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# HawkaMaa-EU

# Decentralized Wastewater Treatment Systems

# Lessons Learned Workshop

# Workshop Outline

1. Background and History
2. Purpose and Objectives
3. Phases of implementation: challenges and lessons learned
4. Case Study: DEWATS for institutions by SI
7. Wrap up and conclusions

# Background and History

## Sanitation Management in ITS

# Background and History

## The Sanitation Action Plan

Primary

Secondary

Tertiary

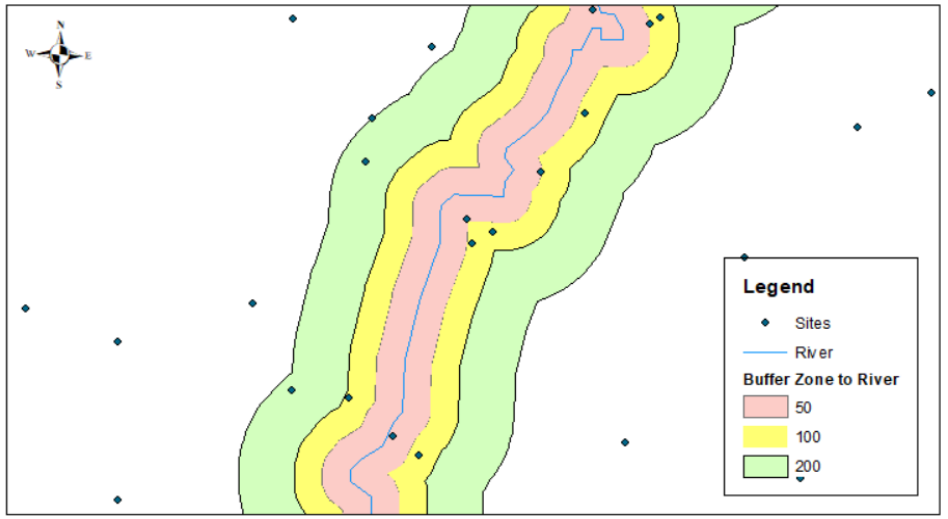
Environment

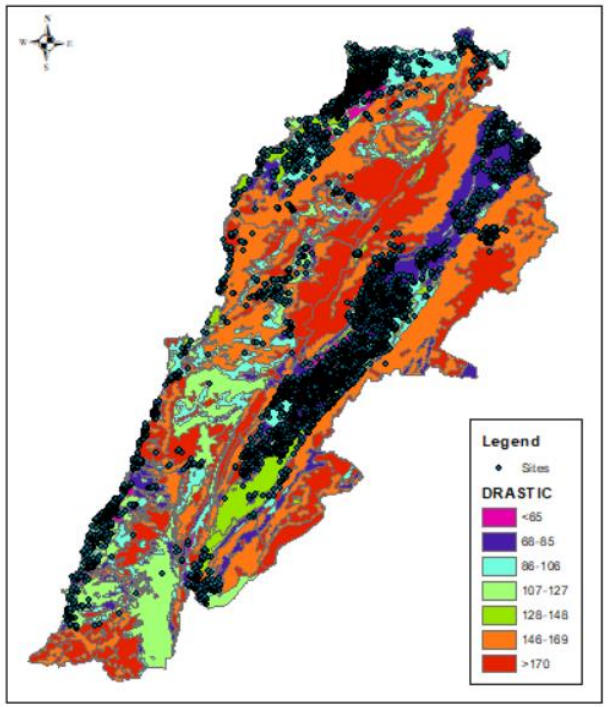
Pollution production

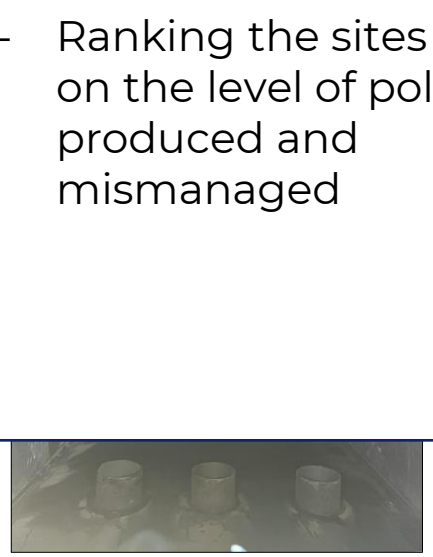
- Integrating greywater and blackwater
- Ranking the sites based on the level of pollution produced and mismanaged

Distance to rivers

Done using a GIS exercise to categorize sites into buffer zones from rivers: 50m, 100m, 200m, and >200m.







# Background and History

## MoEW ban on DEWATS

- The effective Sustainability of the O&M at ITSs level
- The quality of effluents (COD/BOD) not respecting limits
- Possible diversion of Aid in the ITSs

# Purpose and Objectives

- Identifying good practices, limitations and challenges
- Developing recommendations and improvement of DEWATS
- Enhancing knowledge sharing and organizational learning about Decentralized Treatment systems.
- Documenting lessons learned for future contextualized installation.

