

**REPUBLIC OF IRAQ  
MINISTRY OF MUNICIPALITY AND TOURISM  
IN KURDISTAN REGION**

**ASSISTANCE  
FOR PROJECT IMPLEMENTATION  
OF  
WATER SUPPLY IMPROVEMENT PROJECTS  
IN KURDISTAN REGION**

**Final Report  
(Summary)**

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# MAP OF IRAQ





## ABBREVIATIONS

BOEK	:	Board of Environment in the Kurdistan Region
C/S	:	Consulting Services
D/D	:	Detailed Design
DWD	:	Directorate of Water in Duhok
DWE	:	Directorate of Water in Erbil
DWH	:	Directorate of Water in Halabja
DWS	:	Directorate of Water in Sulaimaniya
EA	:	Executing Agency
EIA	:	Environmental Impact Assessment
EL	:	Elevation
E/N	:	Exchange of Notes
F/S	:	Feasibility Study
GAO	:	United States Government Accountability Office
GDWS	:	General Directorate of Water and Sewage
GOI	:	Government of the Republic of Iraq
GOJ	:	Government of Japan
HDPE	:	High-Density Polyethylene
IDP	:	Internally Displaced Persons
ISIL	:	Islamic State in Iraq and the Levant
JBIC	:	Japan Bank for International Cooperation
JICA	:	Japan International Cooperation Agency
JPY	:	Japanese Yen
KRG	:	Kurdistan Regional Government
L/A	:	Loan Agreement
l/c/d	:	liters per capita per day
ISRB	:	Iraqi Strategic Review Board
NDS	:	National Development Strategy
O&M	:	Operation and Maintenance
ODA	:	Official Development Assistance
PMT	:	Project Management Team
MOEK	:	Ministry of Environment in the Kurdistan Region
MOMT	:	Ministry of Municipality and Tourism in Kurdistan Region
MOP	:	Ministry of Planning in Kurdistan Region
MOPDC	:	Ministry of Planning and Development Cooperation

SAPROF	:	Special Assistance for Project Formation
TOR	:	Terms of Reference
UNICEF	:	United Nations Children’s Fund
UN-SCR	:	United Nations Security Council Resolution
USAID	:	United States Agency for International Development
USD	:	United States Dollar
WHO	:	World Health Organization
WTP	:	Water Treatment Plant



# I. WATER SECTOR IN IRAQ

## I.1 Water Sector Situation and Policy in Iraq

1. In 1980s, water supply facilities in Iraq almost operated efficiently and utilized then-current technology. According to the Iraq's National Development Strategy (NDS) for the years 2005-2007 (so-called "the 1st NDS")<sup>1</sup>, announced in June 2005 by the Iraqi Transitional Government at the time, prior to the 1991 Gulf War, safe drinking water was accessible to over 95% of urban and 75% of rural inhabitants. The average water supply was about 330 liters per capita per day (l/c/d) in Baghdad, the capital of Iraq, 250-300l/c/d in other cities and towns, and 180l/c/d in rural areas. But due to wars or economic sanctions during 1990s, after the result of insufficient expansion or improvement of the facilities or inappropriate operation and maintenance (O&M) and rapid population increase more than 2% annually, the said urban water service coverage declined to 92% and the rural coverage dropped to 46%. With regard to the water supply, it dropped to 150l/c/d in Baghdad, 110l/c/d in other cities and towns, and 65l/c/d in rural areas.
2. Water supply services in Iraq deteriorated from bad to worse after the 2003 Iraq War. According to the 2003 United Nations/World Bank Joint Iraq Needs Assessment (October 2003)<sup>2</sup>, production levels of water supply facilities had fallen to about 60% in 2003. The United States Government Accountability Office (GAO) described in its Report to Congressional Committees (GAO-05-872), dated September 2005<sup>3</sup>, that the United States Agency for International Development (USAID) reported that, as of 2003, Iraq's 140 major water treatment facilities were operating at about 35% of their design capacity.
3. As to the water treatment plants, most of them started its operation between 1950 and 1985, and some partially rehabilitation and modification were also implemented. While, assuming proper maintenance, the anticipated lifetime of these plants is estimated at 15 to 25 years, those had been shortened by lack of preventive maintenance and improper operation, as a result, the water supply restriction for just a few hours per day usually been in the whole area of Iraq. Therefore, many of the plants and water networks need emergency rehabilitation of the structure, equipment and plants themselves.
4. Regarding the quality of the drinking water, serious problems have been occurred. Actually, there are vital damage in the water networks, resulting in contaminated water supply at the consumer end. This was exacerbated by the collapse of the sewage network, increasing cross contamination of the water supply, and the collapse of the sewage treatment plants, increasing dramatically the amount of raw sewage being discharged directly into the water source. United Nations Children's Fund (UNICEF) estimated a rise of 160% over in the mortality rate of under-five year old children in Iraq and diarrhea became one of leading causes of death among those under-five year old children<sup>4</sup>.

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<sup>1</sup> ISRB and MOPDC, 2005, [pdf] *National Development Strategy 2005-2007*. Available at: <[http://siteresources.worldbank.org/IRFFI/Resources/Iraq-NDS-July14-FINALFINAL\[1\].pdf](http://siteresources.worldbank.org/IRFFI/Resources/Iraq-NDS-July14-FINALFINAL[1].pdf)> [Accessed 25 May 2018]

<sup>2</sup> United Nations Development Group and World Bank Group, 2003, [pdf] *United Nations/World Bank Joint Iraq Needs Assessment*. Available at: <<http://siteresources.worldbank.org/IRFFI/Resources/Joint+Needs+Assessment.pdf>> [Accessed 25 May 2018]

<sup>3</sup> GAO, 2005, [pdf] *Rebuilding Iraq: U.S. Water and Sanitation Efforts Need Improved Measures for Assessing Impact and Sustained Resources for Maintaining Facilities*, GAO-05-872. Available at: <<https://www.gao.gov/assets/250/247663.pdf>> [Accessed 25 May 2018]

<sup>4</sup> UNICEF, 2002, *National Context: Development in Iraq*. Available at: <<http://www.casi.org.uk/info/unicef/sit0202/context.html>> [Accessed 25 May 2018]

5. As to the tariff, the water rate in Iraq has been suppressed to extremely low by considering the level of general household income. Installation of meters has been slow as a turtle and the fixed amount collection method has been occupied the main current in Iraq. Those undoubtedly contribute to water wastage in large quantities. And, the water rate collection has been done by delivering the bills by collectors every a few months, and they collect water rate directly from the customers. This way is not efficiently. Some reports show the actual collection results are comparable to about 60% of the total O&M costs, and it leads the sustainable water service management to more difficult situation.
6. The Government of Iraq (GOI) has recognized in the “National Development Strategy 2007-2010” (so-called “the 3rd NDS”), dated February 2007, the urgent need and importance agenda of improving access to water and sanitation, continued from the 2nd NDS. Providing safe potable water is listed as key objective for achieving this national development purpose.

## **I.2 Water Supply Problem in Kurdistan Region**

7. The Kurdistan Region is consisted of 4 northern governorates, namely Halabja, Sulaimaniya, Erbil and Duhok. In the summer 2007, cholera ran rampant over the Kurdistan Region, and the deterioration of water pipes and flowing out from plenty of the open sewage channels and old sewage pipes to the distribution pipelines inside the cities were found to be the causes. In addition to the initial mission of administrative services for supplying safe water to the people, in the light of the said situation largely caused by aging or insufficient water supply facilities, replacement of distribution network is currently set to the one of top priorities for the Kurdistan Regional Government (KRG).
8. As of 2013, in the Kurdistan Region, 95% of urban and 62% of rural households accessed drinking water through the water distribution network. In fact, 70% of inhabitants of the Region gets their drinking water through piped water distribution network directly into their homes. However, access to clean drinking water remains a key challenge for the Kurdistan Region, especially for rural areas. Only 25% of urban and 18% of rural inhabitants can access the water distribution network for more than 10 hours each day<sup>5</sup>.
9. Especially in the Sulaimaniya, residents of some areas are able to access the general water distribution network only 2 hours per 3 days. In Halabja, there are some areas, one of which is Hasanawa district, where residents are not connected to water networks and are served only by water trucks. And even in Erbil, the capital of KRG, the water distribution network needs an improvement since quite a few distribution networks are very old, which were installed more than 100 years ago. The estimated water leakage ratio is more than 50%<sup>6</sup>.

## **I.3 Water Supply Sector Policy in Kurdistan Region**

10. The KRG has a vision to correct and improve the current situation necessary for providing water security to the residents and businesses in the Region. As for the development plan for water and sewerage sector in Kurdistan Region, “Kurdistan Region of Iraq 2020: A vision for the Future” was released in September 2013. The vision says the development of water supply sector to improve water access will entail the following five elements:

<sup>5</sup> MOP, 2013, [pdf] *Kurdistan Region of Iraq 2020: A vision for the Future*. Available at: <[http://www.ekrg.org/files/pdf/KRG\\_2020\\_last\\_english.pdf](http://www.ekrg.org/files/pdf/KRG_2020_last_english.pdf)> [Accessed 25 May 2018]

<sup>6</sup> Institute of Regional and International Studies, The American University of Iraq, 2017, [pdf] *Water Resources Management in the Kurdistan Region of Iraq*. Available at: <[http://auis.edu.krd/iris/sites/default/files/Water%20Policy%20Report%20IRIS\\_FINAL%20ES.pdf](http://auis.edu.krd/iris/sites/default/files/Water%20Policy%20Report%20IRIS_FINAL%20ES.pdf)> [Accessed 25 May 2018]

- a) estimating the amount of water leakage in the existing water transportation infrastructure and supporting investments to eliminate it;
- b) investing in water storage facilities to address seasonal fluctuations;
- c) upgrading water treatment infrastructure to international standards;
- d) expanding opportunities for private participation in water provision; and
- e) reforming the water tariff system to reduce waste and provide for cost recovery.

