Ex-Post Project Evaluation 2016

Package III-7

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Republic of Sudan

FY2016 Ex-Post Evaluation of Technical Cooperation Project

"The Project on Human Resources Development

for Darfur and the Three Protocol Areas"

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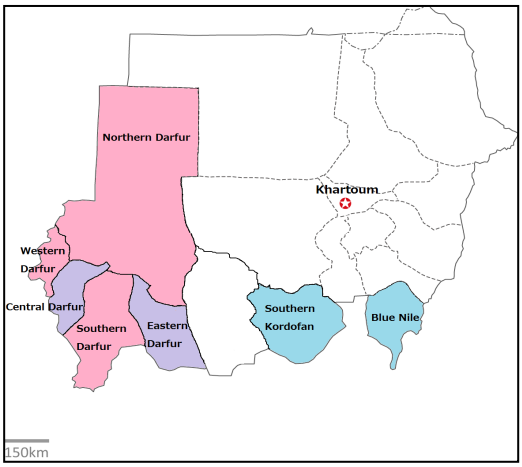
Foundation for Advanced Studies on International Development

0. Summary

This project was implemented to improve the service delivery capacity of related organizations in water supply, health and vocational training sectors in Darfur states and the Protocol Areas in Sudan, thereby contributing to residents' enhanced access to public services. Although the development of conflict-affected areas as well as improvement of water supply, maternal health and vocational training sectors are generally consistent with the country's policy and are highly consistent with the development needs and Japan's Official Development Assistance policy, there are some issues with appropriateness in project planning and approach. Therefore, the relevance is fair. While the project purpose was partially achieved in the water supply and health sectors, it was not achieved in the vocational training sector. This is because monitoring capacity was not sufficiently improved, and the project targeted multiple sectors and states although it was so-called "remote-controlled project." Therefore, achievement of the project purpose is fair. The achievement of the overall goal remained to be medium because achievement of the project purpose was fair and, as for access to public services, the components to improve capacities, technologies and institutional buildings were not included, except for those concerned with the pilot activities, training of trainers (TOT) for the pilot activities, equipment provision and coordination capacity enhancement intended through Output 1. As a result, effectiveness and impact are fair. On the other hand, even though the project cost and the project period significantly exceeded the plan, the excess does not match the increase of the target area and the increase of outputs through modification of the project plan during the implementation period. Thus, efficiency is low. There are some problems regarding sustainability, since sustainability from organizational, technical and financial aspects depends on the target states, although sustainability in terms of policy and institutional aspect is high, so sustainability is fair. In light of the above, this project is evaluated to be unsatisfactory.

1. Project Description



Project Location(s)
(The blue color: the Protocol Area; pink and purple: Darfur states; and purple: with support only in health sector)

A graduate of the short-term training at carpentry work at his workshop
(Kadugli, South Kordofan State)

1.1 Background

In Sudan, "North-South Comprehensive Peace Agreement" was effected in 2005, followed by separation and independence of South Sudan in July 2011. However, the conflict between the two countries continued, as the negotiations on the attribution of Abyei and fixing borders, etc. did not make significant progress. Although peace agreement was concluded with some of the anti-government forces in the Darfur conflict, many anti-government forces continued trying to overthrow the government. The conflicts concerning with resources and lands among residents on various levels continued, and the number of new Internally Displaced Persons continued to be increased. In South Kordofan state and Blue Nile state, where North-South civil war was bitter, the armed conflict between the government army and the anti-government forces continued, while the situation was stabilized in 2009. In these states, maternal health, access to safe water and access to education (vocational training) were in worse condition compared with other states in Sudan. In response to this continuing situation, this project was planned and implemented.

1.2 Project Outline[1]

Overall Goal		Access to public services for water supplies, health (maternal cares) and vocational training is improved in three Darfur states, Blue Nile and Southern Kordofan States.
Project Purpose		Capacities of service providers for water supplies, health (maternal health) and vocational training are improved in three Darfur states, Blue Nile and Southern Kordofan States.
Output(s)	Output 1	Coordination capacities of the state governments are strengthened through management of pilot activities and training programs.
	Output 2	Human resources for water supplies, health (maternal health) and vocational training are improved through the implementation of pilot activities and training programs.
Total cost (Japanese Side)		1,436 million Japanese yen
Period of Cooperation		June 2009–May 2013 (4 years) (extended period: June 2012–May 2013)
Implementing Agency		Ministry of Federal Governance, Government of National Unity (at the time of ex-ante evaluation): Later, as the result of government organizational reform, it became the Higher Council for Decentralized Governance (HCDG). At the time of ex-post evaluation, it became the Federal Governance Chamber (FGC).
Other Relevant Agencies / Organizations		・State Water Corporation (SWC) ・State Ministry of Health (SMOH) ・State Ministry of Education (SOME) and Technical School (TS), etc.
Supporting Agency/Organization in Japan		None
Related Projects		【Technical Cooperation】 ・Human Resources Development for Water Supply (2008–2011) ・Frontline Mother and Child Health Empowerment Project in Sudan (2008–2011)

[1] The citations of the PDM are transcribed exactly as spelled or presented in the original sources.

	・Project for Strengthening Vocational Training (2011–2013) ・The Project for Strengthening Peace through the Improvement of Public Services in 3 Darfur States (2015–2019) 【JICA Grant Aid Project in collaboration with UN agencies】 ・The Project for Infectious Diseases Prevention for Children (collaboration with UNICEF) (2010–2012, 2013) ・The Sudan Disarmament, Demobilization and Reintegration Programme (UNDP)

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement Status of Project Purpose at the Terminal Evaluation

It was assessed that the project purpose would be achieved by the end of the project duration. The staff's skills and knowledge improved through the implementation of the pilot activities, and administrative capacities also improved. Furthermore, the related state government departments supported the pilot activities in coordination with each other, which was confirmed through the amount of the disbursed budget of the local component borne by the state governments as well as their commitment of budget allocation for future activities.

1.3.2 Achievement Status of Overall Goal at the Terminal Evaluation

(Including other impacts)

It was assessed that the overall goal would be achieved to some extent. The pilot activities are the means of enhancing the capacities of the implementing organizations. At the same time, those activities can directly contribute to improving residents' access to public services (i.e., the overall goal) from another aspect. A positive impact was seen because many residents have already received improved public services.

1.3.3 Recommendations from the Terminal Evaluation

The following recommendations were made at the terminal evaluation, which was implemented from January to February, 2013.

	Measures to be taken by the project's completion	Measures to be taken by the Sudanese side after the project's completion
Project Management	1) Promote further communication between SMOF and other implementation agencies through the State Coordinating Committee (hereinafter, SCC) and regular reporting (e.g., monthly reports), and to strengthen the monitoring activities unit at the SMOF level 2) Conduct training to enhance the capacity of managerial staff of SMOF and implementing agencies 3) Inspect and manage the provided equipment regularly based on the inventory system	1) Further enhance management capacity in the provision of public services; introduce guidelines for monitoring/project management to appropriately introduce the PDCA (plan-do-check-act) cycle to CP and utilize it as an efective monitoring and evaluation tool 2) Further improve the inventory system (e.g., databases) and its proper management and utilization 3) Strengthen consultation and communication between HCDG and JICA, particularly on security issues and new activities 4) Further involve the local government staff and community and promote capacity building at the local/community level through on-the-job training (hereinafter, OJT)
Water	1) Implement and complete the remaining pilot activities (rehabilitation work, etc.) and identify issues related to the water tariff collection system 2) Promote in-house training for the state and locality staff at SWC 3) Improve the database of existing boreholes by revising the survey format	1) Develop the capacities of locality staff (especially in surveying and planning) 2) Improve financing stability to expand the rehabilitation of boreholes; review, clarify issues with, and strengthen the water tariff collection system at the community level 3) Improve capacity for managing and procuring equipment 4) Promote borehole rehabilitation work in the highly prioritized areas shown in the state development policy; set up criteria for selecting sites for borehole rehabilitation
Health	1) Start implementing in-service training for village midwives (hereinafter, VMWs) in cooperation with UNICEF based on the direct contract agreed upon between JICA and UNICEF on 31 January 2013. 2) Consider/recommend ways to follow-up/support supervision for VMWs by health visitors (hereinafter, HVs) 3) Extract lessons learned from in-service training of VMWs, 5S activities and TOT training for HVs and assistant health visitors (hereinafter, AHVs)	1) Consider/implement incentives or salaries for VMWs, the provision of consumables, and realistic and systematic suppportive supervision for the VMWs' mental and financial empowerment 2) Consider capacity development for general practitioners, nurses, and midwives at the hospital where the VMWs will refer patients 3) Consider means of improving and strengthening the basic training for VMWs
Vocational Training	1) Confirm the social and economic background of the admitted trainees at the time of selection for smooth monitoring and impact surveys after the training. 2) Conduct a tracer survey of past pilot activities 3) Develop the capacity of trainers through TOTs 4) Finish implementing the second pilot course at OVTC	1) Improve the efficiency of training provision in terms of cost effectiveness; support access to microfinance for graduates as a part of suppport for them to become entrepreneurs or employed 2) Develop clear policy on vocational training provided by technical schools (TSs), including a definition of short-term training; establish an effective implementation system for short-term vocational training courses at TSs that targets returnees in rural areas, ex-combatants, women, and internally displaced persons (IDPs) 3) Further collaborate with the Disarmament, Demobilization, Re-integration (DDR) program in providing vocational training for ex-combatants 4) Set up and implement targets for the training courses that reflect the demand of the market and trainees; consider contributions to social stability as much as possible at the time of implementation 5) Strengthen collaboration with industry sector, such as with craftsman unions, in planning and implementing training as well as promoting employment

2. Outline of the Evaluation Study

2.1 External Evaluator

Mayumi Hamada, Foundation for Advanced Studies on International Development

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: November 2016–March, 2018

Duration of the Field Study: March 4, 2017–March 20, 2017

August 5, 2017–August 10, 2017

2.3 Constraints during the Evaluation Study

The Japanese did not visit the target areas (i.e., Darfur states and the Protocol Area) due to security restrictions. Therefore, the evaluator implemented information collection at Khartoum, the capital, and El-Obeid, North Kordofan state, while the information collection at the target areas was implemented by the local consultant. There was difficulty in information collection on the whole.

3. Results of the Evaluation (Overall Rating: D[2])

3.1 Relevance (Rating: ②[3])

3.1.1 Consistency with the Development Plan of Sudan

The Five-year Plan of the Government of National Unity (2007–2011) set its goal as the "distribution of wealth, coexistence, legal order, as well as the integration and peace of Sudan based on the principle of peace and stability." One of the prioritized strategies is "poverty alleviation and achievement of MDG objectives." In this strategy, the balance of development between the central and local areas and the development of rural villages and the areas affected by conflicts are stipulated to be pursued. Specifically,, measures for health, water supply and education sectors, among others, are prioritized.

Regarding the health sector, one of the objectives described in the "5-year Health Sector Strategy (2007–2011)" is "improvement of maternal health," in which training and skill improvement of midwives are emphasized[4]. In its subsequent policy, "National Health Sector Strategic Plan II (2012–2016)," it is also stipulated that improvement of maternal mortality ratio (152 per 100,000 births) as well as increase of skilled birth attendants (90% of births) shall be sought.

In water supply sector, one of the four objectives concerning with water supply and hygiene fields to be achieved by 2027 includes "sufficient and safe water supply all over the country, both in urban (150 L/person/day targeted) and rural (50L/person/day targeted) areas" in "25-Years Strategic Plan for Water Sector (2003–2027)." Also, in "Water Supply and Environmental Sanitation Policy (2010)," it aims at achieving 79% of residents who can consume water by 20L/day in rural areas by 2015, and 100% of those who can consume water by 50L/day by 2031. "Water, Sanitation and Hygiene National Strategic Plan (2012–2016)" sets improved access to safe water as a goal, aiming at 20L/person/day from water sources within 500m from the residence in rural water supply.

On the other hand, in the field of vocational training, specific strategy is not necessarily clarified, although enhancing training opportunity is stipulated in the medium

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ②: Fair, ①: Low
[4] Goal 4, P64-65

and long-term plan of the government. Also, there is no policy grounds to justify short-term vocational training[5]. This is because formal technical education and vocational training (3 years each) provided in technical schools and vocational training centers are the basic institutions in Sudan, while the short-term training, supported by the project, is not a formal training curriculum. Based on the above, development of conflict-affected areas as well as 2 out of 3 sectors are highly consistent with the government policy. Thus, the consistency between the project and the development policy is generally high.

3.1.2 Consistency with the Development Needs of Sudan

Due to long-term conflicts, basic life environment of Darfur people was significantly deteriorated. It is highly consistent with the people's needs to improve capacities of service providers for the betterment of public services in water supply, health and technical and vocational training, which are directly linked with people's life. The target areas of the project (i.e., rural areas of the Darfur states and the Protocol Area) are the areas where the status of water supply was most serious in the country as well as the status of maternal health was poor. According to the Sudan Household Health Survey in 2006, both areas were positioned as the worst three in the country in terms of 25 health indexes out 26, such as child mortality rate, immunization rate, child health and protection, contraception, HIV, etc.[6]. Also, in 2008, access to drinking water in Darfur areas and Protocol Areas (rural areas) were 38–43%, except for South Kordofan, which were 15–20 points below the national average[7]. In the field of vocational training, improvement of school management and the facilities and equipment were recognized as an urgent task[8]. Furthermore, unemployment rate is high in many of the target states because they are conflict-affected areas[9]. Also, it is regarded that the needs for short-term training is higher than long-term one, taking the risk of recurrence of conflicts into consideration. From the above, consistency between the project and development needs is high.

3.1.3 Consistency with Japan's ODA Policy

Japan's basic policy of ODA toward Sudan[10] pursues "consolidation of peace," and "supporting the people in conflict areas and reintegration of society" as one of the

[5] The project completion report, Chapter 5
[6] The project completion report, P21
[7] The project completion report, P17-18
[8] The ex-ante evaluation summary, P2
[9] Although the national average of unemployment rate (15 years or more) was 13%, it was above national average in the four states except for Blue Nile state (4%), while the average of three Darfur states (17%) was high. (The project completion report, P6)
[10] Japan's ODA by country 2009, (22 Sudan), P536-537

prioritized areas[11]. The project set as its overall goal better access to public services by the residents in conflict-affected areas (i.e., the Darfur area and the Protocol Area). Also, it includes ex-combatants as a target in vocational training field. Thus, it can be said to be a project of "supporting the people in conflict areas and reintegration of society." Thus, consistency between the project and Japan's ODA policy at the time of planning is high.

3.1.4 Appropriateness of the Project Plan and Approach

Although the project targeted the conflict-affected areas where the Japanese experts had difficulties in visiting, it covered multiple sectors and multiple states. Besides, at the time of planning, allocation of budget from Sudanese government to the target areas were in difficult condition[12], while the implementing organizations were not regarded to be accustomed to conduct periodic monitoring[13]. With this reason, securing the budget and the establishing the monitoring system, that the project aimed at, were ambitious plan to be achieved within short period. Also, the access to public services (i.e., the overall goal) was not sufficiently achieved, because activities to enforce skills, organizational capacity and structure, other than the pilot activities, were not included in the plan. As the result, the flow of "input – output – outcome – impact" did not link well and there was a problem as a project plan. Asa reason for these problems, it is pointed out that the project was planned and implemented without sufficiently being able to comprehend the latest situation of the target areas, and to plan based on analyzing specific problems, because sufficient information was not available due to security reasons at the time of ex-ante evaluation. Although the project was planned and implemented with emphasis on its speed as it targeted conflict-affected areas, it is considered that the project objectives were not achieved since it was planned and implemented without being able to obtain sufficient information at the time of ex-ante evaluation, thereby sufficient effect was not brought about.

In the meantime, it can be understood that there was a principle, at the time of planning, to "think while running" (i.e., to cope with issues by continuously planning with information obtained after commencement with information obtained after commencement)[14]. Actually, significant change is observed after project commencement such as expansion of the target areas, increase of inputs such as dispatch of experts, equipment provision and facility reinforcement, etc. However, it cannot be said that the

[11] The ex-ante evaluation summary, 5. Evaluation result of the five evaluation criteria, (1) Relevance
[12] The allocation of resources such as budget to the target areas was in short, as it did not reflect the needs of the areas where the basic social services were deteriorated by the conflicts (The ex-ante evaluation summary, P2).
[13] At the time of the project completion, the custom to make monthly report had not been established, either (The project completion report, P110).
[14] Interview with those who were concerned with the project

background and the aim of these changes were sufficiently shared even among those who were concerned with the project[15], which possibility impeded effective operation and management.

In addition, some issues were observed in terms of the indicators to measure achievement of objectives in the Project Design Matrix (hereinafter, PDM), which shows the project plan. For example, the indicator for Output 1 (i.e., "the coordination capacities are improved" is set as "appropriate budgets are allocated"). It is unclear that in what situation we can judge that "appropriate allocation" is achieved. Also, it was not proper to measure the achievement only by this indicator, because the "coordination capacities" actually included the capacities other than acquiring budget, such as monitoring, etc. Furthermore, the indicator for the project purpose (i.e., "capacities of the service delivery are improved" was set as "activities are implemented in sustainable manner"). The indicator is not the one to be able to measure "to what extent the service delivery capacities are improved, as the result of achieving the project outputs through the activities." In this way, some issues were observed in terms of concreteness, comprehensiveness and logicality. These points had not been properly corrected during project implementation. The modification of the project plan mentioned above were not appropriately reflected into the PDM, either. Thus, there is possibility that the PDM lacking concreteness and logicality had not been properly revised until the end of the project completion, and that modification of the project plan mentioned above had not been appropriately reflected into the PDM became hindrance to sharing the background and the aim of the repeated modification of the project plan among those who were concerned with the project.

Moreover, as the result of reignited conflict in South Kordofan state and Blue Nile state in 2011 during the project implementation period, emergency assistance was implemented in these two states in the fields of water supply (only in Blue Nile state), agriculture and income generation in 2012, as a part of the project. However, agriculture was out of the scope for this project. As for the support in water supply field in Blue Nile state, what was planned and implemented was not the restoration of the water supply facilities in the target village, supported by the pilot activities of the project, but the water supply facilities damaged by the conflict[16]. Thus, this emergency assistance is out of the causal chain of the "input – output – outcome – impact" of the project. In the meantime, at the time of implementing the emergency assistance, it was planned to revise the PDM to reflect the modification of the project plan. However, the PDM had not been revised to reflect this point until the project completion. Therefore, some issues are observed in

[15] Interview with those who were concerned with the project
[16] Interview with those who were concerned with the project

terms of project planning and its modification.

<Aspect of Project Evaluation in Conflict-affected Country and Area >

Since this project supports conflict-affected areas (i.e., the Darfur region and the Protocol Area), the following points were examined in accordance with "Manual for project evaluation in conflict-affected countries and areas" of JICA.

① Timeliness: The time of the project commencement corresponded with the time when related ministries of the Sudanese government began activities to fill the gap left after the exile of international NGOs in March 2009. From the perspective of peacebuilding, the timing of the project cooperation is regarded as being appropriate.

② Political and policy contribution: As a political significance from peacebuilding point of view, it is meaningful to show "fruit of peace" to the residents in the target areas, who felt a growing sense of unfairness to the government. The project brought Japan political and policy significance in a sense that mutual trust was established and strengthened[17] between Japan and Sudan, who had become increasingly isolated in the international society.

③ Content of Activities: The project plan was designed to minimize influence by conflicts of the project, like conducting in-country training such as TOT and meetings where the related organizations joined together were held in Khartoum, the capital city, because it was difficult for the Japanese to visit the target areas.

④ Selection of areas and beneficiaries: The reason why the project targeted multiple states was to avoid further antagonism among the tribes. Due to lack of information, it could not be confirmed whether sufficient measures were taken with consideration to minimize unstable factors such as confrontation among tribes, etc., in determining the sites for repairing boreholes and selecting the participants of training and so on, in conducting the pilot activities.

⑤ Implementing structure: At the time of planning, many donors tended to avoid direct support toward or involvement with the Sudanese government. It was a general approach for those donors to directly support residents who would be benefitted, utilizing NGOs, etc., thereby avoiding the government body. The negative impact from a political and social aspect, caused by selection of the project counterpart and the implementing organizations, as well as the risk to foment unstable factors could not be confirmed.

As stated above, this project was generally relevant to the country's development plan, and highly relevant to the development needs and Japan's ODA policy. However, some issues were observed regarding appropriateness of the project plan and the approach.

[17] Interview with and questionnaire to JICA Sudan Office (of those days)

Therefore, its relevance is fair.

3.2 Effectiveness and Impact[18] (Rating: ②)

In this project, the PDM was established at the initial stage (PDM1) through the ex-ante evaluation and revised twice (in December 2009, when the target areas were expanded [PDM2] and in December 2011, when the project was extended [PDM3]). Although the target areas were expanded and the project duration was extended, there has been no significant change in the project purpose, the outputs, the overall goal and their indicators, except for minor revisions such as expression. On the other hand, the following issues were observed of the indicators, so they could not be utilized in this evaluation.

1) The indicators for the project's purpose and the overall goal show "continuation of the activities," so the objectives expected to be achieved cannot be measured (e.g., The indicator for "improvement of access to public services" was "Measures to improve access are taken in sustainable manner," etc.); and 2) The indicators for Output 1 and Output 2 were lacking in concreteness and do not show the scale to measure the achievement of the outputs (e.g., the indicators for "human resources development" and "skills and knowledge are improved," etc.).

The evaluator sorted out the levels of the indicators in accordance with the logic of the objectives as shown in Table 1, and conducted analysis accordingly. Meanwhile, the indicators were sorted out based on those established in the ex-ante evaluation as well as the "reference indicators" proposed by the project and approved by the Sudanese side at the terminal evaluation as much as possible. As necessity required, it was complemented based on the information acquired through document reviews and interviews with those who were concerned. The evaluator did not modify any of the numerical targets of the existing indicators.

[18] Sub-rating for Effectiveness is to be put with consideration of Impact.