# DEWATS Phases of Implementation

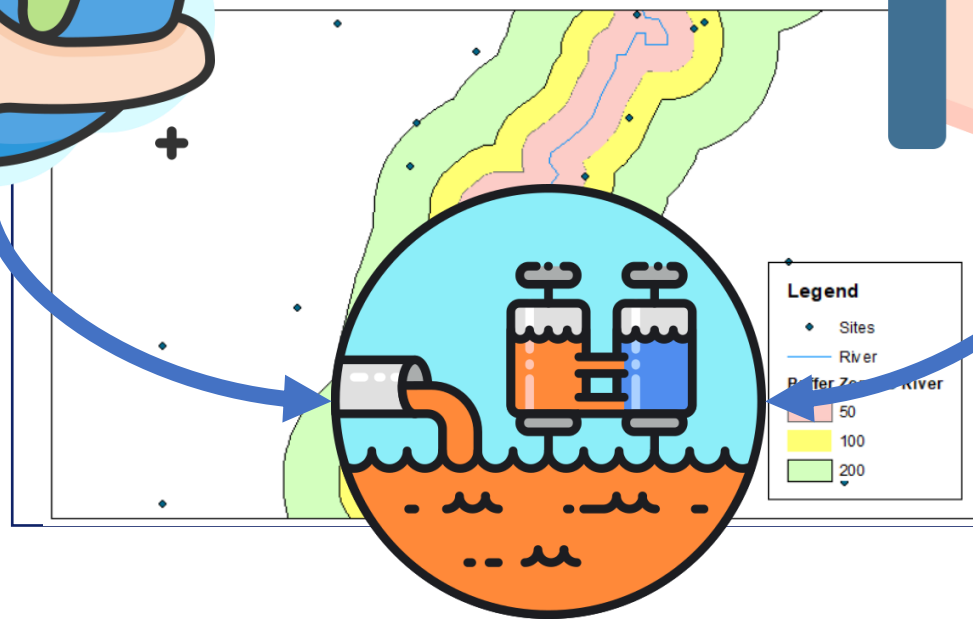
# DEWATS Phases of Implementation

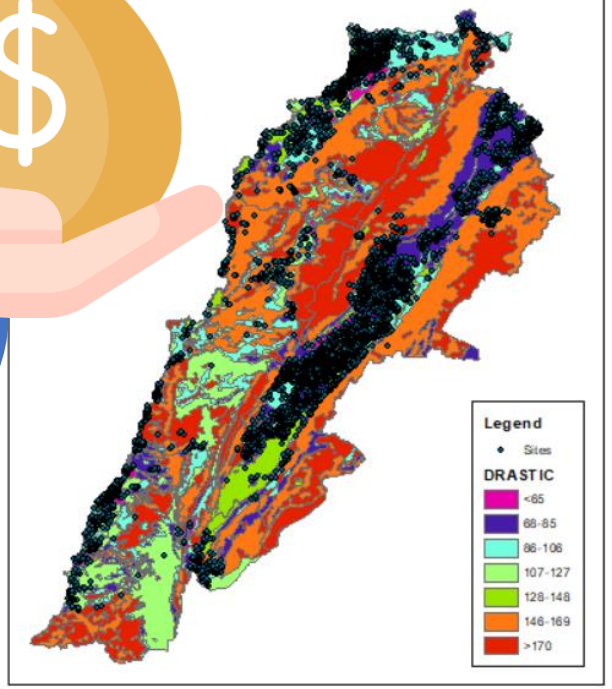
## Identification and Selection: Prioritization List

Pollution producti… …e to rivers

- Integrating grey… and blackwater…
- Ranking the sites b… on the level of pollution produced and mismanaged

…a GIS exercise to categorize sites into buffer zones fro… …100m, 200m, and >200m.



# DEWATS Phases of Implementation

## Identification and Selection: Preliminary Assessment

### Checklist

-

- [ ] Site accessibility
- [ ] Users
- [ ] Existing infrastructure
- [ ] Available space
- [ ] Land gradient
- [ ] Soil type
- [ ] Depth of water table
- [ ] Options for disposal

# DEWATS Phases of Implementation

## Identification and Selection: Stakeholders' Analysis

# DEWATS Phases of Implementation

## Identification and Selection

| Challenges and root causes | Lessons learned and recommendations |
|---|---|
| Finding sites that satisfy all the technical requirements with acceptance from the landowners | Assess as many sites as possible and go for alternative sanitation solutions if DEWATS is not feasible |
| Sites with multiple landowners | Get approval from each landowner through an MoU. Otherwise, let go. |

# DEWATS Phases of Implementation

## Detailed Technical Assessment

**Main parameters needed**

- The wastewater flow (m3/d)
- Quality of wastewater (COD and BOD in (mg/l))
- Peak hours of most flow (h)
- Dimensions of available space (m)
- Distances from interfaces to available space (m)
- Ground levels (m)
- Average and lowest ambient temperatures (C)

Additional information

- Condition of interfaces and network
- Sources of energy
- Site improvement needs
- Options for disposal or reuse

# DEWATS Phases of Implementation

## Detailed Technical Assessment

| Challenges and root causes | Lessons learned and recommendations |
|---|---|
| Lack of resources for geotechnical and hydraulic tests. | Collect information and history of other nearby infrastructural works to get an idea about type of soil and water table. |
| Population figures changing. | Try to select sites with stable communities and consider designing with a population growth factor. |

