

Mongolia

FY2017 Ex-Post Evaluation of Japanese Grant Aid Project

“The Programme for Ulaanbaatar Water Supply Development in Gachuurt”

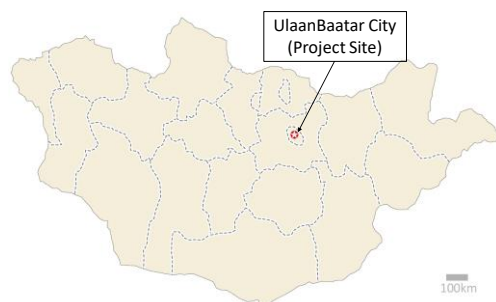
External Evaluator: Keisuke Nishikawa, Japan Economic Research Institute Inc.

## 0. Summary

In this project, a new water source was developed, and water transmission mains were laid in Gachuurt, an eastern suburb of Ulaanbaatar City, to improve the situation of water supply for residents in the ger districts in Ulaanbaatar City. The relevance of this project is high as it was consistent with the development plans and development needs of Mongolia and Ulaanbaatar City at the time of both planning and ex-post evaluation in terms of a stable and sufficient supply of water, and it was also consistent with Japan’s ODA policy at the time of planning to support the development of infrastructure for promoting economic activities. As for implementation of the project, the project outputs were largely as planned, and the project costs and periods were within the plan. Therefore, the efficiency is high. With regard to project effects, in addition to the achievement of operation indicators, a stable water supply and the elimination of users’ waiting time at kiosks were confirmed. However, the water supply volume did not increase as expected because of an economic growth lower than expected at the time of planning and because of water saving measures imposed by the executing agency, showing an aspect of this project that did not necessarily contribute in a sufficient manner. Regarding the impact, a reduction in the burden of water-drawing and improvements in the hygienic environment were observed, and there were no issues in terms of negative impacts to the natural environment or resettlement and land acquisition. Therefore, the effectiveness and impact of this project are fair. With respect to operation and maintenance, there were no major problems in terms of all institutional, technical, financial aspects or the operation and maintenance status. Therefore, sustainability is judged to be high.

In light of the above, this project is evaluated to be highly satisfactory.

## 1. Project Description



Project Location



Chlorination / Operation House and Reservoir

## 1.1 Background

Ulaanbaatar, the capital city of Mongolia, has characteristics in terms of living patterns and water use in which apartment areas have individual water supply connections whereas ger districts require residents to purchase domestic water at drinking water sales offices (hereinafter referred to as ‘kiosks’). As for the volume of water use, there was a big gap that revealed ger residents were using 8.7 liters per person per day while apartment residents were using 236 liters per person per day in 2009. In ger districts, there were kiosks with supply hour restrictions due to the shortage in water supply volumes, requiring the users to continue waiting for resumption of service whenever the water supply was suspended.

Water supply facilities in the city were constructed with the assistance of the former Soviet Union over a period from the 1950s to the 1980s. After that, owing to the city’s individual efforts or to assistance from donors, expansion of water supply capacities was made through facility development, measures against water leakages, transition to a metered tariff system, efforts on water saving awareness and other efforts were made. However, the expansion of water supply capacities was an urgent challenge because of a water demand increase caused by a rapid population increase and population relocation from ger districts to apartment areas based on the national housing policy.

The Water Supply and Sewerage Authority of Ulaanbaatar City (hereinafter referred to as the ‘USUG’) was supplying water by pumping groundwater at four water sources. However, as the existing water sources did not have any potential for further development, it was necessary to develop a new water source in Gachuurt, the eastern part of Ulaanbaatar, which was proposed as the best location in a previous survey.

## 1.2 Project Outline

The objective of the project was to improve water supply conditions for residents of Ulaanbaatar City (particularly in the ger districts) by developing a new water source and laying water transmission mains in Gachuurt, the eastern suburb of Ulaanbaatar City, thereby contributing to the improvement of the hygienic and living environment of residents.

Grant Limit / Actual Grant Amount	Detailed Design: 102 million yen / 102 million yen Main Works: 3,305 million yen / 2,514 million yen
Exchange of Notes Date / Grant Agreement Date	Detailed Design: September, 2010 / September, 2010 Main Works: June, 2011 / June, 2011
Executing Agency	The Water Supply and Sewerage Authority of Ulaanbaatar City (USUG)
Project Completion	November, 2014

Main Contractor	Dai Nippon Construction
Main Consultant	CTI Engineering International Co., Ltd.
Preparatory Survey	July, 2009 – March, 2010
Related Projects	<p>[Technical Cooperation]</p> <p>Study on Water Supply Systems in Ulaanbaatar and Surroundings (1993 – 1995)</p> <p>The Study on City Master Plan and Urban Development Program of Ulaanbaatar City (2007 – 2009)</p> <p>Study on the Strategic Planning for Water Supply and Sewerage Sector in Ulaanbaatar City (2012 – 2013)</p> <p>[Grant Aid]</p> <p>Rehabilitation of Water Supply Facilities in Ulaanbaatar City (1996)</p> <p>The Project for Improvement of Water Supply Facilities in Ulaanbaatar (2004)</p> <p>[Other International and Aid Organizations]</p> <p>(World Bank)</p> <p>Ulaanbaatar Services Improvement Project (1997 – 2003)</p> <p>Second Ulaanbaatar Services Improvement Project (2004 – 2012)</p> <p>Ulaanbaatar City Water Supply and Sewerage Master Plan (2006)</p> <p>(The Netherlands)</p> <p>Water Operators' Partnership Project (2007 – 2010)</p> <p>(Asian Development Bank / European Investment Bank)</p> <p>Ulaanbaatar Urban Services and Ger Areas Development Investment Program (2012 –)</p>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Keisuke Nishikawa, Japan Economic Research Institute Inc.

### 2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2017 – November, 2018

Duration of the Field Study: January 28, 2018 – February 9, 2018, and April 1, 2018 – April 7, 2018

### 3. Results of the Evaluation (Overall Rating: A<sup>1</sup>)

#### 3.1 Relevance (Rating: ③<sup>2</sup>)

##### 3.1.1 Consistency with the Development Plan of Mongolia

At the time of planning of this project, in the *MDG-based Comprehensive National Development Strategy of Mongolia* (targeting 2008 – 2021), which was positioned as the overarching development plan of Mongolia, a potable water supply to ger districts in the capital of Ulaanbaatar was set as an important agenda item in the strategic goals on urban planning and construction. In addition, in the *City Master Plan and Urban Development Program of Ulaanbaatar City* (formulated in 2009) regarding water supply, water demand was projected to exceed the supply capacity by around 2011, and the development of water supply facilities was set as a priority project.

