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Water challenges in the MENA region

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KEYNOTE ADDRESS

Distinguished Audience,

I owe my participation in this conference to Madam Miriam Balaban whom I had the pleasure to meet over a year ago. Then she asked me to deliver a keynote address here. I am pleased to be with you and am grateful to Madam Balaban for her kind invitation. I regret I could not make it to the opening session because I was tens of thousand miles away.

In my address I choose to talk to you about the water challenges and opportunities in the MENA region, which has the highest per capita share of arid lands, and is home to the largest fossil oil reserves and a high intensity of solar energy.

At the outset, I want to emphasize the many faceted features that generate the water challenges everywhere in the world and stress their significance in the developing world and in arid and semi-arid regions like MENA. A one-dimensional analysis of the subject is never complete nor would it lead to an optimum approach in facing these challenges.

Water, as we all know, is an indispensable ingredient to life in all its forms. From this very fact one should realize the multi-dimensional nature of its impact on all walks and aspects of life. It is worthy in our gathering here today to allude to the natural synergy of water and energy, and to the impact of both on the economic and social development potential of the country concerned, on its gross national income and the resulting standard of living that can be attained and maintained. Suffice it to note that water is composed of two atoms of hydrogen, an energy source, and one atom of oxygen, an oxidizing gas needed for combustion.

Without energy the global water cycle would not be possible; the energy input in this cycle is in the form of solar energy, heat energy, wind energy, potential (gravity) energy. Water service to users cannot be done without energy input, be it gravity or electrical energy. During the cycle, energy can be partly recovered by utilizing waterfalls, natural or man-made. In the course of desalting sea waters, energy is an indispensable input. In this regard the slogan "energy for water" holds true, but also the inverse slogan, "water for energy" equally holds true.

It is also important to bring to the fore the fact that no country in today's world can survive in isolation from the community of nations. Commerce is a basic feature of relations between nations and a factor in meeting needs that cannot indigenously be met. It has been so since the dawn of human civilization.

The MENA region is basically a semi-arid but mostly arid region. Except for the Fertile Crescent, the southwest corner of the Arabian Peninsula and the northwestern corner of Africa, food production in the region is not possible without irrigation. Rivers in the region provide the majority of perennial flows but cross international boundaries and the MENA countries (except for the Orontes) are on the downstream. Likewise, renewable groundwater aquifers are shared with neighboring countries. Non-renewable groundwater aquifers are vast in their extension but vary in their water quality. These too underlie territories of neighboring countries.

While MENA is on the arid side of water availability, it is home to the largest energy reserves in the world. Some countries, like Iraq, are blessed with water and energy resources; others, like Lebanon, are blessed with adequate water resources; and many other countries, like the GCC members and Libya, have energy resources but lack water resources. A few others, like Jordan, Palestine

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and Tunisia, are blessed with neither of these essential natural resources.

The economic status across the MENA countries, reflecting the levels of economic development, is not uniform. There are high income countries by virtue of the energy resources like most of the oil exporting countries; there are upper-middle income countries like Oman and Lebanon; lower-middle income countries like Syria, Iraq, Jordan, Egypt, Tunisia, Algeria and Morocco; and low-income countries like Yemen and Mauritania. The water challenges that these countries face could be identical but the opportunities in their management are not essentially the same.

Within the economic development context, I like to remind us all that the levels of indebtedness of the MENA countries are not the same. There are debt-free countries like most of the oil exporting countries; there are moderately indebted countries and highly indebted countries. The ability of such categories to meet the water challenges is not the same either.

The economy system of the MENA countries is not alike in all of them. Some countries like Jordan and Egypt have chosen a free market economy while Syria, Libya and Algeria have centralized economies. The GCC countries, although following a free market system, provide substantial funds in their budgets for water and wastewater subsidies. The rest of the countries occupy a position in between. This economic diversity makes the approach to meeting water challenges as diversified.

Finally, the level of human resources development, although improving in many countries of MENA, leaves much to be desired. Lebanon, Jordan, Syria, Egypt, Tunisia and Morocco have achieved moderately advanced levels of human resources development although not at parity with each other either. The rest of the countries are progressing in this regard at a good pace.

With this background, we proceed to address the challenges and the potentials for opportunities. A country-by-country assessment is not the aim of this paper, but rather an overall assessment that shows the average situation in the region. It should be kept in mind that averages conceal disparities and nothing like a detailed country-by-country assessment gives the focused picture of the water situation in the various countries of MENA.

