



Expert Facility Activity No: EFS-JO-1 Mainstreaming Drought Risk Management, with a focus on proactive measures

Training Report: Technical training on drought monitoring and early warning system in Amman- Zarqa Basin (AZB)

July 2018

Version	Document Title	Author	Review and Clearance
V1	Training Report: Technical training on drought monitoring and early warning system in Amman-Zarqa Basin (AZB)	Demetris Zarris, Drought Hazard NKE	Suzan TAHA



THE SWIM AND H2020 SUPPORT MECHANISM PROJECT (2016-2019)

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

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



Acknowledgements:

Special thanks need to be directed to the Jordanian Ministry of Irrigation and Water (MIW); namely the Focal Point His Excellency Eng. Ali Subah (Secretary General of the Ministry of Water and Irrigation of Jordan), and Eng. Adel Y. Alobeiaat (Acting Director of policies and strategic planning at Ministry of Water and Irrigation) for their personal and institutional support in the organisation of the training. Acknowledgement is also due to Eng. Ali Ghanim from the newly established Drought Monitoring Office.

Disclaimer:

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of the SWIM-H2020 SM Project and do not necessarily reflect the views of the European Union.



TABLE OF CONTENTS

1	GENERAL INTRODUCTION	7
1.1	RATIONALE OF ACTIVITY	7
2	OBJECTIVES OF ACTIVITY	8
3	EXPECTED RESULTS OF ACTIVITY	8
4	PROFILE OF THE PARTICIPANTS	9
5	EVALUATION OF THE EVENT	9
5.1	RESULTS OF THE EVENT	9
6	ANALYSIS OF THE RESULTS OF THE TRAINING COURSE	13
7	CONCLUSIONS & OVERALL ASSEMENT	14
8	ANNEXES	15
8.1	AGENDA.....	15
8.2	LIST OF PARTICIPANTS.....	16



LIST OF TABLES

TABLE 1: NO. OF PARTICIPANTS ATTENDING PER DAY (D) OR GROUP OF DAYS.....	9
TABLE 2: RESULTS OF THE EVALUATION OF THE ORGANIZATION, ADMINISTRATIVE AND PLANNING ISSUES.....	10
TABLE 3: RESULTS OF THE EVALUATION OF THE TECHNICAL ASPECTS OF THE TRAINING	11
TABLE 4: ASSESSMENT BY THE TRAINER	12
TABLE 5: WORKSHOP PARTICIPATION/ DEMOGRAPHICS	13
TABLE 6: EVALUATION OF THE RESULTS OF THE QUIZ:	13
TABLE 7: LEVEL OF ACHIEVEMENT OF TRAINING OBJECTIVES AND OUTCOMES:.....	14



ABBREVIATIONS

D	day
EF	Expert Facility
MWI	Ministry of Water and Irrigation
PET	Potential Evapotranspiration
SPI	Standardized Precipitation Index
RDI	Reconnaissance Drought Index
WEAP	Water Evaluation and Planning
FAO	United Nations' Food and Agriculture Organization
WMO	World Meteorological Organization
NTUA	National Technical University of Athens
WAJ	Water Authority of Jordan
JVA	Jordan Valley Authority



1 GENERAL INTRODUCTION

Within the scope of work of the EU funded SWIM-H2020 SM, the project is undertaking an activity titled: "Mainstreaming Drought Risk Management, with a focus on proactive measures" (Activity no. (EFS-JO-1). The activity aims to support Jordan in enhancing preparedness & response to drought-related natural disasters and boost the resilience in the water sector through a series of interrelated activities that include training of the MWI staff and relevant stakeholders on the application of the "Water Evaluation and Planning" (WEAP) system in drought risk management. In order to achieve that, a training on drought monitoring and early warning system was conducted.

The Ministry of Water and Irrigation provided the facilities where the training took place and also handled the invitations, organization and the workshop logistics.

The workshop was divided in two Parts:

Part 1: Day 1/ (23 July)

An introductory session, as an introduction to hydrologic science with basic data processing techniques. Rainfall data processing (outliers, correlation tests, double mass curves, etc) and calculation of the Potential Evapotranspiration (PET) using the FAO's ETo program.

Part 2: Days 2, 3 and 4 (24, 25 and 26 July)

In-depth training for drought hazard monitoring indices based on precipitation (SPI). Precipitation and evapotranspiration (SPEI, RDI), soil moisture (SMDI). SPI and RDI were calculated using two types of software model namely SPI Calculator from WMO and DrinC originally developed at the NTUA.