Table 1 Latest PDM (PDM3) and readjustment indicators

Narrative summary (PDM3)		Indicators (PDM3)	Indicators (utilized for this evaluation after readjustment)
Overall Goal	Access to public service for water supplies, health (maternal cares) and vocational training is improved in three Darfur states and Blue Nile and Southern Kordofan States.	Measures to improve access to public services for water supplies, health (maternal cares) and vocational education are taken in sustainable manners in three Darfur states and Blue Nile and Southern Kordofan States.	① Water supply: 20% increase in the number and proportion of residents who can access safe water in the target area ② Water supply: 20% increase in the amount of water use by residents in the target areas ③ Health: Reduction of the maternal mortality ratio in target areas ④ Vocational training: Employment rate of 50% or above among the graduates one year after completion of the training
Project Purpose	Capacities of service providers for water supplies, health (maternal health) and vocational training are improved in three Darfur states and Blue Nile and Southern Kordofan States.	The pilot activities are implemented in sustainable manners in cooperation with state governments and relating organizations.	① Water supply: Increase in the amount of water supply/pumping volume of rehabilitated boreholes ② Health: 50% increase in the number of beneficiaries who receive antenatal care by trained VMWs within one year after the in-service training ③ Health: 50% increase in the number of deliveries attended by trained VMWs within one year after the in-service training ④ Vocational training: Improvement in the final examination results at the end of the short-term training courses between the first and third training courses (target level for Darfur is 20%)
Output1	1. Coordination capacities of the state governments are strengthened through management of pilot activities and training programmes.	Appropriate budgets are allocated to implement the Pilot activities in water supplies, health (maternal cares) and vocational training in 3 Darfur states and Blue Nile and Southern Kordofan States.	① Planned costs that are 75% of the actual local cost for the Sudanese side ② A grade of 3.5 or above out of 5 on a self-evaluation of the project management system's improvement by those who are concerned with the project ③ Usage status of the guidelines and monitoring formats developed through the pilot activities in related organizations ④ Status of the periodic submission and sharing of monitoring reports
Output2	2. Human resources for water supplies, health (maternal health) and vocational training are improved through implementation of pilot activities and training programmes.	Skills and knowledge of service providers for water supplies, health (maternal cares) and vocational education are improved.	① Water supply: Assessment results for capacity improvement by the borehole rehabilitation team/management staff at SWC ② Health: Comparison of the pre-/post-test results of the in-service training for VMWs ③ Vocational training: Assessment results from management staff on trainers who received TOT, or self-evaluation results from trainers who received TOT

Source: Compiled based on the existing documents, etc. and the interviews with the former Japanese experts
Remarks: PDM3 was revised from PDM2 in December 2011.

3.2.1 Effectiveness

The indicators of the outputs and the project purpose and its achievement at the time of the ex-post evaluation are shown in Tables 2 and 3. The achievement of Output 1 (strengthening coordination capacities of the state governments through the management of the pilot activities and the training) is low, while the achievement of Output 2 (human resources development in the fields of water supply, maternal health and vocational training) is high. The achievement of the project purpose can be considered neither high nor low, since there is a shortage of data. Therefore, it is assessed to be fair. However, there was difficulty in acquiring data for quality and quantity.

The low level of achievement of Output 1 (strengthening coordination capacities), which includes enhancement of monitoring capacities, became a hindrance to achievement of the project purpose. In case the project implemented especially in a so-called “remote-controlled project,” like this project in which the Japanese experts have difficulty in visiting the target area due to security reasons and stay at the capital city to provide technical support for the project, it is important to strengthen monitoring systems to periodically grasp the progress of the activities and the issues, and to advise and support in a timely manner. For the sake of this, it was planned in the project to develop

and share the monitoring forms, submit and share the monitoring reports and conduct monitoring through organizing various meetings, inviting various stakeholders from the target areas and the related organizations to the capital city. However, the monitoring formats developed were not sufficiently utilized by the organizations, while the monitoring reports cannot be said to have been periodically submitted and shared (Table 2). Also, the accuracy of information was low, and much information was lost, as stated in the project completion report[19].

There are multiple reasons why improvement of the monitoring capacities were not sufficiently achieved, even though the activities to strengthen the monitoring mentioned above had been planned for the project. First, according to the interviews with those who were concerned with the project, monitoring was not customary in the Sudanese implementing organizations, and they were lacking recognition on the importance of monitoring and knowledge on what should be recorded in what way[20]. Second, according to the terminal evaluation report, there was an opinion[21] that the guidelines and the formats developed by the project were difficult to use for those who were concerned with the project, since the usage was complicated. Thus, there is a possibility that they were too complicated for the users. Also, as for the allocation of Japanese experts, the system was to dispatch short-term experts, except for the Chief Advisor and Coordinator, and the period when there were no experts in a respective sector was long. A comment[22] was obtained that this resulted in an inability to establish a monitoring system. The State Coordination Committee's actions were another cause. This committee had the important role of monitoring pilot activities at the project sites, but after the State Ministry of Local Governance was dissolved, the committee's responsibilities were unclear, and they were not held periodically afterwards. Moreover, the means of communication such as email, telephone and postal service are unstable, and English is not easily understood. Since it was a remote-controlled project, it is regarded to be difficult to provide detailed and prompt guidance, which requires a longer time until the project effect emerges compared with an ordinary technical cooperation project.

In addition to insufficiently enforcing monitoring capacities, the scope of the project was too big to comprehend the whole picture, which involved various organizations and targeted multiple sectors in multiple states, and was also a major cause to make the project management difficult. However, although the project was a "remote-controlled" project under the circumstances where communication infrastructure is poor and English Table 2 Achievement of Outputs by the project completion (May 2013)

[19] The project completion report, P45–46
[20] Interview with those who were concerned with the project
[21] The terminal evaluation report, P12
[22] Peacebuilding Department, JICA

<table>
<tr><th>Output</th><th colspan="2">Indicators</th><th>Achievement</th><th>Level of achievement</th></tr>
<tr><td rowspan="4">Output 1:
Strengthened coordination capacities of the state governments through management of pilot activities and training programs</td><td>①</td><td>Comparison of the planned and actual local cost by Sudanese side: 75%</td><td>・Data on the planned/actual budget throughout the project period were not obtained. Based on the data as of November 2010 (Project Completion Report, p. 47), comparison of the planned and actual cost were: 7.5% for water supply, 19.7% for vocational training, 42.8% for health, and 10.6% tota. This is far below the target of 75%.
・The actual local costs borne by the Sudanese side totaled SDG1,594,433 for 4 years (or 35 million yen). This was 3.5% of the total local costs, including the costs covered by JICA (Project Completion Report, p. 120). The implementing agency's budget covered 80% of the project expenditures, while the State Ministry of Finance's budget—which was expected to cover the project's costs—only disbursed 20% of the costs. (Project Completion Report, p. 120).
・In the orginal plan, the pilot activities for the three sectors were planned to be covered by the Sudanese side, but in fact JICA's grant through international organizations (UNICE and UNDP) was utilized for the pilot activities in the the health and vocational training sectors.</td><td>×</td></tr>
<tr><td>②</td><td>A grade of 3.5 or above out of 5 in the self-evaluation on the project management system's improvement by those concerned with the project</td><td>・The self-evaluations by the implementing agency's management staff (at three levels; general director, directors, and project managers of the pilot activities) confirmed the improvement of management capacity, based on a practical skill score of 4.2 and a management skill score of 4.3 (5: greatly improved, 4: much improved, 3: improved to some extent, 2: no change, 1: more problematic). This self-evaluation was conducted in December 2012 by rating without comments (Terminal Evaluation Report, p. 19).</td><td>○</td></tr>
<tr><td>③</td><td>Usage status of the guidelines and monitoring formats developed through the pilot activities by related organizations</td><td>・Although the development of monitoring sheets was attempted several times, they have not been established. In addition, guidelines and formats for report writing were distributed during training in Japan in 2009, but there were opinions that the usage method was complicated and could not be used (Terminal Evaluation Report, p. 12).
・At the SCC in December 2012, each executing agency agreed to submit a monthly report to SMOF, and the format for the monthly report was introduced (Terminal Evaluation Report, p. 12).
・There was no common format for training record at the vocational training institutions, and only fragmentary information was remained. (Project Completion Report p. 45 - 46)
・The monitoring sheet format is not utilized in the water supply sector (based on an interview with those who were concerned with the project).</td><td>×</td></tr>
<tr><td>④</td><td>Status of periodic submission and sharing of monitoring reports</td><td>・The training on report writing was conducted after each implementing agency agreed to submit a monthly report regularly at the SCC in December 2012. Monthly reports were submitted from almost all target states in the water supply and health sectors. On the other hand, no reports were submitted at all from the vocational training sector (Terminal Evaluation Report, p. 12).
・Even at SWC and SMOH, the information in the reports was inaccurate, and much information was missing. The reports produced were less than ¼ of planned (Project Completion Report, pp. 45–46).
・The main monitoring tools were periodic reports and meetings, but they were not sufficiently conducted (Project Completion Report, p. 46).</td><td>×</td></tr>
<tr><td rowspan="3">Output 2:
Improved human resources for water supplies, health (maternal health), and vocational training through the implementation of pilot activities and training programs</td><td>①</td><td>Water supply: Assessment results for capacity improvement by borehole rehabilitation team/management staff at SWC</td><td>・In a survey on the capacity to implement borehole rehabilitation conducted at the expert field visit on January 27, 2013 (in West Darfur and North Darfur), the skill of the borehole rehabilitation team was measured through 1) self-evaluation by the borehole rehabilitation team and 2) evaluation by management staff who supervised the borehole rehabilitation team. In both states, the replies showed that the technical skills of the related staff improved at all points of the work process. However, it was also pointed out that equipment management and pump mounting/dismounting skills were insufficient in West Darfur (Terminal Evaluation Report, "Evaluation Grid," pp. 153–154).
・In addition, 110 SWC staff participated in training in Sudan during project implementation (Project Completion Report, pp. 55–56).</td><td>○</td></tr>
<tr><td>②</td><td>Health: Comparison of the pre-/post-test results of the in-service training for VMWs</td><td>・The pre- and post-test results for the in-service training for VMWs that was conducted in collaboration with UNICEF are shown below. The post-test scores exceeded the pre-test scores in all states.
<table>
<tr><th>Name of state</th><th>Pre-test</th><th>Post-test</th></tr>
<tr><td>North Darfur</td><td>24.6</td><td>59.9</td></tr>
<tr><td>West Darfur</td><td>41.6</td><td>70.0</td></tr>
<tr><td>South Darfur</td><td>34.9</td><td>58.0</td></tr>
<tr><td>South</td><td>37.1</td><td>57.9</td></tr>
<tr><td>Blue Nile</td><td>50.0</td><td>66.8</td></tr>
</table>
Source: Terminal Evaluation Report, p. 27</td><td>○</td></tr>
<tr><td>③</td><td>Vocational training: Assessment results by management staff on trainers who received TOT, or self-evaluation by trainers who receiced TOT.</td><td>・Information about management staff evaluations on the participants of TOT was not obtained. On the other hand, according to an interview with the participants of TOT, all four interviewees gave a score of 5 - the highest score possible - regarding sufficient understanding of the training contents as well as the teaching methods of the TOT trainers. For the teaching materials, two of the four interviewees graded them 5, and the remaining two interviewees responded with 4. In addition, all of them responded that the capacity improvement by TOT was 5 (hearing ex-post evaluation). Therefore, the self-evaluation of TOT by the ex-participants was high. However, it is difficult to generalize the results because the sample size is small.
・Over 90% of the teachers who attended TOT obtained a score over 70 on the test conducted after the training. However, according to the evaluation by TOT lecturers, some lecturers evaluated that the teachers' basic knowledge had improved but that their practical skills were still low (Project Completion Report, p. 87).</td><td>△</td></tr>
</table>

Source: Compiled based on review of the documents

Remarks: The marks in the Level of Achievement mean as follows; ○ high △ medium × low － not applicable

Table 3 Achievement of Project purpose by the project completion (May 2013)

<table>
<tr><th>Project purpose</th><th colspan="2">Indicator</th><th>Achievement</th><th>Level of achievement</th></tr>
<tr><td rowspan="4">To improve the capacities of service providers for water supplies, health (maternal health), and vocational training in three Darfur states and the Blue Nile and Southern Kordofan states.</td><td>①</td><td>Water supply:
Increased water supply/pumping volume of rehabilitated boreholes</td><td>・The pumping capacity of 43 out of 49 boreholes rehabilitated by pilot activities in the three Darfur states increased (about 88%).

・Data on the pumping capacity of boreholes in South Kordofan and Blue Nile states were not obtained. This is because the project covered the renovation of related facilities such as fences and control houses surrounding the boreholes, but the rehabilitation of boreholes was not covered in South Kordofan and Blue Nile states. No information was obtained on which services improved at each facility due to the rehabilitation of the related facilities in those states at the time of the project completion.

・Reliable data on water supply volume was not available.</td><td>△</td></tr>
<tr><td>②</td><td>Health:
50% increase in the number of beneficiaries who received antenatal care by trained VMWs within one year after the in-service training</td><td>・According to an interview with the targeted State Ministry of Health conducted during the ex-post evaluation study, the data on the number of beneficiaries who received antenatal care by trained VMWs by the project's completion are as follows. Only South Darfur state was able to obtain data throughout the project period. Based on the data from South Darfur state, the number of beneficiaries has decreased annually since 2009, the project start year, and the indicators on the left have not been achieved.

Number of beneficiaries who received antenatal care by trained VMW
(Unit: persons)<table><tr><th></th><th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th></tr><tr><td>South Darfur</td><td>36,321</td><td>31,654</td><td>21,438</td><td>13,267</td><td>11,124</td></tr></table>Source: Interview at South Darfur State Ministry of Health

・On the other hand, according to the Project Completion Report (p. 70), the number of antenatatal checkups conducted by VMWs in the target area (excluding West Darfur) in 2012 increased by 29% on average, compared to 2011. However, this number does not represent just the care by VMWs trained in the project.
・Although it is difficult to say whether the indicator was achieved from the data, it is also difficult to say that they have not been achieved because the available data and their reliability were insufficient. Therefore, the degree of achievement was medium.</td><td>△</td></tr>
<tr><td>③</td><td>Health:
50% increase in the number of deliveries attended by trained VMWs within one year after the in-service training</td><td>・Insufficient data on the number of deliveries with trained VMW were obtained.

・Although the data were not limited to the VMWs trained by this project, the total number of deliveries with VMWs in the target area (excluding West Darfur state) was 55,439 in 2011 and 60,251 in 2012, for an increase of about 8.6% (Terminal Evaluation Report, p. 27).

・While it is hard to believe that the indicator was achieved based on the data, it cannot be said that the indicator was not achieved because of the small amount of data whose reliability was not always sufficient. Therefore, the level of achievement was set to medium.</td><td>△</td></tr>
<tr><td>④</td><td>Vocational training:
Improved final examination results at the end of the short-term training course: comparison among the 1st - 3rd training courses (target level for Darfur is 20%)</td><td>・Although the final test results improved for all of the three courses implemented in South Darfur state, the average increase of the three courses was 11.4% and 1.1%, respectively, which was much lower than the target value of 20%. The third training in South Kordofan state was unable to be carried out due to the deterioration of security. The scores of the second test exceeded the scores of the first test in all six courses carried out, with an average increase of 4.7%. The average increase was low, except for the automobile course.

Final test results of the TS short-term training course in South Darfur<table><tr><th></th><th colspan="3">Score</th><th colspan="2">Increase/Decrease (%)</th></tr><tr><th></th><th>1st</th><th>2nd</th><th>3rd</th><th>1st→2nd</th><th>2nd→3rd</th></tr><tr><td>Automobile</td><td>67.5</td><td>76.5</td><td>78</td><td>13.3</td><td>1.9</td></tr><tr><td>Electrical</td><td>67.5</td><td>73</td><td>78.5</td><td>8.1</td><td>0.7</td></tr><tr><td>Machinery/Welding</td><td>65</td><td>73.5</td><td>74</td><td>13.1</td><td>0.7</td></tr><tr><td>Average</td><td>66.7</td><td>74.3</td><td>75.2</td><td>11.4</td><td>1.1</td></tr></table>Source: Interview at Nyala Technical School

Result of the final test of short-term training course in TS of South Kordofan<table><tr><th></th><th colspan="2">Score</th><th>Increase (%)</th></tr><tr><th></th><th>1st</th><th>2nd</th><th>1st→2nd</th></tr><tr><td>Automobile</td><td>80</td><td>92</td><td>15.0</td></tr><tr><td>Electrical</td><td>90</td><td>91</td><td>1.0</td></tr><tr><td>Carpentry</td><td>75</td><td>80</td><td>6.7</td></tr><tr><td>Machinery/Welding</td><td>85</td><td>87</td><td>2.4</td></tr><tr><td>Construction</td><td>90</td><td>92</td><td>2.2</td></tr><tr><td>Tailoring</td><td>92</td><td>94</td><td>2.2</td></tr><tr><td>Average</td><td>85</td><td>89</td><td>4.7</td></tr></table>Source: Interview at Nyala Technical School</td><td>×</td></tr>
</table>

Source: Compiled based on review of the documents, documents provided by the former experts and interviews with the former experts

Remarks 1: The marks in the Level of Achievement mean as follows; ○ high △ medium × low － not applicable

Remarks 2: Although the number of the rehabilitated boreholes is 50 in the completion report, it is 49in the data provided by a former expert, which is regarded to be the original data for it.

is not well understood, the project was implemented with a target of implementing organizations in 3 sectors in 7 states (3 states at the time of commencement), in collaboration with the counterpart organization at the federal level, 2 international organizations, 3 JICA technical cooperation projects, and other local organizations. It is understandable that implementing this project was much more difficult compared with ordinary technical cooperation projects.

Moreover, according to the terminal evaluation report, other factors hindered the achievement of the project purpose as follows: deterioration of security (discontinuance of the pilot activities in the fields of water supply and vocational training in the Protocol Area), restructuring the 3 Darfur states into 5 Darfur states (problems occurred on who should take responsibility to bear the cost since the boreholes to be repaired belonged to new states), the limited use of equipment because the SWC was passive to bring the equipment to suburbs due to the risk that the expensive equipment in the water supply field (such as a probe) might be confiscated at the inspection by the government army. These also became impediments to achieving the project purpose[23].

In the meantime, being unable to strengthen the project monitoring became an obstacle when acquiring the data for the indicator of the project purpose.

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To reduce influence, in case the important assumptions and preconditions are not met, the training and the meetings, where related organizations assembled, were held in Khartoum, the capital city, inviting them.

When a conflict reignited in South Kordofan state and Blue Nile state in 2011, measures were taken to reduce the risk by improving facility construction and rehabilitation of and equipment provision to the Obeid Vocational Training Center (OVTC) in North Kordofan state[24], which is next to South Kordofan state but outside the target states, to secure the environment for receiving the students from these two states in the field of the vocational training. However, it is not clear to what extent the reinforcement of the OVTC with its facility and equipment covered the suspension of activities in the two states, because the data of the number of participants targeted by the project and received by the OVTC was not confirmed.

[23] The terminal evaluation report, P37

[24] According to JICA Sudan Office (then), the facility and equipment support to the OVTC was completed in less than a year from the official request until implementation. A comment was heard that JICA was told by the Sudanese side, “A support of such a volume had never been implemented within such a short period in Sudan so far.”

Table 4 Achievement of Overall goal by the time of ex-post evaluation (March 2017)

<table>
<tr><th>Overall goal</th><th colspan="2">Indicator</th><th>Achievement</th><th>Level of achievement</th></tr>
<tr><td rowspan="4">Improved access to public services for water supplies, health (maternal care), and vocational training in three Darfur states and Blue Nile and South Kordofan states.</td><td>①</td><td>Water supply:
20% increase in the number and proportion of residents who can access safe water in the target area</td><td>・Insufficient data were obtained regarding access to safe water at the district (locality/village) level where the pilot activities (rehabilitation of boreholes and water yards) were done.

・The following information was obtained regarding trends in the use of improved drinking water sources. Although there were variations by state, the average of the target states increased by 3.3%. Figures by gender were not obtained.

・It is difficult to assess the achievement level of this indicator itself, but the achievement level for access to water is considered to be moderate, based on the ratio of the population that can use improved drinking water sources.

Percentage of population who can use improved drinking
(Unit: %)
<table><tr><th></th><th></th><th>2010</th><th>2014</th><th>+/−</th></tr><tr><td>1</td><td>South Darfur</td><td>69.4</td><td>46.6</td><td>-22.8</td></tr><tr><td>2</td><td>North Darfur</td><td>59.8</td><td>50.6</td><td>-9.2</td></tr><tr><td>3</td><td>West Darfur</td><td>44.5</td><td>67.5</td><td>23.0</td></tr><tr><td>4</td><td>East Darfur</td><td></td><td>45.1</td><td>-</td></tr><tr><td>5</td><td>Central Darfur</td><td></td><td>50.6</td><td>-</td></tr><tr><td>6</td><td>South Kordofan</td><td>49.7</td><td>60.1</td><td>10.4</td></tr><tr><td>7</td><td>Blue Nile</td><td>39.9</td><td>71.3</td><td>31.4</td></tr><tr><td colspan="2">Average</td><td>52.7</td><td>56.0</td><td>3.3</td></tr></table>Source: Based on *Sudan Household Health Survey (SHHS-II) 2010, Sudan Multiple Indicator Cluster Survey, Final Report (2014)*
Note: East Darfur and Central Darfur states did not exist in 2010 because East Darfur state was isolated from South Darfur state, and Central Darfur state was separated from West Darfur State in January 2012.</td><td>△</td></tr>
<tr><td>②</td><td>【Water supply】
20 % increase in water use by residents in the target areas</td><td>・Reliable data regarding the boreholes rehabilitated by pilot activities or amount of water usage covering the target areas were not obtained.

