Sanitation Technology Demonstration

in Emergency Settings in Lebanon

External Evaluation

INCEPTION REPORT

Fourth Version 15 June 2022

Submitted to UNICEF

Prepared by Difaf SAL

difaf s.a.l

Dear UNICEF STDP Project Management Team,

We offer to provide the services described in the Tender referenced above. We confirm that we have the experience, expertise, capacity, staff and financial resources to offer the required services, and that all the consultants proposed to be assigned to this task are available for the whole duration of the project.

Difaf aspires to be presenting constructive, scientifically sound and objective work, and looks forward to delivering work that meets your expectations. Hereby, Difaf also commits to adhere to the following standards:

- United Nations Evaluation Group (UNEG) Standards for Evaluation in the UN System
- United Nations Evaluation Group (UNEG) Norms for Evaluation in the UN System, including impartiality, independence, quality, transparency, consultative process
- Ethical Guidelines for UN Evaluations and the UNICEF procedure for ethical standards in research, evaluation, data collection and analysis will guide the overall process
- UNICEF adapted evaluation report standards and GEROS
- The evaluation should incorporate the human rights-based and gender perspective and be based on results-based management principles and logical framework analysis, in compliance with UNEG guidelines on gender and human rights. The evaluation team is required to clearly identify any potential ethical issues and approaches, as well as the processes for ethical review and oversight of the evaluation process in their proposal. Owing to the envisaged participation of human subjects in the evaluation, the evaluation team should seek ethical review board approval either from a recognized Institutional Review Board in Lebanon or via UNICEF's LTA for ethical approval.

Sincerely,
Hussam Hawwa
Difaf CEO

Table of Contents

1.

1. List of Acronyms

AnF	Anaerobic Filter
ABR	Anaerobic Baffled Reactor
ACF	Action Against Hunger
BAF	Biological Aerated Filter
BMGF	Bill and Melinda Gates Foundation
BOD	Biological Oxygen Demand
CAPEX	Capital Expenditure
COD	Chemical Oxygen Demand
CPD	Continuing Professional Development
DAC	Development Assistance Committee
DEWATS	Decentralized Wastewater Treatment Technologies
DFM	Design for Manufacturing
ELV	Environmental Limit Values
FAO	Food and Agriculture Organization
FC	Fecal Coliforms
FGD	Focus Group Discussions
FHH	Female Headed Households
GoL	Government of Lebanon
HDPE	High Density Poly-ethylene
IP	Implementing Partners
IS	Informal Settlement
ISO	International Organization for Standardization
KII	Key Informant Interviews
KPI	Key Performance Indicators
LOST	Lebanese Organization for Studies and Training
LRA	Litani River Authority
MHH	Male Headed Households
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture
MoE	Ministry of Energy
MoEW	Ministry of Energy and Water
NO3-N	Nitrate-Nitrogen
NO2-N	Nitrite-Nitrogen
NH3-N	Ammoniacal Nitrogen
NSSS	Non-Sewered Sanitation System

O&M	Operation and Maintenance
OECD	Organization for Economic Co-operation and Development
OPEX	Operational Expenditure
PPP	Public Private Partnership
PVC	Polyvinyl Chloride
SME	Small and Medium Enterprise
SOP	Standard Operating Procedures
SSF	Slow Sand Filter
STDP	Sanitation Technology Demonstration Project
SWOT	Strength, Weakness, Opportunity, Threats
TF	Trickling Filter
ToC	Theory of Change
ToR	Term of Reference
TP	Total Phosphorus
TN	Total Nitrogen
TS	Total Solids
UNICEF	the United Nations International Children's Emergency Fund
UNEG	United Nations Evaluation Group
UV	Ultraviolet
UPM	Umwelt-Projekt-Management GmbH
VFA	Volatile Fatty Acids
SVI	Sludge Volume Index
WASH	Water, Sanitation and Hygiene
WAP	WASH Assessment Platform
WWTP	Wastewater Treatment Plant
VASyR	Vulnerability Assessment of Syrian Refugees

2. INTRODUCTION

2.1 Background of The Evaluation Mission

In response to the age old and going pressures on public health and the environment from wastewater mismanagement in informal settlements, and the high desludging costs incurred yearly due to extensive operations for emptying septic tanks specifically the Governorates of Bekaa and the North, UNICEF, in coordination with the Government of Lebanon (GoL) has identified the urgent need for a crucial WASH project. The project aimed to develop decentralised, cost-effective, innovative, and sustainable interventions with the aim to treat and dispose of Wastewater and fecal sludge to answer to the dire needs mentioned, and improve the overall sanitation infrastructure in IS and surrounding Lebanese communities. In 2018, the Project was awarded 2.5 million dollars funded by the Bill and Melinda Gates Foundation and was implemented by UNICEF Lebanon along with local and international NGO partners, involved SMEs, and engaged international experiences in direct support informal settlement refugees, and host communities towards improved sanitation, local economies and environmental conditions.

In this respect, Difaf S.A.L. was commissioned for the evaluation of the WASH Emergency project Sanitation Technology Demonstration in Emergency Settings in Lebanon" Project (STDP or Project) to provide an independent third-party evaluation of the project relevance, effectiveness, efficiency and sustainability. The evaluation will identify success factors/ enablers, and challenges or critical barriers for adapting, testing and mainstreaming, innovative DEWATS solutions in refugee settings, serving both humanitarian needs as well as developmental outlooks.

2.2 Context & Background

There are more than one million Syrian refugees currently registered in Lebanon, and more than half are children. Syrian refugees represent one in four persons living in Lebanon, and live in rented apartments, shelters and Informal Settlements (IS) throughout the country with varying levels of quality of life and access to basic services. In August 2021, around 327,000 of displaced persons were living in 5,768 IS[1], usually in rudimentary tent-like shelters or other informally built structures with scarce or limited access to water, sanitation, hygiene, and other essential services. The crowded conditions of many informal settlements and other shelters occupied by displaced Syrians are associated with serious health risks for women and children. The political decision by the Government of Lebanon not to officially recognize these settlements has consequences: all structures that serve Syrian refugees need to be temporary, no structures should give the impression of permanence, and structures in IS cannot be connected to the formal water, electrical, or sewer systems.

This presents a major challenge for delivering adequate water, sanitation, and hygiene (WASH) services, particularly as connecting IS to local drinking water and wastewater network are officially not allowed. The situation regarding wastewater services has become particularly dire in Lebanon's rural areas. These

[1] K.Bonel,S.Halabi,M.Wehbi,2021"WaSHAssessmentPlatformReport",UNICEF,Lebanon.

areas have absorbed the highest proportion of Syrian refugees during the ongoing crisis and had the lowest overall access to public wastewater supply networks prior to the influx of refugees. The increasingly expanding IS and higher density of hosting population concentrations have also placed stress on existing wastewater services. In some communities, Syrian refugees outnumber the local population. Tensions at the community level have flared as WASH resources are stretched and local authorities are struggling to cope with the additional service demands imposed by the growing refugee populations. Additionally, the environment is negatively impacted by these IS in terms of solid waste, water pollution, land use and ecosystems, problems that are exacerbated after years of neglect in Lebanon. Concern about the social and environmental stability of the country is increasing in Lebanon due the current influx of Syrian refugees, and this is igniting a decades-long discussion about environmental sustainability in the country.

UNICEF, through its in-country partners, provides 74% of the individuals in all existing IS with temporary toilets and regular desludging of settlement holding tanks, cesspits, and covered pits, which is currently the only method used for maintaining sanitary conditions in IS. According to the project proposal, desludging costs in ISs incurred by UNICEF in 2017 amounted to $4.4 M[2] . The high cost of desludging is associated with "undersized or inappropriate containment facilities",[3] requiring high frequency of desludging. Nearly one in three IS in UNICEF's catchment area, which service more than half of the Syrian refugee population residing in IS, require at least monthly desludging activities. UNICEF partners' contracts with unregulated vendors in order to meet the level of need for desludging and wastewater transport services. The current method is unsustainable, and costs are used to cover those emergency services in lieu of providing other critical humanitarian services.

Most households (89%) have access to an improved sanitation facility (91% in 2020, and 94% in 2019). The access also varied by shelter type where only 67% of non-permanent shelters had access to an improved sanitation facility, down from 79% in 2020 (VaSyr 2021[4]). The use of a basic sanitation service, which is an improved sanitation facility that is not shared, was found to be at 76% (77% in 2020), with the lowest rate being observed in Akkar and Bekaa governorate at 59% and 61% respectively (ibid.). 19% of households share toilets with other households. Eighty five percent of household members with a disability have access to improved sanitation facility down from 90% in 2020 (ibid.).

According to the project proposal, a Water and Wastewater Vulnerability mapping exercise was undertaken a sample of 699 cadasters across Lebanon, with 480 cadasters, for 1.9 million population, having been identified as not being served with a wastewater treatment plant. According to VaSyr 2021, Female Headed Households-FHH, less commonly have flush toilets (57%) compared to Men Headed Households-MHH (71%), and only 64% of FHH had access to basic sanitation services compared to 77% of MHH.

[2] Grant proposal narrative, revised June 2018.
[3] WASH Assessment Platform Report 2020, https://www.pseau.org/outils/ouvrages/unhcr_wash_assessment_platform_wap_report_2020_2020.pdf
[4] Vulnerability Assessment of Syrian Refugees in Lebanon, 2021, https://reliefweb.int/report/lebanon/vasyr-2021-vulnerability-assessment-syrian-refugees-lebanon

The socio-economic crisis is also affecting access to hygiene, with decreased purchasing power of households: the VASyR in 2021 reported that notably 10% of households with females do not have enough access to female hygiene/dignity items (Highest in Nabatieh governorate # 36%), while 23% of households with babies reported not having enough Baby care items (diapers etc). Highest also in Nabatiyeh # 47% and North 34%. The gender-sensitive provision of water and sanitation services is essential for poverty reduction, women equality and women empowerment and women's active participation in design, implementation, monitoring and evaluation need to be ensured in all WASH interventions[5].

2.3 Main National & International Regulatory Frameworks

Though Lebanon is notary to the 1951 Refugee Convention relating to the Status of Refugees, it is a signatory of multiple international human rights conventions among which:

- The Convention on the rights of the child dated 20th November, 1989 which was ratified by virtue of law number 20 dated 30th of October, 1990.
- The Convention on the Elimination of all Forms of Discrimination against Women dated 18th December, 1979 which was ratified by virtue of law number 572 dated 24th of July, 1996
- The Convention on the Rights of Persons with Disabilities dated 13th December, 2006 which was ratified by virtue of law number 291 dated 12th of April, 2022.

Regarding the national regulatory framework, Lebanon has enacted Law number 444 related to the protection of the environment on the 29th of July, 2002 and an application Decree number 8633 dated August 7th, 2012 on the Fundamentals for Environmental Impact Assessment. Usually these are required for all new projects with potential environmental impact, however pilot wastewater treatment systems and innovations at such small scale and under humanitarian context are exempted since their purpose is pollution abatement. Nevertheless, with regards to wastewater treatment, a decision (Decision 8/1) from the MoE dated 8th January, 2001 defines the Standards of Environmental Limit Values (ELV) for wastewater discharges into surface water where standards must be adhered to and which set the limits for this project in discharging to the environment.

Furthermore, a Water Code has been adopted by virtue of Law number 77 dated 13th April, 2018 modified by virtue of Law number 192 dated 16th October, 2020. The National wastewater strategy, which is following now this law bases its cost recovery on formula it is piloting in some governorates but faced resistance and low compliance, and "polluter pays" principle which if enacted will only target industrial wastewater sector. Still, the enactment of this law is still lacking implementation decrees as is still at its early stages and it remains unclear how it (and any cost recovery scheme) can apply within humanitarian contexts.

[5] Specific guidance on gender equality in WASH programmes in available in Gender Equality, Water, Sanitation and Hygiene, SIDA, August 2019,
file:///C:/Users/islavova/Downloads/brief_gender_equality_water_resources_sanitation_hygiene_webb.pdf

The governmental ministries, and given the current crisis and bottlenecks, have come to welcome decentralized wastewater treatment technologies or (DEWATS), which are being made available through international exchange and customized to fit various localities which is a necessity for these contexts, and which can be designed to meet Environmental Limit Values (ELV) dictated by Decision 8/1 of 2001, or FAO regulations for Wastewater Reuse for Irrigation which the Government currently accepts, and thus safeguard the environment from further pollution loads. These standards are found in ANNEX 2 for reference. According to the project document, UNICEF aimed to promote the use of ISO/DIS 30500, which is voluntary international product standard for non-sewered sanitation systems (NSSS), which "addresses basic sanitation needs and promotes economic, social, and environmental sustainability through strategies that may include minimizing resource consumption (e.g. water, energy) and converting human waste to safe output".[6] This was seen by UNICEF as a starting point for the reinforcement of the policy making in order to ensure that all the prefabricated integrated treatment units are safe and efficient.

