



WaSec - Neighborhood Network

WS-NN



Editor: George N. Zaimes

WP 2.1 - DEVELOPMENT

ESTABLISHING

UNIVERSITY-ENTERPRISE COOPERATION

2.1.2. Water Network



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WP Number	2.1		
WP Leader(s)	The University of Jordan (UJ)		
Due Date of Delivery	14 th , November, 2019	Project Month (expected to be submitted)	M12
Submission Date	14 th , October, 2019	Project Month (real date of submission)	M11
Total Number of Pages	38 Pages		



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1. INTRODUCTION

Water is an essential resource for human life and civilizations. Problems associated with “Water” are particularly severe in semi-arid and arid regions (e.g. Eastern Mediterranean). In these regions, climate change is expected to negatively affect even more the quantity and quality of water resources. Global, regional and national studies have shown an increase in mean and extreme temperatures as well as changing precipitation patterns. The continuing forecasted trend towards decreased and more intensive precipitation events along with increased evapotranspiration, as a result of temperature increase, combined with other anthropogenic stresses, will act to substantially reduce surface and ground water availability. As a result, these regions need to have professionals that know how to conserve and eliminate the waste of water while considering potential climate change impacts. To further enhance water resources management plans based on new innovative tools and methods need to be developed and used. Accordingly, an improved understanding of water resources management plans needs to be addressed in comprehensive and modern courses. This can be accomplished by teaching new technologies and methods to students that will incorporate them in water resources management plans and that eventually will be adopted in the water relevant organizations and businesses.

Another major concern are the many different services that water can offer. This, in many cases can lead to conflict among the stakeholders, making water management a very difficult task. Water managers need to have a holistic perspective on water issues that will enable them to find the optimum solutions based on the specified objectives by taking into consideration all interested parties. Water also involves many different sectors, e.g. water for municipalities, agriculture, industry, recreation, but also the environmental needs. Water Managers need to know how to develop water resources management plants to satisfy at its best all these different sectors. Major emphasis should be given in understanding the principles of water resource management along with water conservation and recycling techniques. In addition, the impending climate change impacts will put more pressure on water resources. Understanding and incorporating the potential impacts in management should be a focal point in Water Management in the Eastern Mediterranean (understanding climate change forecasts and learning climate modeling), a region already facing serious water scarcity problems.



Finally, in many cases students that graduate, do not always learn the tools that are required for the job market. This is a result of the disconnect between universities and enterprises and companies. This can be a serious issue for recent university graduates that are trying to get jobs. To help graduates acquire the necessary tools to make them more attractive and consequently get more easily hired by companies and organizations that deal with “water” the involvement of such organization in regard to course material is required. This can be achieved with the establishment of university-enterprise cooperation that should be long-term and benefit both parties involved.

This is the reason why organization and companies dealing with water are involved in the WaSec project either as partners or associates. The companies and organization will be involved in all phases of the project. They will provide a different perspective, specifically a more practical perspective in regard to the course material. They will also provide support and ideas on how to best support student’s practical placement, internships, entrepreneurship, employability of graduates etc.

All the above make it clear that better communication among the water experts of the region, specifically Jordan and Palestine are required. This is a gap in the region that can be fulfilled with the development of a Network, specifically a Water network. This Network will sustain and further this university enterprise, companies and public authorities cooperation. The cooperation will be further advanced with courses that have real life water management case studies with enterprises involved, and a series of seminars with presenters’ representatives of enterprises. Overall, the purpose of the Network is to help develop deliverables and course material for the countries in the Eastern Mediterranean region to meet the aforementioned objectives. This will be accomplished by heavily involving the people that hire water managers in this process in addition to universities to modernize their curricula and provide new courses or programs with innovative technologies for water resources management principles that will be accredited in the partner countries. Finally, the involvement of many different countries (Jordan, Palestine, Cyprus, Greece, Netherlands and Spain) will also lead to the internalization of the MSc that should significantly benefit the graduates.

When dealing with water management, firstly improved management changes are required, particularly because of the impending impacts of climate change. Without management changes, sustainable water



management will not be achieved even if this was possible in the past. Still at the same time the consideration of the social aspects and further collaboration with society itself will also be necessary in order to be able to face and achieve cost-effectively sustainable water management. Such management plans have a greater likelihood of success if they are developed with support of a Neighborhood Network.

Neighborhood Networks are typically community based, locally led organizations. Their purpose is typically twofold. Firstly, to support people to be able to face independently and pro-actively within their own communities' various issues (e.g. water management) by providing volunteering services. Secondly, to act as a "gateway" to advice/information that will help promote and enhance the readiness and preparedness of people and community. This will enable them to effectively and efficiently make water management changes to achieve sustainability, that will improve the quality of life and enhance the feeling of security.

These activities and services can have a wide range. These include advice and information about what to do in order to achieve sustainable water management and what should be done in different case studies (e.g. agricultural areas, urban areas). Of course, advice and information are also provided once a water shortage has happened on what the best ways are for a community or individual on how to most effectively and timely recuperate and how to provide general support efficiently e.g. water supplies.

Each Neighborhood Network is managed by a committee of local people and a team of committed staff and volunteers. The committee members and other volunteers are responsive and flexible. They work within communities to meet local needs to achieve water sustainability, by providing activities and opportunities that are necessary to be able to achieve water sustainability effectively and efficiently.

2. REGION OF INTEREST – PARTNERS INVOLVED

The region of interest is the Eastern Mediterranean that includes the following countries and territories Cyprus, Greece, Lebanon, Syria, Israel, Palestine, Turkey, Egypt, Libya, and Jordan (Figure 1). The project has partners from 4 of these countries and territories (Cyprus, Greece, Palestine and Jordan). The region is generally dry, with typical Mediterranean climate that faces water-scarcity issues, especially during the summer. This is the reason why sustainable management through education is a necessity. In the project emphasis was given to meet the needs of water sector of Jordan and Palestine although the projects results could also be applied in neighboring countries such as Lebanon, Syria, Israel, Egypt and Libya.



Figure 1. The Eastern Mediterranean region that includes the countries and territories of Cyprus, Greece, Lebanon, Syria, Israel, Palestine, Turkey, Egypt, Libya, and Jordan.

