This Project is funded
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Water and Environment Support
in the ENI Southern Neighbourhood region

RW-4-REG - Regional Training on Water Harvesting including through retention & aquifer recharge with storm water

Training report

Version	*Document Title*	*Author*	*Review and Clearance*
v.0.6	*RW-4-REG training report*	*Demetris Zarris* *George Papanikolaou*	*Suzan TAHA*

WATER AND ENVIRONMENT 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 activity funded by the European Neighbourhood Instrument (ENI South). WES aims to protect the natural resources in the Mediterranean and to improve the management of scarce water resources in the region. WES mainly aims to solve the problems linked to the 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 capacity 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 neighboring countries in the Southern Neighborhood region.

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ABBREVIATIONS

CIS	Common Implementation Strategy for the European Water Framework Directive
EEA	European Environment Agency
ENI	European Neighbourhood Instrument
ENP	European Neighbourhood Policy
EU	European Union
GW	Ground Water
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
NKE	Non-Key Expert
NWRM	Natural Water Retention Measures
P2P	Peer-to-Peer
PCs	Partner Countries
SDG	Sustainable Development Goals
SW	Surface Water
UN	United Nations
UfM	Union for the Mediterranean
WFD	Water Framework Directive
WH	Water Harvesting
WIS	Water Information System

1 GENERAL INTRODUCTION

As part of the Water and Environment Support (WES) project workplan for the second year (2020-2021) related to the Regional Activities on Non-Conventional water Resources (NCWR), a 5 day regional, on-line, training focusing on "**Water harvesting including through retention & aquifer recharge with storm water**" (Activity no. RW-4-REG) was organised during October 2021. The regional training targeted participants/ representatives from the Partner Countries (PCs) in addition to the peers that were nominated by the PCs to participate in the Peer-to-Peer (P2P) exchange addressing the same topic (Activity no. RW-4-P2P) which was launched on 12 July 2021. **Due to COVID19 pandemic, the training was organised on-line** and was carried out along different sessions of a total of 15 hours, that were held twice weekly during October 2021, for 2 weeks.

The activity is in line with the Common Implementation Strategy of the WFD that encourages the use of green and blues infrastructure and the so called Water Harvesting (WH) and Natural Water Retention Measures (NWRMs) in different parts of the hydrologic circle.

Water managers, spatial and urban land use planning bodies, nature protection organisations, agriculture professionals and forest managers, public authorities and stakeholders show an increasing interest in NWRM. Their interest within the EU countries lies with the multiple benefits NWRM can potentially deliver, and their capacity to contribute simultaneously to the achievement of the objectives of different European Union (EU) policies, including *inter alia*:

1. The Water Framework Directive (WFD).
2. The Floods Directive (FD).
3. The EU Biodiversity Strategy.
4. The EU Action on Water Scarcity and Drought.
5. The EU Climate Change Adaptation Strategy.
6. The Marine Strategy Framework Directive (MSFD).
7. The Soil Thematic Strategy.
8. The Common Agricultural Policy (CAP).

2 OBJECTIVES

The **purpose of the specific regional training RW-4-REG** was to introduce the concept of Water Harvesting **(WH)** and Natural Water Retention Measures **(NWRMs)** as an alternative and efficient tool to minimize flood risk and increase the potential for water storage whether on the surface or in the aquifer. The concept is to use clever and small-scale interventions with natural materials minimizing the use of concrete that emulate the physical processes of the hydrologic cycle like infiltration, storage in the vadose zone, and storage in natural depressions. Recent developments on the WH and NWRMs research are proposing an ensemble of **interventions both in urban and natural environments**. Urban environments are mostly crucial since the potential for developing flood producing conditions is almost at the maximum rate. Urban runoff is significant for another crucial reason; urban runoff is almost free of natural sediments and, due to the high kinetic energy from the sewer networks, are acquiring high

potential to erode natural streams downstream of the disposal site. The combination of these two elements: (a) high peak flow rates and (b) high erosional potential are considered key factors contributing to the degradation of natural environments, depletion of groundwater reserves and decrease of the crop productivity.

This training zoomed further into management of irrigation demands through the use of nonconventional water as a means to mitigate climate change and increased demands for food production. Special focus was made on the application of rainwater and floodwater harvesting in irrigation as cheap and reliable source of water suitable to enhance irrigation in arid environments and improve crop production reliability. It introduced the participants to the WH categories and the wide range of available techniques and storage options (surface water retention and detention systems and groundwater recharge, soil moisture storage) as valuable means for the enhancement of water resources availability including water for nature and ecosystems. The selection of suitable sites and techniques were also addressed during the training including their applicability and viability. The training also demonstrated the importance of the awareness at all levels for supportive, enabling policies and extension/technical support in developing different rain/flood water harvesting systems for crop production.

3 EXPECTED RESULTS OF ACTIVITY

Throughout the training event, **participants had the opportunity to:**

- Get introduced to the overall concept of water harvesting and natural water retention and detention measures (hydrologic, environmental and economic components) and their various approaches.
- Learn about the benefits of WH and the use of NWRMs (e.g. assessment, planning, policy decision).
- Get familiar with the computational procedures needed to plan, design and assess the performance of WH and NWRMs.
- Get introduced to the design of WH and NWRMs as described by the EU through its Working Team for the Common Implementation Strategy (CIS) of the WFD.
- Review data needs and requirements for the design and implementation of WH and NWRMs both in urban and natural environments and its links mostly with irrigation and agriculture.
- Explore the real use of WH and NWRMs through countries' case studies (preferably from the MENA region).
- Implement rapid WH and NWRMs exercises and practical problems.
- Discuss real situations in their own countries where WH and NWRMs can be implemented.

4 ELEMENTS OF THE WORKSHOP IMPLEMENTATION

The online regional training was organised over 5 days (ranging from 10:00-14:00 CET) as shown in Table 3-1. **It included 5 main presentation modules** with plenary group sessions involving also activities to engage the participation of trainees into exchange of national experiences as well as deeper understanding of the NWRMs concept. **Interactive quizzes and mentimeter questions were**

also conducted during the plenary sessions to stimulate more active participation. The training included a total of 15 sessions.

TABLE 4-1: OVERALL TRAINING PROGRAMME

Day Date/Time[1]	Title	Session No.	Presentation	Presenters
Day 1 Thursday 7 October 2021 11:00-14:30	Introduction to Water Harvesting and Natural Water Retention Measures – Basic Concepts of Hydrology and Storm water Management in Semi - Arid Countries	S1.1	• Basic concepts of WH and NWRMs • Basic concepts of Hydrology and Water Resources Engineering. • Computer tools for NWRMs modelling and assessment.	Dr. Demetris ZARRIS
		S1.2	Case Study: The Karla Lake Rehabilitation Project, Thessaly Region, Western Greece – A Success Story	
		Practical Session S1.3	Tools and methodologies for NWRM design and environmental impacts	Dr. Demetris ZARRIS, Mrs Eleni AVRAMIDI
Day 2 Monday 11, October 2021 11:00-14:30	Water reuse using distributed technologies in arid countries coupled with groundwater recharge	S2.1	• Novel technologies for water reclaim. • Sewer mining techniques. • Groundwater Recharge • Institutional aspects of water reuse.	Prof. Christos MAKROPOULOS Dr. Demetris ZARRIS
		S2.2	Case study presentation on water harvesting for groundwater recharge in Azraq basin - The Inter-Islamic Network on Water Resources Development (INWRDAM)	Dr Marwan RAGGAD
		Practical Session S2.3	Developing basic skills on artificial groundwater recharge and water reuse technologies	Prof. Christos MAKROPOULOS Dr. Demetris ZARRIS
Day 3 Thursday 14, October 2021 11:00-14:30	Land Use Management to Minimize Flooding and Soil Erosion in Semi-Arid Climatic Zones	S3.1	• Land Use Management • Prevention of Erosion and Desertification. • Sustainable practices in land use management. • Institutional aspects and economic viability of land use management. • Computer modelling of land use management.	Dr. Panos PANAGOS Dr. Demetris ZARRIS

[1] Athens' time (CEST+1)