#### **I.4 Japan’s Contribution in Iraq and Water Supply Project in Kurdistan Region**

11. Responding to significant reconstruction needs in Iraq, the Government of Japan (GOJ) committed to GOI amounting United States Dollar (USD) 5 billion assistance package, including USD 3.5 billion in the form of Japanese Official Development Assistance (ODA) Loan, at the Madrid Conference on Reconstruction of Iraq in October 2003. More than the said official commitment at the Madrid Conference, as of January 2018, 26 Japanese ODA loan projects totaling USD 6.1 billion were committed. Japan International Cooperation Agency (JICA) has its operational focus on active involvement for post conflict countries in its “Basic Strategy of Japan’s ODA Loan: Medium-Term Strategy for Overseas Economic Cooperation Operations” dated April 2005 (the then Japan Bank for International Cooperation). Japan’s ODA policy to Iraq states smooth transition from post-conflict reconstruction to self-sustainable development.
12. Among those Japanese ODA loan assistance for Iraq, JICA concluded the Loan Agreement (L/A) for “Water Supply Improvement Project in Kurdistan” of up to Japanese yen (JPY) 34,266 million on 17 March 2009 (hereinafter referred to as the “Project” or “IQ-P11” as L/A number) in order to address the prioritized needs in the Kurdistan Region. The objective of the Project is to improve quantity and quality of water supply situation in Halabja area, Sulaimaniya area, Erbil area and Duhok area through improvement of water supply facilities, such as water treatment plant, water transmission facility, distribution network, etc.
13. The Executing Agency (EA) of the Project is Ministry of Municipality and Tourism in Kurdistan Region (MOMT) which is an administrative services body in charge of water supply and sewerage systems, waste treatment, city planning and so forth in the Kurdistan Region. Under MOMT, Directorate of Water in Halabja (DWH), Directorate of Water in Sulaimaniya (Center of Sulaimaniya) (DWS), Directorate of Water in Erbil (DWE) and Directorate of Water in Duhok (DWD) shoulder responsibilities for executing the Project as well as O&M of the existing water supply facilities in each governorate, respectively.
14. IQ-P11 was implemented to support social and economic development needs in the region, however, due to the shortage of funds, some of project components still need to be completed. The original scope of work of IQ-P11 and changes from the original scope during the Project are shown in the table below:

Table 1: Original scope of work and changes of the Project

<b>Governorate</b>	<b>Original Scope of Work</b>	<b>Changes</b>
Halabja	Construction of intake station	<ul style="list-style-type: none"> <li>- Implemented with the reduction of some parts of original scope of work</li> <li>- Replacement work for the existing transmission/distribution network was added</li> </ul>
	Construction of transmission/drainage facilities	
	Construction of water treatment facilities	
Sulaimaniya	Replacement of distribution network	<ul style="list-style-type: none"> <li>- Implemented with the reduction of some parts of original scope of work</li> <li>- Replacement work for the existing transmission/distribution network was added</li> </ul>
Erbil	Expansion of water treatment plant	<ul style="list-style-type: none"> <li>- Implemented with the reduction of some parts of original scope of work</li> <li>- Replacement work for the existing transmission/distribution network was added</li> </ul>
	Construction of transmission/distribution facilities	
Duhok	Replacement of distribution network	<ul style="list-style-type: none"> <li>- Implemented with the reduction of some parts of original scope of work</li> </ul>
Consulting Services		-

Source: JICA

## **II. ASSISTANCE FOR PROJECT IMPLEMENTATION**

### **II.1 Need for Project Implementation Assistance**

15. To cope with uncompleted components of the Project, JICA decided to provide its project implementation assistance for IQ-P11 and assign the team of experts from OPMAC Corporation (OPMAC) to carry out such project implementation assistance (hereinafter referred to as the “Survey”). The contract was signed between JICA and OPMAC on 21 August 2017. OPMAC assigned two Japanese ODA loan experts (hereinafter referred to as the “Survey Team”) in compliance with the contract.

### **II.2 Field Survey in Kurdistan Region and the Purpose of This Report**

16. On the request of JICA, OPMAC dispatched the two experts to Erbil, Kurdistan Region, in January 2018. The experts met with the officials of the EA of IP-Q11 from 14 to 18 January 2018 and conducted the meetings.
17. The main purpose of this Survey and description of this report is to scrutinize the facts and reasons behind changes of scope of work shown in Table 1 above and then to search possible solution for coping with the uncompleted components of the Project. Hereinafter, unless otherwise specifically noted, the following descriptions are based on information obtained through the field Survey and domestic research including electronic communications with JICA and EA.

### **III. INFORMATION AND FINDINGS THROUGH FIELD SURVEY AND RESEARCH**

#### **III.1 The Current Situation and Achievement of the Project**

18. Before JICA's commencement of formulation of the Project, pre-Feasibility Studies for water supply system in Kurdistan region prepared by the local consultants were approved by MOMT in August 2004 in the first place, and then, Mini Master Plans of safe drinking water supply for Governorate of Erbil and Sulaimaniya were made by a joint venture company of CH2M HILL/PARSONS in April 2006. Subsequently, JICA's Special Assistance for Project Formation (SAPROF) was provided in order to choose an appropriate project scope for the preparation of Japanese ODA loan project formulation.
19. The L/A for the Project was signed in March 2009. The Project is composed of "Halabja Water Supply Improvement Project", "Sulaimaniya Distribution Network Reinforcement", "Erbil Water Supply Improvement Project" and "Duhok Distribution Network Reinforcement". The current situation of those are as follows:
  - a) Halabja Water Supply Improvement Project
    - (i) As a part of the Project, a large water supply system including a water treatment plant (50,000 m<sup>3</sup>/d) to purify Sirwan River water was needed to construct in order to meet the water demand in 2020. Based on the result of Detailed Design (D/D) conducted by the loan consultant employed under IQ-P11, MOMT once decided to increase the length of distribution networks, but had to decrease the length of networks due to the fund shortage of IP-P11.
    - (ii) Finally, MOMT concluded the scope of the total length of 211.8 km as the final scope. As of October 2017, 206 km has been constructed and MOMT plans to implement the construction of 4.5 km distribution networks if they can obtain the source of finance.
  - b) Sulaimaniya Distribution Network Reinforcement
    - (i) In the center of Sulaimaniya City, which consists of 7 quarters, namely Ibrahim Pasha, Sabunkaran, Dargazen, Iskan, Sarchnar, Qliasan and Kaneskan, in January 2018, its served population is about 800,000 (86% of the total population). The drinking water supply, however, is limited only 3 hour/3days and the water leakage ratio is estimated about 30%.
    - (ii) According to SSWD, it is planned that the production capacity may be increased by constructing new WTPs in order to meet the future demand in 2035. However, the replacement of water supply network will not be included in the scopes of those new WTPs construction project although some of the pipes had not been replaced for more than 90 years, and this caused the permeation of sewage water to the drinking water pipes. Therefore, the existing distribution network pipelines, totally 382 km were planned to be replaced by the Project in order to improve the water distribution and its quality to the target area.
    - (iii) After the completion of D/D, MOMT once changed the original plan of length of replacement and construction of distribution networks from 382 km to 299 km, but, subsequently, the scope was again reduced to 221 km due to the shortage of fund from the Project. While the networks of 221 km were fully installed, in addition to that, MOMT plans to implement the construction of 17 km transmission lines, if they can obtain the source of finance, in order to supply more population and increase the average water supply hours per day.

- c) Erbil Water Supply Improvement Project
- (i) In 2006, the operation of No.3 treatment plant in Erbil city had started only with 60% of designed capacity. Therefore, the extension of No.3 treatment plant (96,000 m<sup>3</sup>/d) to fulfill the rest of designed capacity was needed in order to meet the demand for the target year of operation and effect indicators (2020) under IQ-P11. After the completion of this extension construction work, water treatment plant is currently operating with 96,000m<sup>3</sup>/d (full capacity).
  - (ii) As to water transmission and distribution networks, the replacement of old distribution networks in the central part of Erbil city is planned to contribute to non-revenue water (NRW) reduction. Also, based on the zoning of the served area, which was studied by SAPROF team, the new areas for installation of distribution networks have been selected as Zone-I and Zone-III mid in addition to Zone-II, where the population is recently growing rapidly. It is estimated that the total population of Erbil city will reached to about 2 million in 2020 and installation of new distribution piped network is urgently needed.
  - (iii) After the occurrence of fund shortage of the Project, MOMT cut the length of water distribution network to 173 km from original design (198 km). As of October 2017, 128 km has been installed and MOMT plans to implement the construction of remaining 24.9 km distribution networks if they can obtain the new source of finance.
- d) Duhok Distribution Network Reinforcement
- (i) In the center of Duhok City, which consists of 6 quarters, namely Baroshki, Kani Hamadki, Sheva Shorki, Nohadra, Jamea Khari and Seak, as of January 2018, its served population is approximately 78,000 (60% of the total population). The drinking water supply is limited only 4 hours/day and the water leakage ratio is estimated about 80%. According to DWD, the production capacity increased by constructing new WTPs in order to meet the future demand in 2025. But the scope of replacement of network was not included under the WTPs construction project, although some of the pipes have not been replaced for more than 60 years and it caused the permeation of sewage water to the drinking water pipes. Therefore, the existing distribution network pipelines, totally 194 km was planned to be replaced by IQ-P11.
  - (ii) After the completion of D/D, MOMT added Domez area to the scope of the Project because of its rapid population growth. The total length of replacement and construction of distribution networks was designed to 271 km. However, the scope was cut to 243 km due to the shortage of fund under IQ-P11. Considering the priority, MOMT stated that they had no plan for installation of the remaining 28 km will not be included in the scope even if they can obtain the source of finance.

