CrITERIA

"Cr(VI) Impacted Water Bodies in the Mediterranean:

Transposing Management Options for Efficient Water Resources Use through an Interdisciplinary Approach"

"*Guidance Report*"
Stakeholder Participation in Prioritization of Water Use Demands Issues

By

Dr. Maisa'a Shammout

Dr. Muhammad Shatanawi

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1- Introduction

This Guidance Report addresses the participatory steps for stakeholders' involvement of prioritization of water use demands in each case study area in the framework of the ERANETMED_WATER-13-051, entitled "Cr(VI) Impacted water bodies in the Mediterranean: Transposing management options for Efficient water Resources use through an Interdisciplinary Approach" (CrITERIA). The development of this Guidance depends on the purposes of the project through a participatory process by employing a series of techniques to facilitate dialogue between the stakeholders guided by the Water Framework Directive-Common Implementation Strategy (WFD-CIS, 2002b). The participatory tools for water management that has been developed during the EU-OPTIMA project funded under the INCO-MPC program (ESS-GmbH 2017) will be utilized and adapted. The output of the prioritization of water use demands process will be documented to fit the purpose of the project.

Stakeholders' participation refers to the direct institutional participation where the public participation is initiated by public or private agencies and can be defined as the process by which public concerns, needs and values are incorporated into governmental decision making (Henriksen et al. 2009; Shammout et al. 2013). Increasingly, however, there is a wide recognition that there is much to be gained by engaging the local community in the process of managing water resources. This would enhance links between research and policy-making through the use of Integrated Water Resources Management (IWRM), engaging scientists, policymakers and the public into participatory scenario-building (Pahl-Wostl 2002). Hence, stakeholder participation will fulfill many functions, including acquisition of information and expertise of direct use for the water uses and demand analysis.

In Europe, the supply of renewable water resources is distributed in an extremely inhomogeneous way; the shortage of water is focused in the Southern and Eastern Mediterranean Countries (SEMCs). Water quality problems in this region are also intensified due to intense agricultural activities as well as urban and industrial development. The countries of the Mediterranean have similar water resource problems but also share common cultural heritage and customs. The aggregate water demand has doubled in the last fifty years as a result of demographic pressure and the development of water intensive activities such as tourism and some manufacturing in sectors such as food, textiles and tanning. Most of the water is used in the agricultural sector, which presents high rates of inefficiency. Furthermore, the shortage of water has been affected by the impact of climate change as increase of temperature, and variation of precipitation which, in turn, has different effects in the region: the SEMCs are exposed to desertification while the northern shores of the Mediterranean appear more vulnerable to the increase of

floods and landslides. In the SEMCs, the new water knowledge characterized by environmental awareness is still in a period of evolution. Currently, the SEMCs are evolving towards a demand-side water policy as opposed to a supply-side approach that was adopted in the past. In general, the SEMCs' demographic and economic pressure has given rise in recent decades to a growing gap between supply and demand of water, and to deterioration in the quality of surface and groundwater sources. The water issues (management, demand, supply and quality) are due to these problems and the complexity of the water balance system in the region. The need to carry out reform in the water sector and transpose the management and water policy approach from the supply-side to the demand-side has emerged as a priority in order to deal with the scarcity and quality issues of water in the region.

Recently, most of the projects were technically based and have not considered the involvement the concerned stakeholders. Therefore, this report will be as a "***Guidance***" to assist water resource management organizations and water users on decision making when coping with water scarcity, climate extreme events and contaminated water. Contamination by Cr(VI) as the central theme of the CrITERIA project will be used as an example of a specific water pressure problem that has to be tackled.

2- Steps of Stakeholders' Participatory Network for each Study Area

In line with the EC Water Framework Directive, a participatory prioritization process on water use demands will be employed involving interested parties/ stakeholders. Four main steps are required for stakeholders' participatory network as follows:

Step 1: **Establish Inventory of Related Stakeholders**
Each study area has to draw up a list of those entities who should be involved to join the network of stakeholders such as governmental departments, local communities, water users, industry and commerce, agriculture and environmental groups.