The *Mongolia Sustainable Development Vision 2030* (formulated in 2016) targeting the entire area of Mongolia was set as a development plan at the time of ex-post evaluation, and ‘Environmental Sustainability’ was put up as one of the four pillars in the vision. Among the pillars, an increase in the supply of potable water, one that met hygienic standards, was set as one of the goals of integrated water resource management. In addition, in the *Ulaanbaatar 2020 Master Plan and Development Approaches for 2030*, which was the comprehensive development plan of Ulaanbaatar City formulated in 2014, it was indicated that the proportion of apartments and houses equipped with infrastructure would increase from 43% in 2010 to 78% in 2030. In contrast, it was planned that the proportion of ger districts would decrease from 25% in 2010 to 3% in 2030. Along with the plan, the volume of domestic water use was planned to be halved in ger districts while that in apartment areas would be 2.5 times larger in 2030 compared to 2010.

Based on the above, it can be said that this project is consistent with the national development plans at both points of time in terms of the supply of a sufficient volume of potable water. Regarding the consistency with Ulaanbaatar City’s plan, including the plan for the water sector, it is planned that ger districts in the city will be scaled down in the future. However, there is a need to supply sufficient water to residents in ger districts until the planned decrease is to be accomplished and water supply networks in the present ger districts chosen to be redeveloped as apartment areas in the future need to be developed in advance.

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<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ②: Fair, ①: Low

In this light, this project can be judged to have been in line with the development direction of Ulaanbaatar City.

### 3.1.2 Consistency with the Development Needs of Mongolia

At the time of planning of this project (in 2009), there was a big gap in terms of the volumes of water used by Ulaanbaatar residents, as evidenced by ger residents using 8.7 liters per person per day<sup>3</sup> in contrast to apartment residents using 236 liters per person per day. However, there were kiosks with supply hour restrictions due to the shortage in water supply volumes in ger districts, requiring the users to continue waiting for resumption of service whenever the water supply was suspended. Moreover, there were even ger residents using unsanitary surface water. Regarding the relationship with the above policies, an expansion of water supply capacities was an urgent issue because of the sudden population increase and an increase in water demand caused by population shifts of ger districts to apartment areas in Ulaanbaatar City. This project was implemented to respond to these challenges.

While this project had the components to develop a water source for enhancing water intake capacities, the development of distribution networks remained necessary at the time of ex-post evaluation as the number of kiosks in ger districts requiring water supply by water trucks was 320 among the 640 kiosks. In addition, the executing agency has realized in recent years the prepaid card-operated water supply system at 120 kiosks among the 320 kiosks connected to distribution networks. At these kiosks, a 24-hour water supply had become possible without staffing. It is expected by residents that the number of such kiosks will increase further<sup>4</sup>.

A stable water supply is indispensable for the social and economic activities of Ulaanbaatar City residents. The daily average water supply volume in the city and the water supply volume per person per day to apartment areas and ger districts in recent years are shown below.

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<sup>3</sup> Information provided by the executing agency (identical to the data for 2009 shown in Table 1)

<sup>4</sup> At the time of ex-post evaluation, assistance was being provided by the Millennium Challenge Corporation, a US donor agency, to enable prepaid card-based payment at all kiosks.

Table 1: Water Supply Situations in Ulaanbaatar City

	2009	2015	2016	2017
Daily average water supply volume (m <sup>3</sup> /day) <sup>Note</sup>	152,000	142,700	143,500	144,000
Water supply volume in apartment areas (ℓ/person-day)	236.0	156.2	149.2	140.4
Water supply volume in ger districts (ℓ/person-day)	8.7	8.1	8.1	8.8

Source: Document provided by the executing agency

Note: Only the data of sales volume of water not the actual volume of water supplied are recorded.

With regard to water supply situations in all of Ulaanbaatar City, the water supply volume per capita has decreased – contrary to the expectation at the time of planning – because of delays in the progress of a plan to transform ger districts to apartment areas, which in turn were caused by a sudden slowdown of economic growth since November 2014 (refer to Table 2), raising of the water tariff<sup>5</sup>, increases in water meter installations<sup>6</sup>, measures against water leakages in distribution networks, and so forth.

Table 2: Economic Growth Rate, Inflation Rate and Income (for reference)

	2013	2014	2015	2016
Real growth rate of gross domestic product	11.6%	7.9%	2.4%	1.0%
Inflation rate	12.5%	11.0%	1.9%	1.1%
Nominal gross national income per capita (Tugrik in thousands)	6,241	6,891	7,021	7,209

Source: Taken from the Mongolia Yearbook (2016 version)

In the ger districts targeted in this project, a similar pattern elucidating that water supply volumes remained unchanged while the population increased was observed, leading to a reduction of per capita water supply volume compared to that at the time of planning (refer to Table 3). In 2009, residents were purchasing more water than necessary for fear of not being able to obtain it, as much of the water was supplied through water trucks. However, the development of distribution networks and stability in obtaining water at kiosks gradually had become prevalent at the time of ex-post evaluation. Therefore, a change in which residents efficiently purchased and used water is considered to be the factor for the reduction.

<sup>5</sup> Revised upwards by an average of 10% every year since 2014

<sup>6</sup> The installation rate of water meters in apartment areas was 32% in 2009, but it subsequently rose significantly, reaching 70% in 2017 (based on the information provided by the executing agency).

Table 3: Population and Water Supply Volume in the Ger Districts Targeted in This Project

Name of Ger Districts	2009		2015		2016		2017	
	Population (person)	Water sales volume (ton/year)	Population (person)	Water sales volume (ton/year)	Population (person)	Water sales volume (ton/year)	Population (person)	Water sales volume (ton/year)
Hailast	61,165	179,113	66,000	195,645	68,261	191,588	60,322	204,317
Denjiin Myanga	5,798	44,949	11,900	31,521	11,844	36,038	7,560	36,650
Radio & TV Authority Naran Zuragt	7,599	51,561	15,412	57,350	14,112	57,340	21,890	50,976
In and around North-East Reservoir	5,075	45,360	10,300	24,222	8,820	23,598	10,774	23,578
Chingeltei	12,026	94,295	13,365	45,443	13,364	43,674	17,971	46,715
Dambadarjaa	21,148	57,450	29,289	106,599	28,760	97,010	26,216	114,455
Dari Ekh	15,126	114,144	32,047	96,544	39,437	96,469	23,746	98,194
3,4,5,6,7 Buudal, <sup>7th</sup> Khoroolol	5,841	27,099	12,226	44,892	12,226	44,144	13,790	40,974
<b>Total</b>	<b>133,778</b>	<b>613,971</b>	<b>190,539</b>	<b>602,216</b>	<b>196,824</b>	<b>589,861</b>	<b>182,269</b>	<b>615,859</b>
<i>Water supply volume per capita (day-ℓ)</i>	-	12.6	-	8.7	-	8.2	-	9.3

Source: Document provided by the executing agency

In the ger districts targeted in this project, no increase in water demand associated with the implementation of this project has been observed. However, in the entire city of Ulaanbaatar, a proportion of residents living in apartment areas has gradually become higher in line with the government policy. As shown in Table 4, the proportion of residents in apartment areas, which was 38.5% of the total in 2009, rose to 43.5% in 2017. In contrast, while the population in ger districts had been increasing, the rate of increase has slowed down in recent years. In the comprehensive development plan of Ulaanbaatar City (formulated in 2014), it was planned that the number of households able to partially use utility services (electricity, water, and so on) in ger districts would reduce to 10,000 in 2030 from 65,338 in 2010 and that the number of households able to fully use utility services in apartment areas would increase from 115,196 to 240,280 during the same period.

