

**WATER BALANCES IN THE EASTERN  
MEDITERRANEAN: SUMMARY OF A WORKSHOP**

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## **FOREWORD**

The author organized the Workshop on Water Balances in the Eastern Mediterranean, which forms the basis of this paper, at Carleton University on October 30, 1998. The workshop was co-sponsored by the Center for Defence and Security Studies of The Norman Paterson School and the International Development Research Centre (IDRC). The author gratefully acknowledges the financial assistance he received for this project from the Centre for Security and Defence Studies, the Canadian International Development Agency (CIDA) and the Dean of the Faculty of Public Affairs and Management at Carleton University. The contribution of Keri Holtby as the Workshop rapporteur is also gratefully recognized.

## INTRODUCTION

Determining the water balance for a country or a region is a complex undertaking because of a great variety of factors that influence supply of and demands for water. On the supply side, there are weather and climatic factors, which cause variation from season to season or year to year. On the demand side, the price and subsidy levels greatly influence consumption and economic use of water. Additionally, estimates of water balances depend on bureaucratic efficiency, in particular the quality and frequency of statistical data collection. Last, but not least, there are political factors, such as national boundaries on the map that do not coincide with natural watersheds, or strategic security concerns of neighbouring countries which give rise to conflict rather than cooperation between upstream and downstream states. All of these difficulties exist in the Eastern Mediterranean region, roughly defined as countries bordering on the Mediterranean from Egypt in the South to Turkey in the North.

Yet, despite all of these difficulties regional cooperation in this region is essential. This is partly owing to the need for consolidating and strengthening the Arab-Israeli peace process. Even more fundamentally regional cooperation in water management is essential because the region as a whole is already experiencing critical water shortage. Indeed, projections by the year 2025 indicate that the shortage problem, unless effectively remedied in the meantime, will reach crisis proportions. New technologies in the field of desalinisation of seawater, recycling wastewater or the emergence of an import-export market in water are some intriguing opportunities for solving the Middle East water crisis in the next century.

The authors of papers at the Workshop held at Carleton University on October 30, 1998 were invited to analyse and discuss, at least in tentative ways, the salient issues concerned with water balances in the Eastern Mediterranean while also exploring prospects for regional cooperation. The design of the Workshop was deliberately based on a broad definition of the region of the Eastern Mediterranean in order to transcend the Middle East water issue as strictly an Arab-Israeli problem. This perspective is inadequate for solving the long-term Middle East water shortage as it implies a *Zero-Sum* view of the problem. One option for breaking out of the *Zero-Sum* dilemma is to include Turkish water as a basis of wider regional cooperation. Thus, Turkish participants were invited to the Workshop and the authors of the papers were requested to examine amongst alternatives the costs and benefits of large-scale water imports from Turkey. As was demonstrated during the Workshop, a water market is slowly emerging in the region, starting, on a small-scale, with shipment of Turkish water to North Cyprus.

One major omission in the Workshop was the absence of any Syrian input. Although efforts were made at the planning stage, in the end this proved unfeasible at this time. However, in future Workshops it is hoped to remedy this deficiency.

The key elements of the Workshop papers are summarized below. It is hoped that these papers represent a modest start on a difficult road, but an essential step on the road to a wider regional cooperation in such a vital and critical development resource as water.

A country-by-country review of water balances follows based on presentations delivered at the Workshop together with the discussion that followed in each case.

## SESSION I

In this session there were three papers presented on water balances in Lebanon, Israel and the Palestinian Authority. After the presentations a lively discussion took place. Below is a summary of the presentations and the discussion.

### Lebanon

**Dr. Hussein Amery** began by noting the diversity of estimates on Lebanon's water balances. Two such estimates, summarized in Table 1, range from 2,600 to 3,375 cmc/year. He argued that many factors amount for the discrepancies behind these figures, including timeliness of the estimates, climatic factors as well as the politics of boundaries.