[6] https://sanitation.ansi.org/Standard/ISO30500

3. The Sanitation Technology Demonstration in Emergency Settings in Lebanon Project

3.1. Main Objectives

As part of its broader efforts to improve WASH services, UNICEF has identified an urgent need to provide and/or improve wastewater treatment services in informal settlements, in order to improve the physical environment of communities, as well as hygiene and sanitation, to prevent the outbreak of health epidemics, and to reduce inter-community tensions and violence.

Specifically, the purpose of the Sanitation Technology Demonstration In Emergency Settings In Lebanon Project (STDP) is to: "*Identify and implement innovative sanitation technological solutions to treat wastewater generated by Syrian refugees and discharged from Informal Settlements (IS) in Lebanon, which can serve as a lesson learned to improve global humanitarian responses in similar contexts*".

Additionally, the project hoped to build a solid Public Private Partnerships (PPP) benefitting Lebanese and Refugees with DEWATS spreading in the market. As mentioned, notable environmental and economical improvements are projected to take place locally, nationally, and finally globally in case the project proved to be successful on both the technical (technological treatment) level, as well as the project (design, adaptability, relevance) level. Innovative factors are therefore critical elements in ensuring the successes at these two levels, and UNICEF aims to make them a common reality amidst hosting communities, as well as a common knowledge through the proper dissemination of experiences and lessons learnt.

3.2. Stakeholders & Beneficiaries

Several stakeholders have collaborated on the Project which is being implemented in close coordination with the Ministry of Environment (MoE), Ministry of Energy and Water (MoEW), and five UNICEF implementing partners (IPs): Solidarités International, Action Contre la Faim, SAWA, World Vision International and LOST.

Regarding the beneficiaries, the Project targets Lebanese citizens as well as Syrian refugees. UNICEF has noted in that regard that the original proposition to size and construct technologies for the combined treatment of the wastewater produced by Lebanese citizens and Syrian refugees was prevented by the MoEW to avoid the construction of permanent infrastructures in informal settlements. Thus, UNICEF adjusted its scope of work to include two population segments: Syrian refugees living in ISs and Lebanese citizens not connected to the sewer network nor intended to in the wastewater master plan. UNICEF and the sector utilized data from the WASH Assessment Platform (WAP), which provides real-time information on selecting regions in which to implement innovative sanitation technologies, and support the selection of the most appropriate IS. It is worth mentioning the Litani River Authority (LRA), an Establishment under the MoEW, which had reservations for installing the DEWATS system when they were located next to river banks.

3.3. Site Selection

UNICEF has defined different categories of sites that it aimed to prioritize in the Project according to the following relative criteria:

- Category 1: The cost effectiveness of the intervention (Capital Expenditure (CAPEX) represents an investment smaller than 5-6 years of actual Operating Expenditure (OPEX))
- Category 2: The CAPEX is too high to allow a cost recovery over 4 years, but the current unsanitary conditions of the sites present environmental and/or health hazards and require intervention.

Prioritization of the selected sites was performed using a multitude of relevant criteria including the importance/proximity of the groundwater table, soil conditions, topography, and temperature fluctuations. Sites that presented a high risk pertaining to this criteria were given higher priority on the treatment level even if at the expense of the project cost.

UNICEF has identified two types of sites, those located in areas with no groundwater contamination risks (93 sites in total), and those located in areas with groundwater contamination risks (120 sites in total). For the former group, the investment amounted to m$ 1,9, and was forecasted to reduce the yearly desludging cost from around $320,000 to a bit under $30,000. For the latter group, the investment amounted to m$ 9,44, and was forecasted to reduce the yearly desludging cost, bringing it down from more than M$1.4 to around $107,000.

3.4. Technology Development & Innovation Aspect

UNICEF aimed, using its internal supply procedures, to select and directly contract one or several Small and Medium Enterprises (SMEs) to produce the NSSS in Lebanon. This was meant to engage Lebanese SMEs bring more national and economical benefit value to the investment and contribute to the development of the sanitation solutions in the country. UNICEF, having sized the different solutions, aimed to develop the drawings and technical specification to enable mold production. The innovation weight resides in developing a stackable solution easing and reducing transportation for heavy desludging costs.

For the manufacture of the tanks, UNICEF needed to receive agreement from the GoL in selecting the company with whom the innovation will be developed. UNICEF aimed to save the capital investment of the molds and these molds were considered to benefit the Lebanese market by enriching the sanitation market with a non-electric effective technology for the treatment of wastewater. UNICEF aimed also to ensure that the construction of the NSSS respects the International Standard ISO/DIS 30500, ensuring the safety, reliability and quality of the product. UNICEF aimed also to ensure that the construction of the NSSS respects the International Standard ISO/DIS 30500, ensuring the safety, reliability and quality of the product. The below diagram illustrates the iterative and challenging selection of technologies for primary and secondary treatment as well as tertiary treatment, as it went through three phases of trial and experimentation, with the yield of very interesting and successful results.

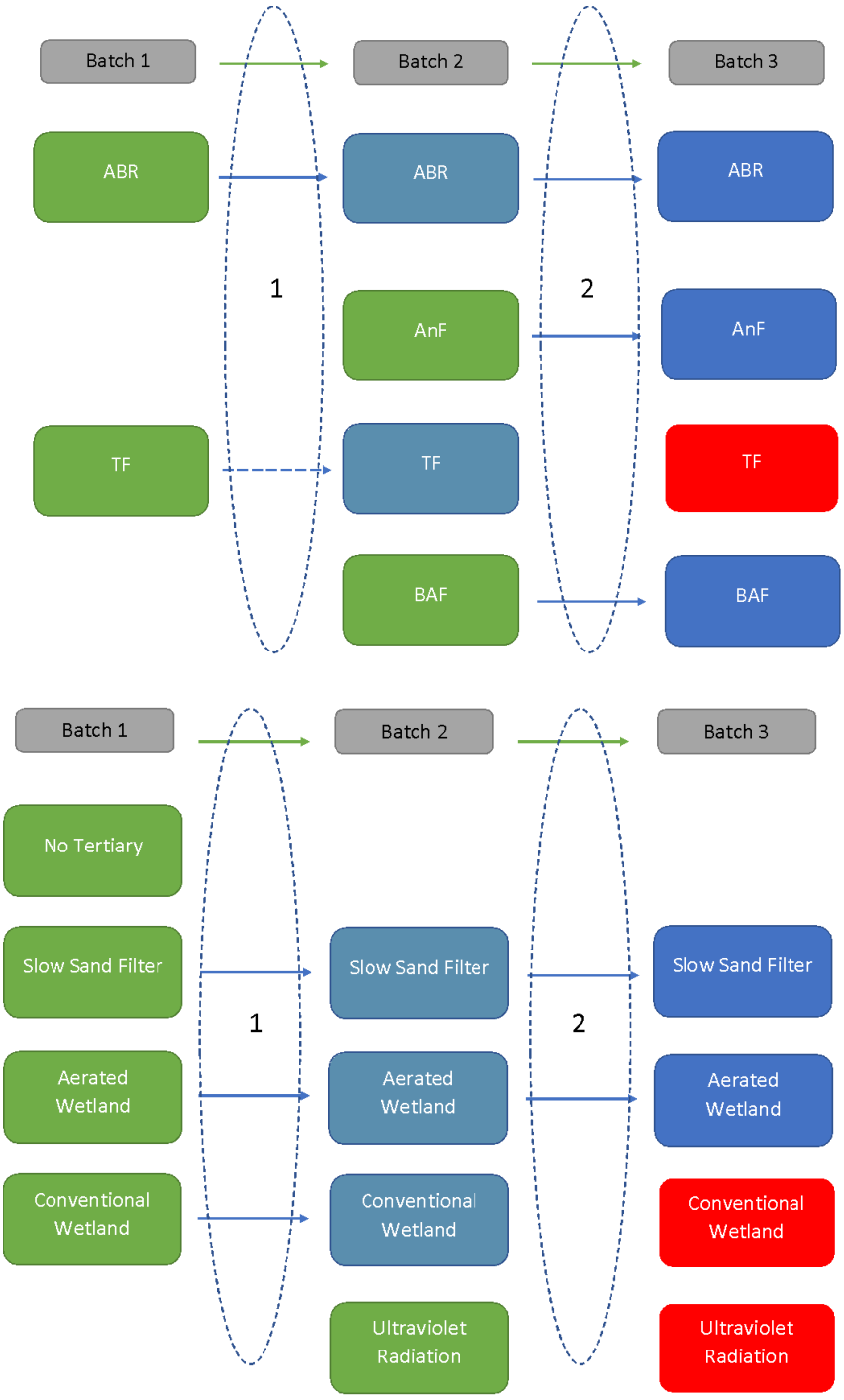
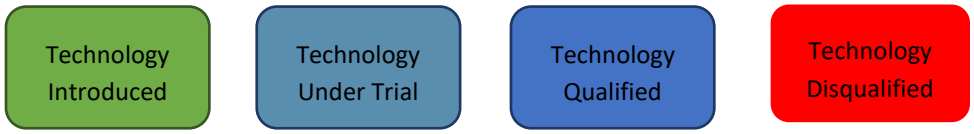


Figure 1- Evolution of secondary treatment (above) and tertiary treatment technologies (below) in STDP

LEGEND



Within this assessment and selection process which went through several years, Difaf identified some important considerations that illustrate the evolution of technology models, resulting in the success of treatment changes using few or several combinations:

Main Considerations / Actions Taken at Stage 1 (Batch 1 Batch 2)

- Testing of ABR efficiencies and optimization of retention time
- Different construction materials tested and compared
- Integration of anaerobic technologies (Anaerobic Filter) in conjunction with aerobic technologies
- Tertiary treatment technologies were introduced in Batch 2
- Evaluation of process chains

Main Considerations / Actions Taken at Stage 2 (Batch 1 & 2 Batch 3)

- Alternative aerobic technology was explored making use of lessons learned from the trickling filter and anaerobic filter.
- Different molds and construction materials developed and commissioned for mass production
- Tertiary technologies that optimize performance, cost, and operation were selected to move to batch 3
- Evaluation of process chains and development of final chains for batch 3

3.5. Project Duration

The project's initial duration was 36 months, which included (i) an eight-month inception period (already completed) in which UNICEF assessed available wastewater technologies and selected an intervention, and (ii) a 28-month implementation period during which UNICEF will implement the intervention in select IS.

Due to the toughening economic crisis and the COVID-19 break-out aside from heavy nationwide disruptive incidents, delays in implementations, hiring and frequent resource turn-over caused the project to extend for another 24 months, to end in December 2022.

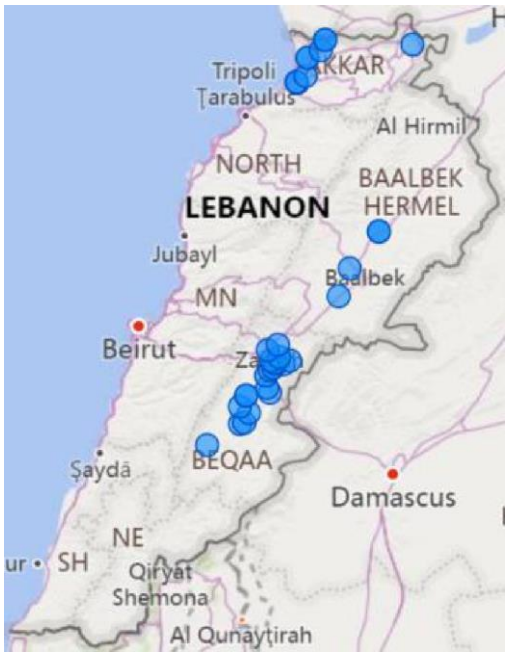


*Figure SEQ Figure * ARABIC 2 DEWATS Sites Location*

3.6. Implementation Modality & Summary

During the inception phase of the project, UNICEF developed and tested different target product profiles of the selected intervention designed and adjusted to meet the specific implementation needs for the target populations and developed designs aiming at improving treatment systems to be used in the sanitation chain.

UNICEF moved forward with connecting existing improved latrines to low-cost sewerage feeding non-sewer sanitation system (NSSS) with black and grey water from the site and has selected the decentralized wastewater treatment systems (DEWATS) with baffled septic tanks connected to an anaerobic filter that discharges to a tertiary treatment. This system should allow for the recovery of nutrients, saves freshwater and helps secure access to water in times of scarcity.

Pilots were installed in 22 sites shown in Fig. 1. where UNICEF and partners Two of those systems are installed in a Village in Akkar (North Lebanon) to treat the wastewater generated by a group of Lebanese houses previously directly discharging the wastewater in a watercourse. In July 2021, UNICEF with the support of UPM (Umwelt-Projekt-Management GmbH), organized a workshop to review the different batches' results from Batches 1&2, informing the final design of two new systems identified as being the combination of the most effective technologies tested before. To continue scaling up such treatment reducing the operation cost, To this date, UNICEF has installed around 70 treatment systems among which 11 systems from Batch 1 and Batch 2 (covering 28 systems) that showed promising results. Those 11 systems are shown in the following Fig.2.