Table 4: Number of Residents in Ger Districts and Apartment Areas

(Unit: person)

	2009	2015	2016	2017
Ger district	658,052 (60.9%)	785,472 (58.4%)	792,099 (57.4%)	795,344 (56.1%)
Apartment area	415,159 (38.5%)	554,225 (41.2%)	582,159 (42.2%)	615,962 (43.5%)
Other <sup>Note</sup>	6,508 (0.6%)	5,803 (0.4%)	6,534 (0.5%)	6,090 (0.4%)
Total	1,079,719	1,345,500	1,380,792	1,417,396

Source: Document provided by the National Statistics Office of Mongolia

Note: Indicating the population living in places such as manholes and garages, which cannot be classified as houses

In Ulaanbaatar City, water supply volumes in the 2010s remained unchanged because of delays in the progress of a plan to transform ger districts to apartment areas caused by a sudden slowdown of economic growth as well as measures taken by the executing agency for water saving. However, it is expected that the water supply volume will gradually increase because (1) the proportion of residents in apartment areas is gradually becoming higher; (2) there is a plan to shift the population from ger districts to apartment areas where the volume of water consumption per capita is higher; (3) economic growth rates will recover<sup>7</sup>; and so forth. Moreover, the importance of a stable water supply in the ger districts were high at the time of both planning and ex-post evaluation. Therefore, this project, as a social infrastructure development project, can be said to be consistent with the development needs.



Water supply at a kiosk  
(at the time of ex-post evaluation)



Water supply through a water truck  
(at the time of ex-post evaluation)

<sup>7</sup> According to the country report published by the IMF, the expected GDP growth rates are: 5.0% for 2018; 6.3% for 2019; 5.0% for 2020; 5.8% for 2021; 8.2% for 2022; and 7.0% for 2023, showing higher rates than those of 2015 and 2016.



### 3.1.3 Consistency with Japan's ODA Policy

In Japan's *Country Assistance Policy for Mongolia* (formulated in 2004) at the time of planning, 'Assistance on infrastructure development for promoting economic activities' was one of the focus areas of assistance, which aimed at strengthening urban functions of Ulaanbaatar City, including improvements in water supply conditions. Also, JICA had established the *Urban Development Program of Ulaanbaatar City* and positioned this project in this program.

As this project contained the execution of infrastructure development of Ulaanbaatar City and measures to respond to issues in the ger districts of the city as well as the increases in water demand, this project can be said to have been consistent with the focus areas of Japan's assistance for Mongolia mentioned above.

It was confirmed that this project was consistent with the development and sector plans as well as development needs of Mongolia at the time of both planning and ex-post evaluation, and with Japan's ODA policy for Mongolia at the time of planning.

Based on the above, the relevance of this project is judged to be high.

## 3.2 Efficiency (Rating: ③)

### 3.2.1 Project Outputs

It was planned in this project that a new water source would be developed along the Tuul River basin in Gachuurt, in the eastern suburb of Ulaanbaatar City, and transmission mains to Ulaanbaatar City would be laid. Table 5 summarizes the planned components and the altered points captured at the time of ex-post evaluation.

Table 5: Planned Components and Altered Points of This Project (portions contributed by Japan)

Item	Planned Component	Altered Point
Transmission mains	Transmission mains (18,813m), Valve chamber (a total of 33 locations), etc.	Transmission mains (18,870m)
Conveyance / collecting pipes	Conveyance / collecting pipes (7,060m), Valve chamber (a total of 4 locations), etc.	Conveyance / collecting pipes (6,892m)
Reservoir	Inflow pipes, Outflow pipes, Discharge pipes, Water gauge, Flow meter, etc.	None (Construction of the reservoir itself was borne by the Mongolian side)
Wells	21 wells (pumping volume: 1,200m <sup>3</sup> /day/well), Construction of pump house (21 locations)	None
Chlorination Unit Operation House	Storage room, Chlorination room, Operation room, Electrical room, Lavatory	None

Source: Prepared using the *Preparatory Survey Report* of this project and information provided by JICA and the executing agency



One of the wells constructed through this project



Maintenance bridge (left) and temporary bridge

Items altered and not described in Table 5 were as follows:

- Change in the construction method for inverted siphon at the point traversing Tuul River
- Location changes for 4 pumping wells and the associated changes in the lengths of conveyance / collection pipes
- Specification change of pump outputs and valves
- Reduction of water hammer pressures in transmission mains
- Addition of a fire alarm system in the Chlorination Unit Operation House
- Removal and restoration of pavement of roads over transmission mains
- Leaving the temporary bridge crossing Tuul River at Gachuurt Water Source intact
- Change in the type of pipes used for transmission mains (reinforced plastic duplex pipe)
- Addition of fences at the location where high voltage power lines for pump houses are drawn in

It was confirmed that these minor changes were the ones associated with the results of a detailed survey or with an enhancement of safety measures and did not cause any negative impacts for the generation of project effects.

A follow-up cooperation effort of this project was carried out from 2015 to 2016, whose main components were (1) the installation of perforated valves to stabilize the pumping volume for controlling the automatic stopping of valves associated with unexpected drops in underground water levels and (2) instruction on facility operations. As a result of this project, pumps do not stop automatically even when water levels drop excessively during the winter season.

The above were the outputs through cooperation offered by Japan, and the items borne by

the Mongolian side (except for general procedures) were as follows: securing of a temporary yard; construction of reservoir (6,000m<sup>3</sup>); installation of distribution lines; installation of fences at well pumps; construction of a maintenance bridge; and monitoring of environmental and social impacts.