1. Imbalance of the population-water resources equation

This equation is reflected by the per capita share of renewable water resources. The population count is straightforward but the evaluation of water resources potential has not been as such. By this I mean that blue water, which is the sum of surface and groundwater resources, is mostly well defined and known for practically all the countries of MENA. What has not been adequately determined is the blue water equivalent of green water, which is the water stored in the soil and supports rain-fed agriculture, grazing lands, forests and wild vegetation. However, an attempt has been made by the author to quantify green water resources pertinent to food production. The author further attempted to quantify the water flow per capita needed to meet the purposes of municipal, industrial and food production uses. Thus the entire water resources of an arid or semi-arid country, including the green water, can be evaluated and the per capita share of such resources can be derived easily [1]. The per capita share is a time-dependent variable that is a function of the population growth, and the sustainability of the renewable water resources, including green water, and their protection against losses or quality degradation or both.

Meeting the challenge of the imbalance in the population-water resources equation entails several approaches addressed below.

1.1. Protection of water resources

This option is probably the least expensive. Every effort should be made to protect blue water resources against quality degradation. Water is needed to enhance the environment. In this regard the slogan "water for the environment" holds true, but the inverse slogan "environment for the water" holds true as well; similar efforts should be made to protect the arable lands, the reservoir of green water, against urbanization. Every dunum of arable lands lost to urbanization entails the annual loss of 250 m^3 of green water. The state should thrive to protect its share of international waters and transboundary waters.

1.2. Supply management

This has been the easy approach to balancing the population—water resources equation. It entails further capital expenditure, something that families do not feel affecting their budgets especially if the taxation system avoids increases of taxes to build water and wastewater projects. This approach is financed by the government treasury either through its own indigenous resources or through borrowing from various sources. Concessionary loans are extended to developing countries by specialized lending institutions which are the arm of the respective governments or of the United Nations system. Commercial loans are available from financial institutions to governments and to contractors bidding on

water projects on a BOT basis. The cost per cubic meter of new supplies is a function of the cost of capital. There could be an investment insurance cost, especially in the MENA region where eruption of violence is a risk to be reckoned with.

If the renewable water resources are exhausted, supply management will have to depend on:

- Desalination of brackish water or seawater for municipal and industrial uses, an approach that has been steadily adopted by the GCC countries to the extent that they house over 80% of the world's desalination capacity. However, this approach cannot be adopted in countries of lower-middle and low-income simply because they cannot afford meeting the cost thereof.
- Collection, treatment and reuse of municipal wastewater for agricultural and industrial uses. It simultaneously serves the environment. The cost of treated wastewater shall be borne by the users of the effluent and by the environment. This approach has been adopted by Jordan, Tunisia, Egypt, Yemen and Saudi Arabia to give some examples.
- Rehabilitation of networks, an approach that helps minimize the leakage of water from networks and makes more water available for use.
- Inter-basin transfers, a measure adopted when the water resources in the vicinity of urban areas are exhausted. Examples exist in Jordan, Syria, Lebanon and Saudi Arabia, among others. Such transfers may involve more than one country in the future.

1.3. Demand management

Although less costly than the option of supply management, this approach is adopted almost reluctantly in MENA. It has domestic political impacts that make politicians hesitate to adopt it. Demand management approach features the following:

- The primary feature of this approach is adjustment of water tariffs to approach a set goal of cost recovery. Such a move is not popular in traditional Arab and Muslim circles. However, some countries have taken bold steps in that direction. Jordan, for example, issued a water tariff structure that is capable of recovery of the operation and maintenance cost of water service and part of its capital cost. Although cross subsidies from the "haves to the have nots" is clear in the water tariff structure, the government treasury is still subsidizing the capital cost or most of it.
- As stated earlier, high-income countries of the region are still subsidizing the water service. However, their economic structure and their high revenues make that affordable by their treasuries.
- Increasing the output of a unit flow of water and that is achieved by adopting advanced irrigation methods and advanced agricultural practice. It is also achieved by introducing water saving devices in the homes and industrial plants. While several countries have adopted advanced irrigation methods and agricultural practices, like Jordan, Lebanon, Syria, Saudi Arabia and Yemen, among others, more has to be achieved in this regard especially in propagating the practice in all irrigated areas in the region. More attention is yet to be paid to improving the output of a unit flow of green water. A lot has to be done in this field to reinforce the efforts of research and extension services, and to devise innovative methods of private-public partnership in this sub-sector.
- Public awareness — In this regard a lot has been achieved in water strained countries, and more has to be done in the rest of the MENA countries.

