Médecins Sans Frontières (MSF)

Five - Star Assessment Report - 2025

Water Network Performance in the Rohingya Camps, Cox's Bazar, Bangladesh

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List of Abbreviations

MSF	- Médecins Sans Frontières
IWM	- Institute of Water Modelling
NGO	- Non-Governmental Organization
DPHE	- Department of Public Health Engineering
L/P/D	- Liters per Person per Day
MSNA	- Multi-Sector Needs Assessment
LQAS	- Lot Quality Assurance Sampling
m^3	- Cubic Meter (or 1000 Liters)
RO	- Reverse Osmosis
GPS	- Global Positioning System
mg/L	- Milligram per Liter
NRC	- Nayapara Registered Camp
KRC	- Kutupalong Registered Camp

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Executive Summary

Médecins Sans Frontières (MSF) completed the 2025 Five-Star Assessment of water network services across all 33 Rohingya camps in Ukhiya and Teknaf, Cox's Bazar, Bangladesh. The aim of the study is to assess and understand water network performance, water quality, supplied water quantity, and beneficiary satisfaction. Using five indicators - water network functionality, flow capacity, distribution timing, water treatment, and beneficiary satisfaction - results were benchmarked to the 2023 IWM baseline and the expanded 2024 assessment to track progress and implementation of prior recommendations. Identified gaps/constraints will guide corrective actions and will be used for advocacy purposes.

Findings show slight deterioration compared to last year; critical monitoring gaps persist, notably widespread absence of operational flow meters that limits actual understanding of distribution. Tap-stand reliability remains inconsistent, with some camps maintaining high uptime while others face frequent breakdowns and slow repairs. The quality of water is still questionable while beneficiary feedback points to rising dissatisfaction.

External pressures intensified in 2025, more than 150,000 new arrivals increased demand on already stretched systems, while reduced funding and low rainfall in Teknaf during 2024 further constrained production and distribution. As a result, **many camps continue to fall short of the emergency standard of 20 L/P/D.**

Overall, the 2025 assessment confirms that targeted investments in metering and pressure management, faster preventive maintenance, and equity-focused distribution - combined with drought-contingency measures and resource mobilization - are essential to stabilize service quality and meet minimum standards amid growing demand.

1. Introduction

A. Assessment Context and Rationale

On 25 August 2017, large-scale violence in Myanmar's Rakhine State triggered a mass displacement of Rohingya refugees into Bangladesh, compounding an already significant refugee presence in Cox's Bazar District. The rapid influx led to the establishment of densely populated camps in Ukhiya and Teknaf sub-districts, transforming the area into one of the largest and most complex humanitarian operations globally.

Between 2024 and 2025, an additional 150,000 arrivals were recorded, further straining already overstretched humanitarian systems. The camps now host an estimated 1.3 million refugees, living in conditions marked by chronic shortfalls in education, food security, safe water, and sanitation. The situation has evolved into a protracted crisis, with sustained humanitarian dependency and limited prospects for durable solutions.

A parallel funding crisis in the Water, Sanitation and Hygiene (WASH) sector has compounded these challenges. Despite sustained efforts toward rationalization, system optimization, and cost-efficiency, severe budget reductions are undermining both the continuity and quality of essential services. These deficits have contributed to declining hygiene conditions, elevated public health risks, and an erosion of dignity and well-being across the camp population.

B. Camps, and Response Context

During the early phase of the Rohingya refugee response, WASH actors rapidly deployed extensive infrastructure to meet immediate humanitarian needs. These efforts were complemented by the construction of water

networks and surface-water treatment plants to ensure a safe and reliable water supply to the population. In parallel, tube wells equipped with handpumps were installed to supplement household access to water.

On the sanitation front, thousands of latrines were constructed, supported by sewage and desludging networks, organized fecal-sludge collection, and treatment facilities. Solid-waste management systems were established through structured segregation, collection, recycling, and disposal mechanisms, forming the backbone of early public-health interventions.

These achievements were the result of coordinated efforts among international and national NGOs, the Department of Public Health Engineering (DPHE), and the United Nations agencies. While service coverage expanded rapidly given the unprecedented scale and operational constraints, the quality and durability of infrastructure varied widely, and critical public-health risks persist due to gaps in system performance and maintenance.

Key challenges in water access and service delivery include:

- **Quantity:** Per-capita water supply often remains below the 20 L/P/D emergency standard.
- **Equity:** Persistent disparities in access both across and within camps and networks.
- **Quality and Safety:** Inconsistent chlorination and treatment practices increase microbiological risk.
- **Access Barriers:** Limited-service hours, long travel distances to collection points, and safety concerns, particularly for women and children.
- **Maintenance and Accountability:** Weak preventive maintenance, fragmented ownership, and inadequate governance leading to service interruptions and uneven performance.

C. Five-Star Assessment Background

In 2023, the WASH Sector, in collaboration with the Institute of Water Modelling (IWM), launched the first system-wide Five-Star Assessment of water-supply networks across all 33 Rohingya camps. The initiative was designed to diagnose technical and operational constraints, prioritize corrective measures, and establish a monitoring framework for tracking progress over time.

In parallel, MSF conducted a complementary structural audit within its south-western operational catchment - covering eight camps - to extend the analysis beyond networked water systems to include tube wells, latrines, and related sanitation assets. This provided an integrated view of infrastructure condition, functionality, and service reliability at the community level.

The evidence base informing the 2025 study was further strengthened through repeated household- and facility-level assessments examining needs, behaviors, and community perceptions. These included the Multi-Sector Needs Assessment (MSNA) 2025 and earlier Lot Quality Assurance Sampling (LQAS) surveys conducted by MSF in 2018, 2022, 2023, and 2024.

Building on the 2024 baseline, MSF undertook a repeat Five-Star Assessment in 2025 to measure progress in water-network functionality, identify persistent service gaps, and provide targeted, evidence-based recommendations to improve the performance, efficiency, and sustainability of WASH infrastructure across the camps.

D. MSF WASH Presence and Operational Role

Since 2017, Médecins Sans Frontières has built core WASH infrastructure for the Rohingya response in Cox's Bazar Camps: more than 400 deep tube wells; 300 latrines and showers; 16 piped water networks with 70 - 90m³ reservoirs; and two fecal sludge management units treating a combined 70m³/day. Much of this infrastructure has since been handed over to other WASH actors for ongoing operation.

Today, MSF focuses on sustaining essential services - identifying critical gaps and public-health risks; providing technical assistance, training, and capacity building; and advocating for adherence to minimum standards - despite shrinking budgets and shifting priorities.

In 2025, MSF helped stabilize the Teknaf water crisis through coordinated emergency actions with partners. MSF installed a high-capacity submersible pump (80m³/hour) in an existing borehole to supply a temporary filling point for trucking by other actors. Around 1-kilometer underground pipeline was laid, and a new filling station was constructed to serve both refugees and host communities affected by water scarcity. Throughout the response, MSF maintained continuous water-quality monitoring to safeguard supply until the crisis phase concluded - demonstrating MSF's commitment to effective, partnership-driven emergency interventions.

E. Overview of the Water Network Systems

Ukhiya (Mega Camp)

In the Mega Camp, the water-network system primarily relies on groundwater abstraction from deep boreholes, which feed into piped distribution systems. Water distribution is typically managed through scheduled shifts in the morning and afternoon, although a limited number of boreholes supply water continuously on a 24-hour basis. Ownership and management of the networks lie with the implementing partners, government, non-governmental organizations (NGOs) and agencies.

Teknaf

In the Teknaf camps, the water-supply system is more complex due to hydrogeological limitations and groundwater scarcity and salinity. The networks rely on a combination of groundwater and surface water, supported by active treatment plants connected to centralized distribution systems. Surface-water treatment plants primarily utilize rainwater, with large reservoirs constructed to store rainwater during the monsoon season. Additionally, some boreholes are rented from host-community owners, and Reverse Osmosis (RO) systems abstract and treat water from the Naf River. Water distribution in Teknaf follows a scheduled shift pattern (morning and afternoon), though water scarcity remains recurrent between February and May. During periods of reduced production, multiple WASH actors coordinate water trucking from external sources to maintain minimum supply standards.

Seasonal variability, resource constraints, and salinity risks continue to challenge sustained water availability and quality in Teknaf.

