



Workshop Report

“REG-14: Refugee Emergency: Fast track project design on water, wastewater and solid waste (focussing on wastewater and solid waste) , 26-29 March 2018 Track 1: “Wastewater Treatment”

July 2018

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THE SWIM AND H2020 SUPPORT MECHANISM (2016-2019)

The SWIM-H2020 SM is a Regional Technical Support Program that includes the following Partner Countries (PCs): Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, [Syria] and Tunisia. However, in order to ensure the coherence and effectiveness of Union financing or to foster regional co-operation, eligibility of specific actions will be extended to the Western Balkan countries (Albania, Bosnia Herzegovina and Montenegro), Turkey and Mauritania. The Program is funded by the European Neighborhood Instrument (ENI) South/Environment. It ensures the continuation of EU's regional support to ENP South countries in the fields of water management, marine pollution prevention and adds value to other important EU-funded regional programs in related fields, in particular the SWITCH-Med program, and the Clima South program, as well as to projects under the EU bilateral programming, where environment and water are identified as priority sectors for the EU co-operation. It complements and provides operational partnerships and links with the projects labelled by the Union for the Mediterranean, project preparation facilities in particular MESHIP phase II and with the next phase of the ENPI-SEIS project on environmental information systems, whereas its work plan will be coherent with, and supportive of, the Barcelona Convention and its Mediterranean Action Plan.

The overall objective of the Program is to contribute to reduced marine pollution and a more sustainable use of scarce water resources. The Technical Assistance services are grouped in 6 work packages: WP1. Expert facility, WP2. Peer-to-peer experience sharing and dialogue, WP3. Training activities, WP4. Communication and visibility, WP5. Capitalizing the lessons learnt, good practices and success stories and WP6. Support activities



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ABBREVIATIONS

BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
DO	Dissolved Oxygen
MEW	Ministry of Energy & Water
PCs	Partner Countries
PWA	Palestinian Water Authority
SRT	Sludge Retention time Sludge Age
WAJ	Water Authority of Jordan
WWTP	Wastewater Treatment Plant



1. GENERAL

1.1 INTRODUCTION

Several partner countries are facing increasing challenges with water scarcity (coupled with limited resources in financing the water and wastewater sector), which is exacerbated by the influx of the refugees from neighbouring countries due to the political unrest in the region. Syria's civil war, almost in its seventh year, has driven more than 60 per cent of its pre-war population from their homes. According to UN estimates, 4.8 million Syrians have fled their country as refugees, seeking safety in Jordan, Lebanon, Turkey, Iraq and beyond. Another 8.7 million Syrians are displaced inside Syria, forced by conflict or insecurity to move homes, villages or even regions, often many times over. The massive exodus of population from Syria has placed enormous pressure on nearby countries.

In Jordan, the addition of more than a million Syrians has skewed demographics to the point where, according to World Bank officials, refugees now constitute a third of the population, which stood at 9.5 million during 2015. In Lebanon, the influx of refugees has resulted in the overpopulation of the camps and cities. According to the UNHCR, there were over a million Syrian refugees who had been registered in Lebanon in 2016. This figure is likely largely underestimated and recent estimates were as high as 1,500,000 people. In Gaza strip of Palestine, cycles of conflict with Israel have required that the Palestinian Water Authority (PWA) and the Coastal Municipalities Water Utility (CMWU) shift funds for development and operations to crisis response. The changes in the demand spurred by the conflict have adversely affected the performance of the water sector in the three countries, and have exerted severe pressure on the existing water and wastewater infrastructure. Several cases exist where recently upgraded/constructed wastewater treatment plants were already overloaded upon their handover and the construction of new plants was required. The challenge is to provide the refugee camps and the hosting communities with adequate water and sanitation services under severe water stress; and/or ensure that water supply networks are rebuilt to new specifications that will accommodate the increased flow.

Management of increased solid waste quantities is also a major challenge that existed even before the crisis. The influx of refugees has markedly lowered the level and quality of solid waste management and municipal services while the disposal sites which are neither sanitary nor sufficient to accommodate the total volume of waste produced on a daily basis, led to acute practical disposal issues and even greater environmental and hygiene impacts.

As part of its workplan, SWIM-H2020 SM has conducted a sub-regional training "REG-14: under the title "Refugee Emergency: Fast track project design on water, waste water and solid waste" (focusing on wastewater and solid waste).



1.2 WORKSHOP OBJECTIVES

The overall aim of this specific sub regional training is to bring together the key stakeholders (from four countries: Jordan, Lebanon, Palestine and Tunisia) who are involved in the management and design of wastewater treatment facilities, introduce them to the relevant technical concepts and approach for the proper design of wastewater treatment facilities taking also in account the description and requirements for emergency sanitation facilities in response to the influx and displacement of refugees. This topic was part of the communicated priorities for Jordan, Lebanon and Palestine during the Fact Finding mission of SWIM-H2020 SM in 2016, while Tunisia expressed interest in participation during the steering committee meeting of Sep. 2016.

The specific objectives of the workshop are:

1. Build the capacity of the relevant staff in the four countries through the provision of in-depth tailored training in the design of wastewater treatment facilities. Consideration will be given to treatment solutions that can be adopted for temporary settlements and refugee camps.
2. Examine long term solutions that can be adopted for permanent refugee camps or long term temporary settlements.
3. Sharing of experiences within the sub-region in dealing with the influx of the refugees as it relates to organisational and financing issues.

2. TRAINING MATERIAL

2.1 GENERAL

The training course is comprehensive and divided into two parts:

Part 1 is dedicated for the technical aspects of wastewater treatment and design; divided into 12 sections, with section 1 on “Wastewater characterization” being considered as prerequisite for process design using simulation modelling.

The material in the slides is prepared in a fashion that can be used as design guidelines for wastewater treatment plants.

The main purpose of the course is to help engineers to master the optimized wastewater treatment plant design procedure for the most commonly used nitrogen removal systems. The course included as/when applicable special considerations related to wastewater treatment solutions that can be adopted for temporary settlements/camps as they would be for long term temporary settlements and/or permanent settlements. Below are the subjects that have been discussed.

- Wastewater chemistry and Characterisation
- Bacterial metabolism
- Mass balances
- Nitrification & denitrification



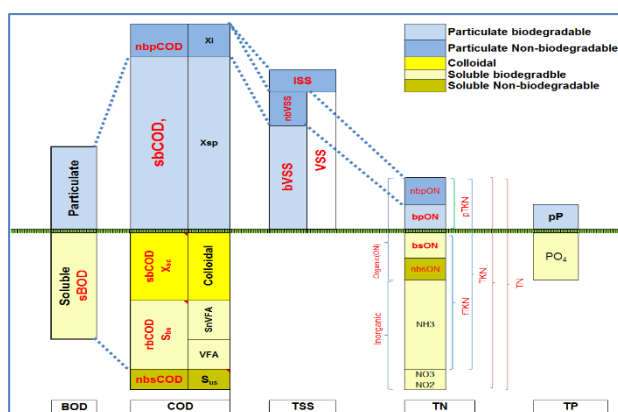
- Optimized design of nitrogen removal
- Biological and chemical phosphorus removal
- Final settler design-solids flux theory
- Sludge thickening
- Aerobic & Anaerobic digestion
- Sizing of aeration capacity
- Filtration & Disinfection
- Current practices and main issues related to wastewater treatment.
- Wastewater treatment quality standards with experience sharing from the Partner Countries.
- Adopted sanitation solutions in some of the refugee camps in Jordan.
- Adopted sanitation solutions for long term refugee camps in Jordan and Syria.

