



Enhancing Water Management Capacity in a Changing World

“Transboundary Waters and Conflicts: Managing Water for Peace”

***TRANS-BOUNDARY WATER
MANAGEMENT IN WESTEREN PART
OF JORDAN
CHALLENGES & SOLUTIONS***

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Introduction

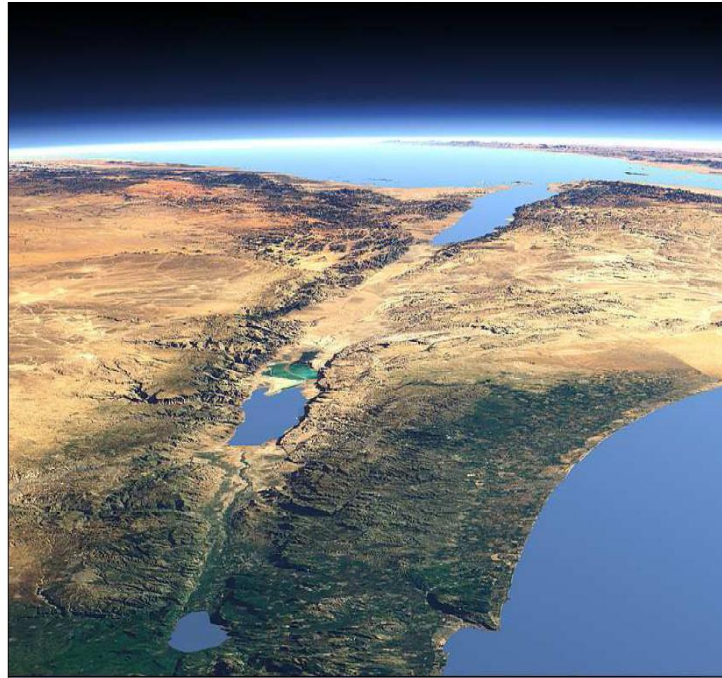
- Middle East is the key of world political and security stability, which is reflected by its strategic geographic location.
- Water was and still the most important reasons for conflict in the area; where the United Nations warned that climate change harbours the potential for serious conflicts over water (Barnaby, 2009).
- So, it is important to find radical solutions to water shortages in the region to avoid new conflicts and wars in the region.



Introduction

- The importance of this study stems from the fact that the subject of this research (Trans-boundary Water in Western Part of Jordan) forms the major water resource to many countries in the region as well as this water forms the half of Jordan's water needs.
- Jordan was depending heavily on the Jordan River system; where there are no other important sources of fresh water available to Jordan which suffered from water shortage (Miriam, 1995).

Welcome to Our World



What will happen to a country which has lost half of its water resources, and classified among the absolute water scarcity countries?



Introduction

- A significant increase in population has led to a sharp decrease in per capita water availability in Jordan, which dropped from 3,600 cubic meters in 1946 to 145 cubic meters in 2008.
- The rates of demand far exceeds supply rates due to uncontrolled internal and external variables;
 - natural population growth,
 - migrations,
 - climate change effects,
 - Jordan's neighbors seized all the surface trans-boundary waters, which led to great pressure on groundwater resources.

Main Trans-boundary Water Resources in Jordan

- *Currently*, the Yarmouk River is the largest source of external surface water, which accounts for 40% of the surface water resources of Jordan, including water contributed from the Syrian part of the Yarmouk basin.
 - It is the main source of water for the King Abdullah canal, and is thus considered to be the backbone of development in the Jordan valley.
- Other major basins include Zarqa, Jordan river side wadis, Mujib, the Dead Sea, Hasa and Wadi Araba.

Jordan River Basin Boundaries, the source: NSU



Main Trans-boundary Water Resources in Jordan

- In 1997 the total amounts of surface waters in Jordan was about 600-680 MCM/Y, Yarmouk River and Jordan River were the main resources; side Wadis and Zarqa River formed the rest of surface water resources.
- According to the Jordanian-Syrian agreement, in 1953 Jordan share of *Yarmouk River* was **370 MCM/Y**; while Jordan's share from main stream of Jordan River was **100 MCM/Y** according to *the Johnston plan 1953-1955*, while side valleys and Zarqa River contribute by 130-200 MCM/Y.