In Ukhiya and Teknaf; Storage capacities vary substantially, ranging from 5m³ to 90m³, and include a combination of Low-Density Polyethylene (LDPE) tanks and Oxfam-designed T-series tanks. Most networks operate on solar power, supplemented by battery storage and/or diesel generators for backup; water treatment is achieved either through batch chlorination or by automated dosing pumps, depending on system design. Tap-stand designs vary across the camps, typically featuring two or four taps per stand; supplied by gravity.

2. Objectives and Scope

A. General Objective

The overarching objective of this assessment is to deliver a systematic and repeatable Five-Star Assessment aimed at enhancing the functionality, efficiency, and sustainability of water-supply systems across the Rohingya camps. The assessment seeks to generate evidence-based insights that inform operational decision-making, strengthen accountability, and guide sectoral planning toward long-term service reliability.

B. Specific Objectives

The specific objectives of the assessment are to:

- **Establish the current status** of the water network by quantifying functionality, coverage, and physical condition across all camps, thereby providing a comprehensive baseline of system performance.
- **Identify gaps and operational constraints**, including technical deficiencies and management of bottlenecks, and propose feasible, context-appropriate corrective actions.
- **Assess public-health linkages** by examining how deficiencies in water-supply systems contribute to elevated health risks - particularly waterborne diseases - and by prioritizing interventions to mitigate these risks.
- **Support targeted advocacy** by producing credible evidence to engage and mobilize donors, government authorities, United Nations agencies, and WASH partners toward coordinated improvements.
- **Inform operations and capacity-building**, ensuring that future interventions and training initiatives focus on the highest-impact technical and institutional needs identified through the assessment.
- **Enable evidence-based planning** by providing robust data and analytical outputs that support effective resource allocation, program design, and policy development within the WASH sector.
- **Facilitate long-term monitoring and learning** by establishing benchmarks that allow functionality and performance to be tracked consistently over multiple assessment rounds (e.g., 2023, 2024, 2025).

C. Geographical Scope

In 2025, the Five-Star Assessment covered all 33 Rohingya refugee camps, assessing conditions at the network, tap-stand, and household (beneficiary) levels. This approach ensured a representative understanding of how water systems function and how users access services across varied hydro-geological, operational, and management contexts.

D. Temporal Scope

The 2025 assessment round was conducted between 22 May and 12 June in the Mega Camp and from 26 June to 8 July in Teknaf. It builds upon the baseline Five-Star Assessment of 2023 and the repeat round in 2024, allowing for comparative temporal analysis. This timeframe captures post-monsoon and dry-season variations in water availability and system performance, ensuring comparability of functionality indicators under similar operational conditions.

E. Thematic Scope

The assessment focuses on the functionality, efficiency, and sustainability of water-supply networks in the Rohingya camps, within the broader framework of public-health risk reduction and service equity.

The Five-Star methodology evaluates performance across five sector-endorsed indicators - water production, tap-stand functionality, distribution times, water treatment (chlorination), and beneficiary satisfaction - and two MSF-specific complementary indicators: water-network functionality and flow capacity.

While the camps show around 16,000 hand-pumped water points (tube wells), the analytical focus of this assessment remains on piped-water systems and network-level service delivery as key determinants of WASH performance, as these networks tap deep into the Dupi Tila aquifer and - ideally well chlorinated - thus present the safest option of drinking water.

3. Methodology

A. Survey Design and Approach

The 2025 Five-Star Assessment followed a staged and systematic methodological framework designed to ensure consistency, comparability, and repeatability across all 33 Rohingya camps. The process began with a focused literature review, anchored in the IWM's previous Five-Star Assessment, to refine evaluation questions, validate assumptions, and identify evidence gaps.

Building on this foundation, two structured questionnaires were developed - one for beneficiaries at tap-stand level and another for pump operators at network level. Both instruments were validated through the WASH Sector technical working group and incorporated into a concise enumerator training package covering data-collection ethics, field procedures, and quality assurance measures.

A mixed-method approach was employed, integrating quantitative data collection with geospatial analysis to evaluate network functionality, water production, and user satisfaction.

B. Data Collection Methods

Data collection employed two complementary instruments:

1. **Beneficiary Questionnaire** - administered at a tap-stand level to capture user experience, satisfaction, and accessibility metrics.
2. **Operator Questionnaire** - administered at pump-house level to document system functionality, water production, and operational conditions.

Field teams utilized ArcGIS Field Maps for data entry, allowing dynamic digital forms, offline capture, automatic geotagging, and real-time data synchronization. Supervisors tracked field progress and preliminary data quality through an ArcGIS Online dashboard. Examples of the survey tools used are shown in Figure 1.

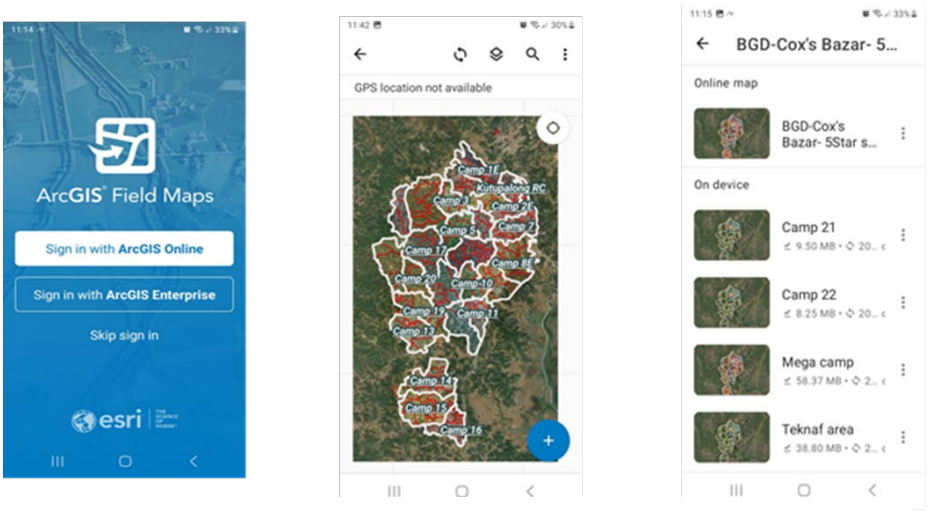


Figure 1: Data Collection Tools

Each record included GPS coordinates, timestamps, and photo documentation to ensure traceability and data integrity.

C. Sampling Framework and Size

Sampling combines random and purposive approaches to ensure representativeness and coverage.

- Beneficiary interviews were randomly selected across multiple tap-stands to reflect user diversity.
- Tap-stand and network sites were purposively selected to include those not assessed in previous rounds, improving temporal comparability.

In total, 271 water networks were evaluated, encompassing both Mega Camp and Teknaf regions.

D. Field Assessment

A total of 24 data enumerators from the camp community, working alongside MSF WASH staff, participated in a structured, hands-on training between 15 and 23 May 2025. The training covered digital form use, GPS handling, ethics, informed consent, and basic troubleshooting.

Following a pilot test conducted in Camp 9, full data collection began in the Mega Camp on 22 May 2025 and continued through 12 June 2025 (13 working days), using 13 handheld devices configured for offline capture to ensure operational continuity in low-connectivity zones.

The Teknaf round was conducted from 26 June to 8 July 2025 (six working days). Throughout the assessment, a live monitoring dashboard tracked daily progress, location coverage, and data quality in real time. This system enabled supervisors to make immediate adjustments and facilitate efficient reporting and analysis.