Part 2 is dedicated to presentation of experience from governmental and relief organizations within the sub-region with a view to both organizational/administrative aspects including procedures for applying for funds for emergency water/wastewater/solid waste projects. Sessions related to this part include:

- The Jordanian experience with the Syrian refugees crisis; introducing the process related to the formulation of Jordan's response plan to the refugees crisis (overall coordination),
- Lessons learned from the response to the Syrian Crisis, in terms of the administrative set up (from the side of the Ministry of Municipal Affairs in Jordan)
- How humanitarian aid works and applying for funds from emergency relief organizations (OXFAM and ACTED)

2.2 DESCRIPTION OF TRAINING MATERIAL

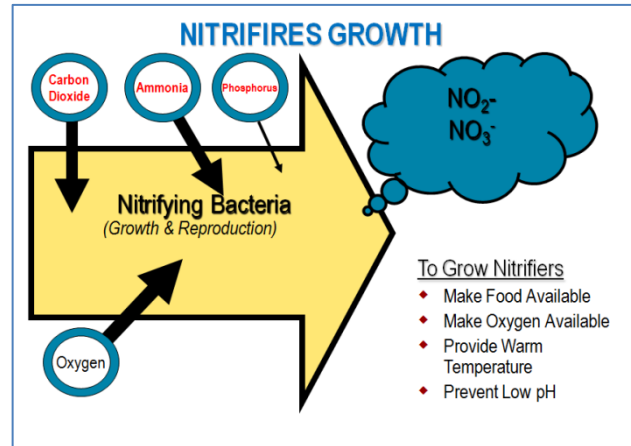
a) Session-1 Wastewater Chemistry & Characterization & Microorganisms



This chapter reviews the characteristics and methods of measuring and testing chemical pollutants in wastewater including suspended, dissolved, organic, volatile and fixed materials. The aim of the chapter is to identify the constituent parts of all major pollutants and to determine the ratios between these parts and the ratios between the pollutants. This session is an introduction and a basic requirement for working on simulation modeling, which are based on the concentrations of the fractions of

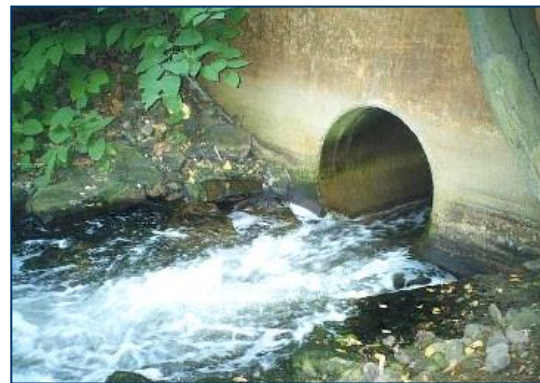
the pollutants and not only on the total concentration of contaminants. The session provides typical ratios between pollutants in the absence of data.

Part 2 of session 1 reviews the major bacterial metabolisms including digestion, respiration, growth, division, decay and food necessary for these processes. It explains the properties of the different type of heterotrophic and nitrification bacteria.

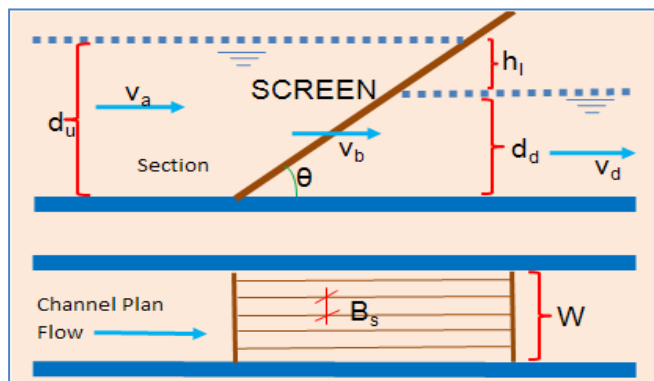


b) Session-2 Flow, Loads and Discharge Standards

This session explains the methods of selection of hydraulic and organic loads based on the standards of treated water. The chapter shows the discrepancy in some standard requirements. The chapter also explains statistical methods for calculating the minimum and maximum flow and load factors.



c) Session-3 Preliminary and Primary Treatment

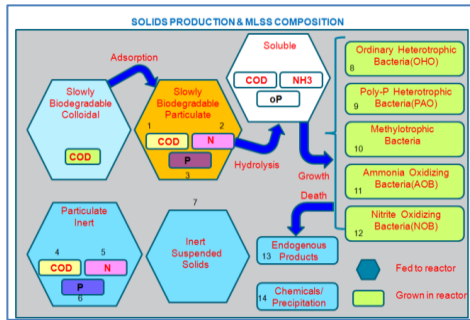


This session reviews the design of preliminary and primary treatment facilities from screens, balancing tanks, grit removal tanks, and flow measurements. It also reviews the design of primary sedimentation tanks.

d) Session-4 Water & Sanitation Facilities for Refugee Camps Under Emergency

This session describes the required water and sanitation facilities in the emergency cases. It also explains the approach and limitations for site selections for refugee camps. The information was based on what has been implemented by UNICEF at Zaatari Camp in Jordan.

e) Session-5 Activated Sludge Processes

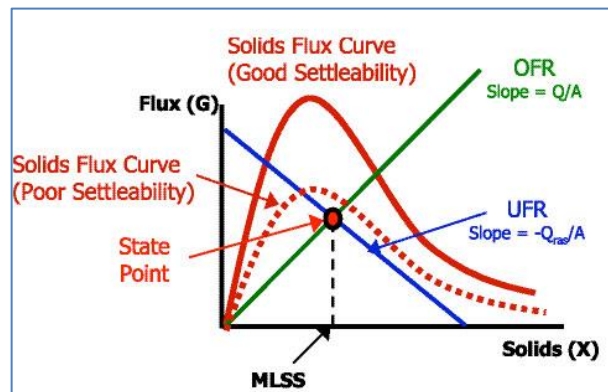


This session explains the chemistry of the removal or reduction of organic pollutants, the chemistry of the process of nitrification and the process of denitrification. It describes the methods of calculating the size of the aeration/biological tanks and the design criteria affecting that, including temperature, sludge age, observed yield and the mixed liquor suspended solids. The session also explains the classification of activated sludge processes according to the

organic loading rate, which is classified into three categories of high, traditional and low rate. In addition, the session shows the techniques of denitrifications and the methods of calculating the size of the anoxic tanks and the factors influencing it. Finally, it explains the method of preparing the nitrogen mass balance.

f) Session-6 Secondary Clarifiers

The session describes the basic design criteria for secondary clarifiers including the surface hydraulic loading rate and the solids rate. The session explains the different ways to determine the efficiency of the clarifiers and the probability of failure in the processes of clarification and thickening.

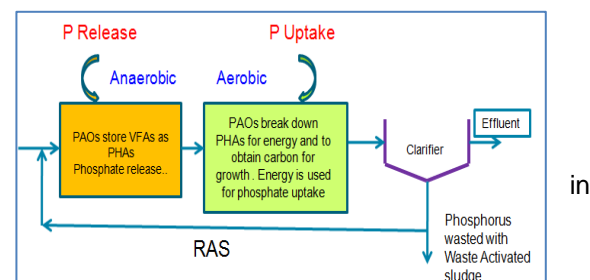


g) Session 7 Chemical Addition and Phosphorus Removal

The session explains how the alkalinity mass balance is prepared. The process of nitrification uses alkalinity and the process of denitrification increases alkalinity and thus affects the pH in the absence of sufficient alkalinity in the raw wastewater. The session describes the chemicals and their possible additions to increase the alkalinity.

Reducing the concentration of phosphorus chemically requires the addition of chemicals to enhance the precipitation of phosphorus in the sedimentation tanks where the coagulants are added, such as ferric chloride, which in turn collects and precipitates the suspended part of the total phosphorus in the initial primary sedimentation tanks and is disposed of with sludge.

Biological phosphorus treatment requires an anaerobic tank prior to the aeration or anoxic tank. This method is more complex and requires necessary precautions because phosphorus stored after biological treatment can be released subsequent sludge processes.