The WaSec project meets the Region 3 South-Mediterranean countries priority and the National priority for Jordan and Palestine (the partner countries of the projects) “Developing the Higher Education sector within society at large emphasizing on university-enterprise cooperation (such as support for student practical placement, entrepreneurship, employability of graduates etc.).” This is accomplished by having partners and associates’ companies, enterprises and organizations that deal with water involved in all phases of the project and the establishment of the Water Network that will provide feedback to the project



results. In addition, it focuses on water that has and will continue to be the major issue for the survival of the region. With climate change only exacerbating this problem, more effective and efficient water resources management should be the main priority for the region. The involvement of Universities from Jordan and Palestine provides essential information on what the current curricula in the region offer in regard to water education, so this will allow to understand what is lacking education wise and what the new course should include. The partner from Jordan and Palestine should also help understand the culture of the region and develop courses suitable for it that will be adopted by other universities in their countries or by neighboring countries. The EU Countries will provide feedback on new and innovative courses on water resources management that are taught in their countries and the rest of the EU. This will ensure that the new courses in regard to water management, reuse and recycling are up to date with EU standards that should allow the region with the same amount of water or even less to be able to provide water sustainably for the residents of the region, agriculture and industry, but also have the best outcome for its environment. In these course principles, methods and tools from European Union Water Framework Directive 2000/60/EC and the Flood Directive 2007/60/EC will be included. Finally, companies, enterprises, public authorities from Jordan and Palestine are also involved as partners or associates so that all the material produced in WaSec are applied and easily adopted by the target groups.

The reason for these last groups involvement is because the objectives are to establish strong and lasting cooperation between universities and enterprises. These types of cooperation will help universities better understand what the expertise and qualifications for their students in water resources management should be in order to succeed and get hired once graduating. Another goal is to understand what steps and tools need to be implemented in order to further advance the adoption of sustainable water management in the Eastern Mediterranean. Finally, emphasis will be given on how to mitigate climate change implication on water management.

3. WATER IN JORDAN

3.1 Introduction

Jordan covers an area of about 90,000 km², with a population of 6.2 million in 2008, and expected to reach 8 million by 2024. The scarcity of water resources in Jordan is dictated by the aridity, high population growth, and the rapid development.

Most of the major water resources in Jordan are shared with neighboring countries, leading to additional challenges as conditions of water scarcity increase. In 2013, the Ministry of Water and Irrigation (MWI) estimated annual water availability at 892 MCM. about 79% of this is from renewable freshwater sources, including about 239 MCM (28%) from surface water (of which 50 MCM comes from Israel under the 1994 peace treaty agreement) and about 433 MCM (51%) from renewable groundwater. The remaining amount comes from non-renewable aquifer (fossil) groundwater (about 75 MCM or 9%) and treated wastewater (about 102 MCM or 12%).

3.2 Precipitation

The rainy season in Jordan extends from October to April, with maximum rainfall occurring in December, January, and February. The long-term mean annual precipitation is 100 mm/year (8,500 MCM). Only 4% of the country (high land areas) receive more than 300 mm/year of rainfall, and about 81% receives less than 100mm/year of rainfall (Figure 2).

3.3 Evaporation

The long-term evaporation rate is 80% of the precipitation. Potential evaporation is in the range of 1600mm/year in the northern highlands to more than 4000 mm/year in the southern and eastern deserts.

3.4 Water supply

Water in Jordan is supplied from three sources: groundwater (60%), surface water (28%), and treated wastewater (12%).

Surface water resources

Jordan has many surface drainage basins where many of them are transboundary basins (Figure 3). Surface water resources in the country vary considerably from year to year. The long-term average surface water flow is estimated at 706.91 MCM/year, comprising of 451.4 MCM/year base flow, and 255.5 MCM/year flood flow (Table 1).