・The results of the interview survey with residents living near the boreholes rehabilitated by the project during the ex-post evaluation (12 households in South Darfur, 10 households in South Kordofan, 22 total households) are as follows. Although the whole trend was difficult to summarize due to the small sample size, many residents responded that their water use had increased, as all 12 households responded "greatly increased" in South Darfur state, while 8 out of 10 households responded either "greatly increased (1 household) or "increased" (7 households) in South Kordofan state. When asked about the amount of currently available water, many residents in South Darfur state responded that the amount of water available was sufficient (11 out of 12 households responded "very satisfactory"), but the residents in South Kordofan State responded that it was moderate or insufficient; thus, the trend was divided.
Changes in amount of water consumed by household
<table><tr><th>Question</th><th colspan="5">South Darfur</th><th colspan="5">South Kordofan</th><th colspan="5">Total</th></tr><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>How has the amount of water consumed by your household changed compared to before 2009?</td><td>0</td><td>0</td><td>0</td><td>0</td><td>12</td><td>0</td><td>1</td><td>1</td><td>7</td><td>1</td><td>0</td><td>1</td><td>1</td><td>7</td><td>13</td></tr></table>Legend: 1 Greatly decreased, 2 Decreased, 3 No change, 4 Increased, 5 Greatly increased, 9 I don't know

Is the amount of currently available water sufficient?
<table><tr><th>Question</th><th colspan="5">South Darfur</th><th colspan="5">South Kordofan</th><th colspan="5">Total</th></tr><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Is the amount of currently available water sufficient?</td><td>1</td><td>0</td><td>0</td><td>0</td><td>11</td><td>1</td><td>4</td><td>5</td><td>0</td><td>0</td><td>2</td><td>4</td><td>5</td><td>0</td><td>11</td></tr></table>Legend: 1 Very insufficient, 2 Insufficient, 3 Medium, 4 Sufficient, 5 Very sufficient, 9 I don't know</td><td>△</td></tr>
<tr><td>③</td><td>Health:
Reduced maternal mortality ratio in the target areas</td><td>・Although the maternal mortality rate in Sudan was 216 against 100,000 birth in 2010, formal data have not been obtained since then. Therefore, it is difficult to measure the level of achivement of the overall goal in the health sector with this indicator.</td><td>-</td></tr>
<tr><td>④</td><td>Vocational training:
Employment rate of 50% or higher among the graduates within one year after completing the training</td><td>・At the time of the ex-post evaluation, none of the graduates had obtained a fixed job in Blue Nile state, and the target schools in the remaining four states did not obtain employment rates or the number of graduates employed. The target school in Blue Nile state responded that no graduates had obtained a fixed job because of limited employment opportunities in the labor market. However, the situation in the other states is not necessarily the same because activities werre discontinued in Blue Nile state due to the recurrence of conflict in 2011.</td><td>-</td></tr>
</table>

Source: Compiled based on review of the documents, documents provided by the former experts and interviews with the former experts

Remarks: The marks in the Level of Achievement mean as follows; ○ high △ medium × low − not applicable

Based on this, the project purpose was partially achieved in regards to water supply and health, but it was not achieved for vocational training. Failing to sufficiently achieve the monitoring capacities included in Output 1 hindered the timeliness of periodic comprehension of progress and improved guidance by analyzing it. Hence, the project purpose (i.e., improvement of capacities of the service providers) was not sufficiently accomplished. It is also regarded that the scope was too big for one project due to the various stakeholders and the multiple target areas and sectors. This is also a reason why accomplishment of the project purpose remained medium. Thus, the project achieved at a limited level its project purpose because of the above reasons.

3.2.2 Impact

3.2.2.1 Achievement of Overall Goal

The achievement of the overall goal (improvement of access to public services in the three target sectors) at the time of the ex-post evaluation was medium, as shown in Table 4.

As for the achievement of the 4 indicators, 2 were medium, and information for the other 2 did not exist[25]. Thus, the indicators in the field of vocational training have not been achieved because the data did not exist. However, according to the impact assessment report[26], which was commissioned to a local consultant firm and implemented in July - August 2012, the graduates acquired jobs, and the income levels increased in some cases. It is possible that the project's effects also emerged at the ex-post evaluation. The achievement of the overall goal (improvement of access to public services), therefore, is assessed to be medium.

The following two points are regarded as major impediments. First, the improvement of implementing organizations' capacities of service delivery (the project purpose) remained at a medium level, which did not sufficiently lead to better access to public services. Second, the project to improve access to public services included pilot activities in the respective fields (rehabilitation of boreholes, in-service training of Village Midwives (hereinafter, VMWs) and short-term vocational training) and TOT, equipment provision required for the pilot activities, as well as enforcement of coordination activities expected by Output 1. However, components to enhance capacities, skills and institution-building of implementing organizations, other than those mentioned above, were not included. Therefore, the overall goal was not achieved.

[25] As mentioned in the initial part of the Effectiveness and Impact (3.2), the indicators of the overall goal were sorted because they could be hardly utilized for this evaluation study as they were inappropriate. They were sorted based on the indicators established at the time of ex-ante evaluation, as well as on the "reference indicators" proposed by the project at the time of terminal evaluation and agreed by the Sudanese side.

[26] JICA Technical Cooperation Project on: Human Resources Development for Darfur and Three Protocol Areas Impact Assessment Report (Partners in Development Services, 2012)

Regarding the effects of the project's outputs and purpose, the operation rate of the boreholes in the water supply field varies depending on the state in which the well is located is located. The operational rate has not increased; however, the number of boreholes has increased (Table 5). In the health field, the interviews were conducted with pregnant and parturient women who received services from VMWs trained by the project (26 persons) in South Darfur and South Kordofan. According to the interview results, the frequency of receiving prenatal care has increased, and their recognition of safety at delivery attended by VMW has been enhanced (Table 6). Even though these results are limited in terms of small sample size and of the number of target states where the interviews were conducted, it is opined that the in-service VMW training by the project contributed to the women's levels of safety recognition. In the vocational training filed, short-term training courses, which are informal courses, have been conducted if there is a request from donors, etc. (Table 7). It is believed that the training equipment provided to the target technical schools contributed to receiving request by donors, etc. for implementing the short-term training[27]. However, implementation of short-term training is irregular.

Table 5 Operation rate of the boreholes

South Darfur state

	2012	2013	2014	2015	2016
Number of boreholes	161	166	176	179	181
Number of functioning boreholes	116	112	115	118	120
Operation rate (%)	72	67	65	66	66

South Kordofan state

	2012	2013	2014	2015	2016
Number of boreholes	N/A	372	416	455	460
Number of functioning boreholes	N/A	352	391	413	429
Operation rate (%)	N/A	94	93	91	92

North Darfur state

	2012	2013	2014	2015	2016
Number of boreholes	360	360	360	362	376
Number of functioning boreholes	252	251	250	251	251
Operation rate (%)	70	70	69	69	67

West Darfur state

	2012	2013	2014	2015	2016
Number of boreholes	75	80	85	95	110
Number of functioning boreholes	50	59	60	65	75
Operation rate (%)	67	74	71	69	68

Source: Interviews with SWCs

[27] Interview with the target technical school

Table 6 Interview results of the pregnant and parturient women who received care from VMWs trained by the project

Change in the frequency of receiving prenatal care

(unit: persons)

	Significantly decreased	Decreased	No change	Increased	Significantly increased
SD	0	0	0	2	12
SK	0	0	3	7	2
Total	0	0	3	9	14

Change in the recognition of safety at delivery

(unit: persons)

	Significantly worsened	Worsened	No change	Improved	Significantly improved
SD	0	0	0	1	13
SK	0	0	3	6	3
Total	0	0	3	7	16

Source: Interviews with the pregnant and parturient women at the time of the ex-post evaluation in South Darfur (14 persons) and South Kordofan (12 persons), 26 persons in total
Remarks: SD indicates South Darfur, and SK indicates South Kordofan

Table 7 Number of participants in short-term training after project completion

Name of state	2013	2014	2015	2016
South Darfur	210	20	3	-
South Kordofan	140	-	50	55
North Darfur	130	130	130	-
West Darfur	80	100	60	310
Blue Nile	75	150	150	140

Source: Interviews with the target technical school in the 5 states above

As stated, the achievement level of the overall goal was medium in the respective field, because improvement of the implementing organizations' capacities (the project's purpose) was medium, and the components for improvement of their capacities, skills and institution-building, other than the pilot activities in the respective field (rehabilitation of boreholes, in-service training of VMWs and short-term vocational training) and the TOT, equipment provision necessary for the activities, as well as improvement of coordination capacities were not included. Based on the above, the project has achieved a limited level of its overall goal.

3.2.2.2 Other Positive and Negative Impacts

The impact on the natural environment and the land acquisition and resettlement were not observed. Some positive impacts were observed, such as an enhanced trust among the residents toward the government and a strengthened trust[28] of the Sudanese government toward JICA, etc.

Interviews were conducted in Khartoum, the capital, with the Sudanese state government staff from the implementing organizations (6 persons) who participated in the project, and have been participating in The Project for Strengthening Peace through the

[28] JICA Sudan Office (then)

Improvement of Public Services in 3 Darfur States (March 2015–March 2019), which virtually succeeded the project. According to the interviews, some comments concerning the changes brought by the project included at an individual level, “technical capacity was enhanced,” “management capacity was improved,” and “capacities to find out problems and to prioritize tasks were improved” through the TOT and overseas training. At an organizational level, some pointed out as impacts that a “the number of high-quality staff increased through the TOT,” “staff worked more enthusiastically,” and “satisfaction with work increased.” Regarding vocational training, some comments were made such as “The high-level equipment provision of the project made the technical school attractive to NGOs and international organizations as an institution for them to commission vocational training.” Also, “The number of students increased. There were 900 applicants while the capacity is 400, and our school received 503 students as the result of selection.” The increase in the number of students is regarded as a positive impact caused by the equipment provision and the TOT. On the other hand, it brings about a risk of negative impacts from the aspect of training quality to accept an excessive number of students compared with the school’s capacity. However, this point could not be confirmed.

Thus, some positive impacts have been pointed out such as an enhanced trust among the residents toward the government and a strengthened trust of the Sudanese government toward JICA, etc. However, detailed information could not be acquired. Also, the increase in the number of students at the target technical school is regarded as a positive impact.

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According to the terminal evaluation report, the project brought about an indirect positive impact on the conflict factor by changing the recognition of HCDG (currently FGC) and of the residents toward the government, as well as strengthening the relationship between HCDG and the state governments[29]. Sufficient information could not be obtained on the specific status of these points at the time of the ex-post evaluation. No negative impact caused by implementation of the project was observed.

As stated above, implementation of this project brought about effects to some extent. Therefore, effectiveness and impact of the project have been assessed as fair. As for the project purpose, its achievement is fair, since strengthening of monitoring capacities included in Output 1 was not sufficiently achieved and the project targeted multiple sectors and states and various organizations, despite it being a remote-controlled project (the project’s purpose was partially achieved in the fields of water supply and health, but not achieved in the field of vocational training). Also, achievement of the overall goal in

[29] The terminal evaluation report, P38-39

the fields of water supply, health and vocational training is fair, because achievement of the project purpose was insufficient. There was a lack of project components to enhance capacities, skills and institution-building of the implementing organizations concerning better access to public services—except for the pilot activities in the respective fields and the TOT and equipment provision necessary for the activities—as well as the component to enhance coordination capacities expected by Output 1.

3.3 Efficiency (Rating: ①)

The achievement of the outputs was stated in the chapter on Effectiveness. Also, the major activities implemented during the project duration are shown in appendix. The inputs are explained below.

3.3.1 Inputs

The inputs until project completion are as follows.

Inputs	Plan	Actual (at the project completion)
(1) Experts	Long-term: 34MM Short-term: 13MM（TQM/5S） Total: 47MM	Long-term: 49.8MM Short-term: 76.8Mm Total:126.6MM
(2) Trainees received	Training in Japan: Project management and monitoring	(Training in Japan: country based, group training Project management, etc. Total: 30 persons
(3) Third-country Training	Management of technical and vocational training, Medical Health by 5S・TQM method	Morocco, Egypt, Rwanda and Malaysia. Peacebuilding such as DDR, Water supply, Health, Vocational Training Total: 30 persons
(4) In-country Training	Project management and monitoring, Budget management, Report-making and analysis, Maintenance and management of boreholes, Technical training of electricity, machinery and vehicles and school management, Improvement of medical health administration	Project management, Water supply, Health and Vocational training Total: 489 persons
(5) Equipment	Equipment for maintenance of boreholes, Equipment for Courses of Electricity, Machinery and Vehicles, Equipment for Health facilities and Office furniture, etc. Approx. 130 million Japanese yen	Equipment for the fields of Health, Water Supply, Vocational Training and Management. (Equipment for Water supply field such as vehicles and generators, etc. shares 58% of the total amount of equipment, which is the largest. Equipment for health field is midwifery kit set, etc.) 694 million yen
(6) Local cost support	18 million Japanese yen	216 million yen
(7) Local staff		9 persons (increased since 2012)
(8) Construction and rehabilitation of facility (OVTC)		Workshops, Accommodations for Trainers, Dormitory USD353,374
Japanese Side Total Project Cost	374 million Japanese yen in total	1,436 million yen in total
Sudanese Side Total Project Cost	Allocation of counterpart staff Project office space Project operational cost	Allocation of counterpart staff 83 persons Project office space

		Project operational cost Total: 35 million Japanese yen

Remarks 1: MM stands for man month.
Remarks 2: The Sudanese side total project cost was SDG1,594,433. It was converted based on; SDG 1=JPY 22.305 (JICA monthly exchange rate for May 2013).

3.3.1.1 Elements of Inputs

Especially, local cost, equipment provision and dispatch of experts significantly increased compared with the plan. The comparison of costs is shown as follows. Out of the total cost for equipment provisions, the water supply field shares the biggest amount (approx. 58%), followed by the vocational training field (approx. 31%).

Elements of Inputs	Plan	Actual	Comparison
Local cost support[30]	18 million Japanese yen	216 million Japanese yen	1,200%
Equipment provision	130 million Japanese yen	694 million Japanese yen	534%
Dispatch of Experts	34M/M	126.59M/M	372%

In this project, two states in the Protocol Area (South Kordofan and Blue Nile) were included in the target locations after project commencement. The required amount of inputs can increase for the additional states.

However, it has not been assessed if the increased costs borne by the Japanese side counterbalance the increase of outputs caused by the inclusion of the additional target areas for the following reasons:

1) The cost for the pilot activities were to be borne by the Sudanese side, while the cost for TOT and the equipment were to be borne by the Japanese side with local cost support.
2) Out of the total equipment costs, which showed a significant increase, the water supply field shared 58%. However, large equipment was provided only for the 3 Darfur states.
3) Due to the reignited conflict in 2011, the activities in water supply and vocational training in the Protocol Area were suspended.

However, the large equipment in the water field provided to the 3 Darfur states[31] was utilized for the pilot activities (the rehabilitation of boreholes), contributed to the capacity development of the water supply personnel (Output 2) and conducted TOT. Also, it

[30] Major items of expenditure were general operational cost, contracted work (local consultant), honorarium, airfare, etc. (JICA internal document).
[31] Major equipment includes borehole cameras, air compressors, water pumps, generators, etc., which are required for rehabilitation of boreholes by airlift system, as well as crane trucks for conveying equipment and materials. This equipment provision cost was about 100 million yen for each SWC in Darfur (The project completion report, P62).

contributed to achievement of the project purpose, as the pump volume (an indicator for the project purpose) increased at 88% of the all the rehabilitated boreholes in Darfur.

On the other hand, since specific content and the targeted level of human resource development by Output 2 are not clear, it is unknown whether fostering personnel who can rehabilitate boreholes utilizing large equipment in the water supply field had been planned. Also, without revisions following the project's commencement, the objectives and the indicators remain unclear. It is regarded that the amount of input costs has increased, leaving clarification of the objectives and modification of the plan insufficient.

The drastic increase of the local cost support by the Japanese side makes it appear that the project was planned and implemented without being able to sufficiently grasp the problems and specify the countermeasures, because on-site information collection at the target areas could not be conducted due to security reasons at the time of planning. In the meantime, the emergency assistance[32] (170 million Japanese yen) provided in the fields of water supply, agriculture and income generation contributed to the increase in project costs on the Japanese side in 2012. This assistance was implemented from the framework of this project to cope with the reignited conflicts in Blue Nile and South Kordofan. In the water supply field, in regard to emergency assistance, repair and rehabilitation of water supply facilities were conducted in Blue Nile in collaboration with Blue Nile SWC. In the agriculture field, emergency assistance provision of improved seed and agricultural tools to ex-combatants was implemented in Blue Nile and South Kordofan, while in the income generation field, training for IDPs and distribution of starter kits[33] were conducted in both states. In both fields, assistance was provided in collaboration with FAO and the Japan International Volunteer Center (JVC)[34]. The emergency assistance mentioned above lacked direct connection with the outputs of this project as mentioned in the chapter for Relevance. The assistance was not connected with the output or the project's purpose and, therefore, further decreased efficiency.

Meanwhile, TOT in the 3 fields was conducted with the cooperation of other JICA technical cooperation projects that were being implemented during the same period[35].

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[32] The details are as stated in 3.1.4 Appropriateness of the Project Plan and Approach in the chapter of Relevance.

[33] As for the specific items of the assistance in the field of income generation in collaboration with FAO, fishery kits, fishery nets, fish-processing sets, etc., were provided in Blue Nile, where fishery is flourishing, while cheese-making kits were provided in South Kordofan, where dairy farming is a major industry. In respective states, training was conducted on fish processing, cheese production, marketing, etc. (JICA internal document).

[34] JICA internal document

[35] In water supply field, TOT was conducted for the SWC staff by the "Public Water Corporation Training Center (PWTC)" with the cooperation of the "Human Resources Development for Water Supply Project". Currently, PWTC is renamed as the "Drinking Water and Sanitation Unit Training Center (DWST)". In the health field, TOT was implemented for Health Visitors (HV) and Assistant Health Visitors (AHV) for the sake of in-service training for VMW, with the cooperation of the "Frontline Mother and Child Health Empowerment Project in Sudan". In the vocational training field, TOT was conducted at the Khartoum 2 Vocational Training Center, etc., and received technical advice from the Supreme Council for Vocational

Since the beginning of the project's planning stage, the intention was to collaborate with other existing projects from a program point of view for the sake of larger effects and better efficiency. It is believed that this was aimed at raising the efficiency of the overall assistance, from JICA to Sudan, by making the best of the human resources of JICA in Sudan. However, at the implementation stage, there was an opinion[36] that this goal led to the delay of project activities because the time and labor of the project experts were consumed with coordinating the schedule, which changed among respective projects since each had its own project plan. Another comment was heard that the situation was improved after JICA began to dispatch the experts of other projects with clear terms of references for this collaboration; although, the terms of reference were not clear for them at the initial stage[37].

The idea of aiming at achieving the outputs in collaboration with the other projects was excellent. However, at the implementation stage, it led to a delay in the activities, etc., and the project did not proceed as planned. This was caused because each project was not planned to coordinate with related projects, but support from other projects was sought after the project commencement. Also, the JICA local office did not take a role in coordinating these projects, but the project experts did.

3.3.1.2 Project Cost

The planned and actual amount of the cost borne by the Japanese side is 384% compared with the plan shown below. The actual amount borne by the Sudanese side was SDG1,594,433. Thus, the project cost from the Japanese side was significantly higher than planned.

Plan	Actual	Comparison
374 million Japanese yen	1,436 million Japanese yen	384%

3.3.1.3 Project Period

The project duration was extended by 1 year, which was 133% compared to the plan shown below. The extension was to allow for technical review and reexamination of the content of the pilot activities, which were behind schedule, for each state based on the difference in actual situations and capacities among the states[38], which were clarified until

Training and Apprenticeship (SCVTA) with the cooperation of the "Project for Strengthening Vocational Training".

[36] Interview with those who were concerned with the project

[37] Interview with those who were concerned with the project

[38] Documents provided by JICA

then, as well as sorting out the activities and the project contents in preparation of the Phase 2 project[39].

As mentioned in 3.2.1.1, the project was planned to receive cooperation from JICA's other technical cooperation project, being implemented at the same period in all of the three fields. It is regarded that this is also a cause of the extension of the project, as much time was needed for coordination among the projects. According to interviews with those concerned with the project on the Japanese side, there was information that the Japanese experts were dispatched sporadically before the extension, and the coordination and collaboration among them was not sufficient[40]. There is a possibility that this led to the delay of the activities and, thereby, leading to one of the causes of the extension.

Plan	Actual	Comparison
36 months	48 months	133%

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Security instability significantly influenced the plan and the implementation of the project. At the planning stage, the project was planned based on information that could be acquired in the capital only, because information collection at the sites could not be conducted. Since the project commenced without clarification of specific needs, the cost (equipment, facility, dispatch of expert, etc.) significantly increased after commencement. At the implementation stage, the risk in terms of security was significant for conveying the need for large equipment in water supply fields to the 3 Darfur states. As a result, conveyance by air cargo became necessary, which increased transportation costs. Moreover, when the pilot activities in the vocational training field were suspended in the Protocol Area due to deteriorated security, construction and rehabilitation of facilities as well as equipment provisions were conducted in the amount of 34.57 million Japanese yen[41] in order to mitigate the effect on the suspension, so the short-term training courses could be conducted at the OVTC in North Kordofan state, which is next to South Kordofan but the outside the target states. This led to a significant increase in costs. Although the increased cost for transporting equipment by air to the 3 Darfur states does not directly contribute to the increase in output; this cost increase is regarded as necessary, taking into consideration the risk of theft of the expensive equipment.

On the other hand, although the facilities and equipment were enforced at the OVTC, it could not be confirmed to what extent implementation of the short-term vocational

[39] Interview with the JICA Sudan Office (then)
[40] Interviews with and questionnaire through email to those who were concerned with the project on the Japanese side
[41] USD353,374 (JICA monthly exchange rate of May 2013)

training courses were covered, since the record after the project completion could not be obtained at the OVTC[42].

Based on this information, the project cost and project period significantly exceeded the plan, and the excess does not match with the increase of the target area during implementation and that of outputs due to modification of the plan. Therefore, efficiency of the project is considered low.

