Executive Summary

Final Evaluation Report of Host Communities Critical Water Infrastructure Rehabilitation Program in Jordan

September 2022





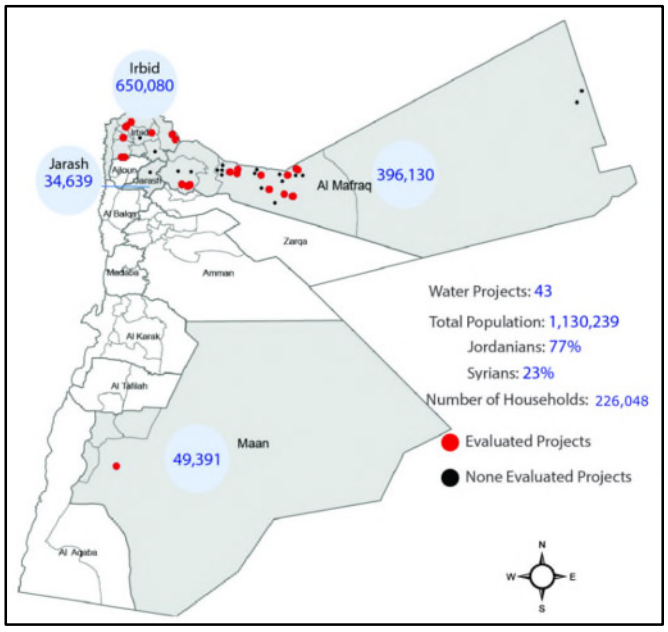

1. Evaluation Objectives and Background

This summary provides a brief overview of the key findings, lessons learned and recommendations from the final **evaluation of the WatHab program "Host Community Critical Water Infrastructure"** implemented between 2014 and 2021 in Jordan in response to the Syrian refugee's influx. During this period 43 water projects were executed. The final evaluation was carried out between January – August 2022 and was aimed at examining the program outcome/outputs in terms of:

I) Accountability to affected population: evaluate whether the needs for water of Syrian refugees and Jordanian host communities are met.

II) Document lessons learned to improve future program planning and achieve objectives more effectively

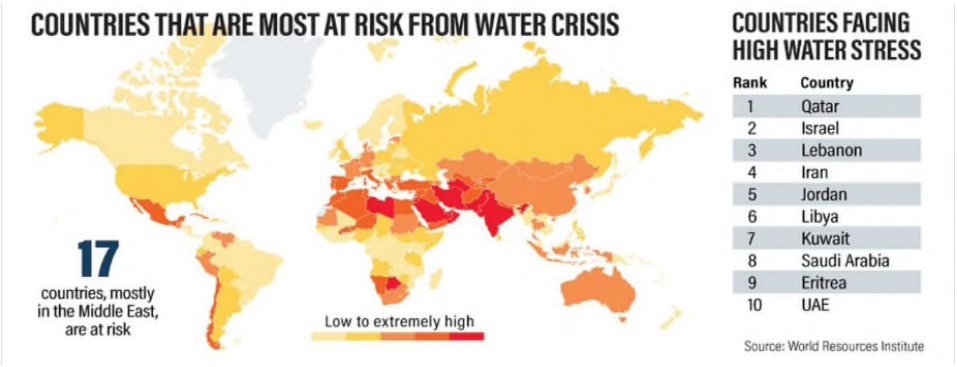
III) Value of money and efficient implementation of program activities.



A mixed method (qualitative and quantitative) was applied to collect primary data through surveys, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and through a desk review of project documents. The 3 tracks (timeframe) approach was applied to reconstruct the context **"before"** and **"after"** the ICRC interventions and **"nowadays".**

1.1 Situation Analysis

Jordan is the **fifth** most water scarce country in the world. The annual water per capita dropped to **46[1] m3/ca/yr. Water is supplied rotationally**, sometimes **once every three weeks** in some areas due to water demand and limited water sources. Combined with the l**ow operational efficiency** of existing water **pump stations (below 45%)**, and physical losses in transmission lines **(between 40 to 70%)**, the average **daily per capita** share is much less than the national standard (**40-65 LCD** compared to the target of **80[2] LCD**). As result, water is insufficient for families' daily needs: drinking, cooking, and personal hygiene. Consequently, people rely on alternative water sources. Moreover, with the forecasted population growth (estimated at 11M in 2021 (**1,36M Syrian refugees**) and 16.8 M by 2040), the water demand will increase significantly.



