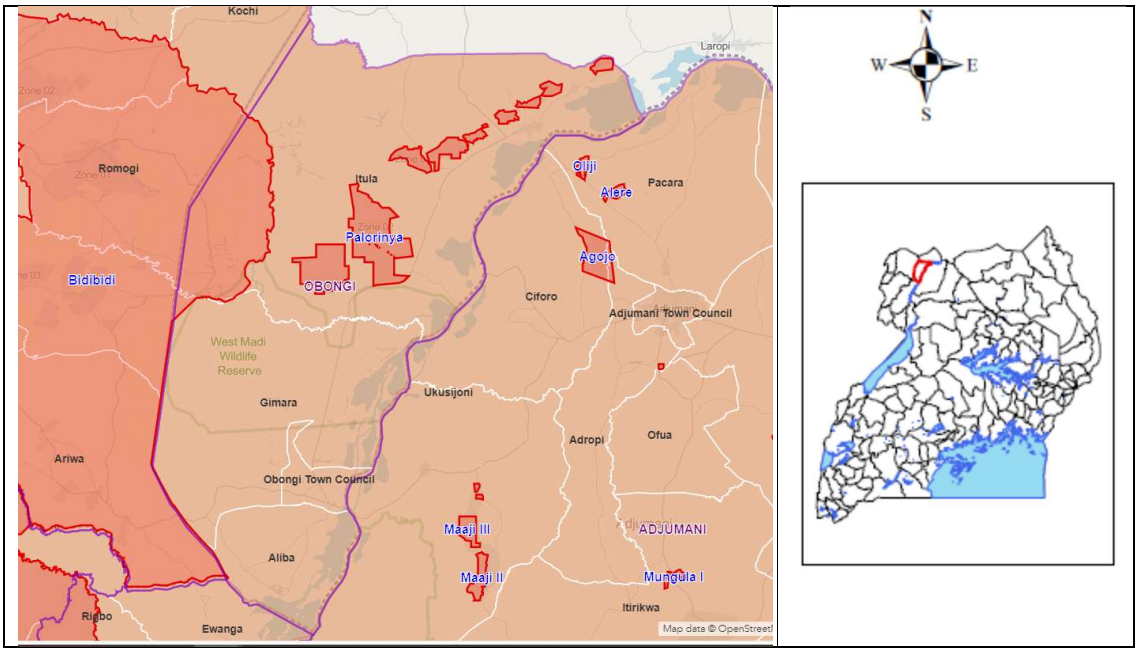
WATER SYSTEM TRANSFER IN OBONGI DISTRICT



ZONE 3 WATER SYSTEM ASSESSMENT REPORT

Doma, Luwakoke, Longa & Waka Schemes

November 2020

Executive Summary

Transferring Water Supply Services in Refugee Settlements from UNHCR to the national Water Authorities: Provision of services in refugee settlements is driven by the Government of Uganda's commitments to the New York Declaration of Refugees and Migrants and the Kampala Declaration, which aim to promote refugee self-reliance and inclusion in the country's development planning. In the context of water supply services, inclusion into government systems means that refugee settlements have to adopt the management models used for water supply in the country. This prompted a decision to transfer the management of water systems in the refugee settlements and the host communities from UNHCR to the national Water Authorities. To this end, the Ministry of Water and Environment developed the Water and Environment Sector Refugee Response Plan (2019) which aims to address the water and environmental needs of the refugees and the requirements for meeting challenges associated with hosting refugee settlements. Some of the planned interventions include strengthening policies and systems for effective and sustainable service delivery; improving operations and maintenance of water systems and strengthening data management.

The success of these national and sectoral plans depends on the capacity of the local authorities to adopt the governance, management and operational changes that are required to integrate the water supply services in the refugee hosting districts into their structures. To this end, the MWE, with support of various partners in development, are supporting capacity development and strengthening of the water authorities and local governments to prepare for the transition and additional responsibilities. Such efforts include ensuring that the systems that are transferred to the Authorities and functional; are able to meet the Uganda standards of water supply; and are in a condition that will not pose an immediate O&M and financial burden to the Authorities.

The transition of responsibilities from UNHCR to the Water Authorities started with the Bweyale/Kiryandongo systems in Kiryandongo District and the Rwamwanja systems in Kamwenge District to NWSC. MWE now desires to transfer the systems in Palorinya settlement in Obongi District to the Northern Umbrella for Water and Sanitation.

Purpose of the Study: The objective of this assignment was to assess four water systems in the Palorinya refugee settlement and host communities in the district of Obongi, as a step in the planned transfer from UNHCR to Northern Umbrella for Water and Sanitation. The systems that were assessed include Luwakoke, Waka, Doma and Longa I schemes, all located in Zone 3 of Palorinya settlement.

Methodology: The methodology employed in executing this assignment included a combination of desk review, key informant interviews / consultations and field visits.

Findings of the Condition Assessment: The findings of the condition assessment are presented below.

	Luwakoke	Doma	Longa I	Waka
Water Source: Borehole and Pump	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges. - The site suffers from poor accessibility.

	Luwakoke	Doma	Longa I	Waka
Energy Source: Solar and Generator	- The solar panels were observed to be in good physical condition. However it was reported that the solar system is not functioning efficiently, resulting in low water production and rationing in the network. - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition. Based on pump records, the system is heavily dependent on the generator, averaging about 63% of production.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.
Civil Structures (pumphouse, generator house, guardhouse, sanitation facility)	- The pumphouse is in need of minor repairs to fix the cabling and pipe connections. - Civil structures in generally good physical condition. - The grounds are well secured using a chainlink fence. However the open area is being used as farmland.	- There is need for additional space: • the pump house is also used as generator house, leaving no space to access the well head fittings. • the guard house is used as a store. - There is need to repair patches in ceiling of the guardhouse. - There is no lighting in all structures. - The grounds are being used as farmland.	All civil structures are in good physical condition. However, the grounds are being used as farmland.	All civil structures are in good physical condition.
Storage	Leakage observed on storage tank.	Leakage observed on storage tank.	Tank in good condition.	Tank in good condition.
Transmission and Distribution Networks	Pipeline network lacks fittings for network management e.g. control valves, air valves, washouts.	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves.	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves.	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves.
Service Connections	It was reported that there are 3no. broken taps in the network.	Taps reported to be in good condition.	Taps reported to be in good condition.	Taps reported to be in good condition.

Capacity Assessment: The findings of the capacity assessment are presented below:

Water Scheme	Resource adequacy (Demand compared to safe yield)	Resource utilisation (production compared to safe yield)	Demand satisfaction - pump capacity	Storage Capacity
Longa I	Resource gap of 108 m^3/d to meet 2020 demand	Production is near capacity @ 82% of safe yield. Additional water resource required to	Water produced does not meet demand: water production meets 51% of 2020 demand. Pump	Storage capacity is 17% of max. demand. Additional storage of 50m^3 required to meet standards.

Water Scheme	Resource adequacy (Demand compared to safe yield)	Resource utilisation (production compared to safe yield)	Demand satisfaction - pump capacity	Storage Capacity
		meet demand in the medium-term.	operates below flow rate.	
Waka	Resource gap of 129 m^3/d to meet 2020 demand.	Production is at capacity @ 99% of safe yield. Additional water resource required to meet demand in the short-term.	Water produced does not meet demand: water production meets 58% of 2020 demand.	Storage capacity is 40% of max. demand. Meets standards.
Luwakoke	Resource gap of 53 m^3/d to meet 2020 demand.	Production is below capacity @ 18% of safe yield.	Pump operating at 18% discharge capacity to meet 13% of 2020 demand.	Storage capacity is 63% of max. demand. Meets standards.
Doma	Reserve capacity available. Borehole safe yield is adequate to meet 2040 demand.	Production is below capacity @ 24% of safe yield.	Water produced does not meet demand: water production meets 59% of 2020 demand.	Storage capacity is 88% of max. demand. Reserve capacity is available.

Operational Assessment: The outcome of the operational assessment is summarised below:

No. of persons per PSP: The MWE guideline for accessibility to water supply is 1 tap serving 250 people (or 50 households). Luwakoke and Doma are within the standards, serving 1 tap per 178 and 227 persons respectively. Longa I and Waka are below standard, having 1 tap serving 270 and 290 persons respectively. It is recommended that additional taps are installed in the Longa I and Waka networks.

Capacity Utilization of water production infrastructure: The capacity utilisation of the systems is a measure of the use of the installed electromechanical equipment. The water produced was compared with the design discharge of the pumps for a 16-hr pumping regime (MWE, 2013). The Luwakoke and Doma pumps are operating below design capacity by 13% and 30% respectively, while Longa I and Waka systems are operating above capacity. This was confirmed by the pumping records which show that the Longa and Waka systems are pumping for an average of 19hrs and 20hrs a day respectively. This has implications on the operational sustainability of the pump.

Cost of Production: Data on O&M costs was obtained for the O&M checklists submitted to UNHCR for the Doma and Longa I systems. Analysis of the expected costs shows a wide variation on cost of production with Longa I at UGX 4000 per m^3 of water produced and Doma at UGX 1600 per m^3 of water produced. This emphasises the need to estimate the tariff as set out in the Business Planning tool of the Umbrella Authorities.

Water Quality Management: The Uganda standards require quarterly testing of ground water sources; while best-practice requires that piped water networks are monitored and sampled bi-monthly at a minimum. There was no evidence that 4 water schemes carried out regular testing. In addition, none of the four schemes were observed to have disinfection systems.

It is recommended to immediately install chlorine-dosing units in each of the water schemes. Furthermore, it is recommended to develop and implement a water quality monitoring and testing schedule that includes testing the water quality at various outlets in the network.