3.4 Sustainability (Rating: ②)

3.4.1 Related Policy and Institutional Aspects for the Sustainability of Project Effects

At the time of the ex-post evaluation, the "25-Year Strategic Plan for Water Sector" (2003–2027) in the water supply field, and the "25-Year Strategic Plan for Health Sector" (2003–2027) in the field of health have remained. Thus, a stable supply of water and promotion of maternal health improvement are given importance in terms of the Sudanese policy, even at the time of the ex-post evaluation. On the other hand, the midterm and long-term policies on technical education from midterm and long-term perspectives are not clear, even though enhancing a trainer's capacity is pursued. In 2013, the "Policy for Technical and Vocational Education and Training" of the Ministry of Labor was compiled with the support of donors such as UNESCO, etc. However, at the time of the ex-post evaluation, it had not been approved by the cabinet. It is because of the difficulty of making consensus among the Ministry of Labor, which oversees vocational training, the Ministry of Education, which oversees technical education at the technical schools and the Ministry of Higher Education, which is responsible for the technical college. Thus, sustainability from a policy perspective in the field of vocational training is medium. Since policy support toward continuation of the activities conducted by the project will be unchanged in 2 out of 3 sectors, sustainability from policy and institutional aspects is generally high.

3.4.2 Organizational Aspects for the Sustainability of Project Effects

The change in the number of counterpart staff at the section in charge at the service providers (implementing organizations in the states) during the implementation period, as

[42] The pilot activities at the OVTC (implementation of the short-term training courses) were planned twice, and the 1st course was conducted with 55 participants from December 23, 2012 to February 9, 2012. The 2nd course was planned for the duration from March 3, 2013, until March 31, 2013, and the recruit of participants was conducted. However, implementation of the 2nd training course had not been completed until the Japanese expert left the country. The cause of the delay is regarded that those who were concerned with the project concentrated on the construction and rehabilitation of the facilities, while the Japanese experts were out of the country, which led to a delay in producing equipment inventory for improvement of equipment management and in preparation of TOT for the OVTC trainers (JICA internal document). Although data on the implementation, including actual number of participants, was requested when the OVTC was visited, the data from the OVTC could not be obtained.

well as that after project completion are shown in Table 8. Out of the 17 target organizations, data for project duration and after-project completion could be attained on 9 organizations through interviews. A comparison between the number of staff during the project duration and after the project completion, showed that the number of staff increased at 2 organizations, decreased at 1, and remained almost unchanged at 6 others. Although accurate analysis is difficult due to the limited number of organizations for which data are available, it is agreed that the number of staff, in general, has been static. Therefore, it can be expected that stability will be maintained to a certain extent from the perspective of staff allocation in the organizations. However, information on the clarity of responsibility assignment could not be obtained.

On the other hand, the number of counterpart staff at the responsible organization to supervise the target states during project duration (the Federal Ministry of Local Governance at the project commencement, which was taken over by HCDG and then by FGC by the time of the ex-post evaluation) has been the same. However, 3 personnel is too few to conduct monitoring while coping with other broad-range work at the federal level, since the size of this project is large, covering 17 target organizations in 3 sectors in 7 states. The shortage of manpower has continued from project duration until the time of the ex-post evaluation, while this section does not have staff with expertise in the 3 sectors due to the inherent nature of the organization. With the reasons mentioned above, there is no organization on the Sudanese side that comprehends the status of continuing activities, securing budgets, emergence of effects and the transition of the project after the completion. Therefore, sustainability from an organizational perspective is assessed to be fair.

Table 8 Number of counterpart staff at the implementing organizations

(Unit: person)

	Project implementation period (June 2009 - May 2013)					After the Project completion			Trend
	2009	2010	2011	2012	2013	2014	2015	2016	
1.State Water Corporation									
South Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
North Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
West Darfur	3	3	3	3	3	6	6	6	↑
South Kordofan	11	11	11	11	11	4	4	4	↓
Blue Nile	8	8	8	9	9	8	9	9	→
2.State Ministry of Health									
South Darfur	2	2	2	2	2	2	2	4	→
North Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
West Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
East Darfur				5	8	11	11	9	↑
Central Darfur				N/A	N/A	N/A	N/A	N/A	
South Kordofan	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Blue Nile	5	5	5	6	6	6	6	6	→
3.State Ministry of Education									
South Darfur	8	8	8	8	N/A	8	8	N/A	→
North Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
West Darfur	2	3	3	3	2	2	2	2	→
South Kordofan	8	8	8	N/A	N/A	N/A	N/A	N/A	
Blue Nile	30	30	30	29	29	29	30	29	→

Source: Based on the interviews with SWC, SMOH and SMOE

Remarks 1: The result of interviews on the change in the number of counterparts at respective organizations, as well as that of the same section after project completions are mentioned above. As for SWC, the number of technical staff, which was obtained most, was utilized because other staff numbers were not sufficiently obtained. Thus, it is possible that the number differs from the actual number of the counterpart.

Remarks 2: East Darfur and Central Darfur were separated from South Darfur and West Darfur, respectively, in January 2012. Since only the health sector included these 2 states in their target areas, the project targeted 5 states in the 3 sectors until 2011, while targeting 7 states in the health sector and 5 states in the water and vocational training sector since January 2012.

Remarks 3: The "trend" in the above table shows the increase/decrease between the number of counterpart staff members during project duration and that of the post-project completion with an arrow.
↑ means increase, ↓ means decrease, and → means almost no change.

Table 9 The number of counterpart staff members at the responsible organization at the federal level

(unit: persons)

	Project duration（2009.6–2013.5）					After the project completion			Trend
	2009	2010	2011	2012	2013	2014	2015	2016	
The Federal Ministry of Local Governance/ HCDG /FGC	3	3	3	3	3	3	3	3	→

Source: Questionnaire to FGC

Remarks: The trend in the above table shows the increase/decrease between the number of counterpart staff members during the project duration and that of the post-project completion with an arrow.

↑ means increase, ↓ means decrease, and → means almost no change.

3.4.3 Technical Aspects for the Sustainability of Project Effects

It is difficult to analyze the technical aspects for the sustainability as a whole, since information on the technical aspects of the implementation organizations in respective fields at the time of the ex-post evaluation is difficult to obtain due to security reasons in the target areas. According to an interview with stakeholders, the technical capacity of the SWC staff differs depending on each individual, which makes it difficult to assess the technical capacities of the SWC staff in general. Similarly, in an interview with the Drinking Water and Sanitation Unit Training Center (DWST), which conducted the TOT for the SWC in Khartoum and has been conducting training for SWC staff across the country, it was pointed out that the knowledge and skills of the participants of TOT significantly differed from person to person, making it difficult to compare with other states. Additionally, although information collection was conducted through interviews in the fields of health and vocational training, reliable information could not be sufficiently obtained. Thus, although the technical capacities in each field are not high, there is no reason to assess them as low. Therefore, sustainability from technical aspect is assessed as medium.

3.4.4 Financial Aspects for the Sustainability of Project Effects

As the result of interviews with each implementing organization in the target states, the transition of budgets of the organizations of which data from both project implementation and after completion are shown below. In the water supply field, data were obtained from 4 out of 5 states, and the surplus has been increasing in West Darfur (Table 10). Blue Nile experienced a deficit after project completion; although, financial balances are not known for the rest of the states due to a lack of information. In the field of health, information from 2 out of 7 SMOHs were obtained, and the 2 states are in deficit (Table 8). Also, in the field of vocational training, information regarding target technical schools from 3 out of 5 states were received. Among the 3 states, North Darfur's revenue and expenditures have been kept in equilibrium, as well as those for South Kordofan, except in 2011 and 2012. Thus, there seems to be no problem for these 2 states. As for Blue Nile, the balance between revenue and expenditure could not be analyzed due to a lack of data. It is difficult to grasp overall trends, as information is lacking in all the fields; although, there will be fewer concerns in the water supply field because of revenue from water fees, an independent financial source of SWC. As far as the data obtained, the vocational training field had the fewest organizations in deficit followed by the water supply field, and sustainability from a financial perspective was the lowest in the health field. There are, however, many target organizations from which data could not be

obtained or partially obtained in all of the three fields, which left concerns on the financial data management and financial management.

Some organization in water supply and health fields are in deficit and others show negative expenditures (Tables 10–12). These organizations compensate for deficits with donor support, and there is concern about the continuation of activities if these external supports are suspended. According to the United Nations Development Assistance Framework (hereinafter, UNDAF) for Sudan, $842 million US dollars is expected to be provided to the social services field, which includes maternal health and water supply, and $105 million US dollars to the field of economic development and poverty mitigation, which includes improvement of unemployment rates between 2018 and 2021, as shown as the target amount of donors' support by international organizations, as for the donor's future support. Thus, a certain amount of support is expected to be maintained[43]. The sustainability from financial perspective is not high, but there is insufficient information to judge it is low. Therefore, sustainability from a financial perspective is low as a whole.

Some minor problems have been observed with the organizational, technical, and financial aspects. Therefore, sustainability of the project's effects is fair.

Table 10 The balance of budget of State Water Corporation

(Unit: Thousand SDG)

	Project implementation period (June 2009 - May 2013)					After the Project completion		
	2009	2010	2011	2012	2013	2014	2015	2016
Revenue								
South Darfur	N/A	N/A	18,052	N/A	N/A	29,341	38,156	51,316
North Darfur	N/A	14	14	23	21	38	45	49
West Darfur	5,600	8,750	11,800	15,950	18,000	19,200	21,250	26,500
Blue Nile	N/A	N/A	N/A	4,527	6,669	7,926	11,400	14,085
Expenditure								
South Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
North Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
West Darfur	600	1,750	2,800	950	-7,000	-10,800	-23,750	-31,500
Blue Nile	N/A	N/A	N/A	6,147	10,439	16,678	N/A	21,891
Balance								
South Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
North Darfur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
West Darfur	5,000	7,000	9,000	15,000	25,000	30,000	45,000	58,000
Blue Nile	N/A	N/A	N/A	-1,620	-3,770	-8,752	N/A	-7,806

Source: Based on the interviews with SWC

[43] Sudan United Nations Development Assistance Framework (UNDAF) 2018–2021, P3–13, P16-19. In the UNDAF Results Matrix, which shows the overview of UNDAF's plan, improved maternal morality ratio as well as the increased ratio of households that can utilize improved water sources are set as the indicators for the field of social services, while an improved unemployment rate is set as the indicator for the field of economic development and poverty mitigation.

Remarks 1: As for the part where the amount of expenditure or balance is in red, it is actually compensated by support from donors, according to the interviews to SWC.

Table 11 The balance of budget of State Ministry of Health

(Unit: Thousand SDG)

	Project implementation period (June 2009 - May 2013)					After the Project completion		
	2009	2010	2011	2012	2013	2014	2015	2016
Revenue								
South Kordofan	27,366	24,973	27,204	31,428	36,720	N/A	N/A	N/A
Blue Nile	3,229	460	415	413	1,149	1,310	1,347	299
Expenditure								
South Kordofan	65,557	69,903	75,617	52,558	57,660	N/A	N/A	N/A
Blue Nile	16,347	19,395	23,518	25,509	39,475	18,684	50,685	49,929
Balance								
South Kordofan	-38,190	-44,930	-48,413	-21,130	-20,941	N/A	N/A	N/A
Blue Nile	-13,118	-18,935	-23,103	-25,096	-38,326	-17,373	-49,338	-49,630

Source: Based on the interviews with SMOH

Remarks 1: East Darfur and Central Darfur became separated from South Darfur and West Darfur, respectively, in January 2012.

Remarks 2: As for the part where the amount of expenditure or balance is in red, it is actually compensated by support from donors, according to the interviews to SMOH.

Table 12 The balance of budget of target technical schools

(Unit: Thousand SDG)

	Project implementation period (June 2009 - May 2013)					After the Project completion		
	2009	2010	2011	2012	2013	2014	2015	2016
Revenue								
North Darfur	40	45	47	49	70	80	119	180
South Kordofan	20	20	20	20	20	20	20	20
Blue Nile	N/A	N/A	N/A	15	15	17	21	35
Expenditure								
North Darfur	40	45	47	49	70	80	119	180
South Kordofan	20	20	N/A	35	20	20	20	20
Blue Nile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Balance								
North Darfur	0	0	0	0	0	0	0	0
South Kordofan	0	0	N/A	-15	0	0	0	0
Blue Nile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Source: Based on the interviews with TS

Remarks: The increase of revenue at the technical school in North Darfur in 2015 and 2016 is due to an increase in wages for staff as well as support from international organizations (UNDP, UNHABITAT, SAG and DDR) and international NGOs (Plan Sudan, Save the Children).

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented to improve the service delivery capacity of related organizations in water supply, health and vocational training sectors in Darfur states and the Protocol Areas in Sudan, thereby contributing to residents' enhanced access to public services. Although the development of conflict-affected areas as well as improvement of water supply, maternal health and vocational training sectors are generally consistent with the country's policy and are highly consistent with the development needs and Japan's Official Development Assistance policy, there are some issues with appropriateness in project planning and approach. Therefore, the relevance is fair. While the project purpose was partially achieved in the water supply and health sectors, it was not achieved in the vocational training sector. This is because monitoring capacity was not sufficiently improved, and the project targeted multiple sectors and states although it was so-called "remote-controlled project." Therefore, achievement of the project purpose is fair. The achievement of the overall goal remained to be medium because achievement of the project purpose was fair and, as for access to public services, the components to improve capacities, technologies and institutional buildings were not included, except for those concerned with the pilot activities, training of trainers (TOT) for the pilot activities, equipment provision and coordination capacity enhancement intended through Output 1. As a result, effectiveness and impact are fair. On the other hand, even though the project cost and the project period significantly exceeded the plan, the excess does not match the increase of the target area and the increase of outputs through modification of the project plan during the implementation period. Thus, efficiency is low. There are partially some problems regarding sustainability, since sustainability from organizational, technical and financial aspects depends on the target states, although sustainability in terms of policy and institutional aspect is high, so sustainability is fair. In light of the above, this project is evaluated to be unsatisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

None.

4.2.2 Recommendations to JICA

Since the monitoring capacities were not sufficiently enforced by the project, it is important to observe the progress of enforcement of monitoring capacities of the State Ministry of Finance (SMOF), which is being undertaken by the phase 2 project ("The Project for Strengthening Peace through the Improvement of Public Services in Three

Darfur States") to support its further promotion[44].

4.3 Lessons Learned

Measures to be taken when information collection at the project site is difficult for project planning due to security restriction

In this project, the cost borne by the Japanese side significantly increased compared with the plan due to lack of information necessary for sufficient analysis of problems and for planning coping measures as the detailed planning study was conducted at the capital city due to security reasons. After the project commencement, as the needs became clearer, inputs such as human resources, equipment and facility were added as required, which resulted in a significant increase in cost from the Japanese side compared with the initial plan. Among others, some of the inputs, such as large equipment in water supply fields provided to 3 Darfur states, were observed to have contributed to the output and the project purpose. However, it is an issue of this project that the inputs were added without clarifying the aim of respective modification of the plan as well as being shared among project stakeholders, while leaving the concreteness of the plan insufficient. If conducting an ex-ante evaluation of a technical cooperation project in the target area is difficult due to security reasons, planning based on sufficient information collection and analysis by applying "step-by-step planning system" (commonly known as two-step method)[45], etc. is desirable. Also, when there is a significant change in the project plan compared with the initial one, it is desired to make a record of the change for keeping it, and clarify the aim of modification as well as the revised plan, including its objectives, etc., after revision so that they can be shared.

Clear setting of objectives and indicators and appropriate reflection of modification of project plan into PDM

In this project, there were some problems in terms of concreteness of the objectives and setting of the indicators of the PDM from the initial planning stage. However, these problems did not improve during the project duration. Additionally, in spite of the repeated changes in the project plan, the changes have not been reflected by the PDM. It is probable that these changes hindered common understanding of the project plan and its modification among those who were involved in the project. When designing a PDM, it is

[44] The project which succeeded this project (virtually the phase II of the project [March 23, 2015–March 31, 2019]). It targets the same sectors with almost the same implementing organizations, while it targets only 3 Darfur states (North, South and West.).

[45] In a JICA technical cooperation project, surveys and activities are conducted based on the temporary PDM in the former half of the project duration, and the project plan is determined with setting indicators of PDM (1st stage). For the rest of the duration, the project is implemented based on the temporary PDM. There is an example in which survey is conducted in the target area in the 1st year, and the indicators of the PDM is determined within 1 year after project commencement, while activities, etc. are revised if needed.

important to set objectives and the indicators appropriately, by sufficiently considering, for example, “What do we perceive as ‘the coordination capacity’ specifically?” and “What should become what condition in order for us to think that ‘the coordination capacity’ has been enhanced?” Whose method should we adopt, and in what way, for us to identify and assess. In case there is a problem in terms of clarity and logicality of PDM, it is important to revise it during the implementation period to sufficiently analyze and examine the change, thereby revising the PDM appropriately.

Effects and points to be kept in mind during implementing activities in collaboration with other technical cooperation projects

The TOT of this project was conducted with the cooperation of the other JICA Technical Cooperation Projects, which were being implemented at the same period. In this project, it was intended to enhance effects and efficiency in collaboration with existing projects from the program point of view since its planning stage. However, there was a complicated allocation of experts, in the form of adding TOR to the experts of the other existing technical cooperation project. When a schedule change occurs at other related projects, much time and labor were required for the coordination made by the project experts, which resulted in the delay of activities. Thus, it did not sufficiently reach the enhanced effects and efficiency by collaboration as planned. However, the situation was improved since JICA started dispatching the experts with clarified terms of reference after sorting out the tasks of the project to be shared by the projects concerned. As for the reason why the excellent idea of maximizing effects and efficiency by collaboration with other projects did not produce sufficient effects as expected, it is believed that supports from other projects were pursued after the other projects were already planned, rather than planning all of the projects together under this concept. Also, it is considered as a cause to have chosen a system in which experts of this project take on coordinator roles, rather than members of the local JICA office. When a project is implemented in collaboration with other technical cooperation projects, it is essential to plan the program simultaneously with the whole group of projects, to examine how to interact with other projects, secure the terms of reference for the project and time required by other projects experts, and allocate a program officer who is responsible for monitoring the whole projects as a program and making coordination during implementation at the JICA local office.

Establishment of monitoring system and setting of project scope of a remote-controlled project

This project is a so-called remote-controlled project due to security restrictions. At the

time of the ex-post evaluation, no Sudanese organization specifically comprehended the transition of the activities as a whole after the project completion, and the access to the implementing organizations at state level was quite limited. Hence, there was difficulty in fully understanding activities completed by the implementing organization at the state level after project completion. This fact also means there are some concerns about sustainability from an organizational perspective, concerning the management of activities by the Sudanese side. This is due to insufficient achievement of monitoring capacity made during the implementation period, and also because this project had multiple concerned stakeholders as it targeted multiple sectors in multiple areas. Further, it is supposed that the project exceeded the scope able to be covered by one project. When a project, especially a remote-controlled project, is planned and implemented, it is desired not to broaden the target area and sector too much, but to focus instead on a size compatible with the counterpart organizations' post-project management.

Points to be kept in mind on the implementation of emergency assistance-utilizing framework of a technical cooperation project

When emergency assistance is provided, utilizing the budgetary framework of the ongoing project, it is necessary to be consistent between the logic of the "Input–Output–Outcome–Impact" of the plan of the ongoing project and the emergency assistance. There are two possible ways for coping with this: 1) Focus the scope of the emergency assistance by coordination with other donors, etc., to make its contents and areas align with the direction of the outcome and the impact of the existing project; or 2) Revise the plan to expand the target area or project component of the existing project to make the emergency assistance as a part of the existing project. However, in case the need for emergency assistance is not consistent with the existing project from the nature of the emergency assistance, careful decision-making is necessary after clarifying the difference between the existing project and the emergency assistance based on the objectives, contents, and the targets, etc.