[1] GIZ Rapid Assessment of the consequences of declining water resources

[2] Ministry of Water & Irrigation National Standard for LCD (Amman=120, Governorates=100, remote areas=80)

1.2 ICRC "Host Community Critical Water Infrastructure"

The program's objective was to improve water supply system and increase the operational efficiency of **43 water projects** by equipping and rehabilitating: Pumping Stations - including water reservoirs and water trucking filling points (22), Water Transmission Lines (16), Boreholes (2), Water Treatment Plants (2) and flood mitigation (1). The program had a **total direct cost of 26,7M CHF.**

2. Key findings

The program achieved its objective of meeting the wide and specific needs of both Syrian refugees and Jordanians in most affected host communities through equal access to safe and adequate water by improving water infrastructure and strengthening the capacity of water utilities, though not all the improvements of infrastructure were fully sustained due the limited resources and capacity of Yarmouk Water Company (YWC).

Water System

- The infrastructure interventions dramatically **improved the operational efficiency** of water pump stations from **22% to 86%** right **after** the intervention and **reduced physical losses** in Transmission Lines from **70% to zero** in some cases. The water supply system becomes more reliable, where the frequency of interrupted supply significantly dropped after rehabilitation.
- The gain in water pump stations' operational efficiency was lost by **HALF** due to **the poor maintenance post interventions** and **lack of supply of genuine parts.**
- **Human resources** (inadequate staff, skills, and knowledge) were a significant factor in the drop in the operational efficiency of water projects.
- There were specific technical issues (e.g. dysfunctional valves at pump outlets) that were prevalent at a high proportion of stations.
- Although **Revenue** collection for YWC was **growing** in the past **3 years**, **operational cost** on the other side has also been **inflated** mainly by **Energy** cost where **consumption of electricity has grown up drastically**, leaving YWC to continue running in **deficit**.

Impacts on households

- The **impact on households was also significant**
  - The number of persons who receive less than **20 LCD** dropped from **26,000 to 6,000** persons (- 77%).
  - Number of people who receive water between **20 and 80 LCD** increased from **381,000 to 427,000 persons** (+ 12%).
- Despite the deterioration of the water *supply* over time, the **changes at the household level in water availability were less affected**. For example:
  - There was a **reduction** in household reliance on purchasing additional water from **water trucking immediately/after** the water intervention, and a similar level of reliance **nowadays**.
  - **Financial burden** on HHs to purchase water through trucking drastically **dropped** immediately **after** the interventions but appears to be **slightly increasing** again **nowadays**.
- The public water network is the main source for nearly **90%** of households, **83%** of households still rely on purchasing additional water from other different sources, mainly **water trucking (35%) and bottled (27%).** Expenditure on water (both public and private sources) remains high at **30% of household income**.
- Water pressure at the household level improved immediately **after** the interventions for households though it remains **insufficient** for the same proportion of households as **before** the interventions.
- Although the tension between Syrian refugees and Jordanians related to water supply was/is not a major issue in the opinion of most of the interviewees, though **a slight decline has been observed**.
- Water supply has improved and satisfied the needs of **ALL** community segments as indicated by household members, school and health facility managers, adolescents and youth,female-headed households and community health workers.

Accountability to affected populations

- The evaluation identified a **very limited number** of households and other stakeholders who participated in water related surveys or consultations organized as part of the water intervention program.

Value for money

- Water system improvement and **efficient** utilization of program resources **(26.7 M CHF)** helped to address the needs of **1.2 Million Syrians and Jordanians** to access safe and adequate water. **A comprehensive approach and the quality of work** implemented ensured service continuity long enough until the operational efficiency started to deteriorate due to improper maintenance.
- A **gain of 102%** of the program cost has been achieved through cost savings in HH water trucking and YWC operational cost over the period (2014-2020).

3. Program evaluation

Applying ALNAP evaluation criteria in a humanitarian context, a scale of 1 to 5 (Excellent=5, Good=4, Fair=3, Poor=2, Very Poor=1) is used below in the evaluation of program interventions based on evaluation criteria.

