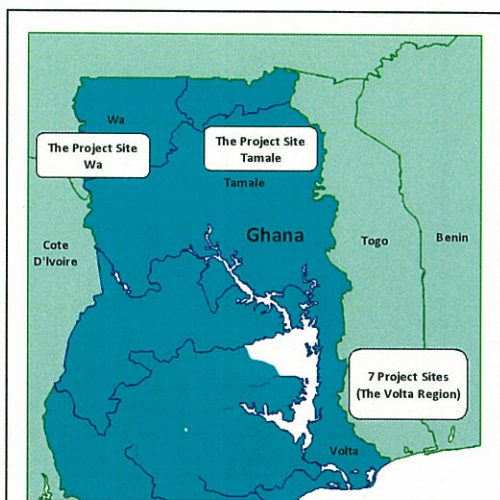


Ex-Post Monitoring of Completed ODA Loan Project  
 Republic of Ghana

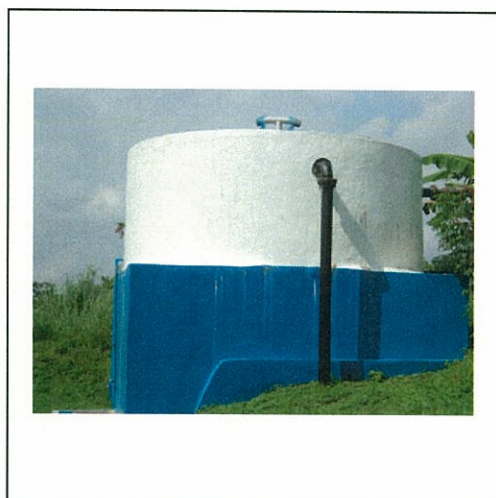
Water Sector Rehabilitation Project

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 INGEROSEC Corporation

**1. Project Description**



**Location of the Project Site**



**Facility in Hohoe**

**1.1 Project Objective**

The objective of this project is to improve the water supply services of the country by providing tools and equipment necessary for rehabilitation of the water supply facilities and maintenance of the nationwide water supply system in a total of 9 water supply facilities, located in the Volta Region and the northern area of the country, thereby contributing to improvement of hygiene standards for citizens of the Republic of Ghana and the development of an infrastructure conducive to the country's industrial development.

**1.2 Outline of the Loan Agreement**

Approved Amount/ Disbursed Amount	5,444 million yen/5,369 million yen
Loan Agreement Signing Date/final Disbursement Date	March, 1994/December, 2000
Ex-post Evaluation	Fiscal Year 2005
Executing Agency	Ghana Water Company, Limited (GWCL)
Main Contractor	Kanematsu Corporation (Japan), Sogea (France)
Main Consultant	COWI Consulting Engineering (Denmark)

### **1.3 Background of Ex-post Monitoring**

During the serious economic crisis in the 1970s and early 1980s, the water supply system in the Republic of Ghana was deteriorated, with over one third of the existing system was dysfunctional. The water service coverage ratio was only 40%, lower than the average of Sub-Saharan Africa. On the other hand, water demand was expanding due to rapid population growth in urban areas. Thereby, the government of Ghana requested the assistance from the government of Japan for rehabilitation of water sector as a matter of priority. Subsequently, the government of Japan decided to implement “the Water Sector Rehabilitation Project” to increase efficiency of water supply of 9 water supply facilities in the Volta Region and the northern area of the country.

However, as a result of the ex-post evaluation in 2006, the following issues were pointed out:

- 1) In the implementing organization, Ghana Water Company Limited (hereinafter referred to as “GWCL”), the management of data necessary for operation and maintenance of the water supply facilities was insufficient, data was not recorded, or was recorded on paper media but not organized. Analysis and verification of the existing data was not carried out, and the reliability of the data was low.
- 2) Because sharing of data from each facility to GWCL headquarters was insufficient, GWCL headquarters did not grasp the status of operation of the facilities, and appropriate business management was not implemented.
- 3) The NRW ratio in the region covered by this project was high at 30.3%, and the water charge was not paid in accordance with the quantity used.