Financial Sustainability: In order to promote financial sustainability of the systems, the following recommendations are made:

i. The Water Authority to develop a service delivery plan that includes encouraging private and institutional connections and improving willingness to pay. This will improve the customer base and potential for cost recovery.
ii. The service delivery plan should include a PSP management approach that uses known PSP management models that include identification of PSP operators, use of local authorities (i.e. the refugee welfare councils and the LCs) to vet and recommend the PSP operators in the refugee settlements and in the host communities respectively. UNHCR and the Water Authority to agree on the modalities of subsidization of the consumption of the refugees.
iii. The Water Authority to determine the appropriate tariff for the water schemes, as set out in its Business Planning tool, and apply to MWE for approval to use this tariff once take-over is complete.
iv. UNHCR to implement the rehabilitation and expansion works in time to enable the receiving Authority to implement its service delivery plan and secure improved water supply.

Recommendations

The following general recommendations are made:

i. Develop and implement a sensitisation campaign to inform communities, build demand and willingness to pay for water services.
ii. In order to garner support and acceptance for the management changes, UNHCR to ensure that on effective take-over of the schemes, the rehabilitation and upgrade works are complete and the NUWS is able to immediately improve reliability and levels of services.
iii. Carry our regular planned preventative maintenance to safeguard the plant and equipment and guarantee functionality of the infrastructure.

The following O&M and rehabilitation recommendations can be made:

	O&M	Upgrade / Rehabilitation	
		Short-term	**Medium-term**
Water Source: Borehole and Pump	***All boreholes:*** - Flushing / de-silting of the boreholes.	***All boreholes:*** - Carry out test-pumping of all boreholes to determine the actual yield. ***Luwakoke:*** - Replace pump (Q=9 m^3/h) to meet resource capacity.	***All boreholes:*** - Install piezometric monitoring systems on all boreholes to enable real-time monitoring of ground water levels. ***Luwakoke:*** - Installation of additional borehole (Yield 53 m^3/d) and pump. ***Longa:*** - Installation of additional borehole (Yield 108 m^3/d) and pump. ***Waka:*** - Installation of additional borehole (Yield 129 m^3/d) and pump. - Rehabilitate the road to improve accessibility to the site.
Energy Source: Solar and Generator	***All Schemes:*** - Regular cleaning of the solar panels. - Servicing of generators.	***Doma:*** - Improve solar power output to reduce	

	O&M	Upgrade / Rehabilitation	
		Short-term	**Medium-term**
		dependence on the thermal generator.	
Civil Structures	***All Schemes:*** - Maintenance of the grounds.	***Luwakoke:*** - Minor repairs to fix the cabling and pipe connections. ***Doma:*** - Installation of lights in all structures.	***Doma:*** - Construction of generator house and store.
Water Quality	***All schemes:*** - Continuous water quality monitoring and reporting.	***All schemes:*** - Install chlorine dosing units for disinfection.	
Storage	***All schemes:*** - Regular maintenance and flushing of the reservoir are recommended	***Luwakoke:*** Repair leakage on reservoir. ***Doma:*** Repair leakage on reservoir. ***Longa:*** Construction of 50 m^3 storage tank.	
Transmission and Distribution Networks	***All schemes:*** Regular flushing of water mains	***All schemes:*** - Carry out investigations to identify the pipe lengths and diameters. - Carry out hydraulic designs and mapping of the systems. - Install network fittings including control valves, air release valves, wash-outs, marker posts etc. - Expansion of the tertiary distribution networks to increase coverage.	
Service Connections	***All schemes:*** - Enter into management agreements with PSP operators	***All schemes:*** - Meter the PSPs ***Luwakoke:*** Repair broken taps.	

An estimate of the recommended interventions is given below.

	Estimated Cost
General	13,000,000
Longa I scheme	165,431,200
Waka scheme	132,080,400
Luwakoke scheme	190,132,000
Doma scheme	47,542,400
TOTAL	**548,186,000**

Roadmap for Transfer of Water Systems in Palorinya

The critical activities in this transfer are:

i. An agreement between OPM, UNHCR and MWE on responsibilities during the transfer, especially responsibility for financing key rehabilitation works and financing user-fee subsidies.

i. Gazette from Ministry of Water and Environment, demarcating the water supply areas and appointing the Northern Umbrella for Water and Sanitation as the Authority to manage the gazetted area.
ii. Rehabilitation and expansion of the systems to enable the Umbrella to meet the objective of increasing water coverage and improving levels of service.

The process to be followed in the transfer of the schemes from UNHCR to the Water Authority is presented below:

Activity	Output	Lead Office	Participating Office	Timeline
Meeting to agree on transfer responsibilities of MWE / OPM / UNHCR	Minutes of Meeting	MWE	- OPM - UNHCR	29 January 2021
Gazetting of water supply area to Water Authority	Gazette of the GOU	MWE		TBD
Verification and due diligence on condition and functionality of assets	Due diligence report	NUWS	- UNHCR; - IP / OP;	1 month from receipt of gazette from MWE.
Handover Meeting and signing of implementation Agreement between UNHCR and Water Authority	Signed Agreement	- UNHCR; - NUWS		Shall be determined by the parties.
Rehabilitation and upgrade works	Completion certificates	UNHCR	- IP/OPs; - NUWS	To be completed during the transition period
Stakeholder Engagements and Sensitization		NUWS	- UNHCR; - OPM	Shall be determined by the Umbrella
Management during the transition period		- UNHCR; - IP/OPs;	- OPM, - NUWS	Duration of the transition to be determined by the parties

Contents

List of Tables

List of Figures

Acronyms

CRRF	Comprehensive Refugee Response Framework
DLG	District Local Government
DWD	Directorate of Water Development
GOU	Government of Uganda
IP	Implementing Partner
KII	Key Informant Interviews
M&E	Monitoring and Evaluation
MOU	Memorandum of Understanding
MWE	Ministry of Water and Environment
NDP	National Development Plan
NUWS	Northern Umbrella for Water and Sanitation
NWSC	National Water and Sewerage Corporation
O&M	Operations and Maintenance
OP	Operating Partner
Opex	Operating Expenditure
OPM	Office of the Prime Minister
STA	Settlement Transformative Agenda
TBD	To Be Determined
UAs	Umbrella Authorities
UNHCR	United Nations High Commission for Refugees
WASH	Water Sanitation and Hygiene
WESRRP	Water and Environment Sector Refugee Response Plan
WESWG	Water and Environment Sector Working Group
WQ	Water Quality
WSDF	Water and Sanitation Development Facility

1 Introduction

1.1 Background

Uganda currently faces one of the fastest growing refugee crises in the world, recording the highest number of refugees in Africa. As at September 2020, Uganda hosted an estimated 1.43 million refugees[1], in the host districts of Yumbe, Adjumani, Arua, Isingiro, Kyegegwa, Kikuube, Obongi, Kamwenge, Kiryandongo, Lamwo, Koboko, Terego and Kampala (see figure below for map of refugee hosting districts). This represents an estimated 3.4% of the country's total population of 40.1 million (UBOS, 2020). The large inflow of refugees into Uganda has placed tremendous pressure on the natural and financial resources of the country and thus created challenges in delivery of public services not only to the refugee settlements but also to the host communities.

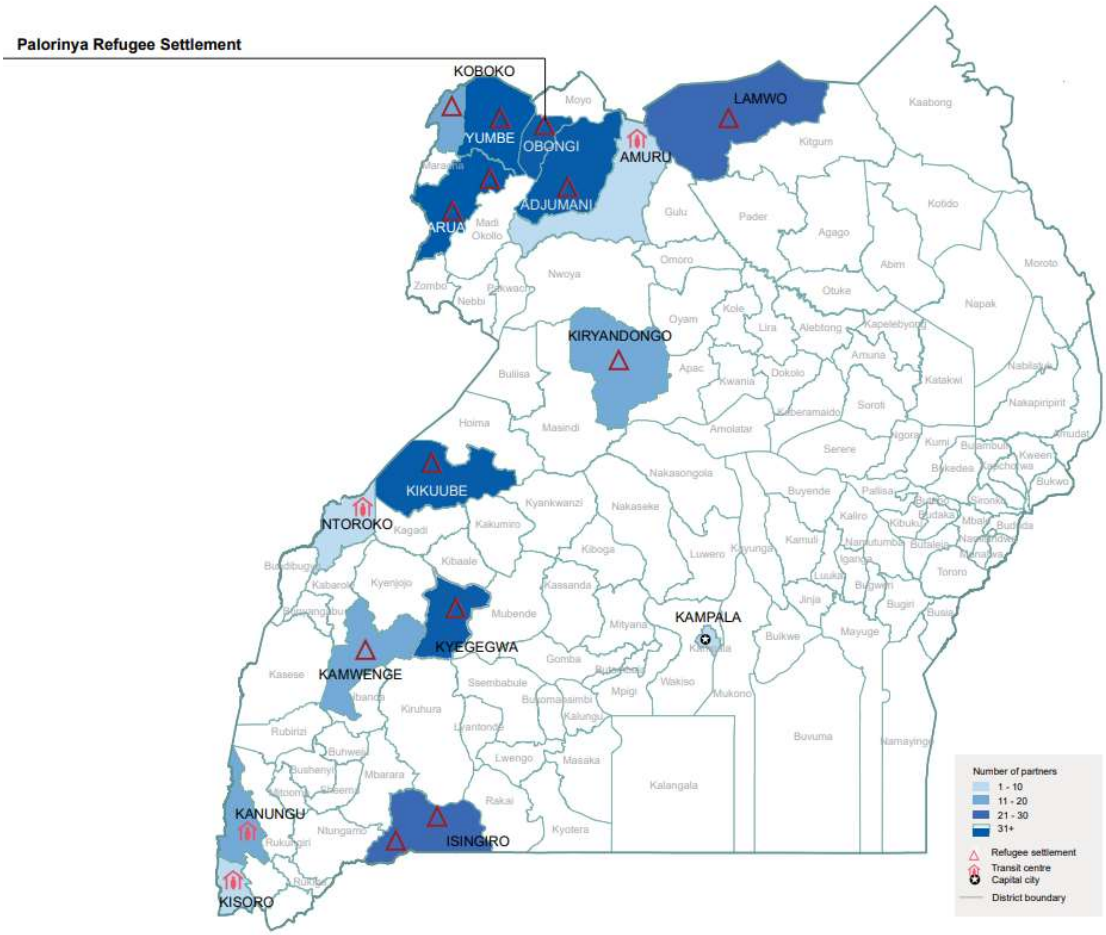


Figure 1: Distribution of the Refugee Hosting Districts in Uganda

Water services to refugee settlements have for a long time been implemented following a humanitarian approach that was driven and financed by UNHCR and implemented by various

[1]https://data2.unhcr.org/en/country/uga

implementing Partners (IPs) or by Operating Partners (OPs). In 2016, the Government of Uganda included refugee management and protection in its second National Development Plan through the Settlement Transformative Agenda (STA) shifting the focus from solely humanitarian approach and recognizing the nexus between humanitarian support and development. In 2017, the Government of Uganda launched the Comprehensive Refugee Response Framework (CRRF) whose overall objective is to support governmental and administrative bodies affected by refugee crises at national, regional and local level. The transition from a mainly humanitarian approach to a developmental approach that integrates refugees and host communities is implemented according to sectoral action plans under the CRRF.