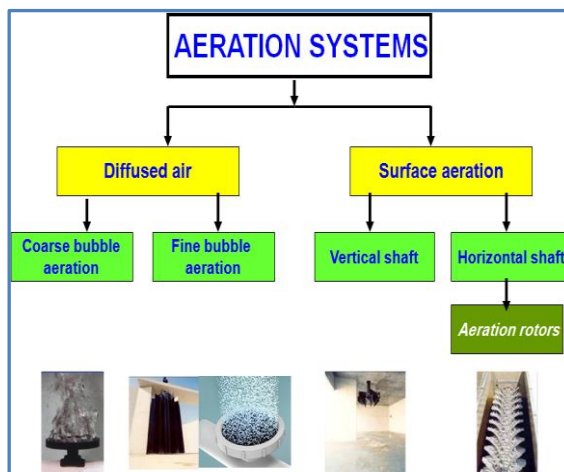


h) Session-8 Mixing and Aeration Systems

Aeration systems are used in the activated sludge process to provide oxygen for the biochemical oxidation of carbon and nitrogen and to keep solids in suspension.

The oxygen required for the biological oxidation of carbon and nitrogen is supplied by the introduction of air or pure oxygen into the mixed liquid in the aeration tanks. In order to be useful to this end, oxygen must be converted from the gaseous state in the air to the dissolved oxygen inside the liquid, and this can be achieved using different diffused aeration or mechanical aeration systems.

The session explains the types of aeration for wastewater treatment, which are divided into three types: mechanical aerators, diffused aeration systems, and pure oxygen systems.



i) Session-9 Sludge Treatment

The session explains the sludge classes and methods of treatment for the different levels and shows the methods of sludge mass balance calculation.

The session also describes the design criteria for gravity thickeners and sludge digestion tanks, both aerobic and anaerobic, as well as ways of selecting the mechanical dewatering systems and methods of design of sludge drying basins.



j) Session-10 Tertiary Treatment- Filtration and Disinfection

The session explains the disinfection methods including chlorination and UV disinfection. In addition, it provides the design parameters for sand filters and other filtration systems.



k) Session-11 Configuration, Layout and Overview of Other Treatment Processes

The session explains method of preparation of the layout and site plan for wastewater treatment facilities and the details for every treatment structure. In addition, it describes treatment processes other than activated sludge.

l) Session-12 Examples of Water & Sanitation Systems of Permanent Refugee Camps

The session presents the lesson learned from the implementation of water and sanitation facilities for two permanent Palestinian refugees' camps in Syria.

During this session the Jordanian and Tunisian participants presented their experience for handling the water and sanitation facilities for refugees. The following technical topics have been emphasised:

- Location for refugee camps should be selected carefully and should be free from the risk of water flood, standing water and existence of important ground water resources.



- b) Estimation of concentration of pollutants should be based on the actual water consumption which is considered low for the case of refugees and may range from 30 to 50 l/c/d.
- c) Due to the high organic load, it would be better to start the primary treatment process with primary sedimentation tank which removes high percentage of the suspended pollution load at little cost.
- d) Sludge age should be selected based on the intended use of treated wastewater.
- e) Should the country effluent standards require denitrification, this would be difficult to achieve at a reasonable cost and small footprint of the plant.
- f) Treated effluent should be used locally for irrigation should close land be available

3. PROFILE OF THE PARTICIPANTS

Representatives of four countries have been invited to attend track-1 of the workshop (dedicated to wastewater treatment).

Jordan has nominated 5 engineers; four working at the Water Authority of Jordan (WAJ) and one working at Yarmouk Water Company (YWC); a private operator in the northern governorate.

Tunisia has nominated 5 participants, four of whom working at the National office of Sanitation and one being an NGO representative.

Palestine has nominated four participants, all working at the Palestinian Water Authority (PWA).

Lebanon has nominated only one participant from the Ministry of Water and Energy (MEW) who attended only part of the first day of the workshop.

Table 1 presents general statistics information on the participants of track-1 workshop.

Table 1: General Statistics Information on the Participants of Track-1 Workshop

Total No. of participants	15
Number of countries that were represented	4 (LB, JO, PS, TN)
Number of participants who filled the pre-training quiz	13
Number of participants who filled the post-training quiz	13
Number of participants who filled the Evaluation questionnaire	13
Gender balance (% of women participants from the PCs)	27%
NGO representation: No. of participants from NGOs	1

Table 2 presents the list of participants with their contact details for track-1 training.



Table 2: List of Participants- track-1 training.

Country	Type of Institution	Name	Position/Function	Organisation/Institution	Email	telephone/Mobile
Jordan	Ministry representative	Raja ABU DAYYEH	Project Engineer	Water Authority of Jordan PMU	Raja_eissa@mwi.gov.jo	+962 799713688
	Ministry representative	Rami ABU RWAQ	Engineer of Studies and Designs Department	Water Authority of Jordan	Rami_Aburwaq@mwi.gov.jo	+962 6 5680100 0799592999
	Ministry representative	Muayyad ELBADO	Operation and Maintenance Engineer WWTP	Water Athority of Jordan	Muayyad_Elbado@mwi.gov.jo	0096265680100 00962 775672290
	Private Operator	Mahmoud OBIEDAT	Director of Environment and Reuse	Yarmouk Water Company	obiedat2008@yahoo.com	0798874854 0775459585
	Ministry representative	Ghada SAFA	Head of Studies and Designs Department	Water Authority of Jordan	Ghada_Safa@mwi.gov.jo	+962 6 5680100 0798702970
Lebanon	Ministry representative	Mufid DUHAINI	Environment Head Depatment	Ministry of Water & Energy	Mfd1965@hotmail.com	009611565071 009613288743
Palestine	Ministry representative	Ass'ad BEZRAH	Engineer – Project Manager in the Project Manegement Unit	Palestinian Water Authority	Asaad28091986@yahoo.com	00972599456613
	Ministry representative	Malak ISSA	Engineer at Design Review Unit/ Quality Assurance Department	Palestinian Water Authority	Malak.a.k.issa@gmail.com	00970599153376 00972599586986



Country	Type of Institution	Name	Position/Function	Organisation/Institution	Email	telephone/Mobile
	Ministry representative	Noureddine MANSOUR	Electrical Engineer / WBWD	Palestinian Water Authority	eng.nour1984@hotmail.com, cc PWA@pwa.ps	0097022987665 00970595959597
	Ministry representative	Majdi SHAHEEN	Water Resources Unit	Palestinian Water Authority	Shaheen.majdi@yahoo.com	0097022987665 00970594233381 00970598135449
Tunisie	Government agency	Jameleddine CHERIF	Chef division épuration rejet industriel de ben Arous	Office National de l'Assainissement	jameleddinecherif@yahoo.fr, cc dhouha31064@gmail.com	+21698385434
	Agence gouvernementale	Thameur JAOUADI	Directeur de la Réutilisation des Eaux Usées Traitées / President	Office National de l'Assainissement / Association pour la Préservation des Eaux	jawadithamr@yahoo.fr, thameurjaouadi2017@gmail.com cc habaieb.hamadi@yahoo.fr	(00216) 71 90 62 11 (00216) 98 26 83 05
	Ministry representative	Dhouha MEGHIRBI EP BENZARTI	Directeur	Office National d'Assainissement	dhouhabenzarti@yahoo.fr, cc dhouha31064@gmail.com	97547532
	Government agency	Slim MRABET	Chef Division Epuration, Analyses et Rejets Industriels / Direction Régionale de NABEUL	Office National de l'Assainissement	mrabet.slim@yahoo.fr, mrabetslim23@gmail.com	+216 72221360 +216 98577861
	NGO representative	Afef ZADDEM	Directrice	Agence de la Démocratie Locale	zaddemafaf@gmail.com	216 27 079 039