R1. Relevance / Appropriateness	R2. Impact

• Needs of both Syrians and Jordanians to have access to safe and sufficient water were addressed and these needs were met by program interventions.
  ◂ ***Although, the rehabilitation of the existing water pump stations and replacement of transmission lines were able to reach a daily per capita share sufficient for the basic needs yet it is still below the national standard (80LCD).***
• Program outcomes/objectives/activities were SMART and aimed to increase water system reliability by
1. Improving project's operational efficiency and more regular and sustainable water supply.
2. Strengthening water companies' operation and maintenance capacity to the extent possible
3. Aligned with other key national water strategies like water demand/supply, community resilience, water loss reduction, energy efficiency, water resources conservation, sustainable solutions to climate posed changes related issues
  ◂ ***Installed solar units for pump stations' lighting system had Insignificant cost reduction in energy cost.***
  ◂ ***Program interventions focused on water loss reduction in water transmission lines but neglected water loss reduction at the distribution network, where water losses are high.***
• Program interventions were shaped in consultation with WAJ/YWC and local water companies.
  ◂ ***No direct consultation of beneficiaries was conducted in the program design***
	✓ Dependency on public network has been increased over water trucking, ***but yet a high percentage of HHs still get additional water from other sources to complement their daily need for water.***
	✓ Equal & safe water distribution to ALL HHs through public network and a more reliable water system. ***Though water losses through leakages and the risk of water contamination will remain high in the distribution network.***
	✓ Wide and Specific needs of different community segments by (gender, and age) in HHs, schools, and health facilities were met.
	✓ Improve in daily per capita share, ***yet it is still below the national standard***.
	✓ Tension related to water supply between Syrian refugees' families and Jordanian host communities reduced.
	✓ Water systems become more resilient to climate change effects (flooding). ***Though, only water pump stations constructed below ground level were protected through flood mitigation measures.***
	✓ Drop in the repair and maintenance costs for the rehabilitated projects.
	✓ Energy savings and water loss reduction in the water system were achieved.

⇨ **Score=3** ★★★☆☆	⇨ **Score=3** ★★★☆☆
R3. Coverage	**R4. Efficiency (Value for the money)**
• Equal access to water from both Syrians and Jordanians. ***Nonetheless, some HHs still have inadequate access due to issues in the distribution network (weak pressure, misuse in water distribution) and household connections (rented houses, shared connection, limited storage capacity). Though some of these reasons are beyond ICRC control and they are the responsibility of the community and water company.*** • Equal coverage of different gender and age needs • Water was adequate to meet COVID19 additional needs for hygiene practices.	• Efficient use of program financial resources over program activities with NO relevant deviation in project estimated prices. ✓ Program interventions were able to achieve cost savings (102%) throughout the maintenance cost of 43 projects and alleviate the financial burden to purchase additional water from water trucking for (5.89%) of the 226,000 HHs.
⇨ **Score=4** ★★★★☆	⇨ **Score=5** ★★★★★

R5. Effectiveness

- ✓ Program interventions have effectively increased the operational efficiency of 43 projects and improved access to safe and sufficient water to 1.2 M Syrians & Jordanians.
  However, this achieved gain in project operational efficiency has deteriorated due to water companies' maintenance incapacity and the absence of genuine parts where some suppliers are not present in Jordan or the region.
- ✓ Program interventions effectively contributed to strengthening water companies' capacity and reducing operation and maintenance costs for the 43 water projects.
- ✓ Improved reliability of water system has increased beneficiaries' willingness to pay water bills.

⇨ **Score=4** ★★★★☆

R6. Connectedness

- ✓ Program objectives/outcomes/activities were able to connect or shift from emergency response activities to community resilience programming by provisioning sustainable water services through infrastructure rehabilitation and utilities capacity strengthening.
  A more structured and diverse capacity building program on operation and maintenance should have been implemented.

⇨ **Score=4** ★★★★☆

R7. Coherence

- ✓ Program Interventions have limited the effects of armed conflict on Syrian refugees by meeting their basic needs of survival (WATER).
- ✓ Alleviated social tension between Syrians and Jordanians related to water supply.

⇨ **Score=4** ★★★★☆

R8. AAP - Accountability of Affected Population

- ✓ No participation or consultation with beneficiaries or community representatives during the planning and design phase of the program.

⇨ **Score=1** ★☆☆☆☆

R9. Coordination

- ✓ Close coordination of program interventions with WAJ/YWC/local water companies across program phases.