Day Date/Time[1]	Title	Session No.	Presentation	Presenters
		S3.2	NWRM in natural/rural areas - Case study from Algeria	Aicha GAYA , Head of Agricultural hydraulics office, National Institute for Equipment Improvement (INPE), Algeria /Demetris Zarris
		Practical Session S3.3	Tools and methodologies for land use planning and management.	Dr. Panos PANAGOS Demetris ZARRIS Ms Eleni AVRAMIDI
Day 4 Monday 18, October 2021 11:00-14:30	Water harvesting in urban areas associated with flood management procedures with emphasis in semi-arid climatic zones	S4.1	• Using Green & Blue technologies in urban areas. • Water Harvesting and NWRMs in urban areas. • Environmental aspects of green & blue technologies. • Basic computer tools for urban hydrology. • Case studies.	Dr. Dimitra THEOCHARI Demetris ZARRIS
		S4.2	NWRM in urban areas - Case study from Israel	Michael Rona, Lior NETZER, Senior Coordinator Risk Assessments of Ground Water Pollution, Israel Water Authority (IWA) Lior NETZER, Head of Hydrogeology of Coastal Aquifer Branch, IWA.
		Practical Session S4.3	Concept planning of NWRMs in urban areas.	Dr. Dimitra THEOCHARI Dr. Demetris ZARRIS
Day 5 Thursday 21, October 2021 11:00-14:30	Water harvesting and irrigation management in sustainable agriculture	S5.1	• NWRMs in agriculture - A quick review • WH for irrigation - Categories • Technical, economic and Legal elements on deciding WH method for irrigation • Irrigation projects: Design and Reality – Comparing Figures • Irrigation Water Demands – Key parameters	Dr. George PAPANIKOLAOU
		S5.2	Water Harvesting in Irrigation - Case study from Morocco	M. Rachid RAJEL, Head of the Rainwater Collection Service, Water Research and Planning Directorate / General Directorate of Water, Morocco
		Practical Session S5.3	Calculating Water Demands in Irrigation Projects	Dr. George Papanikolaou Dr. Demetris ZARRIS

Table 3-2 below lists the number of the different types/elements of the training

TABLE 4-2: TYPE OF ACTIVITIES

No. of presentations on examples/case studies (sharing of experiences, good practices, etc.)	5	Greece, Jordan, Israel, Morocco, Algeria
No. of international speakers from the Region	4	Jordan, Israel, Morocco, Algeria
No. of international speakers from the EU	5	Greece, EU
No. of training-oriented presentations (on concepts, methodologies, etc.)	5	5 modules
No. of interactive/participatory activities (open discussions, brainstorming sessions)	5	5 plenary meetings by session

Following up the transformation of the physical meeting into web-based, a cloud service access was provided to the trainees to ease the sharing of all the materials as below:

- Background and supportive documents – see list in Annex
- All presentations in PDF format
- Documents used for the exercises during the plenary sessions

Relevant spreadsheets have been prepared for the exercises by the trainers to ease the whole process and help apply the knowledge gained.

The key points of the training sessions are presented below:

4.1 DAY 1

Module 1 – Session 1.1 Introduction to Water Harvesting and Natural Water Retention Measures – Basic Concepts of Hydrology and Stormwater Management in Semi - Arid Countries
Key points: • Basic concepts of WH and NWRMs • Basic concepts of Hydrology and Water Resources Engineering. • Computer tools for NWRMs modelling and assessment.

Module 2 –Presentation of a Case Study “The Karla Lake Rehabilitation Project, Thessaly Region, Western Greece – A Success Story”
Key points: • Key aspects of water harvesting in a bigger scale. • Environmental restoration of a drained lake.

Module 3 – Exercise and On-Line Training
Key points: • Tools and methodologies for NWRM design and environmental impacts. • Excel files for determining the volume water retained in a raingarden, the efficiency of water harvesting in private houses and the increase of concentration time by increasing vegetation roughness in the area.

4.2 DAY 2

Module 2 – Session 2.1: Water re-use using distributed technologies in arid countries coupled with groundwater recharge
Key points: • The main pressures resulting in water scarcity • How can we address water scarcity? • Sewer Mining (SM) technology. • Subsurface Water Solutions (SWS) • Detailed descriptions of the new technologies • Examples

Module 2 – Session 2.1 – Plenary session – Discussion 1
• Monitoring, Data and Analytics. • Remote/distributed systems mean remote monitoring and control (by a dedicated team back in HQ) • Stochastic Simulation of non - Gaussian correlated random variables, stochastic processes and random fields. • Enhancing the availability of high - resolution data.

Module 2 – Case study: Water harvesting for groundwater recharge: The case of Azraq basin in Jordan
Key points: • Applying nature based solutions through the Managed Aquifer Recharge approach to mitigate the drought impacts on the natural water resources of Azraq Basin/Jordan • To center Azraq residents as the primary beneficiaries of an intervention, ensuring that their livelihoods, needs and talents are targeted in a solution.

- To revitalize the natural ecosystem of the Azraq basin so that the mudflat and oasis are sustainably maintained, and such that the solution complements the environment, not degrades it further.
- To design an intervention that can be financially independent of external funding while acting as strong, stable anchor for Azraq's economy.

4.3 DAY 3

Module 3 – Session 3.1: Land Use Management to Minimize Flooding and Soil Erosion in Semi-Arid Climatic Zones
Key points: • Land use management –Land Degradation Modelling and mapping soil properties. • The EU thematic strategy for Soil Protection (COM 2006. 231). • Soil Loss by water erosion. • Crop distribution –Management practices. • A set of Cover-Management & Supporting Practices to reduce erosion. • Desertification trends in the Maghreb. • Best management Practices.

Module 3 – Case study: NWRMs in natural/rural areas: A case study from Algeria
Key points: • Développer et vulgariser l'utilisation des méthodes et systèmes de récupération des eaux pluviales dans les petites exploitations agricoles à travers la formation des acteurs du secteur de l'eau. • Presentation de la parcelle de demonstration. • Principe de fonctionnement • Composantes du système. • Conclusions

4.4 DAY 4

Module 4 – Session 4.1: Water harvesting in urban areas associated with flood management procedures with emphasis in semi-arid climatic zones
Key points: • Urban Water Harvesting - Blue Green Infrastructure • Urban Water Harvesting - Copenhagen Cloudburst Masterplan

- Urban Water Harvesting - Zollhallen Platz, Freiburg
- Urban Water Harvesting - Tanner Springs Park, Portland
- Urban Water Harvesting & Nutrient Capture
- Urban Water Harvesting & Closing water, energy and nutrient cycles

Module 4 – Session 4.2: Urban Rainwater Harvesting Workshop Questions
Key points: • How does the scale of the site influence the boundaries and possibilities of a rainwater harvesting project? • How does the nature of the project as more urban or more rural influence the decisions for rainwater harvesting solutions? • Please give 1-3 examples from your cities and town and discuss about potential plaza areas, parks, urban developments or river corridors that you could use these ideas and solutions for. • Please choose one of the previous examples and discuss how the area could be combined to accommodate other natural elements, water cleansing methods, water irrigation in dry months and/or other ecosystem services.

Module 4 – Case study: NWRM in urban areas: Case study from Israel
Key points: • Set a Regulatory Framework for Urban Planning • Optimal water storage as ground water, wherever infiltration/recharge is feasible, it should be the main measure. • NWRM measures addressed and approved by relevant authority at each level. • Cost benefit analysis, applied for different case studies. • Mobilizing financial resources: Generally, NWRM proves to be economical compared to traditional storm water drainage

4.5 DAY 5

Module 5 – Session 5.1: Water harvesting and irrigation management in sustainable agriculture
Key points: • Prioritizing irrigation water pricing and costing. • Systematizing well known agricultural practices (Natural Water Retention Measures). • Strengthening the legislative background framework for water reuse (EU Regulation 2020/741).

- Rain-fed agriculture is the farming system relying on rainfall and in need for "small – scale" interventions for water.
- Water Harvesting and Natural Water Retention Measures in Agriculture.
- Irrigation Water Demands - Important aspects and key parameters.

Module 4 – Session 4.2: Key parameters when calculating irrigation demands
Key points: • Crop Type and Crop Water Needs. • The Correct Use of the Cropwat8. • The Procedure of Estimating Irrigation Demands • Quantitative pressures and water dependent sectors • Integration frameworks – NEXUS approach • Indicative policy questions and decoupling of economic output linked with resource use.