**Table 1**

### Hydrological Budget of Lebanon: Two Perspectives

	Water budget According to Litani River Authority	Water budget According to Mallat(1982)
Total precipitation in Lebanon	+ 8,600 mcm/year	+9,700
Evapotranspiration	- 4,300 mcm/year	5,075 (includes groundwater seepage in Lebanon, and from South Lebanon into Israel and the sea)
Percolation to groundwater and flow to the sea	- 880 mcm/year	- 600 (excludes water flow to sea)
Flow to Israel Hasbani River	- 160 mcm/ year	- 140
Ground water flow to Huleh and northern		

Israel	- 150 mcm/year	
Flow to Syria		
Assi River	- 415 mcm/year	- 415
Elkabir River	- 95 mcm/year	- 95
Net available surface water		
+ 2,600 mcm/year		
+ 3,375		

**Dr. Hussein Amery** highlighted the key hydro-geographical features in Lebanon. There are two mountain ranges running North-South, with high precipitation on western side of mountains and mountain peaks. However, due to the topography of the landscape the country is broken into four hydrological zones with three primary rivers, viz. the Litani, Assi/Orantes and the Hasbani. Dr. Amery's paper, however, concentrated on the former two.

At the present time, Lebanon's river systems are far from optimal development for irrigation and for hydroelectric generation. Although there are proposals for up to 40 dams, only about 16-20 have been taken seriously to store excess water from the wet season from November to April. In the southern section of the Litani River there is a 600m drop (60 km in range) that could be harnessed for hydra generation.

The Litani is Lebanon's largest river in terms of "flow and passion." It "represents the life of Lebanon." Many hold that the Litani is the key to economic success of Lebanon. However, there is widespread unspoken fear of Lebanon's inability to control the Bekaa Valley, the source of the Litani. One consequence of this inability is that it is hard to get accurate figures about water flows. Most records are from the 1920s & 1930s. Moreover, the civil war has resulted in a scarcity of water data in Lebanon, whatever data was collected was done haphazardly by "keen employees." Overall, the official database remains inadequate and out of date.

There are also problems with estimates of renewable water resources in Lebanon. Measurement is difficult because it is impossible at the present to determine and decide what is Lebanese water. The methodology for collecting data is not available, so it remains unclear how the responsible ministry has arrived at official numbers. Consequently, water consumption figures are contradictory. In terms of agriculture, 87,500 hectares are under irrigation, with potentially 177,500 hectares available for irrigated agriculture. There is also an on-going dispute between the urban and rural Lebanese over the distribution of water; there are discussions underway for a project that would divert 500 000mc of water per day from agriculture to Beirut. Currently two projects were started in summer 1998 to build irrigation canals.

So far as the Assi River is concerned, it issues in Lebanon, passes through Syria and then enters the disputed province of Hatay in Turkey. At the present time, there is a deal between Lebanon and Syria regarding sharing of the waters of the Assi whereby if water is at 400 mc or above Lebanon gets 80 mc.

Water quality in Lebanon is also emerging as a concern in Lebanon. Increasingly, the citizens are becoming worried about water quality. Green Peace in Lebanon has found toxins sitting next to the Litani River on top of the aquifer. A significant factor in water quality is the inadequacy of the existing sewer infrastructure. It is noted that only 71% of the population have sewer systems.

In conclusion, Dr. Amery made the following observations and recommendations. Although Lebanon is currently rebuilding its economy and infrastructure at a rapid rate, it is neglecting water quality and quantity concerns. Water production and distribution systems are inadequate. Consequently, Lebanon is water-poor largely because its water infrastructure is grossly inadequate. It is therefore recommended to refurbish, enlarge and add to existing water infrastructure, to update hydrological maps; and to provide better drainage.

### Israel

In his comprehensive paper on Israel, **Dr. Harvey Lithwick** first examined the traditional factors shaping water balances, providing a stock-and-flow estimate from major sources to 1990 (Table 2), and then concentrated on calculations of water's scarcity value. Using a supply-demand framework for water in Israel at the present and in future, he discussed alternatives on how to increase water supplies and how to promote rational management of demand, principally by means of a more efficient pricing policy.

At the present, Israel gets its water from three sources, viz. the Sea of Galilee, Coastal Aquifer, Yukon Aquifer; plus there is recycled sewage water (453 man of sewage water was available for use, 113 of it was treated and used for irrigation mainly in the Negev region). Israel has 2600 mcm/yr. of water much of which is under dispute and therefore much less is being used. Evaporation of water equals 1/4 of total inflow. As much as 50% of city water is lost due to poor pipes, this may reflect the IOW price of water and is perhaps an issue to be examined in the future.