These items were confirmed to have been all executed at the time of ex-post evaluation. Regarding the maintenance bridge crossing Tuul River, while the construction was completed in July 2015, the temporary bridge installed during the construction period of this project was left intact at the time of ex-post evaluation. The reason was that when the components by Japan were completed in November 2014, the temporary bridge was temporarily needed for maintenance purposes as the maintenance bridge had not been completed. It seems to have been a necessary measure for the generation of project effects through appropriate management of the wells. At the time of ex-post evaluation, the permanent bridge, completed in July 2015, was being used and passing over the temporary bridge was prohibited<sup>8</sup>.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

This project was planned at a total cost of 3,557 million yen and was composed of Japan's project cost contribution of 3,407 million yen (102 million yen for the detailed design and 3,305 million yen for the main construction) and Mongolia's project cost contribution of 150 million yen.

The actual project cost borne is shown in Table 6: a total of 2,950 million yen<sup>9</sup> comprising Japan's project cost of 2,616 million yen and Mongolia's cost of 5,455 million Tugrik (334 million yen<sup>10</sup>).

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<sup>8</sup> At the time of ex-post evaluation, the executing agency had been considering the utilization of the bridge by relocating the materials of the temporary bridge to a different location.

<sup>9</sup> The project cost of the follow-up cooperation effort described in '3.2.1 Project Outputs' was 55 million yen. However, it is not included in the cost of this project as it was not expected as an item necessary for the generation of project effects at the time of planning but rather a project implemented in response to the situation where a significant drop of water levels in winter had unexpectedly occurred.

<sup>10</sup> Calculated based on the average rate of the project period by referring to the exchange rate data of the International Financial Statistics (IFS) of the International Monetary Fund. The cost was a sum of the costs for the construction of a reservoir (6,000m<sup>3</sup>), installation of distribution lines, installation of fences at well pumps and the construction of a maintenance bridge.

Table 6: Breakdown of the Actual Cost of This Project

(Unit: million yen)

Breakdown		Project cost
Japan side	Detailed design	102
	Construction	2,395
	Direct construction	2,041
	Other construction	354
	Design and supervision	119
Amount borne by Mongolia		334
Total		2,950

Source: Prepared based on the documents provided by JICA and information provided by the executing agency

According to the executing agency, the cost borne by Mongolia substantially exceeded the planned amount because of a surge in local materials prices and labor costs. However, as Japan's project cost was significantly lower than the planned amount because of competitive bidding among contractors, the total project cost was within the plan (83% of the plan).

#### 3.2.2.2 Project Period

The period of this project, including the detailed design period, was planned at 52 months. The actual project period was 51 months: from September 2010, when the grant agreement of the detailed design was signed, till November 2014, when the main work was completed<sup>11</sup>.

With regard to the items borne by the Mongolian side, there was a delay seen in the construction of the maintenance bridge as described above. Concretely, as it became clear that the construction work would drag on into winter following a delay in the tender process, bridge construction was delayed<sup>12</sup> till the following year and finally completed in July 2015. However, maintenance of wells was not disturbed at all as the temporary bridge, installed in the construction works through this project, was in use for a little over half a year and the delay in construction had few negative impacts on the generation of project effects. Therefore, the delay in the construction of the permanent maintenance bridge is not regarded as a delay of the project period. Consequently, the period of this project is judged to have been within the plan (98% of the plan).

The outputs of this project were executed largely as planned except for minor changes, and the project cost was within the plan. Regarding the project period, while there was a delay in

<sup>11</sup> The detailed design period was between September 2010 and May 2011, and the tender and main work were executed from June 2011 till November 2014.

<sup>12</sup> As Mongolia's winters are extremely cold, outdoor construction works are not usually conducted.

some of the construction of the items borne by the Mongolian side, negative impacts on the generation of project effects were extremely limited. Therefore, it is not regarded as a project delay but rather as a project that was completed within the planned period.

Based on the above, the efficiency is judged to be high.

### 3.3 Effectiveness and Impacts<sup>13</sup> (Rating: ②)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects

At the time of planning of this project, the enhancement of water supply capacities (daily maximum water supply capacity) was expected as an operation indicator.

Table 7: Operation Indicator of This Project

	Baseline	Target	Actual			
	2009	2017	2014	2015	2016	2017
		3 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Water supply capacity (Daily maximum water supply volume) (ten thousand m <sup>3</sup> /day)	24.0	26.5	26.5	26.5	26.5	26.5

Source: Summary of ex-ante evaluation, information provided by the executing agency

Note: Indicating the water supply capacity for all areas of Ulaanbaatar City

The target value of the operation indicator can be said to have been achieved as an increase of 25,200m<sup>3</sup>/day in supply capacity has been realized<sup>14</sup> through the execution of this project. However, as described above, the actual daily maximum water supply volume (effect indicator) has been flat since this project was completed because of the rapid slowdown of economic growth in recent years, upward revisions of the water tariff, increases in the installations of water meters (apartment areas: 23% in 2009 -> 70% in 2017), decreases in non-revenue water (16% in 2009 -> 14% in 2017), and so forth. Therefore, the actual values of the daily maximum water supply volume in Ulaanbaatar City has been hovering at around a little over 150 thousand m<sup>3</sup>/day, as indicated in Table 8. As for the Gachuurt Water Source developed in this project, the pumped amount has been at around 9,000m<sup>3</sup>/day - 12,000m<sup>3</sup>/day on an annual average<sup>15</sup>.

<sup>13</sup> Sub-rating for Effectiveness is to be put with consideration of Impact.

<sup>14</sup> The pumping capacity of each well is 1,200m<sup>3</sup>/day. As 21 wells were constructed, the total has become 25,200m<sup>3</sup>/day.

<sup>15</sup> According to the executing agency, the actual water intake capacity of Gachuurt in March and April every year, when water levels are the lowest, is 5,000m<sup>3</sup>/day – 6,000m<sup>3</sup>/day.

Table 8: Actual Values of Daily Maximum Water Supply Volume (Effect Indicator)  
in Ulaanbaatar City

	2014	2015	2016	2017
Daily Maximum Water Supply Volume: Actual Value (ten thousand m <sup>3</sup> /day)	15.3	15.2	15.1	15.4

Source: Documents provided by the executing agency

Thus, the actual water supply volume has not increased in terms of per capita volume and entire volume because of external factors such as the delay in the progress of a plan to transform ger districts to apartment areas caused by a sudden slowdown in economic growth and operational factors such as upward revisions of the water tariff, increases in the installations of water meters, and decreases in non-revenue water. Moreover, although transmission mains were to be built and water was to be supplied to residents in the ger districts and apartment areas to the west of the North-East Reservoir, which was the end point of the transmission mains at the time of planning of this project, the project had yet to be completed at the time of ex-post evaluation<sup>16</sup>. Consequently, more years were expected to pass till the water from the Gachuurt Water Source would reach the 390,000 people, which was anticipated at the time of planning.