# DEWATS Phases of Implementation

## Design

**Primary Treatment**
Anaerobic Baffled Reactor (ABR)

**Secondary Treatment**
- Anaerobic filter (AnF)
- Biological Aerated Filter (BAF)

**Tertiary Treatment**
- Slow Sand Filter (SSF)
- Vertical Constructed Wetland (VFCW)

**Environment Limit Values**

# DEWATS Phases of Implementation

## Materials Used

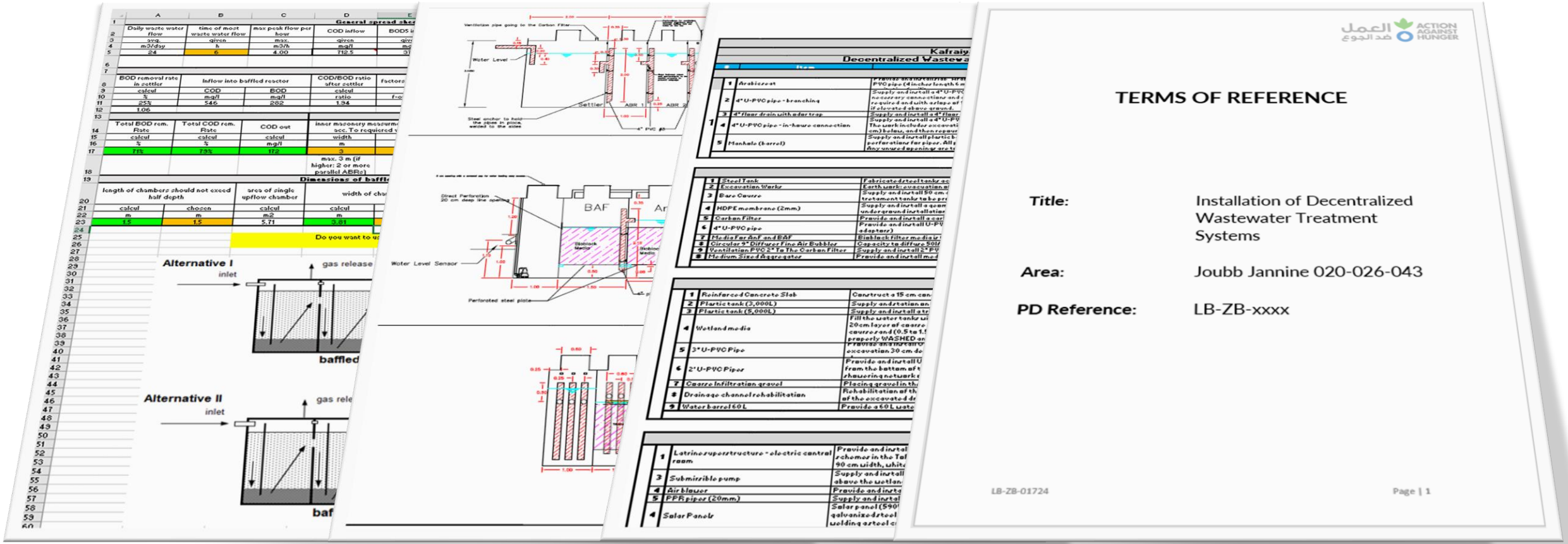
UPVC pipes for network

Plastic tanks for manholes


Steel for treatment unit

# DEWATS Phases of Implementation

## Documents Produced



# DEWATS Phases of Implementation

## Design

| Challenges and root causes | Lessons learned and recommendations |
|---|---|
| Small space for implementation | Try different technologies and different iterations for the sizing of the system to fit the available area. You might need to include energy dependent technologies. |
| Lack of data | Ensure a comprehensive and detailed technical assessment of resources allow, or rely on history of infrastructural works in the area for preliminary knowledge |