Main Trans-boundary Water Resources in Jordan

I. Yarmouk River

- Yarmouk River originates from southwestern Syria and flows southwest to its confluence with the Jordan River.
- For most of its total course of about (80 km), it forms the boundary between Syria and Jordan, also forms the border between Israel and Jordan close to the Jordan Valley (Jordan's Water Strategy, 2008).

Main Trans-boundary Water Resources in Jordan

- More recent measurements indicate a decline in the river discharge due to the *increasing of extractions from the groundwater in the catchment's area*, and because of *upstream* (Syrian and Israelis) *development works* which have been done in the 1980's, in addition to the *precipitation decreasing* in the last five decades, which leads to declining base flow.

Main Trans-boundary Water Resources in Jordan

- The Jordan's share of Yarmouk River has been decreased from *370 MCM* in *1950* down to just *15 MCM* in *2010* according to Ministry of Water and Irrigation in Jordan.
- Where there were several factors led to this tragic outcome; the most prominent of these factors was the *dominance of neighboring countries* militarily, economically and geographically.

Main Trans-boundary Water Resources in Jordan

II. Jordan River

- With about 1,400 MCM, the Jordan River is the smallest major watershed in the region.
- However, because of its geopolitical position, this river has been described as "*having witnessed more severe international conflict over water than any other river system in the Middle East and remains by far the most likely flashpoint for the future*" (Anderson, 1988).
- Jordan River is a smallest trans-boundary river of the Middle East; its basin drains an area of 18,300 km² in five countries: Jordan, Palestine, Lebanon, Syria and Israel. With an annual flow of 1.4 km³/y, the Jordan River constitutes the smallest basin in the region.

Main Trans-boundary Water Resources in Jordan

- Many plans had been proposed for the distribution of Jordan's river water, but no one agreement was signed.
- Johnston plan was subject to many modifications; finally a unified plan was reached and named the (Unified Plan), Table 1.

Table 1: The Unified Plan of Jordan River Basin

Source	Lebanon	Syria	Jordan	Israel	Total
Hasbani	35	-	-	-	35
Banias	-	20	-	-	20
Main Jordan stream	-	22	100	375	497
Yarmouk	-	90	377	25	492
Side Wadis	-	-	243	-	243
Total	35	132	720	400	1,287

Main Water Distribution Plans of the Jordan River Basin

- The Franghia Plan in 1913.
- The Lowdermilk Plan in 1944.
- Johnston Plan in 1953.
- Arab plan in 1954.
- Cotton plan in 1954.
- Unified plan in 1955.

Table 2. Annual Allocations Under the Different Plans
(MCM)

Country \ Plan	Johnston	Arab Technical	Cotton	Unified
Jordan	774	861	575	720
Syria	45	132	30	123
Lebanon	-	35	450.7	35
Arab States	819	1028	1055.7	878
Isreal	394	200	1290	400
Total	1213	1228	2345.7	1278

Main water agreements of the Jordan River Basin

- It is difficult to subdue environmental and natural resources to the political boundaries which are man-made.
- Whatever the degree of hostility between any two states, at the end there should be an agreement or understanding to regulate the uses of shared resources.
- Since it was founded in 1948, Israel has controlled all the main water sources in the region. Its biggest concern was to get as much water as it can; Water was the main reason of most wars carried out by then.