Therefore, based on the above issues concerning project effectiveness and sustainability that were observed during the ex-post evaluation, this project was selected for ex-post monitoring and reviewed under each criterion with the findings from the field survey and other research activities with a final conclusion being drawn.

## **2. Outline of the Monitoring Study**

### **2.1 Duration of Monitoring Study**

Duration of the Study: March 2011 to January 2012

Duration of the Field Study: 16 to 30 July, 2011

### **2.2 Constraints during the Monitoring Study**

There are 9 water supply facilities, covered by the Project. The Volta Regional Office of GWCL provided data on 7 facilities. For the remaining 2 facilities (Tamale and

Wa), however, no data were available from GWCL headquarters. Thus, the evaluation team had to rely on interviews with GWCL officials and existing source material due to time and location constraints. The facilities to be visited were limited to the following 3 facilities that have been arranged to receive the mission: Hohoe, Nkonya-Ahenkro, and Sovie-Digbe.

In addition, in June 2011, GWCL changed their contractor from Aqua Vitten Rand Limited (hereinafter referred to as “AVRL”) to a newly established company, Ghana Urban Water Limited (hereinafter referred to as “GUWL”)<sup>1</sup>. According to GWCL, at the time of the ex-post monitoring, the operational systems under the contract with GUWL, the roles, responsibilities, and the organizational structure (capital size, personnel deployment, etc.) of the company had not been defined, which had caused an obstacle to the survey of the project sustainability.

### 3. Monitoring Results

#### 3.1 Effectiveness

##### 3.1.1 Quantitative Effects

###### (1) Changes in average daily water supply volume

As Table 1 shows, the water supply volume at facilities in Ho and Hohoe exceeded the values of the ex-post evaluation, and were hence considered as achieving a certain level of result. Likewise, as Table 2 indicates, the facility utilization ratio was 59% in Ho and 71% in Hohoe, respectively. Meanwhile, the water supply volume at facilities in Nkonya-Ahenkro and Denu-Aflao fell below the values recorded in the ex-post evaluation, and the facility utilization ratio was at 38% and 31%, respectively.

At the large-scale facilities (i.e. facilities where large-scale water intake equipment and treatment equipment are installed: in the Volta Region, this corresponds to Ho, Hohoe, and Keta-Anloga), GWCL headquarters have prepared annual maintenance plans, and maintenance is carried out in accordance with the plans. Thus the quantity of water supplied and the facility utilization ratio exceeded the planned values.

However, at the small-scale facilities (i.e. facilities with small-scale water intake equipment installed, that treat the water with simple filters: this corresponds to

Large-scale facility (Ho)



Small-scale facility (Sovie-Digbe)



<sup>1</sup> A company that is 100% owned by the Government of Ghana.



Nkonya-Ahenkro, Sovie-Digbe, etc.), maintenance is not sufficiently implemented, which affected the status of operation of the facilities. Also, according to the explanation of GWCL, the reason that the quantity of water supplied at Denu-Aflao reduced was because an elevated tank had a breakdown, and another tank in a nearby location was used instead. Although the latest data for Tamale in the North and Wa in the Northwest was not provided, judging from the 2008 data, it is considered that the planned values are being achieved.

Table 1: Water Supply Volume in 9 facilities (m<sup>3</sup>/day)

	Planned	Ex-post evaluation (2006)	Ex-post monitoring (2010)
Ho	1,260	7,747.6	8,923*
Hohoe	2,400	1,507	1,800
Nkonya-Ahenklo	226	57	36
Sovie-Digbe	196	51.0	57
Anyako	600	271	-
Keta-Anloga	4,600	2,972.9	-
Denu-Aflao	2,330	357.4	94
Tamale	15,900	17,770	19,248**
Wa	1,490	1,117	1,339**

Note: \* indicates figures for 2009 and \*\* for 2008.