# DEWATS Phases of Implementation

## Procurement

# DEWATS Phases of Implementation

## Implementation

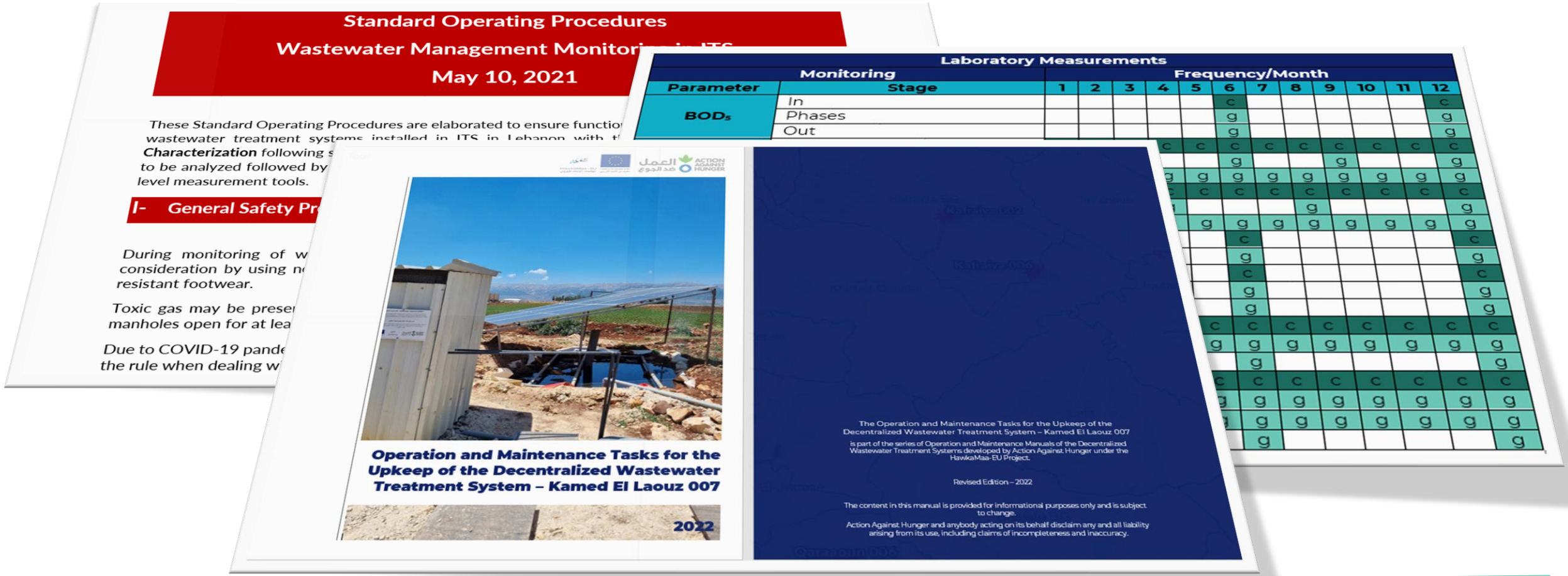
# DEWATS Phases of Implementation

## Implementation

| Challenges and root causes | Lessons learned and recommendations |
|---|---|
| Unforeseen site conditions (high water table, rocky soil) | Risk management and prompt amendments |
| New or unanticipated landowners | Negotiation for approval. Otherwise, let go of the project to avoid tension (no harm approach) |

# DEWATS Phases of Implementation

## Monitoring, Operation and Maintenance (O&M)



# DEWATS Phases of Implementation

## Monitoring, Operation and Maintenance (O&M)

| | Chemical Oxygen Demand (COD) (ELV limit: 125 mg/L) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Site** | **Main Manhole** | **Settler** | **ABR** | **AnF** | **BAF** | **WTL** | **Treatment Efficiency** |
| **Kamed El Laouz 007** | **2,100** | 350 | 120 | 110 | 90 | **40** | **98%** |
| **Ghazze 012-060** | **435** | 170 | 110 | 100 | 90 | **80** | **82%** |
| **Kafraiya 002** | **530** | 650 | 125 | 115 | 70 | **40** | **92%** |
| **Kafraiya 006** | **195** | 120 | 60 | 50 | <20 | **<20** | **95%** |
| **Qaraaoun 006** | **1,450** | 230 | 60 | 40 | <20 | **<20** | **99%** |

# DEWATS Phases of Implementation

## Implementation

| Challenges and root causes | Lessons learned and recommendations |
|---|---|
| Breakage or blockage of pipes or manholes. | Provision of tools and capacity building for community to do minor rehab. |
| Faults or vandalism of electric components. | Secure the system and have an emergency plan. |
| Uncompliant treatment efficiencies. | Optimization of the treatment stages or addition of a treatment stage. |