In line with these developments, the UNHCR, Office of the Prime Minister, and Ministry of Water and Environment, are taking measures to transfer the management of water services from the various UNHCR Implementing / Operating Partners to the national water authorities i.e. the Umbrella Authorities (UAs) and National Water and Sewerage Corporation (NWSC). The transition of responsibilities from UNHCR to the Water Authorities started with the Bweyale/Kiryandongo systems in Kiryandongo District and the Rwamwanja systems in Kamwenge District to NWSC. MWE now desires to transfer the systems in Palorinya settlement in Obongi District to the Northern Umbrella for Water and Sanitation.

1.2 About the Palorinya Refugee Settlement

Palorinya refugee settlement is located about 12km from Moyo town in Obongi District in the West Nile region of Uganda. The settlement was established in December 2016 to relieve the pressure on Bidi Bidi settlement in neighbouring Yumbe District, following an influx of refugees fleeing the South Sudan insurgency (see figure below for geographical presentation of the settlement). The settlement is divided into 5 zones:- Basecamp, Zone I, Zone II, Zone III East and Zone III West. By September 2020, the Palorinya settlement hosted approximately 122,732 refugees with a host population of 48,300 (Jan 2020)[2], representing 72% of the district population.

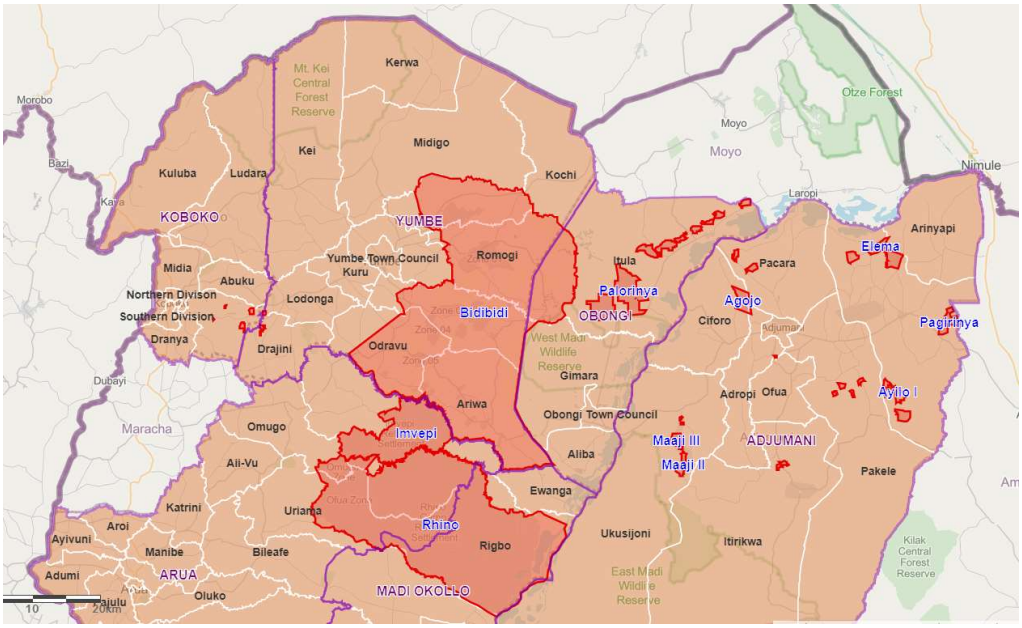


Figure 2: Location of Palorinya Settlement in Obongi District

[2] https://data2.unhcr.org/en/country/uga

As with all other refugee settlements in Uganda, Palorinya settlement is under the overall management of Department of Refugees in the Office of the Prime Minister (OPM), supported by UNHCR and various Implementing and Operating Partners who provide basic services such as education, food security, health and nutrition, water supply, sanitation and hygiene services among others. By June 2020, there were 3No. partners active in the water supply, sanitation and hygiene sector *viz* Better World, Lutheran World Federation and Uganda Red Cross Society.

1.3 Objectives and Scope of Assignment

The objective of the consultancy was to assess four water systems in the Palorinya refugee settlement and host communities in the district of Obongi. The systems that were assessed include Luwakoke, Doma, Waka and Longa I schemes in Zone 3 of the Palorinya settlement.

The scope of work consisted of:

i. Conducting data collection of the selected assets and performance of the specific networks determined by UNHCR and considered for soon-to-be transferred to the Northern Umbrella for Water and Sanitation
ii. Describing the institutional and legal situation of water services in these areas.
iii. Preparing overall findings and recommendations on the assessments, including system upgrade to the national standard and O&M cost recovery sources in short and medium-term.
iv. Outlining the roadmap and procedures for the transfers.
v. Participating in the MWE/UNHCR/World Bank workshop to present the findings.

1.4 Methodology of Assessment

The methodology employed in executing this assignment included a combination of desk review, key informant interviews and field visits.

Desk review. Documents reviewed include policy documents, reports and studies as such as the roadmap for the CRRF in Uganda; the WERRP prepared by MWE in 2019, Design Guidelines for Water Supply Infrastructure in Uganda (2013) and Water Supply Design Manual (2013), Water System Assessment and Service Transfer in the Uganda Districts Hosting Refugees: Final Report; Water System Assessment and Service Transfer in the Uganda Districts Hosting Refugees. Transfer of Rwamwanja Water Systems to NWSC: Lessons Learnt. etc. A list of documents reviewed is shown in the bibliography.

Key Respondent Interviews. These were held with officials from UNHCR, of LWF and URCS, and from MWE and OPM.

Field Visits: Field visits were conducted to the four schemes in Zone 3, Palorinya settlement. Activities carried out include a condition survey and collection of asset information to construct the asset register, collection of information to inform the capacity assessment and key informant interviews.

1.5 Structure of this Report

This report is structured into 5 chapters: Chapter 1 presents the objectives, scope and methodology of the assignment. Chapter 2 describes the management of water services in Palorinya settlement; Chapter 3 presents the findings of the condition and capacity assessments; Chapter 4 presents the recommendations and proposed interventions and Chapter 5 presents the transfer roadmap.

2 Management of Water Supply in Palorinya Settlement

2.1 Policy and Legal Framework

The legal and policy framework that influence the management of water systems in Palorinya Settlement and the planned transfer of management to Water Authorities involves a combination of national legislation, policies that govern the water sector as a whole and policies that are specific to the NUWS as the receiving Water Authority as listed in the table below.

LEGISLATION	POLICIES AND REGULATIONS
• Uganda Constitution (amended 2005) • Local Government Act (1997) • Water Act Cap 152 • National Water and Sewerage Corporation Act Cap 317 • Land Act, Cap 227 • Environment Act, Cap 153 • Refugee Act (2006) • The various MWE Gazettes of water supply areas and appointment of Water Authorities • Performance Contracts between MWE and the Water Authorities	• The National Environment Policy (1994) • The National Water Policy (1999) • Land Policy (2000) • Decentralization Policy (1993) • National Gender Policy (1997) • National Environment Regulations - Environmental Impact Assessments - Standards for Discharge of Effluent into Water or on Land - Waste Management Regulations • Water Supply Regulations (1999) • Water Resources Regulations (1998) • Waste Discharge Regulations (1998) • Refugee Regulations (2010) • Various operational policies of the Water Authorities e.g. Commercial policy; new connections policy etc
DEVELOPMENT PLANS AND STRATEGIES	**WATER DEVELOPMENT MANUALS AND GUIDELINES**
• Vision 2040 • National Development Plan III 2010 - 2025 • Water and Environment Strategic Sector Investment Plan 2018 - 2030 • Comprehensive Refugee Response Framework • Water and Environment Sector Refugee Response Plan (2019) • NWSC Strategic Direction 2016 – 2021 • Strategic Plan of the Northern Umbrella for Water and Sanitation	• Design Guidelines for Water Supply Infrastructure in Uganda (2013) • Water Supply Design Manual (2013) • Water Source Protection Guidelines (2013) • Catchment based Integrated Water Resources Management (IWRM) (2012) • WSDF Operations Manual (2007) • District Implementation Manual (2013) • Technical Specification for Drilling, Test Pumping, Pump Installation and Associated Works (2019) • Manual for Test Pumping Boreholes (2019)

The national policies and regulations promote an integrated and sustainable approach to the management of the water resources, based on recognition of the social and economic value of water, while also incorporating concerns for climate change, environmental protection, gender and the needs of the poor and vulnerable. Provision of services in refugee settlements is driven by the Government of Uganda's commitments to the New York Declaration of Refugees and Migrants and the Kampala Declaration, spearheaded by the Office of the Prime Minister (OPM), facilitated by UNHCR. The Kampala Declaration reaffirms Uganda's commitment to promote refugee self-reliance and inclusion in the country's development planning, as evidenced in the National Development Plan III and in the Water and Environment Sector Response Plan for Refugees and Host Communities in Uganda.

