

PADUCO



*Palestinian - Dutch Academic Cooperation on Water*

## **PADUCO-2 Small Grant Facilities**

Report on

Training project

Operation and maintenance of Newly constructed Activated sludge systems  
in The Gaza Strip

Prepared by

Dr. Husam Al-Najar

2020

## **Summary**

Despite all the difficulties and constraints imposed on water and sanitation sector, Coastal municipal water utility (CMWU), in cooperation with many partners, managed to develop this sector by expanding the wastewater networks and developing the treatment plants in consistence with the present and future expansions. New technologies such as activated sludge systems are currently under construction and will be in operation by 2020. The current systems for treatment plants are limited to aerated lagoons, trickling filters and maturation ponds. Thus preparation of training courses for the staff is fatal for the success of operation of the new constructed systems which has different operation and maintenance concepts. The Dutch partner from IHE-Delft have conduct their training via video conference for 45 training hours to 14 participants who are the candidates to supervise and manage the activated sludge systems in the north, the middle area and south wastewater treatment plants. The Gaza partners in the training project conducted a site visit to Gaza central wastewater treatment plants which currently under construction and installation of the equipment's and the north wastewater treatment plant which is under operation. The training material covered the wastewater characteristics and the principles of organic and nitrogen removal, the troubleshooting and the final clarifier principles'. The organizer of the training in Gaza in close cooperation with CMWU carried out evaluation questionnaire to measure the improvement and the transfer of the knowhow from the Dutch experts to the Palestinian partners. The evaluation outcomes indicated that the objectives of the training are partially achieved. Excellent training material, but the participants concerns were about the means of conducting the training via video conference and the limited time of the training.

## Table of Content

Summary		Page
Table of Content		
1. Introduction		1
	1.1 The PADUCO Program	4
	1.2 Thematic Areas of PADUCO-2	4
	1.3 Scope and Objectives of PADUCO-2	5
	1.4 Background of the training program	5
	1.5 Project objectives	6
2. Project methodology		7
	2.1 Project partners	7
	2.2 Participants and Target group	7
	2.2 Training contents and the lecturers of the training material	7
3. Training Evaluation		8
	3.1 General evaluation	12
	3.2 The knowledge of the participants before and after the training	12
Conclusion		13
Acknowledgement		14

# 1. Introduction

## 1.1 The PADUCO Program

PADUCO-2, the second phase of the Palestinian Dutch Academic Cooperation Programme on Water is being implemented between 2016 and 2019 by a consortium of six Palestinian and five Dutch universities:

### Palestinian partners

Al-Quds University, Abu-Dis, Jerusalem

An-Najah University, Nablus

Birzeit University, Birzeit

Islamic University of Gaza, Gaza

Palestine Polytechnic University, Hebron

Palestine Technical University - Kadoorie, Tulkarm

### Dutch partners

Delft University of Technology, Delft

Free University of Amsterdam

IHE-Delft Institute of Water Education, Delft

Wageningen University & Research, Wageningen

University of Twente, Enschede

The program consists of three interrelated components representing clusters of activities: (1) Applied Research, (2) Education and Training Programs and (3) Institutions, Partnerships and Networks. The activities under the PADUCO-2 are not necessarily limited to the universities and organisations forming the consortium mentioned above. The consortium members however contribute to the management team responsible for the good performance of the program.

## 1.2 Thematic Areas of PADUCO-2

The research and education projects supported through PADUCO-2 are expected to address themes that are closely related to the priority areas for addressing development challenges as identified by policy-setting and management organisations in the Palestinian Water Sector. The Palestinian Water Strategy and the consultations with the main ministries identified a fair number of challenges and priority areas. However, for the purpose of being able to obtain measurable impact and preventing available project resources to be spread too thinly, a selection for two themes has been made, addressing them however on a system-level, which may lead to a significant scale and scope of the research. The two themes are:

- Water quality and pollution. Special reference is made to industrial wastewater treatment and reuse (such as stone cutting, dairy, tanneries, olive mills), possibly including aspects of technology, energy, environmental impact, protecting areas, feasibility, financing, licensing, etc.
- Water resources and supply. Special reference is made to safeguarding and augmenting water availability, equity of distribution, economic feasibility, agricultural water use and agricultural development, improving water services and organising water utilities.