Step 2: Background Material
The strategy will be based on preparing a background document of one to two pages as the current status of water resources (supply, demands and gaps). This also may include amount of surface water, ground water, reclaimed water, desalinated water, and other sources.

Step 3: Water Issues Questionnaire
A water issues questionnaire to be prepared and distributed to selected interested people representing different sectors of society, such as decision makers, industry,

agriculture, environment, NGOs, youth, and women. The questionnaire is designed to tackle the following issues:

a. **Water Management Issues;**
b. **Water Demand Issues;**
c. **Water Supply Issues;**
d. **Water Quality Issues.**

The above issues will be analyzed and presented to the stakeholders' workshop.

Step 4: Stakeholders' Workshop

Workshops are efficient instruments as we can address a group simultaneously. Stakeholder workshops are TOOLS to facilitate DIALOG and stakeholder INPUT, integrating their know-how and experience, facilitate active INVOLEVEMENT and DISSEMINATION of results. Therefore, organizing stakeholder's workshops through CrITERIA will support the study areas in achieving the project purposes.

The objective of the workshop is to identify and present the major water issues, problems, objectives, and actions. Therefore, one day workshop should be organized with participation of >20 stakeholders representing public and private entities from the governmental sector, Municipalities, agriculture farmers, NGOs, local and related groups. The workshop will be divided into:

1- Plenary Session

The idea is to present the stakeholders with the background document and to fill the questionnaire. The participants will be asked to read the document prepared for the session. Then a discussion on the document will be organized including the future trends.

2- Group Discussion/Working Session

- The participants will be asked to define the key water issues, sharing ideas about future scenarios and identifying possible actions. The general objective of this session is to reach a common vision about the future.
- Each person in the workshop will be also asked to write down the related problems, and then invited to read them in order to address the objectives and the actions.

3- Concluding Session

The aim of this session is presentation of the results (issues, objectives, & actions) which were agreed upon during the discussion. Different mode of presentation could be followed.

4- Reporting

- Analysis of participation;
- Gender issues analysis;

- Issues and problems;
- Objectives and actions.

3- Jordan Workshop in Prioritization of Water Use Demands Issues (WP1 2.4)

Therefore, CrITERIA stakeholders' participatory workshop was organized at the University of Jordan on the 7th of May, 2018. The aim of this workshop was to present and identify major water issues, problems, and actions. In addition input from the stakeholder was anticipated regarding the Cr(VI) sources, contamination, and suggested alternative solutions. The sessions and the workshop analysis of the stakeholders' participatory network for Jordan were as follows:

3.1. Plenary Session

The workshop titled: "The Water Resources in the Zarqa River Basin: Quality and Protection" was opened by the Dean of the Scientific Research, with a warm welcome to the participants and an introduction to the goal of the scientific research. The University of Jordan (2018) reported via its official news site http://ujnews2.ju.edu.jo/en/english/Lists/News/Disp_FormNews1.aspx?ID=5689 that the "*Dean of Scientific Research, Prof. Shaher Momani, said after inaugurating the workshop that it aims at recognizing the significance of preventing the pollution of water sources and challenges of protecting water quality. Former water minister Prof. Muhammad Shatanawi explained the importance of the Zarqa River basin; pointing out that 60 years ago the basin was full of scattered forests and pastures and was a sanctuary for wild and domestic animals. He added that the basin deteriorated as a result of urban expansion and land abuse, which increased the level of desertification and affected the overall volume and quality of water. Dr. Maisa'a Shammout, the principal investigator of CRITERIA project, stated that the project is implemented by a number of institutions and universities from Mediterranean countries that share similar environmental problems, including Greece, Italy, Cyprus and Turkey, in addition to the Sultanate of Oman. Shammout focused on the importance of carrying out regular analysis of water to control sources of pollution, and the importance of monitoring the efficiency of industrial water treatment plants. The workshop dealt with a number of topics related to the causes of water pollution and its impact on humans, plants and animals, as well as proper wastewater treatment methods and disposal presented by Dr. Akl Awad from the Royal Scientific Society. It also addressed the role of all of Ministries of Environment and Water and Irrigation on this matter."*

At this Session; one page as a background material has been distributed to workshop's stakeholders. The material shows the importance and the objectives of CrITERIA project. **Figure 1** shows the background material of the project. The participants were asked to fill the water issues questionnaire (attached).