Module 5 – Case study: Water Harvesting in Irrigation - Case study from Morocco
Key points: • Les khettara. • Les micro-bassins : demi-lunes et cuvettes • Demi-lunes. • Collecte de l'eau de toiture. • Citernes couvertes (matfia) • Expériences du Département des Eaux et Forêts (DEF)

5 PROFILE OF THE PARTICIPANTS

5.1 REGISTRATION PROCESS

WES countries' focal points were asked to nominate up to 7 candidates including 4 peers with the following profile:

- Experience in hydrology, water resources engineering, water resources management, geology or soil science,
- Representing, as much as possible, different stakeholders: Ministries of Water, Irrigation Authorities, River Basins Authorities, Land Management, Geological Survey Agencies, Water Utilities, Municipalities and NGOs

- Involvement in the selection, design and implementation of NWRM as part of plans and programmes addressing water, floods, biodiversity, climate change adaptation, forestry, and agriculture or urban issues.
- Computer literacy (in particular MS-Excel file)
- Familiarity with national and local water policies
- Fluency in English or French with adequate English reading skills[2]

A CV and a letter of motivation were provided by each candidate and were assessed with the following criteria:

- Relevance: In order to reap the intended benefit from the training, the PCs participants/ representatives have to be directly involved in the topics of the training, and be able to demonstrate a direct professional relationship or function in this area
- Knowledge: An adequate scientific/ technical background on water resources management, including experience on water policy analysis and indicator-based assessment
- Potential: Expected years ahead of the candidate/trainee in relevant position(s) and opportunities to apply and impact others/ further disseminate the knowledge/information/expertise gained
- Motivation: Evidence of motivation and willingness to improve the situation through implementing new and innovative ideas
- Communication: Expressed willingness to share/transfer the knowledge/expertise gained
- Language: strong ability to follow the activities in English or French, Fluency in English, or in French, but with good understanding of written English
- Previous participation in other similar activities and evidence of their impact
- Direct involvement (or keen interest) demonstrated in any of the WES priority areas (e.g. information about the scope of the specific activity undertaken or in the pipeline, etc.)
- Willingness to actively cooperate with WES: Time availability, willingness to provide information during and after the completion of the project, and to take initiatives for the mainstreaming and implementation of the knowledge he/she had acquired, etc.

5.2 OVERVIEW OF PARTICIPANTS' PROFILE

A total 67 persons participated in the training:

- 20 trainees nominated by WES focal points
- 29 trainees as Peers.
- 4 trainees registered via EU delegations or civil society (NGOs)
- 11 WES staff (trainers, experts and support staff –interpreters, technicians)
- 3 invited speakers, 4 spekaers from MENA countries for exchanging pracices and experiences.

In total 50 trainees participated in the web-training.

[2] Understanding written English will be necessary as most of existing background material are in English

FIGURE 5-1: REPRESENTATION OF TRAINEES PER COUNTRY

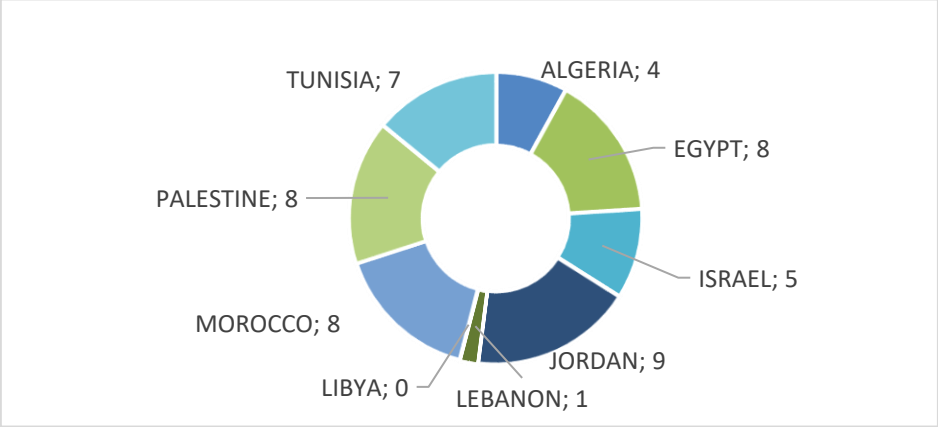
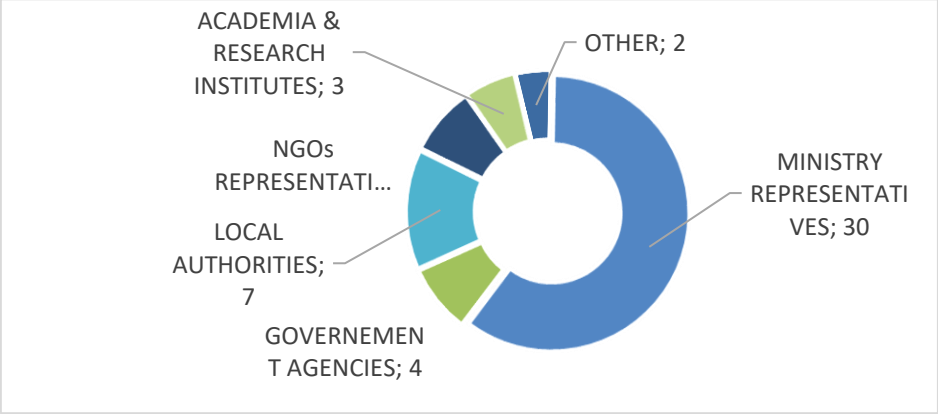


FIGURE 5-2: REPRESENTATION OF TRAINEES PER TYPE OF INSTITUTION



6 STATISTICS GENDER AND YOUTH

FIGURE 6-1: GENDER (ALL PARTICIPANTS)

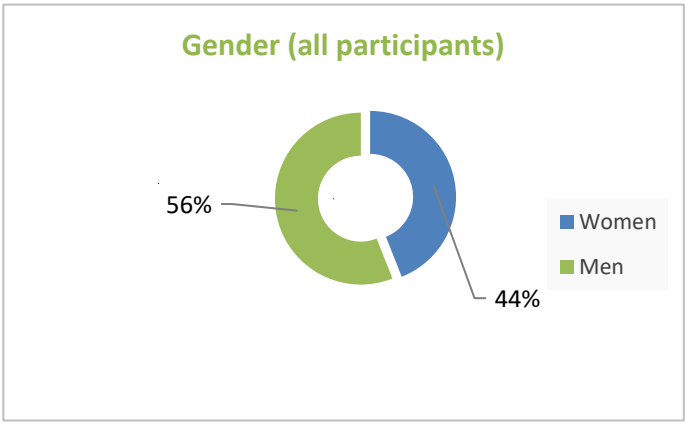


FIGURE 6-2: GENDER (TRAINEES AND OBSERVERS)

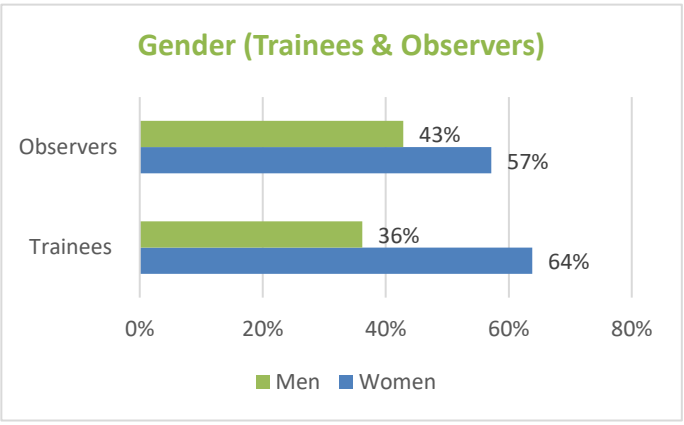


FIGURE 6-3: GENDER (EXPERTS/TRAINERS/WES TEAM))