1.1 RATIONALE OF ACTIVITY

Jordan has prepared a National Water Sector Strategy (NWSS) (2016-2025) which refers to the need to address drought management and adaptation to climate change through proper policies and regulations. The Water Reallocation Policy calls for launching awareness campaigns addressing the importance of issues such as water harvesting, conserving and protecting resources, while the Water Substitution and Reuse Policy proposes the reuse of treated wastewater in irrigation, in order to enable freeing fresh water to be utilized for municipal uses. It also provides for using the treated wastewater in other economic activities, avoiding negative impacts on water and soil quality. Under this context, activities related to drought risk management mainstreaming are highly relevant to the Country's Strategic Framework.

Jordan suffers dramatically by frequent droughts and needs to enhance its capabilities regarding drought monitoring by improving administrative and technical capacity challenging drought issues.



2 OBJECTIVES OF ACTIVITY

The general objective of the training workshop (Task 4 in SWIM-H2020 SM, Activity EFS-JO-1) is to enhance understanding and improve the capacity of the relevant officials and staff in the drought hazard monitoring sector in Jordan, by the following themes.

1. Introduce the relevant MWI staff to the general hydrological and meteorological context regarding droughts including drought definitions.
2. Introduce the relevant MWI staff to the main drought indicators which can be used for drought identification and characterization, incorporating different hydrological elements, (surface water flows, spring discharge, groundwater level and level of water reservoir).
3. Train the relevant MWI staff on the statistical process of rainfall and the meteorological variables that lead to the calculation of the potential evapotranspiration.
4. Hands on FAO (ETo Calculator) model.
5. Train the relevant MWI staff on the software (DrinC model and WMO model) for the computation of Standardized Precipitation Index (SPI), Reconnaissance Drought Index (RDI), and Streamflow Drought Index (SDI). Hands on the DrinC software.
6. Train the relevant MWI staff on simulating the water budget for the Palmer's Drought Severity (PDS) Index with the HEC-HMS Soil Moisture Accounting (SMA) Model.
7. Hands on training for setting up a HEC-HMS model. The HEC-HMS (developed by the US Army Corps of Engineers is used for Hydrologic Modelling, in order to compute the variables for the Palmers Drought Severity Index (PDSI).
8. Train the relevant MWI staff on Drought Early Warning Systems regarding segmented rainfall values from the commencement of the wet period. The findings from the Expert Facility Activity regarding the simplified drought early warning system for the A-Z catchment will be presented.
9. Train the relevant MWI staff on Drought Hazard Mapping in GIS platform.

3 EXPECTED RESULTS OF ACTIVITY

After successful completion of the training, the participants now:

1. Have specific understanding and skills for the meteorological data processing.
2. Have a general understanding on drought monitoring indices.
3. Acquire specific skills for the computation of the most widely used drought indices.
4. Familiarize with specific freeware mathematical modelling regarding drought indices
5. Acquire specific skills for the drought hazard mapping.
6. Acquire specific skills for the water budget modelling in the soil strata.



4 PROFILE OF THE PARTICIPANTS

As mentioned previously, the workshop was divided in two Parts: During the first part, a total of 13 participants attended the workshop in addition to the SWIM-H2020 SM key water expert. Being an introductory policy session, the first part of the training was introduced by his Excellency the Secretary General of the MWI followed by an in-depth introduction on current drought assessment practices by Eng. Adel Y. Alobeiaat.

During days 2, and 4, 13-14 participants attended and 17 during day 3 as per the distribution in Annex 8.2. An in-depth training was conducted during those three days for those directly involved in the drought assessment issues.

The invitees were directly involved, in drought management/ water resources management and planning, hydrological and water balance modeling (Ex: Water Policy Directorate).

Representatives from MWI, WAJ, and JVA are targeted in this training.

Table 1 shows the number of participants who attended one or more training day.

Table 1: No. of participants attending per day (d) or group of days

Day 1 only	Day 2 only	Day 3 only	Day 4 only	Day 2, 3 & 4	All Days	Total
13	13	12	14	11	10	14

5 EVALUATION OF THE EVENT

5.1 RESULTS OF THE EVENT

Two categories of indicators were used to evaluate the workshop: i) evaluation indicators, reflecting the quality of the workshop logistics/ organisational aspects (See section A below) and the assessment of the technical quality of the workshop (See section B below), as perceived by the participants, ii) impact indicators, reflecting the direct impact of the workshop (See Section 6 below). The indicators and associated ratings are presented in Tables 2, and 3 respectively. Table 4 provides the specific remarks made by the non-key expert on the workshop (Section C below).