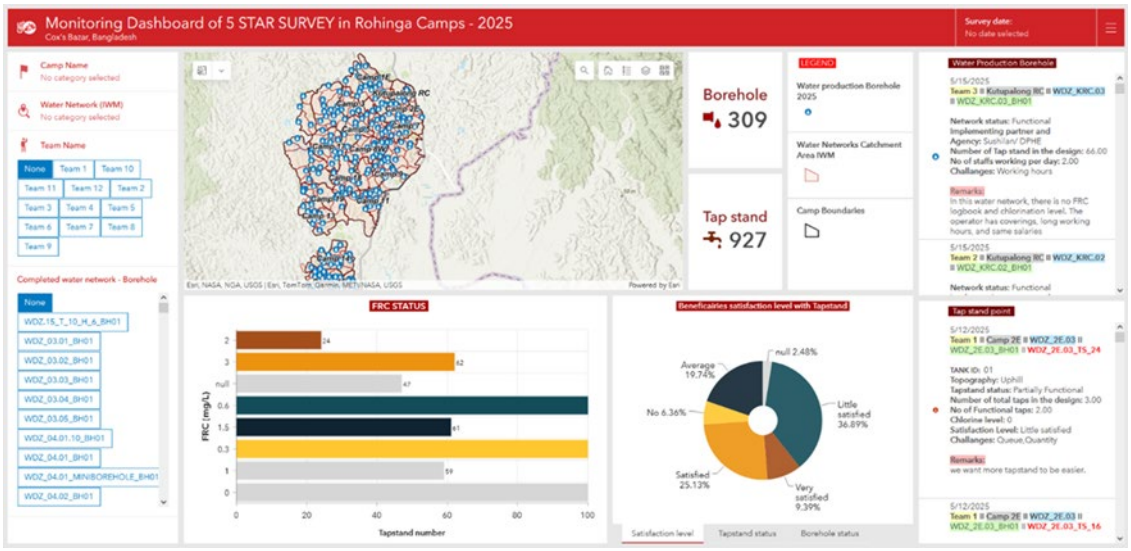


Figure 2: Data Collection Monitoring in the Survey Dashboard

E. Data Quality Assurance

Raw data underwent rigorous cleaning and validation procedures, including:

- Range and skip-logic checks;
- Duplicate and outlier detection; and
- Verification of spatial coordinates and timestamps.

Validated datasets were analyzed using R software for statistical analysis, while ArcGIS Pro was used to produce spatial maps and functionality visualizations. Analytical outputs were converted into geospatial layers to illustrate service gaps, network performance, and per-capita supply variations across camps.

Preliminary results were presented in a sector validation workshop with WASH partners, and all feedback was integrated prior to final report clearance.

F. Timeline and Workflow

The methodology followed a linear workflow as shown in *Figure* 3 encompassing the following phases:

- **Instrument Design**: Development of standardized questionnaires with skip logic and metadata.
- **Pilot Testing and Refinement**: Small-scale field validation to refine question flow and translations.

- **Enumerator Training**: Practical sessions on device operation, consent, and quality assurance protocols.
- **Field Deployment**: Full-scale data collection, followed by daily cleaning and review.
- **Quality Assurance**: Real-time dashboard monitoring and supervisor validation.
- **Data Management and Analysis**: Secure data integration, statistical processing, and spatial mapping.
- **Validation and Dissemination:** Stakeholder workshop and final report clearance.

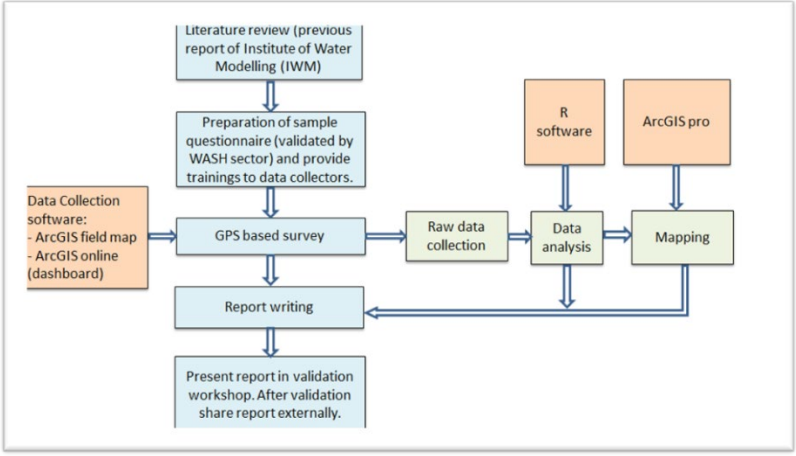


Figure 3: Survey Process Flow Chart

4. Limitations and Assumptions

A. Data Gaps and Measurement Uncertainties

Despite comprehensive coverage across all 33 camps, several data gaps and measurement uncertainties may have affected the precision of results:

- **Flow-meter functionality:** Approximately 28% of assessed water networks lack operational flow meters. In such cases, water-production data were derived from operator logbooks; where no records existed, estimates were calculated using tank volumes and average filling times.
- **Metadata completeness:** A limited number of survey records lacked full GPS coordinates or timestamps due to connectivity and synchronization delays during offline data collection.
- **Beneficiary perception data:** Satisfaction responses were generalized and did not disaggregate the precise causes of dissatisfaction (e.g., water quality, pressure, or distribution times).
- **Beneficiary population estimates:** Reported beneficiary numbers are based solely on network operator statements and may not reflect recent population changes or newly arrived camp residents.
- **Chlorine testing consistency:** Occasionally, the pool testers used to measure FRC showed results that differed from the digital chlorometers that the operating agency used on-site, indicating minor inconsistencies in free residual chlorine (FRC) readings.
- **Transportation delays:** It happened that the survey team reached Teknaf camps after the first distribution cycle due to traffic on the way from Ukhiya. Actors were requested to postpone the distribution, yet, not in all instances, the team could witness the active distribution. In these few instances, no FRC measurements could be taken.
- **Catchment delineation:** Catchment areas were based on the initial network mapping by the Institute of Water Modelling (IWM) and may not accurately reflect the current distribution of population coverage in all areas.

B. Temporal and Spatial Constraints

Field assessments are capturing the late dry-to-pre-monsoon period. Consequently, results may not fully reflect seasonal variability in groundwater levels, turbidity, or system performance during the monsoon.

The survey covers the operational functionality of water networks at the time of data collection - but may exclude networks constructed or commissioned after June 2025. For tap-stands, a representative subset is chosen according to the sampling criteria defined in the methodology. The findings and analysis therefore refer to this defined sample size, unless otherwise stated.

C. Operational and Logistical Limitations

- **Announced assessments:** Assessment visits were announced in advance to facilitate coordination and access. As a result, field conditions during observation may not fully represent typical operational realities, particularly regarding water distribution timing or maintenance practices.
- **Limited verification:** Due to resource and time constraints, datasets relied on single-visit observations rather than repeated measurements for validation. Yet, chlorination and production logbooks were taken into account whenever found at the networks.

D. Analytical Assumptions

To ensure comparability with previous Five-Star Assessments, the following analytical assumptions were applied:

- Where direct measurements were unavailable, production estimates were calculated using pump runtime and design capacity or tank volume and refill duration.
- Equal access opportunity was assumed for all households within a given tap-stand catchment, while acknowledging spatial variations in population density and service reach.
- Star-rating thresholds were applied uniformly across all camps to maintain analytical consistency.
- Records with incomplete data or identified outliers (<2%) were excluded from aggregate statistical analysis but did not materially affect overall trends.

5. Five-Star Assessment Indicators

A. Definition of Indicators

The Five-Star Assessment evaluated water-network performance against five core indicators defined by the WASH Sector and endorsed by all WASH partners. These indicators provide a standardized basis for measuring service functionality, efficiency, and user experience.

1. **Water Production:** Quantifies the total volume of water extracted and supplied, expressed in L/P/D. This indicator assesses the adequacy of production relative to Sphere and WASH Sector standards.
2. **Tap-Stand Functionality:** Evaluates the operational condition of tap-stands, measuring the proportion of fully functional units (i.e., all taps operational) and identifying maintenance or rehabilitation needs.
3. **Distribution Timing:** Assesses the number of service hours and the reliability of the distribution schedule throughout the day, indicating service consistency and equity of access.
4. **Water Treatment:** Examines treatment processes and disinfection performance, focusing on chlorine-residual compliance and the consistency of safe-water delivery from source to collection point.
5. **User Satisfaction:** Captures beneficiary perspectives at the point of collection, including adequacy of supply, waiting time, equity of distribution, and perceived safety and quality.

B. Additional MSF Indicators

In addition to the five indicators set by the WASH-Sector, MSF collected supplementary data to verify collected indicator data, identify priority intervention needs, and support evidence-based advocacy.

6. **Water Network Functionality:** Measures the operational status of pumps, reservoirs, valves, and tap-stands, with attention to downtime frequency, repair timelines, and system resilience.
7. **Flow Capacity:** Quantifies pump discharge rates and tap-stand flow rates in relation to demand, assessing whether system output meets design specifications and user requirements.