Source: GWCL

Table 2: Facility Utilization Ratio in 9 facilities (%)

	Ex-post evaluation (2006)	Ex-post monitoring (2010)
Ho	52	59*
Hohoe	66	71
Nkonya-Ahenklo	61	38
Sovie-Digbe	27	31
Anyako	81	-
Keta-Anloga	41	-
Denu-Aflao	37	10
Tamale	91	98**
Wa	97	116**

Notes: \* indicates figures for 2009 and \*\* for 2008.

Source: GWCL

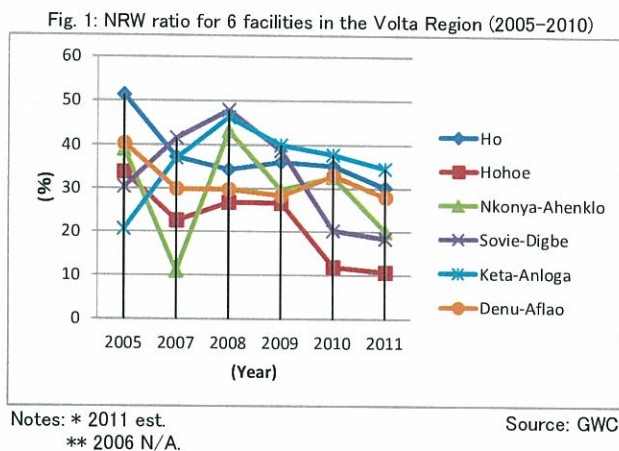
The facility utilization ratio = water supply volume(m<sup>3</sup>/day)/capacity of facility after the project

## (2) Transition in the NRW ratio

Figure 1 shows the transition in the NRW ratio for 6 facilities in the Volta Region. The average NRW ratio for the 6 facilities is 23.6% (2011 est.), and although there are fluctuations, it has improved from 30% at the time of the ex-post evaluation.

According to hearing surveys with GWCL, the reasons for the improvement in the NRW ratio were (1) implementation of the World Bank's "Urban Water Project"<sup>2</sup>, and (2) establishment of the system of water tariffs by GWCL<sup>3</sup>.

However, the values of the NRW ratio for all the facilities fluctuate greatly. Time was not allocated to investigate the reasons for this during the period of the field survey, but based on the interviews with GWCL and reports, it was confirmed that there were issues such as (1) the rate for normally-functioning customers' meters is low at about 40%, so the accurate quantity of water used is not known<sup>4</sup>, and (2) at some facilities, the water flow meters that measure the quantity of water supplied are faulty<sup>5</sup>. It was inferred that because the measurement by meters is insufficient, it is not possible to calculate the NRW ratio based on the accurate quantities of water supplied, quantities of water distributed, and quantities of water consumed, etc., which is the reason that the numbers fluctuate significantly. It is necessary that GWCL continues its efforts to grasp the status of water supply and water distribution based on accurate data, and to investigate appropriate



<sup>2</sup> In the World Bank "Urban Water Project", initiatives to strengthen the capabilities of GWCL were undertaken by commissioning AVRIL to manage the water supply and sewage operations for 5 years from 2006, and to use AVRIL's know-how. Specifically, initiatives were undertaken to (1) identify the data necessary for operation and management, (2) data management and sharing by use of IT, (3) training in GIS (geographical information systems) with the objective of determining the water distribution status (leaks, water theft) in the water supply areas, (4) organization management training with the objective of building the capabilities of the staff in management aspects, and (5) improvement in customer response. The results of these initiatives included improvement of meter percentage (from 48% in 2005 to 74% in 2010), introduction of personal computers into GWCL, establishment of a "Customer Response Plan", and establishment of a call center.