**Table 2**

**Stocks and Flows of Water from Major Sources  
 TO 1990  
 (MCM)**

Source	Net Outflow	Overutilization	Accum. Deficit
Underground			
1. Coastal Aquifer	240-455	34-80 (1980-90)	100-1400
2. Local Aquifers	23-280		Small
3. Mountain Aquifer	300-330	50 (1980-90)	300-350
Surface			



4. Sea of Galilee	575-950	25 (1980-85)	140
5. Floods and Treated Sewage	200-230		
Total	1890-2311		1570
Water Losses	60-100		
Balance	1790		

How can Israel increase its water supplies? Five major options are available:

1. Program to capture rain water and hold it in micro-dams and ponds: the problems with this option is that ponds silt up and lose efficiency, now starting to see construction companies mine the silt and use it for building material;
2. Desalination of sea water: the cost is estimated at \$0.8-1 .00/mc, remains Israel's "ace in the hole" in terms of cheapest alternatives;
3. Import water from Turkey by tank, which is an expensive option: the Turks would need to re-scale price to maintain domination of water market;
4. Buy water from Lebanon; and
5. Canals priced at \$1-2 MC; however, severe environmental impacts make this an unfeasible option.

Turning to the demand side there is increasing efficiency in utilisation of water in agriculture. This stems from several factors, such as new irrigation techniques; differential pricing of water in different sectors and regions, with agriculture being the cheapest and residential the most expensive. However, overall pricing policy is problematic because the subsidies and problems of allocation have a direct effect on efficiency. In future, it is hoped to use more and more treated sewage water for agricultural needs, but Israel feels that in the long run it will have a major water shortage crisis. As well, environmental costs are increasing due to increases in nitrate levels.

Realistic water pricing is key to efficient water use and management. Authorities in the last 7-8 years have begun to press for real prices of water (phasing out subsidies). As a result, the agricultural sector has reduced usage of fresh water and increased usage of treated water through crop changes. Professor Lithwick argued that initiatives for innovative alternatives should come from the market and prove themselves on the basis of cost and efficiency. As well, Israel needs to look into alternative plans to deal with droughts.

Since water is held as a symbol of national security and not simply a commodity, this makes it harder to penetrate the problems and look to transnational solutions and

reallocation. Water rights are not unresolvable; however, strategic planning is required that views water as a vital commodity in short supply in relation to the populations in the region. There is need for long term cooperation between countries through a more economic approach. Increasing scarcity is creating a water market in the region, a fact that must be taken into account in policies of water management in the Middle East.

### Palestine

**Samer Alatout's** paper on water balances in Palestine focussed on underground water sources from four known aquifers and noted that Palestine has claim on 1,666 - 2,045 mcm of water resources, but only uses about 125 mcm of this amount. Compared to Israel and the U.S., Palestine uses a relatively small amount of water.

**Table3**

### Palestinian Water Balances

Water Resource to Which Palestinians Have a Claim	Total Resource	Used in Israel	Used in Settlements	Used in West Bank	Used in Gaza	Unused
Mountain Aquifer:	310-362	313-333	10	21-27		
Eastern Aquifer:	80-172	0	35-100	62-78	0	58
N.E. Aquifer:	131-145	101-115	5	20-25		-2
Gaza Coastal Aquifer:	60-79	5	6		73	
Coastal Aquifer:		240-300				
Jordan and Yarmuk River:	1,060-1,287 1,060-1,287	560-650 (120-220 Palestine Share)				
Total	1,666-2,045	1,219-1,403	56	103-152 (includes Springs)	73	

Going beyond numbers, **Alatout** discussed four inter-related issues. Firstly, he discussed numerous attempts at estimating Palestine's water balance, examining critically their scientific legitimacy and technical authority. His main conclusion here is the fact that estimates of Palestine's water balance are both technically uncertain and reflective of cultural and political contexts within which they are produced.