### 1.3 Scope and Objectives of PADUCO-2

PADUCO-2 consists of three interrelated components representing clusters of activities:

1. **Applied Research**: the largest component, linked to most program results; the research projects also form the basis for and facilitate the activities and objectives of the other two components
2. **Education and Training (E&T)**: a modest component; linked to the research as a way to retain the knowledge developed and update relevance of education; the component also helps to set the scene for and understanding of more far-reaching policies change and adaptation of current practices in water sector education and training, as indicated in supporting documents
3. **Institutions, Partnerships and Networks (IPN)**: although the related activities are embedded in the activities described for the first two components, this component has been identified separately as it is an important underlying principle of how PADUCO operates and sees the benefit of having “a PADUCO”, while some of the program facilities created are especially meant to facilitate this component of partnerships.

### 1.4 Background of the training program

In the Gaza Strip, there are three main treatment plants and two temporary plant for collecting and treating wastewater to treat it to the level allowed to be dumped to the sea and to not pollute the aquifer in case of infiltration except for the north WWTP which infiltrates to the eastern lagoons

These treatment plants are placed along the Gaza Strip (North, Gaza, Rafah, Khanyounis and Wadi Gaza). The treatment systems relies more on the natural low cost treatment ranges from anaerobic lagoons, aerated lagoons and in Gaza and Rafah trickling filters are used. The municipality staff in sanitation department are easily managed this systems since it was constructed and operated in the 70s of the last century. The current treatment plants still do not meet the standards of treating wastewater in Gaza and this is due to the frequent closure of Gaza crossings that hinder the required periodical maintenance. Moreover, the population growth without a proper expansion of the

treatment plants has caused a problem since the wastewater production rate is increasing. Therefore, the regional plan of Ministry of Planning suggests establishing three central treatment plants near the eastern armistice line. The north treatment plant (NGEST) currently in stipulated operation, Gaza and Khanyounis wastewater treatment plants are under construction in the final phase. The three central treatment plants designed to operate as activated and oxidation ditch systems. The responsibility of operation and maintenance is given to the Municipal Coastal Utility (CMWU) which represents 25 municipalities in the Gaza Strip. For the activated sludge treatment plants establishment projects, a project Management Unit (PMU) was established. The PMU members are 10 members from the core cities. In the need assessment meeting with CMWU the outcomes were to train the 10 members of the PMU to be trainers for the whole relevant 25 municipality staff.

### **1.5 Project objectives**

The project aiming to conduct a training course for Municipal water Utility (CMWU) staff and the activated sludge treatment plant management unit (PMU) members of the Gaza Strip involved in wastewater treatment plant operation and maintenance to be a core staff for training of trainee. This activity is necessary to transfer the knowledge of operation of the new technology (activated sludge and oxidation ditches) to the municipality operators who used to operate the old conventional treatment systems. Moreover, to transfer the knowhow from the Dutch experts who have long experience in operating the activated sludge system and the optimal operation.

## **2. Project methodology**

Our effort to timely and successfully complete the training tasks and all related activities of this assignment was guided by a work plan based on a sound and reasonable assessment of the capacity building of targeted group requirements, and a clear understanding of targeted group training need. Implementations of this training focused on mutual learning among the trainer and the participants by using participatory approach of training.

Furthermore, in order to ensure the satisfactory completion of the assignment within the time frame, the trainee has arranged to utilize the capabilities, experience and expertise. The combined capacity of our professional team offers a guarantee for delivering the expected outputs to the best standards of quality and as timely and efficiently as possible.

The trainer brings to the team excellent management capability, and vast knowledge of the technical issues of the program implementation environment. The team who will be assign to implement these activities have several years of working experience on a wide range of wastewater management and conducting trainings.

### **2.1 Project partners**

#### **Main applicant**

Name : Dr. Husam Al-Najar  
University : IUGaza  
Telephone : +972599336745  
Email : halnajar@iugaza.edu.ps

#### **Co-applicant 1**

Name : Dr. Carlos Lopez  
University : IHE- Delft  
Telephone : +31 15 215 1781  
Email : c.lopezvazquez@un-ihe.org

#### **Implementation institute**

Institute : Coastal Municipal Water Utility (CMWU)

### **2.2 Participants and Target group**

The training conducted for Municipal water Utility (CMWU) staff and the activated sludge treatment plant management unit (PMU) members of the Gaza Strip involved in wastewater treatment plant operation and maintenance to be a core staff for training of trainee. As shown in Table 1 the attendance represented the core municipalities of the Gaza Strip who involved in operation and maintenance of the three central activated sludge treatment plants and the CMWU team.