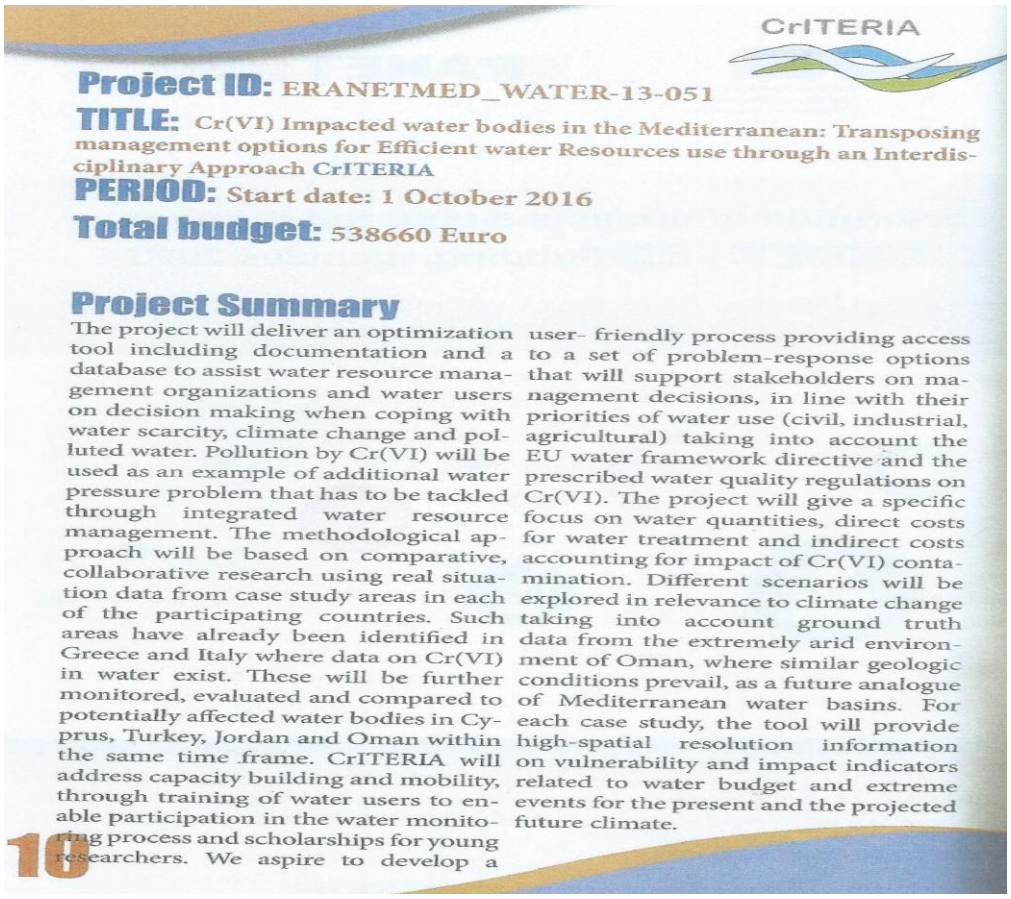

Figure 1 Background material of the CrITERIA project.

3.2. Group Discussion/Working Session

- The stakeholders indicated the type of responsibility and involvement of their institution in water issues. Some entities are involved in one or more of the following issues:

a- Water production such as exploitation of the groundwater, and wastewater treatment;
b- Water distribution such as irrigation and potable water;
c- Water quality such as setting standards and monitoring;
d- Water conservation such as groundwater protection;
e- Water users such as industry, agriculture and tourism;
f- Regional pollution control such as water resources;
g- Other entities: e.g. water research centers, and universities.