Secondly, he argued that estimating water balances is deeply embedded in politics, an issue seldom considered in the literature on water balances in the Middle East. Using new insights from the field of science and technology studies, **Alatout** pointed out that the seemingly neutral and objective language used to discuss Palestine's water balance is, in actual fact, highly political, not in the sense typically discussed by water experts in terms of political interests but rather based on the fact that there exists a culture of water expertise in the Middle East. This culture of water expertise is produced within, and shaped by, institutional, cultural, and political contexts. In that sense, he suggests that "the role of those looking for a workable water-sharing regime between Israel and Palestine is to unpack and make explicit the politics of technical jargon, rather than adding additional layers of obscurity."

Thirdly, **Alatout** points out the fact that since most water resources of Palestine are shared with other parties, therefore the issue is subject to international water law. However, while international law principle of "historic" rights is appropriate for the Palestinian-Israeli context, this is not sufficient. No less significant is the international law principle of "equitable" utilization of shared water resources in determining Palestine's water share. It is argued that the operationalization of these international law principles needs constant negotiation and collaboration among Palestinian, Israeli and international water experts and policymakers.

Fourthly, **Alatout** discusses briefly the notion of water scarcity, reclaiming it as a concept that is, and that should be, grounded in daily, lived experience rather than in technical rhetoric.

## **Discussion**

Dr. Aaron Wolf opened the discussion by cautioning Alatout about mixing up arguments regarding use and demand, and he argued for a clear distinction between the two notions. In regards to water rights, Wolf argued that although people may walk into a room talking about rights, they end up discussing needs. In negotiations, discussions about rights offer little chance of success; it is thus more productive to talk about needs.

Mr. Brooks questioned the value of long-range projections such as looking 30 years into the future when dealing with water. Instead, he argued for the need to build a scenario and then make a connection from the scenario to the needs, start first with a normative view of the future. Also he felt it is important to raise questions concerning the price of water in Israel, especially in terms of the long-term effects of wastewater treatment; and if pricing includes the price of adverse environmental effects.

Dr. Adwan questioned the concept of pricing of water and wondered if water pricing can fully incorporate the preferences, habits and needs of the people of the region,

Dr. Amery responded to David Brooks' question regarding the future impact in Lebanon, stating that massive urban migration in the country has resulted in fluctuations in water use. Therefore, while it is difficult to make predictions of the future, nevertheless, he recognizes the importance in doing so. He also felt that water quality issues should not be neglected. He was also interested in Alatout's argument about water as a determinant of identity, and wanted to hear how water affects identity formation?

Dr. Lithwick agreed that it is difficult, if not impossible, to make predictions of the future. Many elements need to be taken into account, for example externalities. Water

is critical for life quality and standard of living. However, in view of scarcity, pricing of water is essential for rationing to raise productivity as well as for safeguarding a higher standard of living.

Mr. Alatout commented on issue of rights versus needs. He argued that the question of rights is also a question of needs. For peace to occur there must be recognition of rights and a basic acceptance of rights. The perception of rights for Palestinians is very important whether we ourselves consider the rights issue relevant or not. We need to bring the two sides together and show them that the politics of rights and needs are intertwined and important for the parties. He suggested an anthropological approach where the relationship between water and people is examined, perhaps in a more inter-disciplinary approach to the Middle East water issues.

## SESSION II

### Jordan

**Dr. Adwan** concentrated on the Jordan River Basin, which many in the past have considered a potential source of conflict. But he noted that he sees it as a potential source of peace building and cooperation. Regional cooperation in water management is critical for Jordan since all of Jordan's water sources originate outside of the country. Accordingly Jordan has a shared interest in transboundary water resources.

Jordanian water policy is currently centered on the following four priority areas:

1. Management demand: the government applied a new price mechanism that increases the price of water once a certain amount is consumed. This system has yet to be analyzed; however, they speculate that the middle class will be most affected by change;
2. Public education and increase in water awareness: the government has used both cultural values and Islamic teaching for the Purpose of raising public awareness toward more responsible water use;
3. DC Project to build an underground aquifer in North Jordan: this is still in the planning stage but is estimated to cost \$600 million;
4. Drawing water from Israel z&d Turkey through pipelines.

Water issues are very much in the minds of politicians and strategists in Jordan. However, it is felt that projections and scenarios don't work in the Middle East because one cannot predict what will happen in the future. For example, the influx of refugees from the Gulf War cawed the population in Jordan suddenly to increase by 10% in 1990. This was completely unforeseen and it created major social and economic dislocation. Accordingly, a more appropriate approach is to be flexible and to see the "other" in terms of "us" if regional cooperation is to occur, yielding concrete results.