# DEWATS Phases of Implementation

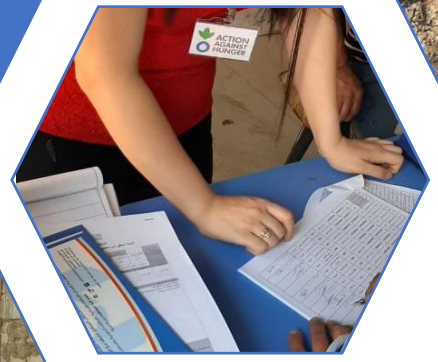
## Community Engagement

Understanding Community Needs

Awareness Sessions

Collaborative decision making

MEAL FGDs and KIIs



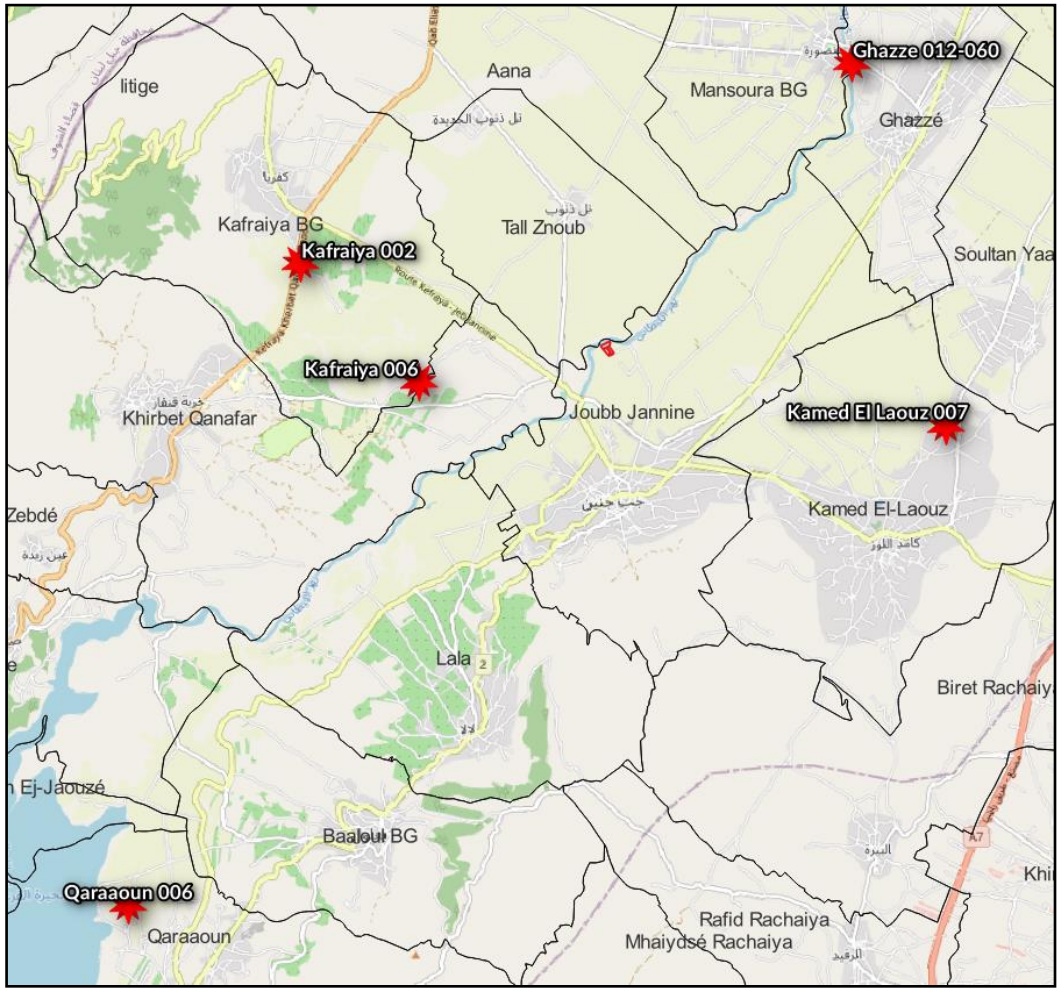
Long-term Sustainability

# Case Study

## DEWATS for ITS by ACF

| Batch I | | | | |
|---|---|---|---|---|
| **Site** | **Shelters** | **Ind.** | **Design** | **Completion** |
| Kafraiya 006 | 10 | 70 | Settler – ABR – AnF – BAF - WTL | Apr 2022 |
| Kamed El Laouz 007 | 21 | 120 | Settler – ABR – AnF – BAF - WTL | Feb 2022 |
| Qaraaoun 006 | 8 | 70 | Settler – ABR – AnF – BAF - WTL | Apr 2022 |

| Batch II | | | | |
|---|---|---|---|---|
| **Site** | **Shelters** | **Ind.** | **Design** | **Completion** |
| Ghazze 012-060 | 40 | 375 | Settler – ABR – AnF - WTL | Aug 2022 |
| Kafraiya 002 | 10 | 50 | Settler – ABR – AnF – BAF - WTL | May 2022 |



# Case Study

## DEWATS in MINJEZ Municipality

This project considered the 1st WWTS installed at communal level out 5 installed under different fund (UNICEF, LHF, EU-MADAD)

**Target Population**: 50 individuals

**Sewer's connection pre-intervention**: Connection by network constructed by the municipality and direct to Valley with no treatment.