As of 2022 UNICEF utilised the remaining funds and sourced additional budget further scale up after discussing findings with the WASH community, partners, and after Ministry of Energy and Water (MoEW) and the Ministry of Environment (MoE) endorsed the final technical solution and complete the Design for Manufacturing (DFM) report enabling the production of molds for further production in the country.

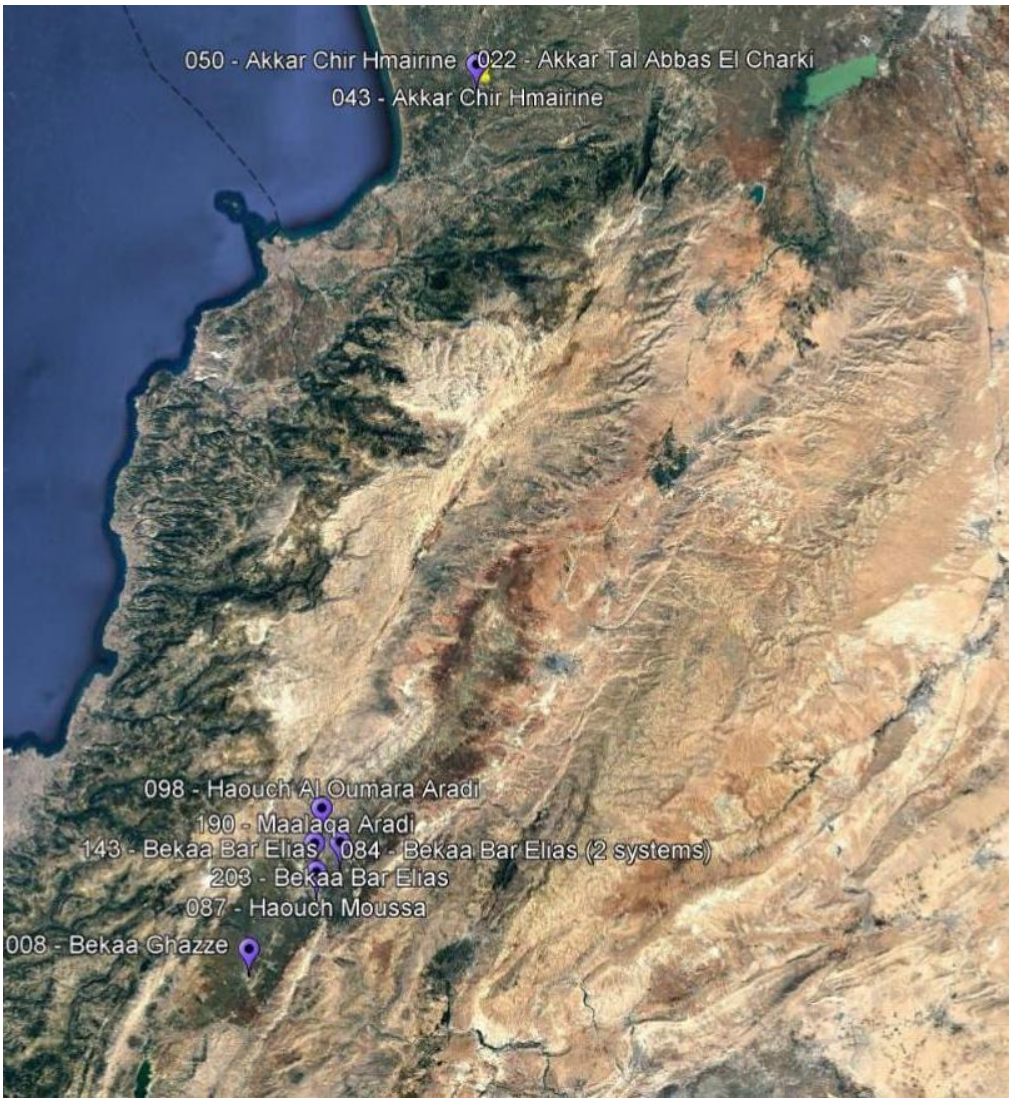


Figure 3 Locations of Systems with Promising Results

All the systems had a settler followed by Anaerobic Baffled Reactors. In the different sites, Anaerobic Filters (AnF), Biological Aerated Filters (BAF), or trickling filters (TF) have been installed for secondary treatments. Finally, the effluent was then polished during Batch 3 trials using tertiary treatment technologies designed to ensure a minimum footprint. The tested technologies were slow sand filters, aerated or conventional wetlands and Ultraviolet (UV).

3.7. Development Hypothesis

Within this Project UNICEF hypothesizes that, through a PPP with the Government of Lebanon and Lebanese SMEs, it can implement a more innovative and sustainable sanitation solution for Syrian refugees residing in Informal Settlements (IS) and corresponding Lebanese host communities that will

reduce WASH operational costs, reduce the frequency of desludging IS sanitation facilities, and improve sanitary and environmental conditions in sites where conditions are poor.

Based on current desludging costs, UNICEF also hypothesizes that implementing a more innovative and sustainable solution can reduce costs by 75% by reducing the frequency of desludging from weekly/monthly to annually. UNICEF estimates the desludging frequency to be reduced at least to a yearly desludging frequency after the installation of the proposed solution. The reduction of the frequency of desludging will save at least $2.6 million per year. By reducing desludging frequency, UNICEF will also be able to reduce dependence on unlicensed vendors.

UNICEF considers the Project to be a success if it is able to demonstrate improvement of sanitary conditions and environmental conditions (via discharge of treated wastewater) and there is benefit of investment that is tied to reduce desludging. These improvements should take into account the context of the IS in its design and its targeting, working towards reducing women's vulnerabilities and answering their needs. An additional success would be the national scaling of the technology to IS and host communities with the appropriate conditions, and replication in Syria or other humanitarian contexts in which UNICEF is responding.

4. Evaluation Objectives & Theory of Change

4.1. Project Results & Sub-results

The project is expected to have achieved the below results and sub-results:

- *Primary Outcome:* By 2020, an innovative sanitation technology that improves wastewater treatment and fecal sludge management is utilized in informal settlements and host communities in Lebanon, improving sanitary conditions for Syrian refugees and Lebanese community residents, with findings shared for the overall humanitarian response with similar sanitation contexts.

- *Outcome 1.1:* An innovative, sustainable sanitation technology that reduces Operation & Maintenance expenses is identified and planned for implementation by UNICEF in order to evaluate opportunities to improve sanitary conditions in Lebanon in IS and host communities.

- *Outcome 1.2:* By 2020, the selected innovative sanitation technology is implemented in target IS and Lebanese host communities and reduces operation and maintenance costs, frequency of service, and improves sanitary/environmental conditions in implementation areas.

Through achieving the above, the project aimed to support:

- *UNICEF LCO Outcome 1*: “Sustained use of safe water supply and sanitation services, and adoption of hygiene practices, by children and their families in poor communities vulnerable to climate change, conflict and public health emergencies".

The project results and intermediate results aimed to feed into:

- *CPD output 1.2* : "Girls, boys and their families have increased access to safe, equitable and conflict sensitive WASH services, especially in poor urban communities and in response to humanitarian crises", and

- *CPD Output 1.3:* "Children, Youth and their communities have increased water security through their engagement to demand and responsibly utilize improved WASH services, and to mobilize for environmental education, youth employment, and a healthier and climate resilient environment.

4.2. Reconstructing Theory of Change

The below Theory of Change (ToC) outline is based on the Results’ Framework shared by UNICEF. The Team refined and completed it by adding the indicators’ sections for assumptions and activities (the ToC is available as an annex in PowerPoint format):

IF an innovative sustainable solution to treat wastewater is identified (Outcome 1.1) and implemented (Outcome 1.2, Part 1), and IF there is no increase in the number of users, the served communities are accepting of the innovation, risks of eviction and vandalism are successfully managed, and there are sufficient resources to maintain the systems (assumptions), THEN the innovative sanitation technology that improves wastewater treatment and faecal sludge management will be utilized in Informal

Settlements (IS) and host communities in Lebanon (STDP Primary Outcome 1, Part 1), and THEN the sanitary conditions for Syrian refugees and Lebanese community residents will be improved (STD Primary Outcome 1, Part 2) and THEN girls, boys and their families will have increased access to safe, equitable and conflict-sensitive WASH services, especially in poor urban communities and in response to humanitarian crises, and will have increased water security (Impact).

IF evidence is generated that the technology reduces operation and maintenance costs, frequency of service, and improved sanitary/ environmental conditions in implementation areas (Outcome 1.2, Part 2), and IF these findings are shared (STDP Primary Outcome 1, Part 3), and IF there are sufficient resource and capacity within national and international institutions (assumptions), THEN there will be a potential for national scale up of the technologies in Lebanon (STDP Primary Outcome 1, Part 4) and potential scale up in overall humanitarian response with similar sanitation contexts (STDP Primary Outcome 1, Part 5).

In addition to that, this element can be added to the TOC and the level of potential for scale-up: IF the innovation is implemented in a way that builds know-how and establishes ways of working in institutions and the private sector, then PPPs in wastewater can be used in future. IF capacity is built and if public institutions (MoEW and MoE) demonstrate commitment to take on the innovation, and IF SMEs demonstrate capacity and have interest (market size) to produce innovative systems, THEN the innovation can POTENTIALLY be used sustainably in Lebanon.

The ToC is provided as a separate document along with this report for better clarity.

THEORY OF CHANGE

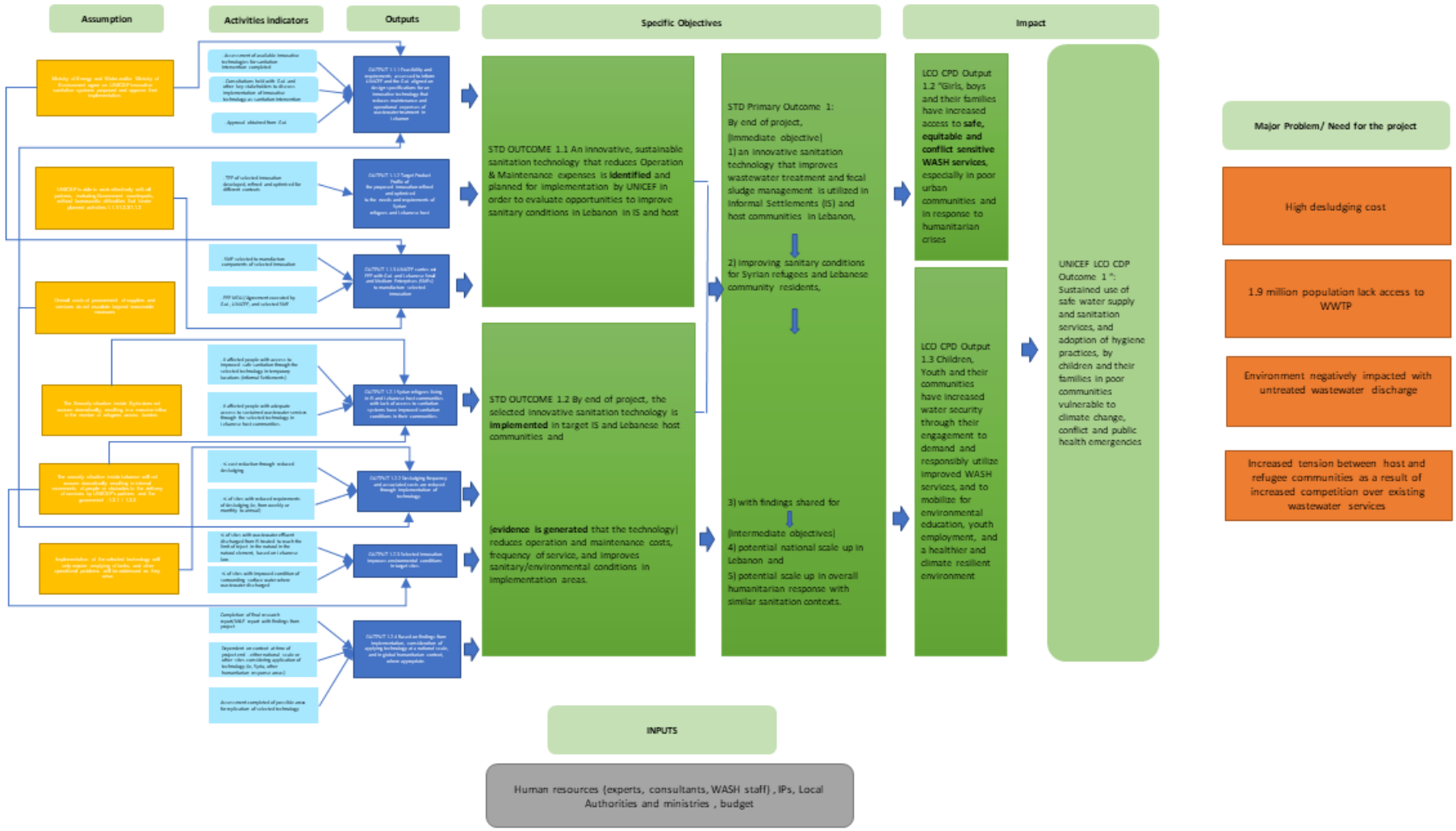


Figure 4- Reconstructed Theory of Change

4.3. Scope & Purpose of the Evaluation

As specified in the ToR, this evaluation is being conducted for both accountability and learning. Learning will be extracted for each phase of the project:

1. Identification and planning of the tech innovation;
2. Implementation of the innovation (implementation approach);
3. Innovation process, including design, testing and filtering of technologies;
4. Dissemination of findings to inform the WASH sector in Lebanon, national authorities and the humanitarian actors working in similar contexts.