<sup>3</sup> In order to improve customers ratio for installation of meters, GWCL have set the water charges for households without meters higher than the charges for households with meters, and are recommending installation of meters (household without meter installed: 520 Ghana pesewa (uniform charge), households with meter installed: 80 Ghana pesewa (20 liters or less), 120 Ghana pesewa (21 liters or higher), as of 2010).

<sup>4</sup> Periodic inspection and replacement of customers' meters is not carried out, so there is a possibility that customers ratio for installation of meters have been calculated including meters that are not functioning properly (GWCL/AVRIL report (2011)).

<sup>5</sup> In small-scale facilities, examples were found where aged and non-functioning water flow meters had not been replaced and continued to be used. At these facilities, it seems that quantities of water supplied and delivered are estimated based on the pump flow rates and past records (GWCL/AVRIL report (2011) and hearing survey with GWCL).

measures against non-revenue water.

### (3) Water quality

From Table 3 below, the quality of water in all the areas monitored in this ex-post monitoring study satisfied Ghana's water quality standards for turbidity, pH and residual chlorine content. Therefore, it is evident that the quality of water in these regions presents no problems for use as daily life water (also as drinking water)<sup>6</sup>. According to GWCL headquarters, no complaints from residents were reported concerning the occurrence water-related disease, and hence considered to have no particular concerns for water quality.

Table 3: Water Quality (as of 2011)

	Turbidity (<5 NTU*)		pH (6.5-8.5*)		Residual chlorine (0.5mg/l*)	
	Raw water	Treated water	Raw water	Treated water	Raw water	Treated water
Ho	0.8	0.0	7.0	8.5	-	0.3
Hohoe	15	1.0	6.9	8.4	-	0.5
Nkonya-Ahenklo	0.0	1.0	6.5	6.5	-	-
Sovie-Digbe	1.0	4.0	6.8	6.6	-	0.8
Anyako	N/A. The facility was taken over from GWCL to the Community Water and Sanitation Agency.					
Keta-Anloga	2.0	1.4	7.3	8.3	-	0.4
Denu-Aflao	0.0	0.5	7.3	7.3	-	0.3
Tamale Wa	N/A. Data were unavailable from GWCL headquarters.					

Notes: \*Ghana standard values

Source: Response from GWCL

#### 3.1.1.1 Results of Calculations of Internal Rates of Return (IRR)

When the ex-post evaluation was conducted, neither the financial internal rate of return (FIRR) nor the economic internal rate of return (EIRR) were calculated. In addition, during this ex-post monitoring, since data on maintenance budgets were unavailable, it was decided not to calculate FIRR or EIRR.

#### 3.1.2 Qualitative Effects

According to the interviews with GWCL Volta Regional Office and water supply

<sup>6</sup> The water quality standards that have been set as shown in Table 3 compare favourably with the WHO standards.

facilities at Hohoe, Sovie-Digbe and Nkonya-Ahenklo, no complaints from residents were reported concerning the water supply service hours, service disruption frequency or water quality.

Staff at the water supply facilities, however, reported that no water supply service was available during the night at the facilities in Nkonya-Ahenklo. Also in Sovie-Digbe, since no generator had been installed and the power supply was unstable when it rained, the water supply was frequently cut off during rainy times or backwashing operations. Under such circumstances, the evaluation reached in the beneficiary survey conducted during the ex-post evaluation (water supply service hours and service disruption frequency) has possibly deteriorated.

### 3.2 Impact

#### 3.2.1 Improvement of public hygiene

The official statistics concerning source of drinking water, provided by GWCL as the latest official data are the same as presented in the ex-post evaluation. According to the GWCL Volta Regional Office, there has been no major change in the share of water sources in the Volta Region from the share shown in the data.