Table 1. Target group and participants list and contacts

Name	Institution	Tel	Email
Farid Ashour	CMWU	0566350550	fsashour@cmwu.ps
Yehia Abu Abaid	CMWU	0562200888	y.obaid@cmwu.ps
Nehad Al-Khatib	CMWU	0562200804	nehad@cmwu.ps
Rafey Abu Hun	CMWU	05622009460	rafey_2009@hotmail.com
Yasser Shaat	CMWU	0599815529	yashaat67@hotmail.com
Yasmine Bashir	CMWU	0562200996	ybasheer@cmwu.ps
Fahed Al Katib	CMWU	0597089889	falkhatib@cmwu.ps
Hatem Abu El tayef	Khan Yunis Mun.	0599349866	hatem.tayef@cmwu.ps
Majed Ekky	Dorsch consult	0594413448	majed.ekky@dorsch.de
Hisham Abu Al komboz	Gaza Mun.	0599815691	hbqmbz@gmail.com
Emran El Dahdouh	Gaza Mun.	0599400065	
Hamdy Mutair	Jabalia Mun.	0599189145	h_mutair@hotmail.com
Ziad Taha	Beit Lahya Mun.	0597772943	ziadftaha@gmail.com
Husam Al-Najar	IUGaza	0599336745	halnajar@iugaza.edu.ps

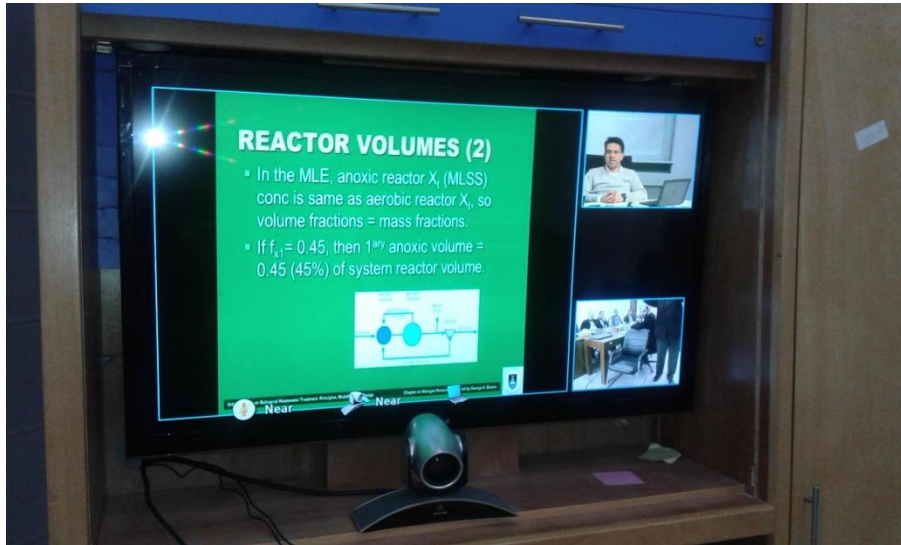
### 2.3 Training contents and the lecturers of the training material

The training was held at CMWU video conference room via Video conference from IHE-Delft for aduration of 35 hours lecturing and full day ( 8 hours) field visits to Gaza central wastewater treatment plant and the North wastewater treatment plant. The lecturers were Dr. Dr. Carlos Lopez, Prof. Damir Brdjanovic from Delft, Dr. Husam Al-Najar and Eng. Farid Ashour in Gaza. As shown in Table 2, the training material included: Wastewater characteristics, Organic matter removal, Nitrogen removal, Troubleshooting, Final design exercise on activated sludge and Final settling.

Table 2. Activated Sludge Operation and Maintenance Training program for CMWU seniors and Gaza Strip core municipalities.