4. EVALUATION OF THE WORKSHOP

4.1 EVALUATION INDICATORS

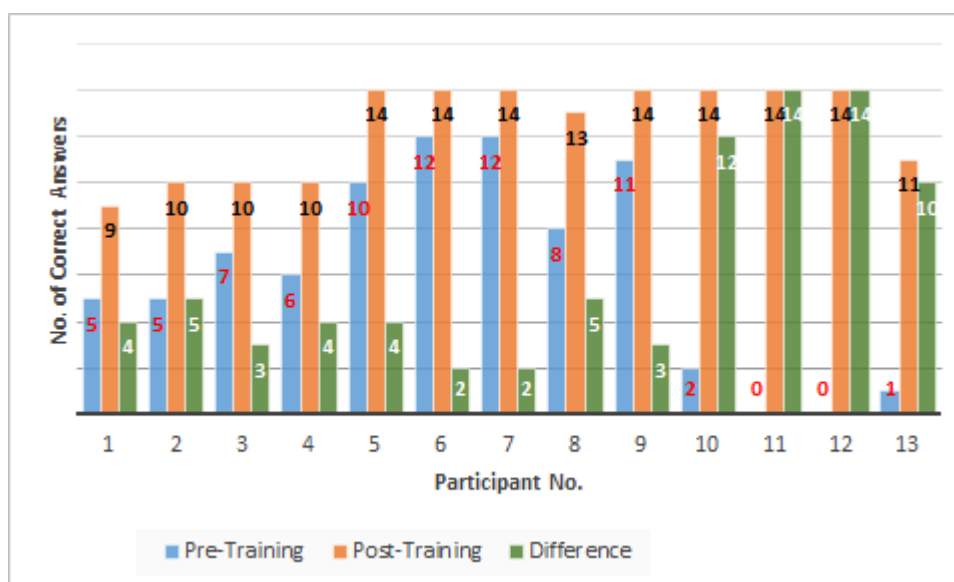
Two categories of indicators have been used to evaluate the workshop: a) impact indicators, reflecting the direct impact of the workshop, and b) evaluation indicators, reflecting the assessment of the technical quality of the workshop, and the quality of the workshop logistics/ organisational aspects, as perceived by the participants.

4.2 IMPACT INDICATORS (PRE AND POST TRAINING QUIZ)

For the purpose of understanding the basic technical background of the participants a pre-training quiz has been prepared and filled. The quiz is given in Annex-1. In addition, the same quiz has been used for post training assessment to provide specific feedback on the impact and understanding of the training.

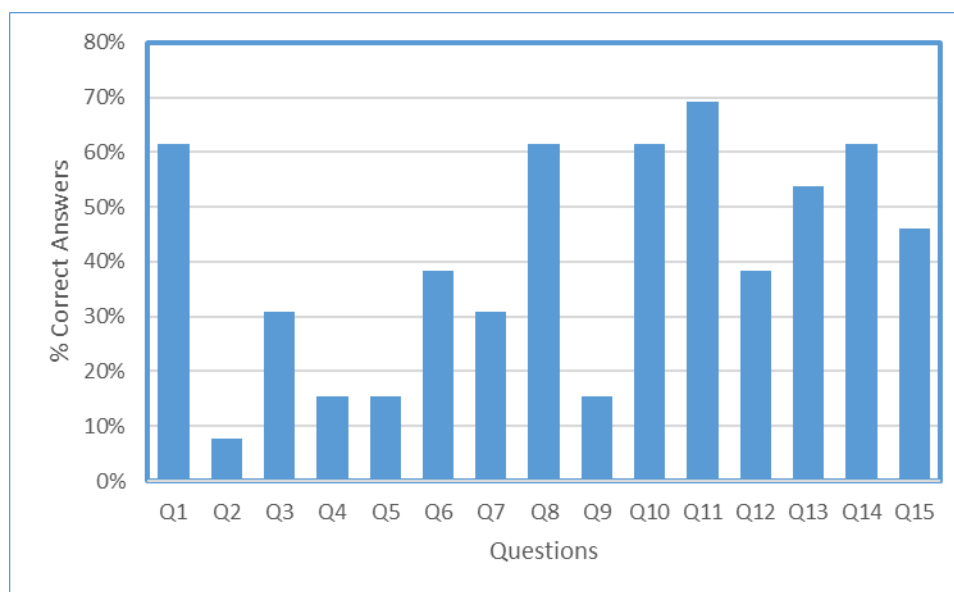
Figure 1 presents the pre-training , post-training, difference between post-training and pre-training) total scores for each of the 13 participants.

Figure 1: Pre-training and post-training scores for all the 13 participants (out of 15)



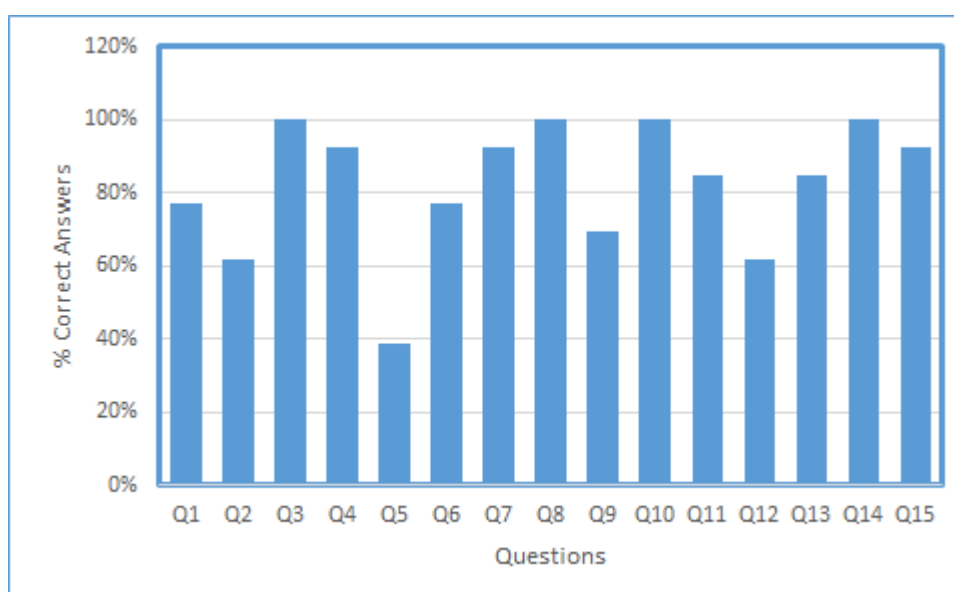
The quiz consisted of 15 basic questions on wastewater chemistry and treatment. The percentage of participants that answered each of the 15 questions correctly in the **pre-training quiz is presented in figure 2**. It seems that questions 2,4,5, and 9 are the most difficult questions where 20% to 30% of the participants has correctly answered.

Figure 2: The percentage of participants that answered each question of the pre-training quiz questions correctly



The percentage of participants that answered each of the 15 questions correctly in the post-training quiz is presented in figure 3. It shows significant improvement in the scores on all questions including those for questions 2,4,5 and 9.

Figure 3: The percentage of participants that answered each question of the post-training quiz questions correctly



4.3 EVALUATION INDICATORS

An evaluation indicators form has been filled by all participants at the last session of the workshop. The evaluation indicators, reflects the assessment of the technical quality of the workshop, and the quality of the workshop logistics/ organisational aspects, as perceived by the participants.



The indicators and associated ratings are presented in Tables 3 and 4, while the responses' classifications are presented in Figures 4 to 9.