⇨ **Score=5** ★★★★★

R10. Sustainability

- ✓ Energy saving, Sustainable and Low operation & maintenance costs through the use of VFD pumps, pumps & pipes resizing. ***Despite the several advantages of using VFD pumps in water systems to increase pumps lifespan and reduce maintenance and energy cost, installed VFD pumps in at least one pump station were not fit for the purpose where water is pumped at max pressure to reach distant areas rather than optimizing water flow and pressure.***
- ✓ Use of Solar systems in pump stations lighting systems. ***However, a solar system could have been used to operate the entire pump station to achieve a significant saving in energy cost.***
- ✓ Innovative engineering and technical designs like a bi-directional flow of water pipe connection to increase water system reliability.
- ✓ Installation of water filling points to provide sheep herders (livestock) and embrace host community livelihood.
- ✓ Water level meters and monitors that allowed better water production monitoring and management.
- ✓ Flood mitigation measures to safeguard water pump stations from flooding.
- ✓ ***Achievement reached through water supply improvement and operational efficiency went down due to water companies' limited capacity in operation and maintenance***

⇨ **Score=3** ★★★☆☆

R11. Learning

- ✓ Feedback/Remarks/Observations were collected from each project to inform new projects' planning and design and allowed to shift from emergency to community resilience programming. ***Though, the program has not been adjusted to accommodate the deterioration in the water station's efficiency and to discuss the impact of water company's incapacity in operation and maintenance on interventions sustainability after project completion and handover.***
- ✓ ***No program reviews were conducted to assess constraints and map out risks that might affect program implementation and delivery of results***

⇨ **Score=3** ★★★☆☆

Overall Program Evaluation
Program interventions were able to address the wide and specific needs of both Syrians and Jordanians by providing equal access to safe and sufficient water to all community segments and strengthened the capacity of water companies in operation and maintenance. In contrast, the gain achieved in water projects operational efficiency immediately after rehabilitation works, deteriorated due to both External and Internal factors that impacted the sustainability of accomplished results. External factors are YWC's limited resources for operation and maintenance and project staff capacity and knowledge. While Internal factors such as no community consultation or participation in program shaping and lack of follow-up visits to assess water projects later after work was handed over.
Overall Program Score = 3.6 ★★★½☆

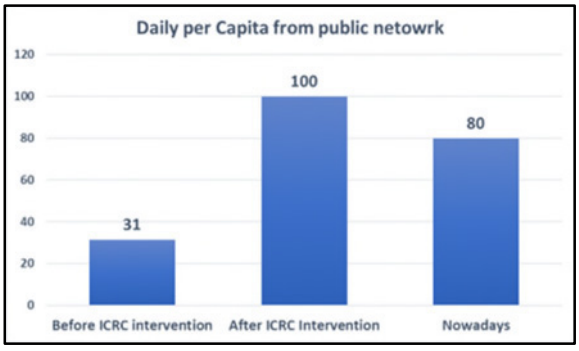
4. Lessons learned

Lesson 1	Water project's operational efficiency is maintained through regularly performed **routine and preventive maintenance.** Regular maintenance will keep water projects far from breaking point and ensure uninterrupted water supply and equal access to ALL.
Lesson 2	**Improvement of the water supply system reduces** dependency on getting additional water via **water trucking**, hence reduced the financial burden on vulnerable families.
Lesson 3	Water company's operational and maintenance capacity is strengthened, through: • **Energy Efficiency:** Use of Proper pumps and pipes sizing; review pros and cons of using VFD pumps in non-continuous water supply system; Wider use of Solar energy • **Water Loss Reduction:** Replacement of TLs; Procurement of repair and maintenance spare parts, tools, equipment and machinery • **Safety and Security:** Re-adapt chlorine gas pit, shower and mask, chlorine detection; Operator room, main building, fencing and security gate • **Climate Change:** Flood mitigation measures at water pump stations; Design of water pump stations • **Capacity Building:** Training of project operators, technicians and engineers on O&M best practices. • **Equipment Standardization:** Provision of equipment with no local agent or supplier for genuine spare part have led to the use of locally or low-quality parts
Lesson 4	**Absence of community participation** or consultation in program design would overlook the details and specific needs of beneficiaries

5. Program highlights

5.1 Operational efficiency Improvements

Based on the technical assessment of the rehabilitated pumping stations, water per capita share (LCD) was calculated **"before", "after" and "nowadays" based on the amount of water supply from projects and population served (NRW is not factored).**
It is evident that the **LCD tripled after the implementation of ICRC projects** implementation in the affected areas. However, it is also evident that there is a **decline (of one-third)** since the projects were finalized this is mainly caused by the **deterioration of the pumping station's operational efficiency** due to **the lack of proper maintenance.**