With regard to the projection of water supply volume, the executing agency is expecting in the strategic plan targeting 2016 – 2020 that the daily average water supply volume in Ulaanbaatar City, which was 144,000m<sup>3</sup>/day in 2017, will gradually increase to 148,800m<sup>3</sup>/day in 2018, 150,400m<sup>3</sup>/day in 2019, and 150,700m<sup>3</sup>/day in 2020. However, this is a very moderate increase, and if the demand expected at the time of planning had manifested, the daily average water supply volume would have been 225,000m<sup>3</sup>/day in 2015. The actual demand, being stagnant at around two-thirds the level, implies that the gap with the planned value will not be narrowed.

It was heard that the executing agency was instructed by the Ministry of Environment and Tourism to set the average proportion of water intake at a level of around 60-70% of the facilities' capacities to avoid both drops of water levels and negative effects on environment<sup>17</sup>, and based on the instructed level of capacity, water needs to be supplied at

<sup>16</sup> The name of the project is 'Ulaanbaatar Urban Services and Ger Areas Development Investment Program', being executed through the assistance of the Asian Development Bank and the European Investment Bank. The project to lay transmission mains was commenced in 2014, but a long time was required for its designing, and it is expected that there will be a significant delay without being completed in 2018 as initially planned because of the additional fact that it is a project requiring relocation of residents. Also, the executing agency was planning to expand the capacity of the North-East Reservoir from its current level of 6,000m<sup>3</sup> to 24,000m<sup>3</sup>, and its design had just been completed at the time of ex-post evaluation.

<sup>17</sup> The Ministry of Environment and Tourism conducted a survey from 2014 – 2015 to identify the amount of available water resources among the water sources of Ulaanbaatar City, and based on the result, set the level of water that can be used. The cause seemed to be a lack of a sufficient amount of water accumulated in the catchment areas of water sources due to urbanization of the city. In a notification letter issued by the ministry in December 2017, it was required that facilities at some water sources operate at 50% of the water intake capacities and all water sources of

an amount of between 159,000m<sup>3</sup>/day and 185,000m<sup>3</sup>/day on average. As the actual growth rate of water demand has been low, the actual amount of water supply at the time of planning has not exceeded the level projected at the time of planning. However, considering the situation in which the proportion of water intake has been restricted, only 10-20% of the reserve supply capacity is available. Therefore, because of the slowdown of demand caused by external factors, a small amount of reserve supply capacity is secured, even under the conditions of lower water intake levels by the notification from the Ministry of Environment and Tourism, making it possible to meet the demand until 2020 with the current supply capacities. However, in terms of meeting the increasing demand, approximately 40% to 50% reserve supply capacities as a whole would still be available in Ulaanbaatar City if no restrictions on the water intake rate were imposed by the Ministry of Environment and Tourism. Therefore, considering the background that the supply capacity was increased to meet the growing demand, the quantitative effects expected at the time of planning of this project cannot be said to have been achieved in the original sense though the operation indicator was achieved.

#### 3.3.1.2 Qualitative Effects (Other Effects)

At the time of planning of this project, it was expected as a qualitative effect that after project implementation, increases in the amount of water supplied to ger districts would eliminate water shortages at kiosks and enable a long-time water supply, leading to the reduction of waiting time of users.

According to the executing agency, reserve supply capacities of water became sufficiently secured through execution of this project, enabling a stable water supply to all parts of the areas targeted in this project. It is difficult from the viewpoint of operation and maintenance of facilities to keep supplying water at a level close to the maximum value of the water supply capacity, and it is necessary to have a certain amount of reserve supply capacity. Therefore, this project is considered to have been effective in terms of securing a stable water supply.

In the ex-post evaluation, an interview survey was conducted<sup>18</sup> in five khoros (i.e, administrative subdivisions of Ulaanbaatar City) among the ger districts in which the following comments were uniformly obtained; before the project, there were cases when water could not be delivered to residents who were at the back of the queues though they lined up for water trucks, particularly in the area where they were dependent on them;

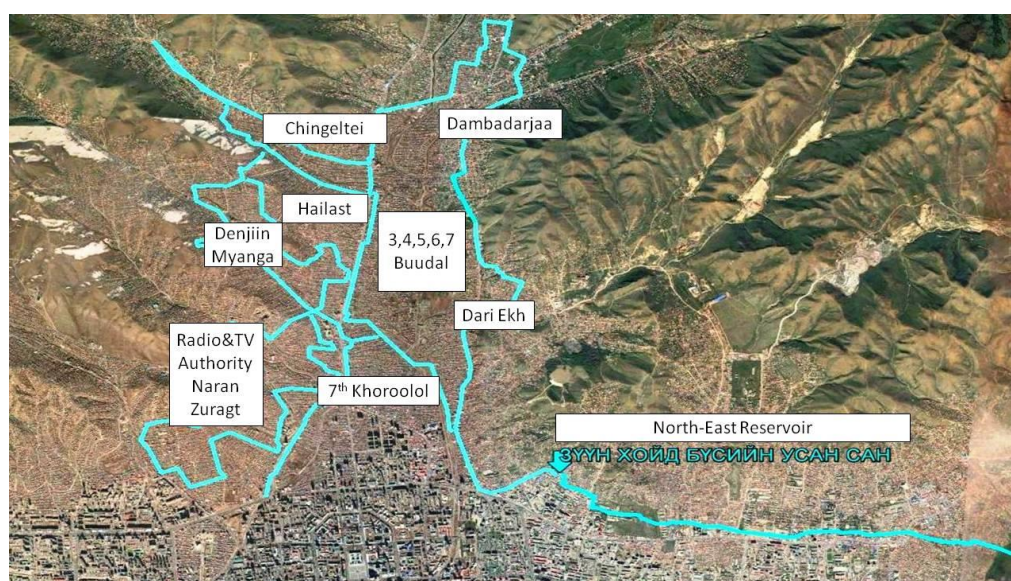
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Ulaanbaatar City as a whole operate at a 60-70% level. The Gachuurt water source is located within a protected area without any major development in the catchment area; therefore, it is not added to the restricted list of water sources.

<sup>18</sup> Five khoros along main streets (having better access) in the ger districts with large population sizes (Hailast, Dambadarjaa, Dari Ekh, Radio & TV Authority, Naran Zuragt) were visited. In Hailast, a district with an especially large population, two khoros were visited.

however, such situations all disappeared after project implementation, and waiting time was substantially reduced as a result of the areas being connected to distribution networks<sup>19</sup> (Figure 1). The Gachuurt Water Source, developed in this project, can be said to have contributed to a stable supply as it provides sufficient water to the North-East Reservoir which distributes water to these ger districts. Also, the survey revealed that each kiosk in the area always has sufficient water stored and there is no complaint as to any shortage of water lodged at the khoroots. However, there were some comments in the khoroots with ger districts expanding in recent years that as the number of kiosks was not sufficient in the expanded areas and distribution networks were not developed, some new residents were feeling inconvenienced.