Main water agreements of the Jordan River Basin

- In 1967 by occupying the Golan Heights and the West Bank, Israel by using its military dominance, worked on changing the geographical reality of the region in order to *control the headwaters of the Jordan River*; and thus, became upstream and the controlling state to the most important water resource in the region.
- In fact, since Israel has full control in Jordan river basin, the Israelis were not interested in any agreement unless such agreement was achieved based on of the following conditions:
 - *First: any agreement provides a legitimate cover for the Israeli occupation of the water and land in the region.*
 - *Second: any agreement that provides an access to new water sources.*

Main water agreements of the Jordan River Basin

- In the 1980s, a discreet agreement was reached between Jordan and Israel, to make arrangements on the Yarmouk River for sharing its waters.
- The most important agreements were the Jordanian Syrian agreements (1953 and 1987) and Wadi Araba peace treaty which signed in 1994 between Israel and Jordan.
 - According to these treaties, Jordan's share of water from Yarmouk and Jordan rivers was defined.

Jordanian-Syrian agreements on the Yarmouk River water *1953 & 1987*

- The first Syrian-Jordanian Agreement was signed in 1953, which relates to the use of the Yarmouk River for both irrigation and hydroelectric power generation.
- Based on this agreement,
 - Syria would use the higher springs of the River for irrigation while the balance of the water would flow downstream into Jordan and generate hydroelectric power for both (Khorri, 1981).
 - Jordan's share of Yarmouk River waters should not be less than 315.36 MCM/year (Yaromuk Water Treaty, 1953).

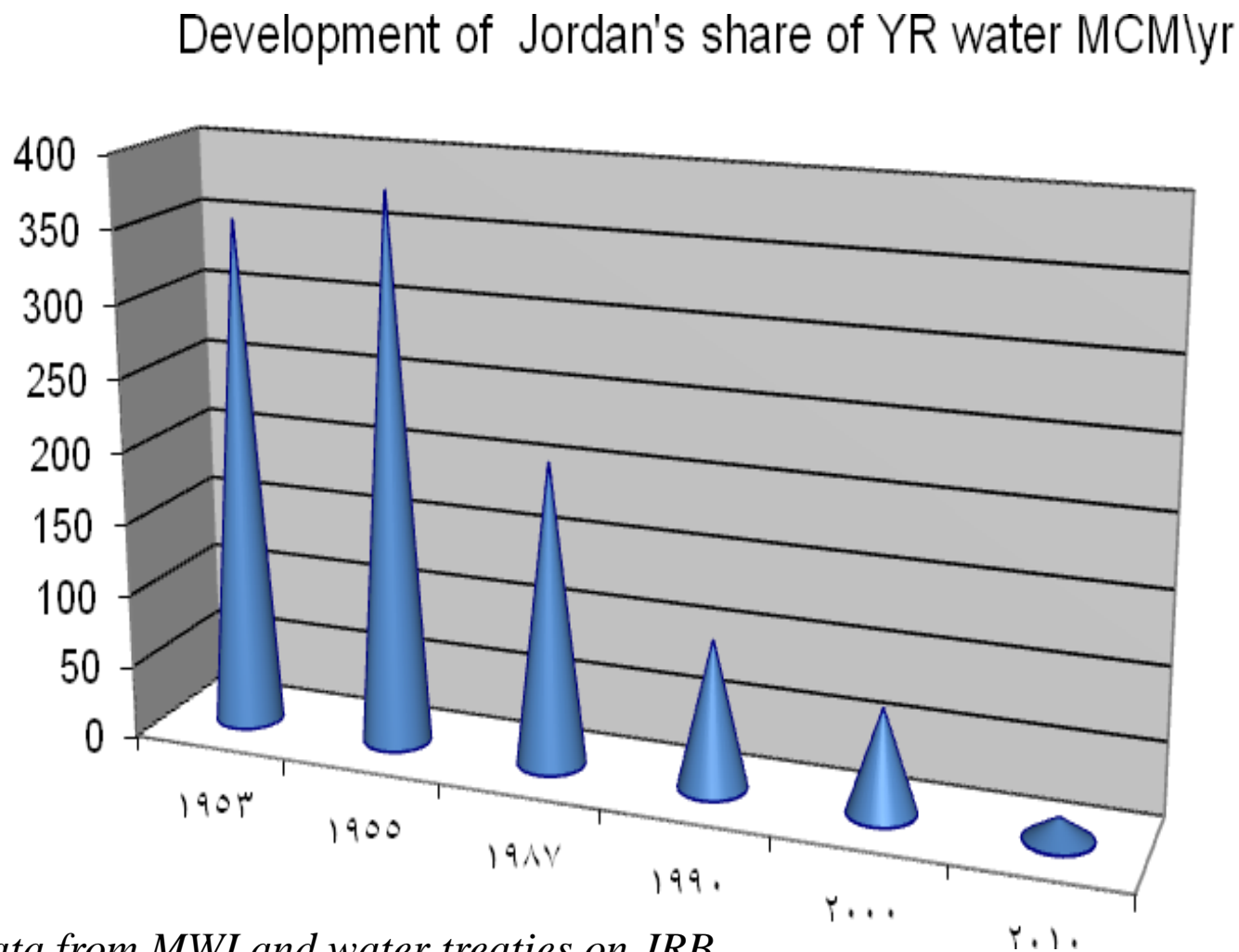
Jordan-Syrian agreements on the Yarmouk River water 1953 & 1987