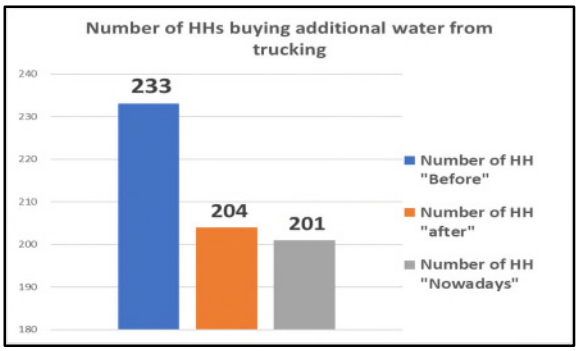


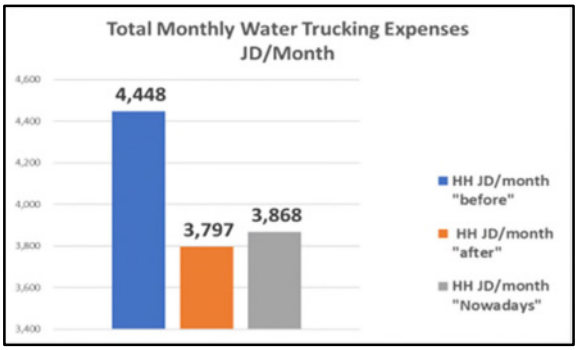
5.2 Improvements in Water Quantity

Water was sufficient for most of the beneficiary survey participants (74%) and has slightly changed across the three timeframes.

5.3 Water trucking

Significant Drop in the Number of households surveyed and supplying additional water from trucking from **233 before** the intervention to **204 (5.9%) after** the improvement of the water supply system, For the entire **226,000 HH** benefited from the program, this represents **13,321 HHs** have **relied more on public network rather trucking.**

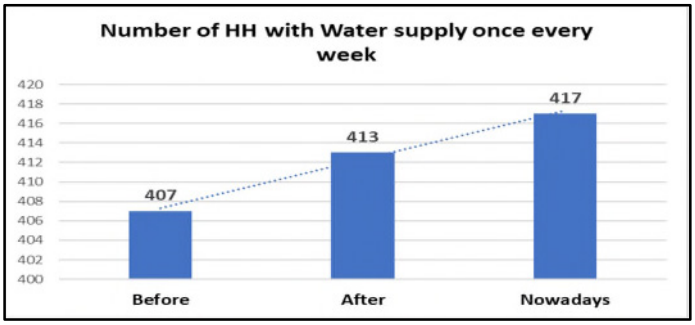




A decrease in HHs expenses on water trucking due to increase in water quantity from public network after the operational efficiency of projects increased. Slight increase "nowadays" due to a decrease in daily water per capita as a result of the **deterioration in water projects' efficiency.** Overall water (all sources) budget is 30% of family income.

5.4 Number of days per week pumped

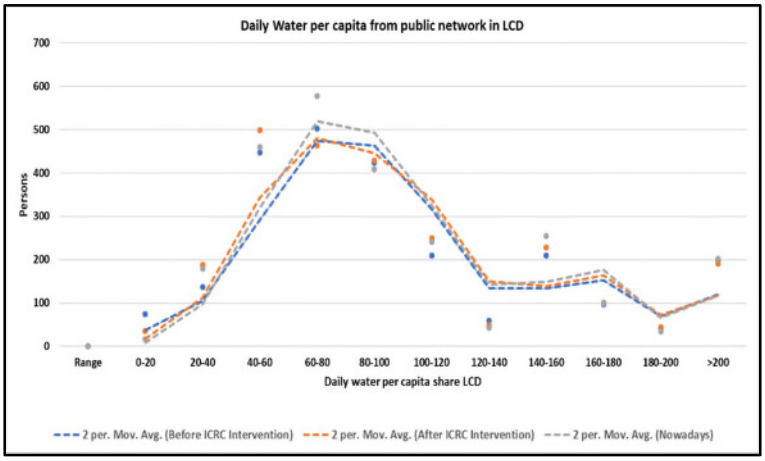
Over 90% of the HHs, receive water **once a week** with an **increased TREND** in the number of HHs **after** ICRC interventions and nowadays. It implies that for the (**entire population served by the program**), the number of HHs receiving water once a week **increased** by **3332** HHs **after** the intervention and further **increased** by **2189** HHs **nowadays**.