Based on the above, sufficient water has been supplied to kiosks in such ger districts and this project can be said to have contributed to the elimination of users' waiting time. In addition, as described above, a 24-hour water supply through introducing the prepaid card system has been realized at some kiosks, leading to the improvement of convenience.



Source: Information provided by the executing agency

Figure 1: Transmission Mains and Distribution Pipes (light blue) Installed in the Target Areas of This Project

The Gachuurt Water Source was newly developed at a location with the highest elevation among the water sources of Ulaanbaatar. Water from the Gachuurt Water Source

<sup>19</sup> Together with the implementation of this project, in the area targeted in this project, distribution pipes were developed and the number of kiosks was increased through the assistance of the World Bank, whose construction was completed as scheduled by the completion of this project.



to the North-East Reservoir can be transmitted by the gravity flow without pumps, meaning a system to transmit water to the target areas of this project without energy force has been established. According to the executing agency, electricity costs have been saved, though it has not been captured quantitatively. It is planned that the capacity of the North-East Reservoir will be expanded from the current level of 6,000m<sup>3</sup> to 24,000m<sup>3</sup>, further stabilizing the water supply to ger districts through storing water from Gachuurt.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

The following impacts were expected upon implementing this project.

- (1)Improvements of the hygienic environment were expected through increases in the volume of water supply and improvements in the water quality.
- (2)Water-drawing work at kiosks was often the task of women. However, reducing the waiting time at kiosks and improving hygienic environments of women and children through increasing the amount of water used were expected through this project.
- (3)The main water supply areas of this project were those in ger districts where the people lived in poverty. This project is expected to be of benefit to approximately 390,000 residents in those ger districts and to contribute to the progress of poverty reduction.

Regarding the quality of water supplied to the target areas of this project, opinions were obtained from each khoroo that it was at a good enough level before this project and that good-quality water continued to be supplied even after execution of this project. In addition, water quality inspections conducted every few days by the executing agency confirmed that no particular water quality deterioration (exceeding the standard values) had occurred. It was also heard from several khoroos that each resident could receive a sufficient volume of water, which realized a more hygienic environment. Openings of a number of shower facilities for residents in ger districts, which were made possible through this project by a sufficient volume of water reaching the areas, are examples. Therefore, it is considered that there is an aspect that the hygienic environment of the target area has been improved through this project.



Shower facility in Ger area (exterior)



Shower facility in Ger area (interior)

It was not observed that water-drawing works became the job of all peoples, that is, males, females, and children, nor that only the burdens of water drawing by women and children were reduced after project implementation. Based on the interviews at khoroots and kiosks, merits of eliminating the waiting time were being enjoyed by all residents using kiosks. It was also heard that an increasing number of residents came to kiosks to draw water with their own cars in recent years, and it was often men driving the cars in such cases. For the households owning private cars, the amount of water that can be transported at one time has increased and it can be said that this has been made possible by realizing a sufficient supply of water.

While no cases were observed where new economic and social activities increased by reducing water-drawing burdens, comments were obtained in the interviews at khoroots and kiosks that the time that could be used for activities other than water drawing had increased in their daily life, implying that the project has generated certain impacts.

With regard to the expectation that 390,000 residents in the target ger districts of this project would benefit, the effects of this project were limited to a little over 180,000 ger residents receiving water directly from the North-East Reservoir at the time of ex-post evaluation because of the delay in the progress of a different project, as described above. It is presumed that the number of beneficiaries will increase significantly once the project is completed. As for the expectation that an expansion of water supply areas would contribute to the progress in poverty reduction, no particular information was obtained.

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

This project contained the construction of pumping wells and transmission facilities in

the protected area of the water source, and the large-scale pumping of groundwater exceeding a level of 20,000m<sup>3</sup>/day at a maximum was expected. It was thought that it could cause serious impacts to the environment and society, such as those concerning water use, ground subsidence, and so on. Therefore, a detailed environmental impact assessment was conducted. There were no procedural issues, as it was confirmed that project implementation was subsequently approved by the Ministry of Environment and Tourism in June 2010, prior to the commencement of this project.

According to the executing agency and the interviews in ger districts, no particular negative impacts on the natural environment occurred during or after the implementation of this project. It is considered that there were no particular issues as a whole since the Ministry of Environment and Tourism commented that no information had been filed regarding the occurrence of any environmentally negative impacts at that time.

The executing agency has always been monitoring groundwater levels. At the time of ex-post evaluation, it was confirmed that the amount of water taken in has been reduced<sup>20</sup> and has kept the water level above a certain level to avoid disruptions to pumping operations when drops in water levels occur (in March and April every year). It was expected at the time of planning that the operational speed would be adjusted so that drops in water levels exceeding two meters would not occur. In fact, there haven't been any occurrences in which the standard water level had dropped two meters or more<sup>21</sup>, and no ground subsidence caused by excessive water pumping has been seen.

Based on the above, it is considered that there were no problems, as no negative impacts on natural environment were seen throughout this project at any phase.

## (2) Resettlement and Land Acquisition

Along with the implementation of this project, it was thought that the transmission mains would mainly run through four residential properties affecting approximately 20 households. It was also possible that a temporary relocation of mobile houses and other similar constructions could occur, but in such cases, it was planned that the Mongolian side would provide the necessary compensations and that monitoring by the organizations concerned would be carried out.

These items were checked with the executing agency at the time of ex-post evaluation, which showed that fences and buildings of some households in the sections along the

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<sup>20</sup> According to the executing agency, annual averages are between 9,000m<sup>3</sup>/day and 12,000m<sup>3</sup>/day, and adjusted between 5,000m<sup>3</sup>/day and 6,000m<sup>3</sup>/day during the winter when water levels drop.

<sup>21</sup> There was a setting installed on the pumps of each well targeted in this project for which sensors would respond to the water levels if the levels went two meters lower than the standard value, then the pumps would automatically stop and sound the alarm. According to the executing agency, when a pump stops, staff switch the well to be used from the control house.

installation route of transmission mains in ger districts were temporarily relocated or removed. It was also confirmed that, when fences and other structures were on the installation route of transmission mains, individual contracts were signed between the USUG and the residents in the ger districts not to reinstall them after the mains were laid. The number of households affected was 82, and a total value of 781 million Tugrik (46 million yen)<sup>22</sup> was paid as compensation by order of the Ulaanbaatar mayor.

According to the executing agency and the interviews in ger districts, it was considered that there was no problem as a whole because no major complaints regarding land acquisitions, temporary relocation, or removal had been lodged by residents.