Appendix Actual main activities

1. Water supply sector

(1) TOT：Training for staff

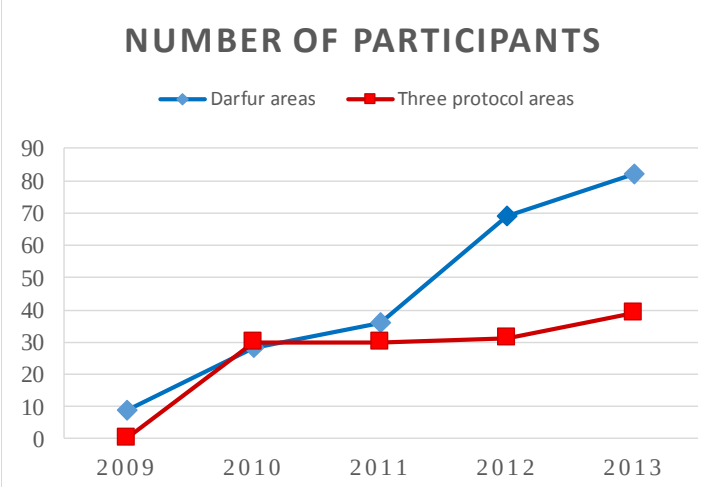


Figure 1 Number of participants from SWC in Darfur and the Protocol Areas (the total number)

Source: Project completion report P55

Note: Training in Japan and training in third country are included

(2) Pilot activities: Borehole rehabilitation work (project implementation period)

Table 1 Achievement of borehole rehabilitation work by May 2013

States / Areas	Target and level of achievement				
	Actual	Target (Original plan)	Level of achievement (%)	Target (Revised plan)	Level of achievement (%)
North Darfur	14	18	78	14	100
West Darfur	16	18	89	16	100
South Darfur	20	18	111	19	105
Sub total	**50**	**54**	**93**	**49**	**102**
South Kordofan	16	72	22	24	66.7
Blue Nile	6	5	120	5	100
Sub total	**21**	**77**	**27**	**29**	**72**
Total	**71**	**131**	**54**	**78**	**91**

Source: Based on the project completion report P51

(3) Pilot activities: Borehole rehabilitation work (after the project completion)

Table 2 Status of borehole rehabilitation work (after the project completion)

States		2014	2015	2016	Total
North Darfur	Borehole rehabilitation	N/A	14	1	N/A
	Rehabilitation of related facilities around boreholes	32	5	4	41
West Darfur	Borehole rehabilitation	N/A	N/A	N/A	N/A
	Rehabilitation of related facilities around boreholes	N/A	3	3	N/A
South Darfur	Borehole rehabilitation	N/A	N/A	N/A	N/A
	Rehabilitation of related facilities around boreholes	N/A	N/A	N/A	N/A
South Kordofan	Borehole rehabilitation	N/A	N/A	N/A	N/A
	Rehabilitation of related facilities around boreholes	16	11	16	43
Blue Nile	Borehole rehabilitation	0	0	0	0
	Rehabilitation of related facilities around boreholes	7	4	2	13

Source: Interview with SWC in each state at the time of ex-post evaluation

2. Health sector

(1) TOT：Actual training of trainers conducted during project implementation period

Table 2 Actual training of trainers of the in-service training for midwives during the project implementation period

	ND	WD	SD	BN	SK	Total
Number of HV/AHV	42	16	23	28	56	165
Number of HV/AHV attended the training for trainers (HV/AHV)	14	9	14	9	10	56
Attendance rate	33%	56%	14%	32%	18%	34%
Number of HV /AHV who conducted in-service training as a trainer	14	5	16	12	10	57

Legend: ND North Darfur, WD West Darfur, SD South Darfur, BN Blue Nile, SK South Kordofan, HV Health Visitor, AHV Assistant Health Visitor
Source: Project completion report P70

(2) Pilot activities: Number of VMW who attended in-service training by Grant Aid Project (cooperation with UNICEF) (from the project implementation period to the project completion)

Table 3 Number of attendees who attended in-service training for Village Midwives (VMW) conducted by the Grant aid in cooperation with UNICEF (reference figures)

Name of state	Number of VMW (2012)[1]	Number of trained VMW					Number of remaining VMW	Remarks
		2010～2011 Grant	2012 Supplement	Total number during	2013 Direct contract	Total number after the		

		Aid Project[2]	ary budget[3]	the project implementation period	by JICA[4]	project implementation		
North Darfur	1,045	560	294	**854**	215	1,069	0	
South Darfur East Darfur	653 305	280	354 63	**697**	235 147	1,079	0	South Darfur State was divided into South and East Darfur states during the project period.
West Darfur Central Darfur	332 276	220	41	**261**	147 147	555	53	West Darfur State was divided into West and Central Darfur states during the project implementation period.
South Kordofan West Kordofan	954	231	436	**667**	126	793	161	South Kordofan state was divided into South and West Kordofan during the project implementation period.
Blue Nile	520	165	203	**368**	147	515	5	
Total	4,085	1,456	1,391	**2,847**	1,164	4,011	74	

Source: Based on the document provided by JICA (November 2013)
Remarks:
1. Health Map 2012, Federal Ministry of Health. However, many VMWs retire and are hired every year. In addition, neither Federal Ministry of Health nor State Ministry of Health have information about the exact number of VMWs. Therefore, the number of VMWs mentioned above is a reference figure, as the exact number of current active VMWs is unknown.
2. Regarding the training from 2010 to 2011, it was conducted as a part of the Grant Aid Project, the "Project for Infectious Diseases Prevention for Children", through the international organization with signing of MOU between JICA and UNICEF. In-service training of 7 days curriculum as well as replacement of delivery support kits were carried out in Darfur states, South Kordofan, and Blue Nile states.
3. Regarding the training in 2012, in-service training of 7 days curriculum as well as replacement of delivery support kits were carried out in Darfur states, South Kordofan and Blue Nile states, by the Grant Aid Project through the supplementary budget of international organization.
4. Regarding the training in 2013, in-service training of 12 days curriculum for 1,964 VMWs (including 1,164 VMWs in Darfur states, South Kordofan, and Blue Nile) as well as replacement of delivery support kits were implemented in Darfur states, South Kordofan, Blue Nile, Gezira, North Kordofan, Northern, Red Sea, White Nile, River Nile, Gadaref, and Khartoum, by the direct contract between JICA and UNICEF (completed at the end of October 2013). However, it is considered that in-service training for 2013 (project completion report P70) that was scheduled during the technical cooperation project was not in time for the planned period as this technical cooperation project ended in May 2013.

3. Vocational Training sector

(1) TOT：Training of trainers (project implementation period)

Table 5 Number of attendees of TOT in vocational training sector

Name of the course	Number of courses	ND	WD	SD	BN	SK	Total	Proportion
Machinery	5 courses	2	2	2	12	11	29	24.4%
Automobile	4 courses	6	2	2	3	1	14	11.8%
Electric	5 courses	2	2	2	4	0	10	8.4%
Carpentry	3 courses	0	0	0	8	7	15	12.6%
Dressmaking	3 courses	0	0	0	13	12	25	21.0%
Food Processing	2 courses	0	0	0	11	15	26	21.8%
	22 courses	10	6	6	51	46	119	100%

Legend: ND, North Darfur; WD, West Darfur; SD, South Darfur; BN, Blue Nile; SK, South Kordofan
Source: Project completion report P87
Note: Trainers of the OVCT are not included

(2) Pilot activities: Short-term training course (during the project implementation period)

Table 6 Number of attendees of vocational training by states

	ND	WD	SD	BN	SK	Total	Proportion
1. Automobile	58	60	60	28	32	238	21.2%
2. Electric	57	59	57	22	17	212	18.9%
3. Carpentry	0	0	0	29	25	54	4.8%
4. Machinery/Metal work, Welding	60	60	59	43	4	226	20.1%
5. Building	0	0	0	8	5	13	1.2%
6. Dressmaking	0	0	0	139	96	235	20.9%
7. Food processing	0	0	0	43	103	146	13.0%
(Total by states)	175	179	176	312	282	1,124	100%
(Planned figure)	180	180	180	475	320	1,335	-
(Level of achievement)	97.2%	99.4%	97.8%	65.7%	88.1%	84.2%	-
(Level of achievement by areas)	98.2%			74.7%		84.2%	-

Legend: ND, North Darfur; WD, West Darfur; SD, South Darfur; BN, Blue Nile; SK, South Kordofan
Source: Project completion report P86
Note: Attendees in SK and BN are included people who received training at the OVTC.

The Republic of the Sudan

FY2016 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Urgent Improvement of Water Supply Facilities at Kassala City" and

"The Project for Improvement of Water Supply System at Kassala City"

External Evaluator: Mayumi Hamada and Chiho Ikeda,

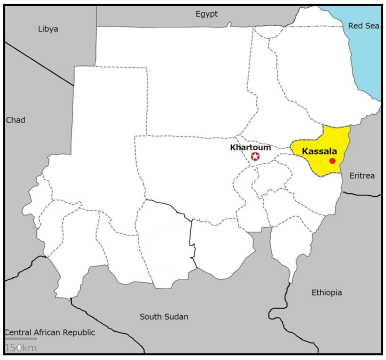
Foundation for Advanced Studies on International Development

0. Summary

The projects were implemented in Kassala city located in the eastern part of Sudan, where its population has been growing, with the aim of improving the safe and stable water supply to the residents through the rehabilitation of the existing water treatment plant (hereinafter WTP) in the East and West Districts and through the construction of a new WTP in the East District, thereby contributing to improvements in the residents' basic human needs. The projects' implementation was consistent with Sudanese development policy and needs as well as Japan's ODA policy. Therefore, the relevance of the projects is high. Although there were minor modifications from the plan with regard to the construction and soft component (technical guidance), the projects implementation and their cost were almost as planned. However, as the projects period exceeded the plan, the efficiency of the projects is fair. The projects contributed to the improvement of water supply and water quality in Kassala East District and to the water quality in Kassala West District where its outputs had been limited. The positive effects by those contributions were also confirmed. In addition, the risk of bursting of the reservoirs was reduced by upgrading old Fiber Reinforced Plastics (hereinafter FRP) reservoirs to reinforced concrete reservoirs through the rehabilitation of existing WTPs in the East and West Districts of Kassala city. This led to the reduced future risk of people being affected by the reservoir bursting. However, the people receiving positive effects through the project are limited, as many people are still unable to receive water supply service because the replacement of the distribution pipes and the water supply pipes by the Sudanese side, although it is outside of the project scope, has been delayed, and also because of the population increase. Therefore, the effectiveness and impact of the projects are fair. Some minor problems have been observed in terms of the technical and financial aspects of Operation and Maintenance (O&M). Therefore, sustainability of the project effects is fair.

In light of the above, the projects are evaluated to be partially satisfactory.

1. Project Description



Project Location

Mahta Water Treatment Plant[1]

1.1 Background

Kassala city, the capital of the Kassala state located in the eastern part of Sudan, is near the borders of Eritrea and Ethiopia, and has received refugees from those countries for many years. In addition, the long-term domestic conflict since the 1980s brought Internally Displaced Persons (IDPs) from west and south Sudan to Kassala city. Owing to the population increase by receiving the refugees and the IDPs, the water supply was not able to meet residents' demand. In such a situation, in 2005, the Sudanese government requested that the Japanese government implement the Grant Aid Project in order to develop new water resources, expand water supply facilities, and install new water supply pipes in East District, Kassala city.

During the preparatory survey of the project, it was confirmed that existing WTPs were deteriorated as the reservoir of the Mahta WTP in East District of Kassala city that was constructed in 1986 by the Grant Aid Project of Japan had burst. Thereupon, it was decided to implement the "The Project for Urgent Improvement of Water Supply Facilities at Kassala City (hereinafter Rehabilitation Project)" in order to rehabilitate the Mahta WTP urgently as well as the Garb WTP in West District, Kassala city that was constructed as same year as the Mahta WTP. After the implementation of the Rehabilitation Project, the Khatmia WTP was newly constructed by "The Project for Improvement of Water Supply System at Kassala City (hereinafter Expansion Project)" according to the initial request to develop new water resources, to expand water supply facilities, and to install new water supply pipes in East District, Kassala city.

Therefore, this ex-post evaluation assessed both the Rehabilitation Project and the Expansion Project.

[1] Front building is a distribution pump building and the back one is a reservoir. Three WTPs have the same design though the capacities of the facilities are different.

1.2 Project Outline

The objective of this project is to improve the safe and stable water supply to the residents of Kassala city by the rehabilitation of existing WTPs and the construction of new receiving wells and reservoirs (through "Rehabilitation Project"), and by the construction of a new WTP (through "Expansion Project"), thereby contributing to the improvement of the basic human needs of the local residents in Kassala city.

<Grant Aid Project>

Project Name	The Project for Urgent Improvement of Water Supply Facilities at Kassala City	The Project for Improvement of Water Supply System at Kassala City
G/A Grant Amount / Actual Grant Amount	1,086 million yen / 1,086 million yen	Detailed Design: 96 million yen / 95 million yen Construction work: 1,790 million yen / 1,488 million yen
Exchange of Notes Date /Grant Agreement Date	April, 2011 / April, 2011	Detailed Design: August, 2011 / August 2011 Construction work: October, 2012 / October, 2012
Executing Agency	Kassala Sate Water Corporation (Kassala SWC)	
Project Completion	October, 2013	July, 2014
Main Contractor(s)	Konoike Construction Co., Ltd.	
Main Consultant(s)	Tokyo Engineering Consultants Co., Ltd.	TEC International Co., Ltd.[2]
Basic Design	February, 2010 – June, 2011	
Related Projects	Technical Corporation: -Human Resources Development for Water Supply (2008-2011) -Human Resources Development for Water Supply in Phase 2 (2011-2015) -Capacity Development Project for the Provision of Services for Basic Human Needs in Kassala (2011-2015) -The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations (2016-2020)	

[2] In October, 2012, Tokyo Engineering Consultants Co., Ltd. split up its overseas division and established TEC International Co., Ltd. as an affiliated company of Tokyo Engineering Consultants Co., Ltd.

	Grant Aid: -Water Supply Project related to International Conference on Assistance to Refugees in Africa (ICARA) II (1986) Others: -WASH Program (2012-2016) UNICEF

2. Outline of the Evaluation Study

2.1 External Evaluator

Mayumi Hamada, Foundation for Advanced Studies on International Development

Chiho Ikeda, Foundation for Advanced Studies on International Development

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule:

Duration of the Study: November, 2016 – March, 2018

Duration of the Field Study: February 18, 2017 – March 7, 2017

July 15, 2017 – July 24, 2017

3. Results of the Evaluation (Overall Rating: C[3])

3.1 Relevance (Rating: ③[4])

3.1.1 Consistency with the Development Plan of Sudan

The *25-Years Strategic Plan for Water Sector (2003-2027)* that was enacted in 2003 is the highest water sector policy in Sudan. One of the targets in this policy was "To be able to supply sufficient and safe water in all urban and rural areas by 2017" and to set the indicators of the water supply as 150 liter/capita/day in urban areas and as 50 liter/capita/day in rural areas. The increase in the number of people who can access the urban water supply is also stated in the *Water Supply and Environmental Sanitation Policy (2010)* and *Water, Sanitation and Hygiene National Strategic Plan (2012-2016)*, which were made in order to practise the *25-Years Strategic Plan for Water Sector (2003-2027)*. *Kassala State Water, Sanitation and Hygiene Sector Strategic Plan (2012-2016)*, which followed the above national-level policies, mentioned the improvement of access to safe water up to 100% by 2016 in urban areas with adequate capacity to provide 90 liters per capita per day within 100-meters from a dwelling by 2016. According to the Kassala SWC, those policies and plans are still valid at the time of ex-post evaluation, and strategic plans from 2017 are still under preparation.

Therefore, this project aimed to improve the city water supply in Kassala state has been consistent with the Sudanese development policy both at the time of planning and the ex-post evaluation.

[3] A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

[4] ③: High, ②: Fair, ①: Low

3.1.2 Consistency with the Development Needs of Sudan

At the planning stage of the projects, the water supply was not able to meet the water demand in Kassala city because of the population increase due to receiving refugees and IDPs for a long time. Under such a situation, in 2005, the Sudanese government requested the Japanese government's support to expand the water supply in Kassala East District. During the preparatory survey for the request, the reservoir of the Mahta WTP in Kassala East District burst in 2009. As the result, the necessity of urgent rehabilitation for the Mahta WTP was recognized as well as the need for rehabilitation of the Garb WTP in West District that was constructed the same year as the Mahta WTP in order to reduce the future risk of bursting. Thus it can be judged as reasonable that a new WTP was constructed by the "Expansion Project" after existing WTPs in East District had been rehabilitated by the "Rehabilitation Project."

At the time of ex-post evaluation, the population of Kassala city has been increasing. According to the estimation of the Central Bureau of Statistics (CBS) Kassala branch, the population in 2016 was 218,144 in East District and 175,503 in West District, which was an increase of 32% (about 95,000) compared with the census of 2008. Thus water demand of the residents is considered to be rising as well.

Therefore, the project which newly constructed water supply facilities in East District after rehabilitating existing water supply facilities for the purpose of improving water supply in Kassala city, has been highly consistent with Sundanese development needs from the time of planning to the time of ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

The project was positioned as Japan's assistance priority area "Basic human needs support" and development subject "water and sanitation support program" of country assistance policy for Sudan. Japan also expressed support for African countries' efforts on water and sanitation and agriculture (irrigation) at the Fourth Tokyo International Conference on African Development (TICAD IV) in 2008. Thus, the project aiming to improve water supply in a provincial city in Sudan is equivalent to that support. Therefore, the project is consistent with Japan's ODA policy.

3.1.4 Appropriateness of the Project Plan and Approach

Eastern Sudan including the project target area was a conflict-affected area where domestic conflict continued until the signing of the peace agreement in 2006[5]. The project target

[5] In eastern Sudan (Red Sea state, Kassala state and Al Gedaref state), the Eastern Front was formed after the anti-government forces of the local tribes led by the Beja tribe formed an armed uprising in 1994 from the government dissatisfaction with development delay, and the conflict between anti-government forces and government forces intensified since 2005. The Eastern Sudan Peace Agreement (ESPA) was concluded between the Sudanese government and the Eastern Front by Eritrea's mediation on 14 October 2006, and the conflict was settled.
(Refer to the Japanese version of "Terminal Evaluation Report on the Capacity Development Project for the Provision

beneficiary was all residents of Kassala city regardless of ethnicity. The case of promoting the conflict by the project implementation between the period of planning and ex-post evaluation was not confirmed. Thus the selection of the project area and target beneficiary group was appropriate.

As stated above, this project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Table 1 shows the planned and actual outputs of the project. As for the Japanese side, by implementing the "Rehabilitation Project" for the existing WTPs, which are the Mahta WTP in Kassala East and the Garb WTP in Kassala West, the receiving wells were newly constructed and reinforced concrete reservoirs were installed as the existing reservoirs of FRP had deteriorated[6]. In addition, the distribution pump facilities and chlorine-dosing facilities of the Mahta WTP were also rehabilitated[7]. Although there were minor changes in the number and size of reinforcement, it was constructed and installed as planned.

By implementing the "Expansion Project," the water treatment plant, water intake facilities, water conveyance facility and water distribution facility were constructed in Kassala East. The selection of the wells was modified based on the result of pumping tests for existing wells and the new wells after the new wells had been drilled during the detailed design survey. The number of wells[8] and the conveyance pipe route were also changed according to the modification of the wells' selection. However, those modifications were appropriate because it was necessary for meeting the planned water supply.

The responsible works of the Sudan side were also done as planned without delay.

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of Services for Basic Human Needs in Kassala (2014)," p. 2)

[6] The lifespan of the reinforced concrete is about 60 years though the life span of the FRP is about 20 years. (Refer to the "Preparatory Survey Report on the Projects for Improvement of Water Supply Facilities at Kassala City (2011)," p. 2-23)

[7] The rehabilitation of the chlorine-dosing facilities and the distribution pump facilities in Garb WTP were not planned because it had been designed to utilize existing ones.

[8] Among the ten existing wells, three wells with low water production were changed to two wells with higher water production. Thus the number of existing wells changed from 10 to 9. Regarding the new wells, planned wells were changed to wells with higher water production.

Table 1 Planned and actual output

<Japanese side>

Project Name	Name of Facility		Plan	Actual (Reason for change)
Rehabilitation Project	Mahta WTP	Receiving well (with roof)	2 wells	As planned
		Reservoir	2 reservoirs	
		Distribution pump building	1 building	
		Piping in the premise	1 set	
		Maintenance within premises	1 set	
		Distribution pump equipment	5 units （of which 1 is spare）	
		Chlorine dosing equipment	1 set	
		Electric facility and instrumentation	1 set	
		Emergency power generator	1 unit	
	Garb WTP	Receiving well (with roof)	2 wells	As planned
		Reservoir	2 reservoirs	
		Piping in the premise	1 set	

Project Name	Name of Facility		Plan	Actual (Reason for change)
Expansion Project	Khatmia WTP	Receiving well (with roof)	2 wells	As planned
		Reservoir	2 reservoirs	
		Distribution pump building	1building	
		Piping in the premise	1 set	
		Maintenance within premises	1 set	
		Distribution pump equipment	5 units（of which 1 is spare）	
		Chlorine dosing equipment	1set	
		Electric facility and instrumentation	1set	
		Emergency power generator	1set	
	Water intake facilities	Existing wells (improvement)	10 wells	9 wells (Changed the number of wells to 9 based on the pumping test conducted in the detailed design survey)
		New wells (converted from test wells)	4 wells	As planned
		New wells	7 wells	As planned
		Existing well facilities (improvement)	10 facilities	9 locations (Change according to the modification of the number of wells)
		New well facilities	11 facilities	As planned
	Water conveyance facility	Conveyance pipe	12.11km	11.07 km (Change according to the modification of the number of wells)
	Distribution main	Distribution pipe	6.3km	As planned

Source: Preparatory Survey Report on the Projects for Improvement of Water Supply Facilities at Kassala City (2011) (p.vi-vii) and Completion Report of the project

<Sudanese side>

Project Name	Plan	Actual
Rehabilitation Project	・Provision of temporary yard (partial area of construction land for south WTP) ・Secure lands for facilities including construction lands and access roads. ・Removal of trees and existing structures, Land leveling inside the construction area ・Disposal area for surplus soil from the work ・Provision of the electric power line to the project area (415V) ・Removal and disposal of old facilities ・Cooperation of the project implementation when shifting to the new facilities from old facilities (e.g., Construction attendance, suspension of water supply and announcement to the residents) ・Construction of the fence and gate (Mahta WTP) ・Water supply for leakage test ・Allocation of project implementation personnel	As Planned

Project Name	Plan	Actual
Expansion Project	<WTP> ・Ensuring site ・Land leveling of site, Relocation of trees, etc. ・Installation of fences and gates ・Replacement of power equipment of power receiving on the primary side (exsiting wells) ・Cabling works for power supply and installing power equipment of power receiving on the primary side (new wells and WTP) ・Emergency generator equipment (existing wells) ・Provision of temporary sites for work ・Access road ・Provision of water for water-filling tests <Conveyance pipes and distribution mains> ・Cooperation related to request for exclusive use of roads and rivers ・Pruning and removing trees, shrubs, etc., in roads ・Clearing objects on the road ・Suspension of water supply because of new pipe and existing pipe connections <Others> ・Disposal area for surplus soil from the work ・Cooperation for the project implementation	As Planned

Source: Preparatory Survey Report on the Projects for Improvement of Water Supply Facilities at Kassala City (2011) (Japanese version) (p.3-44～p.3-45)and interview with Kassala SWC

In addition, workshops and on-the-job-training (OJT)[9] were provided to the O&M staff of Khatmia WTP (engineers and operators) and to the staff of the related departments of Kassala SWC under the technical guidance (soft component) of the "Expansion Project." The attendees of the workshops are shown in Table 2. According to the interviews with the operators who attended the workshops, although teaching materials and lectures were in English, they could understand well through the English-Arabic interpreter. However, at the ex-post evaluation, it was confirmed that one of the three staff of laboratory who attended the workshop on the choline-dosing facilities had left the job, and the remaining two staff only attended the part of the workshop.

[9] In OJT, practical training such as operation method, adjustment of valves, measurement of pumped water volume and input of check sheets was carried out using actual equipment such as water distribution pump, chlorine-dosing equipment and well facilities.