5.5 Improvement in daily per capita share

Program interventions improved daily water per capita from the public network **(based on water consumption and billing data at HHs).**

- **51% decrease** in the number of persons receiving **> 20 LCD** before to after the interventions and further reduced by **53%** nowadays due to an increase in water amount supplied after the operational efficiency of water projects has been increased.
- **Increase** in number of people receiving **20-40 LCD** by **12%** right **after** the interventions due to water system improvement, through **decreased** by **8% nowadays** due to deterioration in water projects' operational efficiency.
- **Overall, the trend shows an increase** in the number of people receiving water **after vs before** interventions due to the **significant** improvement in water projects' operational efficiency, while nowadays, the amount of water produced/distributed by YWC internal and external sources has tripled over the first quarter of 2022, increasing litter per person per day.



5.6 Water Loss Reduction and Number of breakdowns in Transmission Lines

The percentage of physical water losses dropped from **70% "before" the intervention to 0%** "after" the replacement of **39.44 km** of old transmission lines, for instance, the number of breakdowns in Jdaitta Transmission Line dropped from **208 before 2020 to 0 in 2021 and 2022**.

5.7 Program Cost Benefit

A financial analysis of the saving generated from the number of **HHs that are no longer buying additional water via trucks** and the operation and maintenance costs of the projects that have been rehabilitated under the ICRC program is detailed below.

Total number of projects implemented under the ICRC program The estimated total population reached The sample size of the survey	43 1,130,239 individuals (226,048 HHs) 3223 individuals (543 HHs)
Based on evaluation results Number of HH buying additional water via trucks Number of HHs stopped using water via trucks	"before" interventions= 233 "nowadays" = 201 233-201 = 32
% Of HH dropped trucking	32/543 (Total HHs sample survey) = 5.89%
Estimated total number of HHs dropped water trucking	= (5.89% * 226,048HHs) = 13,321 HHs
The average monthly cost of water trucking of ONE HH	19.4 JD (2-4 JD/1 m3)
Monthly saving cost for all HHs dropped water trucking	= 19.4 JD X 13,321 HHs = **258,427 JD**
Yearly saving cost from water trucking	**3,101,124 JD**
Breakdown of medium size water pump station yearly maintenance cost -2 pumps overhauled two times per year -Borehole pump replaced -Valves	 20,000 JD 6,000 JD 4,000 JD
Total maintenance cost	**30,000 JD**
Total Annual Maintenance cost of 23 WTP+PS rehabilitated by ICRC	**690,000 JD**
Accumulative Depreciation (3% annum)	**3,616,926 JD**
Total amount of Savings from (WT+Maintenance) in CHF per year	**5,118,017 CHF**
Total amount of Savings after Depreciation (2014-2020)	**27,091,178 CHF (102% Gain)**
ICRC total direct cost of the program	**26,680,421 CHF**

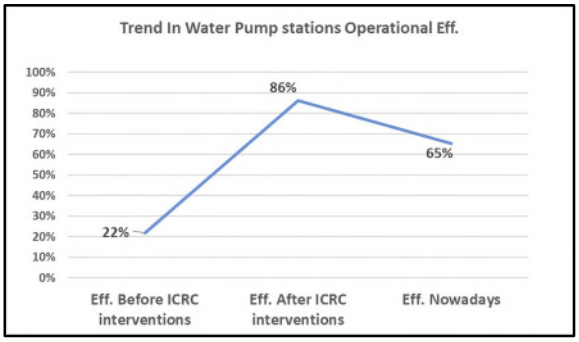
5.8 Technical impact

VFD pumps	**Resizing pumps and pipeline**
✓ Optimized pump flow rate and pressure ✓ Power consumption adapted to water demand and pressure ⇨ Energy Savings ⇨ Water Loss Reduction ⇨ Less maintenance and long life span	✓ Optimum flow rate and pressure ✓ Equal water distribution ✓ Reduce energy cost-effectively ⇨ Energy savings ⇨ Water Loss Reduction ⇨ Less maintenance and long life span
Bi-directional flow	**Flood mitigation projects (Climate change)**
✓ Improved water system reliability ✓ Contingency supply ✓ Allows transport additional water from new sources ⇨ Energy Savings	✓ Protected 3 pump stations from being overflown in case of flood ⇨ Prevented water supply shortages to beneficiaries
Filling Points	**Water Storage**
✓ Provide sheep herders with water ⇨ Hence community livelihood ⇨ Reduce illegal connections	✓ Replacement of improperly sized and rusty tanks ✓ Appropriately sized concrete tanks ✓ Reduce water losses ⇨ Increase water system reliability
Water flow monitoring and connection to SCADA System	**New Transmission Lines Construction**
✓ System operation optimization ✓ Improved water management ⇨ Water sources conservation ⇨ Energy Saving	✓ Reduce water losses ✓ Reduce water supply interruptions ✓ Ensure water quality ⇨ Improvement in the daily water per capita share. ⇨ Water loss Reduction