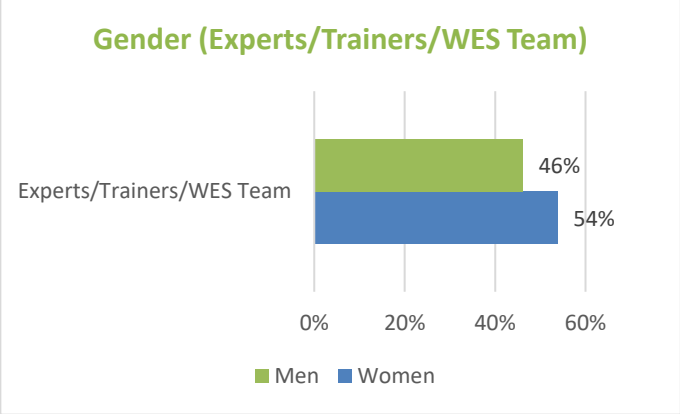


FIGURE 6-4: TRAINEES - AGE

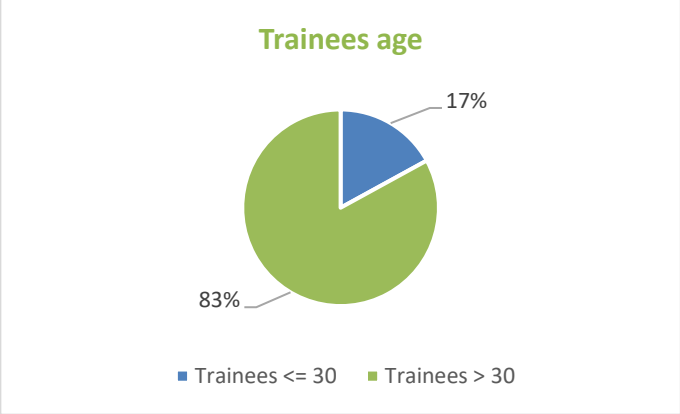


FIGURE 6-5: FEMALE TRAINEES - AGE

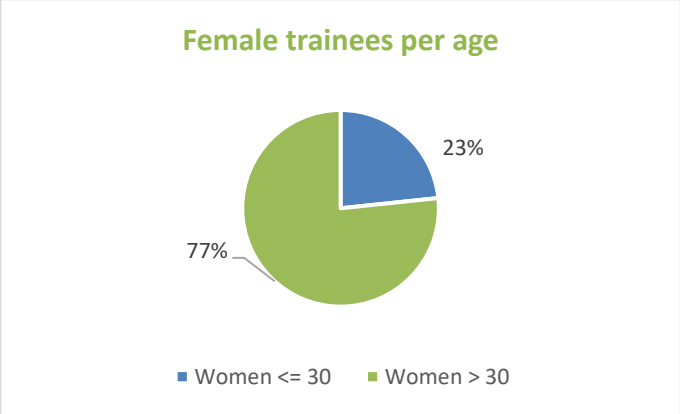


FIGURE 6-6: YOUNG TRAINEES (18-30) - GENDER

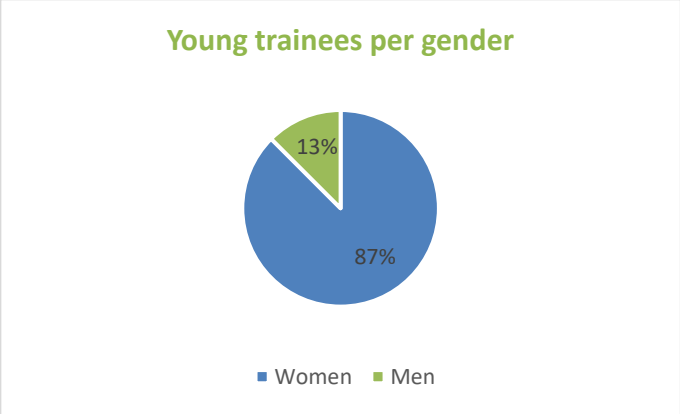
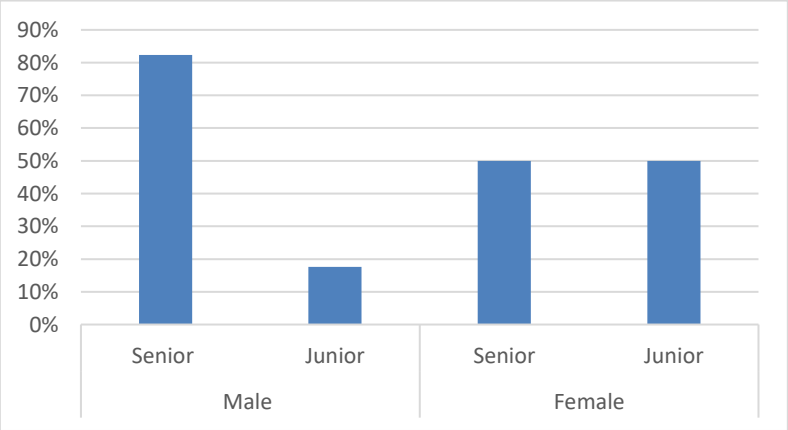


FIGURE 6-7: GENDER - POSITION LEVEL



7 EVALUATION OF THE EVENT

Two categories of indicators have been used to evaluate the workshop: i) evaluation indicators, reflecting the quality of the workshop logistics/ organisational aspects (see section 5.1 below) and the assessment of the technical quality of the workshop (See section 5.2 below), as perceived by the participants, ii) impact indicators, reflecting the direct impact of the workshop (see Chapter 6).

7.1 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". The indicators and associated ratings are presented in Tables 5-1, 5-2 and 6-2 respectively.

TABLE 7-1: ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT

A. ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT		EXCELLENT	GOOD	AVERAGE	POOR	Total Replies	Average Score (max = 4)
A1	Appropriate handling of invitations, information sharing and smoothing obstacles	5	5	3	0	**13**	3.15
A2	Efficient logistics: location of venue and interpretation	3	8	2	1	**14**	2.93
A3	Provision of support (if requested) for participants' preparation for the event	5	7	1	1	**14**	3.14
A4	Efficient and effective follow-up of preparations and progress towards the event	4	8	2	0	**14**	3.14
A5	Planning for the event: selection and design of methodology, programme/daily agenda and work rules	3	9	1	1	**14**	3.00
A6	Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns	5	8	1	0	**14**	3.29
A7	Presentations correspond and contribute to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics	5	6	3	0	**14**	3.14
A8	Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs	2	8	4	0	**14**	2.86
A9	Usefulness of the distributed material	2	6	0	1	**9**	3.00
A10	Efficiency and effectiveness of the facilitation	4	10	0	0	**14**	3.29
A11	Overall rating of the event	4	7	3	0	**14**	3.07

The following figures illustrate in a graphical way the responses on questions A5 to A10.

FIGURE 7-1: PLANNING FOR THE EVENT (A.5)

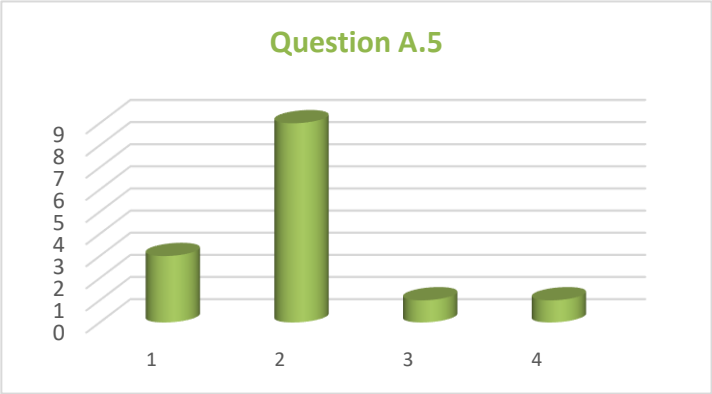


FIGURE 7-2: FLOW OF PROGRAMME, HANDLING OF EMERGING NEEDS (A.6)

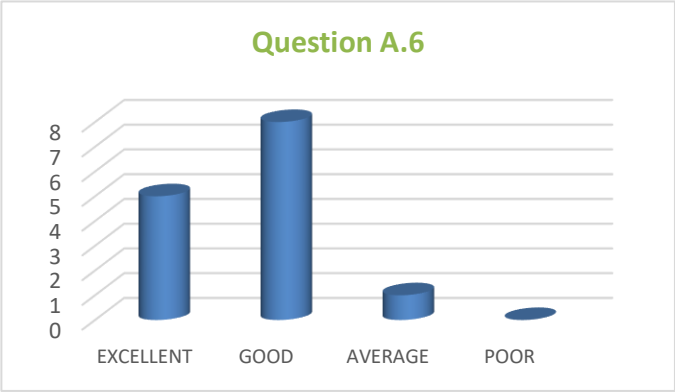


FIGURE 7-3: EVALUTION OF PRESENTATIONS (A.7)

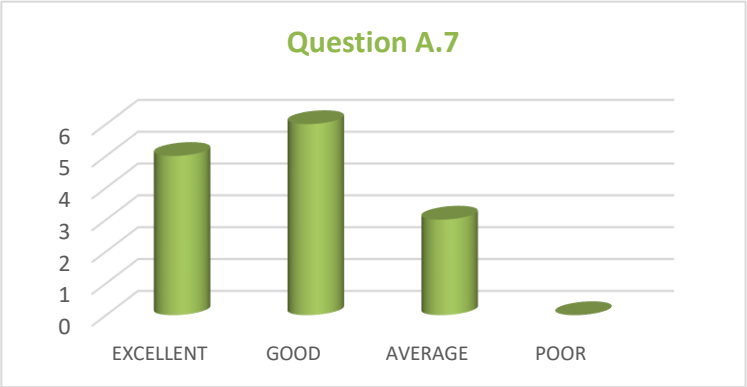


FIGURE 7-4: CLARITY, COVERAGE AND SUFFICIENCY OF CONCEPTS, OBJECTIVES, ANTICIPATED OUTPUTS (A.8)

FIGURE 7-5: USEFULNESS OF THE DISTRIBUTED MATERIAL (A.9)

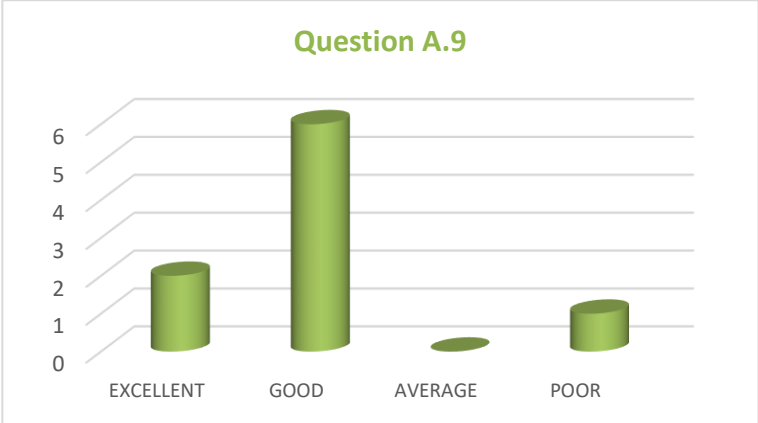


FIGURE 7-6: EFFICIENCY AND EFFECTIVENESS OF THE FACILITATION (A.10)

7.2 FEEDBACK ON TECHNICAL ASPECTS BY PARTICIPANTS

The figures below present the trainees' feedback on questions B1 to B3, of the questionnaire related to the technical aspects of the training (see table below).