The Sector Refugee Response Plan (2019) aligns with the NDP III 2020-2025 to incorporate the needs of the refugees and the requirements for addressing challenges associated with hosting the refugee settlements. Some of the planned interventions include: integration of refugee planning in the national and sectoral plans; strengthening data management; strengthening policies and systems for effective and sustainable service delivery; improving operations and maintenance of water systems.

The success of these national and sectoral plans depends on the capacity of the local authorities to adopt the governance, management and operational changes that are required to integrate the public and social services in the refugee hosting districts. To this end, the MWE, with support of various partners in development, are supporting the capacity development and strengthening of the organisations / institutions such as the water authorities and local government to prepare for the additional responsibilities. Such efforts include ensuring that systems that are transferred to the Authorities and functional; are able to meet the Uganda standards of water supply; and are in a condition that will not pose an immediate O&M and financial burden to the Authorities.

2.2 Institutional Set-up of Water Supply Services in Obongi District

The provision of water services in Obongi District as established by national and local legislature (the Water Act, the Local Government Act and the national decentralisation policy among others) is described below.

At a national level, the provision of water services is the mandate of the Ministry of Water and Environment implemented through the Directorate of Water Development (DWD); the Directorate of Water Resources Management (DWRM); and the Directorate of Environmental Affairs (DEA). The responsibility for delivery of this mandate is distributed as follows (see figure below for illustration):

i. The Rural Water and Sanitation and Urban Water and Sewerage Departments which are responsible for rural and urban water and sanitation respectively.
ii. The Water Supply Development Facilities (WSDFs) under the Urban Water and Sanitation Department are deconcentrated units of MWE responsible for development of piped water supply and sewerage systems in large towns and small towns and in rural growth centres. There are 4 regional WSDFs viz Central, South West, East and North.

    The Water Supply Development Facility – North (WSDF-N) is responsible for development of water supply infrastructure in the Northern region including West Nile. Other actors in the construction of water facilities are the Local Government, NGOs, UN organizations such as UNICEF and development partners of the Local Government.
iii. National Water and Sewerage Corporation (NWSC), a government-owned parastatal that was established under the NWSC Act of 1972 is the appointed water authority for large and small towns in Uganda. By May 2019, NWSC was operating in 253 water supply areas comprising of Kampala city, municipalities, large towns[3] and small towns[4]. NWSC does not operate any water systems in Obongi District.

[3]Definition according to the LG Act: a town has a population above 25,000 inhabitants.

[4] Definitions according to MWE design manual: a small town has a population between 5,000 and 15,000 inhabitants; a rural growth centre has population between 500 and 5,000 inhabitants.

iv. 6No. regionally distributed Umbrella Authorities that hold the mandate for provision of water services in small towns and rural growth centres as gazetted by the Minister of Water and Environment. There are 6 regional Umbrella Authorities as listed below (see figure below for geographical distribution).
   - South-West Umbrella covering the Western and South Western districts and with its main office in Kabale Municipality.
   - Eastern Umbrella covering the districts in the Eastern region and with its main office in Mbale Municipality.
   - Mid-Western Umbrella covering the Mid-Western districts with its main office in Kyenjojo town.
   - Central Umbrella covering the districts in the Central region with its main office in Wakiso town.
   - Karamoja Umbrella covering the Karamoja region and with its main office in Moroto town.
   - **Northern Umbrella covering the Northern and West Nile districts with its main office in Lira Municipality.**

Of the 103 gazetted schemes in Northern Uganda region, NWSC operates 27No. while the Northern Umbrella for Water and Sanitation (NUWS) operates 76No. including all the gazetted schemes in Obongi District.

Figure 3: Geographical Distribution of the Umbrella Authorities

v. Water User Committees (WUCs) comprised of representation from consumers, local government leadership and from the Refugee Welfare Councils. The responsibility of the WUCs is to oversee management of water points, including ensuring hygiene, ensuring functionality and collection of user contributions to O&M. It was reported that the Water User Committees in the Palorinya settlement are not active. All O&M is carried out by the IP/OPs.

vi. MWE support structures, deconcentrated to regional level including:
   - Technical Support Units (TSUs), responsible for provision of O&M support for rural water supply.
   - Water Management Zones (WMZs), responsible for catchment management.

vii. MWE semi-autonomous agencies including:
   - National Environment Management Authority (NEMA) for environmental management.
   - National Forestry Authority (NFA) responsible for management of Forest Reserves; and
   - Uganda National Meteorological Authority (UNMA) responsible for weather and climate services.

viii. Office of the Prime Minister that holds the mandate of refugee management. The OPM is the Chair of the multi-stakeholder CRRF Steering Group which brings together humanitarian and development partners, local authorities and the private sector, to engage and provide guidance on refugee affairs. A CRRF Secretariat, comprising of staff seconded from Government Offices and external stakeholder, provides technical support to the CRRF Steering Group.

ix. Local Governments (Districts and Town Councils) are the appointed water authorities in small towns and rural growth centres that are not gazetted to NWSC or to the Umbrella Authorities. The Local Governments execute their mandate through Water Boards that oversee appointed Private / Scheme Operators that operate the water schemes in their jurisdiction.

   District Local Governments (DLGs) are also in charge of service delivery and driving the CRRF activities at the district level. The DLG operates through different / specific offices such as the District Water Office (responsible for construction and rehabilitation of water facilities); the District Environment Office (responsible for the environment and natural resources management) etc. These offices are coordinated through the District Water and Sanitation Coordination Committee which plays the role of collaborator between the various actors implementing water supply and sanitation programmes.

The coordination mechanism through which the sector plans are channelled and supervised is the Water and Environment Sector Working Group (WESWG). The WESWG organise Joint Technical Reviews and an annual Joint Sector Review which brings together sector players and provides guidance on policy direction and strategy. The WESWG operates through sub-sector working groups (the water and environment subsector and the environment and natural resources subsector). To this end, in May 2019, a Refugee Response sub-group was constituted and included into the coordination structure of MWE, reporting to the Water and Environment sub-sector Working Group. The Refugee Response subsector Working Group is responsible for providing strategic guidance and oversight of Uganda's Water and Environment Response Plan for Refugees and Host Communities. A Secretariat, comprising of representation from each Directorate, NEMA and NWSC among others, was also be established to support the Refugee Response Sub-Sector Working Group in overseeing the implementation of the Response Plan.

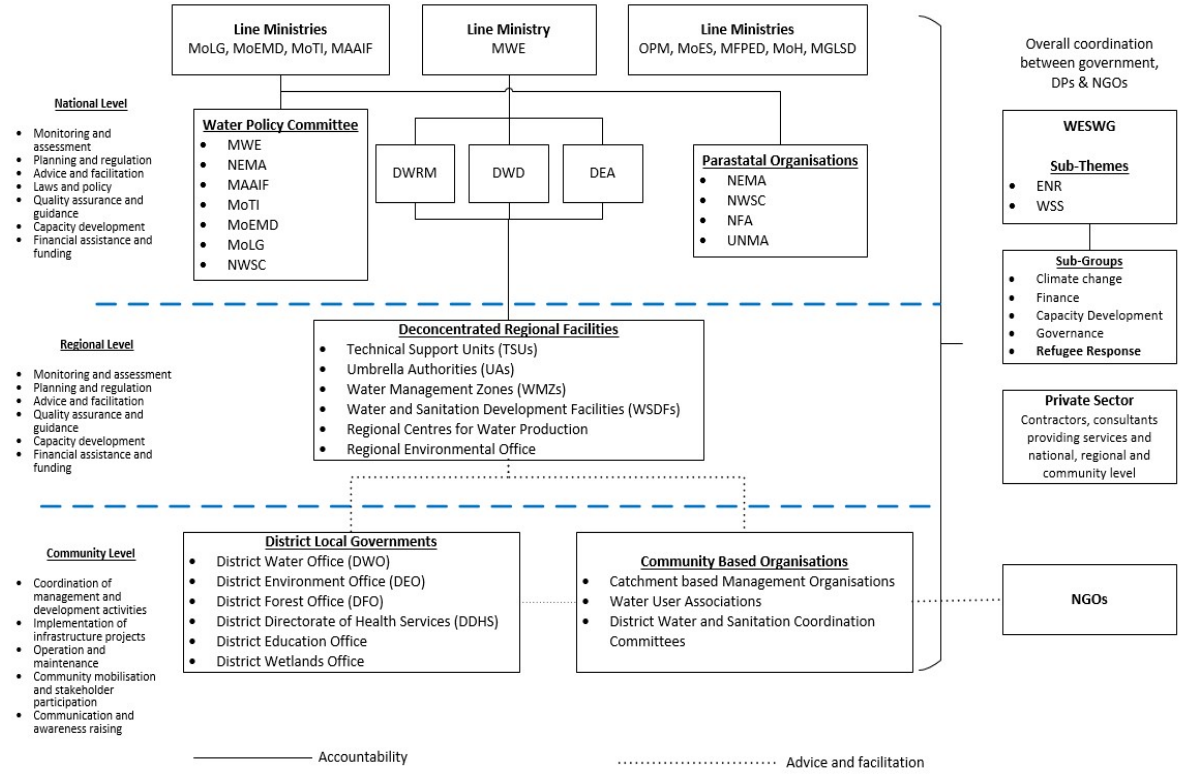


Figure 4: Institutional Set-up of the Water Sector

2.3 Water Supply in Palorinya Refugee Settlement

Water supply in the Palorinya settlement is characterised by a combination of open and protected wells, handpumps and piped water supply. By July 2020, the settlement contained a total of 143No. handpumps and 17No. piped water schemes serving the 5 zones, with an estimated target population of 80,865 as shown in the table below.