The operation indicator expected in this project was achieved and positive effects, such as the reduction of waiting time at kiosks in ger districts as well as a stable water supply, were confirmed. However, the amount of water supply in Ulaanbaatar City has not increased from the time of planning due to the reasons such as a sudden slowdown of economic growth, upward revisions of the water tariff, increases in the installations of water meters, and decreases in water leakages. This was the aspect seen for which this project cannot be said to have made full contributions. With regard to the impacts, improvements of the hygienic environment were achieved and there were neither negative impacts to the natural environment nor resident resettlements through the execution of this project. There were no issues in terms of the process of land acquisition.

In light of the above, this project has achieved its objectives to some extent. Therefore, the effectiveness and impacts of the project are fair.

### 3.4 Sustainability (Rating: ③)

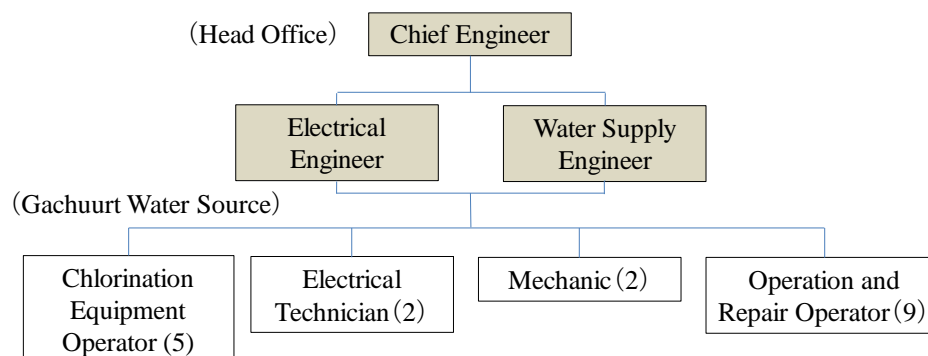
#### 3.4.1 Institutional Aspects of Operation and Maintenance

The water supply and sewerage services of Ulaanbaatar City are taken care of by the USUG which has a total of 1,810 staff members. Operation and maintenance of the facilities and equipment developed through this project are carried out by the section in charge of the Gachuurt Water Source, newly established under the Eastern Area Operations Group within the Division for Water Supply Operations (staff number: 237). In addition to 18 resident staff members including operators and workers at the water source, three members are responsible at the head office: a chief engineer, an electrical engineer, and a water supply engineer. Among the resident staff members, 12 members are split into three groups, each with four

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<sup>22</sup> Calculated based on the average rate (¥1 = approximately 16.98 Tugrik) between June 2013 and August 2014, when the compensations were actually paid out.

members, carrying out 24-hour operation and maintenance works. The breakdown of the staff is shown in Figure 2.



Source: Document provided by the executing agency

Note: Figures in brackets indicate the number of staff members

Figure 2: Operation and Maintenance Structure of the Gachuurt Water Source

The water quality control is carried out by the staff in charge of water quality analysis, dispatched from the USUG head office four days a week, through taking water from the reservoir and inspecting it. While periodic maintenance works on the facilities, including the purchase of spare parts, are conducted by the maintenance team in the Division for Water Supply Operations, there is a structure to carry out repair work in cooperation with the Emergency Control Division in cases of occurrences of serious damages. This organizational structure has remained unchanged in recent years and it seemed to be a sufficient structure for operation and maintenance of the facilities developed through this project.

The operational data and water quality information of the Gachuurt Water Source is recorded every day and reported to the head office by phone at the time of ex-post evaluation. However, through the assistance of the Asian Development Bank, the USUG is establishing a centrally controlled system using optic fiber networks, and it is expected that the data of the Gachuurt Water Source will be captured remotely by the head office of the USUG by the end of 2018<sup>23</sup>. With this system, the number of staff residents at the water source is planned to decrease.

### 3.4.2 Technical Aspects of Operation and Maintenance

After the completion of this project, a drop of water levels far lower than ever recorded before that time occurred during the winter of the first year of operation, which led to

<sup>23</sup> Fiber optic cables were installed at the time of ex-post evaluation and the operation was planned to commence in November 2018.

automatic stoppages of well pumps caused by excessive pumping and freezing of pumping pipes (two locations). Therefore, JICA's Follow-up Cooperation offering instruction on pump and valve operations was executed between November 2015 and February 2016. As a result, occurrences of automatic stopping of pumps eventually ceased, and stable, continuous operations of pumps were realized through the capacity development gained through instruction on operations. At the time of ex-post evaluation, continuous operations of pumps were secured after several years of operating experiences, and no technical issues were observed. It was heard that the operation manual for each piece of equipment was stored by the chief engineer and was referred to when there were problems.

With regard to training for the staff in charge of operation and maintenance, the training division of the USUG annually conducts special training sessions for electrical technicians, mechanics, and chlorination operators as well as training sessions for new staff members. The original staff members at the Gachuurt Water Source have remained since the commencement of operations. While it cannot be assumed that all staff members are transferred to new posts at the same time, it is considered important to sequentially provide training at the head office and in the field as new staff members are assigned.

### 3.4.3 Financial Aspects of Operation and Maintenance

The financial situation of the USUG in recent years is shown in Table 9. While operating revenues have gradually been increasing, partly with the rising water tariff every year, the operating expenditures have also been increasing, resulting in the continuously negative operating balance.

Table 9: Operating Balance of USUG

(Unit: million Tugrik)

Item	2014	2015	2016	2017
<b>Operating revenues</b>	<b>36,661</b>	<b>45,137</b>	<b>44,752</b>	<b>49,429</b>
Water supply	20,088	25,126	24,349	27,096
Sewerage	12,282	16,282	17,021	19,100
Other revenue	4,241	3,728	3,382	3,232
<b>Operating expenditures</b>	<b>41,989</b>	<b>48,791</b>	<b>54,671</b>	<b>58,994</b>
Personnel expenses (salary, social security, training, etc.)	15,403	18,308	19,541	22,422
Materials (chlorine, gasoline, spare parts, etc.)	4,579	4,431	3,962	3,329
Operation cost (electricity, transportation, etc.)	7,766	9,546	10,718	10,692
Maintenance (facility, equipment, etc.)	801	948	1,159	1,353
Office-related cost	290	293	324	451
Consumables (work clothes, gloves, work shoes, washing detergent, etc.)	245	261	833	434
Inspection of water quality, etc. (chemical reagent, etc.)	98	70	91	107
Other (including taxes)	4,120	4,243	4,334	5,012
Depreciation	8,688	10,690	13,709	15,193
<b>Operating balance</b>	<b>-5,328</b>	<b>-3,654</b>	<b>-9,919</b>	<b>-9,565</b>

Source: Information provided by the executing agency

The USUG has not received subsidies from Ulaanbaatar City and is required to operate businesses under a financially independent system. Conversely, the USUG does not have the independent authority to decide the water tariff, as it is decided by the national government (the Urban Water Supply and Sewerage Coordinating Committee under the prime minister). However, upward revisions of the water tariff by approximately 10% per annum have been made since 2014, and price increases of around 20% per annum are planned toward 2020 under the USUG's strategic plan. As the water tariffs have been raised and water revenues have subsequently increased in this way, operating revenues have been consistently increasing. However, the operating expenditure has also been increasing and a trend of negative balances has continued. A significant factor is the water supply by water trucks in ger districts costing 12 Tugrik per liter while the revenue from water supply is one Tugrik. Moreover, a flat rate system is set for households without installations of water meters.