B.1. 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 ☐ Some topics covered are not necessary ☐ Some additional topics should be included
B.2. Level of difficulty (tick one of the following): ☐ Difficult ☐ Adequate ☐ Elementary
B.3. Length of the training In your view the workshop duration (tick one of the following): ☐ Longer than needed ☐ Sufficient ☐ Shorter than required

Figures 5-7 to 5-9 present a visual result of the feedback obtained on the above questions

FIGURE 7-7: FEEDBACK ON WORKSHOP COVERAGE

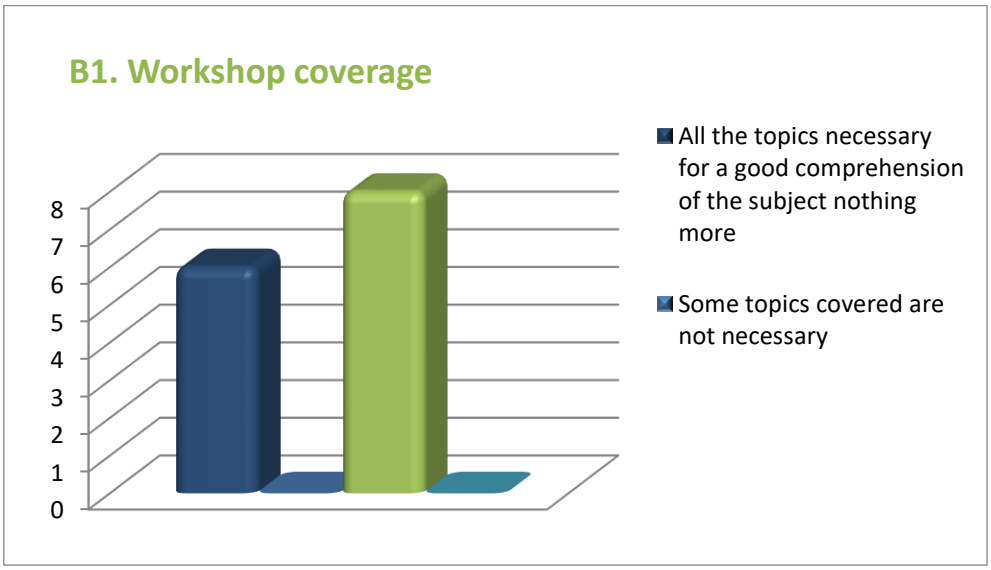


FIGURE 7-8: FEEDBACK ON WORKSHOP DIFFICULTY

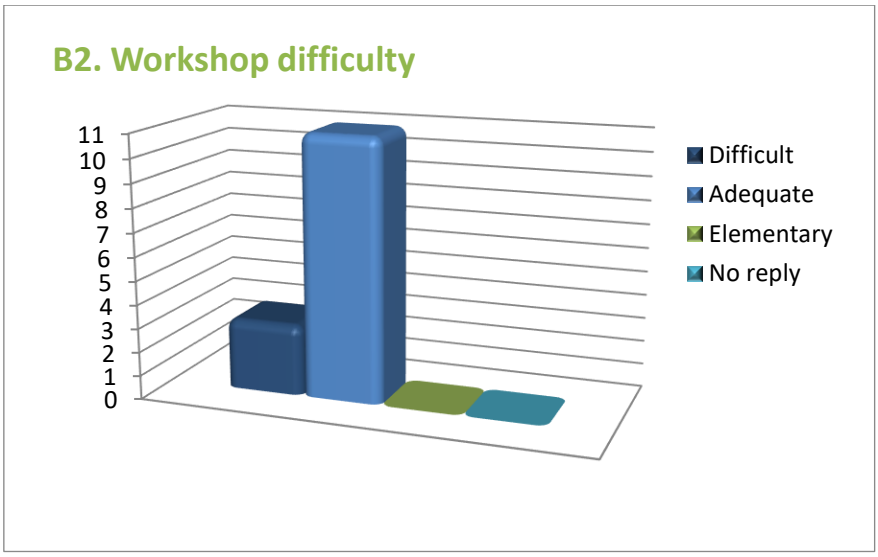
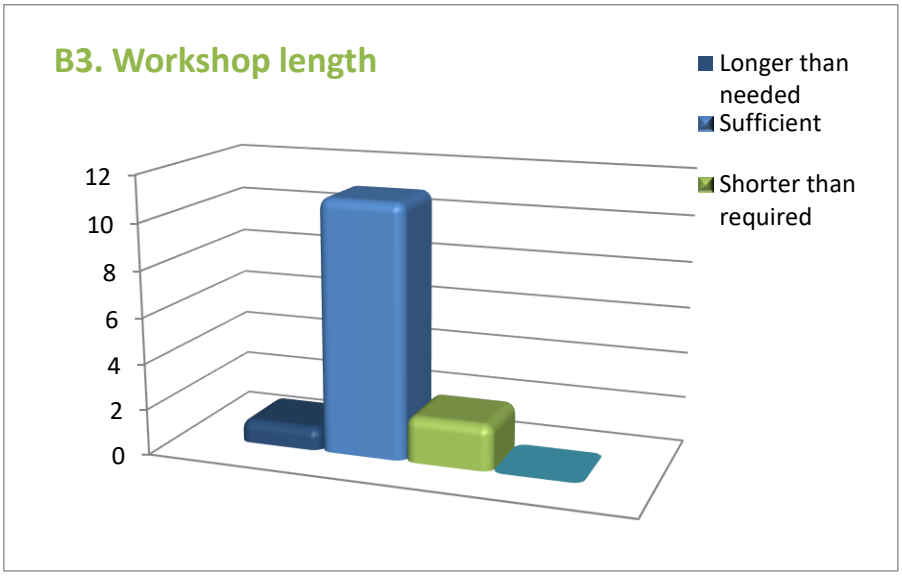


FIGURE 7-9: WORKSHOP LENGTH



Additional remarks made by the participants related to questions B4-B8 are summarized in table 5-2.

TABLE 7-2 : ADDITIONAL FEEDBACK BY PARTICIPANTS

Summary of most frequent statements made by the participants	
B4	**What is the most valuable thing you learned during the workshop (knowledge or skills)?**
	• Analyze in a holistic way and think of unconventional solutions. • Discovery of new methods of storage and recovery of rainwater. • Water harvesting in urban areas. • The discussion about the use of (big) data and the ways to interpret the data • Sharing of country experiences in the field of rainwater harvesting with different objectives (salinity, flooding and irrigation) . • Rainwater collection in Algeria, urban water recovery. • Different uses of the same NWRMs in different experiences / countries. • We must think of working with simple and efficient and low cost systems / the follow-up analysis and treatment for the reuse of the storm water is a necessity. • Analyze in a comprehensive way and think of unconventional solutions.
B5	**How do you think that the current event will assist you in your future work on the subject?**
	• Using natural water retention measures in flood mitigation. – • The workshop fully helps me in my work of monitoring operations and artificial recharge techniques. - it adds new designs that can be applied in my country. • Since I work in the field, it helps me to be more professional. • Acquire new ideas and approaches to use different rainwater harvesting techniques. – • It is a strengthening of my capacities in terms of choice of recharging sites and the evaluation of recharging. • I learned more about NWRMs and their use in our project on promoting sustainable water and land use practices. • Through the examples and case studies you have exposed. • Using the best ways to conserve natural waters to mitigate floods, as well as choosing the best recharge sites. • Gain new ideas and methods for using different rainwater harvesting techniques.
B6	**Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?**
	• Pass on the case studies to colleagues. • By presenting the main related topics of event to my colleagues through discussion groups with interested ones. • I will suggest my ideas supported by participating in this workshop event and discuss if needed. • I will do my current tasks better, I added knowledge about the rural NWRM features.