Table 1: Piped Water Systems in Palorinya Settlement

	Zone	Water System	Supply area (villages)	Target Popn.	# taps	Water produced (m^3/day)	IP / OP
1.	Basecamp	Ibakwe	Ibakwe, Omwijo	9,815	50	144.5	LWF
2.	Basecamp	Reception centre	OPM, WFP, partner offices, Protection House, Police		12		LWF
3.	Basecamp	Yenga	Yenga P/S and Yenga village		8		ADRA
			Subtotal	**9,815**	**70**	**144.5**	
4.	I	Belameling	Belameling H/C, Police, P/school, Refugee Community	7,708	42	112.548	LWF
5.	I	Budri	Ndirindiri, Budri community, Palorinya H/C,	6,930	48	16	Better World
6.	I	Keguru	Keguru, Pasu, including Trinity ECD/P/s, Pasu P/S, Pasu ECD.	19,105	28	82.838	LWF
			Subtotal	**33,743**	**118**	**211.39**	
7.	II	Kali I (Pump I)	Interconnected systems to serve Zone II villages of Doma, Idiwa, Luru, Orinya, Itipa and Drimbulugbulu.	34,297	276	94.1	LWF
8.	II	Kali II (Pump II)				68.7	LWF

	Zone	Water System	Supply area (villages)	Target Popn.	# taps	Water produced (m^3/day)	IP / OP
9.	II	Orinya (Pump III)				185.5	LWF
10.	II	Kali III (Pump IV)				132.6	LWF
11.	II	Dongo East				58.6	LWF
12.	III West	Longa I	Villages A, B, D, Idiwa I, Romogi P/s, Morobi Police, Idiwa H/C	24,737	44	147.8	LWF
13.	III West	Longa II	Designed to serve Idiwa II, Village C		25		World Vision
14.	III West	Waka	Idiwa II, C, E, J, K, L, Belle H/C		44	178.7	IOM
			Subtotal	**24,737**	**113**	**326.5**	
15.	III East	Luwakoke	Dongo, Lukuri	12,570	40	22.2	World Vision
16.	III East	Doma	Parts of Abio, Dongo, Luwakoke, Longa		24	43.5	IOM
17.	III East	Abio				58.9	IOM
			Subtotal	**12,570**	**64**	**124.7**	

The schemes that are planned for transfer from UNHCR, and that are the focus of this assessment are Luwakoke, Doma, Waka and Longa I, located in Zone III East and Zone III West. Zone III with an estimated population of 37,307 in 9449 households (UNHCR, 2020) as shown in the table below.

Table 2: Population of Zone 3, Palorinya

Zone	Village	Population (@ 31 Jul 2020)	#Households
Zone 3 / Dongo East	Abio	1,465	352
	Dongo	4,688	1,149
	Longa	1,597	374
	Lukuri	2,446	597
	Luwakoke	2,374	608
	Idiwa 1	4,627	1,239
	Idiwa 2	3,247	778
	Total	**20,444**	**5,097**
Zone 3 / Dongo West	Village A	4,010	930
	Village B	1,885	497
	Village C	3,582	1,037
	Village D	1,378	359
	Village E	1,671	419
	Village J	1,680	414
	Village K	1,051	269
	Village L	1,538	406
	Others (FGHI)	68	21
	Total	**16,863**	**4,352**

3 Assessment of Water Systems in Zone 3, Palorinya

This Chapter presents the results of the field assessment and desk review of the condition and operational performance of the 4 selected water schemes. The objective of the assessment was to identify the performance levels of the schemes, their ability to meet the national standards and the requirements for upgrading or optimisation. The tables with the detailed field and condition assessments are attached as annexes).

3.1 Condition Assessment

3.1.1 Zone III East: Luwakoke

3.1.1.1 Water Source

The water source for the Luwakoke water supply system is a borehole (DWD 69405) drilled at 108m depth, and with a pump test yield of 10m^3/hr. The borehole is in good condition, since its completion in 2019.

A Grundfos SP11-33 pump is installed at depth 96m with a discharge Q of 11m^3/hr. Based on the pump records, the pump is in operation for an average of 6 hours a day producing an average of 22m^3/day.

The pump is installed with all the necessary pump control accessories (bulk meter, gate valves, air valve, non-return valve) and does not appear to have any leakages.

Well head fittings

Ground water monitoring is done through assessment of bulk meter readings and pumping time. It is recommended that a piezometric monitoring system is installed to enable monitoring of ground water levels.

3.1.1.2 Energy Source

The energy source for the Luwakoke water system is a hybrid system comprising of a solar system and a thermal generator. There are 35No. BLD solar panels, each with a rating of 300W thus a theoretical capacity of 10.5KW which is adequate to power the pump (power rating of 7.5KW).

The solar system is backed up by a 20kVA diesel generator. The controllers for the pump and solar panels were observed to be in good condition.

3.1.1.3 Civil Structures

The civil structures include a pumphouse/generator house, a guardhouse and an ecosan latrine. The following observations were made:

i. The grounds are well secured using a chainlink fence. However the open area is being used as farmland.

ii. All civil structures are in generally good physical condition.
iii. The pumphouse is in need of minor repairs to fix the cabling and pipe connections (see figures below for illustration).

Area that need repairs

Cable from the borehole to the pump house, repairs need to be done

3.1.1.4 Water Quality

The system does not have a disinfection system.

3.1.1.5 Storage

A 108m^3 steel tank is erected 10m above the ground. The field visit observed a leakage on the tank.

3.1.1.6 Transmission Pipeline

The system comprises a 2.69km transmission line of HDPE 90mm PN16 . There are however neither control valves, wash-outs nor air valves.

3.1.1.7 Distribution Pipelines

The system comprises a 4.4km distribution lines of HDPE 75mm and 40mm . There are however neither control valves nor air valves.

3.1.1.8 Service Connections

9No. public standpipes with a total of 25 taps were constructed within Dongo, Lukuri and Luwakoke villages. During the field assessment it was reported that there are 3No. broken taps. It is recommended to repair the broken taps.

3.1.2 Zone III East: Doma

3.1.2.1 Water Source

The water source for the Doma water supply system is a borehole (DWD 69225) drilled at 125.5m depth, and with a pump test yield of 15m^3/hr. The borehole is in good condition, since its completion in 2018.

A Grundfos SP9-25 pump is installed at depth 109m with a discharge Q of 9m/d. Based on the pump records, the pump is on operation for an average of 17 hours a day producing an average of 72m^3/day.

The pump is installed with all the necessary pump control accessories (bulk meter, gate valves, air valve, non-return valve) and does not appear to have any leakages.

Ground water monitoring is done through assessment of bulk meter readings and pumping time. It is recommended that a piezometric monitoring system is installed to enable monitoring of ground water levels.

3.1.2.2 Energy Source

The energy source for the Doma water system is a hybrid system comprising of a solar system and a thermal generator. There are 40No. Risun solar panels, each with a rating of 265W thus a theoretical capacity of 10.6KW which is adequate to power the pump (power rating of 5.5KW). The solar system is backed up by a 17kVA diesel generator. The controllers for the pump and solar panels were observed to be in good condition.

Based on pump records, the system is heavily dependent on the generator, with an average of 63% production based on the thermal generator during the period May – July 2020.

3.1.2.3 Civil Structures

The civil structures include a pumphouse, a guardhouse and an ecosan latrine. The following observations were made during the field visit:

i. The pump house is currently used as pump house and generator house. There is no space to access the well head fittings.
ii. All civil structures are in good physical condition. However, the grounds are being used as farmland.
iii. The guard house is also used as a store. There is need to repair patches in ceiling (see figure below for illustration).
iv. There are no lights installed in the guard and pump houses.

Section of the ceiling in the guardhouse that need repairs

3.1.2.4 Water Quality

The system does not have a disinfection system.

3.1.2.5 Storage

The system has a total storage capacity of 65m³ in steel tank erected 15m above ground as shown below. The field visit observed leakage on the tank.

3.1.2.6 Transmission and Distribution Pipelines

The length and dimension of the transmission and distribution lines are not known.

3.1.2.7 Service Connections

12No. public standpipes with a total of 24 taps were constructed to serve parts of Abio, Dongo, Luwakoke, and Longa villages.

3.1.3 Zone III West: Longa I

3.1.3.1 Water Source

The water source for the Longa I water supply system is a borehole (DWD 66773) drilled at 90m depth, and with a pump test yield of 16.2m³/hr. The borehole is in good condition, since its completion in January 2017.

A Grundfos SP17-9 pump is installed at depth 90m. Based on the pump records, the pump is in operation for an average of 19 hours a day producing an average of 156m^3/day.

3.1.3.2 Energy Source

The energy source for the Longa I water system is a hybrid system comprising of a solar system and a thermal generator. There are 72No. Solinic solar panels, each with a rating of 120Wp thus a theoretical capacity of 8.64KW which is adequate to power the pump (power rating of 5.5KW). The solar system is backed up by a 25kVA diesel generator. The controllers for the pump and solar panels were observed to be in good condition.

3.1.3.3 Civil Structures

The civil structures include a pumphouse, a generator house, a guardhouse and an ecosan latrine. All civil structures are in good physical condition. However, the grounds are being used as farmland.

3.1.3.4 Water Quality

The system does not have a disinfection system.

3.1.3.5 Storage

A 50m^3 steel tank is erected above-ground.

3.1.3.6 Transmission and Distribution Pipeline

The length and dimension of the transmission and distribution lines are not known.

3.1.3.7 Service Connections

17 public standpipes were constructed within Longa, Village A, Idiwa 1, Idiwa 2 villages.

3.1.4 Zone III West: Waka

3.1.4.1 Water Source

The water source for the Waka water supply system is a borehole drilled at 66.31m depth, and with a pump test yield of 15m3/hr.

Although the site is in fairly good condition, it faces challenges of accessibility during the rain seasons.