### **III.2 Factors behind Shortage of Fund under the Project**

20. EA explained that, after the signing of L/A, MOMT once decided to extend the total length of replacement of distribution networks and house connections based on the result of D/D conducted in 2011. MOMT expressed that the decision was made after considerations of about the necessity of expansion of the scope of the Project on the basis of discussions about the deterioration of distribution networks and the expansion of residential areas. At that time JICA made a concurrence on their decision of scope change. In those days, it was planned that this upward revision of the total project cost could be stayed within the L/A amount because of relatively long time period of continuation of the appreciation of JPY to USD exchange rate. (USD 1 = JPY 85.81 in January 2013 whereas the rate was USD 1 = JPY 111.00 at the time of appraisal for the Project).

21. After the physical works started, however, the highly unpredictable events, such as Islamic State in Iraq and the Levant (ISIL)'s disruption in the Middle East regions, strong negative effects of the yen's sharp depreciation (USD 1 = JPY 120.64 in May 2015), etc., were occurred in rapid succession. Those events, which were beyond contractual management, derailed the programs under the said decision of scope change and caused a serious delay in the implementation of the Project. The former, for example, invited the significant slippage in schedules of delivery and construction and the latter brought the chaos of execution of financial plan. As a result, some components of the Project could not be completed within the L/A amount and period.
22. In response to this situation, MOMT decided to deduct the said revised scope, including readjustments of total length of distribution networks and the number of house connections, in order to reduce the total project cost. Although KRG also tried to allocate its own budget, at the same time, KRG was obliged to prioritize a budget for combatting with ISIL and financial support for Internally Displaced Persons (IDPs). To make things worse, since it happened during the period of significant drop of oil price, the main revenue source of GOI had shrunk dramatically in 2014. Moreover, controversy on the trading of oil between KRG and the Federal Government invited the situation in which the temporarily suspension of transfer of national budget to KRG from the Federal Government. As the result, KRG was not able to cover the revised cost of the Project by itself.
23. The following descriptions are summed up information from the hearings with the officials of Directorate of Water apiece concerning how the fund shortage of the Project made the impact on project in each governorate.
  - a) Halabja
    - (i) A city master plan of Halabja was being developed when SAPROF for the Project was conducted in 2008. Therefore, the scope of distribution network was developed based on the preliminary city master plan in consultation with the Municipality of Halabja.
    - (ii) At the D/D stage in 2011, the city master plan was developed and implemented. The discrepancy existed between the planned distribution networks at the time of appraisal of the Project and the actual requirements of the total length of distribution networks to be developed. Moreover, because, the residential area in Halabja was further expanded from 2007 to 2011 than it had been expected, the total length of distribution networks to be constructed and its associated cost increased by 339 km (USD 42 million) from 256 km (USD 34 million).
    - (iii) Due to the shortage of fund, the scope and its cost was required to decrease by 90 km (USD 17 million), and, consequently, Hasanawa, Shaheedan, Bawakochic, Bamak, Zone1-1, were excluded from the scope. Since, however, Hasanawa is the most populated area and the total amount of water demand is higher than other area, the construction of Hasanawa distribution networks is urgently needed.
  - b) Sulaimaniya
    - (i) The original scope of construction of distribution networks in Sulaimaniya was 382 km as a result of the appraisal for the Project. However, during the D/D stage, General Directorate for Water and Sewerage (GDWS) of MOMT's headquarters implemented installation of distribution networks partially with its own budget, and 141 km of total length was reduced from the scope covered by IQ-P11.
    - (ii) On the other hand, GDWS identified that some areas need more water pressure, therefore GDWS decided to increase the diameter of distribution pipes to be installed, which resulted in the increase of the cost by USD 18 million.



- (iii) When the fund shortage happened due to the Japanese yen depreciation in 2015, 17 km of transmission line was excluded and the cost decreased by USD 8 million. Considering the urgency to improve the water supply hours from 2 hours per 3 days to 2 hours per 2 days, this transmission line should be constructed by the new financial assistance.
- c) Erbil
- (i) The construction cost of WTP increased by USD 13 million from its original estimation as a result of D/D conducted by the loan consultant. Therefore, it was necessary to review the total length of rehabilitation of distribution networks of 253 km for three Zones (Zone I, II and III), and it was decided to reduce 55 km by excluding both Zone II and Zone III in response to the budget constraints.
  - (ii) The Zone I was selected considering the high deterioration level of pipes due to their aging. Due to further shortage of funds in 2015 caused by Japanese yen depreciation, even within Zone I, its central area was excluded since its construction had not started at the time of shortage of funds. Finally, more 70 km length of distribution network was reduced in Zone I. However, this reduced area located in Zone I includes very old pipes (more than 100 years old) and its leakage ratio is estimated to be 60%. Therefore, replacement of some pipes in this area is urgently needed.
- d) Duhok
- (i) MOMT and JICA agreed that the implementation of replacement of distribution network should only be done for Baroshki area.
  - (ii) After Duhok city plan was developed in 2011, MOMT added Domez area to the scope of IQ-P11 since its population was rapidly increasing but water was served only from wells and water trucks. 176 km were added to Domez area and, in turn, 98 km of distribution networks were deducted from Baroshki area to accommodate the budget. The planned installation was completed within the allocated budget.
24. Tables below summarize the above-mentioned changes of sites and scope of work under the Project in light of information obtained through field survey and domestic research (as of January 2018).

Table 2: Location of the Project

Original	As of January 2018
(1) Halabja area Halabja District Center in Halabja Shaheed District, Sirwan Subdistrict in Halabja Shaheed District and Said Sadiq District in Sulaimaniya Governorate	(1) Halabja area Halabja District Center in Halabja Shaheed District, Sirwan Subdistrict in Halabja Shaheed District and Said Sadiq District in Sulaimaniya Governorate
(2) Sulaimaniya area Sulaimaniya City in Sulaimaniya Governorate	(2) Sulaimaniya area Sulaimaniya City in Sulaimaniya Governorate
(3) Erbil area Erbil City in Erbil Governorate	(3) Erbil area Erbil City in Erbil Governorate
(4) Duhok area Duhok City and in Duhok Governorate	(4) Duhok area Duhok City and Domez district in Duhok Governorate

Source: JICA

Table 3: Scope of Work of the Project

Items	Original	As of 2018
<b>Halabja Water Supply Improvement Project</b>		
1. Construction of Sirwan Intake Station	Capacity: 110,000m <sup>3</sup> /d i) Infiltration Gallery ii) Intake Pipe (Dia.900mm) iii) Intake Shaft iv) Intake Pumps (55,000m <sup>3</sup> /d)	Capacity: 110,000m <sup>3</sup> /d i) Side Weir and Open Channel ii) Intake Pipe (Dia.1200mm) iii) Intake Shaft iv) Primary Pump (55,000m <sup>3</sup> /d) v) Secondary Pumps (55,000m <sup>3</sup> /d)
2. Construction of Raw Water Transmission Facilities	i) Raw Water main ii) Grit Chamber iii) Raw Water Pump Well & House iv) Raw Water Pumps	i) Raw Water Main Dia.600mm x 2 lines ii) Grit Chamber iii) Raw Water Pump Station iv) Raw Water Main
3. Construction of Water Treatment Facilities	Water Intake Capacity: 55,000m <sup>3</sup> /d Production Capacity: 50,000m <sup>3</sup> /d i) Rapid Mixing Basin ii) Flocculation Basin iii) Sedimentation Basin iv) Rapid sand Filters v) Chemical Injection Facilities vi) Reservoir vii) Wastewater Basin viii) Electric Equipment (Power Distribution, Instrumentation, Standby Generator) ix) Buildings (Administration & Electricity Building, Chemical Building)	Water Intake Capacity: 55,000m <sup>3</sup> /d Production Capacity: 50,000m <sup>3</sup> /d i) Rapid Mixing Basin ii) Flocculation Basin iii) Sedimentation Basin iv) Rapid sand Filters v) Chemical Injection Facilities vi) Reservoir viii) Electric Equipment (Power Distribution, Instrumentation, Standby Generator) ix) Buildings (Administration & Electricity Building, Chemical Building) x) Treated water Pumping Station
4. Construction of Transmission Facilities	i) Transmission Pumps: 50,000m <sup>3</sup> /d, 1,500kw ii) Transmission Main: Dia.400,500,700mm, 17.55km iii) Junction Well: 1,100m <sup>3</sup>	i) Transmission Pumps: None ii) Transmission Main: - Dia.200-700mm, DIP, 42.65km iii) Junction Well: None
5. Construction of Distribution Facilities	i) Reservoir: 3units (Total 27,000m <sup>3</sup> ) ii) Distribution Feeder Main: Dia.75-600mm, DIP, 33.06km (Sirwan, Said Sadiq and new installment for Halabjya Shaheed)	i) Reservoir: 3units (Total 32,000m <sup>3</sup> ) - NDR-1: 15,000m <sup>3</sup> - NDR-2: 5,000m <sup>3</sup> - NDR-3: 12,000m <sup>3</sup> ii) Pressure Break Tank: 500m <sup>3</sup>
6. Replacement of Distribution Pipes	Dia.50-75mm, HDPE, 36.895km Dia.100-150mm, PVC, 37.029km Dia.200-250mm, DIP, 9.135km (Halabjya Shaheed)	Total 211.8km
7. Installation of House Connections (Halabja District Center)	i Domestic: 15,960 ii Mosque: 77 iii School: 50 iv Government office: 67 HDPE (Equipment) Ferrule with Clamp Saddle, Stop Valve, Water Meter, Check Valve	Total 8,920nos
8. Electric Power Supply	i) 33kv Transmission Line ii) 11kv Transmission Line & Transformer iii) Mobile Substation	Executed under IQ-P10 (*) (*"Electricity Sector Reconstruction Project in Kurdistan Region" funded by Japanese ODA loan)