A. Organisational, administrative and planning issues before and during the event

A set of 10 criteria; A1-A10 (See table below) was assessed by the participants, using a qualitative description ranging between “Excellent” to “Poor”, with an opportunity to provide suggestions for improvement. For the sake of comparison, the qualitative descriptions are given assigned numbers as follows: Excellent = 4 Good = 3 Average = 2 Poor = 1



Table 2: Results of the evaluation of the organization, administrative and planning issues

A. ORGANISATIONAL, ADMINISTRATIVE AND PLANNING ISSUES BEFORE AND DURING THE EVENT (8 forms were filled)		Number of Replies					Average Score (max = 4)
		EXCELLENT	GOOD	AVERAGE	POOR	Total Replies	
A1	Appropriate handling of invitations, visa support, information sharing and smoothing obstacles	2	1		1	4	3,00
A2	Efficient logistics: accommodation, transportation, location of venue and interpretation	1	1	2		4	2,75
A3	Provision of support (if requested) for participants' preparation for the event	2	2	2		6	3,00
A4	Efficient and effective follow-up of preparations and progress towards the event	3	2		1	6	3,17
A5	Planning for the event: selection and design of methodology, programme/daily agenda and work rules	4	2	1	1	8	3,13
A6	Smooth flow of programme, efficient handling of emerging needs and attentiveness to participants concerns	4	2	2		8	3,25
A7	Adequacy of the presentations (Presentations correspond and contribute to the planned objectives and are conducive to enhanced shared understanding and participation on addressed topics)	3	3	1	1	8	3,00
A8	Clarity, coverage and sufficiency of concepts, objectives, anticipated outputs	2	4	1	1	8	2,88
A9	Usefulness of the distributed material	2	4	2		8	3,00
A10	Efficiency and effectiveness of the facilitation	3	2	2	1	8	2,88
A11	Overall rating of the event	2	2	2		6	3,00

The overall rating of 3.00 out of four indicates that the event was well appreciated



B. Feedback on Technical Aspects

Table 3 below presents the feedback received from the participants on the technical aspects of the event

Table 3: Results of the evaluation of the technical aspects of the training

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	5
	Some topics covered are not necessary	1
	Some additional topics should be included	1
	No reply	2
	Total Replies	9
B2	Level of difficulty	
	Difficult	1
	Adequate	4
	Elementary	3
	No reply	1
	Total Replies	9
B3	Length of the training In your view the workshop duration (tick one of the following):	
	Longer than needed	1
	Sufficient	6
	Shorter than required	1
	No reply	1
	Total Replies	9
B4	What is the most valuable thing you learned during the workshop (knowledge or skills)?	
	<i>Using Drinc and HEC-HMS software - calculating the drought indices - Mapping the drought using ArcGIS software - monitoring and forecasting the drought / how to calculate SPI & SDI & RDI to monitoring and predict drought / drought meteorological & hydrologic indices & calculate it in software / How we can use SPI and other indices / calculate drought by using new software / general information about drought</i>	6
	No reply	3
	Total Replies	9
B5	How do you think that the current event will assist you in your future work on the subject?	
	<i>it will help in drought mapping, analysis and forecasting and will valid the data used in calculation - it will be useful for other agencies such as Ministry of Agriculture to expect the drought / help us in prepare the future policies / by using the software for more studies</i>	3
	No Reply	6



B. FEEDBACK ON TECHNICAL ASPECTS		No. of replies
	Total Replies	9
B6	Please indicate whether (and how) you could transfer part of the experience gained from the event to your colleagues in your country?	
	<i>Using workshops and general meetings with other colleagues - meeting with other agencies / by training my friends / on job training / by displaying the results of drought model for them, how I can calculate it and how we can analyse the results/ by the software /</i>	5
	<i>No Reply</i>	4
	Total Replies	9
B7	What did you like most about this event?	
	<i>The drought concept and implementing data analysis on hydrological software / software / the trainers / I have got new skills at new softwares and how I compare between the SPI and RDI values to knowing the classification of drought / the topic</i>	5
	<i>No reply</i>	4
	Total Replies	9
B8	What needs to be improved?	
	<i>The room needs more equipment "electrical" - more practical learning is needed - more explanation for concepts is needed - more interactive exercises needed for following up / more training / improve skills and way of presentation in order to transfer knowledge easily / procedure of training - communication with participants should be more - provide power supply to all participants laptops</i>	4
	<i>No reply</i>	5
	Total Replies	9

C. Remarks by the trainer

A set of nine criteria; B1-B9 (See table below) are used hereby by the trainer to provide an overall assessment of the event.