Table 4: Source of Drinking Water

	Spring and rain water	River/ Stream	Borehole	Tap water	Others
Volta Region	5.8%	25.7%	32.3%	24.9%	11.3%
Wa	11.4%	9.3%	48.0%	22.3%	9.0%
Tamale	2.8%		2.3%	78.9%	16.0%

Source: 2000 National Census

According to an interviews with GWCL, the access times of the residents to water and the effect on the health status of the residents have not been identified at each GWCL facility. In the site survey, it was confirmed that the water is cut off during rainy times or during backwashing operations. However, GWCL states that there have been no reports of complaints from the residents regarding the water supply times, the frequency of cut-off of water supply, or water quality. As stated previously, no problems in the water quality as water for daily life (drinking water) have been found. Consequently, it can be said that there has been no negative impact such as a worsening of public sanitation etc. since the ex-post evaluation.

#### 3.2.2 Impact on the environment

As this project did not involve any large-scale construction, there was no impact on

the environment. Also, from the results of a hearing survey with GWCL Volta Region office, there has been no adverse effect such as change to the living environment due to deteriorating water quality and etc. since the ex-post evaluation.

### 3.3. Sustainability

#### 3.3.1 Structural Aspects of Operation and Maintenance

In order to enhance the management capacities under the PPP scheme as part of the World Bank's "Urban Water Project," AVRIL was responsible for overall management under the contract with GWCL. During a five year management contract signed between GWCL and AVRIL, a total of 1,500 officials at GWCL, excluding those working at GWCL headquarters (2,500 officials), were transferred to AVRIL on loan. In addition to the 1,500 officials transferred from GWCL, AVRIL newly employed 1,500 persons and performed operation and maintenance with a total of 3,000 staff members.

In June 2011, when the contract between GWCL and AVRIL expired, however, GWCL

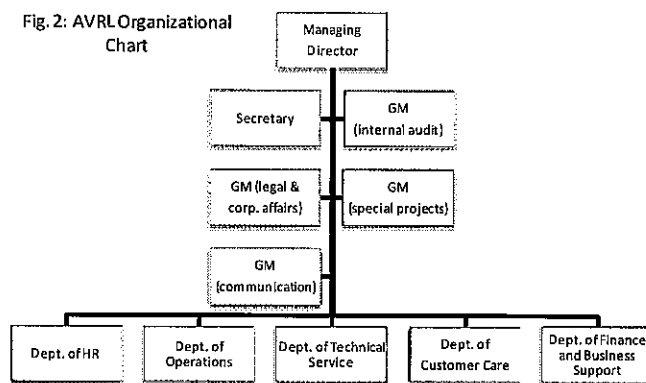
did not renew the contract and concluded a contract with a newly established private company, GUWL. In the interview with GWCL at the ex-post monitoring, it was explained that the size of capital and the personnel deployment, including the number of employees (including engineers) of GUWL, were unknown and the details of the contract were still under review. It was also explained that there was a chance that officials at GWCL who were transferred to AVRIL would be retransferred to GUWL. In addition, it was reported that the Director of the Dept. of Operations at GWCL would assume the position of vice president of GUWL.

Based on the above, it is known that although a new contractor, GUWL, was selected, the contract details were still under review and the future organizational and operational structures had not been determined at the time of the ex-post monitoring. Therefore, it is necessary to pay attention on trends in the future.

#### 3.3.2 Technical Aspects of Operation and Maintenance

As a part of the World Bank's "Urban Water Project", AVRIL was making efforts to improve management of GWCL by inviting 7 experts from overseas (2 million U.S.

Fig. 2: AVRIL Organizational Chart



Source: GWCL



dollars invested in training programs and 2.5 million US dollars in technological transfer programs including OJT). From June 2005 to May 2011 during the contract term with AVRL, training programs were provided for GWCL officials on the topics of “management,” “customer service,” “IT,” “maintenance of facilities,” “water quality,” “GIS,” “debt management,” “supervision work,” and “securing of health and safety.”

In June 2011, however, a change was made to GWCL’s operation system, and it is unknown for the moment whether GWCL officials trained through the programs will remain at GWCL or whether similar training programs will continue to be provided.