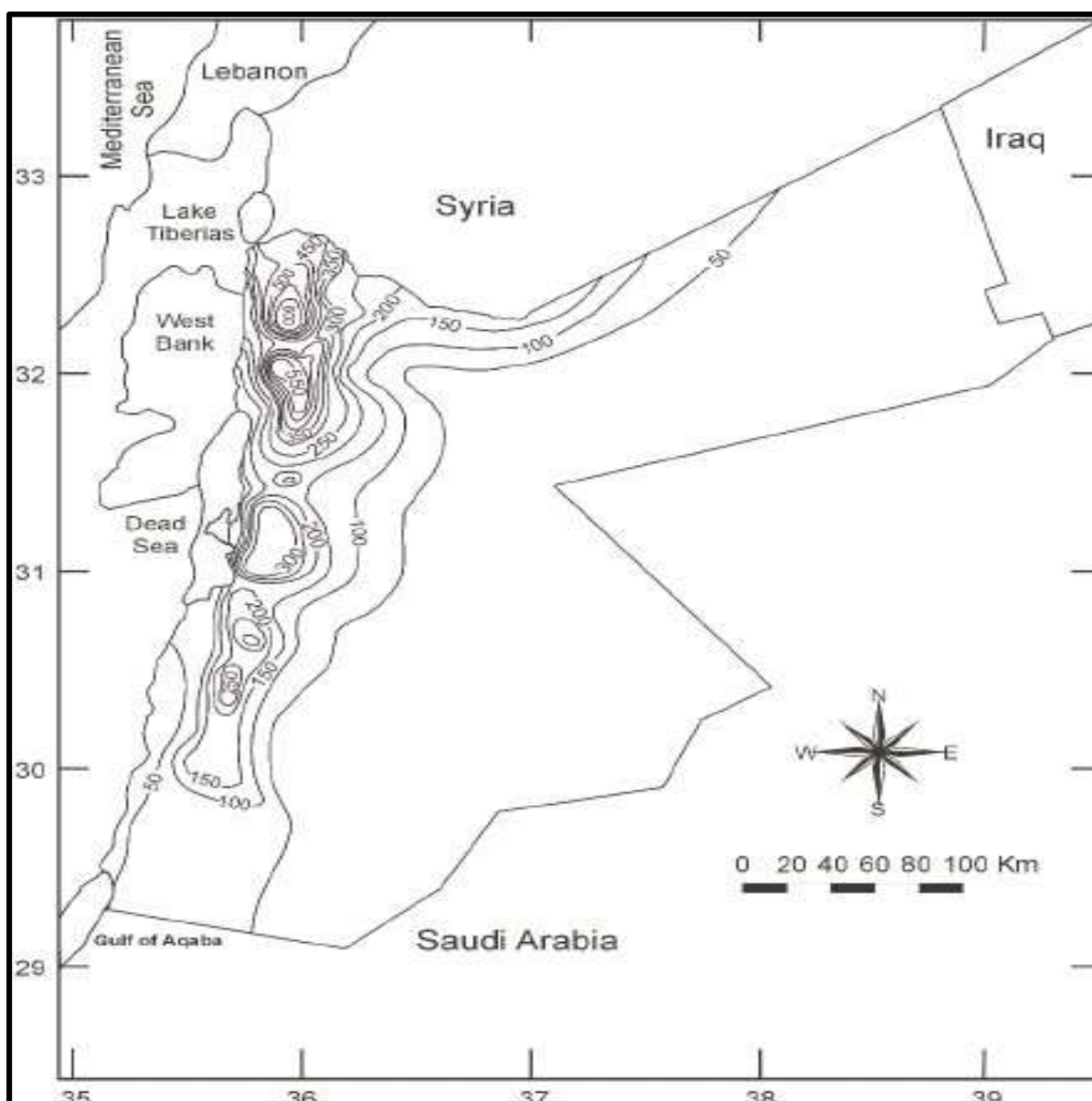


Figure 2. Long-term mean annual distribution of rainfall in Jordan

Jordan River Basin

The catchment area of the basin is 194,194 km², of which 2.833 km² lie in the upstream area of the Lake Tiberias. The part of the river upstream of Lake Tiberias is named the Upper Jordan River, and downstream of the lake it is named Lower Jordan River terminating into the Dead Sea. The Jordan River is 215 km long.

Table 1. Surface water resources in Jordan

Basin	Total Flow (MCM)
Yarmouk River Basin	245
Jordan River and Side Wadis Basin	199.3
Zarqa River Basin	100
Dead Sea Side Wadis Basin	44.6
Mujib Basin	106
Wadi Hasa Basin	41
Wadi Araba North Basin	46
Azraq Basin	41
Hammad Basin	24
Sirhan Basin	17.5
Jafr Basin	12.5
Southern Desert Basin	1
Wadi Araba Basin	7.8

Yarmouk River

The total catchment area of the river is 6,780 km², of which 1,160 km² lie in Jordan, and the rest lies within Syria and in the Jordan River area downstream of Adasiya. The long-term average total flow of the river is 355 MCM/year involving 246 MCM base flow and 109 MCM flood flow.

Zarka River

The catchment area of the river is 4,025 km², and receives an annual precipitation of 237 mm/year. The river has an average natural flow of 92 MCM/year. The river consists of two main branches: Wadi Dhuliel (the eastern part) and Seil Zarka (western part). The former drains flood flow, whereas the later drains both

flood flow and base flow. The river receives treated wastewater from As-Samra Wastewater Treatment Plant and other treatment plants located in the catchment area of the river.

Dead Sea

It is an internal lake, and fed by the Jordan River, and side wadis of which Wadi Mujib and Wadi Hasa are the most important. Development in the countries sharing the Jordan River have significantly reduced the discharge into the Dead Sea, which led to a drop in the Dead Sea level from 392 below sea level in 1920 to 416 m below sea level in 2003.

Wadis

Wadi is an Arabic term for used to describe a dry riverbed that contains water only during times of heavy rain. The following are the most important wadis:

1. Wadis in the Jordan River Area

- a) Wadi El-Arab catchment area. The catchment area is around 246 km². The average annual precipitation ranges from 500 mm to 350 mm, and the average discharge is 6 MCM/year.
- b) Wadi Ziqlab catchment area measures 100 km² and extends from the Jordan Valley eastwards into the highlands. The wadi discharges 8 MCM/year, of which 7 MCM is base flow
- c) Wadi Shueib. The catchment area is approximately 93 km². The average discharge is 10 MCM, of which 8 MCM is base flow.
- d) Wadi Kafrain catchment area is approximately 159 km². The precipitation ranges from 550 to 150 mm/year. Average discharge is 15 MCM/year.
- e) There are a number of other small wadis that discharge into the Jordan Valley. These include Yabis, Kufranja, Jurum, Rajib, and Hisban. Precipitation on these areas ranges from 150 to 550 mm/year. The base flow of these wadis is relatively small and is used for irrigation along the courses of the wadis and at the Jordan River foothills. Flood flows reach the lower stem of the Jordan River.

2. Wadi Araba Catchments

- a) Northern Wadi Araba catchment area is approximately 2,953 km². Precipitation ranges from 300 to 100 mm/year. Different wadis drain into the northern Wadi Araba, the main ones are Fifa, Khuneizerh, Fidan, and Bweirdh. The average annual discharge is about 11 MCM most of it base flow.

- b) Southern Wadi Araba catchment area measures 3,742 km². Precipitation levels range from 150 to 50 mm/year, hence, the area is barren with very low population density. The Wadi discharges about 10 MCM/year into the Red Sea. The Aqaba wastewater treatment plant discharges to the aquifer underlying the catchment.

3. Dead Sea Wadis

- a) Wadi Mujib & Wadi Hidan (Wala) catchment area is approximately 6,727 km²; discharge is 65 MCM
- b) Wadi El-Kerak catchment area measures 19 km²; discharge is 7 MCM
- c) Wadi Zarka Ma'in catchment area is 269 km²; discharge is 20 MCM
- d) Wadi Hasa catchment area is approximately 2,603 km²; discharge is 3 MCM
- e) There are numerous other thermal springs in the Dead Sea area discharging an average annual flow of 30 MCM.

Azraq Basin catchment area

Measures 13,173 km² and extends in the north beyond the borders of Jordan. The average precipitation is 90 mm/year. Before the development of the water resources of the basin for use in the capital, the total discharge was 22 MCM/year.

3.5 Groundwater resources

There are twelve groundwater basins in Jordan (Figure 4); these include two fossil aquifers: Al-Disi and Al-Jafar. Four of the groundwater basins receive recharge from Syria, and two share fossil aquifers with Saudi Arabia. The annual safe yield of the renewable groundwater supply is estimated to be 275 MCM (Table 2).

3.6 Non-conventional water (wastewater)

About 122 MCM/year of wastewater is treated and discharged into various watercourses or used directly for irrigation, mostly in the Jordan Valley. There are many wastewater treatment plants extending from Aqaba at the Red Sea to Ramtha at the Syria-Jordan borders (Figure 5).

3.7 Water use

Water consumption in Jordan is divided into three main uses: domestic, agricultural, and industrial. Agricultural use of water is about 64%, municipal use is 31%, and industrial use is 4%.