- Based on the development of the situations on the ground in terms of growth of water demand in the region, the 1953 agreement has been modified by 1987 agreement, where under this agreement *Jordan gave more than one-third of its share of the Yarmouk River waters to the Syrians.*
 - *Note that Jordan needs to increase its share not to decrease it, because it does not have any water resources substitutes, and still living under water crisis.*

Jordan-Syrian agreements on the Yarmouk River water 1953 & 1987

- The historical Jordanian share from Yarmouk River was equal one third of Kingdom water consumption (MWI, 2010).
- *Jordan's share of Yarmouk River water decreased dramatically from 377 MCM/year to 15 MCM/year* (Figure 1.1).
- Three main reasons led to this bad end for Yarmouk River in Jordan where any drop of water has extremely value;
 - Power balance.
 - The geographical location, where Jordan not only classified as arid to semi arid region but also as a downstream country.
 - The effect of climate change, where this phenomenon has strong effect on the region, which led other countries to capture any water resource.

Figure 1.1: The development of Jordan share of YR water 1953-2010



Source: the data from MWI and water treaties on JRB.

Jordanian-Israeli agreement on the Yarmouk and Jordan Rivers water, Peace treaty 1994 (Wadi Araba Peace treaty)

- In October 1994, Israel and Jordan signed a Peace Treaty.
- As part of this treaty the two countries agreed to settle their differences with regard to the claims both countries had to the waters of the Jordan River basin.
- The result is that Israel is to keep all the waters of the upper Jordan basin, totaling more than 600 MCM/year. In the lower part of the River basin Jordan got a small share of the waters from the mainstream, together with a more sizeable proportion of the flow of the Yarmouk.

Jordanian-Israeli agreement on the Yarmouk and Jordan Rivers water, Peace treaty 1994 (Wadi Araba Peace treaty)

- The volume of water which Jordan will now have access to is considerably less than the water allocations of the Johnston Plan of the 1950s, which was an independent attempt to divide the waters of the Jordan River in a reasonable manner. On the other hand Israel's share is considerably greater.
- Overall, *the treaty was particularly favorable for Israel.*

Main water agreements of the Jordan River Basin

- As for the impact of these agreements on the water situation in Jordan,
 - Jordan waiver of one third of its legal share of the Yarmouk River to the Syrians and bear very expensive costs to establish Al Wehdah Dam; although existence of an agreement and a joint committee, but the amount of water in the Yarmouk River has decreased and almost disappeared.
 - For the Israeli side, regardless of the convention justice, they showed cooperation in the application of some of what came in the Wadi Araba Treaty. For the water quality there were several issues.