C. Performance Criteria and Thresholds

To ensure consistency and comparability across all camps, the Five-Star Assessment applied standardized performance criteria and operational definitions. These parameters were developed in line with WASH Sector guidance and validated through field training prior to data collection.

1. Functional Classification of Tap-stands

Tap-stand functionality was categorized according to observable operational criteria, ensuring objective classification across enumerators:

- **Functional:** All taps present and operational; water flow normal; no visible leakages are observed.
- **Partially Functional:** At least one tap missing or non-functional; visible leakages present; or low/uneven flow rates recorded.
- **Non-Functional:** All taps inoperative; no water flow observed during testing.

These categories formed the basis for star-rating thresholds applied under the "Tap-Stand Functionality" indicator. Tap-stands rated as ≥ 90% functional taps received five stars; those with < 70% functional taps received one or two stars.

2. Performance Criteria for Network-Level Functionality

Network functionality was defined based on operational status of pumps, reservoirs, valves, and connected tap-stands. Networks were classified as:

- **Functional:** System operational, with adequate water delivery and no major disruptions reported.
- **Partially Functional:** Temporary downtime or limited capacity due to mechanical or electrical faults.
- **Non-Functional:** System not delivering water; major failure or decommissioning confirmed.

These classifications were supported by field verification and operator interviews to ensure alignment with real-time operating conditions.

3. Analytical Thresholds

Analytical thresholds were applied uniformly across all indicators to ensure comparability between camps and assessment years:

- **Water Production:** ≥ 20 L/P/D = *adequate*; <15 L/P/D = *deficit*.
- **Tap-stand Functionality:** ≥ 90% operational taps = *5 stars*; 70 - 89% = *3 to 4 stars*; <70% = *1 to 2 stars*.
- **Chlorination (FRC):** 0.3 - 1.0 mg/L = *compliant*; <0.3 or >1.0 mg/L = *non-compliant*.
- **Distribution Duration:** ≥ 4 hours/day = *five stars*; <2 hours/day = *one star*.
- **Beneficiary Satisfaction:** > 20% "very satisfied" = *five stars*; <10% = *low satisfaction*.

6. Findings and Analysis

A. Per Capita Water Production

More than seven years have passed since the onset of the 2017 Rohingya crisis, yet overall improvements in water distribution remain limited across camps. Considerable disparities persist in some camps, the population receives >40 L/P/D, whereas others receive <15 L/P/D. Camp-wise ratings are listed in *Table 1*.

Within the Mega Camp, where groundwater resources are relatively abundant, the analysis indicates that only 46% of the population currently receives enough water (≥ 20 L/P/D) through network supply systems. Approximately 28% of residents continue to receive <15 L/P/D, while the remaining 25% access water volumes within the standard range (15 - 20 L/P/D).

Comparatively, in 2024, 55% of the population had adequate water supply, and 23% experienced insufficient access. The present assessment therefore shows a decline in per capita water availability from the network, most notably in Camps 13, 14, and 16. Minor improvements were observed in a few networks, though these were limited in magnitude (e.g., a one-star increase in a single network offset by a decrease in another within the same camp).

Camp-level ratings indicate that 42% of camps provide water more than the minimum standard; another 42% meets the minimum standard (15 - 20 L/P/D), and 16% remain below Sphere standards. While the minimum standard ensures survival and basic hygiene, it is insufficient to maintain dignity and optimal public health, highlighting the need for increased supply where feasible.

In Teknaf, overall water supply has declined across all camps, with the most significant reductions recorded in Camps 26, 27, and NRC, where the water crisis intensified compared to the previous year.

Table 1: Camp-Wise Five-Star Rating on Per Capita Water Production

Water Supply	Number of camps	Camp
Above Standard	12	Camp 1E, Camp 2E, Camp 4, Camp 6, Camp 7, Camp 8E, Camp 8W, Camp 9, Camp 17*, Camp 20, Camp 21, Camp 25
Within Standard	16	Camp 1W, Camp 2W, Camp 3, Camp 4 Extension, Camp 5, Camp 10, Camp 11, Camp 12, Camp 14, Camp 15, Camp 16, Camp 18, Camp 19, Camp 20 Extension, Kutupalong RC, Camp 24,
Below Standard	5	Camp 13, Camp 22, Camp 26, Camp 27, and NRC

*Camp 17 is mentioned under above standard per capita water distribution, however, reduced water quantities in many blocks compared to 2024 data has been observed.

B. Tap-stand Functionality

Functional tap-stands are essential to ensuring that the quantities of water supplied are effectively utilized and not lost through runoff or leakage. Their condition directly influences water-use efficiency, beneficiary accessibility, and user satisfaction, as visible and functional systems serve as a tangible indicator of service reliability and provider accountability. Conversely, partially functional or leaking tap-stands contribute to water wastage, unequal access, and reduced per capita availability, thereby undermining the overall performance of the water network. Camp-wise results are shown in *Table 2* below.

In the Mega Camp, results of all tap-stands assessed (N=927) confirm a notable decline in tap-stand functionality compared with the 2024 baseline. Of all tap-stands surveyed:

- 67% were classified as *fully functional*,

- 31% as *partially functional*, and
- 2% *non-functional*.

When evaluated at the individual tap level, the situation appears more critical: 49% of taps were found to be leaking or not operating properly, indicating widespread deterioration in tap integrity and maintenance standards.

Flow measurements were conducted for each tap to assess service reliability. Results show that 84% of taps exhibited normal or satisfactory flow rates, consistent with operational design expectations. However, partial blockages and minor leakages were observed in several systems, contributing to reduced overall efficiency.

Under the Five-Star Rating Framework, 61% of tap-stands achieved a 5-star rating (≥ 90% of taps functional), compared with 87% in 2024. The proportion of tap-stands rated 1 - 2 stars (< 70% functional taps) remained constant at 12%, while 3-star ratings (70 - <80 % functional taps) increased from 0 to 13%. This pattern indicates that a substantial portion of high-performing (5-star) systems have deteriorated to 3 - 4-star levels, reflecting both aging infrastructure and declining maintenance effectiveness.

In Teknaf, overall tap-stand functionality has shown modest improvement, although significant disparities persist across camps. Camp 27 recorded a high proportion of 2-star ratings, indicating substantial operational issues. Meanwhile, Camp 21 exhibited a decline from an average of 5 stars to 4 stars, suggesting emerging performance concerns that require targeted maintenance interventions.

Table 2: Camp-Wise Five-Star Ratings on Tap-stand Functionality

Tap-stand rating	Number of camps	Camp
≥ 90	17	Camp 1W, Camp 6, Camp 7, Camp 8E, Camp 8W, Camp 11, Camp 14, Camp 15, Camp 16, Camp 18, Camp 19, Camp 20 Extension, Camp 22, Camp 24, Camp 25, Camp 26, and Nayapara RC
80 to < 90	2	Camp 1E, and Camp 21
70 to < 80	6	Camp 2E, Camp 4 Extension, Camp 5, Camp 13, Camp 17, and Camp 20
60 to < 70	3	Camp 3, Camp 10, and Camp 12
< 60	5	Camp 2W, Camp 4, Camp 9, Camp 27, and Kutupalong RC

C. Distribution Times

Equitable and unrestricted access to water is a fundamental right for every individual. However, many households continue to leave tap-stands without collecting water due to limited or irregular water-supply hours. This constraint remains one of the most significant operational weaknesses in the current water distribution systems.

Among all five indicators assessed, distribution timing was identified as the most compromised. Only 24% of water networks achieved a 5-star rating, reflecting consistent and adequate service hours. Data indicates that KRC, Camp 10, and Camp 20 did not achieve any 4- or 5-star ratings, whereas Camp 1W and Camp 11 demonstrated superior performance, attaining predominantly 4- and 5-star ratings. These results reveal significant variability in operational scheduling across camps. The total tap-stand-level ratings are summarized in *Table 3*, excluding the tap-stands found non-functional. Table 4 provides a detailed per camp analysis.