**Threats**: Underground water, bad smell, health, plants

**Consumption**: 150–200-liter/p/d

Place before the WWTS installments

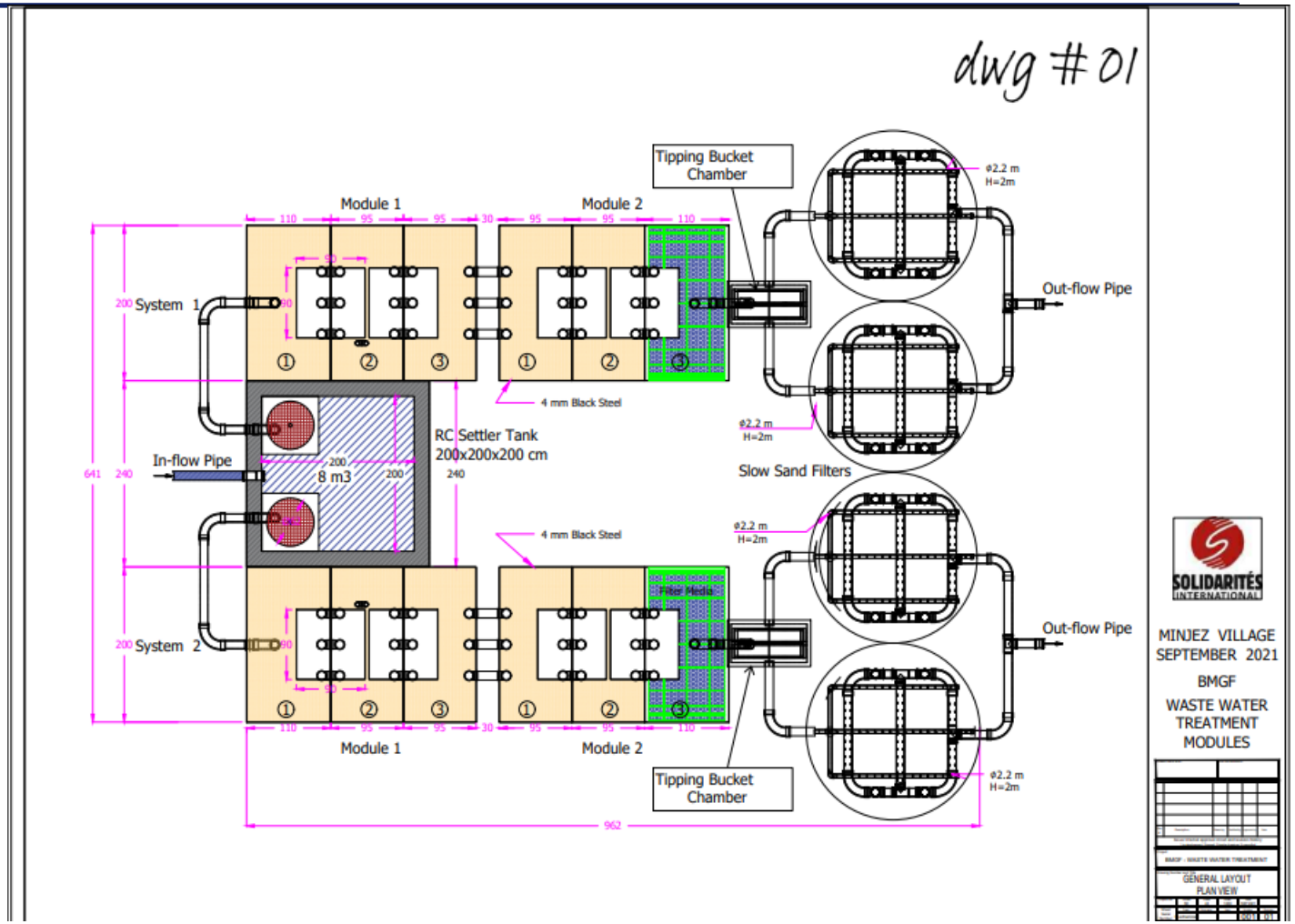
# Case Study

## DEWATS in MINJEZ Municipality

WWT technologies installed / above or underground | **1st Step**: Anaerobic Baffle Reactor / Underground

WWT technologies installed / above or underground **| 2nd Step**: Anaerobic Filter / Underground

WWT technologies installed / above or underground | **3rd Step**: Sand Filter/Underground