As part of the agreement between UNICEF and Bill and Melinda Gates Foundation, this external evaluation is being conducted at the last phase of the project implementation, six months before the project completion and, after all systems have been installed. It will thus provide a clear evolutionary assessment which would help in better defining further potential for developing such programs and implementing decentralized wastewater treatment systems (DEWATS) solutions in Lebanon involving SME's support and mobilizing local economies, giving sustainability proper acknowledgement from both humanitarian and developmental angles.

The purpose of the evaluation also serves to provide lessons about the challenges and success factors of implementing innovation technologies through an independent assessment of the project design, implementation, and performance by identifying success/failure factors, critical barriers and enablers to adapting, testing and mainstreaming requirements, as well as internal and external highlights on knowledge buildup and insights developed on innovative sanitation solutions in refugee settings. A technical and socio-economic summative evaluation of the technologies and models produced will be conducted by comparing their results, outcomes and their effects on the community to sanitation and environmental conditions before their installation.

Furthermore, the findings will validate the choice of most suitable decentralized wastewater treatment systems (DEWATS) solutions to treat wastewater generated in both host communities and informal settlements (IS) in Lebanon. Both technical and business development recommendations shall be provided in conclusions and case studies, which can serve valuable lessons and insights to improve global humanitarian response in similar contexts. These will be based on evaluative evidence that will support UNICEF, Bill and Melinda Gates Foundation and implementing partners, and the WASH sector more broadly, with insights on innovation in such settings, and to improve programs design for current and future WASH interventions. The findings may also allow Project holders to perform adjustments before a new implementation phase if feasible and deemed necessary, or obtain information on impact of the program that can be helpful in the dissemination of the evidence, and in assessing future scalability and replicability.

The team will assess all actions undertaken to date and assess them against the program's conceptual framework (Theory of Change). The evaluation aims to:

1. To assess the innovation systems and the innovation process for quality and rigor and evaluate the ability of the innovations to achieve the desired outcomes and results set by UNICEF;
2. To critically assess the relevance, effectiveness, sustainability, and emerging impact of the project;
3. To assess the intervention's overall design, implementation approach, management arrangements, partnerships, adaptability and conflict sensitivity (intended and unintended outcomes);
4. To provide lessons learned, challenges and success factors of designing and implementing innovative and sustainable sanitation solutions in a refugee context, as well as the potential replicability of such systems.

The results of the evaluation will mostly focus on the results and potential for uptake of the technologies in Informal Settlements and in Host Communities. Therefore, the evaluation findings will seek to inform WASH programming both in humanitarian settings (within Lebanon and in areas with similar conditions such as Syria), as well as development approaches and practices in Lebanon. The evaluation exercise will end with diagnosing the challenges and assumptions in each project phase, and suggesting necessary improvements for the next phase of the program. The evaluation will also consolidate information channels between UNICEF and Project Implementers and other stakeholders, assessing participation of beneficiaries, transparency in the intervention, and appropriation of results.

In summary, the results of the evaluation will serve to:

- Measure and analyze the level of attainment of expected program outputs, outcomes, and emerging impact (emerging impact and potential for impact related to access to safe, equitable and conflict sensitive WASH services);
- Identify the contribution of the program to the development of DEWATS in terms of technology maturation, sustainability, and innovation;
- Identify the contribution of the program to institutionalizing a process of innovation in wastewater management in humanitarian setting;
- Assess the level of gender mainstreaming in program design and implementation;
- Analyze STDP against key quality and performance standards;
- Improve future program design, approach and highlights for upscaling.

Given the limited scope of the evaluation in terms of time and budget, and the critical political and economic situation of the country in the past years covering most of the project implementation period, Difaf will not be able to provide detailed assessment of the following:

- All wastewater technologies, set-ups and sites of intervention;
- Project stakeholder implementations, financial and project management;
- Implementing partners, contractors, performances etc.;
- Market assessments and projections in relation to feasibility;

- Inter-relational or political power tensions and unrelated noise affecting progress due to external factors;
- The efficiency of the project outside of the cost-effectiveness of the evaluated technologies.

However, these factors above will be addressed as part of assumptions and risks when relevant.

4.4. The Conceptual Framework of Evaluation

In developing the conceptual framework for this evaluation, the research methodology design was guided by the overarching objective of obtaining high-quality, relevant data that could inform insightful findings and highly actionable lessons learned. This evaluation aims to produce a final report that will be directly applicable to the sustainability and learning efforts of UNICEF. In order to structure these insights, the evaluation took for its framework the OECD/DAC criteria, a commonly accepted set of criteria developed to assist in evaluations of aid and programming in the development and humanitarian sectors.[7]

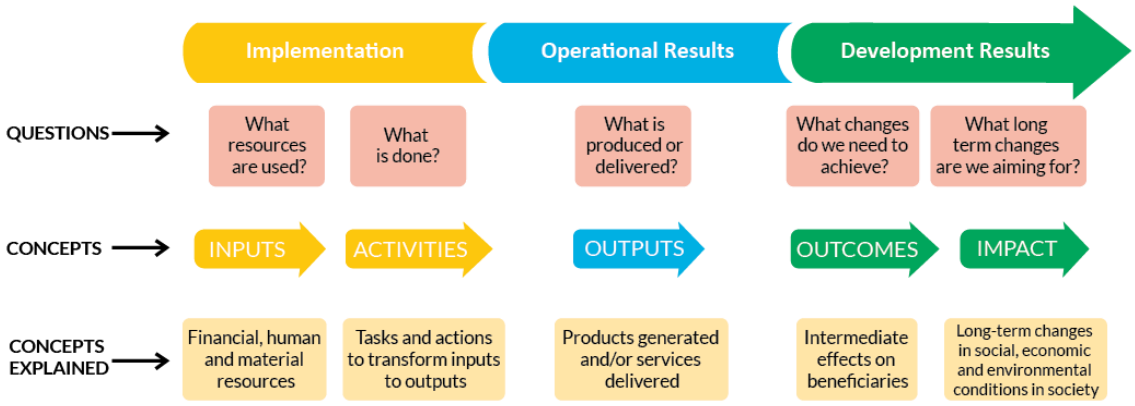


Figure 5- Conceptual Framework of Evaluation

The criteria formed the basis and starting point for developing the main research questions for this evaluation outlined below.

4.4.1. Relevance

- Q1. How relevant is the project to the urgent needs of the refugees and host communities in Lebanon?
  - Q1.1 To what extent do the achieved results respond to the informal settlement and host communities needs in terms of wastewater management? How?
    -
  - Q1.2 To what extent do the project results contribute to the achievement of UNICEF LCO child survival outcome 1 "Sustained use of safe water supply and sanitation services, and adoption of hygiene practices, by children and their families in poor communities vulnerable to climate

[7] OECD DAC, *DAC Criteria for Evaluating Development Assistance*, (https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm)

change, conflict and public health emergencies". – do the solutions create SAFE sanitation services (safe for all population groups)

?

4.4.2. Efficiency

- Q2. To what extent has the intervention been cost effective? – We will focus only on cost - effectiveness of the innovations, which is discussed under effectiveness.
  -
- Q2.1 To what extent were services provided in time and results achieved within an appropriate time period?

4.4.3. Effectiveness

- Q3. To what extent was the intervention successful in implementing effective, financially feasible and innovative technological solutions to treat wastewater in emergency context?
  - Q3.1 Effectiveness of the solution/ Technical assessment of effectiveness of the innovation: Did the implemented solution meet the legal, geographic, geological, physical, climatic and cultural criteria?
  - Q3.2 How effective/evidence based was the selection process and filtering of technologies?
  - Q3.3 Did the solution improve wastewater treatment and access to safe sanitation for Syrian refugees in IS and Lebanese in host communities? How?

- Q4. To what extent was the project able to **build institutional knowledge** and **strengthen the capacity of stakeholders** to improve global humanitarian responses in similar emergency context? What are the **lessons learned** in the process?
  - Q4.1 How did the project build Capacity capacity for PPP in the WASH sector?
  - Q4.2 How did the project affect the capacity for innovation in the humanitarian-development WASH practice?
  - Q4.3 How effective were the design logic and management approach in engaging stakeholders and implementing the intervention successfully? (to derive from the analysis: link to effectiveness of the innovation process; effectiveness of implementing the innovation in target sites)
  - Q4.4 What roles did organizational context, culture, and systems and processes play in what the project was able to achieve? (to derive from the analysis: link to effectiveness of the innovation process; organizational culture for innovation; dealing with the dilemma of time needed for innovation and short term humanitarian interventions; changes at ministries; the effects of the crises on SMEs, etc.)
  - -o Q4.5. What are the lessons learned about the feasibility of adapting and testing successful innovations? (Enablers and barriers)

- Q5. Did project activities show signs of creating **unintended positive or negative outcomes**? If yes, which activities contribute to this?

4.4.4. Impact & Sustainability

- Q6. To what extent are the implemented solutions likely to remain operational following the closure of the project? What are the conditions to maintain their sustainability?
    - Q6.1 How will the systems installed be managed/ maintained after the end of the project?
        - d?
    - Q6.2 What are the barriers to replicability/ scale up and how can they be addressed?
    - Q6.3 To what extent is the private sector showing signs of commitment and ability to take on the innovation and improve it beyond the project period?
    - Q6.4. To what extent can the local supply chain take on the implementation of such systems?
    - Q6.5. To which extent can the technological solution apply to other humanitarian situations globally? What are the enabling factors for a successful replication of this technology?

4.4.5. Gender

- Q7. To what extent has this initiative's design and implementation taken gender into consideration?
    - Q7.1 To what extent are project objectives and activities aligned with UNICEF's strategy, especially on equity, gender, and human rights aspects?
    - Q7.2 To what extent are the equity and gender aspects present in the design and implementation phases of the projects? What were the related constraints faced and what were their solutions?

4.4.6. Partnerships

- Q8. To what extent did the partnerships with IPs, institutions and the private sector facilitate the achievement of the project outcomes?

5. METHODOLOGY

This section presents the methodology designed by Difaf's team that will be mobilized during the data gathering, data processing and data analysis phases.

The proposed methodological design has not been limited to the proposal suggestions submitted by UNICEF. Difaf's team proposed some additional working axes that could enrich the evaluation and help the evaluators meet the purpose and objectives of the assessment, and the objective of this report.

5.1. Methodology Design

This evaluation is focusing on the innovation at three levels: the solution selection, the process and the implementation; alongside focusing on the outcomes of the innovation (the project as a whole). At each of the three levels of the evaluation, the evaluators will assess main innovative achievements, technical success factors and project successes and barriers with its ambitious purposes benchmarked.