A Grundfos SP9-29 pump is installed at depth 51m. Based on the pump records, the pump is in operation for an average of 20 hours a day producing an average of 192m^3/day.

3.1.4.2 Energy Source

The energy source for the Waka water system is a hybrid system comprising of a solar system and a thermal generator. There are 40No. Risun solar panels, each with a rating of 265W thus a theoretical capacity of 10.6KW which is adequate to power the pump (power rating of 5.5KW). The solar system is backed up by a 13.5kVA FG Wilson diesel generator. The controllers for the pump and solar panels were observed to be in good condition.

3.1.4.3 Civil Structures

The civil structures include a pumphouse, a generator house, a guardhouse and an ecosan latrine. All civil structures are in good physical condition.

3.1.4.4 Water Quality

The system does not have a disinfection system.

3.1.4.5 Storage

A 125m^3 steel tank is erected 10m above the ground.

3.1.4.6 Transmission and Distribution Pipeline

The length and dimension of the transmission and distribution lines are not known. The pipeline fittings such as valves, market posts etc could not be identified.

3.1.4.7 Service Connections

22 public standpipes with a total of 44 taps are installed within Village B, C, D, E, J, K and L.

3.1.5 Summary Findings of Condition Assessment

A summary of the findings of the condition assessment of all four schemes is presented in the table below.

Table 3: Summary Findings of the Condition Assessment

	Luwakoke	Doma	Longa I	Waka
Water Source: Borehole and Pump	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges.	- The borehole was in good condition. - The pump was reported to be functioning well with no operational challenges. - The site suffers from poor accessibility.
Energy Source: Solar and Generator	- The solar panels were observed to be in good physical condition. However it was reported that the solar system is not functioning efficiently, resulting in low water production and rationing in the network. - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition. Based on pump records, the system is heavily dependent on the generator, averaging about 63% of production.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.	- The solar panels were observed to be in good condition - The pump and solar panel controllers were observed to be in good condition. - The generator was observed to be in good condition.
Civil Structures (pumphouse, generator house, guardhouse, sanitation facility)	- The pumphouse is in need of minor repairs to fix the cabling and pipe connections - Civil structures in generally good condition. - The grounds are well secured using a chainlink fence. However the open	- There is need for additional space: • the pump house is also used as generator house, leaving no space to access the well head fittings. • the guard house is also used as a store. - There is need to repair patches in	All civil structures are in good physical condition. However, the grounds are being used as farmland.	All civil structures are in good physical condition.

	Luwakoke	Doma	Longa I	Waka
	area is being used as farmland.	ceiling of the guardhouse. - There is no lighting in all structures. - The grounds are being used as farmland.		
Storage	Leakage observed on storage tank.	Leakage observed on storage tank.	Tank in good condition.	Tank in good condition.
Transmission and Distribution Networks	Pipeline network lacks fittings for network management e.g. control valves, air valves, washouts.	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves	- Network characteristics unknown. - Pipeline network lacks fittings for network management e.g. control valves, air valves
Service Connections	It was reported that there are 3no. broken taps in the network.	Taps reported to be in good condition.	Taps reported to be in good condition.	Taps reported to be in good condition.

3.2 Assessment of System Performance

The assessment of system performance aimed to identify demand and supply gaps; availability of system capacity, energy and chemical consumption, and O&M cost.

3.2.1 Capacity Assessment

The capacity assessment was carried out in line with the requirements of the Uganda national standards as outlined in the MWE Design Manual (2013) and included a calculation of water demand for the current year 2020; 10-year and 20-year horizon. The design assumptions are presented below:

Design horizon	20 years 10 years for electromechanical equipment
Peak factors	
Daily	1.8
Hourly	3
Population growth rate	2.7%
Specific consumption	
Domestic: Low income using kiosks or public taps	20
Domestic: Low income multiple household with yard tap	40
Institutional	6%
Commercial	4%
Unaccounted for Water	10%
Borehole safe yield	75% of pump test yield
Storage capacity	30% - 50% of max. demand

3.2.1.1 Capacity Utilisation

The capacity assessment involved an evaluation of the resource capacity of the different boreholes to meet the respective water demand; and an assessment of the operation of the system i.e. the water produced compared to the safe yield of the borehole. For these assessments, a safe yield of 75% of pump test yield and a 16-hour pumping regime were adopted (MWE, 2013). The findings are presented below:

i. Longa I water system is operating at 82% capacity, producing an average of 140m³/d against a safe yield of 180m³/d. In addition, the safe yield of 180m³/d is not adequate to meet the 2020 demand of 288m³/d.
ii. Waka water system is operating at capacity, producing an average of 179m³/d against a safe yield of 180m³/d. In addition, the safe yield of 180m³/d is not adequate to meet the 2020 demand of 309m³/d.
iii. Luwakoke and Doma systems have reserve capacity, operating at 18% and 24% of the safe yield respectively. However for the Luwakoke system, the safe yield of 120m³/d is not adequate to meet the 2020 demand of 173m³/d.

Table 4: Resource and Supply Capacity of the 4 Water Schemes

Water Scheme	BH Safe Yield (m3/hr)	BH Production Capacity (m³/day)	Discharge Capacity of Pump (m³/day)	Water produced (m³/day)	2020 demand (m³/day)	2030 demand (m³/day)	2040 demand (m³/day)
Longa I	11	180	176	148	288	376	491
Waka	11	180	144	179	309	403	526
Luwakoke	8	120	144	22	173	225	294
Doma	11	180	144	44	74	97	126
Total				**392**	**844**	**1,101**	**1,438**

3.2.1.2 Demand Satisfaction

The assessment further evaluated the extent to which the water produced meets the demand and found that the water production in all the four systems does not meet the 2020 demand.

i. The pump at the Luwakoke system has a discharge capacity of 7.5m³/h (~120m³/d), but produces only 22m³/d. As a result, supply in the system is heavily rationed, providing an average of 4 hours of supply to the host and refugee communities. There is need to investigate the underperformance of this pump such as investigating the integrity of the borehole, checking for siltation, and investigating the efficiency of the solar system.
ii. The water production of 148m³/d in the Longa I scheme is only 51% of the 2020 demand. In addition, the pump is operating below its design discharge of 176 m³/d, implying a loss of efficiency. However, it should be noted that the system is operating at 82% of its resource capacity, implying the need for an additional borehole and pump in the medium-term, if the water demand is to be met.
iii. The water production of 179m³/d in the Waka scheme meets only 58% of the 2020 demand. On the other hand, the water produced meets the safe yield of the borehole, implying the need for an additional borehole and pump to meet the 2020 demand.
iv. The water production of 44m³/d in the Doma scheme is only 59% of the 2020 demand. This could be due to suppressed demand or due to underperformance of the electromechanical equipment (pumps and solar power supply).

Recommendations:

i. If the 2020 demand is to be met, Longa I and Waka systems will require additional water resource development in the medium and short-term respectively.
ii. The Luwakoke system is has a significant suppressed demand as evidenced by the average water production of 22m³/d compared to an expected demand of 173m³/d. There is need to improve utilisation of the system's capacity either through increasing coverage or improving levels of service and hence per capita consumption.

iii. Appropriate pump sizing of Luwakoke and Doma systems to meet the demand of the community while also keeping within the safe yield of the boreholes.

3.2.1.3 Storage Capacity

The storage capacity of the systems were compared with the national design guidelines, requiring a storage capacity of 30% – 50% of demand. As shown in the table below, Longa I system does not meet the storage design standards.

Table 5: Storage Capacity of the 4 Water Schemes

Water Scheme	Water produced - (m^3/day)	2020 demand (m^3/day)	Reservoir Capacity (m3)	Check storage
Longa I	148	288	50	17%
Waka	179	309	125	40%
Luwakoke	22	173	108	63%
Doma	44	74	65	88%
	392	**844**		

Recommendation:

i. In the short-term, install additional storage capacity in the Longa I water system. In the long term, install additional storage capacity in the Waka system to meet the 2040 demand.
ii. It is recommended that all systems undergo hydraulic designs to optimize the reserve storage capacity between schemes and potential for network integration. For example, initial investigations show that integrating the Longa I and Longa II systems may provide adequate storage and postpone the need for construction of an additional storage tank.

A summary of the findings of the capacity assessment of all four schemes is presented in the table below.

Table 6: Summary Findings of the Capacity Assessment

Water Scheme	Resource adequacy (2020 Demand compared to safe yield)	Resource utilisation (production compared to safe yield)	Demand satisfaction - pump capacity	Storage Capacity
Longa I	Resource gap of 108 m^3/d to meet 2020 demand	Near capacity @ 82%. Additional water resource required to meet demand in the medium-term.	Water produced does not meet demand: water production meets 51% of 2020 demand. Pump operates below flow rate.	Storage capacity is 17% of max. demand. Additional storage of 50m^3 required to meet standards.
Waka	Resource gap of 129 m^3/d to meet 2020 demand	At capacity @ 99%. Additional water resource required to meet demand in the short-term.	Water produced does not meet demand: water production meets 58% of 2020 demand	Storage capacity is 40% of max. demand. Meets standards.
Luwakoke	Resource gap of 53 m^3/d to meet 2020 demand	Below capacity @ 18%	Pump operating at 18% discharge capacity to meet 13% of 2020 demand.	Storage capacity is 63% of max. demand. Meets standards.
Doma	Reserve capacity available. Borehole safe yield is adequate to meet 2040 demand.	Below capacity @ 24%	Water produced does not meet demand: water production meets 59% of 2020 demand.	Storage capacity is 88% of max. demand. Reserve capacity is available.

3.2.2 Assessment of Operational Performance

The scheme operational data was evaluated to assess operational efficiency of the schemes. The assessment was carried out by comparing key performance indicators against national benchmarks and best-practice in water management. The outcome of the operational assessment is shown in the table below.