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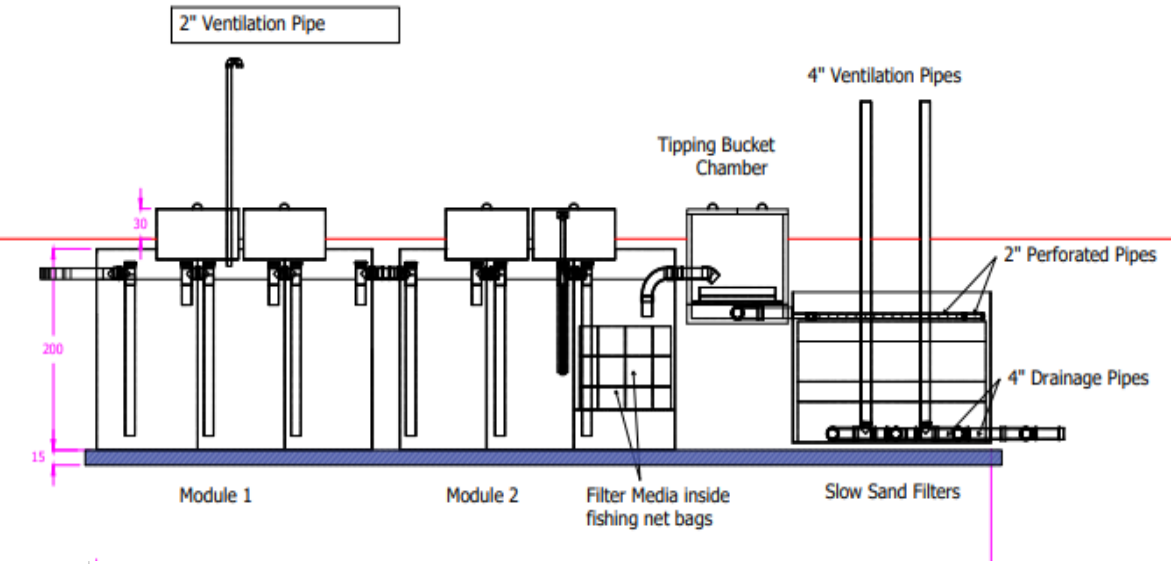
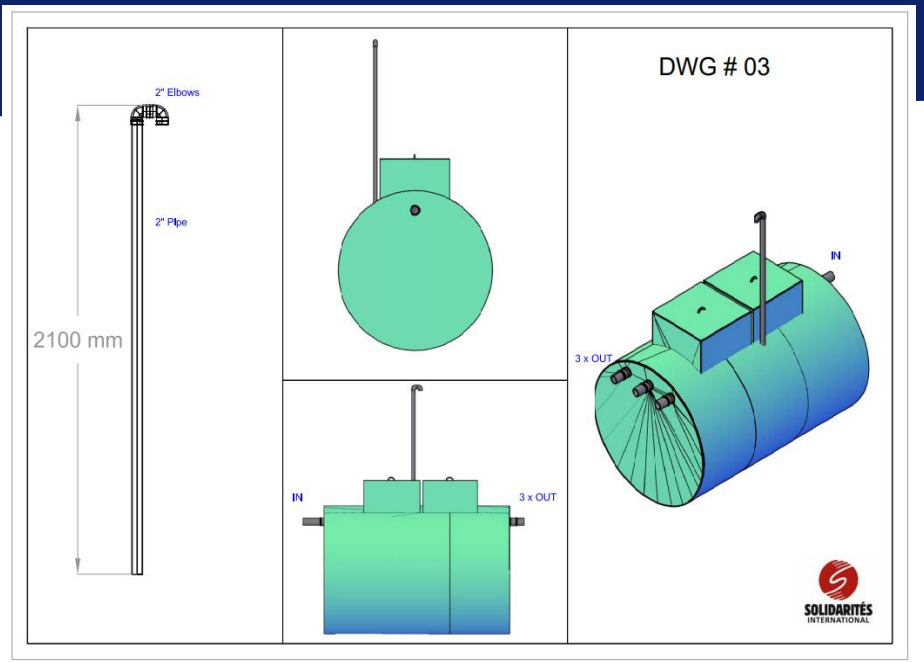
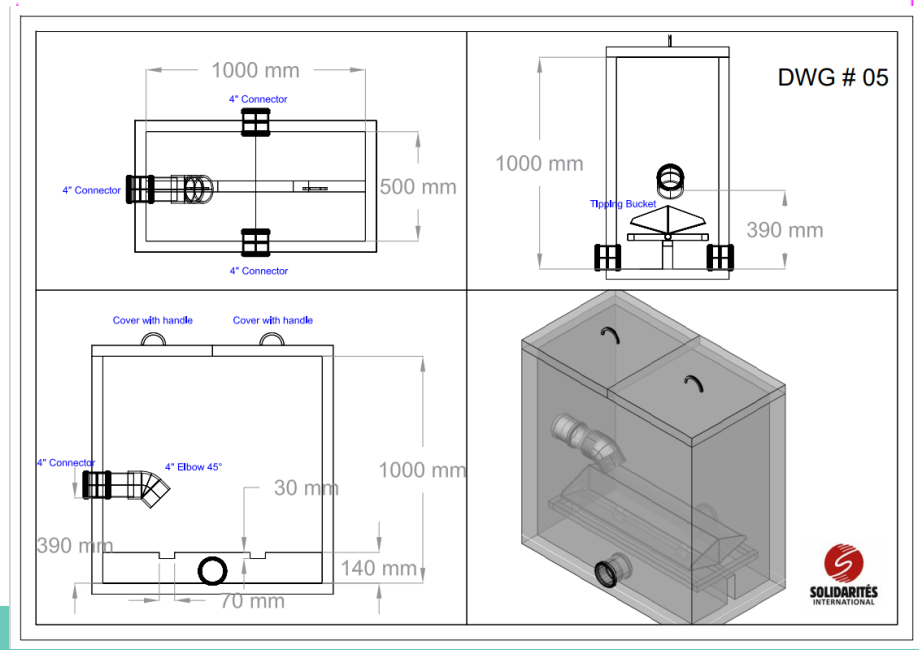
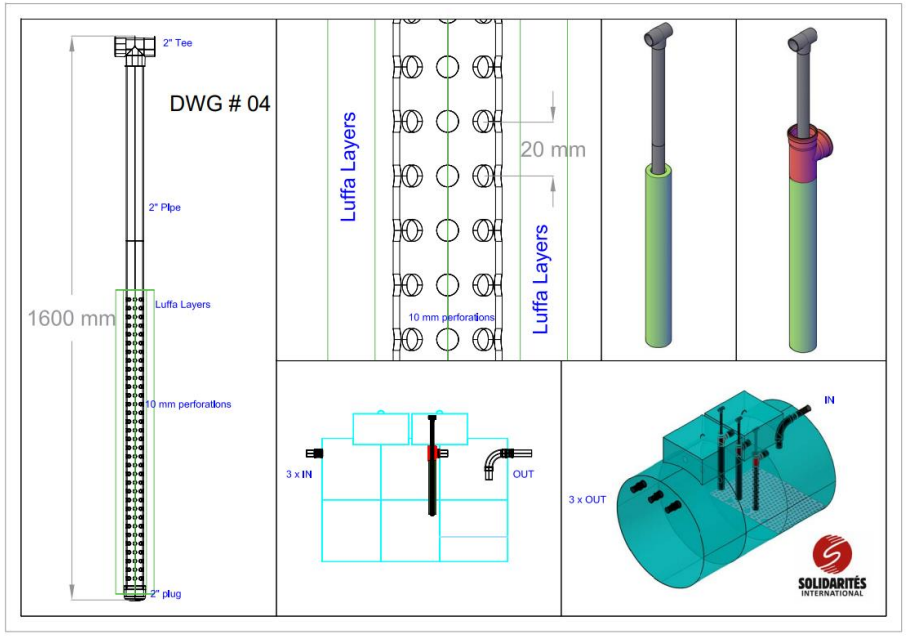
# Case Study



# Case Study

## DEWATS in MINJEZ Municipality

***Prior to the intervention***

***Post-intervention***

# Case Study

## DEWATS in MINJEZ Municipality

unicef for every child

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### *Result of testing the influent vs effluent*

| Governorate | site | # | Black / Grey / Black & grey | Secondary treatment | Tertiary treatment | | pH | TSS | COD | Removal rate on the entire treatment chain | BOD5 | Removal rate on the entire treatment chain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | *5-9* | *60mg/l* | *125mg/l* | | *25mg/l* | |
| Akkar | Menjez -Leb | | black & grey | ABR AF | SSF | in | 7.3 | 850 | 300 | | 130 | |
| | | | | | | out | 7.3 | 760 | 50 | 83% | 15 | 88% |
| Akkar | Menjez - Leb | | black & grey | ABR AF | SSF | in | 7.3 | 850 | 300 | | 130 | |
| | | | | | | out | 7.2 | 750 | 50 | 83% | 10 | 92% |

| Governorate | site | # | Black / Grey / Black & grey | Secondary treatment | Tertiary treatment | | [NO3] | [NO2] | TKN | TN | TP | TC | FC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | *30mg/l* | | *2000* | *100* |
| Akkar | Menjez -Leb | | black & grey | ABR AF | SSF | in | <0.1 | <0.1 | 120 | | 15 | tntbc | tnbc |
| | | | | | | out | <0.1 | <0.1 | 30 | | 10 | tnbc | 0 |
| Akkar | Menjez - Leb | | black & grey | ABR AF | SSF | in | <0.1 | <0.1 | 120 | | 15 | tntbc | tnbc |
| | | | | | | out | <0.1 | <0.1 | 20 | | 8 | tnbc | 150000 |