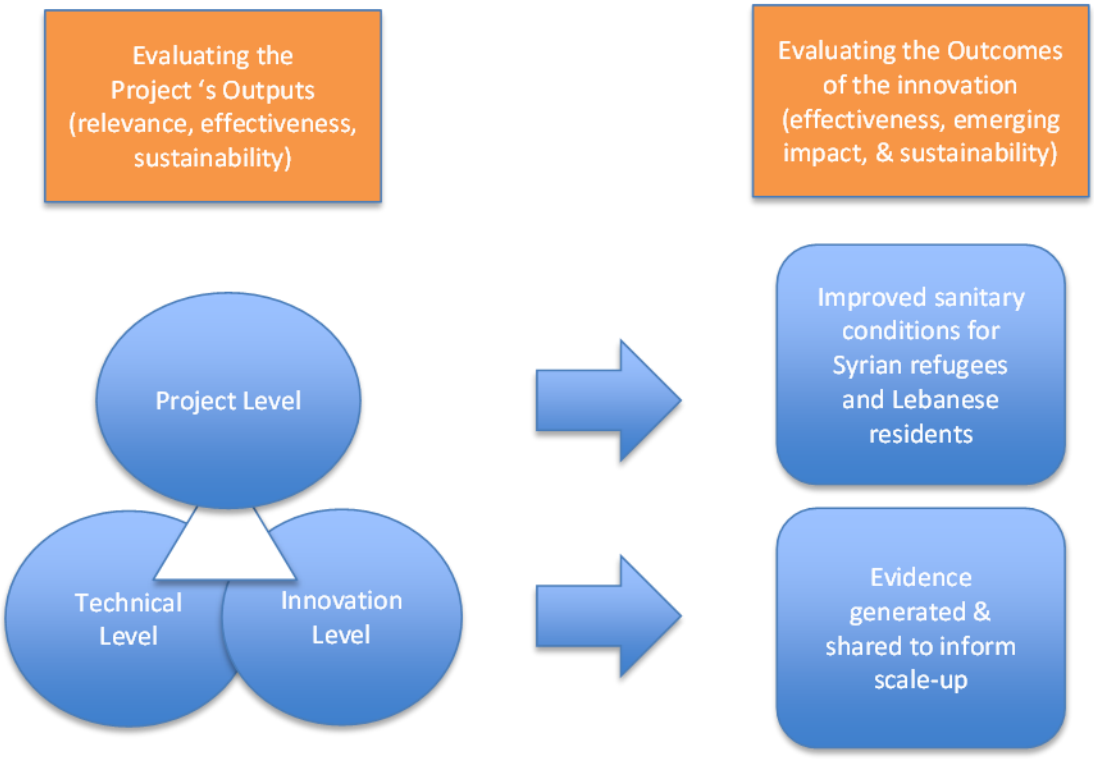


Figure 6 - Evaluation Methodology

5.1.1. The Technical Level (Treatment Technologies)

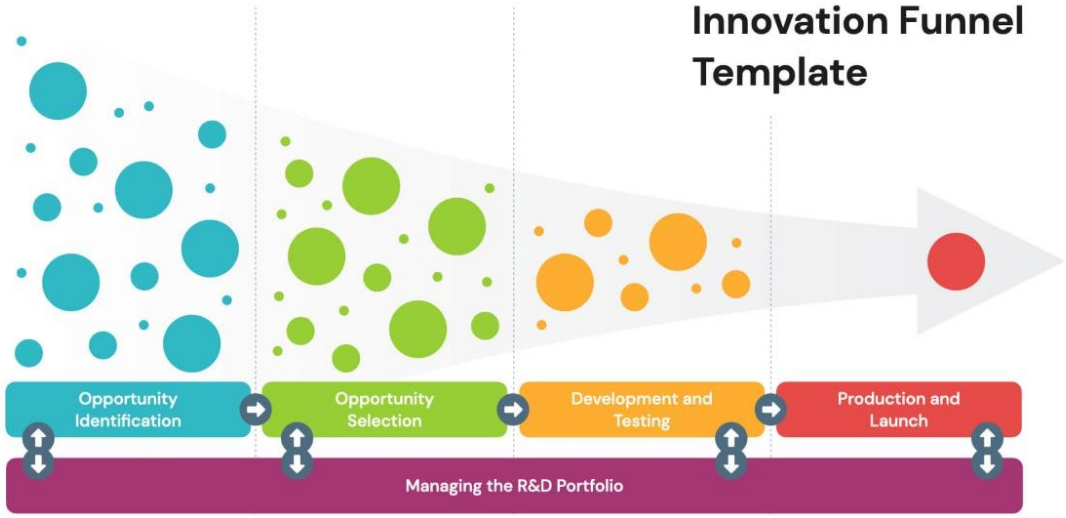
The technology and models evolution aspect of the systems installed will be evaluated through a thorough study of the design, implementation and monitoring processes undertaken by the project, assessing specific technical enhancements for adapting and improving the technologies. The evaluation will focus on the evidence used to inform decisions for continuation and discontinuation of technologies across batches. The design, testing and filtering of the innovations and technicalities will be assessed for suitability, treatment efficiency, and robustness. Operational complexities, adaptability to both host and refugee contexts will also be assessed, as well as potential or unaccounted aspects through a SWOT , which also take into account market considerations. The evaluation will thus focus on the safety, accessibility, equitable use and conflict sensitivity of the implemented innovation technologies in the 12 sites selected for the evaluation. Each technology will be evaluated based on a set of criteria, including but not limited to compliance with MoE decision 8/1, compliance with set targets for affluent quality, suitability to geographical, geological, physical, climatic context (topography, suitability to seasonal fluctuations), suitability to local practices (cultural acceptance), and potential for upscale (mobility and cost-effectiveness). 5.1.2 The Innovation Level

In addition to evaluating the innovation in technicalities, the team will evaluate the project outcomes with regard to the current and potential cumulative effect of innovation processes throughout the value-chain of the intervention. The degree of improvement of sanitary conditions and access to safe WASH will be addressed based on generated evidence, and how such measures can inform the future replication and scale up of the technology for use in humanitarian and development contexts. Another aspect will look into whether there were innovative elements in the selection and evolution of the combination of technologies implemented in 12 selected sites, the selected sites will include technologies from Batch 3 and Batches 1 &2, implemented in ISs and in host communities, and using criteria for selection highlighted before, and study innovation indicators to as we examine the evolutionary track of the project at each of the following stages (fig.:

1. Identification
2. Selection
3. Development & Testing
4. Production & Launch

The indicators shall be developed following the initial KIIs meetings with project holders and implementers, but will be categorised into the following categories:

- Technologies development (treatment, robustness, production)
- Sustainability & scalability (adoption, streamlining, market access)
- Project management (R&D, selection process, collaboration, knowledge build-up)



This aspect of the evaluation approach is presented in sections 4.2 and 4.4. The solutions-oriented aspect of the project DEWATS models will be given enough attention from the evaluators, in order to inform the potential up-scaling in Lebanon and other humanitarian crisis geography based on the level of success and the replicability/scaling-up potential is key.

5.1.3. The Project Level

The thorough study will start by reviewing all the baseline documents and the provision of all the project and technical design reports, progress reports (internal & external), desludging reports (before installation of the systems and after installation), and monitoring reports. Triangulation will be made through interviews (KIIs) and FGDs to understand development of these systems through design, implementation, evaluations and reiterations, as project was rolled out by UNICEF and implementing partners (ACF, Solidarités International, World Vision, LOST, SAWA), as well as SMEs involved in manufacturing or supply.

The study of the design phase of the project will look at how the project was initially conceived, the risks considered, the targets (realistic or too ambitions), the he initial selection of technologies and design considerations, the selection and management of implementing partners, the engagement of the local communities and gender aspects, the reporting agreements, the monitoring of data etc.

The project implementation phase will be evaluated by looking at how the systems were implementing partners' engagement quality assurance and reporting mechanisms, what adaptations were considered, how the evaluation process took place, redesigns, choice of material for manufacturing, overcoming challenges etc. Finally the lessons learnt about the project development, outreach and knowledge dissemination will also be evaluated for considering opportunities assimilated or missed, and the overall

project contribution to knowledge buildup, the potential success for dissemination of technologies in local or similar markets and contexts.

5.1.4. Defining Evaluation Boundaries

Difaf's evaluation will target the following interrelated segments of the project and corresponding project partners and stakeholders, noting that some correspond to more than one segment:

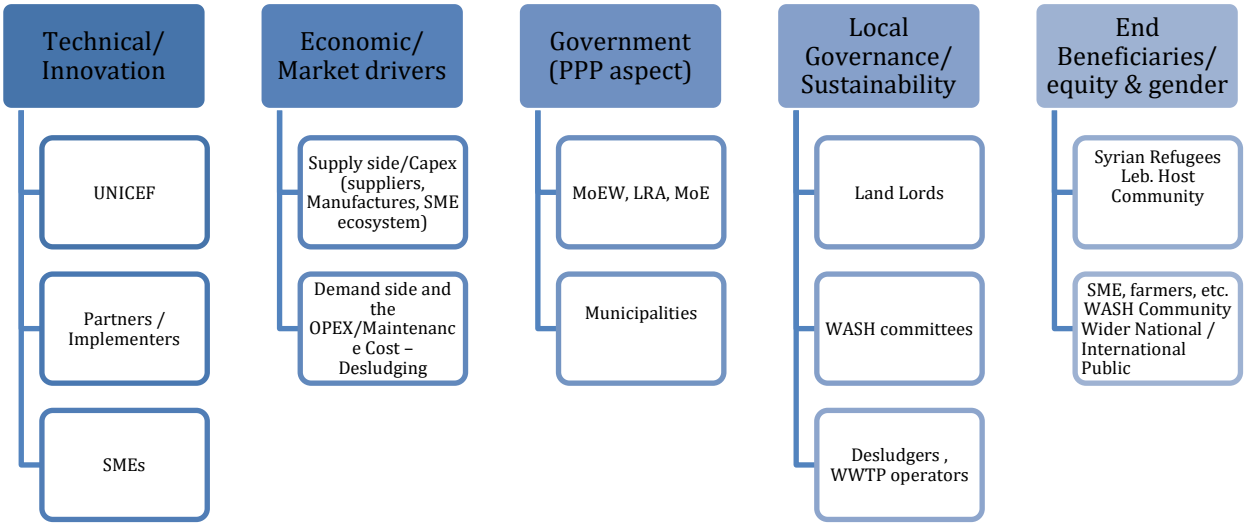


Figure 7- Project Partners and Stakeholders

The main list of identified respondents up to this date are:

- UNICEF WASH programme staff
- The implementing partners WASH staff
- Landowners
- The Shawish (IS of the Syrian Refugees)
- Local Authorities (Municipalities) or representatives
- SMEs: Suppliers and Manufactures
- SMEs: Service Providers (Desludging)
- The Line Ministries
- WASH committees, Hygiene Officers
- Farmers who use surface irrigation

5.2. Data Collection Methods & Sampling

5.2.1. Data Gathering

The evaluation will use a mixed-methods evaluation approach encompassing qualitative and quantitative methods of data collection for this evaluation. This approach was developed with the aim of allowing for triangulation between sources to increase the validity and accuracy of findings across the scope of implementation, while ensuring the design accounts for the sensitivity of the relevant issues.

The performance of the intervention will actively be explored throughout the evaluation. In line with these sectors, the evaluation will focus on assessing the achievements outlined in the project and assessing the technology performance as per the foreseen targets and indicators of achievement at output, and outcome levels both intended and unintended through the strategies and implementation modalities chosen in the context that the project dealt with.

The main tools for data gathering have been developed (Annex 4) and shall be refined before commencing field work, following initial project managers and implementers meetings.

5.2.1.1. Desk Review

Desk review of the project and documents was conducted at the inception phase to gain a comprehensive understanding of the project implementation since 2017. Further desk review will also be integrated into final findings to assess the evolution of the approaches over the course of the project, the justifications and inherent assumptions which led to the change in approach, and the comparative results between components and implementation in the existing project data. UNICEF team already provided baseline documents for the desk review and further documents are requested, whilst others might also be requested depending on the outcome of the field work. Annex 1 lists the main documents that were used by the Team in the course of the desk review.

5.2.2. Qualitative Methods

5.2.2.1. Key Informant Interviews (KIIs)

Our team will conduct 35-40 KIIs at different levels of project implementation. The list of the staff and potential stakeholders to be interviewed will be decided with UNICEF prior to the data collection process. The KIIs will provide insights into the outcomes of the project activities, major challenges, and success factors in implementing the project, and the operational environment and any contextual issues which may have affected the implementation of the project, its effectiveness, and results. Furthermore, the KIIs done with suppliers, industrials, and manufacturers involved in project and the study of any (rapid) market assessments conducted in order to understand the economic (market and business aspect) dimension, and quick market validation will be conducted to ensure the capacity of the local ecosystem to build and operate the new innovative sanitation solutions. Permission to digitally record will be sought prior to each interview as part of the informed consent process. If it is not given, detailed notes will be taken.

Target	Method	Suggested Sample	Purpose
UNICEF Representatives	KII	5	To understand the objectives of the evaluation and goals of the project from the donor perspective
IPs Project managers/Focal point and other	KII, SGI (in person or online)	10	A member from the management staff of each IP will be interviewed individually, and members from the field staff of each IP organization will be

stakeholders			interviewed individually or in small groups. This aims to capture both the initial plan and objectives, as well as the field/implementation challenges, success factors
State agencies (MoE, MoEW, and MoA, LRA focal points)	KII (in-person or phone interviews)	4	To capture impact, relevance, effectiveness, and sustainability aspects
Local level stakeholders	KII (in person or phone)	6-8 informants from municipalities, NGOs, landlords, *shawishes* and desludging vendors	To capture relevance, effectiveness, and sustainability aspects
Project SMEs: Suppliers, manufacturers	KII (in person or phone)	6	To understand the procedures followed in achieving the PPP and their contribution to the overall Project implementation and sustainability

5.2.2.2. Focus Group Discussions (FGDs)

These will be conducted with direct beneficiaries of the intervention, to gather in-depth qualitative data on various perspectives. To ensure open and honest discussion, as per best practice, an FGD will consist of approximately 6-8 participants. Sampling will be stratified by key demographic criteria (age, sex, refugee status) as provided by the implementing partners in both provinces (Akkar and Bekaa) to ensure a fully representative range of viewpoints, and to promote data saturation. Each FGD will last a maximum of 1.5 hours, to ensure the discussions remain dynamic and participants stay focused. Our team will use a well-trained field facilitator to ensure quality data gathering and linguistic and cultural competence. The qualitative data from the FGDs will provide in-depth insight into the lived experience of targeted communities, and will form a crucial aspect of data triangulation.

Target	# of FGDs	# of FGD Participants
Syrian refugees from ISs where DEWATSwere implemented (by gender)	2	12-16
Lebanese residents from communities near ISs where the technology was implemented	1	6-8
Lebanese residents from communities whereDEWATS were implemented (by gender)	2	12-16

Permission to digitally record will be sought prior to each interview as part of the informed consent process.