Table 4: Assessment by the trainer

B1	Efficient and effective performance and interaction by participants: the event was highly interactive with very active discussions on all the topics that were addressed.
B2	Efficient and effective cooperation and team spirit; Drought monitoring is gaining increased attention among MWI experts. Due to the importance of the subject, and the diversity of the participating institutions, and the experience they were bringing with them, there was a lot of exchange and cross fertilisation between the officials which presented a good opportunity for the participants to learn from each other.
B3	Level of achievement of planned objectives: All the information and examples presented were received with impressive enthusiasm. See Table 6 below for the level of achievement of planned objectives and outcomes.
B4	Did the event contribute to helping participants practice skills or gain knowledge related to course concepts: yes.
B5	What worked well during the event; discussions within the group, and with the trainer,
B6	What didn't work well and why: Filling in the quizzes and evaluation forms. At the end of the workshop fewer



	people remained, and more response would have been possible if the training was not done in the home base of the participants.
B7	What components/concepts did participants seem to understand well: the concept of drought hazard indicators based on rainfall.
B8	Were there any components/concepts that participants appeared to not understand: the subtle difference between private sector participation, and, a partnership between public and private sector.
B9	What aspects of the event could be improved and what to be kept: An improvement would be the inclusion of case studies. What worked well was the discussion between participants and the trainer. This could be the major highlight of the training.

6 ANALYSIS OF THE RESULTS OF THE TRAINING COURSE

The training succeeded to mobilise a significant number of organisations and stakeholders that are implicated in PPP as indicated in Table 5 below.

Table 5: Workshop participation/ demographics

Total No. of participants actually attending one or more training days	14
Total No. of participants Planned to attend	15
Planned/Actual	107%
Number of organisations/agencies/authorities that were represented	3
Gender balance (% of women participants)	14%
NGO representation: No. of participants from NGOs	N/A

Prior to the training workshop, a pre-training assessment questionnaire was distributed to test the level of knowledge of the participants in the various subjects of the training. The quiz was also distributed after the training to test the impact of the training. It seems that more questionnaires were completed after the training (9) than before the training (6).

The results of the quiz are summarised in Table 6.

Table 6: Evaluation of the results of the quiz:

Question	Changes in awareness, knowledge and skills	%
Q1	% of participants that answered correctly Question No1 prior to the workshop	17%
	% of participants that answered correctly Question No1 after the workshop	67%
Q2	% of participants that answered correctly Question No2 prior to the workshop	100%
	% of participants that answered correctly Question No2 after the workshop	89%
Q3	% of participants that answered correctly Question No3 prior to the workshop	17%
	% of participants that answered correctly Question No3 after the workshop	11%
Q4	% of participants that answered correctly Question No4 prior to the workshop	50%
	% of participants that answered correctly Question No4 after the workshop	22%
Q5	% of participants that answered correctly Question No5 prior to the workshop	0%



	% of participants that answered correctly Question No5 after the workshop	44%
Q6	% of participants that answered correctly Question No6 prior to the workshop	33%
	% of participants that answered correctly Question No6 after the workshop	78%
Q7	% of participants that answered correctly Question No7 prior to the workshop	83%
	% of participants that answered correctly Question No7 after the workshop	89%
Q8	% of participants that answered correctly Question No8 prior to the workshop	67%
	% of participants that answered correctly Question No8 after the workshop	67%
Q9	% of participants that answered correctly Question No9 prior to the workshop	0%
	% of participants that answered correctly Question No9 after the workshop	78%
Q10	% of participants that answered correctly Question No10 prior to the workshop	33%
	% of participants that answered correctly Question No10 after the workshop	89%

As indicated above, the quiz was filled in by a limited number of participants. Some struggled with the English language. Overall the scores indicated that the workshop was well received and organized.