Nevertheless, while the operating balances are negative, the large amount of depreciation is the most significant factor. Since much of the depreciation is from the facilities and equipment through aid projects and from the budget of Ulaanbaatar City, there are no influences on the actual financing. While it is presumed impossible to achieve growth under

a structure heavily dependent on external assistance for capital investment unless it becomes profitable including depreciation, it is highly prospective that under circumstances where neither independent authority to decide the water tariff nor subsidies are provided, capital investments in the water sector covered through donor assistance and spending by Ulaanbaatar City be made. Therefore, it is possible to regard the actual financial problems as minor.

As indicated in the expenditure item, the USUG has appropriated maintenance costs annually for the entire organization, a portion of which is allocated to the Gachuurt Water Source. The amounts of expenditures by the Gachuurt Water Source in recent years are shown in Table 10.

Table 10: Expenditures of the Gachuurt Water Source

(Unit: thousand Tugrik)

	2016	2017
Salary	91,908	378,788
Medical allowance	644	195
Social security	29,553	31,918
Food	9,586	13,476
Chlorine	18,266	15,128
Spare parts	10,588	5,423
Cleaning materials	614	483
Gasoline	8,906	10,377
Electricity	301,076	279,345
Equipment maintenance	4,140	70
Maintenance of facilities, etc.	7,403	1,910
Work clothes	1,420	2,135
Gloves	324	142
Work shoes	1,123	700
Milk	933	962
Washing detergent	124	68
Tax	667	0
Other	1,782	275
Total	489,057	732,394

Source: Document provided by the executing agency

While it was heard that the total amount of annual expenditures by the Gachuurt Water Source fluctuates year by year because of account processing, maintenance of the facilities and equipment developed through this project did not pile up because of any budget shortage. Therefore, it is considered that there are no issues in terms of financial aspects of operation and maintenance.



#### 3.4.4 Current Status of Operation and Maintenance

As described above, water levels dropped substantially during the first year of operation after this project was completed, which led to the occurrences of automatic stoppages of pumps caused by excessive pumping as well as freezing of pumps. However, partly because of the effects of implementing the Follow-up Cooperation, no problems were observed at the time of ex-post evaluation. According to the executing agency, the pumps have never stopped automatically after the adjustment valves were installed through the cooperation effort, and it is thought to have been effective as an additional cooperation effort for the sustainability of the project effects. Additionally, operational status of other well pumping facilities, chlorination equipment, transmission mains and ancillary facilities, and collection and conveyance pipes as well as their ancillary equipment was checked, revealing that all of them were adequately operated and maintained<sup>24</sup>.

It was also confirmed that each facility and equipment developed through this project was inspected, recorded, and reported every day by resident staff members in accordance with the maintenance schedule.

There were no issues in terms of institutional, technical, or financial aspects of operation and maintenance or in terms of the maintenance condition, and it can be judged that sufficient operation and maintenance were carried out. Therefore, the sustainability of the project effects generated through this project is high.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

In this project, a new water source was developed, and water transmission mains were laid in Gachuurt, an eastern suburb of Ulaanbaatar City, to improve the situation of water supply for residents in the ger districts in Ulaanbaatar City. The relevance of this project is high as it was consistent with the development plans and development needs of Mongolia and Ulaanbaatar City at the time of both planning and ex-post evaluation in terms of a stable and sufficient supply of water, and it was also consistent with Japan's ODA policy at the time of planning to support the development of infrastructure for promoting economic activities. As for implementation of the project, the project outputs were largely as planned, and the project costs and periods were within the plan. Therefore, the efficiency is high. With regard to project effects, in addition to the achievement of operation indicators, a stable water supply and the elimination of users' waiting time at kiosks were confirmed. However, the water supply volume did not

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<sup>24</sup> Although a total of nine pumps had failures after 2016, an agreement on their repair was reached with the supplying company, and there were no issues seen at the time of ex-post evaluation.

increase as expected because of an economic growth lower than expected at the time of planning and because of water saving measures imposed by the executing agency, showing an aspect of this project that did not necessarily contribute in a sufficient manner. Regarding the impact, a reduction in the burden of water-drawing and improvements in the hygienic environment were observed, and there were no issues in terms of negative impacts to the natural environment or resettlement and land acquisition. Therefore, the effectiveness and impact of this project are fair. With respect to operation and maintenance, there were no major problems in terms of all institutional, technical, financial aspects or the operation and maintenance status. Therefore, sustainability is judged to be high.

In light of the above, this project is evaluated to be highly satisfactory.

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

Through the implementation of this project, a stable water supply to ger districts has been realized and water use by residents became significantly more convenient. In addition to the elimination of water shortages through this project, the executing agency has been independently progressing water supply service through the use of the prepaid-card system, enabling the residents in ger districts to draw water at kiosks at any time. However, as the locations introduced are still limited to some areas, it is desirable to introduce more of them to realize a 24-hour water supply in a larger number of areas so that the living environment of residents will improve further.

Moreover, as the transmission mains leading to the North-East Reservoir were constructed through this project and the distribution networks to the surrounding ger districts were developed through the World Bank project, sufficient water now reaches the ger districts around the reservoir. However, distribution of water to the areas farther west, where it was planned to supply water from the Gachuurt Water Source, has not been sufficiently realized because of the delay in the progress of another project on the development of transmission and distribution networks. It is important to implement the project activities steadily to supply sufficient water to a larger number of residents.

### 4.2.2 Recommendations to JICA

None.

## 4.3 Lessons Learned

### Execution of Operation Instruction Together with the Development of Facilities and Equipment

In this project, a significant drop in groundwater levels to which the executing agency could

not fully respond occurred unexpectedly during the winter of the first year after commencing operations of facilities and equipment. In this project, additional valves were installed to the wells, followed by instruction on the operation of the facilities as an additional provision of the Follow-up Cooperation, subsequently leading to stable operations. However, as the temperature falls below minus 40 degrees Celsius in Mongolia's winter, it is considered desirable in a project under such harsh climate conditions to plan sufficient measures in preparation for unforeseen circumstances, such as sufficient comprehension of operation and maintenance capacities of the executing agency followed by supplemental instruction on operations to ensure stable operations of facilities and equipment in addition to the development of new facilities.

(End)