Table 2 Contents of the workshops conducted through the technical guidance and attendees

Contents of the Workshop (WS)		Target staff and number of attendees of SWC staff
WS1	Brief Overview/ Orientation	Operators and SWC staff of related departments Total: 20 staffs
WS2	Chlorine-Dosing Equipment	Staffs of Laboratory for Water Quality Total: 3 staff
WS3	WTP & Wells Facilities Management	Director general and executive staff Total: 3 staff
WS4	Distribution Pump & Well Facilities	Operators and Engineers of WTP Total: 14 staff
WS5	Maintenance	Executive staff, staff of related departments, Engineers of WTP Total: 5 staff
WS6	Comprehensive Workshop (Summary of WS1-W5)	Director general, Engineer of WTP and Staff of related department Total: 13 staff
Total (no double counts on attendees of WS1~WS6)		Total: 51 staff

Source: Final Report on Management Guidance (p.2)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned and actual cost covered by the Japanese side is shown in Table 3.

Table 3 Planned and actual cost covered by Japanese side

	Planned	Actual	Comparison
Rehabilitation Project	1,086 million yen	1,086 million yen	100%
Expansion Project	1,886million yen (Detailed design：96million yen, Construction：1,790million yen)	1,583 million yen (Detailed design：95million yen, Construction：1,488million yen)	84%

The planned and actual cost of the “Rehabilitation Project” was both 1,086 million yen as planned. The actual cost of the “Expansion Project” was lower than planned; whereas the planned cost was 1,886 million yen (details design: 96 million yen, construction 1,790 million yen), the actual cost was 1,583 million yen (details design: 95 million yen, construction 1,488 million yen). The amount of 298 million yen, which was included in the planned cost as a contingencies[10], was not disbursed due to the construction work being implemented as planned. The cost covered by the Sudanese side was not confirmed.

3.2.2.2 Project Period

The planned and actual period of the project is shown in Table 4. The actual period of the “Rehabilitation Project” exceeded the plan; the actual period was 30 months whereas the

[10] “Contingencies” is applied when the contract amount is exceeded due to design change, expenses incurred due to an increase in the unit price of materials, or additional expenses for security and natural disasters. The payment of the contingencies is limited only when the executing agency of the partner country, consultant, and contractor agree, and the Japanese government and JICA approve (document provided by JICA).

planned period was 23 months[11]. During the project, the project contract was extended twice. The reason of the first extension was delay of customs clearance of equipment and the shortage of labour as the skilled personnel returned to South Sudan due to the separation of Sudan. The second extension was owed to the delay of the construction work because the concrete batcher plant[12]broke down[13].

The actual period of the "Expansion Project" also exceeded the plan; the actual period was 36 months whereas the planned period was 32 months. This is because more time was required in details design because the pumping test of the well was done twice at the month of significant decline of the groundwater level.

Table 4 Planned and actual period of the project

Project Name	Planned （Preparatory survey report）	Actual （Completion report）	Comparison／Reason for extension
Rehabilitation Project	Total: 23 months 【Breakdown】 Details design: 4 months Others (tender, etc.): 3 months Construction: 16 months	May 2011-October 2013 (Total: 30 months) 【Breakdown】 Details design: 4 months Others (tender, etc.): 3 months Construction: 22 months	130% ・Delay of customs clearance of equipment and outflow of skilled personnel due to the separation of Sudan (6-month delay) ・Malfunction of concrete batcher plant(1-month delay)
Expansion Project	Total: 32 months 【Breakdown】 Details design: 9 months Others (tender, etc.): 4 months Construction: 19 months Soft component: 3 months	September 2011- August 2014 (Total 36 months) 【Breakdown】 Details design: 12 months Others (tender, etc.): 3 months Construction: 19 months Soft component: 3 months	113% ・Required time for detailed design survey (4-month delay)

As stated above, although the project cost was almost as planned, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness[14] (Rating: ②)

The project implemented was aimed at "the improvement of safe and stable water supply" in Kassala city. At the time of planning, the existing WTPs did not have sufficient capacity to cover the water demand due to aging. Furthermore, there was a risk that it would not be able to supply stable water in the future as the reservoir of the Mahta WTP had burst.

At the time of the ex-post evaluation, "how much water supply to the city has increased by the project implementation" (water distribution volume from each WTP) was examined as a quantitative effect of the "improvement of stable water supply." And as a qualitative effect of

[11] Since the starting point of the project period described in the ex-ante evaluation was not clear, it was set as the starting month of the detailed design (staring month of consultant contract) based on the process chart planned in the preparatory survey report.
[12] Equipment for mixing concrete at a predetermined ratio to make appropriate materials.
[13] Interview with the consultant, and refer to the document provided by JICA.
[14] Sub-rating for Effectiveness is to be put with consideration of Impact.

"improvement of safe water supply," the question "what kinds of improvement has there been on the operation of WTPs compared to the situation before project implementation" was asked to operators in WTPs. In addition, the beneficiary survey was conducted to the residents who received water supply service in order to examine the improvement of service before and after the project.

The water supply system of Kassala city is divided into east and west at the Gash River, and water supply service is provided to the East and West districts, respectively. Water in East District is supplied from the Mahta WTP that was rehabilitated by the "Rehabilitation Project," the Khatmia WTP that was newly constructed by the "Expansion Project," and several wells connected directly to the water supply network. Water in West District is supplied from the Garb WTP that was rehabilitated by the "Rehabilitation Project" and several wells connected directly to the water supply piping network[15] like in East District.

3.3.1 Quantitative Effects (Operation and Effect Indicators)

(1) Water distribution volume in each WTP (Operation indicators)

At the time of planning, water distribution volume of the Mahta WTP in 2014 was only set as a quantitative indicator of the "Rehabilitation Project." However, it is crucial to examine the change of water distribution volume of the other WTPs in order to measure the effectiveness of the project as the project's aim was the improvement of stable water supply in Kassala city. Thus, comparison between estimated and actual figures of the water distribution volumes of Garb and Khatmia WTPs were also examined at the ex-post evaluation. The daily maximum water distribution volume[16] was set as a target and estimated indicators at the time of the planning. However, as for Mahta WTP and Khatmia WTP, the achievement of daily maximum water distribution volume in October-November that are the month with high groundwater level, and the achievement of the daily average water distribution volumes[17] of other months were examined at the ex-post evaluation while considering the special condition of water resource in Kassala city[18] as well as the calculation manner for water distribution volume at the planning.

[15] The proportion of the wells connected directly to the water supply piping networks is 33% (31 wells) in the East District and 74% (25 wells) in the West District. (Document provided by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations.") The beneficiary survey was conducted to residents who were supposed to receive water from the WTPs after confirming the water supply areas by the staff of WTPs and the residents.

[16] Daily maximum water distribution volume is the daily average water distribution volume divided by the load ratio (daily average water distribution volume / daily maximum water distribution volume), which is the maximum figure of the daily water distribution throughout the year. In this project, the adoption figure of Japan's Grant Aid Project in 1984 and the Japanese standard 0.7692 were applied as the load ratios.

[17] Daily average water distribution is the daily average water consumption (designed daily water consumption × design served population) divided by the effective water ratio (1 - water leakage ratio, ratio of water effectively used among water produced in the WTPs).

[18] The water source of Kassala city relies on the groundwater recharged in the Gash River. The Gash River is a wadi (seasonal river) where water flows only during the rainy season, and underground water is recharged from June to September when water flows. Thus, the groundwater level rises from about September when recharging is over and

Daily average water distribution volume was calculated based on the daily maximum water distribution volume of East District (Refer to Figure 1, A and B) that was calculated at the planning.

A. Design water consumption and water distribution volume in Kassala East District

	Item	Design Value	Remarks
a	Designed daily water consumption per capita	90L/capita/day	Target city water supply in 2016 mentioned in "Kassala State Water, Sanitation and Hygiene Sector Strategic Plan (2012-2016)"
b	Designed service population	204,739 persons	Estimation in 2017 by CBS Kassala branch
c	Designed daily average water consumption (a x b ÷ 1000)	18,427m3/day	(= daily average water demand)
d	Designed leakage ratio	0.28	The ratio in case 16km of distribution pipes will be replaced by Sudanese side and connected to water supply pipe
e	Designed effective water ratio(1-d)	0.72	Quantity of water that can be used effectively among the water produced by WTPs
f	Designed daily average water distribution volume (c ÷ e)	25,593m3/day	(= daily average water supply) Water supply to designed daily water consumption (daily average water demand). It is calculated considering the leakage ratio
g	Designed load ratio	0.7692	Daily average water supply / Daily maximum water supply The rate of Japanese Grant aid project in 1984 and standard rate in Japan are used
h	Designed daily maximum water distribution volume (f ÷ g)	33,274m3/day	

B. Design daily maximum water distribution volume based on Table A

Water supply point	Daily maximum water distribution volume	Percentage
Mahta WTP	11,050 m3/day	33%
Khatmia WTP	15,392 ≒ 15,400 m3/day	46%
Others (northern existing wells)	6,832 m3/day	21%
Total	33,274 m3/day	100%

Daily average water distribution volume calculated from Table A and B

Mahta WTP	**8,445 m3/day**	**Designed daily average water distribution volume 25,593m3/day×33%**
Khatmia WTP	**11,773 m3/day**	**Designed daily average water distribution volume 25,593m3/day×46%**

Figure 1 Calculation of the designed daily maximum water distribution volume and daily average water distribution volume calculated from Table A and B[19]

- Mahta WTP 【Daily maximum water distribution volume: Baseline 9,200 m^3/day (2010) → Target 11,050 m^3/day (2014)】

As shown in Table 5, the actual daily average water distribution volume except October-November 2015 was less than the target daily maximum water distribution volume. However, actual daily average water distribution volume per month was generally more than the baseline figure (9,200 m^3/day) before the project implementation and target daily average water distribution volume (8,445 m^3/day). Although the seasonal fluctuation exists, it can be said that water distribution volume was increased due to 24-hour water collection from the wells by expanding the capacity of the reservoir through the project.

reaches its maximum around November, gradually declining and becoming the lowest around June of the following year. Therefore, the water pumping volume of groundwater is also changing throughout the year according to the groundwater level. (Interview with main consultant)

[19] Refer to Japanese preparatory survey report p. 3-14

Table 5 Daily average water distribution volume in Mahta WTP

(Unit: m3/day)

Month	Baseline	Target	Actual					
	2010	2014	2015	Achievement ratio	2016	Achievement ratio	2017	Achievement ratio
	Planned Year	1 Year After Completion	2 Years After Completion		3 Years After Completion		4 Years After Completion	
Jan	9,200	Designed daily maximum water distribution volume (October-November): 11,050 Designed daily average water distribution volume (except October-November): 8,445	-	-	10,654	126%	9,074	107%
Feb			-	-	10,100	120%	8,803	104%
Mar			-	-	7,656	91%	9,840	117%
Apr			-	-	8,937	106%	10,083	119%
May			-	-	8,745	104%	9,475	112%
Jun			-	-	7,362	87%	8,604	102%
Jul			-	-	8,052	95%	-	-
Aug			-	-	9,706	115%	-	-
Sep			-	-	9,696	115%	-	-
Oct			11,799	107%	9,907	90%	-	-
Nov			11,867	107%	10,054	91%	-	-
Dec			10,930	129%	10,503	124%	-	-
Average			11,532	115%	9,163	105%	9,313	110%

Source: Calculated monthly average from the water distribution record in Mahta WTP

- Garb WTP 【Daily maximum water distribution volume: Baseline 5,200 m^3/day (2010) → Estimation 5,200 m^3/day (2014)】

Water distribution volume was not recorded for the Garb WTP because the rehabilitation of the project was limited to construction of receiving well and replacement of reservoir, and had not installed a flow meter. Thus, actual figures of Table 6 were calculated from estimated water production of the well by interviews with the staff of the Garb WTP. According to the interviews, the water distribution volume decreased[20] as the number of wells that can intake the water was decreased to 9 wells from 14 wells because some wells had dried up since 2016.

[20] According to the interview at the Garb WTP during the field survey in July 2017, the water distribution volume has been increased from June 2017 because two wells were newly developed.

Table 6 Daily average water distribution volume in Garb WTP

(Unit: m3/day)

Baseline	Estimation	Actual			
2010	2014	2014	2015	2016	2017
Planned Year	1 Year After Completion	1 Year After Completion	2 Years After Completion	3 Years After Completion	4 Years After Completion
5,200	5,200	5,040	5,040	3,240	3,240
Achievement		97%	97%	62%	62%

Source: Interview with the staff of Garb WTP

Note: Calculation of actual figure: Water production (m^3/hour) × Number of wells × pumping hour (hours) = 15 m^3 × 14 wells × 24 hours (2014-2015); 15 m^3 × 9 wells × 24 hours (2016-2017)

- Khatmia WTP 【Daily maximum water distribution volume: Estimation 15,400 m^3/day (2014)】

As shown in Table 7, actual figures of daily average water distribution volume as well as daily maximum water distribution volume have been less than the expected daily average water distribution and daily maximum water distribution.

This is because the water production of the wells was less than expected[21]. Although the water production fluctuated each year, only 70% was achieved particularly in 2016. However, it has been increased since the first half of the year 2017, and 80% was achieved on average. According to the response from the Groundwater and Wadis Kassala branch[22], it is supposed that inter-annual decline of the groundwater level due to the over pumping of agriculture wells near the Khatmia WTP wells, mutual interference between the agriculture wells and WTP wells owing to the close interval, and a poor aquifer in the location of the WTP wells are regarded to be the causes of the reduced water production.

[21] From the analysis of the monthly water intake data from the wells that was obtained, the number of wells that exceeded the planned water production volume on average was only five (four existing wells and one new well) among twenty (nine existing wells and eleven new wells).

[22] The Department of Groundwater and Wadis is a department belonging to the Ministry of Water Resources, Irrigation and Electricity. It carries out the groundwater monitoring, hydraulic geological survey, aquifer evaluation, and database management of the groundwater and wadi. It has offices in 15 states, one of which is the Kassala branch. (Refer to the "Detailed Design Survey Report of the Project for Enhancement of Integrated Water Resources Management in the Republic of the Sudan" (Japanese version) p. 18.)

Table 7 Daily average water distribution volume in Khatmia WTP

(Unit: m3/day)

Month	Estimation	Actual							
	2014	2014	Achievement ratio	2015	Achievement ratio	2016	Achievement ratio	2017	Achievement ratio
	Completion Year	Completion Year		1 Year After Completion		2 Years After Completion		3 Years After Completion	
Jan	Designed daily maximum water distribution volume (October-November): 15,400 Designed daily average water distribution volume (except October-November): 11,773	-	-	11,817	100%	8,780	75%	10,393	88%
Feb		-	-	10,795	92%	9,111	77%	9,887	84%
Mar		-	-	10,711	91%	9,148	78%	9,906	84%
Apr		-	-	11,231	95%	9,126	78%	9,833	84%
May		-	-	10,809	92%	7,659	65%	9,534	81%
Jun		-	-	8,945	76%	7,163	61%	9,044	77%
Jul		-	-	7,451	63%	6,622	56%	-	-
Aug		9,740	83%	9,549	81%	7,645	65%	-	-
Sep		10,943	93%	11,366	97%	9,600	82%	-	-
Oct		11,708	76%	11,306	73%	9,844	64%	-	-
Nov		11,957	78%	10,659	69%	9,886	64%	-	-
Dec		11,622	99%	9,687	82%	10,382	88%	-	-
Average		11,194	86%	10,361	84%	8,747	71%	9,766	83%

Source: Calculated monthly average from the water distribution record in Khatmia WTP

- East District (The total water distribution volume of Mahta WTP and Khatmia WTP[23])

It was expected that the water supply volume in East District would be improved by the rehabilitation of the existing WTPs through the "Rehabilitation Project" and by the construction of a new WTP through the "Expansion Project." Thus, in addition to the achievement of the target of each WTP, it was also examined how much water supply to East District (i.e., total water distribution volume of Mahta and Khatmia WTPs) has been achieved compared to the expected water distribution volume (refer to Table 8).

Before the implementation of the "Expansion Project," the water in East District was supplied from the Mahta WTP and several wells connected directly to the water supply network. Existing southern wells that were among the wells that were connected directly to the water supply network were utilized as a part of the Khatmia WTP wells. The baseline data was set at 16,736 m^3/day including the water supply volume of 9,200 m^3/day of the Mahta WTP since the water production of existing southern wells was 7,536 m^3/day before the Khatmia WTP construction. Although the actual figure fluctuated by months, average water distribution volume has been more than expected, and overall, it achieved 80-90% of the estimated figure.

[23] The water supplied to the East District is from the Mahta WTP, the Khatmia WTP, and the wells connected directly to the water distribution piping network. But the water from wells connected directly to the water distribution piping network were excluded from the analysis in order to examine the pure effect of the project.

Table 8 Daily average water distribution volume in East District (Mahta and Khatmia WTPs)

（Unit: m3/day）

Month	Baseline	Estimation	Actual					
	2010	2014	2015	Achievement ratio	2016	Achievement ratio	2017	Achievement ratio
	Planned Year	Completion Year	1 Year After Completion		2 Years After Completion		3 Years After Completion	
Jan	16,736	Designed daily maximum water distribution volume (October-November): 26,450 Designed daily average water distribution volume (except October-November): 20,218	-	-	19,434	96%	19,467	96%
Feb			-	-	19,211	95%	18,690	92%
Mar			-	-	16,804	83%	19,746	98%
Apr			-	-	18,063	89%	19,916	99%
May			-	-	16,404	81%	19,009	94%
Jun			-	-	14,525	72%	17,648	87%
Jul			-	-	14,674	73%	-	-
Aug			-	-	17,351	86%	-	-
Sep			-	-	19,296	95%	-	-
Oct			23,105	87%	19,751	75%	-	-
Nov			22,526	85%	19,940	75%	-	-
Dec			20,617	102%	20,885	103%	-	-
Average			22,083	91%	18,028	85%	19,079	94%

Source: Calculated monthly average from the water distribution record in Mahta and Khatmia WTPs

3.3.2 Qualitative Effects (Other Effects)

At the time of planning, the project's effects described in Table 9 were expected as qualitative effects. Those effects were analyzed with the information through the interviews with operators in each WTP as well as the beneficiary survey for the residents who had been receiving the water supply service conducted during the ex-post evaluation survey[24]. As mentioned above, in the East District, Khatmia WTP was newly constructed by the "Expansion Project" after the rehabilitation of the existing Mahta WTP by the "Rehabilitation Project"; thus, the project's expected effects in the East District were high. On the other hand, the effect of the project was limited in the West District compared with the East District, as it was only part of the rehabilitation of Garb WTP in the "Rehabilitation Project." The results of the beneficiary survey were analyzed considering that point.

[24] The zoning method by which the entire service area is divided into smaller areas for each water supply point has not been adopted in Kassala city. In addition, not all well water is collected in the WTP and then sent to the water distribution pipe; some wells are directly connected to the water distribution piping network. Thus, the distribution area by water supply point cannot be clearly identified. But considering the fact that the water supply was not enough due to the problem of water volume and water pressure in the northern and southern parts of the East District (mountain side) away from the Mahta WTP before the project, it was presumed that the area affected by the water distribution of each WTP was its service area, and we conducted a door-to-door survey of the residents. On the survey, the residents were asked about the water supply situation before compared to after the project. Regarding the sample size, see footnote 26.

Table 9 Qualitative effects that were expected at the time of planning

Rehabilitation Project		Expansion Project
Mahta WTP	Garb WTP	Khatmia WTP
・To ensure disinfection of water by the construction of receiving wells in order to enable chlorine dosing ・To improve O&M of the WTPs by using a design that considered flood prevention ・To provide a better sense of security about water supply service to the residents by reducing the risk of bursting the reservoir		・To improve the shortage of water supply, and to reduce the water suspension areas ・To improve the sense of trust of the residents about water supply service by increasing the percentage of chlorine-dosed water ・To improve the management of water sources and the control of water distribution by installation of the flowmeters

Source: Preparatory Survey Report on the Projects for Improvement of Water Supply Facilities at Kassala City (2011)

(1) Results of the interviews with the operators in WTPs[25]

During the interviews with operators in each WTP to see if there were any problems with specifications and how to handle the facilities and equipment that were rehabilitated or newly constructed in this project, all operators answered that there were no problems. In addition, the operators of the Mahta and Garb WTPs were questioned regarding the changes before/after the project involving “chlorine injection,” “risk of flooding,” and “risk of bursting the reservoir.” The results of the interviews are shown in Table 10. It can be said that the risk of flooding and the risk of bursting the reservoir were reduced as compared with before this project, and it became possible to efficiently operate the WTP.

Table 10 Results of the interviews with the operators in WTPs

Rehabilitation Project		Expansion Project
Mahta WTP	Garb WTP	Khatmia WTP
・Risk of bursting reservoir was reduced because the concrete reservoir that was installed is more durable compared to the former FRP reservoir. ・Risk of flooding was reduced due to the new reservoir being constructed at a higher place.However, there was no comment that O&M was improved by that. ・Reliable chlorine injection became possible by installation of receiving well and chlorine dosing facilities. (However, there was a period of malfunction) ・Checking and cleaning of facilities became easier due to the good design. ・Water intake volume and water distribution volume can be managed collectively by distribution pump building (administration building) due to the installation of a flow meter.	・Risk of bursting reservoir was reduced becuase the concrete reservoir that was installed is more durable compared to the former FRP reservoir. ・Risk of flooding was reduced due to the new reservoir being constructed at a higher place.Risk of flooding was reduced due to the new reservoir being constructed at a higher place.However, there was no comment that O&M was improved by that. ・Due to the installation of a receiving well, the impurities were surely removed in sedimentation tank, and the chlorine powder was mixed well due to the fact that the flow was also made. ・Checking and cleaning of facilities became easier due to the good design.	・It is easy to operate the facilities as the water intake volume and water distribution volume can be managed collectively in the distribution pump building (administration building). ・Cleaning of the facilities is easy due to the good design. ・It became possible to supply water to the northern part of Kassala city and the southern part (mountain side) where water supply situation was not good.