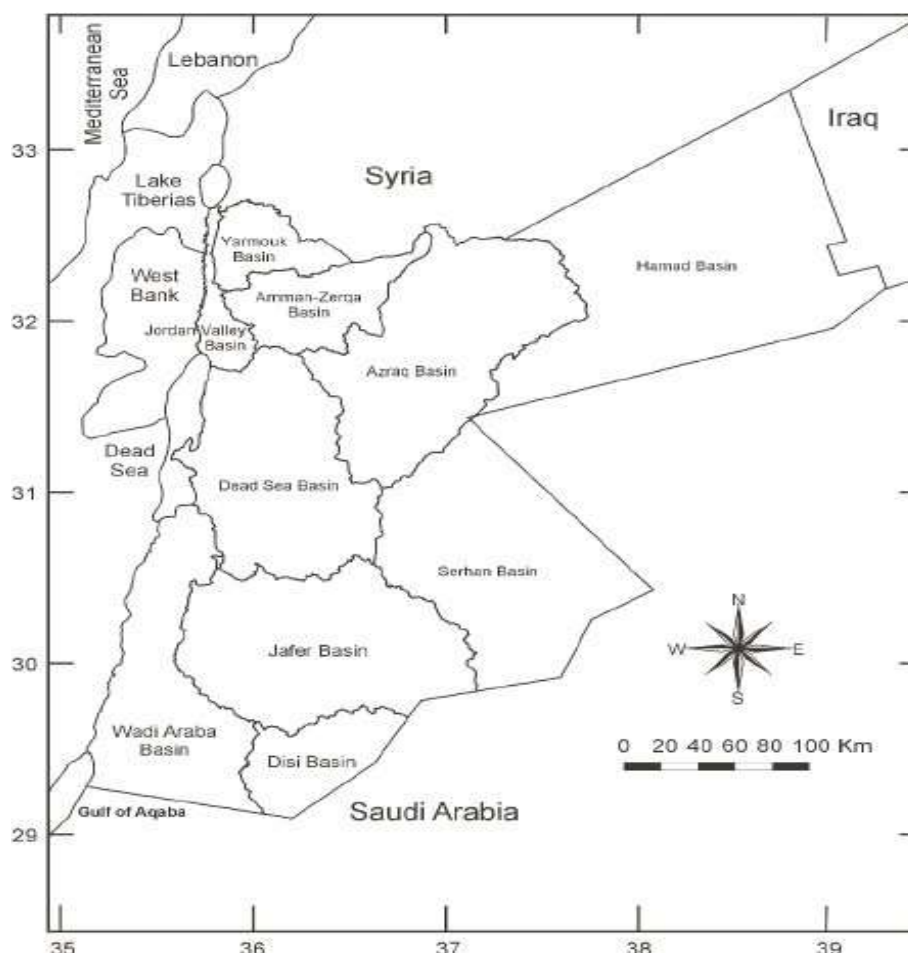


Figure 3. Surface water basins in Jordan

Table 2. Groundwater resources in Jordan

Basin	Safe yield (MCM/year)
Yarmouk Basin	40
Side wadis (north Jordan Valley)	15
Jordan Valley Basin	21
Amman-Zarka Basin	87
Dead Sea Basin	57
Northern Wadi Araba Basin	4
Southern Wadi Araba Basin	6
Al Jafr Basin	9
Azraq Basin	24
Sirhan Basin	5
Hammad Basin	8
Disi	Fossil