1.4. Reliance on shadow water

Shadow water is the water saved domestically through commodity imports. Without exception, all MENA countries display a chronic deficit in foreign trade. It has to be remembered that imported commodities, like indigenous manufactured commodities, take water to be produced. Thus imports substitute consumption of indigenous water with exogenous water. Shadow water helps balance the population-water resources equation. Jordan's water resources, for example, have the potential today of producing 20% of its production requirements goods. The balance of its requirements is met by shadow water.

The other countries of MENA are not much better off. Egypt's water resources have the potential of meeting 55% of its needs; Lebanon 75%, Yemen 42%, and so on. Only Syria and Iraq have the potential of meeting their needs and balance their foreign trade in food commodities.

Disadvantages of reliance on shadow water are several including exporting jobs, the imperative of foreign currency earnings to service trade, food security in times of crisis, among others. The advantages outweigh those disadvantages since the balance of the population-water resources equation cannot be maintained without shadow water.

2. Management of international and trans-boundary waters

By international waters I mean the surface water courses, and by trans-boundary water I mean the groundwater aquifers shared by two or more countries.

Both types exist in the region and the status of them is summarized as follows:

- *On the Tigris*: no riparian agreements exist, and the riparian countries are Turkey, Syria and Iraq.
- *On the Euphrates*: A bilateral agreement has been in existence since April 1990 between Iraq and Syria by which the two countries share the flow that crosses into Syria from Turkey at a ratio of 58:42 for Iraq and Syria respectively. That agreement does not include Turkey, who had worked out an understanding with Syria in 1989 to send in the Euphrates across their borders some 500 m^3/s that Syria is to share with Iraq. This flow represents almost half of the river flow.
- *On the Shatt el Arab waterway*: The riparian parties here are Iran and Iraq, and the dispute is mostly territorial. Its tributary, Nahr al Qaroun, rises in Iran and discharges into the Shatt with Iran exclusively using its waters. An agreement was concluded in 1974 in Algiers between Iran and Iraq that addressed the territorial issue of the Shatt among other issues of political dispute. The thalweg line was defined as the borders between the two countries. However, Iraq revoked that agreement in 1981 concurrent with the thrust of Iraqi troops into Iran.
- *On the Orontes*: A bilateral agreement was worked out between Lebanon, the upper riparian party, and Syria, the middle riparian. Turkey, the downstream riparian, is not included in any official transaction concerning the Orontes. This is because of a territorial dispute between Turkey and Syria. The part of today's Turkey in which the river flows before it discharges into the Mediterranean is the Alexandretta Province. The province had been a part of the Syrian territory until 1939 when France, the mandatory power over Syria, gave it away to Turkey. Syria contests the annexation of the province to Turkey. Without that province, Turkey would not be a riparian party on the Orontes.
- *On the Yarmouk*: A bilateral agreement existed between Jordan, the middle riparian, and Syria, the upper riparian, from June 1953. That agreement was replaced by another in 1988. The river was on the agenda of bilateral negotiations between Jordan and Israel and a bilateral agreement was concluded between them as part of the 1994 peace treaty between the two countries. Palestine, a partner in the water sharing, is yet to be included.
- *On the Jordan*: the riparian parties on the upper Jordan before it discharges into Lake Tiberias are Lebanon on the Hasbani, Syria on the Banyas, Israel on the Dan and Israel, Syria and Palestine on the river course. No agreement has been reached between any two parties on this river. Israel has been using the entire share of Palestine and Syria and most of the share of Lebanon since 1967.
- *On the Nile*: A bilateral agreement has been in existence between Egypt and Sudan since 1959 in which Sudan gets 18.5 bcm/y and Egypt an average of 54.5 bcm. An effort is on-going to reach a multilateral treaty on the Nile sponsored by the World Bank and supported by CIDA and UNDP.
- *On the Senegal*: The riparians here are Guinea, Mali, Senegal and Mauritania. The Organization for Development of the Senegal River, OMVSs, fundamental conventions of 1972 and the Senegal River Water Charter signed in May 2002, which establish its legal and regulatory framework, clearly state that river water must be allocated to the various use sectors, not to the riparian states in terms of volumes of water to be withdrawn, but rather to uses as a function of possibilities. The various uses can be for agriculture, inland fishing, livestock raising, fish farming, tree farming, fauna and flora, hydroelectric energy production, urban and rural drinking water supply, health, industry, navigation and the environment [1].

It is clear that, with the exception of the Senegal, none of the above agreements is all inclusive. Many of the existing agreements above lack water quality provisions, an issue that is expected to cause more conflict in the future, especially on the Euphrates.