7 CONCLUSIONS & OVERALL ASSEMENT

Below is an overall evaluation of the training workshop. It can be concluded that the expected outcomes of the workshop (as planned in the design phase) have been achieved Table 7 below, describes how the planned outcomes were achieved.

Table 7: Level of achievement of training objectives and outcomes:

Planned outcomes as defined prior to the workshop	Have they been achieved?
Have specific understanding and skills for the meteorological data processing.	Yes, through interactive presentations, discussions, and Q&A
Have specific understanding and skills for the meteorological data processing	Yes, through interactive presentations, discussions, and Q&A
Acquire specific skills for the computation of the most widely used drought indices.	Yes (by a dedicated presentation)
Familiarize with specific freeware mathematical modelling regarding drought indices	Yes, through interactive presentations, discussions, hands-on practice and Q&A
Acquire specific skills for the drought hazard mapping.	Yes, through interactive presentations, discussions, and Q&A
Acquire specific skills for the water budget modelling in the soil strata.	Yes, through interactive presentations, discussions, and Q&A



8 ANNEXES

8.1 AGENDA

Day 1: Opening and Overview		
Time	Session	
9:00	Registration	All participants
9:30	Opening Session Welcome Speech from MWI coordinator Opening Remarks Pre-training Assessment	
10:00	<ul style="list-style-type: none">• Introduction to hydrology and droughts• Principles• Rainfall (spatial & temporal distribution).• Statistical process of rainfall data (definition of outliers, double mass curves, correction, gap filling).• Computation of Potential Evapotranspiration (Penman-Monteith, Priestley-Taylor, Hargreaves, Thornthwaite, Blanney – Criddle methods)	
11:30	Break	
12:00	Hands on Potential Evapotranspiration Calculation 1. FAO ETo Calculator 2. DrinC Model	
13:30	Break	
14:00	<ul style="list-style-type: none">• Definitions of Drought, Water Scarcity and Aridity.• Setting the Concept of the Drought Indices	
15:00	Wrap up of Day 1 - Discussion	



8.2 LIST OF PARTICIPANTS

No.	TYPE OF INSTITUTION (please use the options provided*)	TITLE (Mr/Ms)First Name	First Name	Last Name	Organization/Institution	Email Address
1	MINISTRY REPRESENTATIVES	Mr	Hadeel	Smadi	MWI	hadeel_smadi@mwi.gov.jo
2	MINISTRY REPRESENTATIVES	Mr	Safa	Al Shraideh	MWI	safa_alshraideh@mwi.gov.jo
3	MINISTRY REPRESENTATIVES	Ms	Maysa	Subah	MWI	mayasaaali@yahoo.com
4	MINISTRY REPRESENTATIVES	Mr	Enaam	Batayneh	MWI	enaam_batayneh@mwi.gov.jo
5	MINISTRY REPRESENTATIVES	Ms	Najah	Seelawi	MWI	najah_seelawi@mwi.gov.jo
6	MINISTRY REPRESENTATIVES	Mr	Noureddin	Hamad	MWI	noureddin_hamad@mwi.gov.jo
7	MINISTRY REPRESENTATIVES	Mr	Mohammad	Al Masri	MWI	mohammad_almasri@mwi.gov.jo
8	MINISTRY REPRESENTATIVES	Mr	Mohammad	Alawneh	MWI	alawneh81@yahoo.com
9	MINISTRY REPRESENTATIVES	Mr	Wael	Ababneh	WAJ	wael723@yahoo.com
10	MINISTRY REPRESENTATIVES	Mr	Hadeel	Smadi	MWI	qteashkhaled@gmail.com
11	MINISTRY REPRESENTATIVES	Mr	Khaled	Ahmad Qteash	WAJ	giras1411_1970@hotmail.com
12	LOCAL AUTHORITIES	Mr	Firas	Sabha	JVA	majd_mrayat@mwi.gov.jo / majd.almrayat@gmail.com
13	LOCAL AUTHORITIES	Mr	Majd	Al Mrayat	JVA	ali_ghanim@mwi.gov.jo
14	MINISTRY REPRESENTATIVES	Mr	Ali	Ghanim	MWI	fatin_shaban@mwi.gov.jo
15	MINISTRY REPRESENTATIVES	Mr	Fatin	Shaban	MWI	hadeel_smadi@mwi.gov.jo
16		Mr	Demetris	Zarris	Consultant, SWIM-H2020 SM non key expert	dez@ldk.gr