Table 7: Status of Key Performance Indicators

			Luwakoke	Doma	Longa I	Waka
	SERVICE INDICATORS					
1	Population within Scheme	No.	7,134	5,436	11,900	12,769
2	Total Water Demand	cub.m/d	173	132	288	309
3	Number of connections					
	No of Domestic Connections	*No.*				
	No. of Standpipes	*No.*	*10*	*12*	*11*	*22*
	No. of Institutional Connections	*No.*				
	Total no. of service connections	No.	10	12	11	22
4	No. of taps (on standpipes)	No.	40	24	44	44
5	No. of persons per public tap	No./tap	178	227	270	290
	OPERATIONAL INDICATORS					
6	System capacity	cub.m/d	176	144	144	144
7	Volume of Water produced	cub.m/d	22	44	148	179
8	Capacity Utilisation	%	13%	30%	103%	124%
9	Storage capacity	cub.m	108	65	50	125
10	Manpower	No.		3	3	
11	Total Network Length	km		6.5	5.5	
	EFFICIENCY INDICATORS					
12	Energy Consumption					
	Generator	*l/month*		*630*	*630*	
	Fuel for trucking	*l/month*				
13	Chemical Consumption					
	Chlorine	kg/month		25	25	
	Chlorine	*kg/cub.m*	-	*0.019*	*0.006*	-
	COST INDICATORS					
	Operating Expenses					
14	Salaries/Benefits	UGX/month		466,500	650,000	
15	Diesel / Fuel costs					
	Generator	*UGX/month*		*2,520,000*	*2,520,000*	
	Fuel for trucking	*UGX/month*				
	Total fuel cost	UGX/month	-	2,520,000	2,520,000	-
	Unit Fuel Cost	UGX/cub.m	-	1,929	568	-
16	Chemical costs					
	Chlorine	*UGX/month*		*2,250,000*	*2,250,000*	
	Total chemical cost	UGX/month	-	2,250,000	2,250,000	-
	Unit Chemical costs	UGX/cub.m	-	1,722	507	-
17	Administrative Expenses	UGX/month				
18	Other Overheads	UGX/month				
19	Repairs & Maintenance (O&M)	UGX/month			1,700,000	
20	Capital Maintenance Expenditure	UGX/month				
	Total Expenses	**GX/month**	**-**	**5,236,500**	**7,120,000**	**-**
21	Unit Cost of Production	UGX/cub.m	-	4,008	1,606	-

3.2.2.1 Operational Efficiency

No. of persons per PSP: The MWE guideline for accessibility to water supply is 1 tap serving 250 people (or 50 households). The data obtained from the schemes shows that Luwakoke and Doma are within the standards, serving 1 tap per 178 and 227 persons respectively. Longa I and Waka

are below standard, having 1 tap serving 270 and 290 persons respectively. It is recommended that additional taps are installed in the Longa and Waka networks.

Capacity Utilization of water production infrastructure: The capacity utilisation of the systems is a measure of the use of the installed infrastructure (electromechanical equipment). The water produced was compared with the design discharge of the pumps for a 16-hr pumping regime (MWE, 2013). The Luwakoke and Doma pumps are operating below design capacity by 13% and 30% respectively, while Longa I and Waka systems are operating above capacity. This was confirmed by the pumping records which show that the Longa and Waka systems are pumping for an average of 19hrs and 20hrs a day respectively. This has implications on the operational sustainability of the pump.

Cost of Production: Data on O&M costs was obtained for the O&M checklists submitted to UNHCR for the Doma and Longa I systems. Analysis of the expected costs shows a wide variation on cost of production with Longa I at UGX 4000 per m^3 of water produced and Doma at UGX 1600 per m^3 of water produced. This emphasises the need to estimate the tariff as set out in the Business Planning tool of the Umbrella Authorities.

3.2.2.2 Water Quality Management

Water quality testing and monitoring is important in the management of public water supply. Testing and publishing the water quality results assures the public and stakeholders of the potability of the water provided. The Uganda standards require quarterly testing of ground water sources; while best-practice requires that piped water networks are monitored and sampled bi-monthly at a minimum. There was no evidence that 4 water schemes carried out regular testing. In addition, none of the four schemes were observed to have disinfection systems.

Recommendation: In the short-term, install chlorine-dosing units in each of the water schemes. Furthermore, develop and implement a water quality monitoring and testing schedule that includes testing the water quality at various outlets in the network.

3.2.3 Financial Sustainability

The ability of the water authorities to secure financing for their operational and investment needs is an essential part of the effort to ensure provision of safe and reliable water services in the refugee settlements and host communities. Since their appointment as Water Authorities in 2017, the immediate objective of the Ministry of Water and Environment has been to secure improvements in water access while also introducing interventions to improve operational cost recovery and reduce dependence on public subsidies. This means that at a minimum, the Umbrella's revenue should cover all direct operating costs and allow for the costs of capital maintenance necessary to maintain a minimum level of service.

As at November 2020, the main sources of revenue for the Northern Umbrella included an operational subsidy from the Central Government; a conditional grant from central government to be utilised towards capital maintenance; revenue from water sales; and contributions from development partners. Financial sustainability in the context of the NUWS requires that these revenue sources are not only adequate to meet O&M needs but also that the revenue streams are stable and predictable. In order to reduce dependence on government transfers (which are sometimes untimely) and on development partner support (which have been reducing over time), it is important the NUWS strengthen its customer base and increase its revenue from water sales.

Water supply in the 4 schemes in Palorinya refugee settlement is financed by UNHCR through management contracts with the Operating Partners, Lutheran World Foundation and the Uganda Red Cross Society. Through these management contracts, UNHCR meets the O&M costs of providing water supply and does not require the refugees and host communities to pay user-fees. Transferring these schemes into the Water Authorities will require a shift from this humanitarian approach to a utility management model that is driven by commercial principles such as the user-pays principle and efficiency obligations of the Performance Contract with the MWE.

The following recommendations are made towards promoting integration of the humanitarian and utility management model:

i. NUWS to develop a service delivery plan that includes encouraging private and institutional connections and improving willingness to pay. This will improve the customer base and potential for cost recovery.
ii. The service delivery plan should include a PSP management approach that uses known PSP management models that include identification of PSP operators, use of local authorities (i.e. the refugee welfare councils and the LCs) to vet and recommend the PSP operators in the refugee settlements and in the host communities respectively. UNHCR and the Water Authority to agree on the modalities of subsidization of the consumption of the refugees.
iii. The NUWS to determine the appropriate tariff for the water schemes, as set out in its Business Planning tool, and apply to MWE for approval to use this tariff once take-over is complete.
iv. UNHCR to implement the rehabilitation and expansion works in time to enable the receiving Authority to implement its service delivery plan and secure improved water supply.

3.2.4 Outcome of Key Informant Interviews

The key questions that the KIIs aimed to answer are summarised below.

Potential and Mechanism of Subsidization of User Fees: There is little evidence that the refugees are able to pay user fees. Most families are generally still vulnerable, having settled in Palorinya in the last 3 years. However there is experience that households can be self-reliant, as evidenced by their response to the reduction in food distributions (households responded by growing own food). There may therefore be potential for households to pay user-fees if provided with support or subsidy. This could be done either (i) directly to the Authority, in which case the refugee households would not pay at the point of collection or (ii) provide the subsidy to households who would then be responsible for payment of water at a PSP or payment of utility bills for a private connection.

General viewpoints on the moving towards the utility-based approach: The refugee settlements are temporary communities that are expected to dissolve when the refugees return to their countries. Moreover, one of the CRRF objectives is to encourage voluntary repatriations. It is therefore important that a service delivery model that recognises the temporary nature of refugee settlements is identified. This will avoid development of permanent and costly infrastructure for temporary communities.

Organisation of the Transfer: The legal instrument that gives the mandate for management of a water system is the gazette from the Minister of Water and Environment. It is important that the sub-counties that host the refugee settlement i.e. Tula and Palorinya sub-counties, are gazetted to give mandate to a Water Authority to receive the water schemes from UNHCR.

It is also important that the roles and responsibilities of the different stakeholders in the transfer are clear and that the stakeholders commit to implement the activities required for successful

transfer of the water schemes. It is recommended that a stakeholders agreement / MOU is signed between the Water Authority and UNHCR in which responsibilities for critical activities such as payment of user-fees, PSP management etc are clarified.

Management of PSPs: The management of PSPs in the refugee community has implications on the amount of user-fee subsidy and on the monitoring of standards for per capita consumption and water quality. It is therefore important that the PSP management model, including the modalities of engagement and remuneration of the PSP operator, is discussed and forms part of the MOU to be signed between parties.

Stakeholder Engagements: It is recommended that extensive and timely engagement and sensitisation is carried out to prepare the community for the change in water supply management. It is proposed that LWF and URCS support the Water Authority in engaging with the various stakeholders and mobilising the communities, especially during the transition period of the transfer.

Role of the IP/OPs: Due to affordability concerns, there is a risk that the coverage of piped water network will remain low. The IP/OPs will continue to cover the gap as a humanitarian service to the vulnerable households that cannot pay for the piped water services; contribute to demand creation for WASH in communities; and provide support in other areas such as livelihood and incomes. The IP/OPs will also retain their role in advocacy and sensitization.

4 Recommendations and Proposed Interventions

4.1 General Recommendations

Based on the findings of the condition and capacity assessments, and on the discussions with KIIs, the following general recommendations can be made:

i. Develop and implement a sensitisation campaign to inform communities, build demand and willingness of consumers to pay for water services.
ii. In order to garner support and acceptance for the management changes, UNHCR to ensure that on effective take-over of the schemes, the rehabilitation and upgrade works are complete and the NUWS is able to immediately improve reliability and levels of services.
iii. Carry our regular planned preventative maintenance to safeguard the plant and equipment and guarantee functionality of the infrastructure.

4.2 Requirements for Improving Water Supply

The following O&M and rehabilitation recommendations can be made. The O&M recommendations are process-related activities that require management decision and commitment to implement.