Summary of most frequent statements made by the participants	
	• Through teamwork I can transfer the acquired experience to my colleagues. • As part of our project, we support associations and representatives of civil society in the promotion of its ways. • We were not able to discuss and see closely with the experts, we would have liked it to be face-to-face and that there are field visits. But we can provide our support and especially improvements and rectifications on the projects we are working on. now and in the future. • Study new technologies to see if they can be adopted in the country.
B7	**What did you like most about this event?**
	• The examples presented. • The diversity of topics. • Rainwater storage techniques in urban areas and their valuation. • Participants' discussions and case studies. • The discussion about the use of (big) data and the ways to interpret the data. • Discussion between participants and experts and sharing of experiences between countries. • The smooth running of the event and the efforts made by the team. • The quality of the presentations and contents of the speakers and their qualification. • The experts managed to report the work done in the field and bring us as close as possible to the field. • Diversity of topics. Discussion between participants and experts and exchange of experiences between countries. Speakers' ability and qualifications.
B8	**What needs to be improved?**
	• Send exercises and presentations in advance. • It would be better if it's 2 hours for each meeting. • The topics covered are very important, it is possible to develop them in more detail - each topic separately. • Give more time and if applicable could be organized physically instead of online (virtually). – • The excercises and the excel files. The presentation should be available at the site right after the relevant session. • Share presentations schedule before training time so that we can participate and ask questions. • Require trainees to speak the same language. • Educational materials. • Being a civil servant, the time of the training (9 am in Morocco) represented a real obstacle to follow it in full. • The translation of documents to be able to sustain the work and consult it if necessary. • Scientific material and recordings broadcast during the event. Field visits to learn more about such projects and exchange experiences with the participants.

7.3 REMARKS BY THE TRAINER

A set of 9 criteria; B1-B9 (See table below) are assessed by the trainer(s). Please use either the qualitative descriptions used in Section A or open text, as appropriate.

TABLE 7-3 : REMARKS BY THE TRAINER

B1	**Efficient and effective performance and interaction by participants** Excellent.
B2	**Efficient and effective cooperation and team spirit** Excellent.
B3	**Level of achievement of planned objectives** Average.
B4	**Did the event contribute to helping participants practice skills or gain knowledge related to course concepts?** Yes, participants expressed their satisfaction in the training evaluation. They increased their knowledge on WH and NWRMs and expressed their willingness at least to share the relative concepts with their colleagues.
B5	**What worked well during the event** • Quizes and questions during the training functioned smmothly with Mentimeter and similar tools. • Trainees felt comfortable with the web-training set-up as substitute to physical meeting.
B6	**What didn't work well and why** Training with exel files did not work well since we did not have break-out but just a plenary session. Training with hands-on and excel files seems to be very ambitious in such events.
B7	**What components/concepts did participants seem to understand well** Urban WH and NWRMs were well understood.
B8	**Were there any components/concepts that participants appeared to not understand** • There are still some confusions on the benefits of WH and NWRMs: some participants are underestimating the benefits
B9	**What aspects of the event could be improved and what to be kept?** More time should be dedicated to the breakout sessions in smaller groups (i.e. more groups and therefore more trainers)

8 ANALYSIS OF THE TRAINING COURSE RESULTS (quiz results)

Trainers have prepared a set of multiple-choice questions covering all the aspect of NWRMs; principles, methodologies and economic and social aspects to evaluate the positive effects of the training on the

participants. The following Table (6-1) presents the results of the 9 questions', both before and after the web-training (see questionnaire in Annex 8.3). The quiz in the beginning was answered by **36** participants while after the completion of the training it was answered by **31**.

TABLE 8-1: CHANGES IN AWARENESS AND KNOWLEDGE

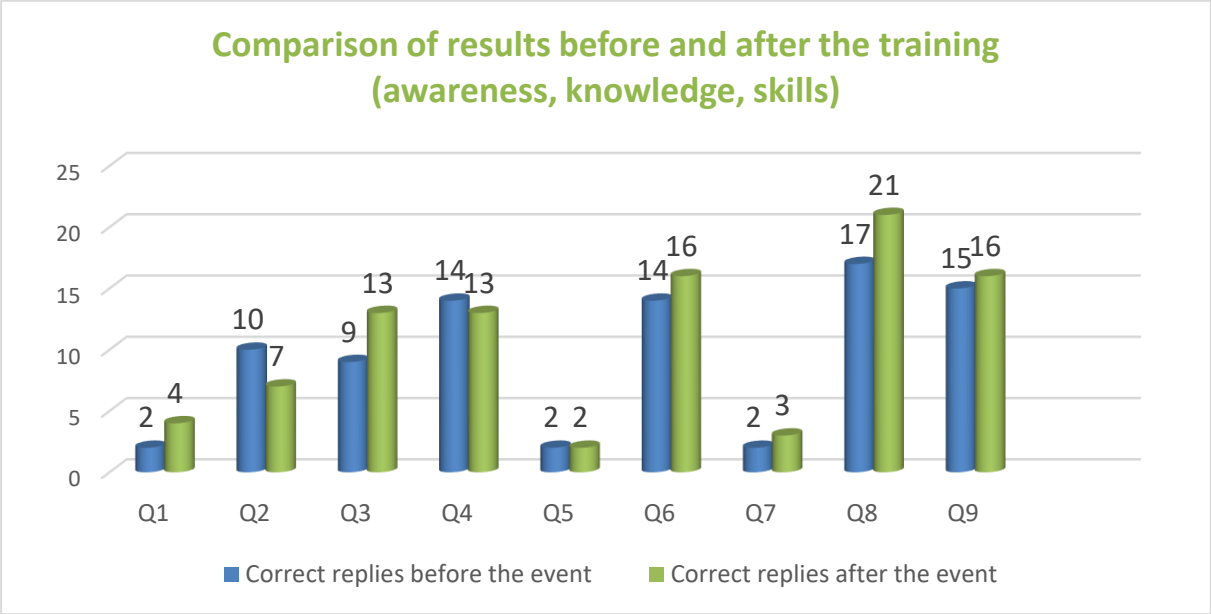
Changes in awareness, knowledge, and skills. New acquired knowledge	Before	After	Before the training		After the training		
No. of completed Q2 (Training Assessment Questionnaire) received by the PC participants	24	23	**Correct replies before the event**	**Correct %**	**Correct replies after the event**	**Correct %**	**Improvement based on right answer**
Question No 1			2	8	4	17	100.0
Question No 2			10	42	7	30	-30.0
Question No 3			9	38	13	57	44.4
Question No 4			14	58	13	57	-7.1
Question No 5			2	8	2	9	0.0
Question No 6			14	58	16	70	14.3
Question No 7			2	8	3	13	50.0
Question No 8			17	71	21	91	23.5
Question No 9			15	63	16	70	6.7

An initial assessment of the results indicates that in 2 questions there has been an improvement, 1 question indicated no change, while in 2 questions there were fewer good results than in the first round of questionnaire. Overall, in the first quiz 39% of the participants answered correct (85 entries) while after the training 46% of them (95 entries).

The appreciation of the progression must be done very carefully due to the uncertainties related to:

- The statement of the questions that some might find them as "tricky".
- There is a part of "subjectivity" in ansewring some of the questions.

FIGURE 8-1: CHANGES IN THE PARTICIPANTS' AWARENESS, KNOWLEDGE AND SKILLS



9 CONCLUSIONS AND OVERALL ASSESSMENT

Objectives

The purpose of the specific Regional Training Activity No. RW-4 to introduce the concept of Water Harvesting (WH) and Natural Water Retention Measures (NWRMs) as an alternative and efficient tool to minimize flood risk and increase the potential for water storage whether on the surface or in the aquifer. This training zoomed further into management of irrigation demands through the use of nonconventional water as a means to mitigate climate change and increased demands for food production. Special focus was made on the application of rainwater and floodwater harvesting in irrigation as cheap and reliable source of water suitable to enhance irrigation in arid environments and improve crop production reliability. It introduced the participants to the WH categories and the wide range of available techniques and storage options (surface water retention and detention systems and groundwater recharge, soil moisture storage) as valuable means for the enhancement of water resources availability including water for nature and ecosystems. The selection of suitable sites and techniques were also addressed during the training including their applicability and viability. The training also demonstrated the importance of the awareness at all levels for supportive, enabling policies and extension/technical support in developing different rain/flood water harvesting systems for crop production.

Set up and preparation

As part of the WES project workplan for the first year (2019-2020) related to the Regional Activities on the "Natural Water Retention Measures", a two-day regional training was planned to be organized in person as all WES Regional Activities. However, due to the COVID-19 pandemic, it was decided to revisit and amend the structure and the organization of the regional training to hold an online one. The training was organized and carried out along different sessions and has been held twice a week

from 07 to 21 October 2021, which necessitated additional preparatory work. The challenges related to holding online trainings, were also offset with the necessary technical support and guidance from WES team, and the prepration and dissemination of relevant supporting background material..