As regards, water security and availability, Dr Adwan noted the following:

1. Security in controlling head waters is important, but this should not be the concern of one government alone, rather it should be the concern of the entire region;
2. There should be a “safety net” in water management to ensure equitable distribution while meeting the demands and needs of everyone in the region;
3. Schemes of regional cooperative management of water are required to promote political and managerial resolution to the issue of scarcity; and
4. A cost-benefit analysis may be appropriate if water is to be treated as an economic issue, but at the same time other factors must be dealt with before hand, for example productive employment of labour.

## **Egypt**

**Dr. Serag El-Din** noted that the Nile accounts for 99% of water balances of Egypt; however, ground water resources are seen as having great potential for growth in future. Seismological mapping and exploration is currently underway to determine this potential.

The largest percentage of water consumption is in the agricultural sector. There is a need to explore ways to divert the Nile water into the desert as a means of increasing food production to feed the country’s growing population. As well, there is need to focus research on new crops that will grow under these conditions in the desert and with ground water irrigation.

Another significant factor in the Egyptian water scenario is the discussions with Libya over the joint development of the aquifer on the Egyptian-Libyan border.

## **Turkey**

**Dr. Mehmet Tomanbay** began by noting that although Turkey may have the largest volume of water in the region, it is not a “water rich” country (it has only 1/5 of the water that true water rich countries like Canada have). There are inequalities in the water supply from region to region. Average precipitation in Turkey is 640mm but differs greatly from region to region. For example, Istanbul, Ankara as well as central and southern Anatolia, all face water shortages, especially in the summer months. Rapid population growth, industry and increases in the standard of living have all caused a reduction in the amount of water for domestic use and for potential exports.

The Euphrates and the Tigris are the two most important basins of water in terms of ground water flows. In spite Turkey’s growing water needs, especially in view of the big South Anatolian Project (see below the section under GAP, the Turkish acronym), the Turkish government is committed to equitable water sharing with its neighbors, Syria and Iraq. In addition, Turkey is willing to export the water from its national rivers, which is now flowing freely into the sea. Thus, a water export terminal has been built at Manavgat near Antalya and water is already being shipped to North Cyprus in Norwegian balloons (see Dr. Bicak’s paper below).

The GAP multi-purpose river basin development in Southeastern Turkey is a mega-project, largely financed from domestic sources, owing to on-going dispute with Syria and Iraq. Its main objectives are as follows:

1. To develop Turkey's poorest and most "backward" region; and
2. to reduce economic disparity and raise the economic welfare of the Kurds who largely populate the region.

The GAP project includes 22 dams, 19 hydroelectric plants and 2 irrigation tunnels as well as 13 subprojects. After its full completion early in the 21<sup>st</sup> century, it is hoped that Turkish crops with double or even triple, employment will increase in the area, the Turkish economy could increase by 12% or more, the GNP will grow four-fold and rural out-migration will slow down.

The GAP's master plan is to transform the region to an economic and export base. The project is now concentrating on building infrastructure, health and tourism as new enterprises for the region with emphasis sustainability and human development.

Dr. Tomanbay believes that GAP will be constructed and finished earlier than originally expected due to the government's eagerness to finish and reap its socio-economic benefits.

### North Cyprus

**Dr. Hasan Bicak** reviewed water balances in North Cyprus. In his remarks, Dr. Bicak noted that there has, for some time now, been a steady reduction in rainfall and that this problem has been further aggravated by the wasteful traditional (flooding) methods of irrigation has resulted in over-extraction of water from the country's natural aquifers.

There is, of course, some potential for new water resources and more efficient water use. These include:

1. The Modern Irrigation Project in Gael Yurt, the cater of citrus growing, where the old flooding system of irrigating citrus trees is now being replaced by a tip method that mixes water from the reservoirs with fertilizer;
2. New and deeper wells;
3. Waste water treatment plants; and
4. The Yesilermek Dam project.

So far domestic measures to support the demand deficit appear to be barely sufficient, but Cyprus as a whole is starting to experience a water shortage.