5.2.2.3. Field Visits (Direct Observations)

As for the field visits, Difaf team will commit to organise visits to 12 sites where photos, direct observations and mapping can be done. The data of the observations will be triangulated with the data provided by the FGD and KIIs to validate findings.

Target	Method	Suggested Sample
12 sites	Technical Assessment / Direct Observation	12 sites 15 to 20 systems

The technical aspect of the evaluation will focus on two components: the technical component looking into the technologies and the models selected, and the innovation component looking into how creation and learning were made in the course of the Project, examining the following aspects:

- Has the investment made to generate innovation been useful?
- Has this type of innovation been appropriate?
- Has the design of the prospective Innovation for Development been rigorous?
- What have been the expected and unexpected implications for supporting certain types of innovation?
- When examining the process used to diffuse innovation and move from one stage to the other, to what extent has it been evidence-based?
- How effective has the Project been in capturing the learning across batches?
- How flexible has the Project been in adjusting to changing circumstances?

Insofar as the technical component is concerned, it falls under Quantitative Methods and is thus discussed in the section below.

5.3. Quantitative Methods

Difaf will undergo a scoping mission to the 28 sites as an initial step, followed by a discussion with UNICEF to identify the most relevant sites for evaluation. As per the project's Financial Proposal, twelve evaluation sites will be selected according to the technology selection, the site selection done by UNICEF, innovation aspect and performance check:

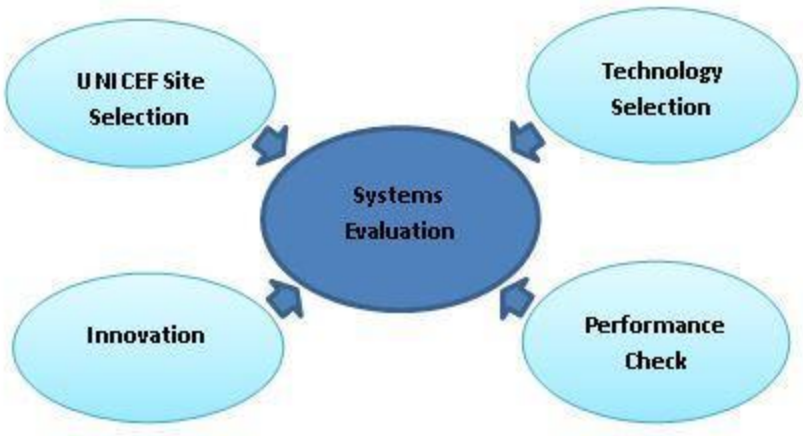


Figure 8- Evaluation Site Selection

The initial UNICEF **site selection** was based on two categories as per their proposal, this will include the end-use/discharge destination of the effluent criteria, the OPEX of the system and the social aspect.

The **technology selection** was based on in-depth DEWATS technologies research and design studies done by UNICEF, partners, and consultants to reach several options for optimal treatment chain cross-checks for comparison where variables such as geographical differences, demographic makeup, and wastewater characteristics will be taken into consideration.

Technical innovations will also be given attention; aerobic systems that utilize creative aeration techniques (be it leading to low footprint requirements etc.), innovations in odor control, wastewater transportation, system integration and more will have an impact on system selection.

Interest in assessing treatment **system performance** will play a major role in site selection. Systems that are working efficiently and others that are failing will be taken into consideration to assess success and failure factors. Viewing both systems have minimal variation, ending with mature model used for batch 3 models. The below criteria will have a set of indicators which Difaf will rely on to justify final systems and site selection, the table below is a non-exhaustive sample:

Evaluation Systems Selection Criteria
Sites including technologies that were used for batch 3 models
Sites including failing models from batch 3
Good performance of the system including treatment efficiency & low desludging frequency
Lebanese host communities Vs. Syrian Informal Settlements
Implementing partners
End-use/ Discharge destination

Social aspect/ relation with landlord
Low OPEX including low desludging frequency, energy consumption and maintenance
CAPEX of systems

The final selection of exact systems / site will be communicated to UNICEF after conduction of first set of interviews with project holders and implementers, one week before commencement of evaluation field visits.

In addition to the mixed method, Difaf, in coordination with UNICEF and implementing partners, will choose one or two sites to conduct an in-depth case study from Batch 3 to draw lessons and the best practices, as well as the main errors to avoid triangulation from other cases.

5.3.1. Technical Evaluation Methodology

5.3.1.1. Preparatory Phase

The aim of this stage is to prepare all the needed tools and equipment to undergo the sampling campaign and technical evaluation:

- The preparation and curation of sampling equipment (sampling containers, bottles, electricity meters etc.).
- Requesting security clearance for field visits.
- Arranging transportation to the sites (starting with the scoping visit) and labs.
- Scoping field visit to the 12 designated sites for ground checking and defining sampling points and critical system components.
- The scoping visit will also include preliminary sampling collection of 3 samples from 3 different sites, followed by in-house and out-sourced testing for different quality parameters for the purpose of validating in-house testing and analysis practices.

5.3.1.2. Initial Sampling Phase

The aim of this stage is to establish the big picture performance of the 12 designated systems with respect to adherence to the Environmental Limit Values (ELVs).

- Samples with be collected in triplicates from the inlet and outlet of each system, totalling approximately 66 collected samples. Two sampling campaigns, one at the start and one at the end of the project duration, will take place to assess the variation of the inflow water quality parameters and system performance.
- The collected samples will be tested in a lab for the following parameters:
    - Chemical Oxygen Demand, COD
    - Biological Oxygen Demand, BOD
    - Total Phosphorus, TP
    - Total Nitrogen, TN
    - Fecal Coliforms, FC

- Total Solids, TS
- Temperature
- pH
- Conductivity

5.3.1.3. Performance Sampling Phase

The aim of this phase is to further study the chosen systems for validating UNICEFs decision for choosing the technologies for batch 3 and confirming the treatment efficiency of the systems installed in batch 3.

- The systems to be sampled will be divided into two categories. The 1st category will be comprised of the 3 systems that included technologies that were integrated into batch 3. Whereas the 2nd category will include systems from batch 3.
- The systems in the 1st category will be analyzed on a stage-by-stage basis to validate UNICEF's decision to move forward with the technologies for batch 3. This category will be analyzed on a weekly basis over the project duration.
- Three different technology chains will be exhaustively tested from batch 3 to validate their treatment efficiency. This collection of systems is referred to as the 2nd category:
  - ABR + AF + SSF
  - ABR + AF + BAF + Aerated Wetland
  - ABR + AF + BAF +SSF
- In addition to the parameters stated in the initial sampling phase, the following parameters will be analysed:
  - Speciation of Nitrogen compounds (Ammonia, Nitrates and Nitrites): this provides a profound understanding of the nitrogen removal process taking place inside the system which is a direct indicator of overall system health.
  - pH and VFAs: this provides an insight on the level of fatty acid-induced inhibition of the anaerobic treatment process and helps identify rectifying practices if needed.
  - SVI: the sludge volume index is a direct expression of sludge settleability. A highly settleable anaerobic sludge is an indicator of a strong anaerobic microbiome, whereas a sludge with low settleability could be an indicator of poor hydraulic performance or biological inhibition.

5.3.1.4. Sampling Matrix

Sampling Phase	Sampled Category	Campaign Frequency	Sample frequency per Campaign per Location
Initial	Total 12 systems	Twice	- 3 sample collecting activities per system - One activity at 9 am - One activity at 2 pm - One activity at 6 pm - Three samples per activity
Performance	1 and 2	weekly	

Phase	Sampling Location	Parameters
Initial	Inlet and outlet of the total treatment chain	COD, BOD, TN, TP, pH
Performance	Inlet and outlet of each treatment unit of the treatment chain*	COD, BOD, TN, TP, pH, SVI, Fecal coliforms and total coliforms

		(NH3-N, NO3-N, NO2-N, VFAs)**

*: Outlet of a unit and the inlet of the immediate unit after it might coincide at times, in this case one sample serves as both outlet and inlet
**: If deemed necessary

5.3.1.5. Sampling Procedure

Sampling will be done in reference to international standards, and the methodologies developed by UPM in its report Sampling for Fecal Sludge and Other Liquid Wastes in Emergency Settings shall be observed for cross-checking and contextualizing.

5.3.1.6. Parameter Assessment Methods

The methods to be used for analysis of the different water quality parameters and sludge parameters are listed in the table below. It is important to note that some of the listed parameters are optional and will be analyzed on a per-need basis. It is also important to note that different Hach methods might need to be used depending on the conditions of the sample (e.g., expected range), however, all methods adhere to the standard methods of water and wastewater examination.

Parameter	Method	Material	Lower Detection Limit (mg/L)
BOD5 (mg O/l)	Standard methods 5210B	• Glass BOD bottles with stoppers and KOH nozzle (300 mL) • Potassium Hydroxide • BOD nutrient buffer powder pillows • ATH • Nitrification inhibitor • 20°C incubator	10
COD (mg O/L)	Standard methods 5220 / Hach 8000	• Block digester • Hach High Range COD kits (#2125925) • Hach Low Range COD kits (#2125825)	3 - 200
TN (mg N/L)	Standard methods 4500-N / Hach 10072	• Block digester • Hach High range TN kits (#2714100)	2
NH3 (mg N/L)	Standard methods 4500-NH3 / Hach 10031	• Hach High range NH3-N kits (#2606945)	0.4
NO_3^- (mg N/L)	Standard methods 4500-NO3- / Hach 8039	• 10 mL spectrophotometer sample cells • NitraVer 5 powder pillows 10 mL (#2106169)	0.4
NO_2^- (mg N/L)	Standard methods 4500-NO2- / Hach 10019	• Hach NitriVer 3 tube set (#2608345)	0.003
PO_4^{3-} (mg PO_4^{3-} /L)	Standard methods 4500-P / Hach 8048	• Hach PhosVer 3 powder pillows 10 mL (#2106069)	0.02
Solids (mg/L)	Standard methods 2540	• Drying oven (105 °C) • Muffle furnace (550 °C)	N/A (Dependent on weighing scale limits)
VFAs (mg CH3COOH/L)	Hach TNTplus 872	• Hach TNTplus 872 kits	50
SVI (mL/g MLSS)	Standard methods	• 1000 mL graduated cylinders	N/A

Parameter	Method	Material	Lower Detection Limit (mg/L)
	2710	• Stoppers • Weighing scales	
Coliforms, Fecal and Total	9222 B and D	• Buchner filtration apparatus • Incubator • Plate counter • Autoclave • Petri dishes • Broth	N/A

5.3.1.7. Quality Control & Quality Assurance

To ensure quality and representation of measurements, a minimum of three samples will be taken from each point. In the case of a particularly critical sampling point, a minimum of five samples will be taken. Measurements will be performed in triplicates and the average reported within a 95% confidence interval. Sample matrix spikes and standard checks will be routinely performed to maintain the integrity of the measurement methods and the equipment.

Difaf shall attempt to perform tests using its own mobile lab kits. For this purpose, she will collect triplicate samples of the same wastewater source and validate its results using two external labs. If numbers turn out in a close range of no more than 5 % deviation, Difaf will ask for permission to rely on its own lab analyses as this would mean more efficient and accurate results as samples would not be transported over long distances, nor stored over lengthy time intervals which may contribute to errors in readings.

5.4. The Evaluation Matrix

Following the main evaluation questions that were devised, sub-questions were developed and integrated into the evaluation matrix according to the main evaluation criteria based on the ToR. These will enable the further development of specific questions and tools and assess strong points and weaknesses of the intervention and the elaboration of recommendations for future programming. This is considered a working document which will be reiterated before field visits and after validation with project owners and own deliberations, where tools shall also be more specified in terms of specific questions and inquiries. A tentative matrix was developed and presented in Annex 7.

5.5. Data Analysis

At the technology level, the data analysis as described in sections 5.3.1.3-5.3.1.6 will determine the extent to which evaluated technologies meet the parameters for water quality. This will be complemented by case studies using narrative analysis of the causes and effects of introducing certain technologies in certain contexts, focusing on success factors and barriers to the implementation and uptake of technologies.

At the innovation level, a process tracing will be conducted to determine how the innovation process happened, and what factors determined the selection of some technologies and the abandonment of others.

At the project level, triangulation, pattern analysis and synthesis will be used to analyze data. Data from secondary and from multiple primary sources will be triangulated to draw conclusions. Patterns or trends in stakeholders' responses and views on the project will be identified, and synthesized around common themes. Comparing and contrasting qualitative data will provide information about the areas of consensus and those of disagreement pertaining to the chosen evaluation questions.

5.6. Limitations & Biases

The evaluation team is aware of several noteworthy biases/limitations in this kind of research:

Political / Economic Instability: The current state of political tension surrounding the new Lebanese parliamentary elections in the face of on-going economic crisis, with its highly fragmented and polarized nature, presents the most significant risk to our ability to conduct the above-mentioned activities. There will be communication with UNICEF on a weekly basis, and if necessary, daily, to report on the impact of the political situation on our ability to conduct data collection as the team reports feedback from the field teams if the tensions escalated. Should this take place, the team will attempt to mitigate its effects by shifting the weight of the data collection process (principally, the KIIs) to the virtual realm.