Items	Original	As of 2018
<b>Sulaimaniya Distribution Network Reinforcement</b>		
Replacement of Distribution Network	Dia.50-75mm, HDPE, 117km Dia.100-150mm, PVC, 199km Dia.200-250mm, DIP, 66km	Distribution Network: Total 221km House Connection: Total 18,339nos. 17km transmission line
<b>Erbil Water Supply Improvement Project</b>		
1. Expansion of No.3 Water Treatment Plant	Production Capacity: 96,000m <sup>3</sup> /d i Raw Water Pumps: 3units ii Mixer in Rapid Mixing Chamber iii Flocculator-Clarifier iv Rapid sand Filters v Pumps vi Chemical Injection Facilities vii Standby Generator	Production Capacity: 96,000m <sup>3</sup> /d i Raw Water Pumps: 3units x 2,000m <sup>3</sup> /hr ii Mixer in Rapid Mixing Chamber iii Flocculator-Clarifier: 4units iv Rapid sand Filters: 8units v High Lift Pump: 3units x 2,000m <sup>3</sup> /hr vi Chemical Injection Facilities vii Standby Generator ix Intermediate Pump Station
2. Construction of Transmission and Distribution Facility	i) Transmission: Dia.600mm, DIP, 3.27km (Zone-I) ii) Reservoir: 75,000m <sup>3</sup> iii) Pumping Stations iv) Distribution Trunk Main: Dia.600mm, DIP, 2.1km (Zone-I) Dia.200-800mm, DIP, 12.9km (Zone-II) Dia.200-1,000mm, DIP, 10.0km (Zone-III-mid) v) Distribution Feeder Main: Dia.600mm, DIP, 1.5km (Zone-I) Dia.1,200mm, DIP, 4.1km (Zone-II) Dia.1,400mm, DIP, 3.0km (Zone-III-mid)	i)~iii) No change  iv)~v) Distribution Network (New and Replacement)  Distribution Network: Total 173.19km House Connection: Total 7,713 nos.
3. Replacement of Distribution Pipes	(Zone-II) Dia.50-75mm, HDPE, 159.25km Dia.100-150mm, PVC, 38.86km Dia.200-350mm, DIP, 17.56km	No change
<b>Duhok Distribution Network Reinforcement</b>		
Replacement of Distribution Network	Dia.75mm, HDPE, 32km Dia.100-150mm, PVC, 115km Dia.200-400mm, DIP, 47km	i) Baroshki Area: - Dia.90-200mm, HDPE, 81,373 m - Dia.200-500mm, DIP, 4,215 m Distribution Network: Sub-Total 85.588km House connection: Sub-Total 7,771nos ii) Domez Area: - Dia.90-200mm, HDPE: 142,251 m - Dia.200-500mm, DIP: 15,228 m Distribution Network: Sub-Total 157.479km House connections: Sub-Total 2,888nos Distribution Network: Total 243.066km House connection: Total 10,659nos

Source: Survey Team

25. In addition to above, the events below shall be mentioned to have better understanding of the current situation of the Project.

- a) The impact of the Earthquake to the operation of the Halabja Water Treatment Plant  
MOMT explained that the clear water production capacity of Halabja Water Treatment Plant (HWTP) constructed under the Project was not affected by the earthquake (7.3-magnitude) centered in about 30 km to the southeast of Halabja on 13 November 2017. MOMT also explained that though some items such as walls of HWTP were damaged, these do not affect the capacity of operation of the plant and necessary repairs has been done by MOMT's own budget. Although MOMT confirmed that it will submit the Supervisory Control and Data Acquisition (SCADA) data to show the stable operation capacity by end of January 2018 to JICA, JICA, however, has not yet received as of 18 May 2018.

MOMT explained that the amount of water inflow to HWTP decreased due to the damage to Darbandikhan Dam in Sulaimaniya. HWTP cannot intake the sufficient quantity of water from river intake at the moment due to lowered water level, which prevent HWTP from operating at its designed capacity. To resolve this, MOMT is planning to complete the construction of river bed water intake which is under the current contract of Package 2 as soon as possible.

- b) Construction of river bed intake in HWTP  
JICA requested MOMT to provide a plan to complete the river bed intake works under Package 2. MOMT explained their plan with a contingency based on inputs from the contractor of Package 2 as follows:
- (i) The water level on site shall be maintained below EL 463m during the 5 days implementation in order for the Package 2 contractor to complete the river bed intake works.
  - (ii) While the schedule depends on the availability of required materials, the existing contractor should be able to complete the river bed intake works no later than 25 February 2018.
  - (iii) Upon completion, General Directorate Water and Sewage will review and issue certificate of completion based on the advice of taking over committee.
  - (iv) As a contingency plan when the water level will not be maintained as below as EL 463m during the expected construction, MOMT will amend the current Package 2 contract by excluding the river bed intake works. Immediately after, General Directorate Water and Sewage will review and issue certificate of completion based on the advice of taking over committee.
  - (v) When the contingency plan is adopted, MOMT will choose a new contractor for construction of river bed intake through Local Competitive Bidding and consult with JICA in advance about the procurement method for its review.

### **III.3 Operation and Maintenance of WTPs Constructed under the Project**

26. MOMT explained that, for the O&M of Halabja Water Treatment Plant, it signed "the contract for technical assistance and training of staffs of GDWS for operation and maintenance of HWTP" (hereinafter referred to as "Service Contract"), dated December 2017, with South Korea's Ssanyong. MOMT stated that the O&M of HWTP is currently implemented with the technical support under the Service Contract, but it will be expired on 30 June 2018.

27. MOMT stressed that it used O&M system in a form of computer system, called as “MEX” developed by the supplier, which monitor the plant 24 hours and shows pop-up alert of the requirement of maintenance automatically. MOMT also explained that the O&M of HWTP was being implemented in accordance with the instructions from MEX, which is automatically generated. In case MEX became out of work, MOMT’s IT department would review and fix the problem or would communicate with its supplier for repair. Regarding O&M manual for WTP had already been developed and in use, but it had not been shared from the contractor of Package 2 to MOMT yet.
28. As to the O&M of Erbil Water Treatment Plant, MOMT explained that facilities constructed under Package 1 of the Project at the existing EWTP were operated and maintained in accordance with the O&M plan and O&M manual of EWTP developed by MOMT, and EWTP had not faced any difficulty in O&M since the scope of work of those facilities constructed under the Project were only the expansion of existing facilities.

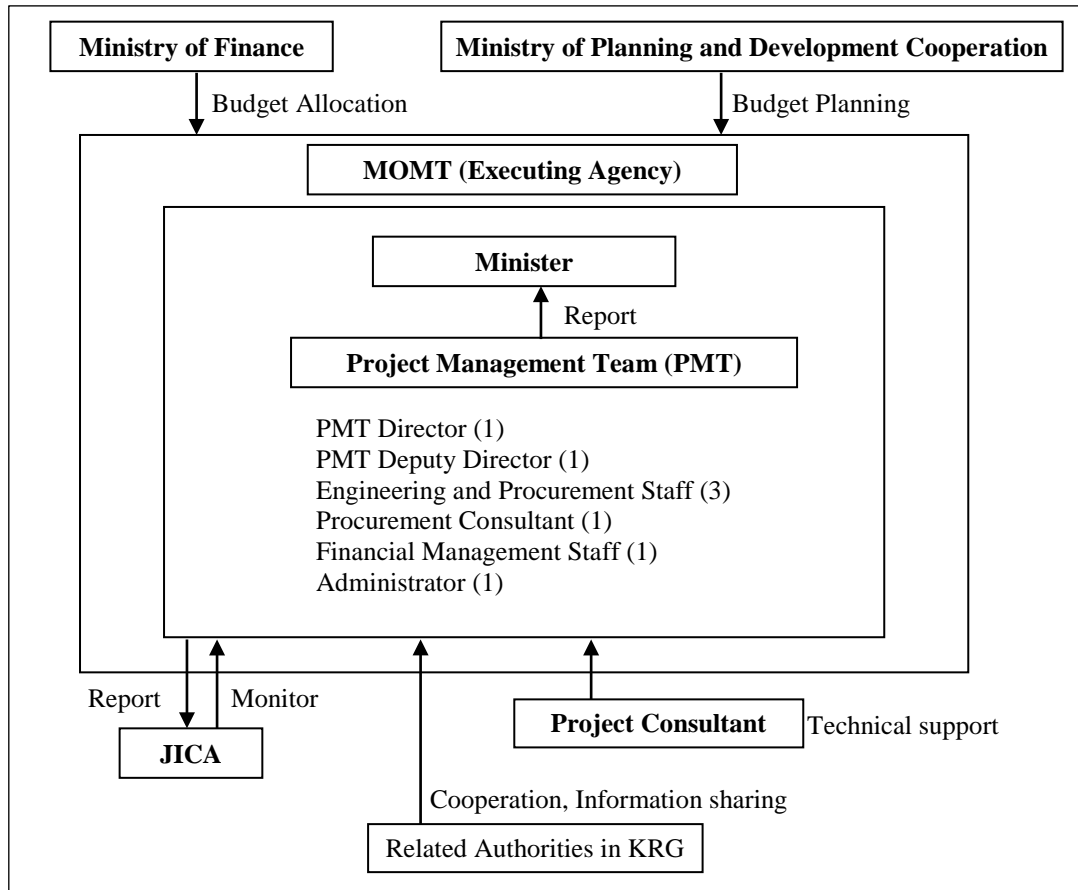
## **IV. NEW FINANCIAL ASSISTANCE PROPOSAL**

### **IV.1 MOMT's Proposal for New Financial Assistance**

29. In the light of the Regional necessary and priority by considering the urgency and financial absorption capacity, MOMT showed their intention to obtain the new financial assistance for implementing the uncompleted scope of work under IQ-P11 as follows:
- a) Existing contract Package 2 under IQ-P11 including retention money, executed works and operation and maintenance
  - b) Installation of Tasluja Transmission Line in Sulaymaniyah  
17km transmission line with 600 mm steel pipe
  - c) Installation of Distribution Network in Halabja  
Construction of 4.5 km distribution networks in Hasanawa district with 180 mm HDPE pipe
  - d) Installation of Generator for reservoir  
2 standby generators for flow control of each reservoir
  - e) Installation of Drainage pipe in Halabja  
Construction of 3 extending overflow and drainage pipes including 2 km of 600 mm HDPE pipe from WTP to river, 0.5 km of 600 mm HDPE pipe from pressure break tank to river and 0.5 km of 600 mm HDPE pipe from distribution reservoir to river.
  - f) Spare parts for Water Treatment Plant  
To operate Erbil WTP 3 continuously at full capacity, Spare Parts for Raw Water Pumps, High lift service Pumps and Intermediate Pumps.
  - g) Rehabilitation of Distribution Network in Erbil  
Rehabilitation of 45 km distribution networks in the following districts located in the center of Erbil city
    - Mustawfi            4.1 km (125mm HDPE)
    - Minara2            4.5 km (125mm HDPE)
    - Saidawa 2           4.5 km (125mm HDPE)
    - Setqan 1            4.5 km (125mm HDPE)
    - 30m ring road      6.4 km (125mm HDPE)
  - h) Consulting Service  
The consulting services will include preparation/modification of contract document by utilizing original contract document, assistances of contract with contractor and construction supervision (excluding defect liability period).