Table 3: Evaluation Indicators (reflecting the assessment of the technical quality of the workshop as perceived by the participants)

Diversity of the workshop presentations and activities	
No. of presentations on international country examples (sharing of experiences, good practices, etc.)	2
No. of training-oriented presentations (on concepts, design, etc)	12
No. of participatory activities (open discussions, brainstorming sessions)	2
Rating of the technical quality of the workshop (average scores)	
Adequacy of the presentations (presentations correspond to the planned objectives and enhance shared understanding)	3.46 / 4
Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs and outcomes	3.31 / 4
Usefulness of the distributed material	3.15 / 4
Efficiency and effectiveness of the facilitation	3.15 / 4
Overall rating of the event	3.5 / 4
% of participants that reflected that all the topics necessary for a good comprehension of the subject were covered	69%

Table 4 Evaluation Indicators (reflecting the assessment of the quality of the workshop logistics/ organizational aspects as perceived by the participants):

Rating of the quality of the workshop logistics/ organizational aspects (average scores)	
Appropriate handling of invitations, visa support, information sharing and smoothing obstacles	3.46/4
Efficient logistics: accommodation, transportation, location of venue and interpretation	3.38/4
Provision of support (if requested) for participants' preparation for the event	3.46/4
Efficient and effective follow-up of preparations and progress towards the event	3.23/4
Planning for the event: selection and design of methodology, programme/daily agenda and work rules	3.46/4
Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns	3.31/4

Figure 4: Classification of participants' replies to the indicators reflecting the technical quality of the workshop

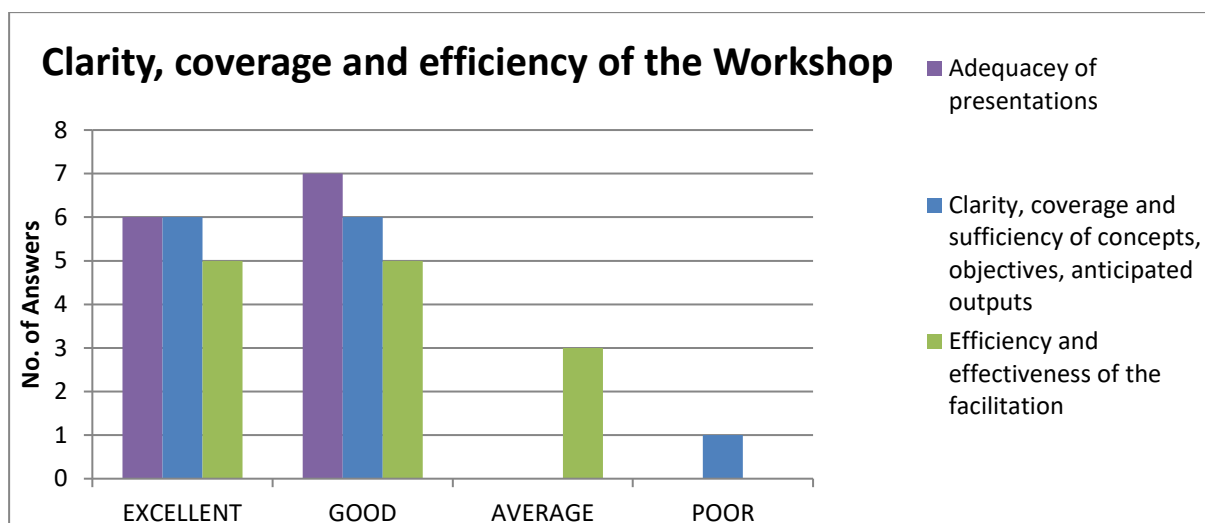


Figure 5: Classification of participants' replies to the indicators reflecting the quality of the workshop quality of the workshop logistics/ organizational aspects (part 1)

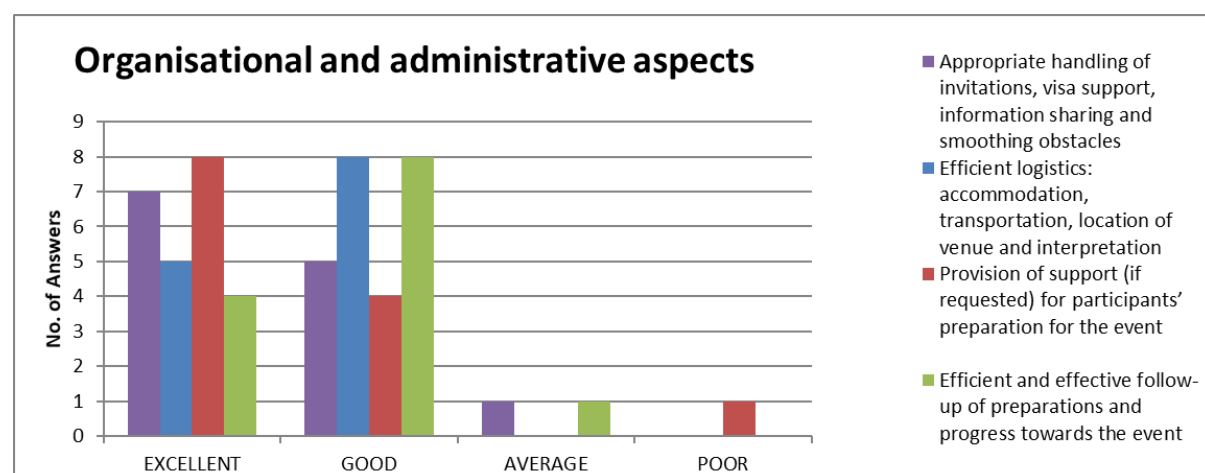


Figure 6: Classification of participants' replies to the indicators reflecting the quality of the workshop logistics/ organizational aspects.

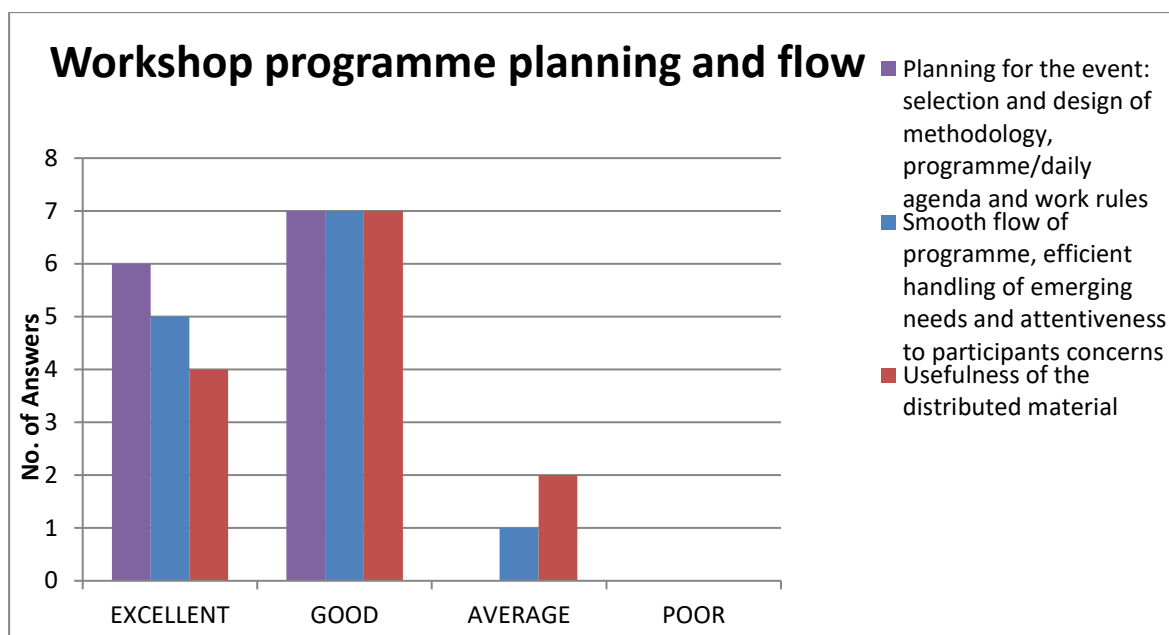


Figure 7: Classification of participants' replies to the indicators reflecting the workshop coverage