Response Bias: Response bias is the risk that key informants may be motivated to provide responses that would be considered desirable or influential in obtaining donor support. For example, an IP may provide positive remarks about the project because he/she would like to maintain similar projects in the future. The team will mitigate these risks by ensuring that respondents feels free and independent, principally through the elimination of intimidating factors from the FGDs, such as the presence of UNICEF staff, project implementers, or other authority figures.

Recall Bias: It is a common evaluation problem where beneficiaries may respond to questions posed by the evaluation with answers that blend their experiences into a composite memory. Respondents who may have participated previously in similar activities may not separately distinguish their experience with the project. Additionally, depending on when beneficiaries participated in the project's activities, their perceptions of events may change over time and their ability to remember specific details may fade. The team plans to mitigate this risk by probing FGDs and the feedback survey as much as possible within the available evaluation period to triangulate responses and increase the validity of the findings.

Limitations in Market Validation: As for this component, the success of the assessment will be limited to the secondary data delivered by UNICEF and the cooperation of the implementing partners (Suppliers, Manufactures, the vendors, Materials, etc.). This is due to the fact that the validation will be based on the Desk Review, and on KIIs with the implementing partners of the type aforementioned (please refer to part 4.2.2.1 within the Methodology section).

Absence of Sufficient Documentation / Data: If the requested documents were not shared / available, this might cause a gap in the data. We will try to mitigate that by depending on the shared documents and elaborating on the data collected from the IPs and the UNICEF team.

5.7. Risks & Mitigation Plan

During the inception phase, the evaluation team has determined what are the possible limitations to the evaluation, as a result of the nature of the Project, or as a result of the information provided during the inception period. Below is a list of limitations that may be encountered during the evaluation:

#	Risk	Mitigation Measure
1	Non-statistical representation (this is considered a risk only at the level of the quantitative data collection)	Rely on triangulation of research information
2	The information provided to the evaluation team may be outdated and may not reflect the current progress of project activities	Interview relevant IPs and UNICEF staff before the submission of the finalization of the data collection strategy
3	Inability of the evaluation team to reach a target area due to various constraints (e.g. weather or security)	Timely planning and coordination with relevant UNICEF and IPs staff and local authorities
4	Respondent fatigue / Unwillingness of program beneficiaries to meet with evaluation team or answer questions	Careful planning and coordination with relevant UNICEF and IPs staff and local authorities. Short but effective meetings and visits
5	Beneficiary feedback is influenced by other stakeholders, power dynamics, fear of retaliation	Clearly explain the purpose of the evaluation and the role of evaluators, make interviewees at ease. “This is not an audit investigation”. Interviewees will be met separately; focus groups will be organized with considerations of power dynamics

The following set of assumptions were also identified by evaluation team, and which our field preparations and implementation will try to overcome:

- Much of the evaluation is dependent on the ability of UNICEF to ensure respondents’ participation and contribution to the evaluation.
- UNICEF staff are able to mitigate any issues that may arise concerning the availability and willingness of stakeholders to participate in the evaluation.
- Ability of the evaluation team to access project areas (e.g. in terms of security).

Willingness of participants to share sensitive information pertaining to tension between stakeholders (citizen-state, Lebanese-Syrian, Syrian-Syrian etc).

5.8. Evaluation Norms & Ethical Considerations

The section should include information on the evaluation norms and standards (UNICEF/UNEG norms and guidelines[8] mentioned in the ToRs). The section must also cover considerations and possible ethical issues that may arise from the evaluation process and the mitigation measures that will be taken to address them. It is essential that the evaluation team review *UNICEF procedure for ethical standards in*

[8] The key documents are listed in the cover page section of this report.

research, evaluation, data collection and analysis,[9] and that special measures be taken when children and adolescents participate, as well as other vulnerable groups in the evaluation process. The process of ethical review and the supervision of the evaluation process must be clearly explained, and all the individuals involved in data collection should have a basic training on ethics.

An ethical review by an external committee (Institutional Review Board or Ethical Review Board) must take place if the evaluation involves minors or other vulnerable groups, or if there are risks to the safety, privacy and wellbeing of the evaluation participants. The informed consent forms and protocols for the protection of participants' identity and for their safety, as well as for data protection and other relevant information shall be provided in the annex. If the evaluation team participates in the dissemination of the evaluation results, how these results will be disseminated to the primary and secondary audiences can be indicated.

The evaluation process will adhere and respect the UNEG and UNICEF norms and standards, including (i) UNEG Norms and Standards for Evaluation (2016) (ii) Ethical Guidelines for UN Evaluations (2008) (iii) Code of Conduct for Evaluation in the UN system (2008) (iv) Integrating Human Rights and Gender Equality in Evaluation – Towards UNEG Guidance (2011) (v) Ethical Research Involving Children, 2013 and UNICEF Procedure on Ethical Standards in Research, evaluation, data collection and analysis dated April 1st, 2021 (UNICEF Procedure).

The evaluation falls in the scope of application of such procedure given that (i) it covers an evaluation and data collection and analysis involving human subjects or the analysis of sensitive secondary data and that (ii) it is being conducted by Difaf, which qualifies as a UNICEF contractor.

As per UNICEF Procedure, Difaf will adhere to the five guiding principles that must inform ethical evidence generation which are Respect, Beneficence, Justice, Integrity and Accountability. Difaf declared no conflict of interest. Difaf will clearly identify any potential ethical issues, or any vulnerable social groups targeted within before/during the assessment process.

All experts, surveyors and facilitators will sign an ethical chart (Impartiality, independence, quality, and transparency) as they will also sign the Pledge of ethical conduct in evidence generation to the UNICEF Procedure. Also, Difaf will conduct its own screening during the surveyors/interviewer's recruitment to assure that engaged employees are respecting the ethical norms and criteria.

Based on the suggested methodology, the consultant has identified Syrian Refugees as a vulnerable group among the targeted population and specifically the Syrian women refugees who are going to participate in one FGD with the Shawish. Difaf will make sure not to expose refugees in general and women refugees in particular to any risk or threat based on their participation in the FGD. The selection/invitation will be conducted in close coordination with WASH committees and the IS Shawish. Informed consent shall also be obtained from all participants according to a template previously agreed upon by UNICEF. Also, all the Difaf employees have already signed on contractual confidentiality of all

[9] UNICEF Procedure for Ethical Standards in Research, Evaluation, Data Collection and Analysis, 2015: www.unicef.org/supply/files/ATTACHMENT_IV-UNICEF_Procedure_for_Ethical_Standards.PDF

projects' information. Difaf will conduct the evaluation in respect to the intellectual property of each source by mentioning it clearly in the report.

To reduce any risk of conflict of interest and increase the level of transparency as well as the confidentiality, Difaf will respect the anonymity of the interviewees except the public servants. Finally, during the data gathering process and field visits, Difaf team will be committed to report immediately to UNICEF any incident or problems that may negatively affect the working plan or the client reputation. To ensure independence of the evaluation, the Evaluation Specialist of UNICEF Lebanon will be the overall manager of the evaluation. The manager will ensure compliance with UNICEF norms and standards.

5.9. Quality Assurance

Difaf will name a senior advisor to accompany the data gathering phase and to oversee the overall quality of the process. The advisor should control the technical steps during the preparation period (tools design, training of employees, claim/incident reporting system, sampling design, etc.) as well as during the process implementation.

The project manager and the senior advisor will be responsible for the quality assurance in respecting the norms and ethical considerations mentioned above.

For each tool (example: the questionnaire), the consultant will conduct a pilot to validate the final version before sending the surveyors and interviewers to the field. Hence, to assure quality control mechanisms, the consultant will designate a quantitative expert in charge to oversee the data gathering process in order to validate the authenticity and the integrity of the information and their compliance to the initial working plan. Difaf will be committed to communicate to UNICEF the final version of each elaborated data gathering tool for its approval before initiating the survey, FGD and KII.

For the main deliverable (Evaluation Report), Difaf will build on the primary and secondary tools delineated in the methodology described above. The final report will be proofread by the Project Manager, WASH Expert, and Innovation Evaluator to verify its adherence to the United Nations Evaluation Group (UNEG) Standards for Evaluation in the UN System, United Nations Evaluation Group (UNEG) Norms for Evaluation in the UN System, and UNICEF's adapted evaluation report standards (GEROS).A Reference Group has been established, and it includes UNICEF program staff, implementing partners, government, and representatives of right holders. It will endorse the Terms of Reference, the Inception Report and participate in the preliminary findings workshop to be organized by Difaf.

The Evaluation Manager of UNICEF will also be the UNICEF focal point for the evaluation team and will be responsible for document validation. He/she will also ensure that the evaluation reference group is informed of the status of the evaluation.

6. WORKPLAN

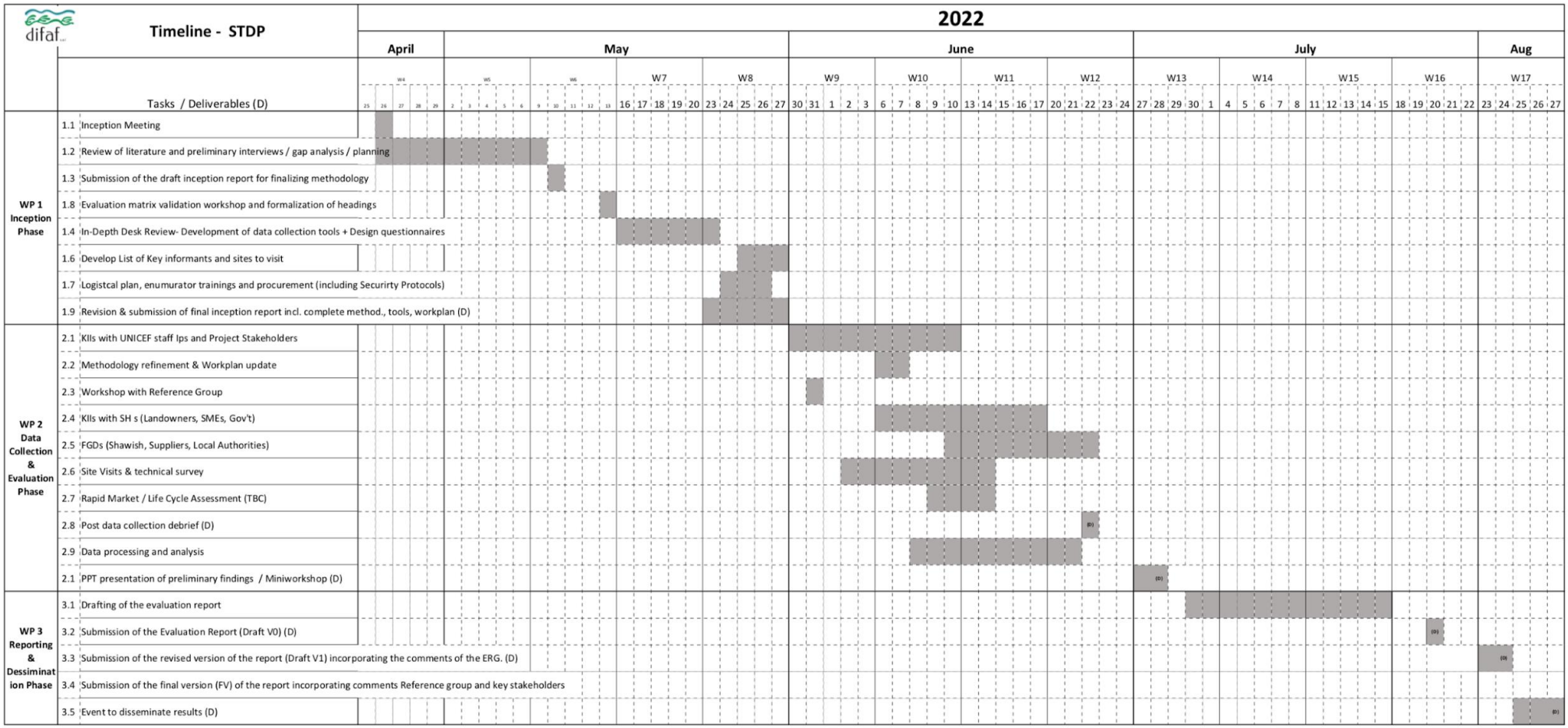
The evaluation workplan details the tasks, purpose and outputs in each of the two outcomes. Effort has been made to maximize the number of activities per day, while also ensuring sufficient time for data collection and analysis. After the approval of the inception report, Difaf will develop the final work plan and will be shared in the final version after revision by client.

6.1. Key Milestones

- **Week of 30 May:** interviews with UNICEF, IPs, Key personnel, Field visit for quick scoping and trials of own lab kits
- **6-22 June:** data collection
- **23-29 June:** data analysis
- **30 June:** presentation of preliminary findings
- **15 July:** Draft report
- **Final report:** one week after receiving consolidated comments from UNICEF, Reference Group and partners

6.2. Timeline

The timeline can be found on the next page, and has been reviewed and approved during the inception phase.


