

Water and **Environment Support**

in the ENI Southern Neighbourhood region



N-W-1-EG1

STRENGTHEN THE WATER UTILITIES CAPACITIES TO MANAGE/REDUCE NRW AND DETECT LEAKAGE

Capacity building/Training on Zone and DMA design and water balance calculation

T5.2

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WATER AND ENVIRONMENTAL SUPPORT IN THE ENI SOUTHERN NEIGHBOURHOOD REGION

The "Water and Environment Support (WES) in the ENI Neighborhood South Region" project is a regional technical support project funded by the European Neighbourhood Instrument (ENI South). WES aims to protect the natural resources in the Mediterranean context and to improve the management of scarce water resources in the region. WES mainly aims to solve the problems linked to pollution prevention and the rational use of water.

WES builds on previous similar regional projects funded by the European Union (Horizon 2020 CB/MEP, SWIM SM, SWIM-H2020 SM) and strives to create a supportive environment and increase the capacity of all stakeholders in the partner countries (PCs).

The WES Project Countries are Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Libya, Palestine, Syria and Tunisia. However, in order to ensure the coherence and effectiveness of EU funding or to promote regional cooperation, the eligibility of specific actions can be extended to neighbouring countries in the Southern Neighborhood region.





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ABBREVIATIONS

AWWC	Asyut Water and Wastewater Company
DB	Database
DMA	District Metered Area
DMZ	District Metered Zone
EU	European Union
HCWW	Holding Company for Water and Wastewater
GIS	Geographical Information System
0&M	Operation and Maintenance
NRW	Non-Revenue Water





1 GENERAL INTRODUCTION

The "Water and Environment Support (WES) in the ENI Neighbourhood South Region" project is a regional technical support project funded by the European Neighbourhood Instrument (ENI South). WES aims to protect the natural resources in the Mediterranean context and to improve the management of scarce water resources in the region. WES mainly aims to solve the problems linked to pollution prevention and the rational use of water.

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Egypt has asked the WES Project to implement a national activity entitled "[Strengthen the water utilities capacities to manage/reduce NRW and detect leakage]". The activity falls under *topic 1:* "Water Use Assessment, estimation ", topic 2 "Water Efficiency Gains at Decentralised Level" and 3 "Water Resources Valuation, Cost Recovery, Affordability of water services", sub-topic 2.2: "Non-Revenue Water (NRW) Management" and dimensions 1 & 2 "Technical Assistance and/or Capacity Building.

Nationally, **the activity supports the Real Loss Reduction Strategy (2017)** prepared with the support of the second phase of the European Union's (EU) Water Sector Reform Program, which promotes an integrated nonrevenue water reduction strategy and its alignment with the real Loss Reduction Strategy.

During this activity, the project will introduce internationally accepted best management practices for improving NRW, such as hydraulic modelling, the design of Distribution Zones, water balancing to enable quantifying the individual components of losses (including commercial losses) and estimating the overall NRW rate at the decentralized level. It will equally contribute towards the adoption of other best practices such as the use of GIS to allow the analysis of the geographic distribution of leaks, and subsequently facilitate the establishment of the link between the customers' information and the GIS.

2 OBJECTIVES OF ACTIVITY

The overall objective of this activity is "to assist a selected water utility to target the reduction of Non-Revenue Water (NRW) and to continue its efforts to improve NRW management".

The specific objectives are to:

- Investigate the situation of non-revenue water management in a pilot city served by Asyut Drinking Water and Sewerage Company and prepare its network, as part of rational planning aimed at NRW reduction, to the next stage of implementation of distribution zones/sectors and their subsequent division into District Metered Areas (DMAs).





- Implement and calibrate a hydraulic model for the network of the pilot city as a tool to provide valid support to move into the design stage and establishment of DMAs.
- Introduce internationally recognised best practices for improving NRW (including the design
 of Distribution Zones and the use of GIS to enable an analysis of the geographical distribution
 of leakage).
- Build the capacity of the utility staff involved in the pilot area on the implementation of best practices for the management of non-revenue water through on-the-job training and direct involvement in the implementation of the tasks with the support of non-key experts (field data analysis, water balancing, model calibration, and fixing anomalies between the results of the model calculations and the field data).
- Develop a manual documenting the proposed procedures for reducing NRW in the Asyut city water network.