In the summer of 1998, importing water from Turkey has now commenced on a pilot project basis. A Norwegian firm has shipped water for \$0.55 per mc, ships water from Turkey and sells it to N. Cyprus. The "balloons" have a capacity of 10,000 - 20,000 mc. The shipment technology has had some problems, such as mooring the water begs at

the receiving terminal, as well as difficulties with regards to insurance policies and financial costs which are likely to be overcome shortly.

Importing water from the Turkish mainland to North Cyprus is a small-scale case study, but it represents a significant model for testing new technologies of large-scale water shipment in the emerging Middle East water market. The “balloon” technology, currently used by the Norwegian firm, is one technology. Alternative technologies include tankers and pipelines. Indeed, a feasibility study conducted by Dr. Bicek and Jenkins, reported at the Workshop, concluded that the transportation cost of per cmc of water imported from the Manavgat export terminal in Turkey to Kumkoy in North Cyprus would be on average \$0.46 per cmc. This figure compares the figure of \$0.55 per cmc for the Norwegian “balloon” alternative. Both figures are simply shipping costs, and do not include charges for water. Nor do they include infra-structural and operating costs in North Cyprus. When the latter costs are included, the unit cost of increases to \$0.79 per cmc, a figure that is still some 50% less than alternative supply options such as desalination.

## **Discussion**

Michael Austrian, an observer, asked if and when Turkey starts charging North Cyprus for water is this when they might lose interest. Dr. Bicak replied that the water pricing is still heavily subsidized, but ultimately prices must reflect the economic costs. At the moment Turkey is providing North Cyprus free water.

Dr. Lithwick asked what is the price of water at Manavgat? Dr. Tomanbay replied by stating that there are political issues surrounding export of water to North Cyprus as well as the technical matter of demonstrating the feasibility of a new technology for large-scale water movement. Is Turkey willing to export water for an extended period and to other countries? We cannot say at this stage, it is a matter of negotiation.

Mr. Brooks asked a question to Dr. Adwan: Jordan faces water shortages, what is your long-term solution to these shortages? Dr. Adwan responded by identifying the following options for Jordan: 1) Pipeline from Turkey or Iraq; 2) desalinization from Dead Sea.

Mr. Alatout raised his concern that political factors are not taken into account when discussing the sale of Turkish water. For example, North Cyprus is not internationally recognised as a country, except by Turkey, while the GAP project is influenced by the Kurdish problem. Dr. Bicak responded by pointing out the primacy of economics: “if the price is right they will find customers.” He also pointed out that risk sharing in long-term water contracts is important in determining there viability of water exporting.

Mr. Alatout again voiced his concern about the geo-politics of the cooperative water projects. He suggested that North Cyprus would be willing to pay in order to be attached to Turkey, but what if it means war with Greece? Does Turkey have an inherit interest in creating an umbilical cord with North Cyprus?

Dr. Mehmet commented on these questions. He pointed out while Turkey is bringing water to North Cyprus to help with socio-economic development, South Cyprus is acquiring armaments, such as the controversial S-300 Russian missiles, and threatening peace in the region.

Dr. Adwan noted that the GAP projects fails to mention transnational issues. This implies that the Euphrates and the Tigris are solely Turkish and not belonging to the Middle Eastern countries. Dr. Tomanbay observed that 95% of the population in the south of Turkey is Kurdish. One can make a direct connection between the project and the Kurds as they are receiving direct benefits from the irrigation and community centres established in the south. Furthermore it has improved relations between the local Kurds and Turks through development and shared prosperity. The GAP project has the potential to solve the Kurdish problem by solving the poverty issue in the area and raising the standard of life in the region.

### **SESSION III**

#### **Promoting Regional Cooperation**

**Dr. Aaron Wolf** reported on his on-going research focused on water related treaties, utilizing the International Crisis Behaviour data set. He emphasized that solutions to the Middle East water problem must be creative and innovative.

As regards the Middle East Peace Process, at first everyone was thinking in traditional security terms, namely territory and resources, for example the stalemate over the Redline in the Golan Heights was quite representative of the mind set in the region. Thus, in Oslo II we see that territory is not tied to water as a negotiating factor. Territory is not a driving force behind water negotiations, creative management is. For example land was returned to Jordan and the water on it was leased to Israel (Israel farms and manages the water). The idea that one needs to keep territory in order to protect the water is no longer tenable.