2 or more times per day for > 2 hours	**47**
At least 2 times per day but only <=2 hours	**284**
Only 1 time per for > 2 hour	**80**
Only 1 time per between >1 to 2 hours	**270**
Only 1 time per for <= 1 hour	**225**

Table 3: Total Tap-stand Level Distribution Ratings

Reduced supply duration compels many households to store water for more than one day, leading to chlorine residual decay and an increased risk of contamination before consumption. Furthermore, uncovered or poorly

maintained storage containers provide favorable breeding conditions for mosquitoes, presenting additional vector-borne disease risks. These findings underscore the interconnectedness between operational efficiency and public-health outcomes within the camp water-supply systems.

Table 4: Tap-stand Level Distribution Ratings Per Camp

	CAMP																															
Rating	1E	1W	2E	2W	3	4	4 Ex	5	6	7	8E	8W	9	10	11	12	13	14	15	16	17	18	19	20	20 Ex	KRC	21	22	24	25	26	27	NRC
1 star	0	0	4	11	6	16	0	18	4	2	1	14	8	7	0	0	18	4	24	11	20	11	0	14	3	13	0	4	2	4	3	3	0
2 star	3	0	3	8	5	19	6	5	0	4	4	5	3	21	0	1	14	3	23	15	16	3	19	11	3	6	4	1	30	14	13	7	1
3 star	11	4	0	0	7	5	1	0	0	1	0	0	9	1	0	0	1	11	3	3	6	0	1	1	1	0	3	0	4	0	5	2	0
4 star	2	8	11	13	6	11	4	3	16	23	20	24	5	0	18	5	7	12	17	5	5	17	3	0	2	0	12	6	2	5	3	9	8
5 star	2	2	1	0	1	3	0	5	0	0	0	0	4	0	4	8	4	7	0	0	0	3	0	0	0	0	3	0	0	1	0	0	0

The assessment also revealed inconsistencies in how the indicator is interpreted and rated. For example, a network distributing water for a total of 2.5 hours per day in two intervals of 1.25 hours currently qualifies for a 4-star rating, whereas a system distributing water once daily for three consecutive hours is rated 3 stars. Such discrepancies suggest a need for further methodological clarification and standardization in collaboration with the WASH Sector to ensure fair and comparable evaluations.

D. Water Treatment (Chlorination)

Effective water treatment is essential in camp settings where environmental and personal hygiene conditions are often compromised. Proper chlorination significantly reduces the transmission risk of waterborne diseases such as diarrhea, hepatitis E, and typhoid fever, thereby ensuring the microbiological safety of distributed water.

Results from the current assessment, displayed in *Table 5* & *Table 6* indicate substantial variation in chlorine residual levels across camps. Among all water samples tested:

Table 5: Tap-stand Level Chlorination Ratings

Chlorine Residual	No. of Samples	Proportion of Total	Rating Interpretation
≥ 0.3 to 1.0	377	42%	Within acceptable range (5 stars)
< 0.3 or > 1.0	147	16%	Inappropriate chlorination (3 Stars)
0	383	42%	No chlorination detected (1 Star)

A total of 26 samples collected from Camp 20 consistently showed no detectable chlorination, suggesting persistent operational deficiencies in treatment practices. Similar issues were observed in Camps 17, 20 Extension, and 25.

Conversely, Camps 1E, 6, and 7 recorded the highest proportion of samples within the acceptable range, demonstrating effective treatment management. Evidence of inconsistent or poor chlorination control was also apparent in Camps 4, KRC, and 22, where irregular dosing practices and resource management constraints were reported.

Table 6: Camp-Wise Chlorination Ratings in Percent

	CAMP																															
Rating %	1E	1W	2E	2W	3	4	4 Ex	5	6	7	8E	8W	9	10	11	12	13	14	15	16	17	18	19	20	20 Ex	KRC	21	22	24	25	26	27	NRC
1 star	0	14	32	66	52	35	64	48	5	7	16	12	52	52	27	7	59	32	54	53	83	29	52	100	67	37	23	18	34	63	46	43	33
3 star	11	29	32	13	8	41	18	19	5	7	8	19	7	17	5	21	16	16	9	21	4	6	22	0	11	37	5	36	26	17	29	19	22
5 star	89	57	37	22	40	24	18	32	90	87	76	70	41	31	68	71	25	53	37	26	13	65	26	0	22	26	73	45	39	21	25	38	44

No statistically significant difference was observed between camps in Teknaf and those in the Mega Camp, indicating that the identified challenges in chlorination are broadly representative across the entire response area.

The results indicate that more than half of all networks fail to maintain consistent residual chlorine levels within safe and effective thresholds. The high proportion of unchlorinated or improperly chlorinated samples reflects operational inefficiencies, inadequate monitoring, and limited capacity for real-time dosing adjustment. Strengthening treatment management, ensuring regular testing, and improving operator training remain critical to safeguard public health and meet WASH Sector water-quality standards.

E. Beneficiary Satisfaction

Beneficiary satisfaction remains a key qualitative indicator of service performance, reflecting how well the water-supply systems meet users' expectations in terms of accessibility, adequacy, reliability, and perceived quality. Since the 2023 IWM Five-Star Assessment, overall satisfaction levels have not reached the threshold benchmark, indicating persistent concerns among camp residents regarding water services.

The satisfaction survey adopts a generalized format without disaggregating the drivers of satisfaction (e.g., reliability, water quality, accessibility, or pressure). Consequently, while the data indicate overall sentiment, they do not pinpoint the exact components of the water-supply system responsible for dissatisfaction. This limitation constrains the interpretability of the findings and underscores the need for a more targeted satisfaction tool in future assessments.

Compared with the 2024 assessment, the proportion of respondents reporting that they were very satisfied with the water supply has declined from 12% to 10%. Overall user satisfaction ratings are shown in *Table 7*, while camp-wise beneficiary responses in percentage are shown in *Table* 8 below.

In the Mega Camp, particularly in KRC, Camp 4 Extension, and Camp 20 Extension, respondents expressed notable dissatisfaction with the water supply. In contrast, camp 1E and camp 12 reported higher satisfaction scores, suggesting relatively better system performance or management responsiveness. The remaining camps generally fall within a moderate satisfaction range, indicating average service acceptability but room for improvement.

In Teknaf, Camps 21 and 24 recorded comparatively higher satisfaction levels, whereas Camp 22 consistently registered the lowest satisfaction, likely due to persistent operational and water-quality challenges.

Table 7: Overall Beneficiary Satisfaction in Percent

Satisfaction Level	Number of Respondents	Percentage of Total
Very Satisfied	87	10 %
Satisfied	233	26 %
Slightly Satisfied	344	38 %
Neutral / Average	184	20 %
Not Satisfied	59	7 %

The results indicate that only 10% of respondents report strong satisfaction with the current water services, while nearly 65% fall within the slightly satisfied average range. This distribution suggests widespread tolerance rather than genuine satisfaction, highlighting systemic issues related to supply consistency, accessibility, and communication with service providers. Continuous engagement with beneficiaries and disaggregated satisfaction metrics are recommended to better inform targeted improvements and strengthen accountability mechanisms.

Table 8: Camp-Wise Beneficiary Satisfaction (Answers in Percent)

Rating %	CAMPS																															
	1E	1W	2E	2W	3	4	4 Ex	5	6	7	8E	8W	9	10	11	12	13	14	15	16	17	18	19	20	20 Ex	KRC	21	22	24	25	26	27	NRC
1 star	0	0	16	25	16	4	0	16	0	3	0	5	7	0	0	0	9	8	3	9	11	12	4	4	11	5	0	0	3	8	8	10	0
2 star	6	14	0	34	12	30	73	19	30	40	16	16	28	10	23	0	27	8	16	18	21	12	35	35	11	26	18	0	18	8	13	19	33
3 star	39	14	58	31	20	48	18	39	20	43	20	40	28	69	36	14	36	18	37	47	34	53	22	31	67	63	18	100	34	50	46	38	44
4 star	44	36	26	6	48	9	9	16	35	13	24	28	10	17	27	64	23	39	34	21	23	21	30	31	0	5	41	0	39	33	33	33	22
5 star	11	36	0	3	4	9	0	10	15	0	40	12	28	3	14	21	5	26	10	6	11	3	9	0	11	0	23	0	5	0	0	0	0

