	62.6	72.0	78.1	83.0

Source: Ministry of Environment, Government of Hungary.

Table 6: Heat Supply System Project in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Varpalota									
Steam Supply Houses (No.)	129	129	129	129	129	129	129	130	130
Steam Supply (Heat Output) (MW)	28.1	26.8	26.2	27.0	25.1	23.6	24.7	20.3	N/A

Source: Ministry of Environment, Government of Hungary.

Table 7: Content of Atmospheric Sulfur Dioxide, Nitrogen Compound and Ash Dust in the Project Area

	At Appraisal 1993	1994	1995	1996	1997	1998	Completion Year 1999	Second Year 2000	Third Year 2001
Sulfur Dioxide SO_2 (μg/m^3)									
Winter Season	12.77	13.6	11.7	13.1	20.28	11.2	12.45	13.30	10.0
Other Seasons	1.58	1.06	3.14	4.37	3.92	2.91	2.4	3.0	N/A
Nitrogen Compound NO_X (μg/m^3)									
Winter Season	14.39	14.65	18.05	20.53	20.21	20.25	18.35	20.0	19.2
Other Seasons	11.38	15.71	18.05	30.51	19.34	14.23	20.0	19.03	N/A
Ash Dust (g/m^2/mth)									
Winter Season	8.63	9.64	8.39	8.31	9.36	8.17	10.35	5.65	5.7
Other Seasons	10.05	8.72	8.24	8.28	6.57	7.63	6.86	7.8	N/A

Source: Ministry of Environment, Government of Hungary.

In addition, mainly for financial reasons, the rehabilitation of road surfaces, damaged by construction, has not been completed yet, leading to inconvenience of part of life. Early measures by municipal governments were requested.

④Recalculation of the Financial Internal Rate of Return (FIRR)

At appraisal, the financial internal rate of return (FIRR) of this project was estimated at 11.0 per cent in the water supply project, 5.5 per cent in the sewage project, and 4.0 per cent in the gas supply project. However, FIRR could not be recalculated because the executing agency did not have actual figures of necessary data when this investigation was made.

2.4 Impact

①Impacts on the improvement of residents' living environment

The authorities responsible for environmental monitoring in the Varpalota region are the Trans-Danubian Environmental Inspectorate, the Trans-Danubian Water Authority, and the Public Health Institute. They implement environmental monitoring according to environment-related regulations, and release annual reports to municipalities. Meanwhile, implementing agencies and companies also undertake regular environmental monitoring. As already explained in the sectionof 'Effectiveness', this project had a certain impact on the quality improvement of drinking water in Osk and Tes, but a positive impact on the fundamental quality improvement of water resources such as ground water and surface waterand the alleviation of air pollution cannot be confirmed in an obvious manner.

This project greatly improved the basic infrastructure and living environment by ensuring acquisition of safe water, a wide-spread use of sewage treatment system, and by shifting coal-fuel to gas-fuel. Between 1999 and 2000, the Central European University undertook a survey of public services, targeting 10 per cent of the adult population in 16 cities in Hungary (including Varpalota City). It revealed that satisfaction (answers of 'sufficiently satisfactory' or 'satisfactory') of Varopalota citizens regarding water supply, sewage and gas supply services by pipeline was turned out to be 82 per cent for water supply, 76 per cent for sewage and 85 per cent for gas supply,illustrating high satisfaction. Contrary to the identified problem of deteriorating sewage pollution and as low as 20 per cent in the area covered by gas services in Varpalota, as already mentioned in the section of 'Effectiveness', the result of this survey which showed an unexpected high satisfaction regarding water supply, sewage and gas supply services is more or less contradictory. Perhaps, looking at the pervasiveness of sewage use after the project implementation, which can be known from a comparison before and after the project, one can infer that the high satisfaction was a sign of citizens' appreciation.

③Other Impacts

To implement this project, the Association of the Municipalities (AOM) was established, composed of six mayors, as a parent organization for the contract with the actual contractor and for project implementation. The co-operative relationship between the neighboring municipalities is still working even after the project completion. Local development projects like this project, which is implemented by the association comprising from multiple municipalities, is the first experience in Central and Eastern Europe, and the municipalities were able to learn the superior aspects of the local development plan based on a mutually co-operative relationship. The Government of Hungary also prioritizes the allocation of developmental budgets for local development featuring regional co-operation between several municipalities. Municipalities are also enthusiastic to reinforce collaborations and to jointly work for future regional development plans.

2.5 Sustainability

①Water Supply and Sewage

The operation and maintenance of water supply and sewage in this project are undertaken by Bankoykaraszt Water and Sewage Works Plc. in five municipalities except Balatonalmadi, and by DRV North Balaton Territorial Directorate in Balatonalmadi. Bankoykaraszt Water and Sewage Works Plc. is a public cooperation that was established through joint investment by the municipalities concerned, and its Varpalota Unit (6 engineers, 9 desk workers and 78 technical experts) is directly involved in the operation and maintenance of this project in Varpalota, Berhida, Osku, Osi and Tes. Water supply is maintained by a modern system, which centrally monitors and controls wells, water tanks and water supply.