An equally important issue is the absence of any agreement over the trans-boundary groundwater aquifers, both renewable and fossil water. There are hardly any two adjacent countries in the region void of a common trans-boundary aquifer. Such aquifers are renewable as the case between Turkey and Syria, Syria and Jordan, Lebanon and Israel, and the Palestinians and Israel. They can also be fossil as the case between Jordan and Saudi Arabia in the Saq aquifer, and between the latter and each of the GCC countries and Yemen; or between Egypt, Sudan, Libya and Chad.

The absence of international agreements over the shared water resources is not comforting. It should be stated that aiming at such international agreements would facilitate easing the tensions in the region and starting a new era of cooperation. This makes the aim a formidable challenge.

3. Human resources development

Inasmuch as "water for the people" is a valid slogan anytime and anywhere, the inverse slogan, "people for the water" is equally valid. In all countries of the region, water is treated as a public good. The public sector is in charge of development and management of the water

systems, and legislation reflects the ownership of the public of the water resources.

As water strain persists and intensifies with time, water management demands the employment of technical and managerial skills of which the region is in short supply. Human resources development centers should be set up to enhance the supply of managerial skills.

Additionally, water infrastructure ages with time and requires replacement. Current management response to water emergencies leaves much to be desired. Unaccounted for water runs at high percentages and needs to be controlled. Continuous education of water officials needs to be institutionalized and practiced to enhance management efficiency.

Good governance is key to successful water management, and well organized public awareness campaigns are important in this regard. It should be a process of inclusion whereby shareholders have a say in decision making in the water sector.

As a sign of the need for more efficient operations in water resources management, some countries in the region, inspired by donor agencies, reverted to management contracts to manage their water and wastewater services. Morocco, Gaza, and Jordan are examples. Some countries have pursued privatization of the water services like Jordan who established water companies in Aqaba and Amman yet totally owned by the public sector.

4. Social and economic development

Social and economic development impacts the water sector and water directly impacts the development potentials. These potentials set the mode for water policies regarding financing options of water and wastewater projects, and for pursuing the objective of full cost recovery.

A direct mutual impact of water and social and economic development is the real cost of water delivery and the affordability of the consumer to meet it. None of the countries of the region has set the water tariff in a pattern that enables them to achieve full cost recovery. Obviously, Treasury subsidies should not be a standing policy, and cost recovery is essential especially in the case of indebted countries. However, the affordability of the consumers to meet the real cost of water heavily depends on the gross national income. Cross subsidies can be designed to have wealthy consumers subsidize the less fortunate. In the context of mutual impact of water and development, the slogan "water for development" is valid, but equally valid is the inverse slogan, "development for water". Development accumulates wealth needed to achieve cost recovery. Economic development has, therefore, to be accelerated in the lower-middle income and low-income category countries so that 2% of the GNI can be set aside to meet full cost recovery, and this aim is so far for many of the countries in the region.

5. Allocation and re-allocation of water resources

Because of the population growth and the industrial development in the MENA countries, the need for municipal and industrial water is on the rise. In several cases local water resources were exhausted and water from afar had to be conveyed to urban centers to meet municipal and industrial needs. Cases are evident in Jordan, Saudi Arabia, Lebanon and Syria, among others.

With the population increase, the need for food escalates. Water allocation to agriculture was made when local resources, close to urban centers, were sufficient to meet municipal and industrial needs, but the growing needs for municipal and industrial water started to erode the water shares of agriculture. Examples in the region exist in the capitals of Syria and Jordan.

Financial and economic returns from municipal and industrial water are more attractive than parallel returns from agriculture. Calls for diverting agricultural water to municipal and industrial uses are heard in several countries under the pretext of letting the market forces decide the water allocation or re-allocation. This challenge carries major issues to the region and is worth of examining:

First: the tariff set for municipal and industrial and agricultural water at this time has not been dictated by market forces. So, looking at the current returns from industrial and municipal water per unit flow may not be realistic in a free market environment.

Second: the value added and export potentials have to be factored in when the alternative allocation is suggested before a decision is made to re-allocate.

Third: water allocation to agriculture creates jobs at a much less capital cost per job than offered by tourism or industry to which the diversions are intended. These jobs help maintain a balance in the population distribution over the territories of the country. These are important factors to reckon with as one compares the benefits from water allocation to various sectors.

Fourth: the social, environmental and demographic benefits, usually ignored in the free market environment, accruing from the targeted beneficiary sectors, have to be compared to those accruing from agriculture.