F. Water Network Performance

Network Performance Overview

Water-network performance was assessed camp by camp, with functionality results summarized in the map (find in the GIS maps link in annexes). The overall functional status is as follows:

- Functional: 255 networks (94%)
- Partially functional: 2 networks (1%)
- Non-functional: 12 networks (4%)
- Under construction: 2 networks (1%)

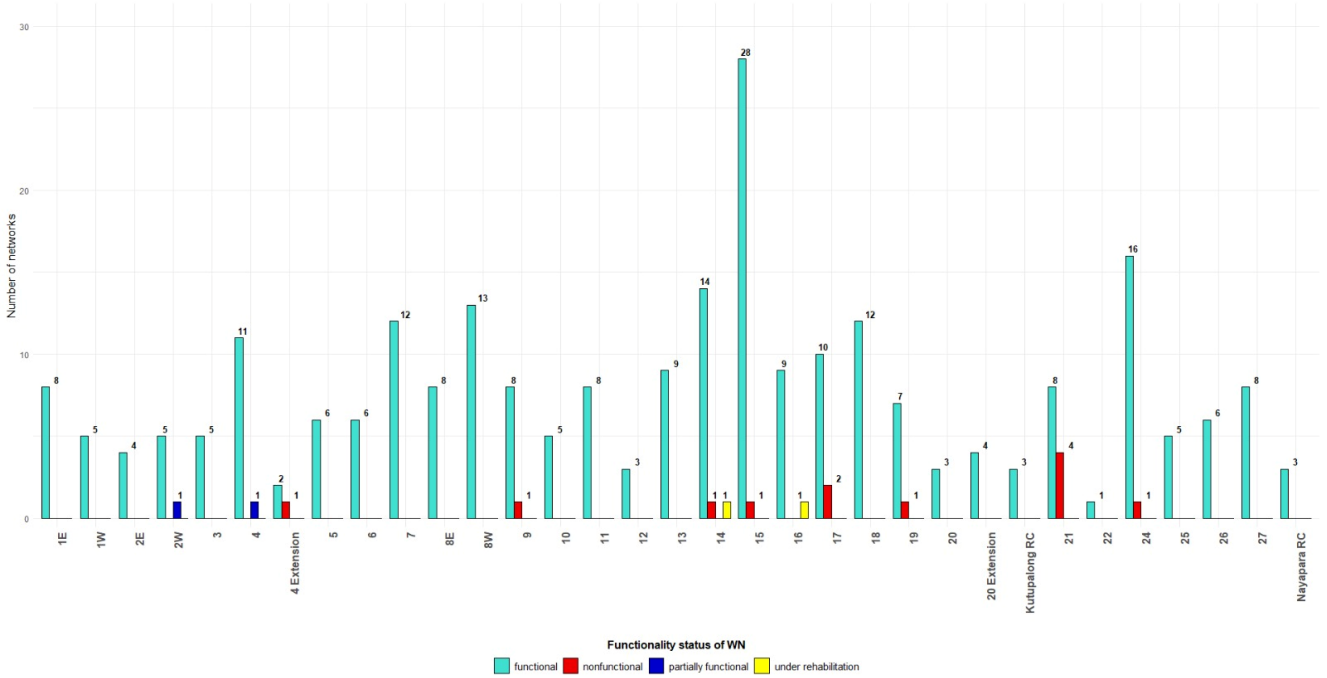
Among the 12 non-functional networks, indicating permanent cessation of operation rather than temporary failure. Camp 21 accounted for the highest proportion of non-functional systems - 31% (4 out of 12) - followed by Camps 14 and 15, which together host 29 networks, including one non-functional/discontinued and one under construction.

The assessment team also identified multiple functional and partially functional networks with improvement potential, particularly where aging infrastructure, mechanical wear, or inadequate maintenance were evident. These systems, though currently operational, are at risk of performance decline if not rehabilitated or properly maintained.

Comparative data indicate no overall change in the total number of non-functional networks between 2024 and 2025 (both years recorded 12 non-functional systems). However, the distribution by camp has shifted. In 2024, non-functional networks were observed in Camps 1W, 4, 8E, 14, 15, 19, and 20 Extension, while three networks in Camps 3 and 18 were rated as partially functional.

This year, some previously non-functional systems have been rehabilitated, while others - particularly in Camp 21 - have deteriorated, suggesting uneven progress in maintenance and recovery efforts across camps.

Although the overall functionality rate of 94% is encouraging, the persistence of non-functional systems in key camps underscores the need for targeted rehabilitation and enhanced maintenance oversight. Continuous monitoring, prompt repair mechanisms, and improved spare-parts logistics are essential to maintain service continuity and prevent further degradation of the water-supply infrastructure.



G. Flow Capacity

The overall water-supply capacity in 2025 has declined compared to 2024, reflecting both environmental and operational challenges. One of the principals contributing factors is the water crisis that affected Teknaf and its camps in early 2025, which led to reduced water availability and lower system output in several camps. Meanwhile, the situation within the Mega Camp has shown some improvement, corroborating the findings presented under the Water Production indicator.

A critical and recurring limitation in evaluating network performance is the absence or malfunction of water-flow meters across many systems. Reliable flow measurement is essential for understanding volumetric supply, system efficiency, and water-loss ratios, yet this remains an underdeveloped aspect of network monitoring.

This lack of consistent flow data hampers accurate quantification of extraction volumes, delivery efficiency, and real-time system performance, thereby limiting evidence-based management and maintenance planning.

The observed reduction in flow capacity underscores the need for systematic rehabilitation and instrumentation upgrades, particularly the installation, calibration, and maintenance of flow meters across all networks. Strengthening flow monitoring would enhance the reliability of future assessments and support sustainable water management practices within both the Mega Camp and Teknaf areas.

H. Out of Indicator Findings

In addition to the core Five-Star indicators, the assessment collected supplementary data on operational practices, equipment functionality, and documentation systems to capture a more comprehensive picture of network performance.

1. Chlorine Stock Availability

Among all assessed networks and boreholes:

- 246 sites reported having chlorine stock available on-site,
- While the remaining operators stated they collect chlorine from their agency’s office as needed

The absence of consistent on-site chlorine stock management suggests potential risk of treatment interruptions, particularly where logistics constraints or fuel shortages delay resupply. Ensuring buffer stock at each site would improve treatment reliability and continuity.

2. Dosing Pump Availability and Functionality

Chlorine dosing systems are critical for maintaining water safety. The assessment found:

- 184 operators reported dosing pumps available,
  - Of which 163 were functional, 20 were non-functional, and 1 operator provided no comment.
- 103 operators reported no dosing pump available.

The total number exceeds the number of networks assessed because, for systems with multiple boreholes per network, each operator was interviewed individually. Where a network has only one borehole, the presence of a dosing pump was interpreted as representing the entire network.

These findings indicate that while most systems are equipped with dosing pumps, roughly 11% of pumps are non-functional and one in three boreholes lacks a dosing pump entirely, limiting uniform chlorination coverage.

3. Flow-Meter Functionality

Out of the 271 assessed networks:

- 208 were found to have functional flow meters,
- 81 had no functional or missing flow meter.

This limits the precision of water-production data and complicates the calculation of per-capita supply. Routine calibration, repair, or replacement of flow meters is needed to improve measurement reliability and enable evidence-based management.

4. Logbook Maintenance

Recordkeeping practices varied considerably across camps:

- 257 networks-maintained production logbooks, while 30 reported none.
- 214 networks kept FRC logbooks, while 70 (including networks and boreholes) had no chlorine records.

Missing or inconsistent documentation constrains supervisors' ability to verify compliance with operational standards. Standardizing logbook templates - covering production, FRC, and maintenance - is recommended to improve data traceability and comparability across partners.

5. Operator-Reported Challenges

During interviews, 63 operators identified their main operational challenges as:

- Inconsistent availability of chlorine, and
- Fuel shortages affect generator operation and pumping hours, especially during low energy yield from solar panels.

These constraints directly influence both chlorination performance and water distribution times, underscoring the operational fragility of the system under current resource conditions.

6. Synthesis

Collectively, these findings reveal that equipment functionality, documentation discipline, and supply continuity remain central determinants of network performance beyond the formal Five-Star indicators.

