Kenya

Joint Evaluation for Water Supply and Sewerage Projects in Nakuru

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1 Project Profile and Outlines of Japan's ODA Assistance

1) Background

The Greater Nakuru Water Supply Project was implemented as an element of Japan 's aid to Kenya, using an ODA loan, to provide a water supply to the eastern division of the Greater Nakuru District. It was followed by a feasibility study for the Nakuru Sewage Works Rehabilitation and Expansion Project , and the implementation of that project, using grant aid. These projects rehabilitated and expanded water supply and sewerage treatment facilities in the region. Water supply and sewerage/waste water are in an inseparably close relationship, and the development of both in a mutually effective way yields the maximum benefit for urban environmental infrastructure. Therefore, Japan Bank for International Cooperation (JBIC) and Japan International Cooperation Agency (JICA) have come jointly together to conduct a joint ex-post evaluation of the total effect of the water supply and sewerage projects.

Nakuru Municipality, which is the main beneficiary of these projects, is Kenya 's fourth largest city, with a population of approximately 360,000 people. It is Kenya 's primary tourist location, having Lake Nakuru, which is a famous Flamingo habitat (protected territory under the Ramsar Convention). Lake Nakuru is a closed lake with no outflowing rivers. All household and industrial waste water generated in Nakuru and the surrounding area flows into the lake, causing concern over pollution. Therefore, this evaluation investigated the impact of the projects on the water quality and ecology of Lake Nakuru.

2) Objectives

The Greater Nakuru Water Supply Project (referred to below as the water supply project) was intended to build water supply facilities for the eastern division of the Greater Nakuru District (referred to below as the project areas). The project area has Nakuru Municipality, the capital city of Kenya 's Rift Valley Province, at its center. The water supply project was intended to alleviate the water shortage in the area, improve living standards and promote economic development.

The Nakuru Sewage Works Rehabilitation and Expansion Project (referred to below as the sewerage project)

addresses concerns over the water quality in Lake Nakuru following the increase in sewerage volume resulting from increased water supply, which caused restrictions on the volume of water supply. The sewerage project is intended to reduce the turbidity load from the urban area of Nakuru Municipality, and contribute to improving water quality in Lake Nakuru.

3) Project Scope

The water supply project used an ODA loan to build water supply facilities with capacity for 17,000m³/d in order to meet the water supply demand in the project area until 1995.

<Outline of the water supply project component>

①Construction of new water intake, aqueduct, treatment, conveyance and distribution facilities

②Rehabilitation of existing facilities

The sewerage project refurbished and expanded sewage works at two locations in Nakuru Municipality, and built a rainwater detention pond and water quality testing laboratory to protect the water quality in Lake Nakuru.

<Outline of the sewerage project component>

①Refurbishment and expansion of existing sewage treatment works (two locations)

②Construction of a new rainwater detention pond

③Refurbishment of pumping facilities

④Construction of a water quality testing laboratory and procurement of water quality testing equipment and materials

⑤Procurement of equipment and materials for maintenance (vehicles etc.)

4) Borrower / Executing Agency

(ODA Loan) Borrower: Government of the Republic of Kenya

Executing Agency: Ministry of Water Development (MOWD)

(Grant Aid) Executing Agency: Ministry of Local Government (MOLG)

5) Outline of Assistance

Loan Amount/ Loan Disbursed Amount	¥5,017 million / ¥4,984 million (Including costs of implementation design and construction supervision for the urgent expansion of sewage treatment works Note)
Exchange of Notes/Loan Agreement	December 1986 / March 1987
Terms and Conditions	Interest rate: 3.5%, Repayment period: 30 years (10 years for grace period), Partial Untied
Final Disbursement Date	September 1994
Grant Aid Amount	(Phase Ⅰ) ¥1,421 million, (Phase Ⅱ) ¥1,383 million
Exchange of Notes	(Phase Ⅰ) August 1994, (Phase Ⅱ) May 1995

(The first phase covered the Town sewage treatment works, and the second phase covered the Njoro sewage treatment works).