Fifth: communities and settlements cannot exist without water. If agricultural water, benefiting the rural areas, is to be re-allocated to municipal and industrial purposes, the cost of people's migration to urban areas has to be assessed.

6. Can a crisis be averted?

I believe there are opportunities to successfully meet these formidable challenges if the political will in the country concerned so decides. There have been easy solutions that generated immense environmental problems. I refer in this regard to the diversion of irrigation water to municipal uses mentioned above. It has to be remembered that agriculture is a historic profession of the people of the Middle East by which civilization dawned, and it is not easy to eliminate or shrink a trade that has been running deep in the history and culture of the region.

Facing the challenge of water supply, fossil water, treated as a strategic reserve, can be mobilized to meet the needs of municipal and industrial purposes. Justification for that is simple. Fossil water, like fossil oil, is depleted with use and passage of time. Energy has become so vital to the sustainability of human civilization so much that running out of energy resources is not an option. Mankind will have to discover a new form of energy source that is affordable and environmentally friendly to replace fossil fuel before it runs out[1]. At such a time, desalination technologies will have been improved to reduce cost, and the new affordable energy source will enable man to desalinate sea water, meet the municipal and industrial needs, and proceed to treat the wastewater for use in agriculture.

The water challenge is many-fold as listed above diagnosis indicates. The response to the challenge can be summarized as:

- Preserve the available water resources against degradation; augment the usable resources through the treatment and reuse of municipal wastewater and agricultural drainage water. Such undertakings require environmental and health controls, and they, in turn enhance the environment. This proves the validity of the reversible slogan: environment for the water and water for the environment.
- Pay due attention to the training of human resources and to their continuous education to optimize their number, reduce operations cost; install upgraded systems of water management both in terms of hardware and software (water for people and people for water).
- Enhance and upgrade water governance; make transparency part of the water management phases; devise workable accountability systems; minimize and eradicate corruption of all kinds, and enhance public participation and public awareness.
- Accelerate the pace of economic and social development; improve the national income and its distribution pattern in order that cost recovery can be attained (water for development and development for the water).
- Restructuring of the water sector to improve responsiveness to needs; over-employment should be minimized as jobs become available elsewhere in the wake of accelerated development.
- Be aware of the linkage of water, energy and the environment while plans are made for water resources utilization (water for energy and energy for the water).
- Call on fossil water for use to meet municipal and industrial demands until such time as seawater can be desalinated at an affordable cost.

International parties can help in their capacities as:

- Development partners: by focusing on assistance to restructure the water sector and by extending technical support and capital assistance where needed.
- Lending agencies: promote and maintain a high level dialogue on the sector reforms and their requirements and follow-up.
- Research promotion: by supporting research and technology transfer to maximize the yield of a unit flow of water.

7. A community of water and energy

We have alluded in the above to the challenges to be faced in international rivers and trans-boundary waters. We have not embarked on addressing potential conflicts over shared fossil oil fields like the Rumeil field between Iraq and Kuwait and potential fields that may be trans-boubdary between Iraq and Iran, or Saudi Arabia and its neighbors.

Water and energy have a lot of synergy between them as mentioned above. Both have been sources of tension. The military conquests in the Middle East, for example, can hardly be disassociated from designs for the oil reserves in it.

To promote the understanding of water and energy conflicts and explore potentials for conflict resolution, it is perhaps a wise idea to advance the notion of establishing in the MENA region a Community of Water and Energy following the successful European experience undertaken in 1951 when the Community of Coal and Steel was established to put an end, once and for all, to the conflicts over coal and steel that triggered wars between Germany and France and the rest of Europe. A

[1]Reference is made to the inventions by MIT researchers of a fuel cell that can store hydrogen and oxygen from water (Science Magazine of 31 August 2008), and to UCLA researchers discovering x-ray emissions from peeling scotch tape off the surfaces they are stuck to (Yahoo, September 22, 2008).

call for the establishment of such a community has been voiced recently by prominent world thinkers like President Vaslav Havel, HRH Prince El Hassan Bin Talal, Fredrick Willem de Klerk, Mike Moore, Desmond Tutu, Richard von Weizaecker, and others. A similar idea was advocated about the same time by Joshka Fischer.

May be it is just about time to initiate efforts toward establishing such a community. It can be a cornerstone for peace making and peace building in the region.

I must have taken more time than I intended to; I thank you for being such a listening audience.

References

[1] M.J. Haddadin, Quantification and significance of shadow water in semi arid countries, Water Policy, 9 (2007) 439–456.