Table 8: O&M and Rehabilitation Requirements

	O&M	**Upgrade / Rehabilitation**	
		Short-term	**Medium-term**
Water Source: Borehole and Pump	***All boreholes:*** - Flushing / de-silting of the boreholes.	***All boreholes:*** - Carry out test-pumping of all boreholes to determine the actual yield. ***Luwakoke:*** - Replace pump (Q=9 m^3/h) to meet resource capacity.	***All boreholes:*** - Install piezometric monitoring systems on all boreholes to enable real-time monitoring of ground water levels. ***Luwakoke:*** - Installation of additional borehole (Yield 53 m^3/d) and pump. ***Longa:*** - Installation of additional borehole (Yield 108 m^3/d) and pump. ***Waka:*** - Installation of additional borehole (Yield 129 m^3/d) and pump. - Rehabilitate the road to improve accessibility to the site.
Energy Source: Solar and Generator	***All Schemes:*** - Regular cleaning of the solar panels. - Servicing of generators.	***Doma:*** - Improve solar power output to reduce dependence on the thermal generator.	
Civil Structures	***All Schemes:*** - Maintenance of the grounds.	***Luwakoke:***	***Doma:*** - Construction of generator house and store.

	O&M	Upgrade / Rehabilitation	
		Short-term	**Medium-term**
		- Minor repairs to fix the cabling and pipe connections. ***Doma:*** - Installation of lights in all structures.	
Water Quality	***All schemes:*** - Continuous water quality monitoring and reporting.	***All schemes:*** - Install chlorine dosing units for disinfection.	
Storage	***All schemes:*** - Regular maintenance and flushing of the reservoir are recommended	***Luwakoke:*** Repair leakage on reservoir. ***Doma:*** Repair leakage on reservoir. ***Longa:*** Construction of 50 m^3 storage tank.	
Transmission and Distribution Networks	***All schemes:*** Regular flushing of water mains	***All schemes:*** - Carry out investigations to identify the pipe lengths and diameters. - Carry out hydraulic designs and mapping of the systems. - Install network fittings including control valves, air release valves, wash-outs, marker posts etc. - Expansion of the tertiary distribution networks to increase coverage.	
Service Connections	***All schemes:*** - Enter into management agreements with PSP operators	***All schemes:*** - Meter the PSPs ***Luwakoke:*** Repair broken taps.	

4.3 Financial Estimate

An estimate of the recommended interventions is given below.

Table 9: Financial Estimate of Rehabilitation Needs

	Unit	Quantity	Rate	Total
General				
i. Carry out test-pumping of all boreholes to determine the actual yield.	LS			1,000,000
ii. Carry out hydraulic designs and mapping of the systems.	LS			10,000,000
iii. Flushing / de-silting of the boreholes.				2,000,000
Subtotal				**13,000,000**
Longa I				
i. Expansion of distribution network (Diwa, Village B, C, J). HDPE OD 40		600	15,000	9,000,000
ii. Construction of additional PSPs		10	250,000	2,500,000

	Unit	Quantity	Rate	Total
iii. Metering PSPs (new and current)		16	133,200	2,131,200
iv. Chlorination unit		1	24,000,000	24,000,000
v. Install network fittings				1,800,000
vi. Construction of 50 m3 additional storage tank.		1	126,000,000	126,000,000
Subtotal				**165,431,200**
Waka				
i. Extension of main distribution line to host community. HDPE OD 90		2000	35,500	71,000,000
ii. Expansion of distribution network. HDPE OD 40		900	15,000	13,500,000
iii. Construction of additional PSPs		15	250,000	3,750,000
iv. Metering PSPs (new and current)		22	133,200	2,930,400
v. Chlorination unit		1	24,000,000	24,000,000
vi. Install network fittings				16,900,000
Subtotal				**132,080,400**
Luwakoke				
i. Upgrading of main distribution line. HDPE OD 90		2000	35,500	71,000,000
ii. Extension of main distribution line. HDPE OD 63		1500	21,000	31,500,000
iii. Expansion of distribution network. HDPE OD 40		700	15,000	10,500,000
iv. Construction of additional PSPs		35	250,000	8,750,000
v. Metering PSPs (new and current)		10	133,200	1,332,000
vi. Chlorination unit		1	24,000,000	24,000,000
vii. Repair leakage on reservoir				300,000
viii. Replace pump (Q=9 m3/h) to meet resource capacity, incl. motor and control panel		1	20,000,000	20,000,000
ix. Repair broken taps		3	50,000	150,000
x. Install network fittings				22,600,000
Subtotal				**190,132,000**
Doma				
i. Expansion of distribution network. HDPE OD 40		1200	15,000	18,000,000
ii. Construction of additional PSPs			250,000	-
iii. Metering PSPs (new and current)		12	133,200	1,598,400
iv. Chlorination unit		1	24,000,000	24,000,000
v. Install network fittings				3,600,000
vi. Repair leakage on reservoir				300,000
vii. Installation of lights in all structures				44,000
Subtotal				**47,542,400**
TOTAL				**548,186,000**

5 Roadmap for Transfer of Water Systems in Obongi District

This chapter presents the roadmap for handing over the responsibility of management of the 4 water supply schemes *viz* Luwakoke, Longa I, Waka and Doma from UNHCR to NUWS. The critical activities in this transfer are:

i. An agreement between OPM, UNHCR and MWE on responsibilities during the transfer, especially responsibility for financing key rehabilitation works and financing user-fee subsidies.
ii. Gazette from Ministry of Water and Environment, demarcating the water supply areas and appointing the Northern Umbrella for Water and Sanitation as the Authority to manage the gazetted area.
iii. Rehabilitation and expansion of the systems to enable the Umbrella to meet the objective of increasing water coverage and improving levels of service.

The process to be followed in the transfer of the schemes from UNHCR to the Water Authority is presented below:

I. **Gazetting of water supply area**: The Ministry of Water and Environment to gazette the Tula and Palorinya sub-counties to a responsible Water Authority. The Northern Umbrella for Water and Sanitation is already the only Water Authority in the small towns and rural growth centres in Obongi District. In order to consolidate and create opportunities for economies of scale, it is recommended that the NUWS is gazetted as Water Authority, serving the communities in Tula and Palorinya sub counties (refugee and host communities).

II. **Joint Due Diligence and Asset Verification:** A joint due diligence and asset verification exercise to be carried out following gazetting of the water supply area. The assessment team shall comprise of the Water Authority, UNHCR, Obongi District Local Government, LWF and URCS (the outgoing IPs / OPs). The objective of the assessment shall be to verify the assets that are to be handed over; to verify the condition and capacity of the existing water supply infrastructure; and verify the improvements required. The asset register and condition assessments prepared during this assignment shall be used as the basis of the due diligence exercise. The findings of due diligence will also be used to inform decisions relating to financing of infrastructure upgrades and to inform the scheduling for the effective take-over of the system.

III. **Handover Meeting and signing of MOU:** Following the due diligence exercise, the key parties i.e. Water Authority and UNHCR shall hold a handover meeting to discuss the following topics, among others:

- The findings of the joint asset verification exercise and the requirements for rehabilitation and upgrade;
- Roles and responsibilities of the parties both during and after the transfer;
- Any outstanding liabilities of the IP/OP (e.g. energy bills, staff emoluments, statutory payments, pending supplier invoices), compensation demands.
- The management model under the new authority including the following topics:
  - The gazette & its meaning.
  - The governance and management structure employed by the Water Authority.
  - Authority's procedures for new connections, billing, payment of user fees, management of PSPs etc.
  - Consideration of the existing staff.

- A transition period during which communities would be sensitized of the change in management and its implications, especially with respect to user fees and payment of bills and during which rehabilitation works shall be undertaken. The duration of the transition period shall also be agreed during this meeting.

The issues and agreements during this meeting shall inform an Agreement to be signed by the parties.

IV. **Stakeholder Engagements:** The Water Authority in liaison with OPM and with support from the IP/OP shall embark on stakeholder engagements with local leadership and users / customers to communicate the changes in management of the water system and the roles and responsibilities of the stakeholders. It is important that stakeholders are sensitized on critical implications such as user fees and revenue collection; levels of service available and their responsibilities as users of the system.

V. **System Upgrades:** The transition period shall be used to carry out system upgrades and interventions needed to immediately improve service delivery. The NUWS shall use this transition period to develop their approach to management of PSPs; collaboration with UNHCR and their partners etc. During this period, the IP/OPs shall manage the systems and train NUWS in operation of the schemes as part of the handover process.

VI. **Effective takeover of the Systems:** At the end of the transition period the NUWS as the Water Authority shall commence direct management of the system. Immediate actions include establishment of office, community engagements, customer mapping, staff training in the new operational procedures such as billing, commercial, stores and procurement etc.

A roadmap for transfer of the systems is presented below.

Table 10: Roadmap for Transfer of Water Systems

Activity	Output	Lead Office	Participating Office	Timeline
Meeting to agree on transfer responsibilities of MWE / OPM / UNHCR	Minutes of Meeting	MWE	- OPM - UNHCR	29 January 2021
Gazetting of water supply area to Water Authority	Gazette of the GOU	MWE		TBD
Verification and due diligence on condition and functionality of assets	Due diligence report	NUWS	- UNHCR; - IP / OP;	1 month from receipt of gazette from MWE.
Handover Meeting and signing of implementation Agreement between UNHCR and Water Authority	Signed Agreement	- UNHCR; - NUWS		Shall be determined by the parties.
Rehabilitation and upgrade works	Completion certificates	UNHCR	- IP/OPs; - NUWS	To be completed during the transition period
Stakeholder Engagements and Sensitization		NUWS	- UNHCR; - OPM	Shall be determined by the Umbrella
Management during the transition period		- UNHCR; - IP/OPs;	- OPM, - NUWS	Duration of the transition to be determined by the parties.

Annex 1: Asset Register and Condition Assessment
(as @ October 2020)

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