DRV is a government-owned enterprise, and its 53 staff (20 staff for maintenance) in North Balaton Territorial Directorate of DRV maintain this project in Balatonalmadi. Both organizations carry out ordinary and regular maintenance and continuous staff training. Since their operation and maintenance have been smooth even after the project completion, their staff scale and technical level in implementation appear to have no significant problems.

②Gas Supply

As regards the gas supply project in Varpalota, Berhida, Osku, Osi and Balatonalmadi, a gas company—called KÖGÁZ (a gas supply company owned by the municipalities concerned and private energy companies)—is involved in the operation and maintenance of the project entrusted

by the municipalities. Similar to the case of water supply and sewage, KÖGÁZ has been undertaking prescribed maintenance activities and continuous staff training, and making an effort to operate and maintain according to safety standards and ISO9001. Since operation and maintenance have been smooth even after the project completion, staff scales and technical levels in implementation appear to have no significant problems.

③Heat Supply Plants

The operation and maintenance of heating supply plants are undertaken by ÖKV—a public enterprise of Varpalota City. The facilities have been smoothly operated since the completion as well. No significant problems are observed.

Table 8: Operators in Charge of Operation and maintenance

Project	Maintenance Agencies	Targeted Location
Water Supply and Sewage	Bankoykaraszt Water and Sewage Works Plc.	Varpalota, Berhida, Osku Osi, Tes
	DRV North Balaton Territorial Directorate	Balatonalmadi
Gas Supply	KÖGÁZ	Varpalota, Berhida, Osku Osi, Balatonalmadi
Heat Supply System	ÖKV	Varpalota

Source: Ministry of the Environment, Government of Hungary.

④Financial Capacity of Implementing Agencies(KÖGÁZ)

Among the above three project operators, there were financial statements available only of KÖGÁZ. As regards the basic financial capacity of KÖGÁZ (1999), since KÖGÁZ is a facility-based industry, 0.82 per cent of total assets turnover and 77.5 per cent of capital-to-asset ratio are considered reasonable in its stability. But since the policy side adopts a policy of fixing a gas rate low all over the country, the profitability presumed from the net profit ratio of total capital(0.82%) and the net return on sales(1.06%) remains to be slightly low, though the net profit during the last 2 years is steadily increasing.

Table 9: KÖGÁZ Balance Sheet (Abstract)

Items	1998 (31, Dec.)	1999 (31, Dec.)	1998/99 Comparison	
	1,000 HUF	1,000 HUF	1,000 HUF	%
Assets				
1. Fixed Assets	17,460,755	20,854,092	3,393,337	19.43
(1) Intangible Fixed Assets	108,374	88,383	-19,991	-18.45
(2) Tangible Fixed Assets	17,126,047	20,477,696	3,351,649	19.57
(real estate)	14,751,906	18,362,079	3,610,173	24.47
(3) Investment and Other Assets	226,334	288,013	61,679	27.25
2. Current Assets	5,430,935	3,347,130	-2,083,805	-38.37
(1) Stock	44,444	50,377	5,933	13.35
(2) Account Receivable	5,037,054	2,974,252	-2,062,802	-40.95
(3) Marketable Securities	102,693	322,131	219,438	213.68
(4) Quick Assets	246,744	370	-246,374	-99.85
3. Prepaid Expense	1,249,659	2,305,772	1,056,113	84.51
Total Assets	24,141,349	26,506,994	2,365,645	9.80
Liabilities				
4. Liabilities	6,433,884	6,573,642	139,758	2.17
(1) Fixed Liabilities	29,987	10,645	-19,342	-64.50
(2) Short-term Liabilities	6,403,897	6,562,997	159,100	2.48
5. Unpaid Account	3,205,722	5,113,316	1,907,594	59.51
Capital				
6. Capital Account	14,318,932	14,537,984	219,052	1.53
(net profit of current term)	223,201	219,052		
7. Reserve Fund	182,811	282,052	99,241	54.29
Total of Liabilities–Capital	24,141,349	26,506,994	2,365,645	9.80

Source: KÖGÁZ

Table 10: KÖGÁZ Profit-and-Loss Statement (Abstract)