Solar Power to operate PSs lighting System	Supply repair and maintenance / Training
✓ Renewable Energy ⇨ energy saving (minor)	✓ Faster repair of network breakdowns ✓ Operators' O&M skills improved ⇨ Improved Operational & Maintenance ⇨ Water loss reduction
Chlorine gas cylinder Pit	
✓ Provide safe working environment to project personnel and surrounding community from gas leakage incidents ⇨ Safety operational procedures	

6. Program Challenges

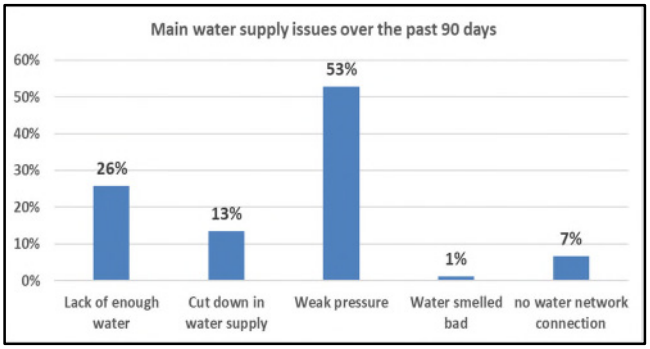
6.1 Deterioration in operational efficiency



Poor maintenance capacity of both (routine and preventive) in local water companies resulted in the deterioration in water projects' operational efficiency, hence water supply services due to:

- Lack of qualified (operators, and technicians)
- Inadequate specialized staff (electricians, mechanicals, plumbers, welders, etc...),
- Lack of knowledge of operation and maintenance best practices,
- Low salary scale and wages, public recruitment rules and regulations for new staff,
- Lack of necessary spare parts and tools for repair and maintenance,
- YWC's limited financial resources.

6.2 Water Pressure Issues



- **Half** of the surveyed HHs reported Weak water pressure across the three timeframes, especially in HHs located at high elevation areas.
- **16%** of HH have faced problems with water supply over the **past 3 months**.
- **Weak** water pressure was the main issue (53% of respondents).

The insufficient amount of water supplied due to the limited available water sources compounded with the rapid drawdown in groundwater level and water losses at the networks, HHs installed online pumps on the network causing a significant drop in the pressure of water to other households.

6.3 Accountability to Affected Populations

Throughout all field surveys, **only 4 House Holds and one School manager** participated in water related surveys and no survey or consultation was organized under the ICRC program.

6.4 Technical issues

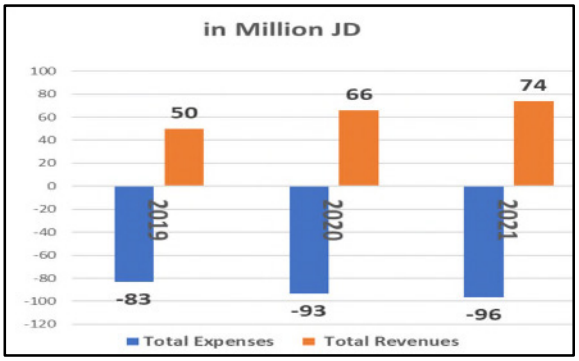
Dysfunctional non-return valves	Design Issues
✓ There were difficulties in operation and maintenance due to dysfunctional non-return valves at pumps outlets in over 80% of the 12 water pump stations under evaluation	✓ Difficulties in Operation & maintenance in 3 pumping stations that were constructed 1.5 to 2 meters below ground level were extremely difficult

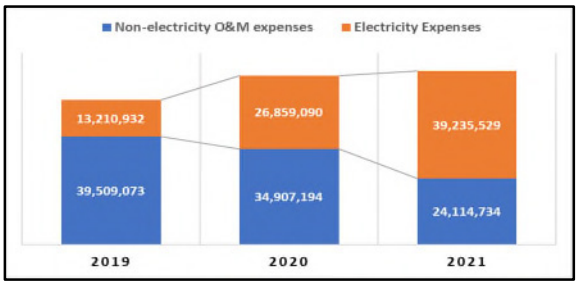
Local providers of Equipment and Supplies	Project Documentation
✓ Difficulties in maintenance of pumps in some projects due to lack of genuine parts since no local representative of those suppliers exist in Jordan, leading to replace these parts with low quality locally fabricated parts.	✓ Lack of proper project documentation such as (progress reports, closure reports, list of participants in the training courses and training materials) inside WatHab unit.