Also, since IT was introduced into GWCL operation as part of the World Bank project, and staff have learned the basic methods of using personal computers, data collection and management has improved in part. However, in the ex-post monitoring it was found that the data collected at each facility was not properly managed at GWCL headquarters.

The introduction of GIS with the objective of determining the water distribution status was limited to a trial introduction in some areas. Also, the World Bank pointed out that GWCL is an organization mainly composed of engineers, and thus it is necessary for them to operate their business with more awareness of customers. As a result of the trainings to improve customer care (e.g. response to complaints, etc.), the satisfactory ratio of customers has improved<sup>7</sup>. On the other hand, it has also been reported that the majority of customer registers are recorded manually, and that the management and record accuracy are not sufficient<sup>8</sup>.

Regarding technical aspects, if large-scale facilities only are to be considered, it was confirmed that there are no problems since the maintenance such as replacement of filter sand, inspection and repair of equipment, etc., is carried out in accordance with the annual plans, and the water quality is inspected daily. However, at some small-scale facilities, inspection and repair of equipment was not carried out periodically as at the large-scale facilities.

Based on the above, there is a concern about the technological aspects of sustainability, since, although training programs to improve the techniques and skills of GWCL officials were provided under the contract with AVRL, after June 2011 it is not known how personnel deployment will be conducted and it is uncertain whether training budgets can be secured.

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<sup>7</sup> Based on the results of a beneficiary survey (2011) carried out by GWCL, about 90% responded that they were satisfied with processing of complaints.

<sup>8</sup> As the method of recording and managing customer registers is not defined, both management by electronic data and management by paper media are adopted.

### 3.3.3 Financial Aspects of Operation and Maintenance

As the Ghana cedi denomination was introduced in 2007, the financial data from 2005 onwards was obtained again from GWCL, which is shown in Table 5.

Table 5: GWCL's Main Financial Indicators

	2005	2006	2007	2008	2009	2010*
Gross Assets	274,522,912	319,176,050	453,437,724	590,775,758	706,824,246	777,280,689
Current Assets	35,546,230	43,671,294	53,366,422	74,490,518	86,317,947	114,940,302
Non-Current Assets	238,976,682	275,504,756	400,071,302	516,285,240	620,506,299	662,340,387
Current Liabilities	17,585,042	36,647,096	52,045,062	76,371,979	88,698,918	70,535,676
Capital	248,789,047	295,181,980	426,839,530	549,653,819	659,804,166	636,274,833
Total Revenue	55,898,133	59,082,986	72,822,327	104,709,064	106,864,913	102,531,226
Total Expenditure	54,316,248	56,945,346	75,607,700	107,812,901	99,882,048	82,222,623
Surplus/Loss	1,581,885	2,137,640	▲ 2,785,373	▲ 3,103,837	6,982,865	20,308,603
Capital-to-asset Ratio(%)	90.6%	92.5%	94.1%	93.0%	93.3%	81.9%

Unit: Ghana Cedi (Ghc)\*\*

Source: GWCL/AVRL Report

Notes: \*2010 est.

\*\*In July 2007, the Cedi was denominated to Ghana Cedi (Ghc), such that ten thousand Cedis is equivalent to one Ghana Cedi. The figures presented as above were recalculated based upon Ghc.