Source: Interviews with operators in each WTP

(2) Results of the beneficiary survey[26]

Figure 2 shows the results of the beneficiary survey. Many residents living in each WTP covered area responded that the water supply service has been improved as compared with

[25] Separate interviews were conducted for 6 staff in each WTP.

[26] The sample size of the beneficiary survey was 49 households (respondents: 6 men, 43 women) in the Mahta WTP covered area (center of the city in East District), 43 households (9 men, 34 females) of the Garb WTP (West District), and 51 households (respondents: 6 men, 45 women) in the Khatmia WTP covered area (mountain side of the East District). The interview survey using questionnaires was carried out especially targeting women, who mainly use water at home. For the method of sampling, see footnote 24.

before. Especially, most of the residents in the East District, where the rehabilitation of the existing WTP and the construction of the new WTP were carried out, responded that they are "very satisfied" or "satisfied." Thus, it is supposed that the reliability of the water supply service of the residents who has been receiving water supply service has been generally improved as compared with before the project. In addition, the survey results show that the residents of the Khatmia WTP covered area, where the water supply situation was not good before this project, think that the water supply service has been improved greatly with respect to the amount of water[27]. On the other hand, in the West District (covered area of Garb WTP), where the project implemented only the rehabilitation of the existing WTP, many residents felt that the quality of water has been improved, but about half of the respondents responded that the amount of water was "not changed" or "worse." Thus, the satisfaction of the residents in the West District is not as high as in the East District[28].

(Unit: %)

Source: Results of the beneficiary survey

Figure 2 Results of the beneficiary survey in relation to the project's effectiveness

As stated above, although the water distribution volume of the Mahta WTP has generally achieved the target volume, the Garb WTP and the Khatmia WTP have not achieved the estimated volume because the water production of their wells is lower than expected. However,

[27] Some of the residents in the East District feel that the situation of the water supply has become worse. According to the interviews with the residents, the water supply volume and water pressure to the areas away from the WTPs are limited, as many people living near the WTPs, where the situation of the water supply was not bad even before, use more water than before due to the improvement of the water supply service. In addition, the number of households using water pumps has increased compared to before. However, it is considered that many residents in areas where the water supply situation was not good before the project think the water supply in their area has been improved because they can obtain more water compared to before.

[28] In addition to that, it is supposed that the high percentage of the wells connected directly to the water supply piping network is another reason for reducing the residents' satisfaction.

the combined water volume of the Mahta WTP and Khatmia WTP has achieved 80% of the total target water volume in the East District. Regarding the situation in the East District, certain effects are observed. The amount of water supply has increased due to the construction of the Khatmia WTP, and the residents in the areas where the water did not reach due to the low water pressure before the project have been able to receive water thanks to improved water pressure due to the increase of the proportion of water sent by the distribution pump. Thus, the objective of this project has been generally achieved with regard to the "improvement of safe and stable water supply." As for the water quality, the proportion of chlorine disinfection of the water supplied to the East District has been increased due to the installation of the chlorine dosing facilities and the receiving well. As a result, many residents pointed out the improvement of water quality during the beneficiary survey. In addition, the risk of bursting the reservoirs of the Mahta and Garb WTPs was reduced by replacing the FRP reservoirs with reinforced concrete reservoirs through the project implemented as urgent support. This means that the risk of damage to the residents, who are assumed would suffer from the burst of the old reservoirs in the future, was reduced. Therefore, the effectiveness of the project is high.

3.4 Impacts

3.4.1 Intended Impacts

Improvement of the water supply situation in Kassala city by the implementation of the project was expected to contribute to improvement of the basic living environment of the residents. Therefore, at the time of ex-post evaluation, it was examined that how many residents receiving the water supply service led to improvement of basic living (quantitative effect) and what kind of changes in terms of living environment occurred by improving the water supply service among residents receiving water supply service (qualitative effect).

(1) Percentage of the households receiving the water supply service, population receiving the water supply service, and daily water use per capita in the East District (quantitative effects)

At the time of the planning, the water distribution pipe renewal work and water supply pipe connection work by the Sudanese side, which were planned outside of the scope of the project, were regarded as necessary work of the partner country in order to achieve the project effect and were indispensable for the effective use of the facilities constructed by the project. Therefore, the percentage of households receiving the water supply service, population receiving the water supply service, and daily water supply per capita[29] in the East District were set as effect

[29] Daily water supply per capita, which was set as an indicator at the planning stage, means daily water use per capita.

indicators of the project on the premise that those works by the Sudanese side would be completed[30].

As shown in Table 11, the number of households receiving the water supply service in the East District has been increasing year by year. Especially in the completion year of the "Expansion Project" (2014), the number of households increased significantly compared to other years. Thus, the project contributed to some extent to the increased number of households receiving water supply service in the East District.

Table 11 Number of households receiving the water supply service (East District)

	2010	2011	2012	2013	2014	2015	2016	2017
				Completion year of Rehabilitation Project	Completion year of Expansion Project			
Kassala East	19,237	20,520	21,671	22,824	24,484	25,008	25,607	26,235
Increase in number from last year	-	*1,283*	*1,151*	*1,153*	*1,660*	*524*	*599*	*628*
Increase rate	-	*107%*	*106%*	*105%*	*107%*	*102%*	*102%*	*102%*

Source: Kassala SWC Financial Department

The achievement of the indicators (percentage of households receiving household water supply, population receiving the water supply service, and daily water use per capita, set at the planning stage) at the time of the ex-post evaluation was analyzed via the number of households receiving the water supply service (Table 11) and the information provided by the related organization[31]. The results of the analysis are shown in Table 12, and the indicators (percentage of households receiving household water supply and population receiving the water supply service) have not been achieved at present.

However, the population receiving water supply service has increased compared to 2009. It can be said that the expansion of the water supply volume in the East District through the project contributed to some extent to the increase of the population receiving the water supply service. Regarding the amount of water use per capita per day, the target has been achieved, taking into account that the leakage rate is set to 28% and divided simply by the population figures. As a result of the beneficiary survey, it is supposed that some residents who had been receiving water supply service before the project can use more water than before as a result of the project. However, it is thought that there are still 30% of the residents in the East District who cannot receive water supply service because the water supply pipes are not connected to their household. In other words, it would have been ideal if the water supply volume per day

[30] Although these indicators were set as quantitative effects at the time of planning, they are considered to be the effect brought about by the increase in the water distribution volume, which is a quantitative indicator of effectiveness. Thus, they were reset as indicators of impact at the time of the ex-post evaluation. Although the target year was mentioned as 2016 in the preparatory survey report, it was reset to 2017 in the ex-post evaluation because the indicator of the quantitative effect 3 years after the project completion was set as a target figure.

[31] The estimated population (218,144 people) and estimated number of households (38,102 households) in the East District in 2016 were provided by CBS Kassala branch. And the number of households receiving the water supply service in the East District in 2016 (25,607 households) was provided by Kassala SWC.

that was increased by the project were allocated for those 30% of people, but currently it is thought that it has been allocated for the residents who receive water supply service.

Table 12 Status of achievement of the impact indicators which were set at the planning stage

Indicators	Baseline	Target	Actual	
	2009	2017	2016	*Remarks*
Percentage of households receiving water supply services	73%	100%	67%	*25,607 households（number of households in East District receiving the water supply service）÷ 38,102 households（Estimated total households in East District) × 100*
Population receiving water supply services	125,479	204,739 （Total population in Kassala East estimated by CBS Kassala branch at the planning stage)	146,600	*5.725 persons/household ×25,607 households（number of households in East District receiving the water supply service） *Note1*
Water use per capita per day (L/capita)	62L/capita	90L/capita	90.2L/capita	*19,634m3/day（Daily average water consumption [=daily average water demand] / 218,114 persons（Estimated population in East District）× 1000 *Note2*

Source: Analysis by evaluator

Note1: The number of persons per household was determined by dividing 218,144 people (estimated population in the East District in 2016) by 38,102 households (estimated number of households in 2016).
Note2: The daily average water consumption was calculated by taking the daily average water distribution volume in the East
District (27,270 m^3), that is, the average daily water distribution from Mahta WTP (9,163 m^3) + from Khatmia WTP (8,747 m^3) + from others (9,360 m^3), minus the same water leakage rate as planned (28%). Others refers to the estimated water production of the wells connected directly to the distribution pipe network according to the interview with Kassala SWC. As for the water leakage rate, the same water leakage rate as planned, as shown in Figure 1, was applied since the exact leakage rate was unknown.

Factors that led to not being able to achieve the indicators at the time of ex-post evaluation include population increase and delay in construction work of the renewal distribution pipes by the Sudanese side[32]. Water distribution pipe renewal work was started in January 2014[33]. According to the Kassala SWC, the renewal work of the water distribution pipes was completed in both the East District and West District in July 2017. In order to switch the water supply to the new water distribution pipe, some households whose water supply pipe is connected to the old water distribution pipe will require replacement work of the water supply pipe to the new distribution pipe. The replacement work has been started with the agreement that the Kassala SWC will bear the material cost of the water supply pipe and the installation cost will be borne

[32] If considering the target population in 2017 as the total population of the East District estimated in the planning stage (204,739 people), the population receiving the water supply service (146,600 people) in 2016 that was calculated by the analysis covered 72% of the target population. However, the total population of the East District in 2016 estimated at the time of ex-post evaluation is 218,144 people, which is more than the estimation in the planning stage due to the increase in the number of people in Kassala city. Therefore, the coverage is 67% of the target population. Thus, it can be said that the increase in the population in Kassala city affected the achievement of the target indicator together with the delay of work by the Sudanese side.

[33] Making a renewal plan for the water distribution pipe was supported by the water cluster of the “Capacity Development Project for the Provision of Services for Basic Human Needs in Kassala” (2011-2015).

by the residents[34]. It is expected that the leakage of water from the pipes will be reduced if the connection work between the water supply pipe and new water distribution pipe is carried out appropriately and completed. Moreover, if the water supply pipe is connected to the 30% of households to which the water supply pipe is not yet connected, it is expected that the achievement of the indicators will improve in the future, but it will be difficult to achieve the figure of the target year 2017.

(2) Changes of residents' living environment (Qualitative effects)

It was expected that the improvement of the residents' basic living environment in the target area would be an indirect effect of the project. Thus, at the time of the ex-post evaluation, an interview survey of the residents with questionnaires about "what changes occurred in their lives due to the changes in water supply conditions" was conducted. Also, question about "the amount of water purchased from a water vendor due to improvement of the water supply situation" was asked the residents in order to see the change in the cost of water. The results are shown in Table 13.

Table 13 Results of the beneficiary survey in relation to the project's impact[35]

Changes due to improvement of water supply situation (multiple answers)

	Mahta	Garb	Khatmia	Total	Percentage of total households surveyed
Number of households surveyed	49	43	51	**143**	-
Number of households that responded the water supply situation had improved	41	33	43	**117**	**82%**
Time of collecting water has decreased	22	13	21	**56**	**39%**
The frequency of diarrhea (especially children) has decreased	22	18	9	**49**	**34%**
The work of drawing water for women and children has been reduced	16	8	25	**49**	**34%**
Life became comfortable	13	9	26	**48**	**34%**
Frequency of collecting water has been reduced	17	4	22	**43**	**30%**
Became possible to secure sufficient water for cleaning and washing.	19	1	10	**30**	**21%**
Became possible to do housework without worrying about the water collection time.	3	3	9	**15**	**10%**
Cost of purchasing water has been reduced.	8	1	3	**12**	**8%**
Became possible to grow plants in a garden.	3	3	7	**13**	**9%**
Became possible to secure sufficient water for showering.	8	0	3	**11**	**8%**
Became possible to save money.	6	1	3	**10**	**7%**
Became possible to sprinkle the garden with water.	0	1	3	**4**	**3%**
Sub total	137	62	141	340	

Changes due to deterioration of water supply situation (multiple answers)

	Mahta	Garb	Khatmia	Total	Percentage of total households surveyed
Number of households surveyed	49	43	51	**143**	-
Number of households that responded the water supply situation had deteriorated	8	10	5	**23**	**16%**
Time of collecting water has increased	8	9	6	**23**	**16%**
Frequency of collecting water has increased	6	7	6	**19**	**13%**
The work of drawing water for women and children has increased	5	10	4	**19**	**13%**
Cost of purchasing water has increased.	0	6	1	**7**	**5%**
The distance to draw water has increased.	0	0	2	**2**	**1%**
The frequency of diarrhea has increased.	1	0	0	**1**	**1%**
Sub total	20	32	19	71	

Has the amount of water purchased from the water vendor changed?

	Mahta	Garb	Khatmia	Total	Percentage of total households surveyed
It has decreased compared to before.	12	9	33	**54**	**38%**
It has increased compared to before.	3	13	7	**23**	**16%**
Never purchased from water vendor.	31	21	7	**59**	**41%**
No response	3	0	4	**7**	**5%**
Sub total	49	43	51	143	

Source: Results of beneficiary survey

Although there was a negative answer from the residents of the Garb WTP covered area where the output of the project was limited in the West District as well as the part of the East

[34] Information provided by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations" (October, 2017).

[35] The sample size of the beneficiary survey is referred to in footnote 26. "Time and frequency of collecting water" means that water is collected in the early morning or at night in case sufficient water cannot be obtained from the household water tap. Some households collect water by using the water pump during times of low water pressure. "Drawing water" is drawing water from the household tap and moving the water to a container to keep it.

District where the water supply situation was not good even after the project, the positive effect was generally confirmed. Regarding the amount of water purchased from a water vendor, many respondents, except for the water supply area of the Garb WTP, responded that it has been decreased. Especially in the water supply area of the Khatmia WTP, it is regarded to have improved remarkably. Thus, the project contributed to saving the cost of residents' water purchases in the East District[36].

3.4.2 Other Positive and Negative Impacts

At the planning stage of the project, it was concerned that the project would cause "economic difficulty due to the reduction/loss of sales activities of water vendors" and "the decrease of the groundwater level" at the operation stage, and it was expected that necessary measures would be taken. The status of those effects and measures taken by the Kassala SWC at the time of the ex-post evaluation are mentioned below (1)-(3). According to the interview at the Kassala SWC, there was no land acquisition and resident resettlement due to the "Rehabilitation project", as the land for the project was within the premises of the existing WTP. And the land for the "Expansion project" was agricultural land, and it was obtained by Kassala state government through compensating alternative land to the owner before the start of the project[37]. Regarding the other impacts that were concerned would occur during the construction stage of the project, such as air pollution and noise, planned measures such as arrangement of staff for traffic control, construction of a protective fence, and establishment of an information desk for receiving the residents' complaints were taken, and the negative impact of the project during the construction stage was not identified.

(1) Economic difficulty of water vendors by reduction and loss of water vendors' sales activities

The sufficient information about the number of water vendors and their sales activities was not obtained. According to the interviews with the currently active water vendors (3 people), they purchased water from the public water taps of the Kassala SWC (about 25 places) by around 2011. But currently all places are closed, and they purchase the water from private water trucks. Regarding the customers, they previously sold to households, but currently they sell at

[36] According to the interview with water vendors, they sell two barrels of water (same as 400 liters) at SDG30. Most of the households receiving the water supply service are categorized as "Residential 3" in their contract water fee categories, and they pay SDG32 per month. For example, assuming that 62 liters, which is the daily water consumption per capita of 2009, is bought from the water vendor, the necessary amount of water per month will be 1,860 liters, which costs about SDG140. If there are five family members, it costs about SDG700. Compared with purchasing the water from water vendors, the water supply service, whose monthly water fee is fixed at SDG32/household, is very cheap.

[37] The land acquisition and resident resettlement by the project were not planned during the planning stage. Although there was no resident resettlement, in fact, land acquisition occurred for the "Expansion Project." The background and process of obtaining the land were not identified. But there was no negative impact up to the time of the ex-post evaluation (Interview with Kassala SWC and Main consultant).

construction sites. Their income has decreased as compared with before. However, one water vendor out of three said that he still sells to previous customers, and there was no change in his income. Although the enough information about the loss of their jobs was not obtained, from their interviews, the vendors said that many water vendors have engaged in other jobs after quitting as water vendors.

(2) Decline of the groundwater level

In Kassala city, decline of the groundwater level has been pointed out for many years. The data of the observation well observed by Groundwater and Wadis Kassala branch also shows that the groundwater level has declined with the passage of time. The pumping volume of the wells in the WTPs constructed by the project has also tended to decrease, and it seems that it is influenced by the groundwater level decreasing to some extent. Factors influencing the decrease of the groundwater level are considered to be over pumping of agricultural wells, installation of the wells in close intervals, propagation of plants called mesquite, etc. However, the evidence to prove those factors was not obtained because the exact data have not been recorded. Regarding whether the project has affected the decreasing of the groundwater level, it is considered that the negative impact of the project is not much as compared with the number of agricultural wells (although the accurate number is unknown, there are about 3,000 wells according to the related person of farmers union) and the number of wells for drinking water (136 wells[38]). On the contrary, the over pumping of the agricultural wells is considered to have a negative effect on the reduction of the pumping volume of the WTPs' wells. To see the current situation of the decreasing groundwater level, the Kassala SWC has begun monitoring activities since November 2016, and 15 observation wells were being monitored twice a week at the time of ex-post evaluation[39]. Through the accumulation and analysis of those data in the future, it is expected to see the exact current situation based on the data[40].

[38] Document provided by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations."

[39] The monitoring activities are also supported by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations."

[40] Among the observation wells being monitored, one well with a large fluctuation range of one day has been confirmed. The agricultural wells are adjacent to the observation wells within 50m, and the decrease in the groundwater level of the observation wells is nearly consistent with the pumping time of the agricultural wells every day. Thus, it is considered that the fluctuation of the water level is due to the interference of the water pumping of each other (interview with the expert of "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations").

(3) Contribution to the increased number of households receiving the water supply service in West District

As Table 14 shows, the number of households receiving the water supply service in the West District is increasing year by year. The certain contribution of the project has been observed, as the number has increased in the completion year of the "Rehabilitation Project."

Table 14 Number of households receiving the water supply service (West District)

	2010	2011	2012	2013	2014	2015	2016	2017
				Completion year of Rehabilitation Project	Completion year of Expansion Project			
Kassala West	11,919	12,802	14,079	15,015	16,113	16,481	16,853	17,161
Increase in number from last year	-	*883*	*1,277*	*936*	*1,098*	*368*	*372*	*308*
Increase rate	-	*107%*	*110%*	*107%*	*107%*	*102%*	*102%*	*102%*

Source: Kassala SWC Financial Department

As described above, with regard to the impact of this project, the quantitative indicators that were set at the planning stage had not been achieved at the time of ex-post evaluation. This was because external factors such as delay in construction on the part of Sudanese work were an impediment to the achievement of the goal, by separating the Sudanese side work, which was indispensable for realizing the effect, to be outside of the scope of this project. Although the population receiving the water supply service is increasing in the East District, there are still many people who cannot receive water supply service because the population in Kassala city is also increasing year by year. In the future, improvement of indicators will be expected by proceeding with renewal work of the water distribution pipes and replacement work of the water supply pipe connected to each household by the Sudanese side. But achievement in the target year of 2017 is difficult. Regarding the qualitative effects (improvement of basic living environment for the residents in the target areas) that were set at the time of planning, it was confirmed that many residents feel that the water supply situation has been improved according to the beneficiary survey, although there is a difference in results according to area. It is also assumed that there were many positive impacts on their living environment. Although sufficient information was not collected about the "economic difficulty on water vendors by losing/decreasing their sales activities," which was a concern as a negative effect at the time of planning, several water vendors who were interviewed at the ex-post evaluation survey said that most of their colleagues have already shifted their job from water vendor. As for the "decline of groundwater level," it is supposed that it is not caused by the project but caused by over pumping of agricultural wells, etc. Thus, the impact of the project is fair[41].

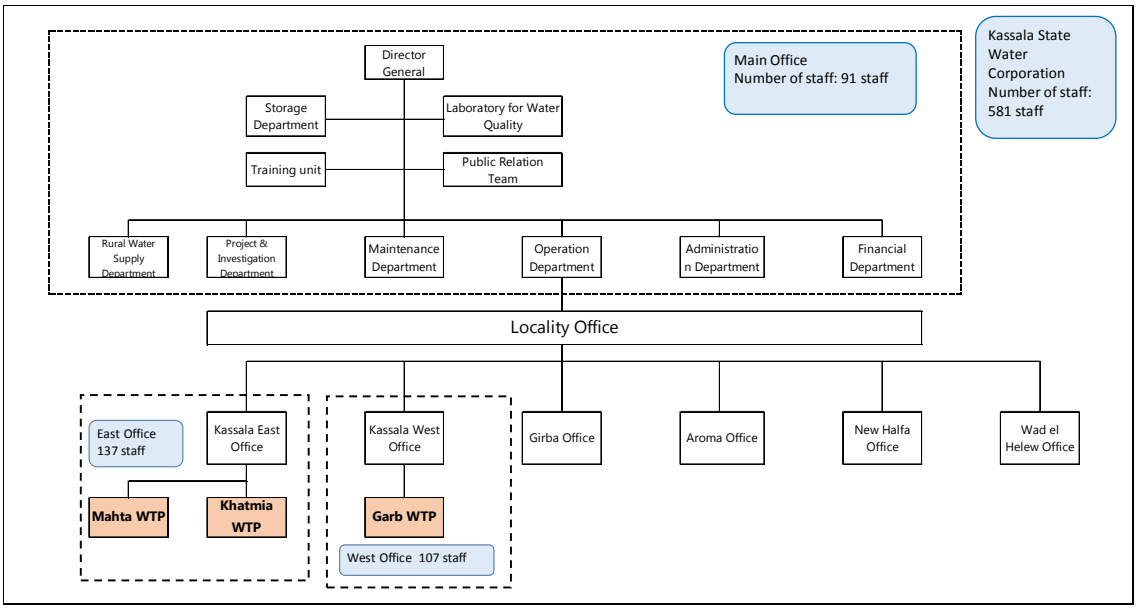
[41] The timing of ex-post evaluation of the Grant Aid Project is the timing at which the project's outcome is expected. Thus, when evaluating the project's impact at the time of ex-post evaluation, it is general to assess the impact with taking into consideration the added value that can be seen at the time of ex-post evaluation (refer to FY2016 External ex-post evaluation reference). However, because this project set the quantitative indicators (percentage of households receiving the water supply service, population receiving the water supply service, and daily water use per capita) on the premise that the Sudanese side work, which was outside the project scope, would be completed, as stated in footnote 30, those indicators were determined as impact indicators at the time of ex-post evaluation. In

As stated above, this project has achieved its objectives to some extent, and the effectiveness and impact of the project are fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

Kassala SWC has the authority to decide the issue about water supply in Kassala State. Figure 3 is the organizational chart of Kassala SWC. There has been no big change from the time of the planning.