Summer of 2011

- In the hot summer of 2011 many regions and villages in Jordan did not receive water for weeks or month; in some cases, people demonstrated in the streets where a violent incidents and riots happened because of the disruption of water for long periods.
- Moreover, all groundwater aquifers have been exploited to more than 170% of its safe yield (MWI, 2011).



a sustainable solution is needed

Methodology Used

- To address water crises in Jordan, simple methodology was adopted that can be summarized by answering three questions in three parts;
 - In the first part, the following question was answered:
What will be the direction of the water balance in the coming period under expected conditions?
 - This part consisted of seven scenarios which can be used to examine wide variety of variables and challenges that may face Jordan in terms of water up to 2025.
 - These variables would be *population growth, water demand, potential impacts of climate change* on water availability, and *impacts of migrations*.

Methodology Used

- In second part, while Keep in mind that Jordan stands somewhere between Zero and 1000 CM/y on the water poverty line: *What is the maximum effect of the application administrative measures regarding to the (145 CM/capita/year)?*
 - To answer this question the study had examined the effects of applying different alternative tools in managing water issues such as wastewater treatment and water harvesting on the Kingdom scale.

Methodology Used

- In the third part, after knowing the direction of water deficit under all expected conditions, and the effect of using various administrative tools, *the potential impact of the application of one of the important sustainability principles in water field, a regional cooperation* was examined. The final question is: *Is it possible to change Jordan movement's direction along water poverty line through regional cooperation?*
 - *At this step five scenarios were developed, each scenario includes a number of countries in the region that can cooperate among themselves in the water issue, in each scenario a group of region countries has been selected, were considered as a single entity, on this basis the calculations of Population growth rates and the quantities of renewable water was carried out.*



Results

- Part I: *Scenarios of Future Challenges of Water Sector in Jordan.*
 - According to different scenarios used, It was found that the water deficit will increase to rate that cannot be controlled.
 - In first group we examined the potential effects of variant factors which may affect water availability in Jordan under different conditions, where it found that Jordan will face continues water deficit whatever used of classical water management tools (Table 2).

Table 2: Water Deficit According to Different Potential Scenarios 2007– 2025

Scenario	Deficit Average MCM/Y	Deficit rate to Available amounts
Scenario 1	542	55%
Scenario 2	616	58%
Scenario 3	871	77%
Scenario 4	1062	120%
Scenario 5	1102	130%
Scenario 6	1405	165%
Scenario 7	1551	187%

Results

- Part II: *Managerial options. Impact of applying of traditional tools on domestic water sector scale in Jordan.*
- *Comprehensive water management on a family scale.*
- *The effect of applying Wastewater treatment on Kingdom scale.*
- *Water Harvesting System (WHS).*
 - The total saving by use all previous procedures was about 6% of available amounts of water.
 - If we take into consideration the non-revenue water, this means that the maximum saving by using all administrative tools will not exceed 4% of the (246 MCM) which used by domestic sector.

Results

- Part III: *The Effects of application regional cooperation.*
 - The last group of scenarios, by applying the regional cooperation, it was found that Jordan's share of water for example, will rise immediately to 2000 CM per capita per year, while it would reach to 1300 CM per capita per year at 2025, comparing with 145 CM per capita per year recently, and with 90 CM per capita at 2025 (MWI, 2009).
 - Also, the per capita per year for every country in the region was between 1632 - 2547 according to the 2011 population numbers, and it would be between 1322–2093 by 2025.



Results

➤ Part III: *The Effects of application regional cooperation.*

- Also, it was clear that the regional cooperation in terms of water will achieve water security for all countries with lowest costs, which will reflect on all other sectors especially in energy field and environmental protection, achieving more of welfare and social security to the region's countries.

In Conclusion....

- *The environment does not recognize the political boundaries. So, the sustainable solutions of natural resources scarcity will depend on this principle.*
- *The cooperation of the region in the water field will achieve good returns to all countries in the region, especially if it accompanied by establishment of common markets.*
- *The existence of common interests among nations, would contribute to avoiding conflicts, which will direct the capability of these countries into the development efforts, which would expand the concept of sustainable development to include largest number of states and peoples.*



Thank
You