Although GWCL's gross assets are on the increase, there was a reduction in capital between 2009 and 2010. Thus the capital-to-asset ratio was around 90% between 2005 to 2009, but it dropped in 2010. Until 2008, both the revenue and expenditure of GWCL were on the increase, but from 2008 revenue maintained a certain level whereas expenditure tended to reduce, and from 2009 onwards an operating profit was produced. It is considered that the reasons for the increase in operating profit are an increase in the number of customers, the improvement in the tariff collection ratio, and an increase in the water tariffs. Also, as shown in Figure 6, GWCL has made efforts to reduce its expenditures, so the management status of GWCL can be said to be healthy. However, as this refers to the

Fig. 3: GWCL's Revenue and Expenditure (2005-2010)

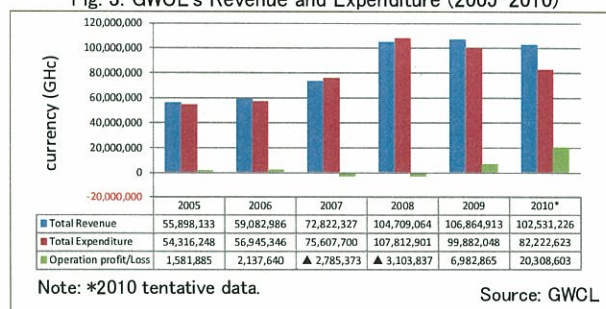


Fig. 4: Total Number of Customers (2005-2010)

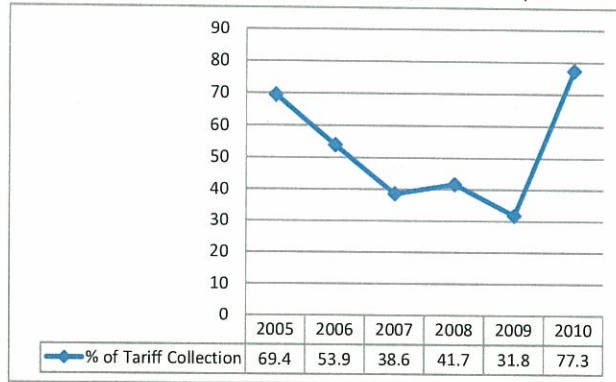


past 2 years since 2009, it is necessary to pay attention to the future trends.

According to interviews with GWCL officials during the ex-post monitoring study, maintenance budgets were allocated as needed and spare parts were provided without delay during the contract term with

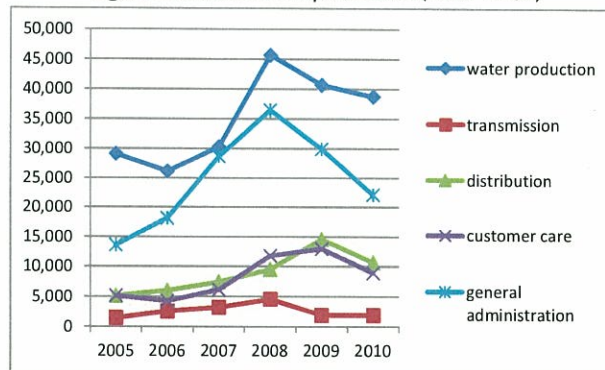
AVRL. After the contract was concluded with GUWL, however, allocation of the budget necessary for management and provision of spare parts have been delayed and there is concern that such a situation will further negatively affect financial sustainability.

Fig. 5: Tariff Collection Ratio (2005–2010)



Source: GWCL

Fig.6: Breakdown of Expenditures (2005–2010)



Unit: Ghana Cedi (GHc)  
Note: 2010 est.

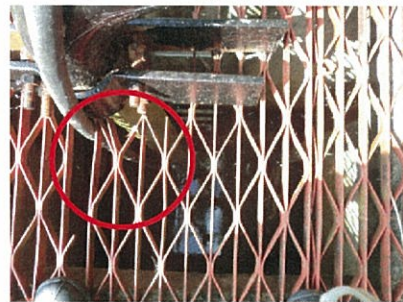
Source: GWCL

### 3.3.4 Current Status of Operation and Maintenance

Based on the interviews at the Volta Regional Office, at large-scale water facilities, periodic maintenance (e.g. changing sand in the filters, inspection and repair of equipment) was conducted in accordance with annual maintenance and clean-up plans, prepared by GWCL headquarters. Also, at the facility in Hohoe, it was confirmed that the intake pump was replaced with GWCL’s own budget and the water tank was cleaned once a year. It was also confirmed that a water quality test was conducted every 2 hours daily and no particular problems were found in terms of maintenance.