The data highlight three key systemic issues:

1. Incomplete equipment coverage (especially dosing pumps and flow meters),
2. Inconsistent recordkeeping, and
3. Operational resource gaps (chlorine and fuel).

Addressing these factors is essential for improving accuracy of monitoring data, sustaining service reliability, and ensuring full compliance with WASH minimum standards across the camps.

7. Discussion

A. Interpretation of Results

The 2025 Five-Star Assessment reveals a complex and uneven performance profile across water networks in the camps. While the overall infrastructure base remains functional, service quality and reliability have shown a gradual decline compared with 2024. Key indicators - particularly water production, tap-stand functionality, and distribution times - demonstrate both localized deterioration and persistent systemic constraints.

At the meta level, the majority of water networks continue to deliver above-minimum service standards, but an increasing number now fall short of the 20 L/P/D benchmark. In the Mega Camp, only 46% of the population currently receives sufficient daily quantities, compared with 55% in 2024, indicating a measurable decline in network output. The trend reflects a combination of infrastructure aging, resource depletion, and limited maintenance capacity.

Similarly, tap-stand functionality - a key proxy for accessibility and service quality - dropped from 87% five-star ratings in 2024 to 61% in 2025, confirming an observable erosion of maintenance performance and component durability. Although water flow remains generally adequate (84% of taps showing normal pressure), the increased proportion of partially functional and leaking taps (49%) signals significant water loss and inefficiency.

Water treatment and chlorination performance also remain inconsistent. 42% of water samples met standard FRC levels, while another 42% showed no detectable chlorine and 16% fell outside acceptable limits, either too low or too high. This finding aligns with earlier reports from IWM and MSF highlighting operational challenges in chemical dosing, supervision, and supply continuity.

In contrast, beneficiary satisfaction remains low and has declined slightly from 12% in 2024 to 10% in 2025 reporting being “very satisfied.” Dissatisfaction is most acute in camps affected by intermittent supply, long collection queues, or poor tap conditions - particularly KRC, Camp 4 Ext., and Camp 20 Ext.

This pattern reinforces the interdependence between technical functionality and user perception, emphasizing that access quality is not defined by infrastructure alone but by the reliability and predictability of service.

B. Comparison with Previous Assessments or Benchmarks

Indicator	2024 Status	2025 Status	Change
Water Production (≥4 stars)	55 %	46 %	↓ 9 %
Tap-Stand Functionality (5-star)	87 %	67 %	↓ 20 %
Water Treatment (Acceptable FRC)	50 %	42 %	↓ 9 %
Distribution Times (≥4 stars)	37 %	37 %	0
Beneficiary Satisfaction (“Very satisfied”)	12 %	10 %	↓ 2 %

Overall, the comparative findings indicate slight to moderate regression across most indicators, despite efforts by WASH partners to optimize resource use.

C. Factors Influencing Functionality

The functionality of water networks in the Rohingya camps is influenced by a combination of interrelated technical, environmental, operational, institutional, and behavioral factors. These determinants collectively shape system performance, service continuity, and water safety outcomes. Understanding their interaction is crucial for developing sustainable corrective actions and prioritizing investments.

1. Technical and Infrastructure-Related Factors

a) **Infrastructure Age and Design Limitations**: A significant portion of the water-supply infrastructure - especially in the Mega Camp - was constructed during the 2017–2019 emergency phase, when rapid deployment was prioritized over long-term durability. Many systems are now beyond their designed operational lifespan. Aging components such as galvanized pipes, valves, and non-stainless pump fittings contribute to recurrent leakages, reduced pressure, and contamination risks.

b) **Pump and Flow-Meter Condition:** While 208 networks were found with functional flow meters, 81 lacked operational units, severely limiting the ability to quantify production and monitor efficiency. Similarly, worn-out submersible pumps and solar units in several networks operate below capacity due to deferred maintenance, leading to lower discharge and shorter distribution hours.

c) **Dosing Pump and Chlorination System Gaps:** Of 184 reported dosing pumps, 20 were non-functional, and 103 boreholes had no dosing system installed. This variation in treatment infrastructure directly affects chlorination consistency and overall network star ratings. Systems without automated dosing rely on manual mixing, which is highly dependent on operator skill and resource availability.

d) **Tap-Stand Condition and Leakage:** Nearly half (49%) of all taps exhibited leakage or incomplete functionality, reducing effective delivery volumes and contributing to localized waterlogging. The deterioration of tap-stand fittings - often caused by high user density and mechanical wear - is a recurrent issue that undermines both efficiency and user satisfaction.

2. Operational and Resource Constraints

a) **Maintenance and Repair Delays:** Operational response capacity remains constrained by limited spare-part availability, procurement delays, and funding shortfalls. Many networks rely on reactive maintenance, addressing failures after service interruptions occur rather than implementing preventive maintenance schedules.

b) **Fuel and Power Supply Interruptions:** Operators in 63 networks reported fuel shortages as one of their primary operational challenges. Inadequate supply for generators and low battery charge for solar systems frequently lead to reduced pumping hours, thereby shortening water distribution periods.

c) **Incomplete Recordkeeping and Monitoring:** Despite overall improvements in data capture, 70 networks lack FRC logbooks, and 30 do not maintain production records. Inconsistent documentation undermines early warning of system failures and constrains accountability.

d) **Chlorine Stock Management:** Although 246 sites reported having chlorine stock, others depend on periodic collection from their offices. This logistical gap risks interruptions in chlorination, particularly during transport delays or access restrictions.

3. Institutional and Coordination Factors

a) **Funding Contraction and Resource Prioritization:** The WASH sector has faced a 33% reduction in secured funding (2022–2024), limiting capacity for preventive maintenance, equipment replacement,

and human-resource retention. As a result, actors are forced to prioritize emergency repairs over long-term upgrades.

b) **Fragmented Ownership and Accountability:** Responsibility for network management is distributed among multiple agencies, leading to variable operational standards. Absence of unified accountability mechanisms and weak enforcement of maintenance protocols result in performance inconsistencies between camps.

c) **Human Resource Turnover and Capacity Gaps:** High rotation rates among operators, combined with the absence of refresher training on chlorination, equipment handling, and recordkeeping, have weakened institutional memory and consistency in field practices.

4. Summary

Water-network functionality in the Rohingya camps is constrained not by a single determinant but by the interaction of aging infrastructure, hydrogeological limitations, and chronic resource scarcity, technical degradation, insufficient chlorination systems, and power interruptions. Addressing these factors requires a multi-dimensional approach - combining reliable funding, technical standardization, and stronger local accountability - to safeguard equitable and sustainable water access across all camps.

D. Implications for Future Planning and Methodological Improvements

The findings of the 2025 Five-Star Assessment underline both persistent operational challenges and critical opportunities to strengthen WASH service delivery in the Rohingya camps. They also highlight methodological insights that can enhance future assessment accuracy, comparability, and practical relevance.

1. Operational and Strategic Implications

The assessment demonstrates that while infrastructure coverage remains substantial, service reliability and efficiency have declined in several camps. To safeguard equitable and sustainable water access, planning and resource allocation should prioritize:

- Restoration and optimization of underperforming networks, particularly in Teknaf and lower-performing Mega Camp zones;
- Improved asset maintenance systems, including routine servicing of pumps, solar panels, and storage infrastructure;
- Enhanced chlorination control, with daily FRC verification at tap-stand level; and
- Community engagement through water committees and feedback mechanisms to identify problems early and strengthen accountability.

Given the continuing funding contraction in the WASH sector, agencies must adopt evidence-driven prioritization, focusing on investments where functionality gains will yield the highest public-health impact.

Integrated planning between humanitarian and development actors will also be essential to manage long-term groundwater stress, service equity, and infrastructure sustainability.

2. Methodological Reflections and Future Improvements

The 2025 round also provides critical learning on how to enhance data precision, consistency, and sector-wide comparability in future Five-Star Assessments.

Strengthening Measurement and Verification

- Expand flow-meter installation and calibration across all networks to enable accurate, continuous production tracking.

- Standardize chlorine-testing procedures and maintain reagent and equipment stocks for reliable results.
- Validate beneficiary figures and catchment boundaries, currently based on operator statements and earlier IWM mapping, using updated demographic data.
- Conduct unannounced verification visits to reduce bias from pre-announced assessments.