Timeline - STDP
2022
April
May
June
July
Aug
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
W16
W17
Tasks / Deliverables (D)
WP 1 Inception Phase
1.1 Inception Meeting
1.2 Review of literature and preliminary interviews / gap analysis / planning
1.3 Submission of the draft inception report for finalizing methodology
1.8 Evaluation matrix validation workshop and formalization of headings
1.4 In-Depth Desk Review- Development of data collection tools + Design questionnaires
1.6 Develop List of Key informants and sites to visit
1.7 Logistcal plan, enumurator trainings and procurement (including Securirty Protocols)
1.9 Revision & submission of final inception report incl. complete method., tools, workplan (D)
WP 2 Data Collection & Evaluation Phase
2.1 KIIs with UNICEF staff Ips and Project Stakeholders
2.2 Methodology refinement & Workplan update
2.3 Workshop with Reference Group
2.4 KIIs with SH s (Landowners, SMEs, Gov't)
2.5 FGDs (Shawish, Suppliers, Local Authorities)
2.6 Site Visits & technical survey
2.7 Rapid Market / Life Cycle Assessment (TBC)
2.8 Post data collection debrief (D)
2.9 Data processing and analysis
2.1 PPT presentation of preliminary findings / Miniworkshop (D)
WP 3 Reporting & Dessiminat ion Phase
3.1 Drafting of the evaluation report
3.2 Submission of the Evaluation Report (Draft V0) (D)
3.3 Submission of the revised version of the report (Draft V1) incorporating the comments of the ERG. (D)
3.4 Submission of the final version (FV) of the report incorporating comments Reference group and key stakeholders
3.5 Event to disseminate results (D)

7. ANNEXES

ANNEX 1 List of Documents Gathered & Reviewed

The preliminary documents provided by the client and examined by Difaf was sufficient to provide initial all-around information that helps to grasp the project basis and evolvement, some of its reported success and challenges, stakeholders and technical data, and producing and detailing our tools and questions. Furthermore, it helped in refining methodology, workplan, and set put a time frame for the evaluation since the process is commencing prior to the final completion of the project. Below are the main objects of our Desk Review.

Document Name	Available	Partner/ donor	Mentioned somewhere in other reports/ anywhere in the documents '	Read by Difaf
Inception report - UNICEF	yes	Donor	yes	X
Project proposal	yes	Donor	yes	x
Results Framework	yes	Donor	yes	X
Project budget??		Donor	yes	
SOP Landlord, Supplier, Municipality issues	yes			X
TORs for sampling and analysis of wastewater	yes			X
L&I Learning framework	yes			
SANITATION ACTION PLAN	Yes	Donor	yes	X
Sampling for Faecal Sludge and Other Liquid Wastes in Emergency Settings	yes			X
Comprehensive Overview of Biogas for Sanitation Options – Training of Trainers	yes			X
Design Considerations for Simplified Sewer Network in Informal Settlements	yes			X
Anaerobic Baffled Reactor (ABR) Design Considerations for Faecal Sludge	yes			X
Anaerobic Filter (AF) Design Considerations for Faecal Sludge	yes			X
Comprehensive Overview on DEWATS Effluent Post-Treatments	yes			X
Consolidated Emergency Report	yes	Donor		X
Progress Narrative	yes	Donor		X
Consolidated Emergency Report 2	yes	Donor		
Technical data				
UNICEF LEBANON_Evaluation and ranking20210716	yes			
UNICEF LEBANON_Introduction for Workshop_Day 1.pdf (Workshop - Definition of the Product Profile for Wastewater Treatment in Lebanon)	yes	Donor		X
UNICEF LEBANON_Introduction for Workshop_Day 2	yes			X
Report batch 1 and 2 and product profile batch 3-1.pdf (DECENTRALIZED WASTEWATER TREATMENT IN THE LEBANESE INFORMAL SETTLEMENTS)	yes	Donor		X
UNICEF LEBANON_Evaluation and ranking20210716.pdf	yes	Donor		X
Efficiency of treatement	yes	Donor		X
Overall effiencies	yes	Donor		X
Weighing Summary	yes			X
ABR AF BAF SSF.pdf	yes	Donor		X
ABR AF BAF Wetland.pdf	yes	Donor		X
ABR AnF Slow Sand Filter.pdf	yes	Donor		X
BoQs systems.xlsx	yes	Donor		X
Design Cylinder ABR AF BAF Aerated Wetland	yes			X
Design cylinder shape ABR AF SSF	yes			X

ANNEX 2 Wastewater Environmental Limit Values & FAO Standards for Irrigation

Standards	ELV's	Class I	Class II	Class III
Restrictions	Discharge into surface waters	Produce eaten cooked; irrigation of greens with public access	Fruit trees, irrigation of greens and with limited public access; impoundments with no public water contact	Cereals, oil plants, fiber and seed crops, industrial crops, fruit trees (no sprinkler irrigation); nurseries, greens and wooden areas without public access
pH	6-9	6-9	6-9	6-9
TSS (mg/l)	60	60	200	200
Active Cl2 (mg/l)	1	-	-	-
Cl2 residual (mg/l)	-	0.5-2	0.5	0.5
COD (mg/l)	125	125	250	250
BOD5 (mg/l)	25	25	100	100
NO3-N (mg/l)	90	30	30	30
Coliform Bacteria/1000ml	2000	-	-	-
FC /100ml @25C	-	<200	<1000	none required
Helminth (eggs/l_	-	<1	<1	<1
Note: Irrigation of vegetables eaten raw is not allowed				

ANNEX 3 List of People to Interview & Site Visits

To be completed and sent after revision and sharing of contacts and conducting initial set of KIIs with project caretakers. So far, the project team has provided the evaluation team with contacts for UNICEF, IPs (ACF, LOST, SAWA, SI, WVI, and Nabad), and two ministries (MoEW and MoE). It will request for contacts of municipalities, SMEs, and vendors from UNICEF in the coming period, and will obtain contacts of field NGOs, landlords, and shawishes from the IPs.

ANNEX 4 Data Collection Tools

Provided in a separate document.

ANNEX 5 Template of Informed Consent Forms

Name of the Evaluator:

Evaluation project title: Third Party Evaluation for "Sanitation Technology Demonstration in Emergency Settings in Lebanon" Project

PURPOSE OF THE EVALUATION
You are being invited to take part in the evaluation of the "Sanitation Technology Demonstration in Emergency Settings in Lebanon" Project. Before you decide to participate in this study, it is important that you understand why the evaluation is being done and what your participation will involve. Please read the following information carefully and feel free to ask the evaluation if there is anything that is not clear or if you need more information.

I am working independently for UNICEF to conduct an evaluation of the work conducted by UNICEF and its partners regarding the "Sanitation Technology Demonstration in Emergency Settings in Lebanon" Project.

The purpose of the evaluation is to provide lessons about the challenges and success factors of implementing innovative technologies and suitable solutions to treat wastewater which can serve as a lesson learnt to UNICEF and its partners in future work. You have been chosen to participate in this evaluation as a beneficiary/stakeholder.

STUDY PROCEDURES
If you choose to participate, you will be asked questions related to the evaluation of the project.

DURATION
The interview will take (enter amount of time).

VOLUNTARY PARTICIPATION
Your participation in this study is voluntary. It is up to you whether or not you decide to participate. If you decide to participate, you will be asked to sign this consent form. After you sign this consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this evaluation will not affect the relationship you have, if any, with the evaluator. You will also still receive all the services they usually do and will not receive any sanction if they decline participation. If you withdraw from the evaluation before data collection is completed, your data will be destroyed.

RISKS
I don't anticipate that there are any risks associated with your participation, but you may decline to answer any or all questions and you may withdraw your participation at any time if you choose.

BENEFITS
There will be no direct benefit to your participation in the evaluation. However, we hope that the information from this evaluation may serve the community to find suitable solutions to treat wastewater as well as UNICEF and its partners for future projects.

CONFIDENTIALITY

Your responses in this evaluation will be anonymous. Every effort will be made by the evaluator to preserve your confidentiality, including *assigning codes/pseudonyms for participants that will be used on all research notes and documents.*

CONTACT INFORMATION

This study was approved by UNICEF. If you have any questions at any time about this study, you may contact the evaluator whose contact information is on the first page. If you have any questions regarding your rights as an evaluator participant, or if problems arise which you do not feel you can discuss with the evaluator, please feel free to contact the Director of Difaf, Mr. Hussam Hawwa, at hussam@difafwater.com or by calling +9611-397 025.

CONSENT

I have read the provided information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I understand that I will be given a copy of this form, and the evaluator will keep another copy on file. I consent voluntarily to be a participant in this evaluation.

Name of Participant_____ **Signature of Participant** _____

Date _____
Day/month/year

Name of Evaluator_____ **Signature of Evaluator** _____

Date _____
Day/month/year

ANNEX 6 Structure of Final Report

Below is an initial suggestion of the outline of final report, adapted from UNEG Evaluation Report Standards:

I. Table of contents, list of annexes/figures/tables, etc.

II. List of Acronyms

III. Executive Summary (2 # 5 pages)

IV. Background to the project (object of the evaluation)

V. Evaluation Purpose, Objectives and Scope

V. Methodology, Limitations & Ethical Considerations

VI. Evaluation Findings

1. Relevance
    a. Technology level
    b. Project level
    c. Innovation level
2. Efficiency
    a. Technology level
    b. Project level (timeliness)
3. Effectiveness (incl cost-effectiveness)
    a. Technology level
    b. Project level
    c. Innovation level
4. Sustainability
    a. Technology level
    b. Project level
    c. Innovation level
5. Gender
6. Partnership

VII. Conclusions and Lessons learned

VIII. Recommendations.

IX. Annexes

ANNEX 7 Terms of Reference

Provided in a separate document.

ANNEX 8 Evaluation Matrix

Provided in a separate document.

ANNEX 9 Informed Consent & Data Storage Protocol

1. Obtaining informed consent

For the purpose of evaluating the Sanitation Technology Demonstration in Emergency Settings in Lebanon project, the Difaf team has developed the following protocol to ensure the safety and protection of all informants.

Informed consent will be sought by all informants in the evaluation. Consent will be written or verbal depending on the profile of the informants.

1.1. Written and signed consent.

Written and signed consent will be sought from participants in key informant interviews (KIIs) and small group interviews (SGIs) from UNICEF and the partner organizations, as well as from public institutions, namely the ministries that were active stakeholders to the project. For that purpose an informed consent form provided in Annex 5 will be used.

1.2. Verbal and not signed consent.

Verbal consent will be sought from all participants in KIIs and focus group discussions (FGDs) who are not associated with partner organizations and relevant ministries. The choice of seeking verbal consent is due to cultural sensitivities associated with perceived risks stemming from signing documents and is in line with research practice in Lebanon.

The evaluation team will inform all participants in detail about the aims of the evaluation, the type of questions asked and the right to withdraw at any point, as well as contact points in case of any concerns or questions. They will be provided with contact information of two persons from whom they can contact in case of any concerns or complaints (one from the evaluation team and one from the assisting implementing partner organization).

The consent process will occur in a suitable space, for while in most cases private rooms are preferable, for some categories (especially young women) semi-private spaces are preferable in order to avoid the possibilities of suspicions being cast upon them, which may endanger them physically and emotionally.

All information provided to KII and FGD participants in included in the introductory section of each tool, and includes:

- An explanation of the purpose of the study,
- A notification that participation is voluntary,
- An explanation of the risks and benefits,
- A description of privacy and confidentiality,

- The duration of subject's involvement, and
- Contact information for subjects with questions or concerns.

2. Data storage and data protection

During the FGDs and interviews, the evaluation team will ask if the participants consent to a recording of the discussion. If they agree, the session will be recorded and deleted immediately after transcription. If permission for a recording is not given, the national evaluators (data collectors) will take hand-written notes in Arabic, which the evaluation team will compare internally immediately following each FGD and in-depth interview to ensure that all data is captured. These hand-written notes will then be translated and typed up in English. All handwritten notes will be stored in a secure manner and all electronic data will be encrypted. Each interview will be anonymised and catalogued using a standardized code number. In addition to the notes of the FGDs and interviews themselves, the evaluators will take notes of any observations they made before, during or after the FGDs/interviews that might be of relevance.

Particular care will be paid to possible adverse events, be it involving participants, members of the evaluation team or third parties. All participants will be given a contact number to which they can report and in the case of more serious issues arising, the evaluation team will be able to give the contact number of a staff member of the implementing partner, who would be able to use any necessary referral mechanisms.

Upon transcription, the data files will be stored by Difaf in electronic format in password protected computers. National evaluators (data collectors) will hand over all hardcopies of acquired data to Difaf for destruction at the end of the evaluation. Data collectors will hand over the softcopies to Difaf senior management and destroy all softcopies available on their computers. Difaf will store the data for 3 years.

All evaluation team members have signed data protection and confidentiality clauses as part of their agreements with Difaf.