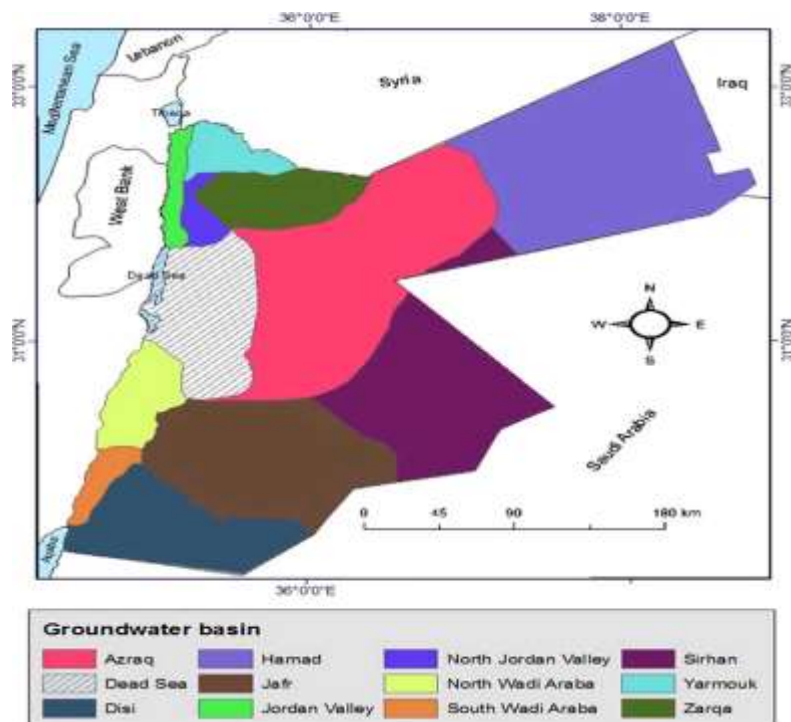


Figure 4. Groundwater basins in Jordan

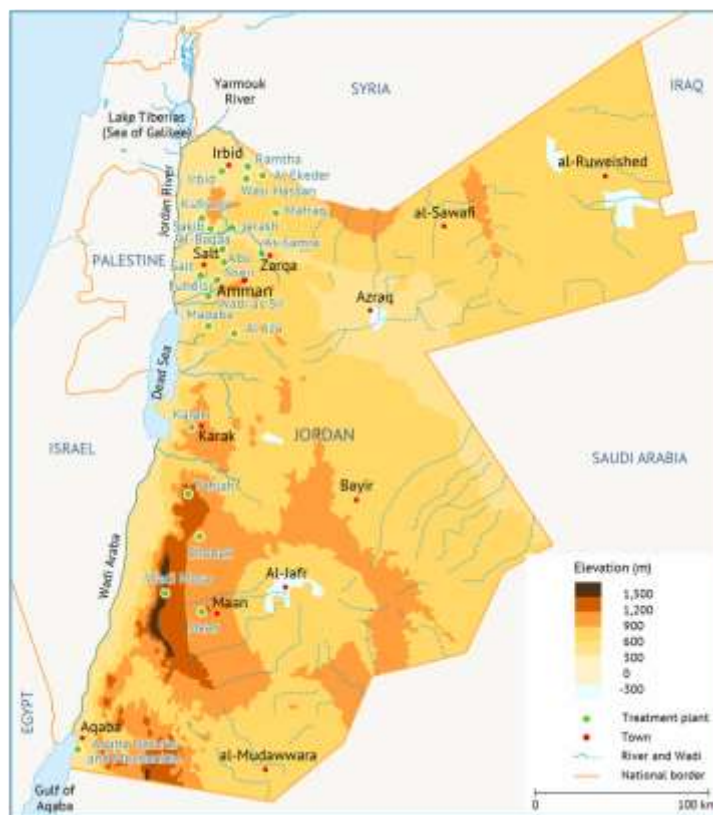


Figure 5. Wastewater treatment Plants in Jordan

4. WATER IN PALESTINE

Throughout the Middle East, the natural facts of water supply and the socio-political facts of water control, consumption and demand interplay to form a complex hydropolitical web. The allocation of the region's three major river basins - the Nile, the Euphrates-Tigris and the Jordan - are nascent sources of tension, and potential sources of conflict. Syrian-Turkish relations are strained over Turkey's South East Anatolia Project, and Egypt is concerned about possible Ethiopian development of the Nile. Of all the Middle East's river basins, however, it is the Jordan that hosts the most fraught and inflammable dispute. It is this latter area that will be the focus here. Above all, the emphasis will be upon the hydropolitical situation in Palestine (which is defined as the West Bank, including East Jerusalem, and the Gaza Strip) and Israel. Hydrologically, as well as politically, the Palestinian-Israeli conflict lies at the heart of the wider Arab-Israeli conflict. Hence Palestine and Israel should be central to our fear of yet more conflict, and pivotal to our hopes for peace and regional development. Only limited recommendations for resolving the Israeli-Palestinian water conflict will be made here. Instead the focus will be upon clarifying hydrological and political facts. Thereafter it will be the reader's prerogative to consider the ways in which an equitable and therefore sustainable - peace can be achieved.



Figure 6. The main watershed in the Eastern Mediterranean

Topographically, Israel and Palestine are characterized by three zones: (1) a coastal plain which rises up to 200 m above sea level, and stretches from northern Israel to Gaza; (2) a limestone mountain ridge, reaching elevations of up to 1000 m, most of which lies within the West Bank; and (3) the Jordan Rift Valley, located on the eastern rim of Israel and the West Bank, which drops to almost 400 m below sea level. The topography of the Palestine is shown in Figure 1. Palestine and Israel have Mediterranean climates, which are characterized by dry summers and cool wet winters. 70% of total annual rainfall falls in December, January and February: typical patterns are shown in Figure 2, which presents rainfall histograms for Hebron and Tulkarem, located in the northern and southern West Bank respectively, for the years 1991 and 1992. There are, however, substantial regional variations, conditioned by two factors: (1) Palestine and Israel are intermediate between the subtropical rainy climate of Lebanon and the subtropical arid climate of the Negev and Sinai. Hence northern areas receive more rainfall than southern areas. (2) The region's topography is a strong determinant of rainfall patterns. Highest rainfall is recorded where the land rises from the coastal plain, and on the mountain ridge's western rim. The eastern highlands and the Jordan Valley are rainshadow areas. The resultant distribution of rainfall is illustrated in Figure 7. Potential evaporation is similarly subject to local variations, although it exceeds rainfall throughout Israel and Palestine. On average, 75% of rainfall is immediately lost through evaporation. The Jordan River international drainage basin offers precious water resources to all its riparians: Palestine, Israel, Jordan and, to lesser extents, Syria and Lebanon. The chief headwaters of the Upper Jordan are the Dan, Hasbani and Banias Rivers, which rise in Israel, southern Lebanon and the Golan Heights respectively. These sources feed Lake Tiberias, below which the lower Jordan flows into the Dead Sea. The Yarmouk River, the headwaters of which are in Syria and Jordan, joins the Jordan River 10 km below Lake Tiberias; additionally, a number of minor tributaries and springs in Jordan, Israel and Palestine feed the lower Jordan and the Dead Sea, from which there is no outflow. The Jordan basin is not, however, the only water resource to which Israel and Palestine are co-riparians. Westward-flowing mountain aquifers straddle the Israel-West Bank border: while their recharge areas are largely in the West Bank, water surfaces in Israel. In addition, the coastal plains of Israel and Gaza share coastal aquifers where there is potential for salinization given mismanagement of resources. Underground sources constitute the most important water resource in the region; surface waters contribute only 30% of total supply in Israel and Palestine (Zarour and Isaac 1991).



Figure 7. The rainfall pattern in the Israel and Palestine.

Israel currently has control over the major part of the Jordan basin. Through its control in southern Lebanon, Israel is able to limit Lebanese exploitation of the Hasbani River; through the occupation of the Syrian Golan Heights, Israel controls the Banias River and minor eastern tributaries of Lake Tiberias. The Jordan headwaters are stored in Lake Tiberias, and transferred, at a rate of around 1.5 million cubic meters (mcm) per day, into the National Water Carrier, which supplies coastal and southern Israel with water (Rudge 1992). Israel also diverts an estimated 70-100 million cubic meters per year (mcmy) from the Yarmouk to Lake Tiberias (Isaac 1994).

Israel meets its water demands through this control of the Jordan River basin and the West Bank's mountain aquifers. As Figure 8 illustrates, 25.3% of Israeli water is derived from West Bank aquifers; a further 30% of Israel's water consumption is met by exploiting Lebanese, Syrian and Jordanian sources. Internal sources account for only 44.7% of Israeli water consumption. While the consequences of Israel's water monopoly on the West Bank are severe, the situation is much worse in the Gaza Strip. An arid area, located above the shallow aquifer which abuts the Mediterranean, Gaza lacks the plentiful water resources of the West Bank. Gaza currently has an annual 65 mcm of renewable water, constituting a water deficit, as over 100 mcmy are extracted from the Strip's aquifers, which are dropping by 15-20 cm per year, and becoming increasingly saline (Shawwa 1993). The lower Jordan River is increasingly ecologically damaged. Not only do Palestinians suffer through being prevented access to Jordan waters. The lower Jordan, as a result of water diversion into the National Water Carrier and the diversion of saline water to below Lake Tiberias, is an increasingly saline trickle, the quality of which is too poor even for agricultural use. In 1953, 1250 mcmy flowed under the Allenby Bridge, just a few miles upriver of the Dead Sea (Main 1953); nowadays, annual flow into the Dead Sea is a mere 152-203 mcm (Soffer 1994). The water in the lower Jordan is also highly polluted.