On the other hand, at small-scale facilities the inside of the tank and the sand filter were not cleaned as regularly as at large-scale facilities. According to the Volta Regional Office, regular clean-up was not carried out at any of the facilities for budgetary

Pump replaced with GWCL budget (Hohoe)



Sand filter (Sovie-Digbe)





reasons. Moreover, it was also difficult to routinely conduct water quality tests by allocating personnel in charge of testing to the site due to the shortage of human resources. In the interviews, it was explained that specialists in water quality testing would be dispatched to small-scale facilities from the Volta Regional Office (approximately twice a week).

#### **4. Conclusion, Lessons Learned and Recommendations**

##### **4.1 Conclusion**

For large-scale facilities, the quantity of water supplied and the facility utilization ratio exceeded the values at the time of the ex-post evaluation, which means that a certain level of result was achieved. However, for small-scale facilities, maintenance is not sufficient and this is affecting the operational status of the facilities. The NRW ratio has improved for all the facilities since the time of the ex-post evaluation, but all the values exhibit large fluctuations. This is inferred to be because the NRW ratios are not calculated based on accurate data due to insufficient measurement of water supply quantities and quantities used, etc.

In the maintenance of large-scale facilities, replacement of filter sand, inspection and repair of equipment, etc., is carried out based on annual plans. However, at small-scale facilities, it was confirmed that periodic maintenance is not carried out due to budget constraints and other problems.

In June 2011, GWCL changed the private contractor for operation and maintenance work to GUWL. At the time of this survey, the business operation system, the details of the work commissioned, the structure (personnel deployment, size of budget), etc. of GUWL had not been defined. As this could affect the operation and maintenance as a whole, it is necessary to pay attention to the trends in the future.

##### **4.2 Recommendations**

Of the facilities, it was confirmed that deterioration at some facilities had advanced and the initially targeted water supply volume was not achieved. GWCL should improve the operation and maintenance structure so that these facilities can operate properly to secure the required water supply volume. In order to maintain and inspect the facilities and machinery regularly and to retire old equipment and replace parts without fail, efforts should be made to (1) consolidate the maintenance system centering around the third party contractor (GUWL) and (2) enhance GWCL headquarters' capability to supervise the private company to which maintenance is contracted.

##### **4.3 Lessons Learned**



When operating and maintaining the water supply facilities, the implementing organization should regularly develop and maintain the data to determine the transmission/distribution conditions, operating rate of each facility and the water quality, while the importance of such work should be communicated to the implementing organization when implementing a project.

End

### Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	<ul style="list-style-type: none"> <li>• Rehabilitation and limited expansion of water supply facilities located at the following 9 sites: Ho, Hohoe, Nkonya-Ahenkro, Sovie-Digbe, Anyako, Keta-Anloga, Denu-Aflao, Tamale, Wa.</li> <li>• Construction of maintenance management buildings</li> <li>• Procurement of maintenance management tools and equipment (vehicles, tools, meters and communication equipment)</li> </ul>	<ul style="list-style-type: none"> <li>• Basically, the Project was implemented as planned. Some items, however, were eliminated as a result of the re-examination during the Project period.</li> </ul>
2. Project Period	March 1994 – October 1997 (43 months)	March 1994 – December 2000 (81 months)  An 18 month-extension was granted.
3. Project Cost		
Amount paid in Foreign currency	4,655 million yen	5,325 million yen
Amount paid in Local currency	1,750 million yen (5,922 million cedi)	995 million yen
Total	6,405 million yen	6,320 million yen
Japanese ODA loan portion	5,444 million yen	5,369 million yen
Exchange rate	1 cedi = 0.296 yen (As of 1993)	1 cedi = 0.056-0.016 yen (Average between 1996-2002)