- The participants invited to discuss the water issues and problems, sharing ideas about current problems and future scenarios and identifying possible actions to reach these scenarios for the Zarqa River Basin. Thus, the Water Issues Questionnaire has been filled and discussed. Most important problems under each issue were identified..

3.3. Workshop Results

- Analysis of participation

The workshop was attended by 30 persons representing different stakeholders that are involved in water related issues in the basin. They were already identified by the team of CrITERIA project; they represent the following: the Royal Scientific Society, Ministry of Water and Irrigation, Ministry of Agriculture, Ministry of Environment (Zarqa Environmental Directorate), Municipalities (Greater Zarqa Municipality), research and academic institutions (Water, Energy and Environment Center, The University of Jordan, and Hashemite University), industries (Zarqa Chamber of Industry), agriculture farmers (local groups), water and civil societies. Moreover, within the workshop, most of industrial activities in the Basin have been identified. The main industrial activities in the basin are: Al-Hussein Thermal Power Plant, Petroleum Refinery, Electroplating, Textile, Clothing, Tanning, Paper and Carton Processing, Painting Industry, Plastic Industry, Leather Production, Food Industries, Dairy Farms, Poultry Farms, Distillery and Food Industries, Pharmaceutical Industry and Chemical Industries, Aluminum Industry, Intermediate Petro-Chemicals, Engineering Industries, and Mining Industries (mainly phosphate). However, some industries were moved from the basin to an area which does pose any environmental hazards while other industries were closed due economical reasons.

- Gender Issues Analysis

Table 1 summarizes the participation activity with regards to gender involvement in the Jordan workshop.

Table 1 Participation activity with regards to gender.

Item	**Total number**	**Women**
Invited group of stakeholder to the workshop	24	7
Staff group composition, including the steering committee members (3 persons)	6	2
Total	30	9
Number of filled issue questionnaire	22	5

- Issues and Problems

During discussion/working session of the workshop, the main problems related to prioritization water demand in the Zarqa River study area have been identified based on Water Issues Questionnaire and other specified problems. All problems were summarized and then discussed to be agreed upon. Findings on the main problems are shown in Table 2 which shows the opinion of stakeholder ranked according to the main issue of water. The most important issues were ranked according to number of opinions out of the total. As it can be seen, water management issue was the major issue in the basin followed by water supply to

less extent by water demand and quality. Many of the stakeholders did agree that management issues are affecting other issues of water.

Table 2 The Opinion of Stakeholder to the most Important Problems

Issue	Opinion	Very important problems
Water Management	19/22	- Deficiencies of enforcement of water quality standards (8/19). - Conflict among sectors (7/19). - Lack of public awareness and free public access to information about management process (4/19).
Water Demand	17/22	- Households: Extremely demand on ground water (6/17). - Agriculture: Extremely pressure on surface & ground water (6/17). - Industry: Impact of Industrial activities on surface & ground water quality (5/17).
Water supply	18/22	- Conflicts from the limitation of ground water (7/18). - Conflicts from the limitation on water supply; Climate change and rainfall variability (7/18). - Forecasted future dependence on water imported from outside (4/18).
Water Supply versus Quality	15/22	- Deterioration of groundwater quality due to over abstraction (6/15). - Limit to domestic use of water, as a consequences of quality degradation (5/15). - Limit to agricultural use of water, as a consequences of quality degradation (4/15)

Specified Problems via CrITERIA Workshop on Zarqa River Basin

1- Problems related to random disposing of waste such as septic Tanks,
2- Problems related to Yeast factory in the Basin,
3- Problems related untreated wastewater at the disposal site in Al-Ekayder near Halabat area,
4- Problems related to the lack of law enforcement to protect water resources,
5- Problems related to disposing solid waste at Swaqeh (Hazardous waste disposal site).