Day	Date	Time	Topic	Lecturer
Monday	4 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Wastewater characteristics</b> (10:00-12:30) <b>Organic matter removal</b> (13:00-15:00)	Dr. Carlos Lopez
Tuesday	5 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Organic matter removal</b> (10:00-12:30) <b>Nitrogen removal</b> (13:00-15:00)	Dr. Carlos Lopez
Wednesday	6 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Nitrogen removal</b>	
Tuesday	19 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Final design exercise on activated sludge</b>	Dr. Carlos Lopez
Thursday	21 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Final settling</b> (10:00-12:30) <b>Final design and operation exercise of settleability</b> (13:00-15:00)	Dr. Carlos Lopez
Monday	25 <sup>th</sup> Feb.	10 am - 12:30 pm 12:30- 13:00 break 13:00 till 15:00	<b>Troubleshooting</b> (10:00-12:30) <b>Final settling</b> (13:00-15:00)	Dr. Carlos Lopez
Wednesday	27 <sup>th</sup> Dec.	Site visit	8:30- 15:00	Dr. Husam Al-Najar

The following pictures show the participants in the video conference at CMWU video conference room. The site visits are also organized for the master students at the Islamic university of Gaza who were studying wastewater management and wastewater treatment. Sample of site visit pictures are also shown below.





### 3 Training Evaluation

Questionnaire was distributed to the 14 participants to evaluate the project training materials, their knowledge in activated sludge system before and after the training. The questionnaire results are represented as the following.

#### 3.1 General evaluation

The general evaluation of the training including the items; the content of the training, the lecturing materials, organization, achievements of the training objectives preparation and the presentation means and the period of the training. Table 3 shows the participants response. Based upon the response of the participants it is clear that the content of the training and the suitability of the material and achievement of the objectives were ranging from excellent to very good. The using of video conference as a mean of presentation was fair moreover, the period of training is short to cover the proposed topics according to the participant point of view.

Table 3. Participants response the general evaluation

Content	Excellent	Very good	good	fair
1. The content of the training	8	6	0	0
2. The suitability of lecturing materials,	6	7	1	0
3. Organization	6	6	3	0
4. Achievements of the training objectives	6	4	4	0
5. Presentation means	3	5	2	4
6. Period of the training	2	6	3	3

#### 3.2 The knowledge of the participants before and after the training

In order to assess the improvement of the participants experience and knowledge of the activated systems, specific questions were highlighted such as; their knowledge of wastewater characteristics, components of activated sludge systems, effluent standards and the principals of organic and nitrogen removals. As shown in Table 4. the response of the participants to their knowledge and experience in activated sludge system before the training was rarely excellent and ranges from very good to fair. In contrast, after the training the response of excellent and very good were the highest in all contents. Their response after the training is shown in Table 5.

Table 4. the response of the participants to their knowledge and experience in activated sludge system **before** the training

Content	Excellent	Very good	good	fair
1. Wastewater characteristics and classification	1	7	4	2
2. Components of activated sludge systems	1	6	3	4
3. Effluent standards	3	5	6	0
4. Principals of wastewater treatments	1	6	6	1

Table 5. The response of the participants to the improvement of their knowledge and experience in activated sludge system **after** the training.

Content	Excellent	Very good	good	fair
1. Wastewater characteristics and classification	6	8	0	0
2. Components of activated sludge systems	6	8	0	0
3. Effluent standards	8	6	0	0
4. Principals of wastewater treatments	5	5	3	1

### **Conclusion:**

The newly constructed activated sludge systems is facing the problem of operation and maintenance due to the long time experience and operation of the traditional systems of treatment which constitutes of anaerobic lagoons, aerated lagoons and trickling filters. The concept of activated sludge is completely different and the required staff for operation is more less than the activated sludge. Additionally, the current staff of operation of the traditional systems nearly reach the retirement age. Therefore most of the training staff are from young generation who never work and operate activated sludge systems, but the experience is limited to planning and design during their theoretical study at either B.Sc or Master courses. The conducted training offered new material and approach from international experts to operate the activated sludge systems with nitrogen removal which was never treated in Gaza Strip by the traditional treatment systems. The training also included site visits to the treatment components showing the treatment stages and the expected problems. In spite of the video conference conducted training due to the siege imposed to the Gaza Strip, the participant have showed good reaction. This was clear when they answered the questionnaire before and after the training.

## **Acknowledgement**

The training organizers (IUGaza and IHE), the training participants representing all Gaza Strip municipalities and the coastal municipal water utility (CMWU) would like to thank the Netherlands government for financializing training in Palestine through PADUCO2 program. All parties still wish to have further trainings to strengthening the capacity building of water and sanitation sector in Palestine to cope with the modern environmental standards.