In negotiations between Israel and Jordan it boiled down to rights versus allocations. Therefore the mediators in these negotiations managed to break the deadlock by coining the term “rightful allocations” to be used in the treaty and now in international law. While this was helpful in Israeli-Palestinian negotiations, it has not helped the Syrian question. Here two opposing views of water resources under the Golan Heights (one Syrian and one Israeli) remain unresolved.

Dr. Wolf then outlined various options for resolving trans-boundary waters which include the following:

1. Water management options that increase the supply and availability of water;
2. Adoption of a broader perspective of region from Egypt in the South to Turkey in the North; for example Egypt could pipe water to the Sinai and Gaza, and the Latani river could be used to get water to Israel and the West Bank, or Turkish water imports could be utilized;
3. In evaluating these options, it is necessary to look at engineering, environmental, economical, and political variables. It is also important that one should take into account of the “gut feeling” of each party and where they stand vis-a-vis the others.

Dr. Wolf concluded by briefly reviewing “techno-political options.” These include:



- The need to look at short and long term crisis and management, to determine what are the areas most in need (e.g. Gaza) and how can we help them now; and
- The importance of planning time required for such big projects to be realized. “We need to start planning for the future now, even if it may not seem feasible and whether we like the options or not.”

## Discussion

An observer asked a question regarding the geo-political dimensions of Middle East water, pointing out that water is “a strategic target.”

Dr. Lithwick replied that the parties overrate much of the debates over “geo-political” issues. He suggested that water needs to be looked at as a separate issue, and that there is an urgent need to look for “creative options” and as academics we can all do this.

Dr. Amery’s response on “geo-politics” of Middle East water was to emphasize the need to make stronger efforts to bring in people from Syria and Iraq in order to discuss fully the debate.

Mr. Alatout argued that “politics” are problematic. But, there is a need to be careful that it does not come out as the most pressing issue all the time and thus impeding us from looking at the other issues on the table.

Mr. Wolf argued that agreements come out of disputes, the water agreements between Jordan and Israel stem from the Peace Talks, where both sides had already vented out their problems and gotten to know each other.

Dr. Mehmet intervened in the discussion by noting that “geo-politics can be seen as the pursuit of national interests.” We have to recognize that in the region there are conflicting national interests. The critical challenge is how do we balance interests, in order to promote peace building and arrive at cooperative solutions. The key fact is that early in the 21<sup>st</sup> century, the region will be a critically water-stressed region and will have to rely on water imports. Dr. Wolf’s presentation was useful precisely because it has shown us how creative old enemies can become!

Mr. Brooks noted that if geo-politics are symbols then maybe we need to deal with the symbols, in this case water.

Prof. Alan Steeves, speaking as an observer, drew attention to water loss from high evaporation in the area. These rates are as high as 50%. Therefore, why are we discussing the building of dams and canals? Will they really fly? Secondly, if the price of water is between \$.60-.70 per mc, then would this not put the agricultural sector out of business?

Dr. Sadar agreed with this position. At professional level we know that we cannot manage water basins unless we have some sort of agreement to deal with the ecological systems. Dr. Tomanbay stated that environmental questions in the GAP project are becoming a great issue for the entire country. For example, there is now a Green Peace chapter in Turkey.

Mr. Alatout offered an ecological suggestion. Let the Jordan River go back to its old water shed. Furthermore he pointed out that Israel does have many environmental NGOs; yet it remains difficult to talk about water quality with Palestinians. Dr. Adwan observed that Jordan is concerned about Israel’s pollution of the Jordan River and the

Gulf of Aqab'a. Dr. Amery added that there is a correlation between the standard of living and environmental concerns.

Then there was a brief discussion about the "shadow price" of water. Dr. Bicak stated that he believed the shadow price of value of water in North Cyprus is greater than \$0.6 cm. However, Dr. Mehmet was hesitant to say what the shadow price is until one knows what the equilibrium price is, which at this stage of our knowledge is a distant prospect.

The Workshop concluded with a strong consensus on (a) the benefits of this type of inter-disciplinary research group on Middle East Water, and (b) the need to continue with future Workshops. Thereupon, Dr. Adwan offered to host the next Workshop at Yarmouk University, Jordan, in a year's time.