Source: Refer to the document provided by "The "Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations"

Figure 3 Organizational chart of Kassala State Water Corporation

The daily operation of the WTPs is carried out by full-time operators belonging to each WTP[42]. In case the operators find trouble of the facilities, they inform the shift leader, and the shift leader contacts the engineer. When the engineer judges that repair is necessary after checking the facilities, he requests the maintenance department to repair the facilities. If the maintenance department cannot manage to repair the trouble, the repair is outsourced by the maintenance department. According to the interviews at the WTPs, the number of O&M staff in each WTP is as shown in Table 15, and the sufficient number of O&M staff is secured.

addition, the work conducted by the Sudanese side, which was implemented outside of the project scope, was recognized as a factor of the development of the project effect, and the target year was set at the time of ex-post evaluation (2017). Therefore, this project was assessed with more emphasis on the impact compared with general ex-post evaluation because the project impact had been expected to be confirmed at the time of ex-post evaluation as planned. It is considered that the plan based on the premise of the Sudanese side work completion, which was implemented outside of the project scope, involved risk.

[42] The four-rotating-shift is applied to each WTP. One shift team in the Mahta WTP and the Khatmia WTP consists of 3 operators (one of them is the shift leader), and the team in Garb WTP consists of 2 operators.

Table 15 Number of staff in WTPs

	Mahta WTP	Garb WTP	Khatmia WTP
Engineer	1	1	1
Operator	16	13	12
Other staff	3	0	3
Total	20	14	16

Source: Interviews at the WTPs

Therefore, there are no big challenges in the institutional aspect of O&M.

Although the training unit has been established since 2012 at the Kassala SWC, and technical training has been implemented, the activities of the training unit have been stagnant recently. Currently, it has been attempted to revitalize its activities through "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations"[43].

3.5.2 Technical Aspects of Operation and Maintenance

Operators who received OJTs in the "Rehabilitation Project" and who attended workshops and OJTs of the technical guidance in "Expansion Project" belong to each WTP[44]. It is assumed that there are no big challenges in daily operation as the experienced operator supervises the other operators as a shift leader. However, the chlorine dosing facilities in both the Mahta and Khatmia WTPs that were installed by the project broke down for over the one year. According to the interview with the laboratory staff, the cause was leakage of chlorine gas, and the joint of the changeover corroded due to the fact that its repair was done improperly. Although the training related to the O&M of the chlorine dosing facilities was conducted by the technical guidance of the project, it is considered that proper O&M was not done because one of the three staff members in the laboratory who attended the training quit the job, and the other two only partially attended the training. Subsequently, it was repaired by an expert of "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations" in November 2016, and it was operating at the time of the ex-post evaluation. For Kassala SWC to maintain the facilities by itself in the future, technical support under the guidance of the expert of "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations" has been implemented. It is assumed that there are minor challenges with WTP's O&M as a result of the scoring based on the work achievement sheet in the O&M of WTP and mini tests for the maintenance team conducted by "The Project for Strengthening Capacity of Institutional Management, Operation and

[43] The draft of the business plan developed by Kassala SWC through "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations" describes revitalization of the training unit.

[44] Not less than 70% of the staff of the Kassala SWC who attended workshops hosted by the technical guidance of the project have worked at the time of the ex-post evaluation.

Maintenance in State Water Corporations" in October 2016[45]. Thus O&M in WTPs is aimed to improve by the activities of "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations" in the future. Therefore, some minor problems have been observed in the technical aspect of O&M.

3.5.3 Financial Aspects of Operation and Maintenance

All the necessary expenses for the O&M of the Kassala SWC, including the WTPs, are covered by the water fees collected from the customers. The water fees in Kassala city are fixed rates. According to the Kassala SWC, the collection rate has been not less than 80% since the start of entrusting the fee collection to the Electricity Corporation in late 2012[46]. As shown in Table 16, the water fees structure are regularly reviewed, and the income is increasing year by year with the increasing number of customers[47].

Table 16 Monthly water fees by the customer categories[48]

(Unit: SDG)

	2012	2013	2014	2015	2016
Residential -1	40	40	45	50	60
Residential -2	35	35	40	45	55
Residential -3	20	20	20	30	32
Commercial-A	280	280	350	450	600
Commercial-B	80	80	120	200	250
Commercial-C	45	45	65	100	150
Commercial-D	N/A	N/A	801	1,000	1,500
Commercial-E	N/A	N/A	250	350	500
Governmental -A	80	80	100	150	200
Governmental -B	45	45	55	60	70

Source: Kassala SWC Financial Department

To see the financial document provided by the financial department, there was no year in which the expenditure greatly exceeded its income (refer to Table 17).

[45] On the work achievement sheet, the scoring was conducted for 16 items related to well management, WTP management, procurement, and inventory management. The average score was 23.5 points out of 100 points. Mini tests were conducted on the basic knowledge of water quality and chlorine treatment, and calculation of the chemical injection volume was conducted for 16 maintenance team members from the operation department, maintenance department (electricity section and machinery section), and laboratory. The average score of the mini test was 20.1 points out of 100 points (Document provided by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations").

[46] Regarding the collection of water fees, 77% of customers' water fee collections are entrusted to the Electricity Corporation, and the remaining 23% customers who do not use electricity are collected by the Kassala SWC.

[47] Revision of water fees and categories was supported by the water cluster of the "Capacity Development Project for the Provision of Services for Basic Human Needs in Kassala (K-TOP), and it was revised since 2014.

[48] There are ten categories (eight categories until 2013) of water fee. The category of "Residential" is household, "Commercial" is restaurant, farm, and factory, and "Governmental" is public institution and schools.

Table 17 Annual income and expenditure of Kassala SWC

(Unit: Thousand SDG)

	2012	2013	2014	2015	2016
Total revenue (fee collection)	14,404,545	14,915,700	18,424,428	23,161,095	29,502,108
Residential -1	246,960	245,520	222,345	250,200	303,480
Residential -2	1,378,755	1,374,345	1,562,040	1,777,545	2,198,790
Residential -3	10,790,280	11,281,860	13,034,475	15,952,230	20,003,238
Governmental -A	360,000	386,640	514,800	776,250	1,063,800
Governmental -B	133,245	131,220	115,560	106,920	141,750
Commercial-A	292,320	322,560	872,550	793,800	1,042,200
Commercial-B	669,600	678,240	1,245,240	2,147,400	2,704,500
Commercial-C	533,385	495,315	628,560	1,049,400	1,594,350
Commercial-D	N/A	N/A	72,000	90,000	108,000
Commercial-E	N/A	N/A	156,858	217,350	342,000
Total expenditure	10,926,902	13,807,484	13,700,233	23,204,475	18,973,582
Salaries	6,247,864	6,858,995	7,545,818	12,107,198	9,955,021
Electricity	2,069,095	2,097,532	2,510,733	2,872,972	2,182,541
Fuel	737,705	859,749	1,126,495	1,371,216	960,332
Maintenance (materials, tools, etc.)	568,166	798,346	535,648	366,813	1,097,412
Others	1,304,072	3,192,862	1,981,539	6,486,276	4,778,276

Source: Kassala SWC Financial Department

Note: Commercial-D and Commercial-E are the categories introduced since 2014

However, according to the interview with the director general of Kassala SWC, there are some expenses that are not reflected in the total expenditure of Table 17. In fact, the funds are insufficient, and the costs of developing new wells and new facilities are difficult to cover with the income of the customers' fee. Therefore, Kassala SWC depends upon subsidies from federal and state governments as well as through support from donors. Although Kassala SWC manages to develop new wells, the chlorine dosing facilities and distribution pump in Garb WTP, which had been installed in the 1980s by the Japanese Grant Aid Project, have not yet been replaced. As a result, chlorine powder is manually placed in the receiving wells, and only two distribution pumps among three are working[49]. In addition, accurate water distribution volume has not been recorded in Garb WTP, as the flow meter was not installed due to the shortage of funds.

Thus, the financial aspect of O&M has minor problems.

[49] Two out of three of Garb WTP's water distribution pumps, which were procured in the 1980s, were out of work in February 2017. But after repair work done by Kassala SWC, two pumps were working in July 2017.

3.5.4 Current Status of Operation and Maintenance

(1) Current status of O&M in each WTP

The status of O&M in each WTP at the time of ex-post evaluation is shown in Table 18.

Table 18 Status of O&M at the time of ex-post evaluation (July 2017)

	Mahta WTP	Garb WTP	Khatmia WTP
Operation Records	・The chlorine-dosing facility and distribution pumps are checked and operation records are recorded every day. ・Water distribution volume is recorded every hour.	・No operation record because flow meter was not installed as the project's output of Garb WTP was limited and distribution pump building was not rehabilitated like Mahta and Khatmia WTPs. However, the time of water distribution is recorded.	・The chlorine-dosing facility and distribution pumps are checked and operation records are recorded every day. ・Water distribution volume is recorded every hour. ・Engineer can check the water intake and distribution anywhere by using the remote monitoring system.
Facility Maintenance	・Although the chlorine-dosing facility was out of use for a year, it is currently working after the repair by the technical cooperation project. ・One of the distribution pumps is not operating due to the high temperature during its operation. (but it is not a big problem at present as one of the distribution pumps is installed as a spare.)	・The facilities rehabilitated by the project are operating without any problem. *＜The followings are the malfunction of the facilities provided by the Grant Aid Project in the 1980s. ＞* *・Only two distribution pumps among three are operating.* *・Chlorine-dosing facility was out of order since 2011.*	・Although the chlorine-dosing facility was out of use for a year, it is currently working without any problem after the repair by the technical cooperation project. ・Operator has to adjust the water distribution pump valve manually to control the water flow every time water is conveyed because no screw of the valve for flow adjustment meets its specifications.

Source: Observation at the time of ex-post evaluation

Although there are minor challenges in the Mahta and Khatmia WTPs in terms of the current status, their facilities are generally managed well. In the Garb WTP, where the outputs of the project is limited, the existing facilities that have been utilized since the 1980s, such as the chlorine-dosing facility and distribution pumps, are not utilized partially due to deterioration, However, the facilities rehabilitated by the project are managed well.

Thus, generally, there are no challenges in terms of the current situation of O&M.

As stated above, some minor problems have been observed in terms of the technical aspect and financial aspect. Therefore, the sustainability of the project effects is fair.

Column: Negative factors concerning the sustainability of the project effect

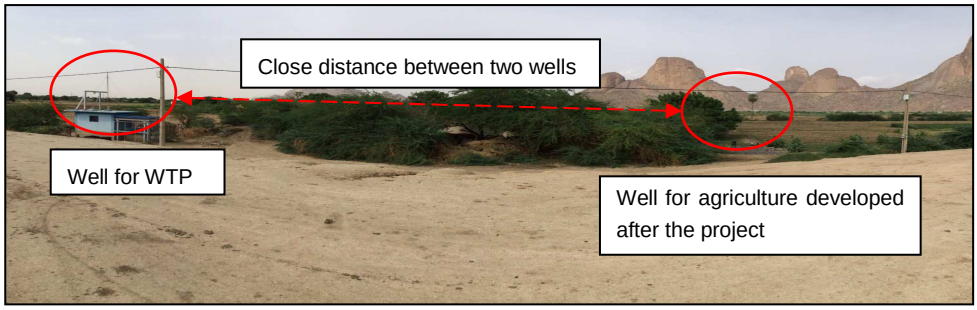
As stated in the section on effectiveness, the water distribution volume and water pumping volume of each WTP tend to decrease. According to the director of the Groundwater and Wadis Kassala branch, it is assumed that over pumping as well as the overdevelopment of agriculture wells due to the expansion of the agriculture lands, mutual interference of wells located within a close distance, and effect of the plant called mesquite (*1), are causes of the decrease of the groundwater level. However, a clear reason has not been specified at the moment, as the detailed investigation has not been conducted. Kassala SWC has begun periodic monitoring of several wells in the city since November 2016 in order to grasp the current situation of the decline of the groundwater level. A block meeting with the residents to discuss effective water use has also started. (*2) In addition, new wells for drinking water are being developed by Kassala SWC to increase the water distribution volume. But those efforts require time to take effect, and it is unknown how much they can mitigate the decrease in water distribution due to the decline of the groundwater level.

In July 2017, the Kassala state government established the local act (No.58 and No.59) concerning the management of groundwater, and the coordination and supervising of the groundwater resources management in Kassala state was to be carried out by the Groundwater and Wadis Kassala branch. In addition, the restriction is imposed for future expansion of farmlands and for excavating new wells due to the necessity of approval by the committee chaired by the Groundwater and Wadis Kassala branch. (*3)

*1 Mesquite is an exotic species brought in to prevent the desertification. According to the director of the Groundwater and Wadis Kassala branch, it is thought to be a cause of groundwater decline because of its high reproductive potential and deep underground rooting, and, as a result, it hinders the recharge of groundwater.

*2 Those activities are supported by “The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations.”

*3 The committee members consist of the Groundwater and Wadis Kassala branch (chair), Kassala SWC (vice chair), Farmers Union, Gash River Training Unit, and Law Administration (Interview with the director of Groundwater and Wadis Kassala branch). It is also assumed that the 3rd Joint Coordination Committee (JCC) of “The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations”(2016-2020) held in 27 April 2017 contributed to the establishment of the committee. This is because about 60 stakeholders such as the officers of Kassala SWC, Kassala State government, related ministries, farmers, NGOs, and the residents of Kassala could share the information and discuss groundwater management at this JCC.



（Example of close interval between the well of WTP and agricultural well）

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The projects were implemented in Kassala city located in the eastern part of Sudan, where its population has been growing, with the aim of improving the safe and stable water supply to the residents through the rehabilitation of the existing WTP in the East and West Districts and through the construction of a new WTP in the East District, thereby contributing to improvements in the residents' basic human needs. The projects' implementation was consistent with Sudanese development policy and needs as well as Japan's ODA policy. Therefore, the relevance of the projects is high. Although there were minor modifications from the plan with regard to the construction and soft component (technical guidance), the projects implementation and their cost were almost as planned. However, as the projects period exceeded the plan, the efficiency of the projects is fair. The projects contributed to the improvement of water supply and water quality in Kassala East District and to the water quality in Kassala West District where its outputs had been limited. The positive effects by those contributions were also confirmed. In addition, the risk of bursting of the reservoirs was reduced by upgrading old FRP reservoirs to reinforced concrete reservoirs through the rehabilitation of existing WTPs in the East and West Districts of Kassala city. This led to the reduced future risk of people being affected by the reservoir bursting. However, the people receiving positive effects through the project are limited, as many people are still unable to receive water supply service because the replacement of the distribution pipes and the water supply pipes by the Sudanese side, although it is outside of the projects scope, has been delayed, and also because of the population increase. Therefore, the effectiveness and impact of the projects are fair. Some minor problems have been observed in terms of the technical and financial aspects of O&M. Therefore, sustainability of the projects effects is fair.

In light of the above, the projects are evaluated to be partially satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Completion of the replacement of a new distribution pipe and water service pipe for the customer

When considering how to effectively deliver water from limited water resources to more residents, while also considering the current situation of Kassala city's water supply, the most effective way is to increase water supply volume by decreasing the water leakage rate. In order to decrease the water leakage rate, it is recommended for Kassala SWC to complete the replacement of a new distribution pipe steadily through close communication with the contractors. In addition, Kassala SWC needs to monitor sufficiently the process of replacing the water supply pipes for existing customers whose installation costs are covered by the customers

so that their installation will be properly completed.

(2) Strengthen cooperation with Groundwater and Wadis Kassala branch

It can be said that Kassala SWC and Groundwater and Wadis Kassala branch will be able to cooperate more easily than ever before through the establishment of the local act related to the management of the groundwater resource from the state government. Kassala SWC has great knowledge about the water supply system, and Groundwater and Wadis has great knowledge about groundwater resources. In order to continuously supply stable water to residents, water supply and water resource management cannot be considered separately. It is significant for Kassala SWC to monitor the fluctuation of the groundwater level periodically and consider the proper water resource management as well as the water supply management in the future in cooperation with the Groundwater and Wadis Kassala branch.

(3) Making sure to keep the O&M record

Although the operation records such as check records of the facilities and water intake/water distribution are taken on a daily basis in the Mahta WTP and Khatmia WTP, maintenance records such as engine oil change logs of the generator are not taken. For efficient O&M in the future, it is recommended to take a maintenance record in addition to the daily operation records. Regarding the Garb WTP, it is desirable to take records of water intake/water distribution together with the installation of the flow meter, since it is not even possible to record the intake and distribution as there is no flow meter installed.

(4) Providing the training opportunities for the operator of WTP

Many operators requested training related to maintenance during the interview with the operators. Although the training for operators is being conducted by “The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations,” it is recommended that the training unit of the Kassala SWC takes initiative to provide more training for the staff. Kassala SWC has personnel to conduct the maintenance training and OJT for operators, as some staff members were dispatched to receive training at the Drinking Water and Sanitation Training Center (DWST), and the staff members who have taken the TOT (Training of Trainers) at the DWST can conduct the training as trainers. Thus, it is important for the Kassala SWC to secure the cost of training proactively and promote the capacity building of the staff by itself to enhance the sustainability of the project’s effect.

(5) Promoting water conservation among residents

In the beneficiary survey, there are many residents who responded that their living environment became comfortable due to an increase in water supply, but some residents responded that the situation of water supply worsened. One of the reason for worsened water

supply situation for some residents is considered that the residents in areas close to the WTPs, where the water supply situation was relatively good before the project, used water more than before due to the improvement of the water supply situation, and as a result, the water volume and water pressure in areas far from the WTPs were restricted. It was pointed out that residents wasted water because the monthly water fee in Kassala city is a fixed rate and is not proportional to the water usage[50]. The demand for water use is expected to increase in the future because the population in Kassala city tends to increase. To provide water supply service to all residents equally, it is important for the Kassala SWC to continue educational activities on efficient water usage. Although it is considered that the future excavation of new wells is restricted by the establishment of a local act, it is recommended that Kassala SWC persistently educate the farmers about the over pumping of existing agricultural wells.

4.2.2 Recommendations to JICA

(1) Enhancing the improvement of water supply service through the continuous support of the JICA technical cooperation project

It is very crucial to manage the groundwater in order to provide water supply service that continuously meets customer demands in the future. Also, an indispensable issue for improving future water supply service is how to effectively use limited water resources for water supply service. For that purpose, JICA is implementing the capacity development of the water supply service of Kassala SWC, including the water leakage control and the water supply system monitoring, through "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations." Regarding groundwater resource management, it is recommended to support strengthening capacity of the Groundwater and Wadis Kassala branch and educating the residents and farmers about the effective water use of limited water resources through the activities of the "Project for Enhancement of Integrated Water Resources Management."

4.3 Lessons Learned

<u>Making the plan to enhance the sustainability of the Grant Aid Project</u>

Collaboration with technical cooperation projects during and after the project implementation has contributed greatly to the effectiveness, impact, and sustainability of the project. Firstly, during the implementation of the project, renewal work of the water distribution piping network

[50] Introduction of the water meter system is the most effective way to prevent wasteful water use. But the main collection system of the water fee in Sudan is the flat rate system. Thus, it is assumed that it requires considerable time and continuous support such as securing a budget, building the system, and human resource development to shift the water meter system from the flat rate system. By taking a step, it is desirable to gradually introduce the water meter system after strengthening the management capacity of Kassala SWC to operate and maintain the system

by the Sudanese side advanced by supporting the management of pipe network facilities of Kassala SWC through the water cluster of "Capacity Development Project for the Provision of Services for Basic Human Needs in Kassala (K-TOP) (2011-2015)." In addition, the water fee that had not been revised for many years was revised with the support of K-TOP and thereby improved the financial situation of Kassala SWC. Furthermore, K-TOP also contributed to the launch of the training unit, which provided the foundation of the current O&M knowledge of Kassala SWC staff, and various technical trainings were conducted under the training unit during the implementation of K-TOP[51].

Secondly, after the project, the chlorine dosing equipment provided by the project was repaired with the support of "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations (2016-2020)." In addition, continuous advice in terms of maintenance method is also provided by "The Project for Strengthening Capacity of Institutional Management, Operation and Maintenance in State Water Corporations." Although the technical training of O&M of the facilities was conducted during the project through the so-called "Soft Component," it is difficult to practically learn facility repair at the time of provision because the facilities are new. In this manner, it is very effective to make a plan from a program perspective, in which technical cooperation projects implement technical support during and after the grant aid, to improve the sustainability of the project.

Including the work to be implemented by the partner country in the project scope to enhance the project effect

At the time of the project planning, it was recognized that completion of the water distribution pipe renewal work and water supply pipe connection work conducted by the Sudanese side was indispensable for the project's effectiveness, and the indicator of the quantitative effect of the project was set based on that assumption. However, as a result of the work on the Sudanese side not being included in the project scope as a necessary work covered by the partner country and implemented outside of the project scope, the project's effectiveness was affected by external factors such as delayed work on the Sudanese side. In this manner, to prevent external factors from hindering the development of the aimed effect of the project, in the case that difficulty is foreseen in the feasibility, after recognizing the technical, institutional, and financial capacity of the partner country with regard to components indispensable for the project effect, it is desirable to include it within the project scope as part of the work to be borne by the partner country and to manage the progress while also sharing progress with the partner country to enhance the project effect.

[51] The training unit is reducing its activities at the time of the ex-post evaluation. Thus, the revitalization of the training unit is included in the recommendation to the Kassala SWC.