Note The start of water supply would inevitably result in an increase of polluted water flow into Lake Nakuru. Therefore, at the time of the water supply project appraisal, the plan was that the Kenyan side would take steps to deal with the increased sewage flow caused by increased water supply, but it was unable to take independent steps for sewage treatment, leading to concern that water quality in Lake Nakuru would be adversely affected. In April 1990, this situation led the Kenyan government to ask the Japanese government for a grant aid for the rehabilitation and expansion of existing sewage works. The Japanese government asked the Kenyan government to take appropriate steps for environmental protection, based on the provision of that assistance, and the start of water supply to Nakuru Municipality was delayed while remedial action was taken. The decision was taken to use past ODA loan funds (the ODA loan for the water supply project, and counterpart funds on the loans provided in 1991 and 1993 for the Financial Sector Adjustment Loan and the Export Development Loan) to build sewage treatment facilities with peak capacity of 6,000m³/day.

2 Results and Evaluation

■ Water Supply Project

The facilities for the water supply project were completed as planned, with no significant functional problems. The results of the social survey show a general benefit in the levels of health and hygiene among the beneficiaries. The setting of water supply charges lower than the cost of water procurement, and other factors, have put the Nakuru Quality Water and Sanitation Services Company Ltd. (NAQWASS) in a poor business position, so that it cannot obtain adequate water supplies from the Nakuru Water Conservation and Pipeline Corporation (NWCPC), which is the water source. Therefore the water supply volume at the time of evaluation was 60~70% of the planned volume.

Nevertheless, as the water supplied by this project amounted to nearly 30% of the water supply in Nakuru Municipality, the project has had a degree of effect in alleviating the city's water supply shortage. While improvement is still required in water quality testing and management systems etc., there have been no notable problems to date in the quality of the supplied water. There is no data for water revenue non-collection; the executing agency estimates that around 60% is lost to leakage and water theft.

The sustainability and independent realization of effects from this project requires improved management by the water supply agency in Nakuru Municipality (installation of meters, improved fee collection systems and other measures to improve the fee non-collection rate, increased water charges etc.) in order to increase the volume of water supplied by this project to reach the planned supply volume.

■ Sewerage Project

The facilities for the sewerage project were completed according to the basic design and they have no notable functional problems. However, while the rehabilitation and expansion works have eliminated the previous overload on the facilities, the sewerage connection rate is low, the sewer network suffers from leakage, and the water supply volume in Nakuru Municipality is lower than planned, resulting in low volume of sewage water inflow to the sewage treatment works. The work rate has not risen above around 70% of treatment capacity. There are no notable problems with the quality of the treated water, and the sewerage project can be credited with helping to reduce the load on the aquatic environment of Lake Nakuru.

As sewerage projects themselves do not yield any direct economic benefits, they are often accorded a low development priority. Such projects face difficulties because, in the face of that situation, their facilities must receive proper maintenance as they realize sustained and independent effects. The water quality testing laboratory, which is not necessarily used to the full at present, must be brought up to full operation urgently by encouraging the Kenyan government to adopt an operation plan and carry out necessary development work to support it. If the quality of treated sewage water is to be maintained, the facilities and equipment must be used effectively and receive proper maintenance, and greater efforts must be exerted on the regulation of factory waste water entering the facilities. A comprehensive approach to the treatment of sewage water and factory waste water would be desirable.

■ Third-party Evaluation on Environmental Impact

This evaluation included a third-party evaluation of the environmental impact of the water supply and sewerage projects on Lake Nakuru. The following is a summary of that report.

Overall Conservation of Lake Nakuru and its Catchment Area:

by Dr. Masahisa Nakamura, Lake Biwa Research Institute

As noted in the other section, the facilities are functioning in line with their initial purpose, as part of a series of projects developing the environmental infrastructure of Nakuru Municipality with Japanese cooperation. The water supply and sewage treatment facilities built through this ongoing cooperation is essential urban infrastructure for the development of Nakuru, and they are important factors in the urbanization, industrialization and population concentration of Nakuru Municipality. However, if one considers the relationship between environmental infrastructure development and the sustainable development of the region as a whole, there are concerns over the gap relative to the basic service level in areas not covered by the projects, the rapid conversion of surrounding forests to farmland to sustain the growing population, and the increased use of agricultural chemicals on that farmland. There is a growing need for integrated conservation of Nakuru Municipality and its surrounding area. The facilities built under this project are very important for the future conservation of the entire catchment area of Lake Nakuru. Consideration must be given to follow-up measures to strengthen the functions of the water quality testing laboratory, to take measures against harmful chemicals and to gather scientific opinion for the integrated conservation of the whole Lake Nakuru area.