- **Objectives and Actions**

Jordanian participants identified the main objectives related to prioritization of water use demands in the Zarqa basin. The objectives which were agreed upon at the end of the session are shown in Table 3. It can be seen that the enforcement of law is the main action for water resources objectives, followed by minimizing of over-pumping considering the enforcement of law related to groundwater pumping, and then other objectives become more important. These objectives are related to quality standards, optimization at farm level and proper land use. Thus, the supply-demand objective can be eliminated or reduced by achieving other objectives.

Table 3 List of the most Important Objectives and actions.

No.	Objective	Action
1	Minimization of over pumping, and ground water protection	Reduction in groundwater extraction for irrigation and municipal use by law.
2	Enforcement of law	Involvement of concerned entities like the Ministry of Interior in law enforcement.
3	Monitor industries impacts (water, air and land)	Enforce the laws of Environment
4	Reaching quality standards	by applying Jordanian water quality standards
5	Management of water use for farmers	Improve on farm water management like precision irrigation and proper irrigation scheduling
6	Increase efficiency of irrigation systems	Use of modern irrigation systems and proper irrigation scheduling
7	Minimize difference between supply and demand	Invest in Mega project like Red Dead Sea conduit
8	Farmers' future investment	Invest in high value crops and new technology.

- **Interventions of Stakeholders**

The planned actions based on stakeholders' interventions can be summarized as follows:

- Additional Waste Water Treatment Plants (WWTP) at Zarqa, west of Jarash and other sites within the basin.
- Upgrade and expansion of existing WWTP's.
- Desalinization of brackish water in Husban and Sukhneh areas
- Water Harvesting: the encouragement of water harvesting projects at household and farm levels is needed in the future to utilize surface water supplies. Within this intervention, some participants suggested water harvesting projects for groundwater recharge.
- Improved cropping patterns and selection of crops suitable for low quality water.
- The concept of organic farming and market competition was also suggested by some stakeholders.
- Different interventions such as drought mitigation and desertification control are needed.
- Improved extension and public awareness programs: interventions related to this issue were seen important.
- Construction of dams in the remaining sites to utilize available surface water
- Preventing mixing of water coming from WWTP with fresh water resources.

4- Costing of Cr(VI) Contamination via CrITERIA Workshop (WP3.2)

Contamination by Cr(VI) is the central objective of the CrITERIA project. Where, Jordanian team presented the sources and impacts of Cr(VI) on environment for Mediterranean countries that share similar environmental problems, including Greece, Italy, Cyprus and Turkey, in addition to the Sultanate of Oman.

The analysis of water samples in Jordan did not show any hazardous level of Cr(VI) in Zarqa River, where they are within the ideal detection limits. This due to the following:

- ✓ Administration measures;
- ✓ Regulations for industries as tanning;
- ✓ Cost of prevention for Cr(VI) contamination;
- ✓ Cost of industry moving to another area;
- ✓ Cost of using new technology or alternatives;
- ✓ Economic issues
- ✓ In site treatment of industrial waste water.

Practically, there will no risk in ground water contamination by Cr(VI). However, in some areas, the contamination may be due for presence of Cr(VI) in the hydrological formation of the aquifer. In this case, treatment of groundwater is possible. We suggested a remediation measures to remove Cr(VI) from water at a minimum cost by using natural materials. These measures can be used in countries that have pollution in terms of the following:

- ✓ Adsorption process such as Zeolite;
- ✓ Bio-sorption Process such as Olive Pomace and Reed Plants;
- ✓ Wetlands

5- Conclusions

- Jordan workshop opened the stakeholders' floor for discussion in "Prioritization of Water Use Demands Issues" and "Cr(VI) contamination. The workshop's outputs will be provided to decision makers.
- The representative locations as a Surface Water and as a Ground Water; we did not find a hazardous level of Cr(VI) or other heavy metals, where they are within the ideal detection limits.
- A remediation measure to remove Cr(VI) at minimum cost will be provided for countries that have heavy metals pollution.
- The water uses accounting shows a gap between supply and demand as a result of water sectors conflict.

- The analysis of the Participatory Prioritization of Water Demand was highly needed to discuss the management interventions or instruments to minimize the gap between supply and demand.

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TITLE:
PERIOD:
Project Summary


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