Feedback from the quizzes

The interactive quizzes proved to be very useful during the training in the plenary sessions; as an instrument of instant and individual engagement of the experts from their remote sites, as well as providing the trainers immediate identification of the dynamics regarding expertise and background as well as the level of knowledge and overall understanding. Our feedback from the quizzes can be organized in 3 main groups as follows:

- Group identification: In terms of gender participation the training can be regarded as gender balanced. Moreover, most of the male attendees are senior officers while for the female attendees senior and junior are balanced.

- NWRMs adoption: Almost all attendees agreed that the presentations regarding the NWRMs adoption corresponded and contributed to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics. Moreover the participants found that the overall procedures and presentations were in the direction of clarity, coverage and sufficiency of concepts, objectives, and anticipated outputs.

- Quiz Results: An initial assessment of the results indicates that in 2 questions there has been an improvement, 1 question indicated no change, while in 2 questions there were fewer good results than in the first round of questionnaire. Overall, in the first quiz 39% of the participants answered correct (85 entries) while after the training 46% of them (95 entries).
- Evaluation of the training: More than 75% of the participants considered the training of good level regarding the planning, flow of the program, efficient facilitation, and sufficient presentation of the planned objections with high quality materials. Considering the standard list of 11 evaluation criteria, the training was ranked as excellent with average grade score of 3.07 (max 4).

Overall assessment

The RW-4-REG activity has been conducted under volatile conditions due to the COVID-19 pandemic and international restrictions in action. Despite this fact, it gathered the expected number of participants from the MENA region countries and managed to fulfill its purpose to increase awareness and improve the knowledge of the application of the Natural Water Restention Measures (NWRMs). Now, the participants understand that NWRMs can support integrated water resureces management with the simultaneous merits of increasing water availability and mitigating flood risk.

It provided balanced content from plenary presentations to breakout sessions with focused and easy to follow background material and exercises. The inclusion of the additional module of external speakers from various European Union countries and organizations, as well as from the participating countries of the MENA region, provided the trainees the right perspective on the effort, time and economic resources needed to elaborate NWRMs as well as the principles of ENI on water harvesting in general. This will boost international and transboundary cooperation around water issues and shall provide a good knowledge base towards the sustainable use and protection of water resources.

Although participants are willing to contribute to NWRMs projects in their countries, the main barrier still exists on the issue that NWRMs have no specific application in the region**. Therefore, external support is necessary and should be considered by WES project and the UfM Mediterranean Water Knowledge platform in coordination with pilot projects in the countries.**

Regarding the quantified results of the evaluations, the performance and knowledge of the participants has been improved during the training weeks. Therefore, the training could be regarded as successful.

10 ANNEXES

10.1 AGENDA

Day 1/5 "Introduction to Water Harvesting and Natural Water Retention Measures – Basic Concepts of Hydrology and Stormwater Management in Semi - Arid Countries"

7 October 2021 - From 11:00 to 14:30 pm Athens time (CEST+1)

(Videoconference)

PROGRAMME

10:30-11:00	**Access to the video-conference**
11:00-11:28	**General Introduction**
	- ***Welcome, Rules and Structure of the Meeting (5 min)*** *Ms. Suzan TAHA, Key Water Expert, WES* - ***Overview of the Water and Environment Support (WES) Project (8min)*** *Ms. Suzan TAHA, Key Water Expert, WES* • ***Introducing the Regional Training (5min)*** *Prof. Michael SCOULLOS, Team Leader, WES* • ***Initial knowledge evaluation Quiz (10min)***
11:28-12:23	**Workshop Presentation**
	• **Presentation of the Workshop – Scope and Objectives (10 min)** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • ***Session 1 (30 minutes) - "Introduction to Water Harvesting and Natural Water Retention Measures – Basic Concepts of Hydrology and Stormwater Management"*** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • **Questions and Answers – Short Discussion** (15 min) *Facilitator: Dr. Demetris ZARRIS: Non-Key Expert (NKE1)*
12:23-12:38	**Break**
12:38-13:08	• **Presentation of a Case Study "The Karla Lake Rehabilitation Project, Thessaly Region, Western Greece – A Success Story" (20 min)** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • **Questions and Answers– Short Discussion** (10 min)

	Facilitator: Ms. Suzan TAHA, Key Water Expert, WES
13:08-14:23	**Discussion and Practical Assessment**
	• **Exercise and On-Line Training** (45 min) – Tools and methodologies for NWRM design and environmental impacts. *Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Mrs Eleni Avramidi: Non-Key Expert (NKE3)* *All Participants* • **Discussion of the Exercise: Plenary** (30 min) *Dr. Demetris ZARRIS: Non-Key Expert (NKE1).* *Mrs Eleni Avramidi: Non-Key Expert (NKE3)* *All Participants*
14:23-14:30	**Closure of the Session**

Day 2/5 "Water re-use using distributed technologies in arid countries coupled with groundwater recharge"

11 October 2021 - From 11:00 to 14:00 pm Athens time (CEST+1)

(Video-conference)

PROGRAMME

10:30-11:00	**Access to the video-conference**
11:00-11:02	**General Introduction**
	• ***Welcome to the training session (2 min)*** *Ms. Suzan TAHA, Key Water Expert, WES*
11:02-12:12	**Workshop Presentation**
	• **Presentation of the Workshop – Scope and Objectives (8 min)** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • **Introduction of the Invited Speaker (2 min)** *Dr. Demetris ZARRIS: Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • ***Session 2 (45 minutes) - Water re-use using distributed technologies in arid countries coupled with groundwater recharge*** *Invited Speaker: Prof. Christos Makropoulos, Scholl of Civil Engineering, National Technical University of Athens* • **Questions and Answers – Short Discussion (15 min)** *Dr. Demetris ZARRIS: Non-Key Expert (NKE1) - Dr. George Papanikolaou: Non-Key Expert (NKE2)* *Prof. Christos Makropoulos, Scholl of Civil Engineering, National Technical University of Athens*
12:12-12:30	**Break**
12:30-13:00	• **Water harvesting for groundwater recharge: The case of Azraq basin in Jordan (20 min)** Dr Marwan Raggad, Head of the Inter-Islamic Network on Water Resources Development (INWRDAM) • **Questions and Answers– Short Discussion (10 min)** *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES*
13:00-13:55	**Discussion and Practical Assessment**
	• **Exercise and On-Line Training (40 min)**: Developing basic skills on artificial groundwater recharge and water reuse technologies

	Prof. Christos Makropoulos, Scholl of Civil Engineering, National Technical University of Athens *All Participants* • **Discussion on the Exercise (15 min)** *Facilitator: Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Prof. Christos Makropoulos, Scholl of Civil Engineering, National Technical University of Athens* *All Participants*
13:55-14:00	**CLOSURE OF THE SESSION**

Day 3/5 "Land Use Management to Minimize Flooding and Soil Erosion in Semi-Arid Climatic Zones"

14 October 2021 - From 11:00 to 14:00 pm Athens time (CEST+1)

(Video-conference)

PROGRAMME

10:30-11:00	**Access to the video-conference**
11:00-11:05	**General Introduction**
	• ***Welcome to the training session (2 min)*** *Ms. Suzan TAHA, Key Water Expert, WES*
11:05-12:15	**Workshop Presentation**
	• **Presentation of the Workshop – Scope and Objectives (8 min)** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • **Introduction of the Invited Speaker (2 min)** *Dr. Demetris ZARRIS: Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • ***Session 3 (45 minutes) - Land use management to minimize flooding and soil erosion in conjunction with agricultural management (40min)*** *Invited Speaker: Dr. Panos Panagos, EU Joint Research Centre, European Soil Data Centre, GIS and Database Development* • **Questions and Answers – Short Discussion** (15 min) *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES - Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Dr. Panos Panagos, EU Joint Research Centre, European Soil Data Centre, GIS and Database Development*
12:15-12:30	**Break**
12:30-13:00	• **NWRM in natural/rural areas: A case study from ALgeria (20 min)** Mme Aicha GAYA, Head of Agricultural hydraulics office, National Institute for Equipment Improvement (INPE), Algeria • **Questions and Answers– Short Discussion** (10 min) *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES*
13:00-13:55	**Discussion and Practical Assessment**
	• **Exercise and On-Line Training -** (40 min): Tools and methodologies for land use planning and management