7. Other Relevant Findings

7.1 YWC Operational capacity: Revenue vs Expenses

One of the partners, Yarmouk Water, company has had sustainability issues for many years. Even though the revenue increased in the last 3 years, the expenses also increased significantly. Specially the **electrical supply expenses**, that in 2021, represented **+60%** of the total amount.





The main reason for the increase in electricity expenses is energy consumption increased from 1500 GWH in 2014 to 2000 GWH in 2019 and 2250 GWH in 2021.

7.2Daily Water Consumption per capita (Residential Subscribers)

Public water network is the main source for 90% of HH. Daily per capita served in Yarmouk Water Company areas is much lower than in the remaining country areas served by Miyahuna (-14%) and Aqaba (-47%) water companies, mainly due to Yarmouk Water Company limited water resources, rapid drawdown in groundwater and water supply operational issues.

8. Recommendations

Program Objectives/needs Program Design		
Audience	Recommendation	Impact
ICRC	**Topic1: Projects Identification and Selection** More systematic and multi-indicator approach in project identification and selection to be applied. Engage beneficiaries in program shaping and needs identification through consultation process.	Result-based programming bottlenecks assessment
ICRC/YWC/ Local water companies	**Topic 2: Support Community Resilience** Financial resources need to be mobilized to increase rehabilitated projects' operational efficiency to at least 75%, by the maintenance of pumps and defective equipment. Increase daily water per capita throughout the construction of HHs rain harvesting/collection system.	Increase daily water per capita. Reduce abstraction and preserve water resources Increase water system reliability
ICRC/MWI/ WAJ/YWC	**Topic 3: Inadequate human resources** Advocate change/improve existing recruitment rules and regulations to overcome the shortage of adequate and specialized staff for operation and maintenance.	YWC human resources is strengthened to ensure quality operation and timely maintenance. Water projects Operational efficiency maintained.
ICRC/WAJ/ YWC	**Topic 4: Structured Capacity Building program in place.** ➔Capacity needs assessment of project operators, technicians and engineers will help to identify the gaps and	Water projects Operational efficiency will be properly maintained.

Program Objectives/needs - Program Design		
Audience	Recommendation	Impact
	needs in terms of technical themes, Operation and Maintenance best practices and project management. Review existing capacity buildings activities conducted by other partners ➔Design and carry out training courses/modules tailored to Capacity Need Assessment outcomes and improve the skills of projects operators, technicians and engineers. ➔Design and develop Standard Operating Procedures manual in Arabic.	Pumps and equipment life span will be prolonged through Operation and Maintenance best practices. Operational and Maintenance cost reduced
ICRC	**Topic 5: Enhance YWC operational and maintenance resources.** ➔Maintenance cost saving, through the support of establishing a central workshop for YWC, fully equipped with necessary equipment and tools, and technical staff training. ➔Mobile workshop for each governorate equipped with necessary parts, tools and equipment to conduct repair and maintenance onsite.	YWC operational and maintenance capacity improved through maintenance cost savings, Water system efficiency improved through timely repair and maintenance response
ICRC	**Topic 6: NRW/Water loss reduction** ➔Extend rehabilitation works of water network to include Replacement of outdated and small sized water distribution (Tertiary) network.	Ensure water quality and safety Strengthen YWC's operational and maintenance capacity through 1. Energy and Cost saving 2. Non Revenue Water reduction
ICRC	**Topic 7: Solar Power in operation** ➔Cover the operation of water pump stations through the installation of a solar hybrid system.	Energy saving YWC Electricity bill reduced More resources for project maintenance
ICRC	**Topic 8: Improve Project Implementation** ➔Purchase supplies and equipment where spare parts are available in the local market. ➔More Engagement of YWC/local water companies engineers in technical bids evaluation or arrangement is made for a framework service contract to ensure timely and quality maintenance of water projects. ➔Project documentation needs to be improved, i.e. clear structured monthly progress reports (achieved, planned, constraints, success), similarly to project's closure report which should include the impact of project, efficiency reached, as-built drawings, list of projects personnel participated in the training.	Operational efficiency of water projects sustained. YWC operational and maintenance costs reduced Life span of project equipment prolonged.