Items	1998 (31, Dec.)	1999 (31, Dec.)	1998/99 Comparison	
	1,000 HUF	1,000 HUF	1,000 HUF	%
1. Sales	19,827,701	20,562,988	735,287	3.71
2. Other Incomes	365,703	246,575	-119,128	-32.58
3. Income from Self-owned Resources	154,583	213,093	58,510	37.85
4. Raw Material Costs	16,675,091	16,630,509	-44,582	-0.27
5. Employment Costs	1,316,885	1,434,378	117,493	8.92
6. Depreciation Allowance	1,342,802	1,634,926	292,124	21.75
7. Other Costs	891,438	947,515	56,077	6.29
I. Gross Profit on Sales	121,771	375,328	253,557	208.22
8. Interest Earned and Dividend	101,066	34,175	-66,891	-66.19
9. Interest Due	76,411	340,672	264,261	345.84
II. Non-operating Profit	24,655	-306,497	-331,152	-1,343.14
III. Operating Profit	146,426	68,831	-77,595	-52.99
IV. Special Profit	76,775	150,221	73,446	95.66
V. Income before Taxes	223,201	219,052	-4,149	-1.86
10. Tax	0	0	0	0,00
VI. After-Tax Profit	223,201	219,052	-4,149	-1.86
VII. Net Profit of Current Term	223,201	219,052	-4,149	-1.86

Source: KÖGÁZ

④Other

The borrower in this project was the Government of Hungary. The reimbursement of the ODA loan was completed at the same time as the project completion. Based on an agreement between the central government and the municipalities, 25 per cent of the local currency portion of the project cost was supposed to be paid by the municipalities concerned, and it took the form of government finance with no interest from the central government to municipalities. Reimbursement from the municipalities to the central government was supposed to be started from 2001. The municipalities therefore gradually raised the fees for water supply and sewage, except for gas, for which the central government provides permissions, in order to account for the reimbursement fund. Besides, in Balatonalmadi, a building tax which targeted buildings like new hotels, was introduced and came into effect from 2000 as a special tax revenue for reimbursement fund. However, while further increase of the fees are necessary to sufficiently meet project costs, this is not easy when considering residents' payment capacity. Basically, it is a matter between the Government of Hungary and the municipalities, but the problem of securing sources of finance for reimbursing from the local municipalities to to the central government is a task that must be tackled continuously.

Comparison of Original Plan and Actual Scope

Item	Plan	Actual
① Project Scope		
I. Water Supply		
a. Varpalota		
- Well	2 wells	Cancelled
- Pipeline	Totally 10.5 km	Totally 20.7 km
- Storage Tank	5 tanks (total capacity: 3,400 m^3)	6 tanks (total capacity: 2,600 m^3)
- Pumping Station	2 stations (500 m^3/h. each)	3 stations
b. Osku		
- Pipeline	Total 4.0 km	same as original
- Storage Tank	1 tank (500 m^3)	Cancelled
c. Tes		
- Well	1 well	Cancelled
- Pipeline	Total 1.7 km	Total 7.7 km
d. Balatonalmadi		
- Well	1 well	Cancelled
- Pipeline	Total 2.2 km	Total 2.1 km
- Storage Tank	1 tank (500 m^3)	Cancelled
- Pumping Station	-	1 station (added)
II. Sewage		
a. Varpalota (Pet and Inota, included)		
- Sewer System	Total 52.2 km	Total 50.55 km
- Sewage Treatment Plant	2 plants 1) Inota: 7,300 m^3/day 2) Pet: 1,500 m^3/day	1 plant (Varpalota+Inota: 6,000 m^3/day)
- Compost Plant	1 plant	same as original
b. Osku		
- Sewer System	Total 18.9 km	Total 19.32 km
- Sewage Treatment Plant	1 plant (350 m^3/day)	same as original
c. Tes		
- Sewer System	Total 7.26 km	Total 10.43 km
- Sewage Treatment Plant	1 plant (150 m^3/day)	same as original
d. Berhida		
- Sewer System	Total 16.1 km	Total 39.08 km (Papkeszi, included)
- Sewage Treatment Plant	1 plant (720 m^3/day) (Extension of the original plant)	same as original
e. Osi		
- Sewer System	Total 14.1 km	Total 13.80 km
- Sewage Treatment Plant	1 plant (400 m^3/day)	1 plant (350 m^3/day)
f. Balatonalmadi		
- Sewer System	Total 6.85 km	Total 22.56 km
III. Gas Supply		
a. Varpalota		
- Distribution System	Total 77.20 km	Total 76.81 km
b. Berhida		
- Distribution System	Total 4.47 km	Total 8.73 km
c. Osku		
- Distribution System	Total 20.32 km	Total 15.24 km
d. Osi		
- Distribution System	Total 17.32 km	Total 1.82 km
e. Balatonalmadi		
- Distribution System	Total 42.54 km	Total 52.8 km
VI. Heating Plant		
a. Varpalota		

- Heating Power Plants	2 plants (Varpalota and Petfurdo)	1 plant (Varpalota)
②Construction Period Overall Construction Period	November, 1994－December, 1988 (50 months)	September, 1995–April, 1999 (44 months)
③Project Cost		
Foreign Currency	968 million yen	704 million yen
Local Currency	7,222 million yen	7,073 million yen
Total	8,190 million yen	7,777 million yen
Out of which JBIC Yen loan portion	4,914 million yen	4,614 million yen
Exchange Rate	1 HUF＝1.41 yen	1 HUF＝0.64 yen