### **IV.2 Project Implementation and Operation and Maintenance Capacities**

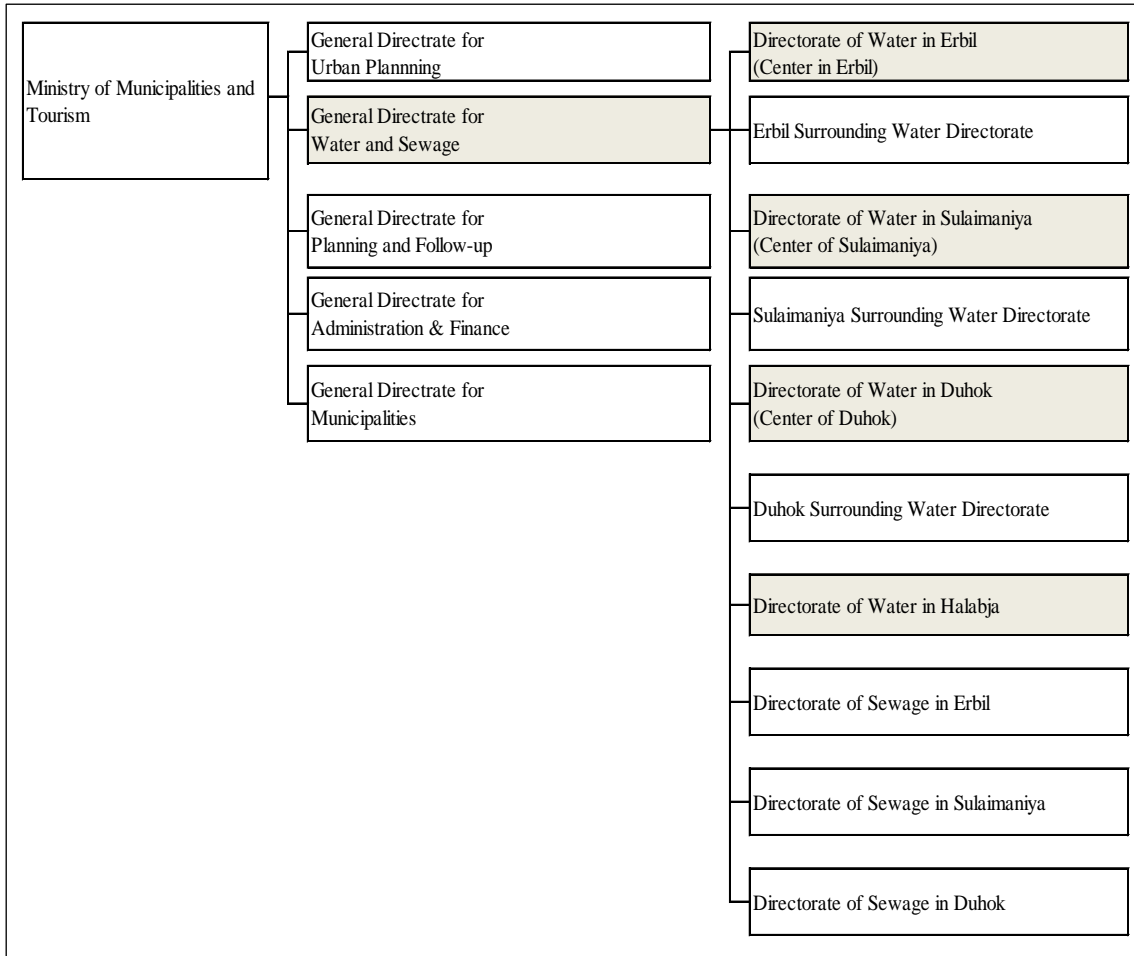
30. When we think about the feasibility of the said MOMT's new financial assistance proposal, in the first place, we have to check and consider the organizational role and capacity of EA, especially in terms of capacities of project implementation and O&M. According to GDWS, DWH, DWS, DWE and DWD, basic roles and responsibilities of each Directorate will be the same with IQ-P11 if they obtain new fiancé for implementing the works listed above.
- a) MOMT is responsible for implementation, O&M for the water and sewerage sector project in Kurdistan region.
  - b) MOMT stated that, when the project under the new financial assistance is actually planned or committed, the Project Management Team (PMT) established inside MOMT for IQ-P11 shall manage and implement that new project exclusively. And, according to MOMT, overall mechanism among the organizations concerned and PMT will also be similar to IQ-P11. Expected overall structure is as indicated below:



Source: Survey Team

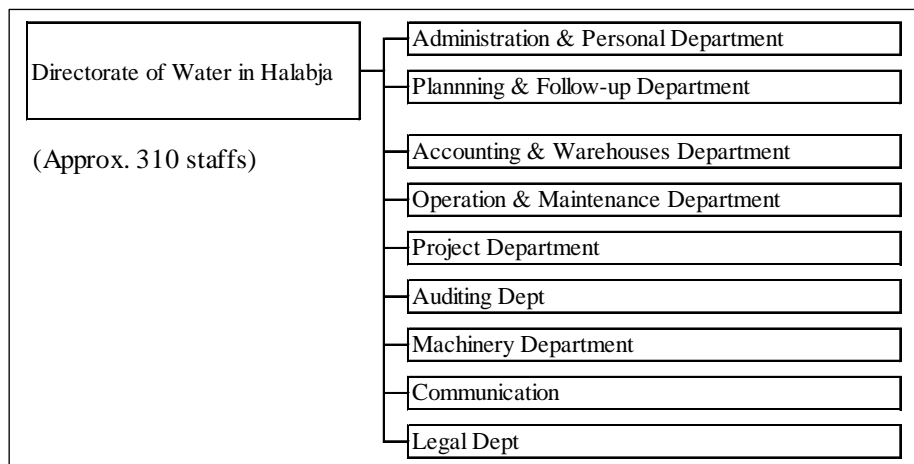
Figure 1: Expected overall project implementation structure

- c) DWH, DWS, DWE and DWD which belong to GDWS and under management of MOMT as headquarters (approx. 350 staffs) are responsible for providing water in Halabja, Sulaimaniya, Erbil, and Duhok Governorates, respectively. Those Directorates are responsible for preparation of water supply plans and for construction new water treatment plants, investigation of a proper land for water facilities, a technical design of a pipe network, execution of construction, rehabilitation of existing facilities, replacement of pipes, O&M, monitoring of water quality and so on. Technical Departments of DWH, DWS, DWE and DWD which have totally 475 staffs as of 2017, are specifically in charge of operation and maintenance of water treatment plants, transmission system and distribution networks.
- d) Organization diagram of MOMT as a whole, DWH, DWS, DWE and DWD as of January 2018, respectively, are indicated below:



Source: MOMT

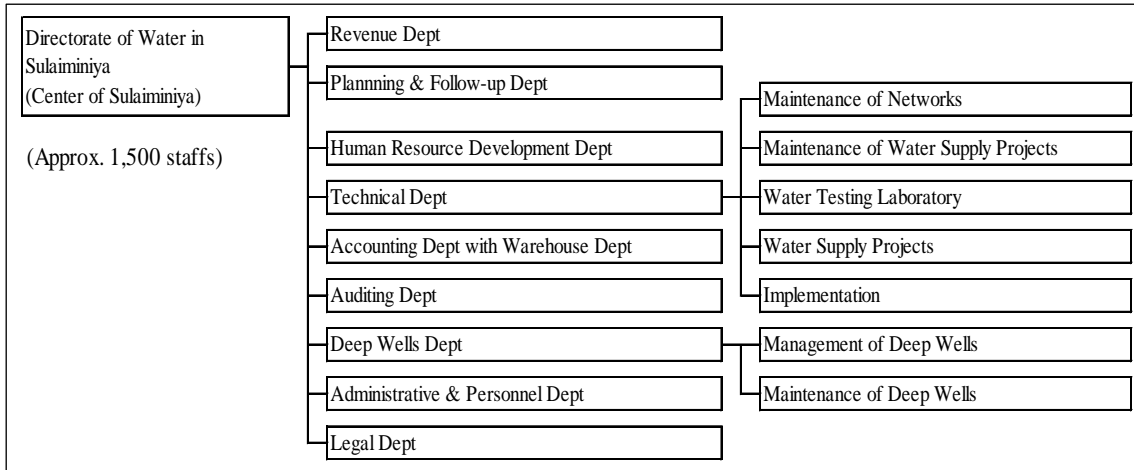
Figure 2: Organization diagram of MOMT



Source: MOMT

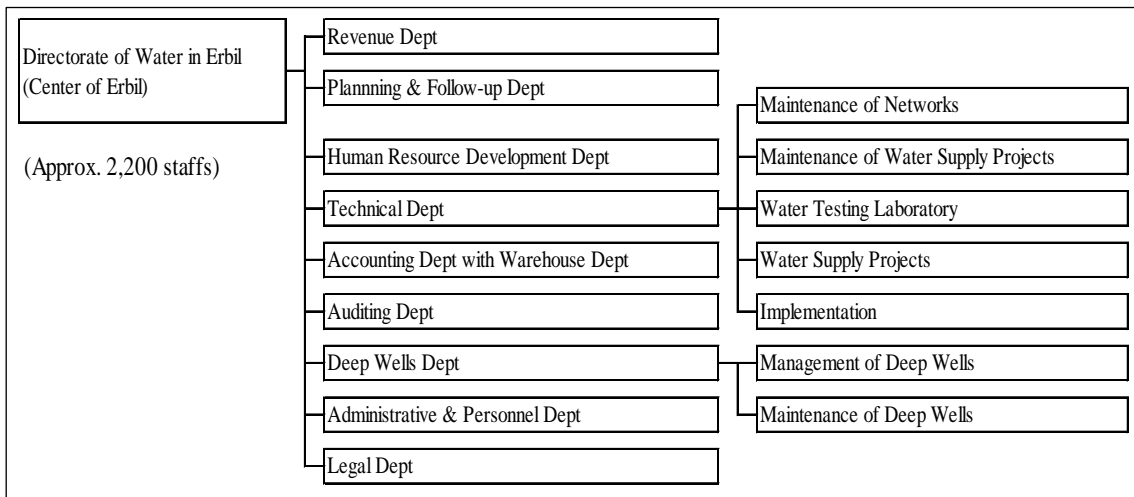
Figure 3: Organization diagram of DWH





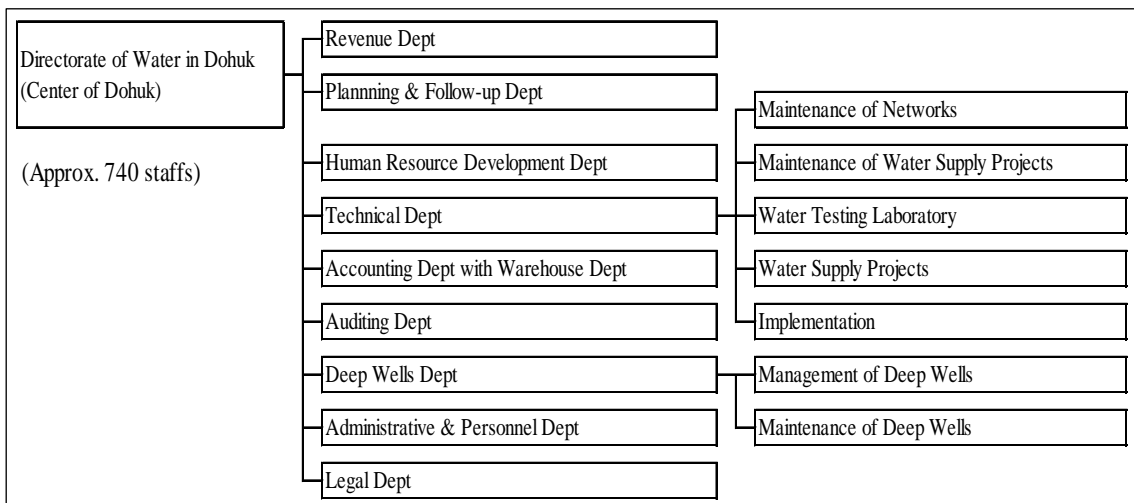
Source: MOMT

Figure 4: Organization diagram of DWS



Source: MOMT

Figure 5: Organization diagram of DWE



Source: MOMT

Figure 6: Organization diagram of DWD

### IV.3 O&M Budget and Tariff Reform

31. The current water tariff is very low comparing with the average household income in the Kurdistan Region, which does not cover even O&M cost for existing facilities. Under the circumstances, KRG confirmed that it should keep the adequate covering by allocation of O&M budget in order to make up the necessary cost for water supply facilities. MOMT explained that the O&M cost is covered by the budget allocated from Ministry of Finance in Kurdistan Region and it is not covered by tariff or subsidies. USD 1,890,330 is currently allocated every year for O&M cost of each WTP in Erbil and the O&M cost of the Halabja WTP are planning to start allocating from July 2018.
32. MOMT, however, recognizes the near total lack of sustainability of the current O&M that depends largely on the government budget allocation. Because of that, according to MOMT, the budget structure for O&M will be reformed by the end of 2018. The current mechanism of transfer of water tariff collected by MOMT to Ministry of Finance in Kurdistan Region (as national purse) will be abolished, and GDWS will be able to use it for O&M cost. In addition, MOMT plans to commence its pilot projects for installation of water meter and for introduction of consumption-rate-based tariff by the end of 2018. After the commencement of those projects, tariff will be revised as shown in table below.

Table 4: New tariff structure

	Use for one month (m <sup>3</sup> )	Price per m <sup>3</sup> (Iraqi Dinar)
Households	From 1 to 20	300
	From 21 to 40	400
	From 41 to 70	1,000
	From 71 to 120	1,500
	more than 121	3,000
Price for one month		
Donor organization such as United Nations or others		500
Governmental		500
Semi-governmental and non-Investment parts		750
Trading, industrials, Tourism and Investment parts		1,000

Source: MOMT

## **V. ENVIRONMENTAL AND SOCIAL CONSIDERATION**

During the field survey, under the premise that the project under the new financial assistance described in IV. above would be formulated, environmental and social consideration issues had been discussed with MOMT as follows:

### **V.1 Treatment of Sludges from WTPs**

33. MOMT explained that the sludge of the water treatment plants constructed in Erbil and in Halabja, respectively, under IQ-P11 is dumped directly to the river. It would be required to implement appropriate treatment according to the related regulations in Iraq, and it is strongly requested that MOMT should take necessary measures to solve this dumping issue through the measures such as utilizing drying lagoons and so on as soon as possible to follow the regulation.
34. MOMT explained, according to DWH laboratory test result, it does not negatively affect the quality of water. JICA requested to submit the evidence that shows it complies with Iraqi standards relating to river water quality and MOMT agreed to submit it by the end of January 2018, but it has not yet been submitted to JICA.
35. In case the said evidence does not show that the water quality complies with the Iraqi standards of river water quality, it would be required to take necessary measures to comply with Iraqi standards without direct dumping to the river. MOMT stated that the following measures will be taken for each plant.
  - a) HWTP
    - (i) MOMT chose the method of machinery sludge treatment plant by considering the insufficient location and size for applying sludge lagoon method.
    - (ii) Detailed Design of machinery sludge treatment plant has been prepared under the consulting services for the Project as a part of D/D of HWTP.
    - (iii) The budget shall be allocated for construction by GDWS.
    - (iv) The contract of the construction shall be concluded no later than the completion of construction of water distribution networks in Halabja under the Project.
  - b) EWTP
    - (i) MOMT will choose the treatment method of sludge from sludge lagoon or machinery treatment plant.
    - (ii) In case of lagoon, the study on size (area) and its construction cost shall be conducted by MOMT with the assistance from the consultant hired under the Project.
    - (iii) In light of the result of the study, the budget shall be allocated for construction by GDWS.
    - (iv) The contract of the construction shall be concluded no later than the completion of construction of water distribution networks in Erbil under the Project.

### **V.2 Environmental Checklist**

36. MOMT submitted the environmental checklist of IQ-P11 as per Attachment 1.

### **V.3 Environmental Certificate**

37. According to the environmental laws and regulations in Iraq, a project executing agency is required to conduct an environmental and social impact assessment of its project regardless of the project scale and level of possible impact. Concretely, the environmental screening and EIA approval should be necessary for all projects. Those projects classified as 'B' category in the regional office of Board of Environment in the Kurdistan Region (BOEK) is not required to be evaluated by the Federal Ministry of Environment.
38. In the end of November 2007, Ministry of Environment in the Kurdistan Region (MOEK) approved the EIA report as to Halabja and Erbil projects which was prepared and submitted by MOMT. MOMT confirmed that the scope of Sulaimaniya and Duhok Distribution Network replacement classified as 'C' category and it is unnecessary to submit EIA report and are approved by BOEK. It is confirmed by the Letter No. 1422 from BOEK as per Attachment 2.

### **V.4 Social impact of the Project**

39. MOMT explained that all major project sites for the facilities (intake, WTPs, junction well and reservoirs) are located within government-owned open lands outside built-up areas which are not under any economic activities such as agriculture. Therefore, involuntary resettlement is not expected to occur. But, if the additional land acquisition is required in future, it will be advanced in accordance with the Iraqi internal regulations and "Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations" (April 2002).

### **V.5 Environmental Management and Monitoring**

40. MOMT, JICA and the Survey Team had a series of discussions on how to monitor, manage and mitigate the potential environmental impact which may be occurred by the prospective project under the new financial assistance described in IV. above. As the outcome of discussions, the following items for environmental monitoring and management were developed in compliance with the concerned Iraqi regulations and guidelines, such as Regulation for the Protection of Rivers No. 25 (1967), Iraqi Drinking Water Standard No. 417 (2001):
  - a) Monitoring Form: Construction Phase (Attachment 3-1)
  - b) Monitoring Form: Operation Phase (Attachment 3-2)
  - c) Monitoring Plan for Construction and Operation Phases (Attachment 4)
  - d) Environmental Management Plan in Construction Phase (Attachment 5-1)
  - e) Environmental Management Plan in Operation Phase (Attachment 5-2)

## Environmental Checklist (for IQ-P11)

Attachment 12-1

## JBIC Environmental Check List (1/4)

Project Items		Content of Environmental Evaluation
1 Permits and Explanation	(1) EIA and Environmental Permits	<p>① Have EIA reports been officially completed?</p> <p>② Have EIA reports been approved by authorities of the host country's government?</p> <p>③ Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?</p> <p>④ In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?</p>
	(2) Explanation to the Public	<p>① Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?</p> <p>② Are proper responses made to comments from the public and regulatory authorities?</p>
2 Mitigation Measures	(1) Air Quality	<p>① Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?</p>
	(2) Water Quality	<p>① Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards?</p>
	(3) Wastes	<p>① Are wastes, such as sludges generated by the facility operations properly treated and disposed of in accordance with the country's standards?</p>

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## JBIC Environmental Check List (2/4)

Category		Question	Answer
2 Mitigation Measures	(4) Noise and Vibration	① Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	All the major construction sites proposed for the project are outside built-up areas. However, the impact of noise during construction should be minimized by choosing an appropriate construction method.
	(5) Subsidence	① In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	Subsidence will not occur due to the proposed project because ground water extraction will be significantly reduced by the implementation of the project both in Halabja and Erbil.
3 Natural Environment	(1) Protected Areas	① Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	None of the proposed project sites is located in protected areas. Therefore, the project will not affect any protected areas.
	(2) Ecosystem	① Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? ② Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? ③ If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? ④ Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	None of the project sites encompass primeval forests, tropical rain forests, ecologically valuable habitats or protected habitats of endangered species. Therefore, significant ecological impacts are not anticipated.  The amount of surface water used by the project will not adversely affect aquatic environments of the rivers. The additional intake volume from Great Zab River (1.1 m <sup>3</sup> /sec) is only 1.5% of its water intake potential (draught flow during 10 years: 75 m <sup>3</sup> /sec). The intake volume from Sirwan River (0.64 m <sup>3</sup> /sec) is about one third of the recorded minimum flow of Sirwan River (2.0 m <sup>3</sup> /sec). However, the distant and period of reduced flow will be quite limited because the intake point at Sirwan River is closely and ecologically connected to neighboring Derbendikhan Dam Reservoir where water is abundant (>500,000,000m <sup>3</sup> ) throughout year (the intake point is even part of the dam reservoir for many months).