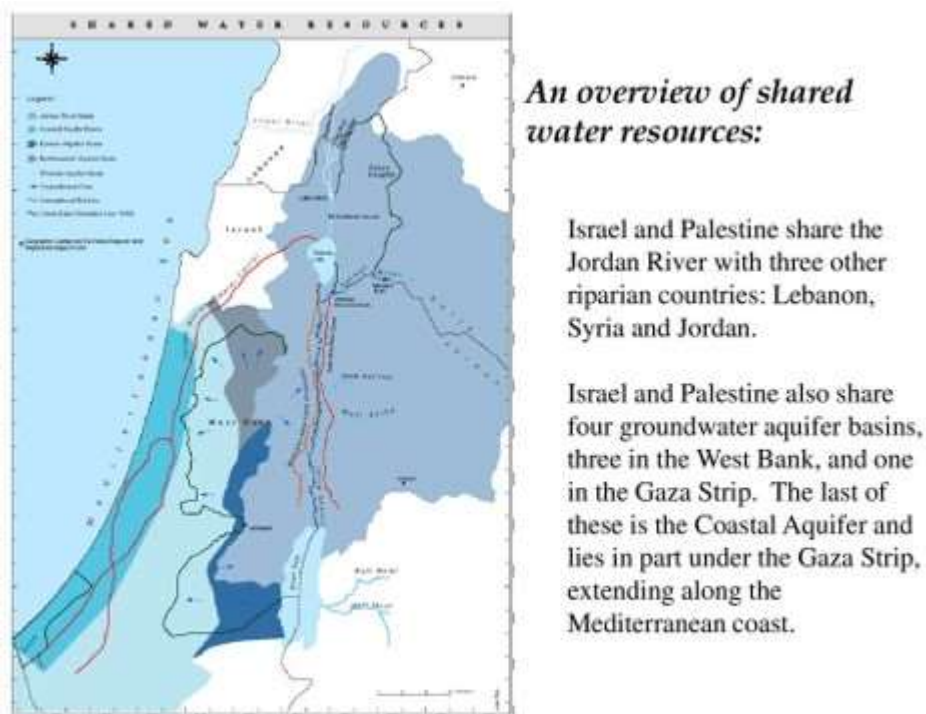


Figure 8. The shared water resources between Israel and Palestine.

Current water supplies in Palestine are simply insufficient to cater for domestic demand. Palestinians suffer from intermittent supplies of piped water, and are often forced to survive on tanked supplies for periods of several months. Some areas of the West Bank district of Bethlehem were without piped water between May and October, 1994. Comparable shortfalls in domestic supply are unknown in Israel. The prospect of substantial water demand increases in the coming years renders finding a solution to Palestine's water shortage absolutely imperative. Both the Israeli and Palestinian populations are expected to increase dramatically in the coming years, and population increase is bound to heighten demand. The calculations are premised upon the aforementioned population growth projections, and upon the lifting of current restrictions on water supplies. Thus, the projection assumes both a higher population and an increased per capita water demand. Industrial water demand is expected to increase at an annual rate of 10% up to 2000, declining thereafter: this pattern reflects a rise in the volume of the tourism and construction industries, which are likely corollaries of the lifting of occupation in the West Bank and Gaza. The projections for agricultural water demand, meanwhile, are premised upon the expansion of irrigation to areas that are well-suited for irrigated agriculture, and upon Palestinian utilization of land that is currently irrigated by

Israeli settlers. In Israel, water demand is not expected to increase at the same rate, chiefly because levels of supply, especially for the domestic sector, are adequate. Nevertheless, immigration is likely to continue to result in a high rate of population growth, and economic growth will further increase demand. Future demand will vary in accordance with the extent to which agriculture is irrigated, the extent to which further irrigation technologies are developed, and the extent to which the real cost-price of water is charged. Eckstein and Fishelson estimate that total demand will increase by over 400 mcm by 2020, to 2171 mcmy. All projections are necessarily tentative; nevertheless, the clear picture in both Israel and Palestine is one of upwards-spiralling demand. Any moves towards resolution of the Israeli-Palestinian riparian dispute must incorporate an understanding, not only of the current hydropolitical situation, but also of probable future changes in demand.



Figure 9. Water sustainability is essential for the socio-economic prosperity of the region.

5. WASEC OBJECTIVES AND GOALS

The purpose of this project is to bring together and strengthen the cooperation between companies and HEIs through the development of courses in Water Resources Management, while taking into consideration potential climate change impacts, with adaptive learning and teaching methods. HEIs are not highly engaged to the larger society that can lead to graduates less desirable by enterprises and companies. This can be alleviated by establishing truly collaborative relationship between HEIs and enterprises. This is one of the purposes of establishing the Water Network. The enterprise involvement in the course will be active and proactive. WaSec will also strengthen the collaboration among the countries of the region by providing courses that could be adopted and implemented by all the neighbouring countries of the region. Students from different countries of the region will have the chance to interact with each other through the virtual courses. The courses will utilize new learning methods and pedagogical approaches that would intrigue the interest of younger generations. Finally, the ability to practice distance-learning will assist students, particularly from rural areas of the region.

The overarching aims of WaSec are: a) develop a new culture of working relationships among HEIs and enterprises to allow HEIs better integration within the larger society. b) true collaborative efforts with enterprises to provide student support from practical placement, entrepreneurship and employability that should allow graduates to develop capacities that guarantee greater success when joining the labor market, c) graduates with a cultural, environmental and social identity that utilize water resources sustainability assuring its future while also incorporating climate change impacts. The specific objectives are: a) a Water Network among institutions involved in water management to promote HEIs and enterprise collaboration; b) new or updated courses on water management with the true integration of enterprises in English and Arabic; c) graduates specialized in water resource management specialized for the region that understand climate change implications, how to exploit the results by organizing knowledge transfer to other practitioners. Finally, the target groups are: Water Management, Environmental Sciences, Environmental Engineers, Foresters, Natural Ecosystem Management, Urban Planning students.