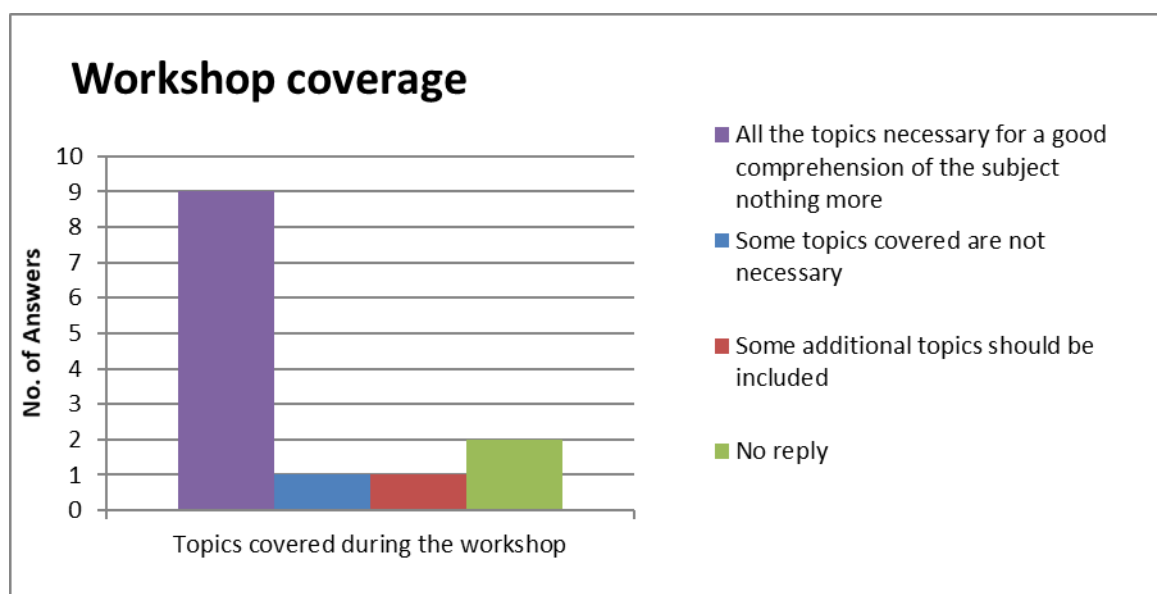


Figure 8: Classification of participants' replies to the indicators reflecting the workshop difficulty

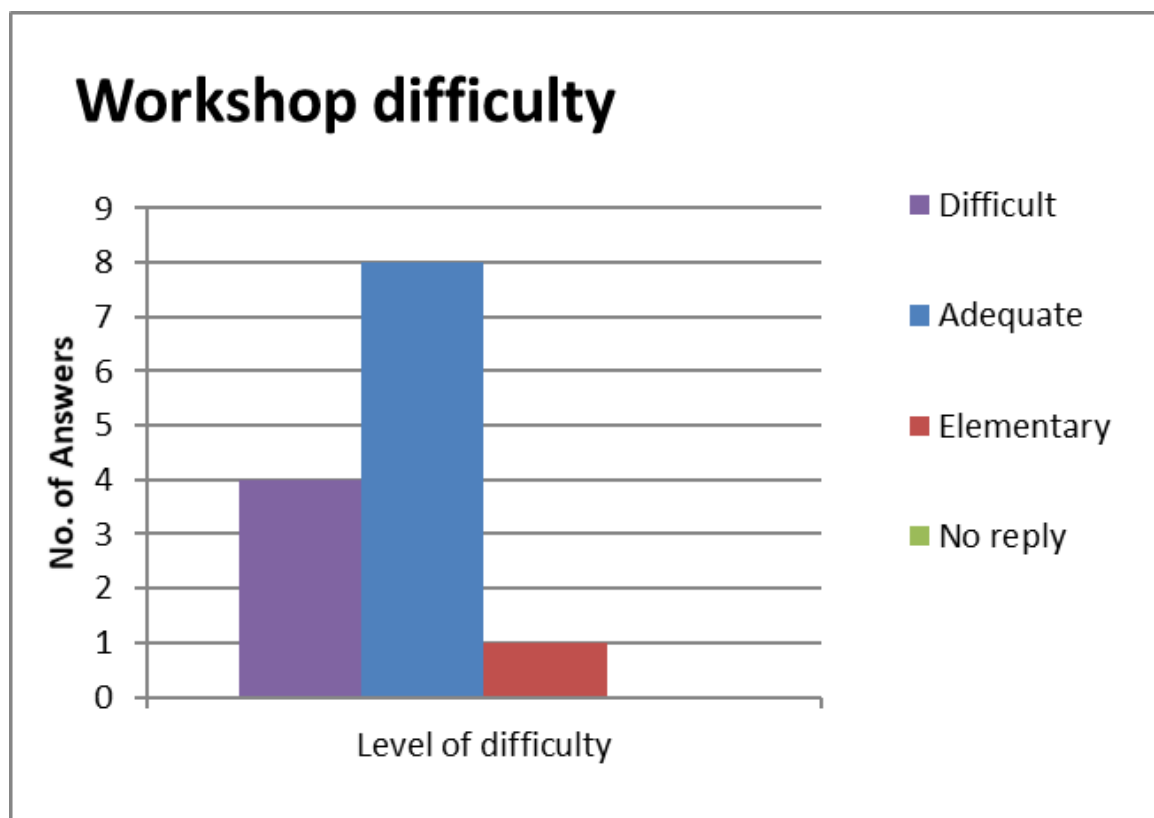
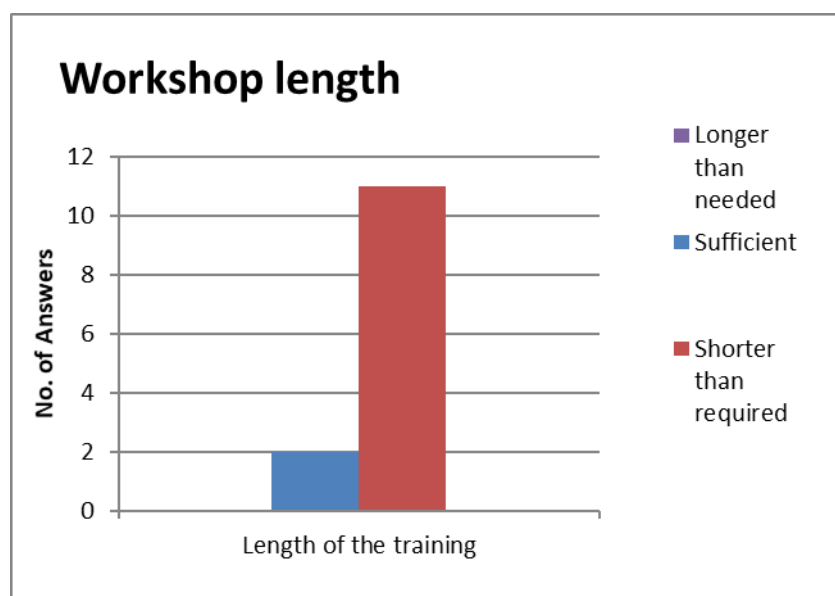


Figure 9: Classification of participants' replies to the indicators reflecting the workshop length



5. CONCLUSIONS AND RECOMMENDATIONS

Evaluating the results presented in Chapter 4, it is concluded that the expected outcomes of the workshop (as planned in the design phase) have been achieved (refer to Table 5 below).



Table 5: Level of achievement of the expected outcomes of the regional training:

Expected Outcomes as defined prior to the workshop	Have they been achieved?
The trainees are introduced to emergency sanitation management strategies (involving population displacement, temporary shelters and long-term displacement that result in semi-permanent settlements)	YES
The nominated technical staff of the respective sectors are provided with in depth training in the design of wastewater treatment plants with a view to solutions that can be adopted for temporary settlements/camps as they would be for long term temporary settlements and/or permanent settlements.	YES
Lessons learnt in wastewater treatment management schemes / facilities under emergency, based on the accumulated hands-on experience as a result of dealing with temporary settlements related to refugees in the sub-region,	YES
Experience in dealing with the influx of the Syrian refugees in the region is shared with the trainees of both tracks.	YES

The participants were very active during the interactive sessions, engaging with the topics and their contributions to the discussions were very extensive and valuable.

Regarding the workshop coverage, 69% of the participants reflected that all the topics necessary for a good comprehension of the subject were covered, 8% reflected that some additional topics could have been included, while 8% reflected that some topics covered were not necessary (15% did not reply to this question). On the other hand, the majority of the participants (62%) found the level of difficulty of the workshop adequate.