## JBIC Environmental Check List (3/4)

Category	Main Check Items	Confirmation of Environmental Dependence
4 Social Environment	(1) Resettlement ① Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? ② Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? ③ Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? ④ Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? ⑤ Are agreements with the affected persons obtained prior to resettlement? ⑥ Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? ⑦ Is a plan developed to monitor the impacts of resettlement?	All the major project sites for the proposed facilities (intake, WTPs, junction well and reservoirs) are located within government-owned open lands outside built-up areas which are not under any economical activities such as agriculture. Therefore, involuntary resettlement is not expected to occur.
	(2) Living and Livelihood ① Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? ② Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?	The proposed water supply project will improve the living conditions of inhabitants and will not adversely affect their living hood.
	(3) Heritage ① Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	There are no archeological, historical, cultural, and religious heritages around the proposed project sites. However, installation of transmission and distribution pipes should be carefully conducted in terms of access obstruction, noise, etc. especially where pipes are installed under the roads that run close to any heritages such as a local religious building.
	(4) Landscape ① Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	None of the proposed major facilities such as WTPs and reservoirs will be built in or near tourist resorts. All the facilities are also limited in height so that they will not significantly affect the view of their surrounding environments from a distant.

## JBIC Environmental Check List (4/4)

		Environmental Impacts	Environmental Mitigation Measures
4 Social Environment	(5) Ethnic Minorities and Indigenous Peoples	<p>① Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?</p> <p>② Are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?</p>	The proposed project will not adversely affect any minorities or indigenous people.
5 Others	(1) Impacts during Construction	<p>① Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>② If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>③ If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p> <p>④ If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?</p>	Although it is predicted that the impact during construction is minimal and temporary, some basic mitigations measures was gusseded regarding noise, dust, etc. caused during construction. Safety of construction workers should be carefully considered especially for the construction of the intake facilities at Sirwan River. The contractor's safety education to their construction workers should be carefully supervised during the construction.
	(2) Monitoring	<p>① Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>② Are the items, methods and frequencies included in the monitoring program judged to be appropriate?</p> <p>③ Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>④ Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>Periodical water quality monitoring at the intake points (raw water), WTPs (treated water and effluent) and distribution networks (treated water) was proposed. The proposed frequency and parameters of water quality tests seems to be of minimum requirements for the environmental monitoring.</p> <p>The proponent should review and finalize the proposed monitoring program and establish an appropriate implementation structure for the monitoring in accordance with related Iraqi environmental laws (including Standard No. 417, 2001, Drinking Water and Analysis and Regulation No. 25, 1967, Control of River and Public Water Contaminations, Amended in 2001) before the operation of the proposed project begins.</p>
6 Note	Note on Using Environmental Checklist	① If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	The new water source in Halabja, Sirwan River is an international river shared with Iran. There may be a risk of pollution and over extraction of the river water within Iranian territory (if Iran develops its catchment areas significantly in the future) before the river reaches to the intake point.



Certification Letter from BOEK  
(note: translated to English by MOMT)

**Kurdistan Regional Government**

**Council of Ministers**

**Board of Protecting and Improvement of Environment**

**Office of Technical Affairs**

**Ref. No.: 1422**

**Date: 23/11/2017**

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**To/General Directorate of Water and Sewerage**

**Sub.: Approval**

This is reference to your letter (47-17) dated 23/11/2017 on the replacement of the water pipe networks in Erbil, Sulymaia and Dohuk implemented under JICA loan. For the public interest and for the purpose processing the loan and in-order providing clean water to the citizens, we have approved the projects without preparing EIA report as we considered them within "category C", completion report should be submitted.

**Signed by**

**Samad Mohammed Hussein**

**Deputy Mister, Ministry of the Region for**

**Protecting and Improvement of Environment**

**CC:**

- HE Mister Office
- HE Deputy Minister Office
- Administration, Finance and Legal Office
- Technical Affairs
- EIA department with references
- General file

**Monitoring Form**  
**Environmental and Social Impact – Construction Phase**

1. Response/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2. Natural Environment

2-1 Air Quality: Visual Inspection (Dust generation)

No.	Date	Reported Problem/Complain	Proposed Solution	Solved	In case "Solved-No", describe further action
1				Yes / No	
2					

2-2 Water Quality (River in Goonda): Laboratory Test

No.	Item	Unit	Measured Value	Standard in Iraq (Laws 25 1967) River Water A1	Standard in Iraq (Laws 417 2001) Drinking Water	Remarks*
<b>Natural Characteristics</b>						
1	Color	TCU		-	10 units	
2	Turbidity (NTU)	NTU		Normal	5 units	
3	pH	-		6.5-8.5	6.5-8.5	
<b>Chemical Characteristics</b>						
4	Alkalinity	mg/l		-	-	
5	Ca	mg/l		-	50	
6	Mg	mg/l		0.1	50	
7	Cl	mg/l		200	250	
8	SO4	mg/l		200	250	
9	Na	mg/l		-	200	
10	K	mg/l		-	-	
11	TDS	mg/l		-	1000	
12	EC	S/m		-	-	
13	TH	mg/l		-	500	
14	Al	mg/l		0.1	0.2	

2-3 Noise and Vibration (Complaint)

No.	Date	Reported Problem/Complain	Proposed Solution	Solved	In case "Solved-No", describe further action
1				Yes / No	
2					

2-4 Odor (interview)

	Date	Reported Problem/Complain	Proposed Solution	Solved	In case "Solved-No", describe further action
1				Yes / No	
2					

2-5 Soil Pollution (Visual Inspection)

No.	Monitoring Factor	Monitoring Place	Monitoring Method	Frequency	Monitoring Result
(1)	Soil pollution of surface soil by oil, grease and waste soil	All site area	Visual inspection	1 time/day	

2-6 Solid Waste (Construction Phase: Visual Inspection)

No.	Monitoring Factor	Monitoring Place	Monitoring Method	Frequency	Monitoring Result
(1)	Appropriate disposal of waste	All the site area and dumping site	Visual inspection	Constant	

3. Working Environment (Visual Inspection and Interview)

No.	Monitoring Factor	Monitoring Place	Monitoring Method	Frequency	Monitoring Result
<b>Risk of HIV/AIDS and other infections</b>					
(1)	Control risk of HIV/AIDS	All construction sites	Blood Tests	Twice/Year	
<b>Workplace Safety</b>					
(2)	Wear of safety shoes and hats and safety control manners in working time	All construction sites and in facilities	Visual inspection	Constant	
<b>Accidents</b>					
(3)	Adequate safety traffic control manners	Entrance, exit and in-site road in new facilities.	Reporting by the engineer	Constant	
(4)	Fallen object and grade of dirtiness of roads	Passage roads of vehicles for transportation of equipment and materials.	Reporting by the engineer	Constant	

**Monitoring Form**  
**Environmental and Social Impact – Operation Phase**

1. Response/Actions to Comments and Guidance from Government Authorities and the Public

Monitoring Item	Monitoring Results
Number and contents of formal comments made by the public	
Number and contents of responses from Government agencies	

2. Natural Environment

2-1 Air Quality: Visual Inspection (generators)

	Date	Reported Problem/Complain	Proposed Solution	Solved	In case "Solved-No", describe further action
1				Yes / No	
2					

2-2 Water Quality (Drainage Pipe Discharge point): Laboratory Test

	Item	Unit	Measured Value	Standard in Iraq (Laws 25 1967) River Water A1	Standard in Iraq (Laws 417 2001) Drinking Water	Remarks*
<b>Natural Characteristics</b>						
1	Color	TCU		-	10 units	
2	Turbidity (NTU)	NTU		Normal	5 units	
3	pH	-		6.5-8.5	6.5-8.5	
<b>Chemical Characteristics</b>						
4	Alkalinity	mg/l		-	-	
5	Ca	mg/l		-	50	
6	Mg	mg/l		0.1	50	
7	Cl	mg/l		200	250	
8	SO4	mg/l		200	250	
9	Na	mg/l		-	200	
10	K	mg/l		-	-	
11	TDS	mg/l		-	1000	
12	EC	S/m		-	-	
13	TH	mg/l		-	500	
14	Al	mg/l		0.1	0.2	
<b>Biological Characteristics</b>						
15	Coliform (100 ml after 24hr at 35°C)				<1.1	
16	E.coli (100 ml after 24hr at 44°C)				<1.1	
<b>Pesticides (mg/l)</b>						
17	Organic chloro (chlorinated)				0.7	
18	Organic Phosphorous				0.000005	
19	Multi chloro-diphenolic				0.001	