6. NETWORK STEPS AND OBJECTIVES

To establish a Network that will have representatives from most water sectors and from most water stakeholder groups, the first step was to compile a List of Potential Collaborating Enterprises (Deliverable 2.1.1). Specifically, the partners from Jordan and Palestine primarily but also from the EU countries compiled a list of enterprises, companies, NGOs, authorities and organizations of their countries and neighboring countries that are involved or interested in Water Management. These will be the basic members of the Network.

An official invitation will be sent to the potential members of the Water Network based on D2.1.1. In addition, policy-makers will be invited. Those that accept will be part of the Network that should be operational in November 2019 and function until the end of the project. At the same time an official document in regard to the network's purpose, responsibilities and obligations was written. The network will meet online every 6 months through Acrobat CONNECT to discuss the project's issues and results providing valuable feedback on WPs 2.2 and 2.3 Deliverables. In addition, a web portal will be developed for the Water Network on the project's website. The members will have access to documents of the project before they are placed on the website so they can provide feedback to improve them.

The goal of the creation of the Network is to strengthen and expand cooperation between existing institutions in regard to sustainable water management in the Eastern Mediterranean with an emphasis on Jordan and Palestine. This will allow the communication among authorities managing water resources and authorities responsible water protection and conservation in order to exchange expertise, best management practices and innovation in technical and scientific methodologies. The exchange of experience and best management practices will improve the sustainable management of water resources and promote economic and social development and enhance water security. This will also provide support for the monitoring, protection and conservation of water resources and potentially provide a regional framework for its monitoring and protection. The network should also provide visible assistance. This will be done by trying to establish new collaborations but also by collaborating with existing environmental and water initiatives.

The specific goals are:

Goal 1: Establish a Sharing Network among peers of the Eastern Mediterranean region that will:

Objective A: Promote true collaboration among the water institutions of the Eastern Mediterranean region

Objective B: Develop more efficient and effective management plans for water resources.

Objective C: Lead to better, cheaper water management solutions and plans

Objective D: Increase Jordan's and Palestine's but also the other Eastern Mediterranean region's countries and communities' resilience to water scarcity

Objective E: Enhanced the protection of the water resources of the region

Objective F: Support peer learning – improving their knowledge on sustainable water management.

Objective G: Create tools and resources on water management for the region

Objective H: Facilitate formal and informal communications between water institutions

Objective I: Allow countries to assist each other in the planning of management plans for sustainable water management.

Objective J: Allow countries to assist each other in regard to the management of transboundary basins and watersheds.

Goal 2: Create mechanisms for informing the general public to:

Objective A: Enhance the general public knowledge on sustainable water management and its importance

Objective B: Enhance the general public knowledge new innovative best practice on how to conserve water resources and promote sustainability.

Objective C: Develop written (brochures) and online material (website) for the general public

Objective D: Host events (e.g. workshops, awareness events) to inform the general public.

7. POTENTIAL PARTICIPANTS

Based on the goals and objectives of the Neighborhood Network all institutions and organizations that deal with water resources and water management but also those stakeholders interested in water management are potential participants. Ideally you would want all the organizations involved or as many as possible.

The target groups of the Neighborhood Network will be the key actors dealing with the management of water resources around the Eastern Mediterranean region with an emphasis on the Jordan and Palestine. These key actors' include: ministries, regional and local governmental public national services, civil protection agencies, water supply services, environmental agencies or similar organizations, NGOs, water professionals in the private sector, local development agencies, decision makers, planners, community and environmental associations, economic operators and management bodies for protected areas (including parks) individual local experts, and stakeholders.

Initially the institutions and organizations that will be invited include:

- Ministries involved with protection, conservation and/or management of water and/or of the environment (e.g. Ministry of Agriculture, Ministry of Water and Irrigation of the Hashemite Kingdom of Jordan, Ministry of Agriculture of the Hashemite Kingdom of Jordan, Ministry of Environment of the Hashemite Kingdom of Jordan).
- Regional authorities (e.g. Region of Eastern Macedonia and Thrace, Decentralized Authority of Macedonia and Thrace)
- Government agencies (e.g. Palestinian Water Authority, Service of Civil Protection and Emergencies)
- International Organizations (UNESCO Chair on E-Ect Conservation and Ecotourism of Riparian and Deltaic Ecosystems)
- Professional Associations (e.g. Arab Agronomists Association (AAA), Jordan Agricultural Engineers Association)
- Prefectures, Governates (e.g. Drama, Irbid, West Bank)
- Municipalities (e.g. Drama, Amman, Kadoorie, Ramallah)
- Municipality Water Supply Companies
- Water Companies and Enterprises (e.g. Hydro-Engineering Consultancy, Green Project SA)



- Institution managing protected areas (e.g. Management body of the Nestos Delta and Lakes Vistonida - Ismarida)
- Environmental Agencies
- Non-governmental Organizations (e.g. Terra Cypria – the Cyprus Conservation Foundation, Palestinian Hydrology Group (PHG))
- Environmental Volunteer Groups
- Universities
- Research Institutions

8. OPERATIONAL CONTEXT

Once the members of the Neighborhood Network are finalized the Neighborhood Network will start functioning. The network will be organized and directed by the Advisory Board that will be determined by the Steering and Scientific Committee of the WaSec project. There will be five main activities of the Neighborhood Network that include: a) regular meetings, b) informal meetings, c) outreach activities, d) post disasters meeting and e) pre-disaster planning. Initially, the Neighborhood Network will function primarily through regular and informal meetings, but will move toward the remaining three activities once meaningful relationships are established. After one full year of functioning of the Neighborhood Network, the Advisory board (president, vice-president and secretary) will be elected from its members.

a. Regular Meetings

1. Eastern Mediterranean Region Meeting. The Neighborhood Network member of all countries will interact formally with each other every six months with online meeting that will be organized by the Advisory Board.
2. National meetings. The Neighborhood Network member of each country will also meet every six months. These meetings could be either in person or online.

b. Informal Meetings

1. Among the Advisory Board and members(s). These meeting can be either online through email or phone calls.
2. Among the members of the Neighborhood Network. These meeting can be either online through email or phone calls.

c. Outreach Activities

1. The Neighborhood Network members can set-up and host Workshops.
2. The Neighborhood Network members can set-up and host Awareness Events.
3. The Neighborhood Network members can present the WaSec project on other conferences, workshops, seminars, awareness events etc.