Results before and after the training indicate success in conveying specialized technical information to participants and an improved knowledge and raised awareness on the design for wastewater treatment.

The participants were highly satisfied as reflected in the evaluation, both with the technical aspects, as well as with the training organization aspects, as indicated by the logistics' evaluation.

Recommendation and future steps:

The majority of the participants (85%) felt that the workshop length was shorter than required, while another 15% felt it was adequate. It is recommended that the length of the future workshops and the inclusion of more interactive/ working group sessions will be carefully planned.

The participants indicated that among the most valuable things they learned during the workshop were the correct design procedure for WWTPs. Along the same line, the participants indicated that among the thing they liked most in this workshop was the way the material is presented.

The participants indicated that they gained good knowledge which can assist them in their future work on the subject, namely in the understanding of the chemistry and fractions of pollutants.

Knowledge transfer and propagation are very important aspect of capacity building. The participants indicated that they will transfer the experienced gained during the workshop to their colleagues though



reporting, presentation and/ or workshop with colleagues and stakeholders in their countries. It is highly recommended that the participant's follow-up on this and that they pursue this action.

Table 6: Follow-up questions to the participants

Follow-Up Questions	Most Popular Answers
What is the most valuable thing you learned during the workshop (knowledge or skills)?	<i>Ways of pollutants fractions calculations</i>
	<i>Understanding of effluent Standards</i>
	<i>Correct design method for WWTPs</i>
	<i>Simulation modeling software</i>
How do you think that the current event will assist you in your future work on the subject?	<i>Utilize the training material for design and operation of WWTPs.</i>
	<i>Reinforced the knowledge for better review and discussion of Consultants' designs.</i>
	<i>Do better planning and operation</i>
Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?	<i>Share training material with others.</i>
	<i>Provide training for colleagues using the same material.</i>
	<i>Encourage colleagues to use simulation modeling</i>
What did you like most about this event?	<i>The organization of the event</i>
	<i>The quality of the presentations</i>
	<i>The covered topics.</i>
	<i>The wide knowledge of the instructor</i>
	<i>The way the material is presented</i>
	<i>Get to know simulation modelling</i>
	<i>Learn from experience from different countries</i>
What needs to be improved?	<i>The duration of the workshop should be expanded.</i>
	<i>Hard copies of the training material should be provided</i>
	<i>More training material on simulation modeling</i>
	<i>More practical examples should be considered</i>
	<i>Separate the course in several phases</i>



ANNEX 1 – PRE AND POST TRAINING QUIZ FORM

TRAINING ASSESSMENT QUESTIONNAIRE

26.03.2018

Workshop Title	REG-14: Refugee Emergency: Fast track project Design of wastewater
Date	26-26 March 2018
Venue Location	Bierut, Lebanon
Participant Name	
Participant Title/ Position	
Participant Country	

INSTRUCTIONS/ INSTRUCTIONS:

Please respond to the questions below. Your feedback is sincerely appreciated. Thank you.

1. What is the advantage of a COD test over a BOD test?

- ☐ Shorter test time
- ☐ More accurate
- ☐ Safer
- ☐ Less chemicals needed

2. COD is slightly higher than ultimate BOD because?

- ☐ Not all of COD is biodegradable
- ☐ COD evaluates everything that is biologically or chemically oxidizable
- ☐ All of the above

3. For NO_3 of 60 mg/l, $\text{NO}_3\text{-N}$ is equal to:

- ☐ 20 mg/l
- ☐ 13.54 mg/l
- ☐ 5.76 mg/l
- ☐ None of the above

4. The first indication that your treatment plant is receiving a high organic load is:

- ☐ Flow increase by 20%
- ☐ BOD result of the influent composite sample is 50% higher than normal
- ☐ DO residual drops in the aeration tank
- ☐ Effluent more turbid than usual



5. Which of the following are removed from the wastewater in the primary clarifier?

- ☐ Colloidal solids
- ☐ Dissolved organic matter
- ☐ Dissolved BOD
- ☐ None of these

6. Grit is mainly

- ☐ Inorganic material
- ☐ Organic material
- ☐ Total suspended solids
- ☐ Volatile solids

7. What happens to the BOD of the clarified wastewater in an activated sludge process unit?

- ☐ BOD is removed through oxidation into CO_2 and H_2O
- ☐ BOD is precipitated and removed
- ☐ BOD is transformed into biological flocs and removed
- ☐ None of these

8. The nitrification process is controlled by temperature and what other factor?

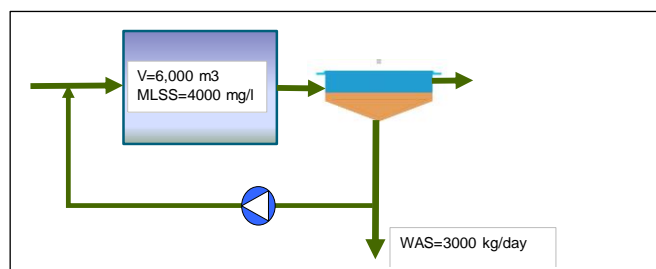
- ☐ Sludge age(SRT)
- ☐ Sludge settling rate
- ☐ Hydraulic loading

9. Denitrification requires

- ☐ Presence of nitrate
- ☐ Absence of DO
- ☐ Carbon material
- ☐ All of the above

10. The MLSS concentration in 6000 m³ activated sludge reactor is 4000 mg/l and the amount of waste sludge is 3000 kg/day. What is the sludge age(SRT)

- ☐ SRT =





11. Typical sludge age(SRT) for conventional activated sludge plant is:

- ☐ <3 days ☐ 3-15 days ☐ >15 days ☐ None of the above

12. The purpose of the selector tank is to:

- ☐ Promote growth of floc formers
☐ Inhibit growth of filamentous bacteria
☐ Improve sludge settlement
☐ All of the above

13. Typical sludge volume index(SVI) for activated sludge process is:

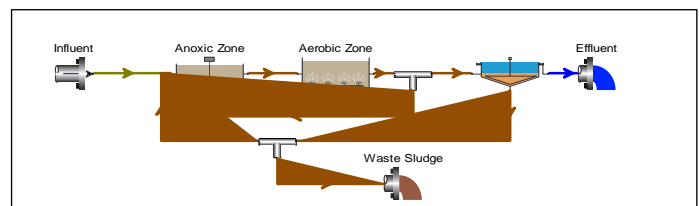
- ☒ <150 ml/g ☐ 50-150 ml/g ☐ 150-300 ml/g ☐ >300 ml/g

14. Which of the following types of aeration systems are the most efficient?

- ☐ Diffused aeration ☐ Vertical aerators ☐ Horizontal aerators ☐ Aspirators

15. The technical name of the activated sludge process given below is:

- ☐ Modified Ludzack-Ettinger(MLE) Process
☐ Bardenpho Process
☐ Sequencing Batch Reactor(SBR)
☐ Oxidation ditch



THANK YOU!



ANNEX 2 - TRAINING ACTIVITIES EVALUATION FORM

EVALUATION QUESTIONNAIRE

Workshop Title/ Intitulé de l'Atelier	SWIM-Horizon 2020 Support Mechanism regional on-site training workshop (REG-14) on Refugee Emergency: Fast track project design on water, waste water and solid waste (focusing on wastewater and solid waste) Track 1: "Wastewater Treatment"	
Date/ Date	26-29 March 2018	
Location/ Lieu	Country/ pays	Beirut, Lebanon
	Venue/ Salle de Conférence	Golden Tulip Serenada Hotel - Hamra
Participant Name (optional)/Nom du Participant (facultatif)		
Participant Title/ Position du Participant		
Participant's Country Pays du Participant		
INSTRUCTIONS/ INSTRUCTIONS: Please circle/tick your response to the items. Your feedback is sincerely appreciated. Thank you. / Veuillez encercler/cocher vos choix. Vos commentaires sont les bienvenus. Merci.		

A. ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT	A. QUESTIONS ORGANISATIONNELLES, ADMINISTRATIVES ET DE PLANNIFICATION AVANT ET PENDANT L'ATELIER
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A.1. Appropriate handling of invitations, visa support, information sharing and smoothing obstacles <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.1. Gestion appropriée des invitations, soutien à l'obtention de visa, diffusion des informations et aide à la résolution des difficultés
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	<input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.2. Efficient logistics: accommodation, transportation, location of venue and interpretation <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.2. Efficacité de la logistique: hébergement, transport, lieu de réunion et interprétation <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.3. Provision of support (if requested) for participants' preparation for the event <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.3. Assistance fournie (si elle a été demandée) pour le travail préparatoire des participants pour l'évènement <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.4. Efficient and effective follow-up of preparations and progress towards the event <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.4. Suivi efficace de la préparation et des progrès accomplis pour la tenue de l'évènement <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.5. Planning for the event: selection and design of methodology, programme/daily agenda and work rules <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.5. Planification de l'évènement: choix et conception de la méthodologie, programme/ordre du jour et règles de travail <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.6. Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.6. Bon déroulement du programme, gestion efficace des besoins émergents et aide aux participants <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.7. Presentations correspond and contribute to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.7. Les présentations correspondent et contribuent aux objectifs fixés et favorisent la compréhension mutuelle et la participation aux questions abordées <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais



A.8. Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs and outcomes <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.8. Clarté, couverture et suffisance des notions, des objectifs, des produits et des résultats attendus <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.9. The materials distributed were helpful/ <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.9. Les matériels distribués ont été utiles <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.10. Efficient and Effective Facilitation <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.10. Modération efficace <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
A.11. Overall rating of the event <input type="checkbox"/> Excellent <input type="checkbox"/> Good <input type="checkbox"/> Average <input type="checkbox"/> Poor	A.11. Evaluation globale de l'évènement <input type="checkbox"/> Excellent <input type="checkbox"/> Bien <input type="checkbox"/> Moyen <input type="checkbox"/> Mauvais
B. FEEDBACK ON TECHNICAL ASPECTS	
B. COMMENTAIRES SUR LES ASPECTS TECHNIQUES	
B.1. Coverage of the event In your opinion did the event cover (tick one of the following): <input type="checkbox"/> All the topics necessary for a good comprehension of the subject nothing more <input type="checkbox"/> Some topics covered are not necessary <input type="checkbox"/> Some additional topics should be included	B.1. Couverture de l'évènement A votre opinion l'atelier a traité (cochez une des options suivantes): <input type="checkbox"/> Tous les sujets nécessaires pour la bonne compréhension de la thématique et rien de plus <input type="checkbox"/> Certains sujets traités ne sont pas nécessaires <input type="checkbox"/> Des sujets supplémentaires devraient être inclus
B.2. Level of difficulty (tick one of the following): <input type="checkbox"/> Difficult <input type="checkbox"/> Adequate <input type="checkbox"/> Elementary	B.2. Niveau de difficulté (cochez une des options suivantes): <input type="checkbox"/> Difficile <input type="checkbox"/> Adéquat <input type="checkbox"/> Élémentaire



B.3. Length of the training

In your view the workshop duration (tick one of the following):

- ☐ Longer than needed
☐ Sufficient
☐ Shorter than required

B.3. Durée de l'atelier de formation

A votre avis, la durée de l'atelier était (cochez une des options suivantes):

- ☐ Trop long
☐ Suffisante
☐ Trop courte

B.4. What is the most valuable thing you learned during the workshop (knowledge or skills)?

B.4. Quelle est la leçon la plus utile que vous avez-vous apprise pendant l'atelier (connaissances ou compétences)?

B.5. How do you think that the current event will assist you in your future work on the subject?

B.5. Comment pensez-vous que l'atelier de formation peut vous aider dans votre travail futur sur le sujet?

B.6. Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?

B.6. Veuillez indiquer si (et comment) vous pourriez transférer une partie de expérience acquise lors de cet évènement à vos collègues dans votre pays ? (Question ouverte)



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B.7. What did you like most about this event?
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B.7. Qu'avez-vous le plus apprécié dans cet évènement?

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B.7. What needs to be improved?
--

B.7. Quelles sont les améliorations à apporter aux prochains évènements?:
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ANNEX 3 - TRAINING AGENDA

“REG-14: Refugee Emergency: Fast track project design on water, wastewater and solid waste (focussing on wastewater and solid waste)

, 26-29 March 2018

Track 1: “Wastewater Treatment”

Plenary session with Track 2

Item	Time	Description	Speaker
26 March			
1	09:00-09:10	Welcome Remarks	Suzan Taha
2	09:10-09:30	Pre training test	Mohammad Sutari
3	09:30-11:00	Wastewater Constituents, Chemistry, Characterization & Microorganisms	Mohammad Sutari
	11:00-11:20	Coffee Break	
4	11:20-13:00	Flow, Loads & Discharge Standards & Lessons Learnt Under Emergency	Mohammad Sutari
	13:00-14:00	Lunch Break	
5	14:00-15:00	Preliminary & Primary Treatment	Mohammad Sutari
6	15:00-16:30	Water & Sanitation Facilities for Refugee Camps Under Emergency	Mohammad Sutari
27 March			
7	09:00-11:00	Activated Sludge Process -Session 1	Mohammad Sutari
	11:00-11:20	Coffee Break	
8	11:20-13:00	Activated Sludge Process - Session 2	Mohammad Sutari
	13:00-14:00	Lunch Break	
9	14:00-15:00	Secondary Clarifiers	Mohammad Sutari
10	15:00-16:00	Chemicals Addition & Biological & Chemical Phosphorus Removal	Mohammad Sutari
28 March			
11	09:00-10:00	Aeration & Mixing Systems	Mohammad Sutari
12	10:00-11:00	Sludge Treatment and Possible Energy Generation	Mohammad Sutari



	11:00-11:20	Coffee Break	
13	11:20-12:20	Tertiary Treatment - Filtration & Disinfection	Mohammad Sutari
14	12:20-13:00	Configuration, Layout & Overview of Other Treatment Processes	Mohammad Sutari
	13:00-14:00	Lunch Break	
15	14:00-14:30	Example of Water & Sanitation Systems for Permanente Refugee Camps	Mohammad Sutari
16	14:30-16:00	Closing of Training and Post training test and assessment	Mohammad Sutari
29 March: Plenary session with Track 2			
1	09:00-09:40	Jordan response to the Syrian Crisis: moving from crisis management to planned response: <ul style="list-style-type: none"> - Process/Procedures for the development of Jordan Response Plan (JRP) - Q&A 	Ammar Abu-Drais, Solid Waste Consultant (Short term solutions - the case of Jordan); SWIM-H2020 SM
2	09:40-10:20	Lessons learned from the response to the Syrian Crisis (case of Lebanon). How humanitarian aid works <ul style="list-style-type: none"> - Presentation by the Economic and Social Fund for Development - Q&A 	Dima Sader, Community Development and Infrastructure Manager, Economic and Social Fund for Development (Lebanon Office)
3	10:20-11:00	How humanitarian aid works and applying for funds <ul style="list-style-type: none"> - Presentation by Oxfam International - Q&A 	Prasad Bhagwan Sevekari - Oxfam International Regional WASH Advisor – MENA (Jordan office)
	11:00-11:30	Coffee Break	
4	11:30--12:00	Municipal peer to peer learning: how best practices in solid waste and wastewater management can be replicated through on the job coaching between municipalities <ul style="list-style-type: none"> - Presentation by ACTED - Q&A 	Ciara Noon: WASH Technical Coordinator for ACTED (Lebanon)
5	12:00-12:30	Solid Waste Management plans of the Greater Amman Municipality / The impact of the Syrian crisis <ul style="list-style-type: none"> - Presentation by Greater Amman Municipality (GAM) - Q&A 	Omar Arabiyat: Manager of Env. Studies and Planning Department Greater Amman Municipality (GAM)
	12:30-13:30	Lunch	