This report deals with the capacity building of the utility staff through the three-day training on NRW practices and the presentation of the results of the activities of the project.

3 EXPECTED RESULTS OF ACTIVITY

The project ended with a three-day training involving the operation and maintenance (O&M) staff, non-revenue water staff, GIS specialists and the Commercial Department.

The training aimed to (a) present the findings and results of the activity together with its recommendations and (b) agree on a set of actions emanating from the recommendations. The Agenda for the training can be found in Annex 8.1.

Expected result

- 1. A set of procedures aimed to reduce NRW has been prepared giving special attention to:
 - a. Data collection and GIS DB implementation, upload and maintenance
 - b. Understanding of Hydraulic calculation as a tool to improve the performance of the water supply network.
 - c. Procedures for the operation and maintenance of the DMZs
 - d. Calculation of the water balance and analysis of results
 - e. Guidance on how to divide the Distribution zones further into District Metered Areas (DMAs)
- 2. The results and recommendations of the activity have been presented to the beneficiaries and validated, and problems and potential solutions are discussed.

4 PROFILES OF THE PARTICIPANTS

Sixteen persons participated in the three-day training, fifteen were from the Asyut water company and one was from the holding company. The list of participants can be found in Annex 8.2. In detail, these are the AWWC department which attended the training:





Hydraulic analysis department	4
GIS department	2
Measurement and Water Losses department	3
Commercial department	4
HWWC	1

In addition, the General manager and the manager of planning of AWWC attended one day of the training.

5 EVALUATION OF THE EVENT¹

5.1 ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT

A set of 11 criteria; A1-A11 (See table below) were assessed by the participants, using a qualitative description ranging between "Excellent" to "Poor".

A. ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES							Average
BEFORE AND DURING THE EVENT		EXCELLENT	GOOD	AVERAGE	POOR	Total Replies	Score (max = 4)
A2	Efficient logistics:	1	4	7	2	14	2,29
А5	Planning for the event: selection and design of methodology, programme/daily agenda and work rules					0	0,00
A6	Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns	1	4	7	2	14	2,29
A7	Presentations correspond and contribute to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics	1	4	7	2	14	2,29
A8	Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs	1	4	7	2	14	2,29
A10	Efficiency and effectiveness of the facilitation	1	4	7	2	14	2,29
A11	Overall rating of the event	1	4	7	2	14	2,29

The overall rating of the training is 2.9 of 4, which can be considered satisfying.

5.2 SUMMARY OF MOST FREQUENT STATEMENTS MADE BY THE PARTICIPANTS

The opinion of those who participated in the training was that it was a positive opportunity to show the results obtained during the project and to introduce the criteria that lead to (i) a rationale use of available data, (ii) an informed use of the available tools for hydraulic network analysis and (iii) a new vision on how to combine all that is available to begin the preparation of a Water Balance and how to improve it over time.

¹ As Event is considered to be: training session, peer-to-peer session and study tour





The supporting logistic provided by AWWC, combined with what was provided by the WES team was efficient; the room and the devices available made the hours of the training go smoothly with no problems. The WES team also provided translation into Arabic when needed and there were no communication problems between the participants and the trainers.

The presentation covered the following topics:

Day-1: Customer DB and GIS DB data manipulation and combined analysis

Day-2: Zoning and DMA concepts, design and operation

Day-3: Water Balance concept and preparation.

In particular, the topics of the second training day attracted the attention of the audience because they were related to ongoing activities at AWWC's Engineering and Measurement and water loss departments; namely the design and implementation of DMAs in Asyut's Water Supply System.

So, in general, the presentation corresponded and contributed to the planned objectives and was conducive to enhanced shared understanding and participation on addressed topics.

As a positive conclusion to the three-day training, participants asked for more and better explanations on the creation, design and operation of DMAs, especially in the more complex inner-city areas of Asyut.

Below is a summary of the most frequent statements made by the participants.