2-3 Noise and Vibration (Complaint) - from generators

	Date	Reported Problem/Complain	Proposed Solution	Solved	In case "Solved-No", describe further action
1				Yes / No	
2					

2-4 Liquid Waste (Visual Inspection)

No.	Monitoring Factor	Monitoring Place	Monitoring Method	Frequency	Monitoring Result
(1)	Oil from generators	Generators sites	Visual inspection	Once/Year	

2-5 Sludge Amount

Name of WTP	Unit	Measured Value (Mean)	Measured Value (Max)	% of Sludge Treatment (Discharge/Treatment)

## Monitoring Plan for Construction and Operation Phases

No*	Adverse Impact and Countermeasures	Monitoring Parameters	Monitoring Locations	Monitoring Manners	Frequency	Responsibility of Monitoring	Responsibility for Monitoring Cost	
<b>Construction Phase</b>								
Air Emissions	1	Temporary air pollution caused by operation of construction machinery	Smell and color of exhaust gas	All construction sites	Visual Inspection	1 time/d	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
	2	Dust and dirt during construction	Dust and dirt	All construction sites	Visual Inspection Report by employees and residents	Constant	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
Noise	3	Noise from construction activities and machineries	Noise levels	Near sensitive receptors	Noise measurement with noise meter	1 time/d	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
Solid Waste	4	Construction waste	General site solid waste	All construction site	Visual monitoring	Constant	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
	5	Domestic wastes from workers	Collection bins/containers	All construction site	Visual monitoring	Constant	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
	6	Waste dumping in river in Halabja	Wastes in river stream	Halabja/Goonda	Visual monitoring	Constant	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
Health Safety	7	Impacts on workers	Site conditions and health and safety guidelines	All construction site	Visual monitoring	Constant	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)

No*		Adverse Impact and Countermeasures	Monitoring Parameters	Monitoring Locations	Monitoring Manners	Frequency	Responsibility of Monitoring	Responsibility for Monitoring Cost
Water Quality (Law 25 of 1967)	8	Impact on river water quality	Quality of water	All construction site	Sampling and testing	Water testing: 1 time prior to the start of construction works to establish the baseline; 1 time 2 weeks prior to project completion	Person responsible for Contractor	Included in construction cost (Contractor is responsible for it)
<b>Operating Phase</b>								
Air Emissions	9	Air emissions from generators exhausts	Smell and color of exhaust gas	Generators Sites	Visual Inspection	1 time/yr	MOMT	MOMT
Noise	10	Noise from generators	Noise levels	Generators Sites	Noise measurement with noise meter	1 time/yr Or, during maintenance and repairs	MOMT	MOMT
Liquid Waste	11	Oil from generators	Oil, grease and filters	Generators Sites	Visual Inspection	1 time/yr	MOMT	MOMT
Water Quality (Law 25 of 1967)	12	Impact on river water quality	Quality of water	Discharge point of drainage pipes in Goonda	Sampling and testing	2 times/yr	Water Directorate	MOMT
Sludge Amount	13	Impact on river water quality	Amount and percentage of sludge treatment	WTP, Sludge Treatment Facility	Measurement of sludge discharge amount and treatment amount	1 time/d	MOMT	MOMT

### Environmental Management Plan in Construction Phase

Category	Impact	Countermeasures	(1) Responsible Organization and (2) Supervising Agency	Responsible Organization for Cost
Air Emissions	<ul style="list-style-type: none"> <li>- Dust generated from land clearing, drilling, site excavation and cutting and filling activities.</li> <li>- Air emissions generated from construction vehicles and machinery.</li> <li>- Trucks conveying construction materials for project construction.</li> </ul>	<ul style="list-style-type: none"> <li>- Minimize land disturbance.</li> <li>- Regular watering of site to reduce dust dispersion.</li> <li>- Cover open trucks that transfer dust producing material.</li> <li>- Cover stockpiles on-site.</li> <li>- Turn-off machinery and power generators during idle time.</li> <li>- Regular maintenance of power generators and machinery.</li> <li>- Stabilize the surface of dirt piles if not removed immediately.</li> <li>- Use windbreaks to prevent any accidental dust pollution.</li> <li>- Limit vehicular paths.</li> <li>- Minimize unnecessary vehicular and machinery activities.</li> <li>- Minimize dirt track-out by washing or cleaning trucks before leaving the construction site.</li> <li>- Use dust suppressants on travelled paths which are not paved.</li> <li>- Minimize unnecessary vehicular and machinery activities.</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost
Noise	<ul style="list-style-type: none"> <li>- Noise generation is due to ground clearing, excavation activities, use of heavy machinery and onsite power generators.</li> <li>- Vibration results from the usage of heavy equipment (bulldozers, heavy trucks) and explosives.</li> <li>- Noise and vibration from the licensed quarry site from which trucks convey raw materials and crushed stones for the project.</li> </ul>	<ul style="list-style-type: none"> <li>- All equipment must be pre-certified by the contractor before any equipment is allowed to work on site.</li> <li>- Use low noise generating equipment/machinery.</li> <li>- Turn machinery off during idle time.</li> <li>- Provide continuous maintenance of equipment and machinery.</li> <li>- Advanced muffled equipment and silencers have to be used during construction work.</li> <li>- Construction traffic must be directed to avoid built-up environments (schools, hospitals, residential units, etc.) if applicable.</li> <li>- Construction equipment operating hours will be limited to daytime hours only.</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost
Solid Waste Generation	<ul style="list-style-type: none"> <li>- Generation of excavated soil and construction wastes.</li> <li>- Minimal domestic waste will be produced from worker's camps.</li> </ul>	<ul style="list-style-type: none"> <li>- Most environmentally sustainable approach to handling excavated material: application of excess excavated material in other projects that require the types of material generated.</li> <li>- Next preferable option: disposal of excess excavated material in a licensed landfill by a contractor.</li> <li>- Domestic waste will be disposed of in municipal containers.</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost



Category	Impact	Countermeasures	(1) Responsible Organization and (2) Supervising Agency	Responsible Organization for Cost
Water Resources	Contamination of water resources: <ul style="list-style-type: none"> <li>- Fuel and oil spills from excavation machinery and equipment.</li> <li>- Leaching of construction materials into groundwater.</li> <li>- solid waste dumping due to construction activities such as excavation, sewage disposal by site workers could reach groundwater</li> <li>- Water consumption of machinery.</li> <li>- Interception of the water table, or other physical changes through earthwork, etc. that alter flow, recharge, or other hydrologic conditions.</li> </ul>	<ul style="list-style-type: none"> <li>- Reduce machinery water consumption.</li> <li>- Proper disposal of waste generated from construction material.</li> <li>- Proper storage of used oil, oil filters and oily rags in leak-proof drums and dispose them in proper locations far from water bodies.</li> <li>- Immediate cleanup of any chemical spills.</li> <li>- Ensure water quality is within national and international standards for discharge in rivers (for drainage pipe in Halabja).</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost
Socio-Economic	- Inconvenience to people living in nearby communities in the short-term, due to the heavy traffic of construction related vehicles, dust, noise levels and erosion.	<ul style="list-style-type: none"> <li>- Construction vehicles shall stick to specific roads designed for the transport of construction materials, machinery and equipment in order to reduce dust levels on the adjacent properties.</li> <li>- Traffic jams due to construction works on roads (for distribution networks).</li> <li>- Warning signs will be provided.</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost
	Job opportunities to local market and people	-	-	-
Health and Safety Hazards	Exposure of workers to health and safety risks from: <ul style="list-style-type: none"> <li>- Heavy equipment and machinery use.</li> <li>- Tripping and falling hazards.</li> <li>- Exposure to high noise levels.</li> <li>- Heat exhaustion or cold exposure.</li> </ul>	<ul style="list-style-type: none"> <li>- The Contractor to conduct a health and safety plan.</li> <li>- Ensure all health and safety requirements are available on construction site.</li> <li>- Enforce the use of personal protective equipment (PPE) and ensure that all workers know how to use it.</li> <li>- Install lights and caution signs in hazardous areas (if any).</li> <li>- For occupational safety, ensure the availability of first aid and medical assistance in case of accidents or emergency situations.</li> <li>- Mark construction areas with visible signs indicating 'do not cross' areas.</li> </ul>	(1) Contractor (2) Consultants, PMT	Included in construction cost

Category	Impact	Countermeasures	(1) Responsible Organization and (2) Supervising Agency	Responsible Organization for Cost
		<ul style="list-style-type: none"> <li>- Providing adequate sanitary facilities and drainage in the temporary camps of the contractor, where he stores his equipment, materials and where his offices are located.</li> </ul>		

### Environmental Management Plan in Operation Phase

Category	Impact	Countermeasures	(1) Responsible Organization and (2) Supervising Agency	Responsible Organization for Cost
Air Emissions	- Power generators that will be installed for the reservoirs are the only source of air emissions.	- Power generators should be equipped with exhaust cyclone filters. - Regular maintenance of power generators.	MOMT	MOMT
Noise	- Power generators that will be installed for the reservoirs are the only source of noise.	- Power generators shall be equipped with silencers. - Regular maintenance of power generators.	MOMT	MOMT
Water Resources	- The distribution networks and transmission lines provide a reliable and continuous water source/flow to meet the demand of the local population.	-	-	-
	- River might be impacted by the overflow discharge from the WTP in Halabja.	- Ensure quality of water discharged into the river is within the national and international standards.	MOMT	MOMT
Liquid waste	- Oil from generators.	- Oil and filters shall be handled by a specialized contractor.	Contractor MOMT	MOMT
Socio-Economic	- Provide concerned populations with a reliable and continuous water source/flow for domestic consumption. - Providing different job opportunities for people living in nearby communities, therefore encouraging settlement of people in the region.	-	-	-
Sludge Treatment	- River might be impacted by sludge discharge from the WTP	- Operation of sludge treatment facility in WTP <ul style="list-style-type: none"> <li>• sludge lagoon</li> <li>• machinery treatment plant</li> </ul> - Measurement of sludge discharge amount and treatment amount	MOMT	MOMT