The Natural Environment of Lake Nakuru and Recent Changes in its Ecology:

by Dr. Shigeo Tsujimura, Lake Biwa Research Institute

Lake Nakuru, which is a sealed lake, has three important characteristics. It is an alkali soda lake, it is nutrient rich, and it is subject to extreme changes in water level. The first two characteristics increase the growth of the spirulina plant plankton on which the small flamingos feed, but the last characteristic reduces the spirulina population. When the change in water level reduces the spirulina population, the small flamingos move to another alkali soda lake which offers more feed, so it is natural for the small flamingos to be temporarily absent from the lake. When considering the ecology of the small flamingo, it is important to take a broader view of whether or not the entire group of alkali soda lakes which dot the Rift Valley provide the flamingos with a stable supply of food.

In recent years it has been suggested that, besides the water level fluctuation, the spirulina population might be under pressure from organic contamination and heavy metal pollution. Heavy metal pollution is also said to be a cause of mass deaths of flamingos. The sewerage project appears to be helping to prevent organic contamination and heavy metal pollution, but treatment for heavy metals is outside the original purpose of the sewage works, and much waste water does not pass through the sewage works, which means that the heavy metal problem will be difficult to tackle through treatment alone. More reliable methods need to be employed alongside the sewerage project, such as mandatory primary treatment of waste water in factories and guidance in the usage of agricultural chemicals. A comprehensive environmental conservation plan must be drawn up urgently to protect the environment of Lake Nakuru.

The Impact of Changes in the Aquatic Environment of Lake Nakuru on the Flamingos and Other Waterfowl:

by Dr. Ryozo Kakizawa, Yamashina Institute for Ornithology

The small flamingos of East Africa form the largest flocks of the species in world, but many aspects, such as flamingo numbers and their ecology, remain unclear. The water level in Lake Nakuru varies widely, and that natural variation greatly exceeds the change in water level expected to result from the implementation of the Greater Nakuru Water Supply Project . The relationship between the water level fluctuation in Lake Nakuru and the number of migrant flamingos coming to the lake is that the number of flamingos tends to increase at times of higher water level, but the flamingo population also rises and falls without relation to changes in water level. The number of migrant flamingos coming to

Lake Nakuru is strongly influenced by conditions in other nearby soda lakes and the mating behavior of the birds. It is not controlled solely by the lake water level. Therefore the flamingos are not suitable organisms for use as an indicator of water quality. Fish-eating waterfowl would be more suitable indicators of water quality, and using them as an indicator we can infer that there may have been a degradation of water quality in Lake Nakuru.

3 Lessons Learned

The financial problems of the water supply operator for Nakuru Municipality in this project have prevented the volume of water supplied to the city from reaching the planned level. The need to improve the financial position was recognized at the time of the appraisal, but despite the Kenyan government's efforts to improve the management of water supply and sewerage operations through privatization, the resulting improvement has been inadequate. Raising water charges would probably be difficult due to political factors, but there are many other points where improvements could be made through management efforts in the field, such as the establishment of an efficient charge collection system, meter installation and stronger control of illegal water usage, which would cut the non-collection rate. Measures to improve the management of the water supply business (including the implementation of management consulting services and follow-up by JICA experts) should have been considered at the project formulation and appraisal stages.

4 Recommendations

1) Points for Improvement in Operation and Maintenance

This evaluation has observed the need for the improvement of the following aspects of the operation and maintenance of the water supply and sewerage projects. The related Kenyan agencies must take urgent action to realize the sustained effects of the project.

①Non-collection and water leakage should be reduced and more appropriate water charges should be adopted to secure the volume of water supply to Nakuru Municipality.

②Water quality management at the water treatment works needs to be improved.

③Appropriate operation and maintenance work needs to be carried out at the sewage treatment works and the rainwater detention pond.

④The water quality testing laboratory should be fully used (improvement in its operation and the content of its work in order to strengthen its water quality monitoring functions).

2) Adoption of a Comprehensive Environmental Conservation Plan for the Whole Lake Nakuru Catchment Area

For the conservation of the environment of Lake Nakuru, the contribution made by sewage treatment works developed under this project to prevent pollution of the Lake has been confirmed. However, agricultural waste water, factory waste water, urban garbage, industrial waste and other pollutants generated in and around Nakuru Municipality go beyond the scope of the sewage treatment works' treatment operations, and there is concern over ongoing pollution of the lake from these factors.