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	B. FEEDBACK ON TECHNICAL ASPECTS	No. of replies
B1	Coverage of the event	
	In your opinion did the event cover (tick one of the following):	
	All the topics necessary for a good comprehension of the subject nothing more	4
	Some topics covered are not necessary	4
	Some additional topics should be included	
	No reply	6
	Total Replies	14
B2	Level of difficulty	
	Difficult	2
	Adequate	4
	Elementary	3
	No reply	5
	Total Replies	14
B3	Length of the training	
	In your view the workshop duration (tick one of the following):	
	Longer than needed	
	Sufficient	8
	Shorter than required	
	No reply	6
	Total Replies	14
B4	What is the most valuable thing you learned during the workshop (knowledge or skills)?	
	Using EPANET and QGIS softwares - calculating the DMA boundaries - Mapping $$ - Calculatng the Water	
	Balance by EasyCalc	4
	No reply	8
	Total Replies	12
B5	How do you think that the current event will assist you in your future work on the subject?	
	it will help in mapping the network, analysis and forecasting fthe DMA design and will valid the data used in calculation	4
	No reply	10
	Total Replies	14
B6	Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?	
	Using workshops and general meetings with other colleagues - on job training / by displaying the results of network model for them, how I can calculate it and how we can analyse the results/ by using the software /	6
	No reply	8
	Total Replies	14
B7	What did you like most about this event?	
	The DMA concept and implementing data analysis on EPANET software / software / the trainers / I have	
	aot new skills at new softwares	6
	No reply	8
	Total Replies	14
B8	What needs to be improved?	
	More practical learning is needed - more interactive exercises needed for following up / more training	6
	No reply	8
	Total Replies	14

5.3 REMARKS BY THE TRAINER

It is the opinion of the trainers that the interaction showed by participants was effective and efficient; there was also cooperation and good team spirit.

What made the event catch the attention of participants was certainly the combination with the activities that some departments have going on and that are of great interest to the Asyut Water Company.





It is also the opinion of the trainers that some of the achievements of the project – in particular, the way of creating DMAs by introducing pipe by-passes to limit the number of bulk flowmeters – caught the audience's attention and led to their request for further information.

What worked well during the event was the presentation of theoretical aspects combined with practical ones closely related to the problems faced by the participants during their daily work activities (this is certainly true for the staff of the Engineering and Measurement departments).

It is the opinion of the trainers that some presented topics, of great importance, such as data collection and data harmonisation between GIS DB and HM data were not fully grasped by the participants. It is not easy to explain this impression; usually, this is because data collection is almost always considered non-essential and very often costly and time-consuming compared to other parts of the process of creating a hydraulic model.

The calculation of a Water Balance through the use of the IWA standard can certainly be part of a later stage, together with the practical implementation of some of the project results of the DMA design.

6 ANALYSIS OF THE TRAINING COURSE RESULTS (QUIZ RESULTS)

At the beginning of the training, participants were presented with a training assessment questionnaire to assess their level of knowledge on the topics covered during the training.

Thirteen participants responded to the questionnaire, demonstrating a good understanding of the topics and a clear idea of approaches to improve the situation.

The proposed questionnaire and scanned copies of the forms with answers can be found in Annex 8.3.

In the opinion of the trainers, the response of the audience to the subjects presented was sincerely positive. During the training there was cooperation, and the level of attention was always high. In the preliminary phases of the training, the audience generally showed a good level of preparedness for the subjects, and this was confirmed by questions and comments particularly when DMA design and waster balance subjects were covered.

7 CONCLUSIONS AND OVERALL ASSESSMENT

A three-day training concluded the project "Strengthen the Water Utilities Capacities to Manage/Reduce NRW and Detect Leakage"; the training participants showed interest in the topics presented and indicated a willingness to obtain more information on some of the aspects introduced, with special regard to the design and implementation of DMA. This provides overall positive feedback on the effectiveness of this training and supports the idea of developing a second stage of the training focused on this topic and the development of DMA water balances.





8 ANNEXES

8.1 AGENDA





8.2 LIST OF PARTICIPANTS





8.3 QUIZ FORMS