	Dr. Panos Panagos, EU Joint Research Centre, European Soil Data Centre, GIS and Database Development *Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *All Participants* • **Discussion on the Exercise** (15 min) *Facilitator: Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Dr. Panos Panagos, EU Joint Research Centre, European Soil Data Centre, GIS and Database Development* *All Participants*
13:55-14:00	**CLOSURE OF THE SESSION**

Day 4/5 "Water harvesting in urban areas associated with flood management procedures with emphasis in semi-arid climatic zones"

18 October 2021 - From 11:00 to 14:00 pm Athens time (CEST+1)

(Video-conference)

PROGRAMME

10:30-11:00	**Access to the video-conference**
11:00-11:05	**General Introduction**
	• ***Welcome to the training session (5 min)*** *Ms. Suzan TAHA, Key Water Expert, WES*
11:05-12:15	**Workshop Presentation**
	• **Presentation of the Workshop – Scope and Objectives (8 min)** *Dr. Demetris ZARRIS: WES Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • **Introduction of the Invited Speaker (2 min)** *Dr. Demetris ZARRIS: Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • ***Session 4 (45 minutes) - Water harvesting in urban areas associated with flood management procedures with emphasis in semi-arid climatic zones*** *Invited Speaker: Dr.Dimitra Theochari, Landscape Architect* • **Questions and Answers – Short Discussion (15 min)** *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES - Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Dr.Dimitra THEOCHARI, Landscape Architect*
12:15-12:30	**Break**
12:30-13:00	• **NWRM in urban areas: Case study from Israel (20 min)** *Michael RONA, Senior Coordinator Risk Assessments of Ground Water Pollution, Israel Water Authority (IWA)* *Lior NETZER, Head of Hydrogeology of Coastal Aquifer Branch, IWA Israel* • **Questions and Answers– Short Discussion (10 min)** *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES*
13:00-13:55	**Discussion and Practical Assessment**
	• **Exercise and On-Line Training – Tools and Methodologies for Water Harvesting in Urban Areas (40 min):** *Dr Dimitra THEOCHARI, Landscape Architect*

	Dr. Demetris ZARRIS: Non-Key Expert (NKE1) *All Participants* • **Discussion on the Exercise** (15 min) *Facilitator: Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *Dr. Dimitra THEOCHARI, Lansdcape Archtitect.* *All Participants*
13:55-14:00	**CLOSURE OF THE SESSION**

Day 5/5 "Water harvesting and irrigation management in sustainable agriculture"

21, October 2021 - From 11:00 to 14:30 pm Athens time (CEST+1)

(Video-conference)

PROGRAMME

10:30-11:00	**Access to the video-conference**
11:00-11:05	**General Introduction**
	• ***Welcome to the training session (5 min)*** *Ms. Suzan TAHA, Key Water Expert, WES*
11:05-12:20	**Workshop Presentation**
	• **Introduction of the Invited Speaker (3 min)** *Dr. Demetris ZARRIS: Non-Key Expert (NKE1), specialised in Hydrology and Technical Coordinator* • ***Session 5.1. (15 minutes) - Water harvesting and irrigation management in sustainable agriculture*** *Dr. George Papanikolaou –Non-Key Expert (NKE2)* • ***Short quiz(2 minutes)*** • ***Session 5.2. (15 minutes) - Water harvesting and irrigation management in sustainable agriculture*** *Dr. George Papanikolaou –Non-Key Expert (NKE2)* • ***Short quiz(2 minutes)*** • ***Session 5.3. (20 minutes) - Water harvesting and irrigation management in sustainable agriculture*** *Dr. George Papanikolaou –Non-Key Expert (NKE2)* • ***Short quiz(3 minutes)*** • **Questions and Answers – Short Discussion** (15 min) *Facilitator: Dr. George Papanikolaou: Non-Key Expert (NKE2)*
12:20-12:30	**Break**
12:30-13:00	• **Water Harvesting in Irrigation - Case study from Morocco) (20 min)** *M. Rachid RAJEL: Head of the Rainwater Collection Service, Water Research and Planning Directorate / General Directorate of Water, Morocco* • **Questions and Answers– Short Discussion** (10 min) *Facilitator: Ms. Suzan TAHA, Key Water Expert, WES*
13:00-14:00	**Discussion and Practical Assessment**
	• **Exercise and On-Line Training -** (45 min):Key parameters when calculating irrigation demands *Dr. George Papanikolaou: Non-Key Expert (NKE2)*

	Dr. Demetris ZARRIS: Non-Key Expert (NKE1) *All Participants*
	• **Discussion of the Exercise** (15 min) *Dr. George Papanikolaou: Non-Key Expert (NKE2)* *Dr. Demetris ZARRIS: Non-Key Expert (NKE1)* *All Participants*
14:00-14:30	**Final knowledge evaluation Quiz (15 mins)** **Training evaluation questionnaire (10 mins)** **CLOSURE OF THE** TRAINING **(5 mins)**

10.2 QUIZ FORMS

Below is the list of questions that formed the training assessment questionnaire, with the correct answers highlighted in yellow:

1. The efficiency (water stored compared to the flood runoff) of Water Harvesting (WH) and Natural Water Retention Measures (NWRMs) is increasing… (1 out of 4 is correct answer)
    a. When rainfall intensities are increasing.
    b. When catchment sizes are decreasing.
    c. It is irrelevant to the rainfall magnitude and/or the associated catchment size.
    d. Nothing of the above.
2. What is the most characteristic element of WH and NWRMs? (1 out of 4 is the correct answer)
    a. WH and NWRMs are generally referring to small-scale interventions to provide sources of water locally.
    b. It is irrelevant to the scale of application. Even a large dam can be categorized as a NWRM.
    c. WH and NWRMs are typical applications of storm drainage with engineering applications.
    d. Nothing of the above.
3. The main benefit of WH and NWRMs during flood conditions is (1 out of 4 is correct answer)
    a. The increase of the storm drainage system capability to discharge flood volumes quickly to the receiving body.
    b. The increase of the amount of water retained in the catchment.
    c. The potential for providing environmental flow in streams and rivers.
    d. Nothing of the above.
4. During dry seasons, actual evapotranspiration of an arid area compared to the potential evapotranspiration is (1 out of 4 is correct answer):
    a. At least equal to the potential evapotranspiration.
    b. Actual evapotranspiration is not dependent on the potential evapotranspiration.
    c. Actual evapotranspiration can be as much as zero but certainly much less than the potential evapotranspiration.
    d. Nothing of the above.
5. The runoff interception capacity of check dams constructed in mountainous streams (1 out of 4 is correct answer)
    a. Is being reduced during heavy rainstorms.
    b. Is the same regardless the rainfall intensity and duration.
    c. Additionally to the rainfall intensity, is also dependant on the slope and flow velocity of the stream at the check dam position.
    d. Nothing of the above
6. The main property of check dams constructed in mountainous/hilly streams is (1 out of 5 is correct answers)
    a. They store water for irrigation purposes.
    b. They reduce the overall longitudinal slope of the stream providing flood peak attenuation and means for infiltration in the riverbed.
    c. They are technically complex structures to be constructed.
    d. The storage area behind check dams will be soon filled completely with sediment and be useless for flood mitigation.
    e. None of the above.

7. Minimization of flood risk and soil erosion in agricultural lands can be achieved by (1 out of 5 is correct answer):
    a. No tillage.
    b. Tillage with the use of heavy machinery.
    c. Tillage perpendicular to the contours.
    d. Removal of all short vegetation under orchards and other tree plantations.
    e. None of the above.
8. WH and NWRMs can also be used for drought mitigation (1 out of 4 is correct answer)
    a. No, because most of the intercepted water is lost to evaporation.
    b. Yes, because most of the water is stored in the unsaturated and saturated zone for subsequent use and smaller losses from evaporation.
    c. No, because the water saving is infinitesimal.
    d. None of the above.
9. WH and NWRMs in urban areas exhibit (1 out of 4 is correct answer)
    a. Little potential for water storage because the construction and maintenance costs are disproportionally expensive that over exceed possible benefits.
    b. Cost – benefit is neutral as the environmental gains (e.g. biodiversity) are marginal.
    c. Significant potential of reducing flood volumes and augment biodiversity and generally are not expensive interventions to construct and maintain.
    d. Nothing of the above.

10.3 LIST OF BACKGROUND MATERIAL PROVIDED

Pre-event material

- Concept notes in English and French
- Lits of participants
- Day by day agenda

General background document

- Arid Green Infrastructure for Water Control and ConservationState of the Science and Research Needsfor Arid/Semi-Arid Regions, U.S. Environmental Protection Agency (EPA) (2016)
- Natural small water retention measures : combining drought mitigation, flood protection, and biodiversity conservation - guidelines. Global Water Partnership Central and Eastern EuropeEditor: Waldemar Mioduszewski & Tomasz OkruszkoISBN: 978-80-972060-2-4 (2015)