9. COMMUNICATION STRATEGY

The communication strategy of the Neighborhood Network members will rely on both formal and informal communications mechanisms. The method of communication will depend on the goal and purpose of the communication. Initially the following tools are expected to be utilized:

- Online meetings with SKYPE
- Online meeting with the ACROBAT Connect
- Project website
- Project web-portal
- Emails
- Conference calls
- In person meeting
- Workshops
- Informal meeting among the members of the Advisory board

Communication will also be established between the Neighborhood Network and the stakeholders and general public to share some resources and information. In these situations, the communications mechanisms used will be the following:

- Project website
- Project web-portal
- Facebook, twitter, linkedin
- Discussion forums organized by questions
- Compiling best management practices and guidelines

10. TIMELINE

a. Phase 1 – April to November 2019

1. Compile a list of the potential members of the Water Network
2. Write the first draft of the draft of the Neighborhood Network profile
3. Invite potential members
4. Have an online meeting with the members that have accepted to be part of the Neighborhood Network
5. Test pilot communications mechanisms

b. Phase 2 – December 2019 – November 2020

1. Finalize Neighborhood Network members of all countries
2. Finalize the Neighborhood Network profile
3. Establish communications mechanisms
4. Operational Neighborhood Network website
5. Have online meeting with Neighborhood Network members every 6 months
6. Build relationships among members
7. Establish the Neighborhood Network Advisory Board

c. Phase 3 – December 2020 - November 2021

1. Continue online meetings with Neighborhood Network members every 6 months
2. Create a resource guide
3. Identify potential toolkit components
4. Participate in national project workshops
5. Identify scientific gaps (use survey monkey and questionnaire in workshops)
6. Elect the New Neighborhood Network Advisory Board

d. Phase 4 – December 2021 - future

1. Consider potential expansion; invite additional members
2. Identify potential sources for additional funding
3. Identify potential pilot projects (best management practices, recovery, training, etc.) and seek funding.



4. Work on finalizing toolkit



11. EXPANSION OPTIONS

a. Additional funding

In order to maintain and expand the Neighborhood Network additional funding will be required. This is particularly true after November 2021 when the funding from the ERASMUS + WaSec project will end. One of the main objectives of Advisory Board but also of the Neighborhood Network will be able to find potential source and try to secure additional funds.

b. Additional members

Additional members for the countries involved will be invited to participate after the Neighborhood Network is well established (after November 2021).

c. Additional countries

The goal is to have all the countries of the Eastern Mediterranean Region. Once the Neighborhood Network is well established (after November 2021), members from the other countries that are not currently involved, will be invited to participate in the Network.

d. New projects

The Neighborhood Network should continue to expand its current projects or develop new innovative ones in regard to sustainable water management. Such potential projects could include:

1. Areas hit by disasters could invite mentors from the Neighborhood Network
2. New booklets, books, webinars etc. on success stories and best management practices in regard to water
3. Awareness events to enhance the knowledge on sustainable water management and how to enhance the conservation of water resources
4. Training modules for sustainable water management
5. Toolkit for water resources conservation in arid and semi-arid regions.
6. Workshops to show best management practices to achieve sustainable water management
8. Research projects that will enhance the current state of the science in regard to sustainable water management in the Eastern Mediterranean

12. SUCCESS MEASURES

a. Measures

The success of the Neighborhood Network will be based on:

1. The number of members accepting the invitation
2. Levels of members' participation and engagement
3. Informal interactions
4. Sustainability of the network
5. Awareness of the Neighborhood Network by the stakeholders and general public
6. Enhanced awareness of the general public of the countries of the project on the importance and best practices on sustainable water management.
7. Number of new members enrolment

b. Measurement tools

Some potential tools to measure the success are:

1. Measurement of website and web portal visitation
2. Measuring network reach
3. Measuring levels of members' participation and engagement
4. Measuring number of participants in workshops and awareness events.
5. Measuring Neighborhood Network involvement in situations regarding sustainable water management

13. CONCLUSIONS

Water is essential for the socio-economic development and security of every country. Unfortunately despite living on blue planet that is covered mostly with water, freshwater supplies are actually quite limited and have remained approximately the same from thousand of years. The exponential increase of humans along with the impending impacts of climate change will only increase the pressure on water resources and the competition among the different sectors and countries. Climate change is leading to more evapotranspiration, alteration of precipitation patterns, less snow events and in general more extreme events and a quicker hydrologic cycle. It is appearing that for short periods of time there will be excess of water (e.g. flooding) while for the rest of the time water scarcity (e.g. droughts). These impacts will be even more severe in regions that are already arid or semi-arid such as the Eastern Mediterranean.

The only way to survive these new emerging conditions is the development and implementation of sustainable water management plans at the watershed scale that will incorporate new techniques such as integrated water resources management, ecosystem-based approaches and nature-based solutions. Such techniques can only be truly implemented with the participation of all sectors interested in water along with inclusion of the stakeholders. In addition, with many watersheds and basins being transboundary the collaboration of riparian countries will be another key component for sustainable water management.

The new conditions will require water managers that are well trained in the new emerging conditions and with these new and innovative techniques. This is the main purpose of the ERASMUS + program funded project "Innovations in Water Education: Enhancing Water Security and Socio-economic Development in the Eastern Mediterranean under Climate Change" with the acronym "WaSec."

Many projects have developed many innovative tools and educational programs that in most cases are very theoretical and not very applicable to real life situations. One of the major reasons for being mostly theoretical was because they were based primarily on input from universities but lacked the feedback and consultation from people that the tools were developed for would hire the graduates of the water program.

One of the main purposes of the establishment of Neighborhood Network is to have an active role during the development of all the deliverables of this project. It will provide the members the opportunity and evaluate and provide feedback by the people that will hire the graduates from this educational program. This will allow the development of a material that is user-friendly but at the same time will meet the needs of the water job market thus making the graduates more attractive to them.



The Neighborhood Network will also allow professionals for the same field from around the Eastern Mediterranean region to come in communication with each other and enhance the cross-border communication and strengthen collaborations by exchanging experience in regards sustainable water management. This collaboration is necessary since watersheds and basins do not follow political boundaries.

This network will also be an expert group that will be able to offer support, education and management plans in regard to sustainable water management in the Eastern Mediterranean. These plans will allow communities to become places that will their water security and improve the management of their current water resources or find new water resources.

Finally, this network could also be an instrument to continue the innovative work after the project is terminated. The pressure on water resources will continue to be a threat for the security of the region and the best way to face it is by being proactive. Having an active network in the region with the scientific and practical expertise can help mitigate future problems on sustainable water resources.

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This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.