Expanding Coverage and Temporal Depth

- Include newly commissioned water networks and additional tap-stands in future rounds to maintain representativeness.
- Revise catchment delineations and beneficiary estimates to reflect recent population movements and infrastructure changes.

Improving Data Management and Analysis

- Standardize logbook formats for network operators to track flow, FRC, and maintenance systematically.
- Conduct refresher training for water network operators to ensure consistency in log bookkeeping.

Institutional Coordination and Learning

- Establish a joint WASH Sector data-review mechanism for harmonizing methodologies and aligning indicators.
- Strengthen capacity building for network operators and local WASH committees to sustain monitoring beyond project cycles.
- Advocate for multi-year monitoring and evaluation frameworks to ensure continuity and institutional memory within the WASH sector.

8. Conclusions

A. Summary of Key Findings

The 2025 Five-Star Assessment provides an evidence-based overview of the functionality, efficiency, and service quality of water networks across the 33 Rohingya camps. Key findings demonstrate that, while the physical infrastructure base remains extensive and operational in most locations, service reliability and performance have declined since 2024.

- **Water Production:** Overall, the per-capita water supply has decreased. In the Mega Camp, only 46% of the population currently receives ≥ 20 L/P/D, compared with 55% in 2024. Several camps - particularly 13, 14 and 16 - show marked declines, whereas only a few networks recorded minor improvements.
- **Tap-Stand Functionality:** The proportion of five-star tap-stands dropped from 87% (2024) to 67% (2025). Leakage and missing fittings have become widespread, with 49% of individual taps found leaking or inoperative.
- **Distribution Times:** Only 37% of networks achieved a five & four-star rating for service hours, indicating that many households still experience limited and irregular access, leading to water storage and secondary contamination risks.
- **Water Treatment and Chlorination:** 42% of samples met standard free-chlorine limits (0.3–1.0 mg/L); 42% had no residual chlorine; and 16% were outside acceptable range, reflecting operational and supervision gaps.
- **Beneficiary Satisfaction:** Community satisfaction remains low and declined slightly - from 12 % (2024) to 10 % (2025) reporting they are “very satisfied.” Concerns relate mainly to reduced supply duration, inconsistent water quality, and maintenance delays.
- **Network Functionality:** Out of 271 assessed systems, 94 percent were functional, 1 percent partially functional, and 4 percent non-functional. However, hidden inefficiencies - such as low flow, non-

functional meters, and irregular chlorination - suggest performance fragility beneath apparently high functionality rates.

- **Out-of-Indicator Findings:** Significant management gaps persist: 81 networks lack functional flow meters; 30 have no production logbooks; 70 lack FRC records; and 103 boreholes operate without dosing pumps. Fuel shortages and chlorine-supply constraints remain recurrent operational challenges.

B. Overall Status of Water Network Functionality

Despite extensive infrastructure coverage, the overall status of water-network functionality in 2025 is moderate and declining relative to previous years. Approximately two-thirds of the networks meet minimum functionality criteria, yet sustained service quality and reliability are uneven both within and across camps.

In the Mega Camp, groundwater remains stable for deep production boreholes, but operational efficiency has fallen due to leakages, poor maintenance, and intermittent power supply. In Teknaf, hydrological stress continues to be the primary limiting factor: Salinity intrusion reduces production capacity, and emergency trucking remained a necessary measure in the dry pre-monsoon season of 2025.

The cumulative data suggests that the WASH response is transitioning from an emergency infrastructure phase to a maintenance-intensive stabilization phase. Most systems are physically present but require stronger operational management, preventive maintenance, and standardization to ensure long-term sustainability.

C. Lessons Learned

The 2025 assessment reinforces several strategic and operational lessons for future WASH planning and monitoring in the Rohingya response:

1. **Infrastructure presence does not equal service quality.** High coverage rates can mask chronic inefficiencies in production, distribution, and treatment. Performance monitoring must therefore emphasize functionality and reliability - not only infrastructure counts.
2. **Preventive maintenance and asset management are critical.** Delayed maintenance leads to escalating repair costs and progressive decline in service quality. Regular inspections, spare-parts availability (stock), and clear maintenance accountability are essential for sustainability.
3. **Data reliability depends on consistent measurement and recordkeeping.** Missing flow meters, incomplete logbooks, and unverified chlorination data reduce the accuracy of decision-making.
4. **Environmental stress must be factored into design and planning.** Groundwater decline and uneven aquifer productivity require adaptive management, including alternate water sources, recharge studies, and seasonal contingency planning.
5. **Community engagement enhances accountability.** Beneficiary participation through local water committees and user feedback systems helps detect operational problems early and strengthen ownership.
6. **Integrated sector coordination is vital.** The functionality gap is not primarily technical but systemic - arising from fragmented management, budget shortfalls, and inconsistent standards. Stronger inter-agency coordination and donor alignment can improve efficiency and equity across camps.
7. **The Five-Star Framework remains a valuable management tool.** Its standardized indicators allow year-on-year tracking and evidence-based prioritization; however, periodic methodological refinement and data-quality assurance are needed to maintain credibility and comparability.

9. Recommendations

A. Technical Recommendations

- **Ensure the presence and functionality of flow meters** across all water networks to enable accurate monitoring of water abstraction and distribution volumes.
- **Increase water-supply quantities** in camps identified with insufficient per capita provision, taking into account the additional demand resulting from new arrivals or demographic changes.
- **Extend and standardize water supply duration** to ensure that all households have equitable and regular access to sufficient water quantities.
- **Maintain accurate records** of daily water production and free residual chlorine (FRC) levels in dedicated logbooks for each network.
- **Display key operational information** (e.g., water network ID, funding agency, total beneficiaries, number of tap-stands, production capacity, operational date, staff names, and coverage areas) at each network site for accountability and transparency.
- **Conduct regular flushing of water lines** (at least once annually) to prevent sediment accumulation and ensure optimal flow.
- **Establish contingency stocks** of essential spare parts and equipment to enable rapid response during system breakdowns.
- **Maintain and service generators, batteries, and solar panels** regularly to ensure uninterrupted energy supply for water production
- **Regular Well Development** to prevent sedimentation inside the wells (reduced production)

B. Water Quality and Chlorination Management

- **Perform daily FRC testing at the tap-stand level** to ensure compliance with WASH Sector standards (0.3 - 1.0 mg/L). Adjust chlorination accordingly to maintain consistent water safety.
- **Conduct monthly comprehensive water quality testing** for each network and maintain records of test results.
- **Periodically verify chlorine concentration (%)** at storage facilities to ensure the effectiveness and stability of the chlorine used.
- **Provide regular refresher training for operators on chlorination techniques, dosage calculations, and safety procedures.**

C. Maintenance, Monitoring, and Rapid Response

- **Reduce operation and maintenance (O&M) response time** to ensure timely repair of leaks, damaged taps, or network failures.
- **Implement routine inspections** for pipe leaks, illegal connections, and pressure drops; take immediate corrective measures when detected.
- **Ensure full tap and tap-stand functionality** through scheduled preventive maintenance to minimize water wastage and service disruption.
- **Regularly clean and inspect tap-stands and drainage systems** to prevent blockages and improve service accessibility.

D. Community Engagement and Feedback Mechanisms

- **Establish a community-anchored reporting system** enabling beneficiaries to report infrastructure failures, water-quality concerns, or irregular distribution in real time.
- **Collect and review beneficiary feedback regularly** to identify and address service gaps, leakage issues, or dissatisfaction promptly.

- **Conduct awareness sessions** on the health risks associated with private or untreated water sources and encourage exclusive use of treated network water.

E. Planning and Coordination

- **Map out catchment areas and beneficiary populations** to adjust distribution times and quantities in line with the latest population figures and WASH Sector standards.
- **Coordinate with WASH Sector partners** to harmonize methodologies for flow measurement, service-hour rating, and chlorination monitoring.
- **Integrate findings from the Five-Star Assessment** into operational planning, donor engagement, and policy discussions to promote evidence-based resource allocation.

10. Annexes

Annex 1. Site-Level Data Tables

Annex 2. GIS Maps of Assessed Water Networks: The maps are based on the average of the data for all tap-stand related indicators (such as FRC, tap-stand functionality, beneficiary satisfaction etc.) and may conflict with the tables or percentages mentioned above.