# Case Study

## WWTS in Salamtk PHC

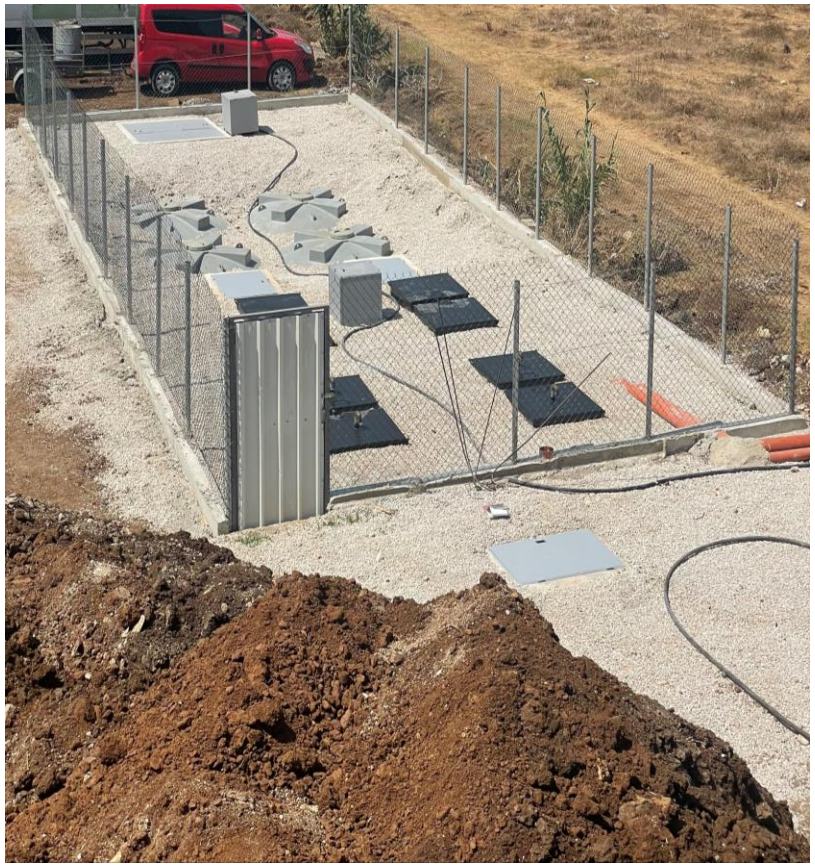


WWT technologies installed / above or underground | 1st Step: **Anaerobic Baffle Reactor / Underground**

WWT technologies installed / above or underground | 2nd Step: **Anaerobic Filter / Underground**

WWT technologies installed / above or underground | 3rd Step: **Biological Aerated Filter / Underground**

WWT technologies installed / above or underground | 4th Step: **Sand Filter / Above Ground/ underground**

# Case Study

## Challenges and Lessons Learned



**Challenges:**

1. Manholes installed by municipality were mixing black/grey water and rainwater.
2. A consistent flow of water
3. Difficult to persuade the owner of the system since it requires a large amount of land (20 m2) for project in PHC, vaccination center or others

**Lessons Learned for communal level projects:**

1. The selection of the system and municipality should take into account the representative's willingness to manage the project and recognize its importance
2. Capacity training and inclusion of representatives in all implementation phases ensure their understanding and ability to maintain the system.
3. **For other project** Conducting focus group discussions involving beneficiaries, the owner, municipality, and representatives from the surrounding community is essential. This aims to elucidate the system's benefits and thoroughly discuss every aspect of the project before commencement.
4. **For other project** Ensuring community approval in the vicinity is crucial to prevent tensions, particularly in the case of solar system installation.
5. **For other project**: Due to the potential risk of theft, especially targeting items like solar panels, batteries, inverters, and electrical pumps, precautions should be taken, security/risk assessment should be conducted.
6. **For other project:** For the discharge of purified water, it is imperative to verify the feasibility of releasing it through outlets such as rivers, water channels, seas, etc.

# Case Study



## Successes and Failures

**Successes:**

1. Remarkable success has been achieved in purifying wastewater to the designed value, meeting acceptable standards for environmentally safe discharge. While the removal rate on the entire treatment chain is 83-92% comparison of the inlet and outlet result.
2. Successful community engagement efforts by SI and municipality facilitate the implementation and monitoring
3. Demonstrating cost-effectiveness
4. System working on gravity, no need for electricity.
5. Ensuring continuous and thorough follow-up, along with regular cleaning, is essential for system maintenance and optimal performance.

**Failures:**

1. Managing fluctuations in the number of users/beneficiaries is critical, as the system's capacity is designed for a specific user base. Any increase may require an additional system, while a decrease could impact the quality of the outlet water.

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