In addition to the this project, new measures are needed to reduce the load on Lake Nakuru, such as mandatory primary treatment of waste water in factories and guidance in the usage of agricultural chemicals. A comprehensive environmental conservation plan covering the whole of Nakuru Municipality and its surroundings must be drawn up. At that stage there

must be an awareness of water as the keyword linking human activity around Lake Nakuru with the natural environment of the lake and its surroundings, and therefore water management based on that awareness should be the starting point for preparing the plan.

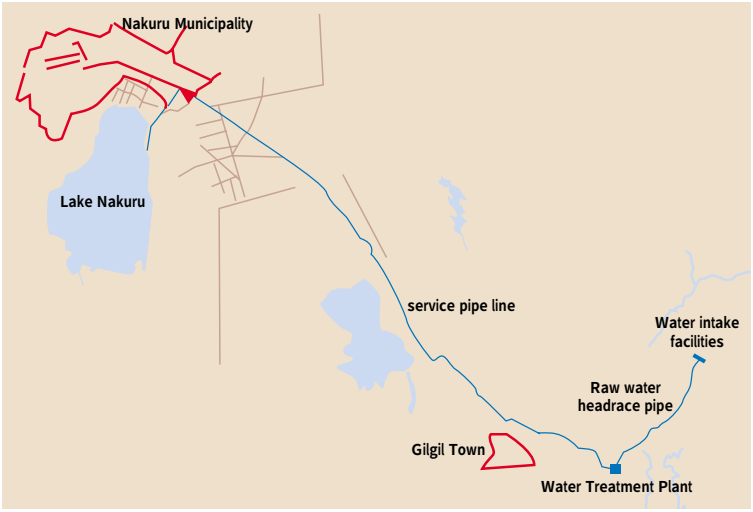
Comparison of Original and Actual Scope

Greater Nakuru Water Supply Project (ODA Loan)

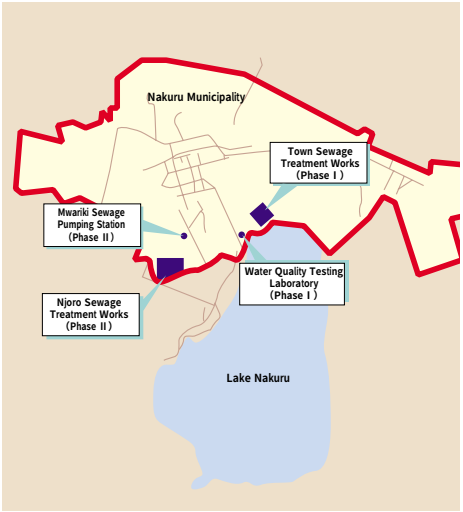
Item	Plan	Actual
1. Project Scope ① Construction of water intake facilities ② Construction of aqueduct facilities ③ Construction of water cleaning facilities ④ Construction of water-conveyance facilities ⑤ Construction of water distribution facilities ⑥ Rehabilitation of existing facilities	Facility capacity 17,000m³/day Construction of 2.7km aqueducts (pump-up method) Facility capability 17,000m³/day Construction of 44.2km service pipe line Development of distributing reservoir and drain pipe network Water intake, treatment and distribution facilities	Facility capacity 18,000m³/day Construction of 9.5km aqueducts (natural water flow method) Facility capability 18,000m³/day Construction of 49km service pipe line Development of distributing reservoir and drain pipe network Water treatment and distribution facilities
2. Implementation Schedule ● Consulting Service ● Main construction (water supply) ● Main construction (emergency expansion of sewage treatment works)	Nov. 1986～Jun. 1990 Jul. 1988～Jun. 1990 Not initially planned	Oct. 1987～Oct. 1994 Jan. 1990～Jan. 1992 Jan. 1994～Sep. 1994
3. Project Cost Foreign Currency Local Currency Total ODA Loan Portion Exchange Rate	¥3,512 million 127KSh ¥5,481 million ¥5,017 million 1KSh=¥15.6 (Aug. 1985)	¥3,540 million 446 KSh ¥5,092 million Note1 ¥4,979 million 1KSh=¥3.48 (end of 1992) Note2

Note 1 The project cost includes costs of implementation design and construction supervision for the urgent expansion of sewage treatment works (the building of a 6,000m³/day line at the Njoro Sewage Treatment Works).

Note 2 The exchange rate is the value recorded in the report submitted by the executing agency.



Water Supply Project



Sewerage Project

Water Treatment Plant

Njoro Sewage Treatment Works

Lake Nakuru and Flamingos